BERGRIVIER MUNICIPALITY

Disclaimer

Version Control:

Status	Description	Date	Reference
Version 1	Draft 2021/2022 Annual WSDP Performance- and Water Services Audit Report	26 October 2022	Project No. P08355
Approval	Final 2021/2022 Annual WSDP Performance- and Water Services Audit Report	Will be submitted with Annual Report	The Mun will forward the Council Resolution for the approval of the Audit Report to the DWS.

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PROJECT P08355 - BERGRIVIER MUNICIPALITY: ANNUAL WSDP PERFORMANCE AND WATER SERVICES AUDIT REPORT FOR 2021/2022

REV	DESCRIPTION	ORIG	REVIEW	IX ENGINEERS APPROVAL	DATE	CLIENT APPROVAL	DATE
Draft	Draft issued for external review	R Kuffner	JT Human		26/10/22		26/10/22
		Author	A Reviewer	Approval		Approval	
Final	Final Report for Council approval	R Kuffner	JT Human		27/10/22		27/10/22
		Author	A Reviewer	Approval		Approval	

FOREWORD:

Bergrivier Municipality is required in terms of Section 18 of the Water Services Act, 1997 (Act No.108 of 1997), as well as the "Regulations relating to compulsory national standards and measures to conserve water", as issued in terms of sections 9(1) and 73(1)(j) of the Water Services Act, to report on the implementation of its WSDP during each financial year and to include a water services audit in such an annual report.

The WSDP Performance- and Water Services Audit is designed to monitor the compliance of Bergrivier Municipality with these regulations. It also assists the communities within Bergrivier Municipality's Management Area and the DWS to assess how well the Municipality is performing relative to their stated intentions and their capacity. The WSDP Performance- and Water Services Audit Report can be seen as an annexure to the Municipality's Annual Report. The Annual Report is compiled as required by the Local Government Municipal Systems Act, Act no 32 of 2000 (Section 46) and the Local Government: Municipal Finance Management Act, Act no 56 of 2003 (Section 121).

Bergrivier Municipality's Vulnerability Index for 2022 was indicated as 0.28 "Moderate Vulnerability" for the 2022 Municipal Strategic Self-Assessment (MuSSA). The only areas of concern evident from the 2022 assessment is Financial Asset Management (40.0%, Extreme Vulnerability).

The water and sanitation services of Bergrivier Municipality is managed in a financially sustainable manner, with a surplus generated on the operation and maintenance budgets of both services for the last thirteen financial years. The Operation and Maintenance budget allocated towards the operation and maintenance of the existing water and sewerage infrastructure is adequate, but the budget allocated towards the replacement of old water and sewerage infrastructure needs to be increased. A budget of approximately 2% of the total asset value per annum should be allocated towards the replacement of existing infrastructure. In the case of the operations and maintenance of the systems, a budget of approximately 1% to 2% of the value of the system is typically required to ensure that the systems remain in good condition.

Bergrivier Municipality successfully completed various capital projects over the last financial year. The capital budget expenditure, for the 2021/2022 financial year, was R5.310 million (99.1% of the budget) for the water infrastructure projects and R9.993 million (90.6% of the budget) for the sewerage infrastructure projects.

The implementation of the WC/WDM measures were extremely successful, especially over the drought period. The average annual growth percentage in total raw water requirements for Bergrivier Municipality over the period 2010/2011 to 2021/2022 was -0.80 %/a. The overall percentage of NRW for all the internal distribution systems was a respectable 15.4% for the 2021/2022 financial year.

The Western Cape experienced a severe drought over the period 2015 to 2017, with some relief during the 2018 to 2021 winter months. The drought over the period 2015 to 2017 reduced the safe yield of the WCWSS (Velddrif and Dwarskersbos) and the Municipality's own existing surface and groundwater resources. The Municipality therefore continue with their WC/WDM measures to lower the current and future water requirements and investigations of augmentation options for the existing water resources.

Operational and Compliance Water Quality sampling programmes are implemented by the Bergrivier Municipality and the West Coast District Municipality. Operational and Compliance Effluent Quality sampling programmes are also implemented by Bergrivier Municipality at the various WWTWs. The water quality performance indicators of all the water distribution systems in Bergrivier Municipality was categorised as either "Good" or "Excellent" for 2020/2021, except the "Acute Health Microbiological" indicators for Piketberg and Dwarskersbos and the "Operational Efficiency" indicator for Eendekuil that were categorised as "Unacceptable".

The overall percentages compliance of the water quality samples taken over the period July to June for the last three financial years are indicated in the table below (SANS 241:2015 Limits).

Overall percentage compliance of the water quality samples taken over the period July to June for the last three financial years for all the systems															
Acute Health						Chronic Health (%)			Aesthetic (%)			Operational Efficiency (%)			
Chemical (%)			Microbiological (%)												
21/22	20/21	19/20	21/22	20/21	19/20	21/22	20/21	19/20	21/22	20/21	19/20	21/22	20/21	19/20	
100.0	100.0	100.0	94.9	98.0	99.8	99.8	100.0	99.3	99.0	99.0	99.6	94.7	95.6	94.4	

The overall percentage compliances of the final effluent samples taken over the period July to June for the last three financial years are summarised in the table below.

Overall percentage compliance of the final effluent samples taken over the period July to June for the last three financial years for all the WWTWs								
Microbiological (%)			Chemical (%)			Physical (%)		
21/22	20/21	19/20	21/22	20/21	19/20	21/22	20/21	19/20
55.0	77.3	62.1	64.3	74.6	71.4	71.8	78.9	77.3

A comprehensive Performance Management System and Customer Services and Complaints system are also in place. The SDBIP is the process plan and performance indicator / evaluation process for the execution of the budget. The SDBIP is being used as a management, implementation and monitoring tool that assists and guide the Executive Mayor, Councillors, Municipal Manager, Senior Managers and the community. The plan serves as an input to the performance agreements of the Municipal Manager and Directors.

The Municipality has maintained a high and consistent level of service to its urban water consumers. After hour emergency requests are being dealt with by the control room on a twenty-four-hour per day basis. Bergrivier Municipality further developed a Client Services Charter in collaboration with various stakeholders to affirm their commitment to providing unsurpassed service delivery within the Bergrivier Municipality's Management Area.

"Community involvement and excellent client services are the building blocks of Bergrivier Municipality"

The Municipality also performed excellent with DWS's 2021 Blue Drop Risk Assessments (All plants in the low risk category) and the 2021 Green Drop Assessments (Impressive performance with a Green Drop Score improvement from 44% in 2013 to 72% in 2021).

BERGRIVIER MUNICIPALITY

WATER SERVICES AUDIT FOR 2021/2022

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Annexure B:	No Drop spreadsheets and ILI for the various distribution systems
Annexure C:	Future water requirement projection models for the various distribution systems.
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Annexure F:	Organogram (Water and Wastewater)

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FIGURES

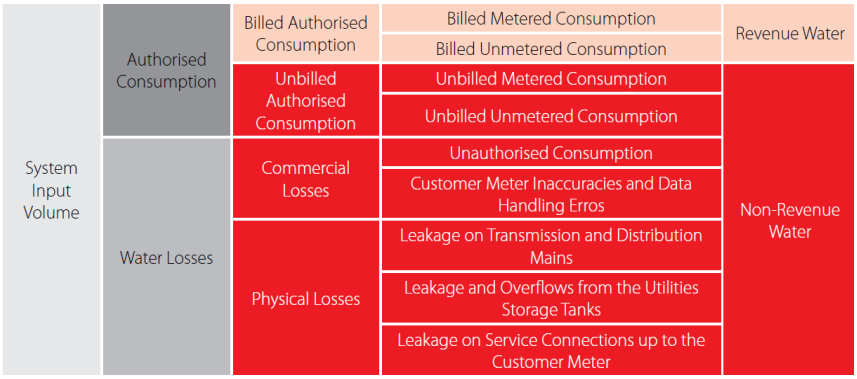
ABBREVIATIONS AND DEFINITIONS

AADD	Average Annual Daily Demand
AIDS	Acquired Immune Deficiency Syndrome
BDS	Blue Drop System
BH	Borehole
BPT	Bulk Pressure Tank
CAH	Chemical Acute Health
CCH	Chemical Chronic Health
CF	Consequence of Failure
CNA	Chemical Non Health Aesthetic
COD	Chemical Oxygen Demand
CRC	Current Replacement Cost
CRR	Cumulative Risk Ratio
D	Disinfectant
DRC	Depreciated Replacement Cost
DWS	Department of Water and Sanitation
EIA	Environmental Impact Assessment
ESETA	Energy and Water Services Sector Education and Training Authority
GAMAP	General Accepted Municipal Accounting Practice
GDS	Green Drop System
GIS	Geographic Information Systems
GPS	Global Positioning System
HIV	Human Immunodeficiency Virus
IAM	Infrastructure Asset Management
ICT	Information and Communications Technology
IDP	Integrated Development Plan
ILI	Infrastructure Leakage Index
IMP	Incident Management Protocol
IMQS	Infrastructure Management Query System
IRIS	Integrated Regulatory Information System
IRP	Integrated Resource Planning
IT	Information Technology
IWA	International Water Association
KPI	Key Performance Indicator
l/c/d	Litre per Capital per Day
LF	Likelihood of Failure
LGTAS	Local Government Turn Around Strategy
LM	Local Municipality
l/p/d	Litre per Person per Day
l/s	Litre per Second

ABBREVIATIONS AND DEFINITIONS / Continue

m	Metre
M	Microbiological
MAH	Microbiological Acute Health
MFMA	Municipal Finance Management Act
MISA	Municipal Infrastructure Support Agent
Ml	Mega Litre
Ml/a	Mega Litre per Annum
Ml/d	Mega Litre per Day
MNF	Minimum Night Flow
MuSSA	Municipal Strategic Self-Assessment
NQF	National Qualifications Framework
NRW	Non-Revenue Water
O&M	Operation and Maintenance
PAT	Progress Assessment Tool
PRP	Pipe Replacement Prioritisation
PRV	Pressure Reducing Valve
PS	Pump Station
RAS	Return Activated Sludge
RDP	Reconstruction and Development Programme
RUL	Remaining Useful Life
SALGA	South African Local Government Association
SANS	South African National Standard
SDBIP	Service Delivery and Budget Implementation Plan
SWRO	Sea Water Reverse Osmosis
TSS	Total Suspended Solids
WC/WDM	Water Conservation / Water Demand Management
WCWSS	Western Cape Water Supply System
WDM	Water Demand Management
WSA	Water Services Authority
WSDP	Water Services Development Plan
WSI	Water Services Institution
WSP	Water Services Provider
WSS	Water Supply System
WTW	Water Treatment Works
W_2RAP	Waste Water Risk Abatement Plan
WWTW	Waste Water Treatment Works

KEY TERMS AND INTERPRETATIONS

KEY TERMS	INTERPRETATIONS
Current replacement cost (CRC)	The cost of replacing the service potential of an existing asset, by reference to some measure of capacity, with an appropriate modern equivalent asset. GAMAP defines CRC as the cost the entity would incur to acquire the asset on the reporting date.
Depreciated Replacement Cost (DRC)	The replacement cost of an existing asset after deducting an allowance for wear or consumption to reflect the remaining economic life of the existing asset.
Financial Year	Financial year means in relation to- • a national or provincial department, the year ending 31 March; or • a municipality, the year ending 30 June.
Integrated Development Plan (IDP)	An IDP is a legislative requirement for municipalities, which identifies the municipality's key development priorities; formulates a clear vision, mission and values; formulates appropriate strategies; shows the appropriate organisational structure and systems to realise the vision and the mission and aligns resources with the development priorities.
International Water Association (IWA) Water Balance	
System Input Volume	The volume of treated water input to that part of the water supply system to which the water balance calculation relates.
Authorised Consumption	The volume of metered and/or un-metered water taken by registered customers, the water supplier and others who are implicitly or explicitly authorised to do so by the water supplier, for residential, commercial and industrial purposes. It also includes water exported across operational boundaries. Authorised consumption may include items such as fire-fighting and training, flushing of mains and sewers, street cleaning, watering of municipal gardens, public fountains, frost protection, building water, etc. These may be billed or unbilled, metered or unmetered.
Water Losses	The difference between System Input and Authorised Consumption. Water losses can be considered as a total volume for the whole system, or for partial systems such as transmission or distribution schemes, or individual zones. Water Losses consist of Physical Losses and Commercial Losses (also known as Real Losses and Apparent Losses).
Billed Authorised Consumption	Those components of Authorised Consumption which are billed and produce revenue (also known as Revenue Water). Equal to Billed Metered Consumption plus Billed Unmetered Consumption.
Unbilled Authorised Consumption	Those components of Authorised Consumption which are legitimate but not billed and therefore do not produce revenue. Equal to Unbilled Metered Consumption plus Unbilled Unmetered Consumption.
Commercial Losses	Includes all types of inaccuracies associated with customer metering as well as data handling errors (meter reading and billing), plus unauthorised consumption (theft or illegal use). Commercial losses are called "Apparent Losses" by the International Water Association and in some countries the misleading term "Non-Technical Losses" is used.
Physical Losses	Physical water losses from the pressurized system and the utility's storage tanks, up to the point of customer use. In metered systems this is the customer meter, in unmetered situations this is the first point of use (stop tap/tap) within the property. Physical losses are called "Real Losses" by the International Water Association and in some countries the misleading term "Technical Losses" is used.
Billed Metered Consumption	All metered consumption which is also billed. This includes all groups of customers such

KEY TERMS	INTERPRETATIONS
	as domestic, commercial, industrial or institutional and also includes water transferred across operational boundaries (water exported) which is metered and billed.
Billed Unmetered Consumption	All billed consumption which is calculated based on estimates or norms but is not metered. This might be a very small component in fully metered systems (for example billing based on estimates for the period a customer meter is out of order) but can be the key consumption component in systems without universal metering. This component might also include water transferred across operational boundaries (water exported) which is unmetered but billed.
Unbilled Metered Consumption	Metered Consumption which is for any reason unbilled. This might for example include metered consumption by the utility itself or water provided to institutions free of charge, including water transferred across operational boundaries (water exported) which is metered but unbilled.
Unbilled Unmetered Consumption	Any kind of Authorised Consumption which is neither billed nor metered. This component typically includes items such as fire-fighting, flushing of mains and sewers, street cleaning, frost protection, etc. In a well-run utility it is a small component which is very often substantially overestimated. Theoretically this might also include water transferred across operational boundaries (water exported) which is unmetered and unbilled – although this is an unlikely case.
Unauthorised Consumption	Any unauthorised use of water. This may include illegal water withdrawal from hydrants (for example for construction purposes), illegal connections, bypasses to consumption meters or meter tampering.
Customer Metering Inaccuracies and Data Handling Errors	Commercial water losses caused by customer meter inaccuracies and data handling errors in the meter reading and billing system.
Leakage on Transmission and /or Distribution Mains	Water lost from leaks and breaks on transmission and distribution pipelines. These might either be small leaks which are still unreported (e.g. leaking joints) or large bursts which were reported and repaired but did obviously leak for a certain period before that.
Leakage and Overflows at Utility's Storage Tanks	Water lost from leaking storage tank structures or overflows of such tanks caused by e.g. operational or technical problems.
Leakage on Service Connections up to point of Customer Metering	Water lost from leaks and breaks of service connections from (and including) the tapping point until the point of customer use. In metered systems this is the customer meter, in unmetered situations this is the first point of use (stop tap/tap) within the property. Leakage on service connections might be reported breaks but will predominately be small leaks which do not surface and which run for long periods (often years).
Revenue Water	Those components of Authorised Consumption which are billed and produce revenue (also known as Billed Authorised Consumption). Equal to Billed Metered Consumption plus Billed Unmetered Consumption.
Non-Revenue Water	Those components of System Input which are not billed and do not produce revenue. Equal to Unbilled Authorised Consumption plus Physical and Commercial Water Losses.
Municipal Finance Management Act (MFMA)	Municipal Finance Management Act, 2003 (Act No. 56 of 2003)
MIG	A conditional grant from national government to support investment in basic municipal infrastructure.
Remaining useful life (RUL)	The time remaining over which an asset is expected to be used.
Service Delivery Budget Implementation Plan (SDBIP)	The SDBIP is a management, implementation and monitoring tool that enable the Municipal Manager to monitor the performance of senior managers, the Mayor to monitor the performance of the Municipal Manager, and for the community to monitor the performance of the municipality.
Strategic Framework for Water Services	The Strategic Framework provides a comprehensive summary of policy with respect to the water services sector in South Africa and sets out a strategic framework for its implementation over the next ten years.
Water Conservation	The minimisation of loss or waste, the care and protection of water resources and the efficient and effective use of water.
Water Demand Management	The adaptation and implementation of a strategy by a water institution or consumer to influence the water demand and usage of water in order to meet any of the following objectives: economic efficiency, social development, social equity, environmental protection, sustainability of water supply and services, and political acceptability.
Water Services Authority (WSA)	A water services authority means a municipality with the executive authority and the right to administer water services as authorised in terms of the Municipal Structures Act, 1998 (Act No.117 of 1998). There can only be one water services authority in any specific area.

KEY TERMS	INTERPRETATIONS
	Water services authority area boundaries cannot overlap. Water services authorities are metropolitan municipalities, district municipalities and authorised local municipalities.
Water Services Development Plan (WSDP)	A plan to be developed and adopted by the WSA in terms of the Water Services Act, 1997 (Act No.108 of 1997)
WSDP Guide Framework	Modular tool which has been developed by the DWS to support WSAs in complying with the Water Services Act with respect to Water Services Development Planning and which is also used by the DWS to regulate such compliance.
Water Services Provider (WSP)	A WSP means any person or institution who provides water services to consumers or to another water services institution, but does not include a water services intermediary.

BERGRIVIER MUNICIPALITY

ANNUAL WSDP PERFORMANCE AND WATER SERVICES AUDIT REPORT FOR 2021/2022

EXECUTIVE SUMMARY

Bergrivier Municipality is required in terms of Section 18 of the Water Services Act, 1997 (Act No.108 of 1997), as well as the "Regulations relating to compulsory national standards and measures to conserve water", as issued in terms of sections 9(1) and 73(1)(j) of the Water Services Act, to report on the implementation of its WSDP during each financial year and to include a water services audit in such an annual report.

Section 62 of the Water Services Act requires the Minister to monitor every WSI in order to ensure compliance with the prescribed national standards. This regulation requires a WSA to complete and submit a WSDP Performance- and Water Services Audit Report every financial year.

The WSDP Performance- and Water Services Audit is designed to monitor the compliance of the WSA and other WSIs with these regulations. The Water Services Act allows the audit to be used as a tool to compare actual performance of the WSA against the targets and indicators set in their WSDP. The WSDP Performance- and Water Services Audit also assists local communities and DWS to assess how well WSAs are performing relative to their stated intentions and their capacity.

The WSDP Performance- and Water Services Audit Report will give an overview of the implementation of the Municipality's previous year's WSDP, for the 2021/2022 financial year, and can be seen as an annexure to Bergrivier Municipality's Annual Report. The Annual Report is compiled as required by the Local Government: Municipal Systems Act, Act no 32 of 2000 (Section 46) and the Local Government: Municipal Finance Management Act, Act no 56 of 2003 (Section 121).

Availability of the Water Services Audit Report: The WSDP Performance- and Water Services Audit Report is a public document and must be made available within four months after the end of each financial year and must be available for inspection at the offices of Bergrivier Municipality. It is also recommended that the document be placed on the Municipality's website and that copies of the document be placed at the public libraries. The WSDP Performance- and Water Services Audit Report also needs to be made available to the Minister of the DWS, the Minister of the Department of Cooperative Governance, the Province and to SALGA, as required by the Water Services Act, 1997.

The WSDP Performance- and Water Services Audit Report includes the following detail information:

- The Municipality's performance with regard to their KPIs for water and sewerage services for the 2021/2022 financial year, as included in the Municipality's SDBIP.
- The Municipality's Performance with regard to DWS's Blue and Green Drop Assessments. Blue drop status is awarded to those water schemes that comply with 95% criteria on drinking water quality management. Green drop status is awarded to those WWTWs that comply with 90% criteria on key selected indicators on wastewater quality management.
- DWS's Scorecard for assessing the potential for WC/WDM efforts in the Municipality.
- Information to be included in a WSDP Performance- and Water Services Audit as stipulated in regulations under section 9 of the Water Services Act, "Guidelines for Compulsory National Standards" and also required by DWS's 2014 WSDP Performance- and Water Services Audit Report guidelines.
- Information on the implementation of the various WSDP activities, as included under the WSDP Business Elements in DWS's WSDP guidelines.

The Municipality has a comprehensive Performance Management System in place. The SDBIP is the process plan and performance indicator / evaluation for the execution of the budget. The SDBIP is being used as a management, implementation and monitoring tool that assists and guide the Executive Mayor, Councillors, Municipal Manager, Senior Managers and the community. The plan serves as an input to the performance agreements of the Municipal Manager and Directors. It also forms the basis for the monthly, quarterly, mid-year and the annual assessment report and performance assessments of the Municipal Manager and Directors.

The following water and sanitation related investigations were successfully completed during the last financial year.

- The WSDP Performance- and Water Services Audit Report for the 2020/2021 financial year was finalised and approved by Council as part of the Annual Report. The NRW water balance models were updated for each of the distribution systems (Up to the end of June 2021) as part of the Water Services Audit Process.

- Bergrivier Municipality continues with the implementation of their Drinking Water Quality and Effluent Quality Sampling Programmes (Both Operational and Compliance Monitoring). Sample results are loaded on a monthly basis onto DWS's IRIS. All the WTWs and WWTWs are registered on the IRIS website.

- The Asset Register was updated to include all the water and sewerage capital projects completed during the 2021/2022 financial year.

- Fourth Dam Safety Evaluation Report was done for the Porterville Irrigation Dam, Ingerop, April 2022.

- Second Dam Safety Evaluation Report was done for the Eendekuil Raw Water Dams (North and South), Ingerop, April 2022.

- Water Safety Plan was done for the Withoogte bulk water distribution system by the West Coast District Municipality (Velddrif and Dwarskersbos).

- A detail WTW Process Audit was done for the Withoogte WTW by the West Coast District Municipality (Velddrif and Dwarskersbos).

- Detail WWTW Process Audits were compiled for all the WWTWs.

The Municipality also received the following awards / acknowledgements:

- **Bergrivier Municipality's performed well with regard to DWS's 2021 Blue Drop Progress Assessment (Drinking Water Process and Quality). The Blue Drop Risk Ratings for all six systems fall in the low-risk category (<50%).**

- **Bergrivier Municipality delivered an impressive performance with a Green Drop score improvement from 44% in 2013 to 72% in 2021.** The Green Drop Scores for the five WWTWs and drainage systems were between 59% and 81%. The Wastewater Risk Ratings were at low risk (<50%) for the Porterville-, Dwarskersbos- and Eendekuil WWTW and at medium risk for the Piketberg- and Velddrif WWTW (50% - <70%).

Quantity of Water Services Provided (Water Balance)

Detail IWA water balance models are in place for each of the distribution systems (towns) in Bergrivier Municipality's Management Area. These models include the volume of potable water supplied to the Bergrivier Municipality by the West Coast District Municipality, the volume of raw water abstracted from the Municipality's own water resources, the treated volume supplied from the WTW (System Input Volume) and the Treatment Losses, NRW and Water Losses for each of the distribution systems. The Municipality also records the flows at the WTWs and WWTWs.

Water Services Delivery Profile

The number of consumer units per category or user type is available for each of the distribution systems. The 2021/2022 number of formal water consumers in Bergrivier Municipality was 9 783. The average annual growth in the number of water consumers over the period 2014/2015 to 2021/2022 was 1.84%. All the formal households in the urban areas of Bergrivier Municipality's Management Area are provided with water and sewer connections inside the erven. Informal areas are provided with shared services as an intermediary measure. Currently there are no informal areas with shared services in any of the towns. Bergrivier Municipality is committed to work with the private landowners to ensure that at least basic water and sanitation services are provided to those households in the rural areas with existing services still below RDP standard.

All schools and medical facilities in Bergrivier Municipality's Management Area are supplied with adequate water and sanitation services.

Cost Recovery and Free Basic Services

A detail six-block step tariff system is implemented by Bergrivier Municipality for their residential consumers. This tariff structure discourages the wasteful or inefficient use of water. It is expected that this tariff structure will continue to be implemented in the future. The sustainable supply of potable water is however becoming an ever-increasing challenge, due to the bulk infrastructure needs of Bergrivier Municipality over the next number of years.

The first six (6) kl of water is provided free to all indigent registered households. Bergrivier Municipality's tariffs support the viability and sustainability of water supply services to the poor through cross-subsidies where feasible. Free basic water and sanitation services are linked to the Municipality's Indigent Policy and all indigent households therefore receive free basic water and sanitation services. This implies that either the equitable share is used to cover this cost, or higher consumption blocks are charged at a rate greater than the cost in order to generate a surplus to cross-subsidise indigent consumers who use up to six (6) kilolitres per month.

The operational and maintenance expenditure and income for the last five financial years for water and sanitation services are summarised in the table below.

Operational and maintenance expenditure and income for water and sanitation services						
Service	**Expenditure / Income**	**21/22**	**20/21**	**19/20**	**18/19**	**17/18**
Water	Expenditure	R22 961 276	R19 205 696	R21 304 717	R20 167 157	R20 478 535
	Income	-R39 397 815	-R35 054 863	-R30 870 115	-R26 209 734	-R21 255 934
	Surplus / Deficit	**R16 436 539**	**R15 849 167**	**R9 565 398**	**R6 042 577**	**R777 399**
Sanitation	Expenditure	R8 509 260	R13 100 560	R12 679 726	R10 622 981	R9 987 129
	Income	-R24 805 573	-R22 569 830	-R16 509 629	-R15 624 739	-R28 958 707
	Surplus / Deficit	**R16 296 313**	**R9 469 270**	**R3 829 903**	**R5 001 758**	**R18 971 578**

Water Quality

Operational and Compliance Water Quality sampling programmes are implemented by the Bergrivier Municipality and the West Coast District Municipality. Operational and Compliance Effluent Quality sampling programmes are also implemented by Bergrivier Municipality at the various WWTWs. **The water quality performance indicators of all the water distribution systems in Bergrivier Municipality was categorised as either "Good" or "Excellent" for 2020/2021, except the "Acute Health Microbiological" indicators for Piketberg and Dwarskersbos and the "Operational Efficiency" indicator for Eendekuil that were categorised as "Unacceptable".**

The percentage compliance of the water quality samples taken over the period July to June for the last two financial years for the various distribution systems are summarised in the table below (SANS 241:2015 Limits).

Percentage compliance of the water quality samples for the period July to June for the last two financial years										
Distribution System	Acute Health				Chronic Health		Aesthetic		Operational Efficiency	
	Chemical		Microbiological							
	21/22	20/21	21/22	20/21	21/22	20/21	21/22	20/21	21/22	20/21
Porterville	100.0%	100.0%	99.2%	100.0%	100.0%	100.0%	99.7%	100.0%	94.9%	97.0%
Piketberg	100.0%	100.0%	86.0%	93.8%	100.0%	100.0%	98.8%	97.1%	90.6%	89.4%
Dwarskersbos	100.0%	100.0%	87.5%	97.9%	100.0%	100.0%	100.0%	100.0%	96.2%	98.1%
Velddrif	100.0%	100.0%	96.9%	99.1%	100.0%	100.0%	99.8%	100.0%	98.3%	99.1%
Aurora	100.0%	100.0%	98.7%	85.5%	100.0%	100.0%	95.6%	97.0%	98.6%	94.7%
Eendekuil	100.0%	100.0%	100.0%	98.6%	100.0%	100.0%	99.4%	100.0%	89.5%	95.1%
Redelinghuys	100.0%	100.0%	96.2%	98.6%	98.6%	100.0%	99.1%	99.3%	96.0%	98.9%
Overall Compliance	**100.0%**	**100.0%**	**94.9%**	**98.0%**	**99.8%**	**100.0%**	**99.0%**	**99.0%**	**94.7%**	**95.6%**

Note: *Unacceptable* (According to SANS241-2:2015, Table 4)

The table below indicates the compliance of the E.Coli monitoring frequency in the water distributions systems of Bergrivier Municipality, in terms of the minimum requirements of SANS 0241:2015 (Table 2). The period assessed was for samples taken from July 2021 to June 2022.

Bergrivier Municipality's compliance of the monthly E.Coli monitoring frequency in the water distributions systems in terms of the minimum requirements of SANS 241-2:2015 (Table 2)			
Distribution System	Population served	Required number of monthly samples (SANS 241-2:2015: Table 2)	Average number of monthly microbiological compliance samples taken by the Bergrivier Municipality during 2021/2022
Porterville	8 190	2	10.1
Piketberg	14 363	2.9	10.6
Velddrif	17 946	3.6	10.6
Dwarskersbos	945	2	4.5
Aurora	638	2	6.3
Eendekuil	1 865	2	6.2
Redelinghuys	603	2	6.3
Total	**44 550**	**16.5**	**54.6**

It can be noted from the above table that the number of monthly E.Coli samples taken by the Municipality during the 2021/2022 financial year was more than the required number of samples for all the water distribution systems.

The overall Microbiological, Chemical and Physical compliance percentages of the final effluent samples taken over the last three financial years at the Dwarskersbos-, Eendekuil-, Piketberg-, Porterville- and Velddrif WWTW is summarised in the table below (General Limits).

Percentage Microbiological, Chemical and Physical compliance of the compliance samples taken at the various WWTWs for the last three financial years									
WWTW	Microbiological			Chemical			Physical		
	21/22	20/21	19/20	21/22	20/21	19/20	21/22	20/21	19/20
Dwarskersbos	100.0%	100.0%	100.0%	83.3%	88.9%	91.7%	29.2%	33.3%	20.8%
Eendekuil	100.0%	100.0%	83.3%	83.3%	100.0%	58.3%	100.0%	100.0%	100.0%
Piketberg	25.0%	44.4%	40.0%	75.0%	77.8%	73.3%	86.1%	92.6%	83.3%
Porterville	33.3%	100.0%	41.7%	79.2%	81.3%	75.0%	91.7%	91.7%	88.9%
Velddrif	16.7%	44.4%	41.7%	29.2%	55.6%	63.9%	47.2%	70.4%	83.3%
Overall Compliance	**55.0%**	**77.3%**	**62.1%**	**64.3%**	**74.6%**	**71.4%**	**71.8%**	**78.9%**	**77.3%**

Water Conservation and Water Demand Management

A new WC/WDM Strategy was drafted for Bergrivier Municipality during the 2020/2021 financial year. The implementation of the WC/WDM measures by Bergrivier Municipality were extremely successful, especially over the drought period. The average annual growth percentage in total raw water requirements for Bergrivier Municipality over the period 2010/2011 to 2021/2022 was -0.80 %/a.

The overall percentage of NRW for all the internal distribution systems was a respectable 15.4% for the 2021/2022 financial year. The table below gives a summary of the treatment losses, bulk distribution losses, NRW, water losses and ILIs for the various distribution systems in Bergrivier Municipality's Management Area.

Treatment Losses, NRW, Water Losses and ILIs for the various water distribution systems								
Description	**Component**	**Unit**	**21/22**	**Record : Prior (Ml/a)**				
				20/21	**19/20**	**18/19**	**17/18**	**16/17**
Porterville	Treatment Losses	Volume	35.989	45.681	45.414	80.321	Unknown	Unknown
		Percentage	7.8%	9.8%	9.8%	17.0%	Unknown	Unknown
	NRW	Volume	53.095	61.015	45.158	78.733	18.704	97.301
		Percentage	12.4%	14.5%	10.8%	20.0%	5.3%	19.5%
	Water Losses	Volume	52.239	60.171	44.323	77.947	18.000	96.305
		Percentage	12.2%	14.3%	10.6%	19.8%	5.1%	19.3%
	ILI		**1.46**	**1.70**	**1.14**		**0.47**	**2.50**
	The current Treatment Losses of less than 10% is good. The NRW and Water Losses were reduced during the last financial year. The current NRW and Water Losses percentages of less than 15% are good and these levels should be maintained. The current ILI value is also excellent.							
Piketberg	Treatment Losses	Volume	54.926	60.076	49.042	40.069	104.210	136.169
		Percentage	7.50%	7.50%	7.50%	7.50%	19.17%	16.25%
	Bulk Distribution Losses	Volume	13.150	36.990	11.680	0.070	11.850	1.259
		Percentage	1.9%	5.0%	1.9%	0.0%	2.7%	0.2%
	NRW	Volume	95.732	150.126	116.729	113.793	50.231	93.754
		Percentage	13.8%	20.9%	17.9%	18.8%	9.5%	11.3%
	Water Losses	Volume	94.344	148.687	115.426	112.583	49.171	92.102
		Percentage	13.6%	20.7%	17.7%	18.6%	9.3%	11.1%
	ILI		**1.36**	**2.17**	**1.46**		**0.63**	**1.17**
	The current treatment losses are an estimate and the Municipality need to ensure that the raw water readings before the treatment plant is recorded. The historical bulk distribution losses of less than 5% is good and needs to be maintained at these levels. The NRW and Water Losses were reduced during the last financial year. The current NRW and Water Losses percentages of less than 15% are good and these levels should be maintained. The current ILI value is also excellent.							
Velddrif	NRW	Volume	134.744	82.662	126.550	16.774	5.184	44.615
		Percentage	14.1%	10.3%	15.6%	2.7%	0.8%	4.5%
	Water Losses	Volume	132.837	81.062	124.927	15.552	3.914	42.619
		Percentage	13.9%	10.1%	15.4%	2.5%	0.6%	4.3%
	ILI		**3.54**	**2.20**	**2.47**		**0.08**	**0.90**
	The NRW and Water Losses increased during the last financial year. The current NRW and Water Losses of less than 15% are however still good. The Municipality needs to keep the NRW and Water Losses percentages below 15%. The current ILI value is good and no urgent action is required, but the NRW and Water Losses should however be monitored carefully.							
Dwarskersbos	NRW	Volume	25.600	24.669	16.821	18.490	5.928	0.172
		Percentage	21.8%	23.4%	19.5%	25.3%	10.0%	0.2%
	Water Losses	Volume	25.365	24.458	16.649	18.344	5.809	-0.018
		Percentage	21.6%	23.2%	19.3%	25.1%	9.8%	0.0%
	ILI		**4.60**	**4.71**	**3.04**		**1.15**	**0.00**
	The NRW and Water Losses were reduced during the last financial year. The current percentages of less than 25% are still acceptable, but the Municipality needs to work towards percentages of less than 20% for the NRW and Water Losses. The ILI of above 4 however indicates a poor ILI level, which requires attention and the Municipality needs to work towards an ILI of between 2 and 4.							

Treatment Losses, NRW, Water Losses and ILIs for the various water distribution systems								
Description	**Component**	**Unit**	**21/22**	**Record : Prior (Ml/a)**				
				20/21	**19/20**	**18/19**	**17/18**	**16/17**
Aurora	Treatment Losses	Volume	3.660	4.117	7.879	7.686	3.476	8.261
		Percentage	8.0%	9.4%	18.3%	19.8%	11.1%	13.9%
	NRW	Volume	9.260	9.862	3.957	4.485	4.408	10.345
		Percentage	21.9%	24.9%	11.2%	14.4%	15.8%	20.2%
	Water Losses	Volume	9.175	9.783	3.887	4.423	4.352	10.243
		Percentage	21.7%	24.7%	11.0%	14.2%	15.6%	20.0%
	ILI		**1.02**	**1.05**	**0.38**		**0.44**	**1.03**
	The NRW and Water Losses were reduced during the last financial year. The current percentages of less than 25% are still acceptable, but the Municipality needs to work towards percentages of less than 20% for the NRW and Water Losses. The ILI of 1.02 however indicates an excellent system and the Municipality need to keep the ILI levels between 1 and 2.							
Eendekuil	Treatment Losses	Volume	-18.150	-21.164	-10.423	-2.190	-16.429	-7.754
		Percentage	-28.8%	-38.8%	-16.4%	-3.8%	-30.0%	-8.9%
	NRW	Volume	27.856	22.580	22.195	13.674	22.223	27.450
		Percentage	34.3%	29.8%	30.0%	22.6%	31.2%	28.8%
	Water Losses	Volume	27.694	22.428	22.047	13.553	22.081	27.260
		Percentage	34.1%	29.6%	29.8%	22.4%	31.0%	28.6%
	ILI		**5.07**	**4.16**	**3.96**		**4.05**	**4.96**
	The NRW and Water Losses further increased during the last financial year and were high for the last three financial years. The raw water meter at the WTW register less than the two potable water meters after the WTW. The raw water meter needs to be calibrated to accurately calculate the treatment losses. It also suggested that a bulk raw water meter be installed at the source to determine the bulk distribution losses. The current NRW and Water Losses of roughly 30% for the last three financial years are high and needs to be reduced to levels below 25%. The ILI of above 4 also indicates a poor ILI level, which requires attention and the Municipality needs to work towards an ILI of between 2 and 4.							
Redelinghuys	Treatment Losses	Volume	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
		Percentage	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
	Bulk Distribution Losses	Volume	9.565	9.379	10.534	3.959	1.243	3.209
		Percentage	16.4%	16.6%	21.9%	10.5%	3.5%	6.5%
	NRW	Volume	17.465	13.573	11.352	9.626	6.992	7.850
		Percentage	35.8%	28.7%	30.2%	28.5%	20.5%	17.1%
	Water Losses	Volume	17.368	13.479	11.277	9.558	6.924	7.758
		Percentage	35.6%	28.5%	30.0%	28.3%	20.3%	16.9%
	ILI		**6.18**	**4.93**	**4.29**		**3.16**	**4.25**
	The bulk distribution losses of above 15% for the last three financial years between the WTW (System Input Volume) and the outlet of the reservoir is high and needs to be investigated. A bulk raw water meter was installed at the source in order to determine the bulk distribution losses and the treatment losses in the future. The current NRW and Water Losses of 35% are high and needs to be reduced to levels below 25%. The ILI of above 4 also indicates a poor ILI, which requires attention level and the Municipality needs to work towards an ILI of between 2 and 4.							
Total	**NRW**	**Volume**	**363.752**	**364.487**	**342.762**	**255.575**	**113.670**	**281.487**
		Percentage	**15.38%**	**16.5%**	**16.2%**	**14.1%**	**6.7%**	**10.8%**
	Water Losses	**Volume**	**359.022**	**360.068**	**338.536**	**251.960**	**110.251**	**276.269**
		Percentage	**15.18%**	**16.3%**	**16.0%**	**13.9%**	**6.5%**	**10.6%**
	ILI		**2.11**	**2.15**	**2.06**		**0.53**	**1.34**
	The overall NRW and Water Losses were reduced during the last financial year. The percentages of just above 15% are excellent and the Municipality needs to work towards a target percentage of 15% for the NRW. The current ILI value of 2.11 for the systems combined is good.							

Note: Infrastructure Leakage Index (ILI) for Developed Countries = **1 – 2 Excellent (Category A)**, **2 – 4 Good (Category B)**, **4 – 8 Poor (Category C)** and > **8 – Very Bad (Category D)**

Category A = No specific intervention required.

Category B = No urgent action required although should be monitored carefully.

Category C = Requires attention

Category D = Requires immediate water loss reduction interventions

Water Services Asset Management

Bergrivier Municipality's Asset Register also needs to include the CRC of all the water and sewerage infrastructure. The Municipality also needs to ensure that all the existing water and sewerage infrastructure are included in the current Asset Register. The table below give an overview of the Opening Costs, Carrying Values, RUL, Age distribution and Condition grading of the water and sewerage assets currently included in the Asset Register (June 2022).

Opening costs, Carrying values, RUL, Age distribution and Condition grading of the water and sewerage infrastructure					
Asset Type	**Opening Costs**		**Carrying Values**	**Carrying Values / Opening Costs**	
Water Infrastructure	R109 531 804		R67 364 377	61.50%	
Sewerage Infrastructure	R98 685 526		R75 109 428	76.11%	
Remaining Useful Life (Opening Costs)					
Asset Type	**0 – 5 yrs**	**6 – 10 yrs**	**11 – 15 yrs**	**16 – 20 yrs**	**> 20 yrs**
Water Infrastructure	R5 713 377	R5 037 660	R5 341 783	R1 672 123	R91 766 861
Sewerage Infrastructure	R6 318 060	R4 705 495	R13 155 590	R2 953 123	R71 553 258
Age Distribution (Opening Costs)					
Asset Type	**0 – 5 yrs**	**6 – 10 yrs**	**11 – 15 yrs**	**16 – 20 yrs**	**> 20 yrs**
Water Infrastructure	R21 169 433	R9 029 272	R11 928 993	R2 412 230	R64 991 876
Sewerage Infrastructure	R44 253 046	R13 502 485	R14 086 195	R8 105 253	R18 738 547
Condition Grading (Opening Costs)					
Asset Type	**0 – 5 yrs**	**6 – 10 yrs**	**11 – 15 yrs**	**16 – 20 yrs**	**> 20 yrs**
Water Infrastructure	R20 078 157	R50 192 239	R37 473 719	R1 211 170	R576 519
Sewerage Infrastructure	R30 525 939	R42 782 226	R22 907 720	R2 048 822	R420 819

The Opening Costs and Carrying Values in the above table indicate that 38.50% of the value of the water infrastructure and 23.89% of the value of the sewerage infrastructure has been consumed.

The Opening Costs of the water and sewerage infrastructure that will need to be replaced over the next five years (RUL <5 yrs) is R12.031 million. The asset renewal needs for the **water infrastructure assets** over the next ten years is R2.278 million per year. The reinvestment required is R5.713 million in the first five years and R5.038 million in the second five-year period. The age of 59.3% of the water infrastructure assets is greater than twenty years. The asset renewal needs for the **sewerage infrastructure assets** over the next ten years is R1.102 million per year. The reinvestment required is R6.318 million in the first five years and R4.705 million in the second five-year period. The age of 19.0% of the sewerage infrastructure assets is greater than twenty years.

Some of the key challenges of Bergrivier Municipality are to identify adequate funds for the rehabilitation and maintenance of their existing infrastructure, which is critical to ensure the sustainability of the services that are provided by the Municipality. It is important for the Municipality to secure adequate funding for major refurbishment, replacement and maintenance work, the provision of bulk infrastructure and development of additional sources to keep up with the high demand for services.

Water Services Operation and Maintenance

Design-out Maintenance, Preventative Maintenance and Corrective or Breakdown Maintenance are practised by Bergrivier Municipality (Planned and unplanned preventative and corrective maintenance). Adequate resources, information and activity control and management are mostly in place to ensure proper operation and maintenance of the water and sewerage infrastructure. The assessment criteria currently inadequate is the number of Process Controllers at the various treatment plants, the O&M Manuals and Asset Register. Additional Process Controllers need to be appointed to comply with the legislative requirements with regard to the number and Class of Process Controllers per WTW and WWTWs.

Water Resources

The Western Cape experienced a severe drought over the period 2015 to 2017, with some relief during the 2018 to 2021 winter months. The drought over the period 2015 to 2017 reduced the safe yield of the WCWSS (Velddrif and Dwarskersbos) and the Municipality's own existing surface and groundwater resources. The Municipality therefore continue with their WC/WDM measures to lower the current and future water requirements and investigations of augmentation options for the existing water resources.

Velddrif and Dwarskersbos: A Service Level Agreement is in place with the West Coast District Municipality for the provision of bulk potable water to Velddrif and Dwarskersbos. A new bulk raw water licence was issued to the West Coast District Municipality in October 2017, which include a volume of 1 439.4 Ml/a for Bergrivier Municipality from the Berg River (Abstraction at Misverstand Dam). This allocation is for Velddrif and Dwarskersbos, currently supplied by the West Coast District Municipality with potable water. The allocation is adequate to meet the medium future water requirements for these two towns.

Piketberg: A Geohydrological investigation was completed for Piketberg during the 2017/2018 financial year. Five boreholes were drilled. The blowout yields ranged between 0.3 l/s and 5 l/s and based on the blow yields only two boreholes were considered for yield testing. A Water Augmentation Prefeasibility Study was also completed during the 2020/2021 financial year for Piketberg. Four augmentation options were investigated. The Municipality can also apply to the DWS for an increased allocation from the Berg River for Piketberg.

The yields from the existing resources for Aurora (With implementation of Groundwater Management Plan), Redelinghuys, Eendekuil and Porterville are adequate to meet the medium- to long-term future water requirements of these towns.

The table below gives an overview of the years in which the annual water requirement will exceed the allocations, licence volumes or sustainable yields from the various resources.

Years in which the annual water requirement will exceed the allocations / licence volumes / yields from the various water resources				
Distribution System	**Allocation (A) / Yield (Y) / Licence (L) (Ml/a)**	**High Annual Growth on 2021/2022 requirement (%)**	**Low Annual Growth on 2021/2022 requirement (%)**	**WSDP Projection Model**
Porterville	711.385 (Y)	2042 (2%)	> 2046 (1%)	> 2046
Piketberg	945.075 (A)	2026 (4%)	2028 (3%)	2033
Velddrif	1 295.460 (L)	2031 (3%)	2036 (2%)	2029
Dwarskersbos	143.940 (L)	2028 (3%)	2031 (2%)	2032
Aurora	64.964 (Y) *	2034 (2.5%)	2042 (1.5%)	2029
Eendekuil	116.435 (Y)	2029 (3%)	2033 (2%)	> 2046
Redelinghuys	577.109 (Y)	> 2046 (2%)	> 2046 (1%)	> 2046

Notes: * Safe yield of existing four production boreholes (Exclude safe yield of newly drilled Au BH6)

Water Services Institutional Arrangements and Customer Services

Bergrivier Municipality is the WSA for the entire Municipal Management Area. A Service Level Agreement is in place with the West Coast District Municipality for the provision of bulk potable water to Velddrif and Dwarskersbos. The Municipal staff is continuously exposed to training opportunities, skills development and capacity building at a technical, operations and management level in an effort to create a more efficient overall service to the users. A Workplace Skills Plan is compiled annually and the specific training needs of the personnel, with regard to water and wastewater management are determined annually.

Bergrivier Municipality's Vulnerability Index for 2022 was indicated as 0.28 "Moderate Vulnerability" for the 2022 Municipal Strategic Self-Assessment (MuSSA). The only areas of concern evident from the 2022 assessment is Financial Asset Management (40.0%, Extreme Vulnerability).

A comprehensive Customer Services and Complaints system is in place at Bergrivier Municipality and the Municipality has maintained a high and a very consistent level of service to its urban water consumers. After hour emergency requests are being dealt with by the control room on a twenty-four-hour basis.

Bergrivier Municipality further developed a Client Services Charter in collaboration with various stakeholders to affirm their commitment to providing unsurpassed service delivery within the Bergrivier Municipality's Management Area.

"Community involvement and excellent client services are the building blocks of Bergrivier Municipality"

Barriers implemented by Bergrivier Municipality against contamination and deteriorating water quality include the following:

- Service Delivery Agreement between the West Coast District Municipality and Bergrivier Municipality. A Monitoring Committee is also in place.
- Participate in catchment management and water source protection initiatives.
- Protection at points of abstraction such as river intakes and dams (Abstraction Management).
- Correct operation and maintenance of the WTWs (Coagulation, flocculation, sedimentation and filtration).
- Protection and maintenance of the distribution systems. This includes ensuring an adequate disinfectant residual at all times, rapid response to pipe bursts and other leaks, regular cleaning of reservoirs, keeping all delivery points tidy and clean, etc.

Three other important barriers implemented by Bergrivier Municipality against poor quality drinking water that are a prerequisite to those listed above are as follows:

- A well-informed Council and municipal managers that understand the extreme importance of and are committed to providing adequate resources for continuous professional operation and maintenance of the water supply system.
- Competent managers and supervisors in the technical department who are responsible for water supply services lead by example and are passionate about monitoring and safeguarding drinking water quality.
- Well-informed community members and other consumers of water supply services that know how to protect the water from becoming contaminated once it has been delivered, that have respect for water as a precious resource and that adhere to safe hygiene and sanitation practices.

BERGRIVIER MUNICIPALITY

ANNUAL WSDP PERFORMANCE AND WATER SERVICES AUDIT REPORT FOR 2021/2022

BACKGROUND

Appointment

iX engineers was appointed by Bergrivier Municipality to assist them with the compilation of their WSDP Performance- and Water Services Audit Report, which forms part of their annual report for the 2021/2022 financial year. The purpose of the WSDP Performance- and Water Services Audit Report is to report on the implementation of Bergrivier Municipality's previous year's WSDP, for the 2021/2022 financial year.

The DWS developed the "Annual Water Services Development Plan Performance- and Water Services Audit Report" template during 2014, to assist Municipalities with the drafting of their reports. iX engineers agreed with Bergrivier Municipality to follow this template as far as possible.

Purpose

Bergrivier Municipality is required in terms of Section 18 of the Water Services Act, 1997 (Act No.108 of 1997), as well as the "Regulations relating to compulsory national standards and measures to conserve water", as issued in terms of sections 9(1) and 73(1)(j) of the Water Services Act, to report on the implementation of its WSDP during each financial year and to include a water services audit in such an annual report.

Section 62 of the Water Services Act requires the Minister to monitor every WSI in order to ensure compliance with the prescribed national standards. This regulation requires a WSA to complete and submit a WSDP Performance- and Water Services Audit every financial year. The WSDP Performance- and Water Services Audit is designed to monitor the compliance of the WSA and other WSIs with these regulations. The Water Services Act allows the audit to be used as a tool to compare actual performance of the WSA against the targets and indicators set in their WSDP. The purpose of the WSDP Performance- and Water Services Audit is as follows:

- To monitor compliance with the Act and these regulations;
- To compare actual performance against targets contained in the WSDPs.
- To identify possibilities for improving water conservation and water demand management.

The WSDP Performance- and Water Services Audit Report will give an overview of the implementation of the Municipality's previous year's WSDP, for the 2021/2022 financial year, and can be seen as an annexure to Bergrivier Municipality's Annual Report. The Annual Report is compiled as required by the Local Government: Municipal Systems Act, Act no 32 of 2000 (Section 46) and the Local Government: Municipal Finance Management Act, Act no 56 of 2003 (Section 121). The WSDP Performance- and Water Services Audit Report contain the following detail information:

- The Municipality's performance with regard to their KPIs for water and sewerage services for the 2021/2022 financial year, as included in the Municipality's SDBIP.

- The Municipality's Performance with regard to DWS's Blue and Green Drop Assessments. Blue drop status is awarded to those water schemes that comply with 95% criteria on drinking water quality management. Green drop status is awarded to those WWTWs that comply with 90% criteria on key selected indicators on wastewater quality management.

- DWS's Scorecard for assessing the potential for WC/WDM efforts in the Municipality.

- Information to be included in a WSDP Performance- and Water Services Audit as stipulated in regulations under section 9 of the Water Services Act, “Guidelines for Compulsory National Standards” and also required by DWS’s 2014 WSDP Performance- and Water Services Audit Report guidelines.

- Information on the implementation of the various WSDP activities, as included under the WSDP Business Elements in DWS’s WSDP guidelines.

A. WATER SERVICES AUTHORITY PROFILE

A.1. Map of Water Services Authority Area of Jurisdiction

Bergrivier Municipality is located in the West Coast District of the Western Cape, as indicated on the figure below.

Figure A.1.1: Location of Bergrivier Municipality in the Western Cape

The figure below gives an overview of Bergrivier Municipality’s Management Area and the settlements located in the Area.

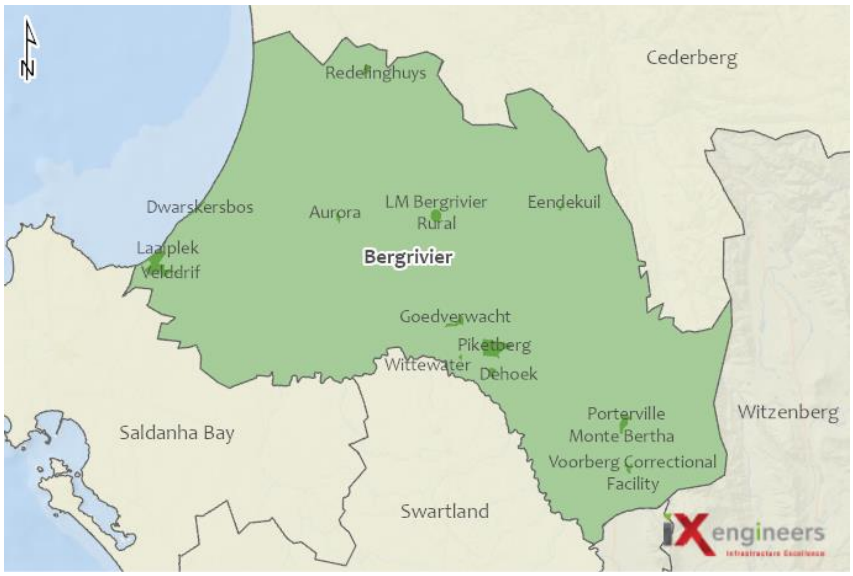


Figure A.1.2: Bergrivier Municipality’s Management Area

The Municipality is bordered to the North by the Cederberg Municipality, to the West by the Saldanha Bay Municipality, to the South by Swartland Municipality and to the East by the Drakenstein and Witzenberg Municipalities. The Municipality covers a diverse geographical area of approximately 4 407.04 km². The various schemes supplied with bulk water by Bergrivier Municipality are discussed in more detail under Section A.3. The existing water and sewerage infrastructure of the various distribution systems are indicated on the Aerial Photos included in the Municipality's detail WSDP documents.

The following table provides an overview of the various settlements that constitute the Bergrivier Municipality's Management Area:

Table A.1.1: Overview of settlements in Bergrivier Municipality's Management Area	
Aurora	Aurora is also classified as an isolated village. The town has a rural character against a picturesque topographical setting. This town has no autonomous economic base other than the accommodation of farm workers involved in the nearby farms and basic provision associated with this use.
Dwarskersbos	Dwarskersbos is a coastal town characterized by its property market, holiday accommodation and tourism. The sea and coastal area are the most important natural resources. The main function of the town is to provide holiday accommodation. Tourism, retirees and second home residents provide a solid base for the local economy.
Eendekuil	Eendekuil is also classified as an isolated village. It functions as a low-order agricultural service centre that is dependent on Porterville for higher-order municipal services. Mainly a dormitory town for farm workers and retired people. This town has no autonomous economic base other than the accommodation of farm workers involved in the nearby farms and basic service provision associated with this use.
Piketberg (Including Piket Bo Berg)	Piketberg is classified as a central place and is the administrative seat of the Bergrivier Municipality. It is also the service and commercial centre of the surrounding agricultural area. The primary economic base of Piketberg is agriculture. Public-sector activities related to the municipal head office, district offices, provincial government offices and other public functions also provide a solid base for the local economy.
Porterville (Including Dasklip Pass)	Porterville is also classified as a central place and sound infrastructure has contributed towards the establishment of a Regional Kaap Agri Office as well as the Voorberg prison. The economic base of Porterville is primarily agriculture, which is supplemented by some recreational and tourism activities.
Redelinghuys	Redelinghuys is classified as an isolated village. The town mainly functions as a residential area for the surrounding agricultural sector and retired people. Redelinghuys is dependent on Porterville for higher-order municipal services. There is some recreational and tourism potential in the Verlorenvlei area which is a Ramsar Site which falls partially within Bergrivier's area of jurisdiction. This town has no autonomous economic base other than the accommodation of farm workers involved in the nearby farms and basic service provision associated with this use.
Velddrif (Including Laaiplek, Port Owen and Noordhoek)	Velddrif is a coastal town, which functions as a focal point for the fishing industry along the West Coast. The most important resources are the sea, the coastal environment, salt pans and the Bergrivier Estuary. Tourism, retirees and second home residents provide a solid base for the local economy.
Goedverwacht and Wittewater	Goedverwacht and Wittewater are also classified as isolated villages. These towns are located on private land, within a predominantly agricultural area. They are Mission Stations run by the Moravian Church of South Africa, and have little direct investment to stimulate economic activities. Inhabitants work mainly on the surrounding farms, but the villages do boast some very good builders. The scenic mountains and the missionary culture offer some tourism potential, but this can only be realized within the context of the larger tourism plan for the region.

A.2. Water Services Administration and Organization

Bergrivier Municipality is the WSA for the entire Municipal Management Area. The small rural settlements of Goedverwacht and Wittewater are however, Moravian Mission stations and the services are managed by the Church and Bergrivier Municipality only provides a support service to the Church. Bergrivier Municipality's Organogram for Engineering Services is included in Annexure F. The table below gives the contact details of the persons responsible for water services management and planning within Bergrivier Municipality.

Table A.2.1: Water Services Administrative Structure	
Accounting Officer	
Designation	Municipal Manager
Name	Adv. H Linde
Telephone Nr.	022 913 6012
Cell Nr.	082 448 1231
Email	MM@bergmun.org.za

Table A.2.1: Water Services Administrative Structure	
WSA Manager	
Designation	Manager: Civil Engineering Services
Name	Mr J Breunissen
Telephone Nr.	022 913 6025
Cell Nr.	083 272 3805
Email	breunissenj@bergmun.org.za
WSP Manager	
Designation	Manager: Civil Engineering Services
Name	Mr J Breunissen
Telephone Nr.	022 913 6025
Cell Nr.	083 272 3805
Email	breunissenj@bergmun.org.za
WSDP Manager	
Designation	Manager: Civil Engineering Services
Name	Mr J Breunissen
Telephone Nr.	022 913 6025
Cell Nr.	083 272 3805
Email	breunissenj@bergmun.org.za
IDP Manager	
Designation	Manager: Strategic Services
Name	Ms A van Sittert
Telephone Nr.	022 913 6076
Cell Nr.	083 607 4644
Email	sb@bergmun.org.za

A.3. Water Services Overview

Bergrivier Municipality is situated within the Berg-Olifants Water Management Area. The Municipality further falls within the West Coast Region of the Western Cape Province, in which the following Local Municipalities are also located:

- Matzikama Municipality;
- Cederberg Municipality;
- Swartland Municipality; and
- Saldanha Bay Municipality

The Municipality comprises of nine (9) urban settlements, approximately 40 kilometres of coastline and a vast rural area. The main urban settlements that constitute the Municipality are Piketberg, which is the administrative head office, Porterville, Velddrif (which include Port Owen, Laaiplek and Noordhoek), Dwarskersbos, Eendekuil, Aurora, Redelinghuys, Goedverwacht and Wittewater. Another settlement, De Hoek, also falls within the municipal boundary, but is not serviced in respect of water by the Municipality.

The Municipality consists of seven (7) individual wards and is the only WSA within this municipal area. It is also the Water Services Provider (WSP). Bulk potable water is however provided to the towns of Velddrif and Dwarskersbos by the West Coast District Municipality through their Withoogte bulk water distribution system. The bulk potable water supplied from the Withoogte WTW is augmented by abstraction of groundwater from the Langebaan Road Groundwater Aquifer System. The bulk distribution scheme is a cross-border scheme and supply water to Bergrivier Municipality, Swartland Municipality and Saldanha Bay Municipality. A Service Level Agreement between the West Coast District Municipality and Bergrivier Municipality is in place for the provision of bulk potable water to these two towns. Bergrivier Municipality's responsibility as WSA also extends to the rural areas within its Municipal boundary.

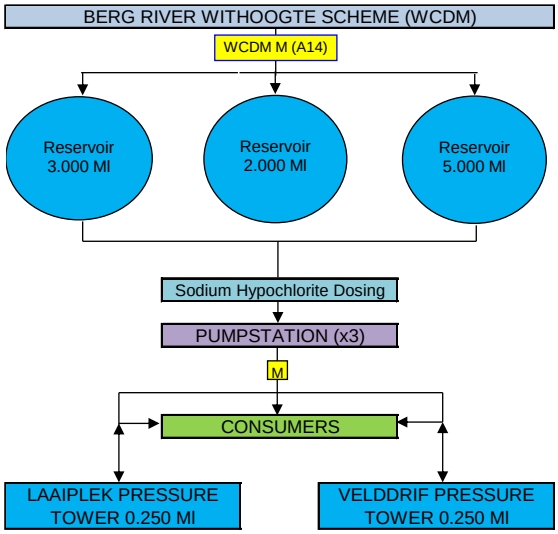
Bergrivier Municipality's Management Area includes the following areas (***Water Distribution Systems***):

- Porterville - ***Porterville Water Distribution System***
- Piketberg – ***Piketberg Water Distribution System***
- Velddrif – ***Velddrif Water Distribution System***
- Dwarskersbos – ***Dwarskersbos Water Distribution System***
- Aurora – ***Aurora Water Distribution System***
- Eendekuil – ***Eendekuil Water Distribution System***
- Redelinghuys – ***Redelinghuys Water Distribution System***
- Wittewater, managed by the Moravian Church
- Goedverwacht, managed by the Moravian Church
- The rural farm areas

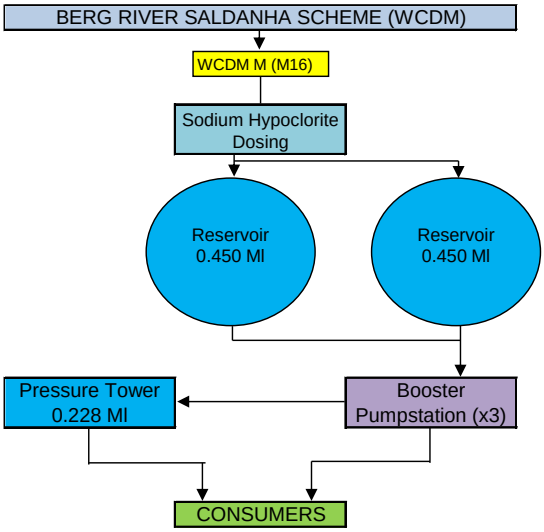
The West Coast District Municipality supplies bulk potable water to Velddrif and Dwarskersbos. Bergrivier Municipality provides bulk potable water to all the other towns and settlements.

Velddrif: Potable water is supplied to Velddrif by the West Coast District Municipality as part of the Withoogte Regional Scheme, which forms part of the Western Cape Water Supply System. The Voëlvlei Dam is the main storage dam to supply water to this part of the system, as well as the Berg River. Water can also be released from the Berg River Dam in the upper part of the Berg River should it be necessary. Raw water is pumped from the Misverstand Weir to the Withoogte WTW for treatment, before distribution to the various West Coast District Municipality's consumers. The potable water supplied by the West Coast District Municipality to Velddrif is stored in three reservoirs in Velddrif, with a total storage capacity of 10.000 Ml. There are also two water towers with a total storage capacity of 0.500 Ml in Velddrif.

Dwarskersbos: Potable water is also supplied to Dwarskersbos from the Withoogte WTW. The potable water is stored in two reservoirs in Dwarskersbos, with a total storage capacity of 0.900 Ml and a water tower with a capacity of 0.228 Ml.

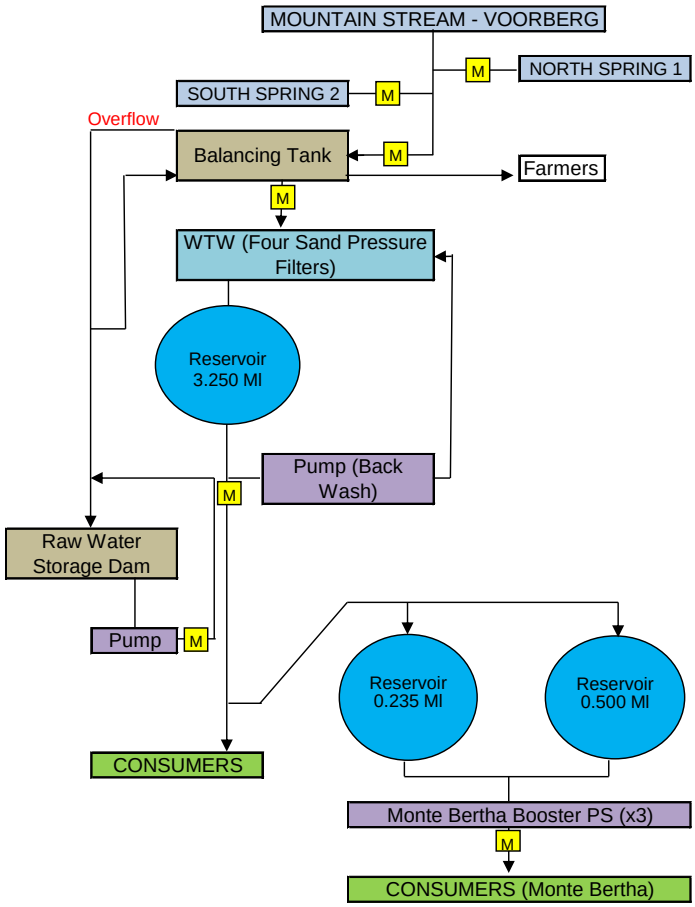


Velddrif

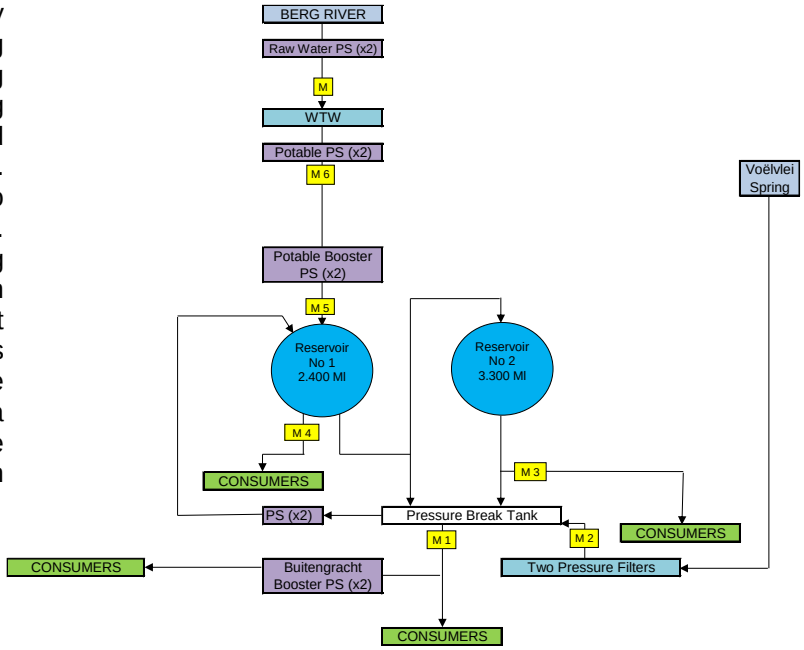


Dwarskersbos

Porterville: Bulk raw water is supplied to the Porterville WTW from two springs (South and North) and the Voorberg Stream. The raw water flows through a balancing tank to the WTW and the overflow water is stored in a dam just below the WTW from where it can also be pumped back to the WTW. A new bulk raw water pipeline was constructed during the 2015/2016 financial year to supply raw water to the farmers, according to the new Service Level Agreement. The WTW consists of four pressure sand filters. The potable water is stored in the town's main reservoir with a storage capacity of 3.250 Ml from where it gravitates to the town and the two Monte Bertha reservoirs, with a total storage capacity of 0.735 Ml.

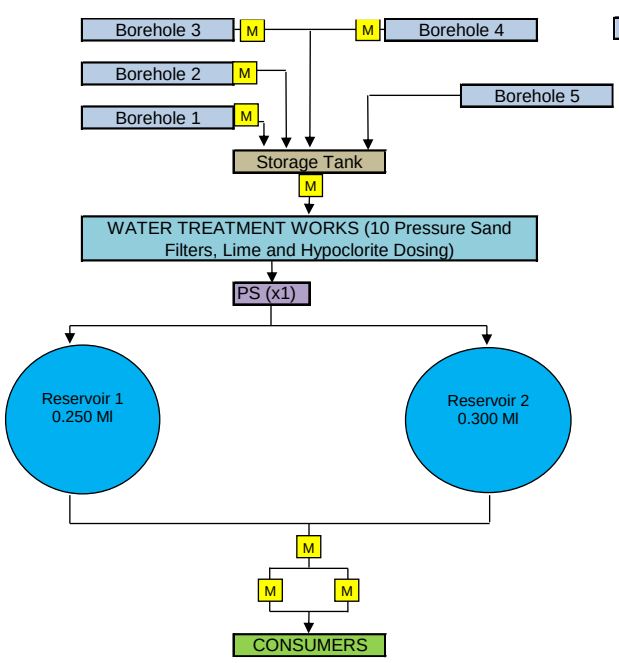


Piketberg: Bulk raw water is primarily supplied to Piketberg from the Berg River. Water is pumped from the Berg River pump station to the Piketberg WTW, where the water is treated and the final water is pumped to the town. Piketberg is allowed to abstract up to 0.704 million m³/a from the Berg River. Bulk water is also supplied to Piketberg from the Voëlvlei Spring, with less than 5% of Piketberg's total system input volume for the last two financial years supplied from this source. Potable water is stored in two reservoirs with a total storage capacity of 5.700 Ml before it is distributed to the consumers in Piketberg.

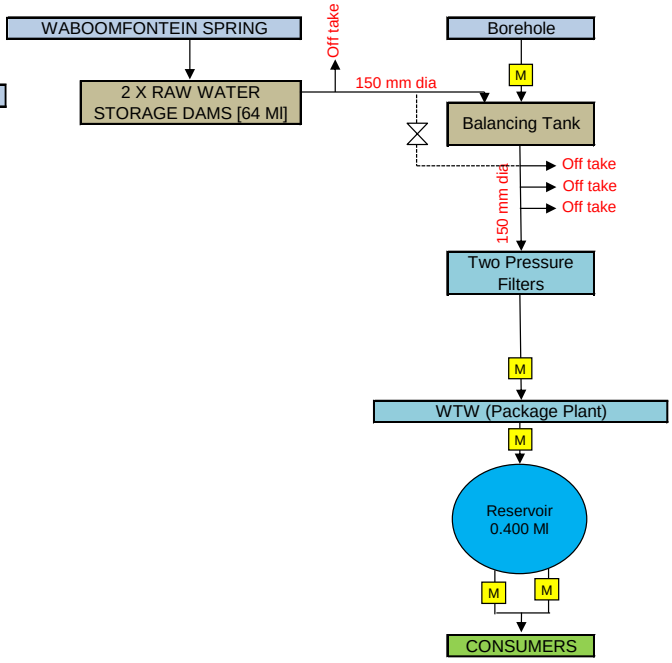


Aurora: Bulk raw water supply to Aurora is from four production boreholes. The water is pumped from the boreholes to the Aurora WTW for treatment. The WTW consists of ten pressure sand filters, with soda-ash dosing. The treated water from the WTW is pumped to the town's two reservoirs with a total storage capacity of 0.550 Ml. The water gravitates from the two reservoirs to the consumers in Aurora.

Eendekuil: Bulk raw water gravitates to the Eendekuil WTW from two raw water storage dams (Capacity of 64 Ml) outside the town. The drainage to the dams is from the Waboomfontein spring. The supply from the dams can also be supplemented with groundwater from one borehole outside the town. There are two pressure filters on the bulk supply pipeline to the WTW (Package Plant). Treated water from the WTW is stored in a 0.400 Ml reservoir form where it gravitates to the consumers in Eendekuil.

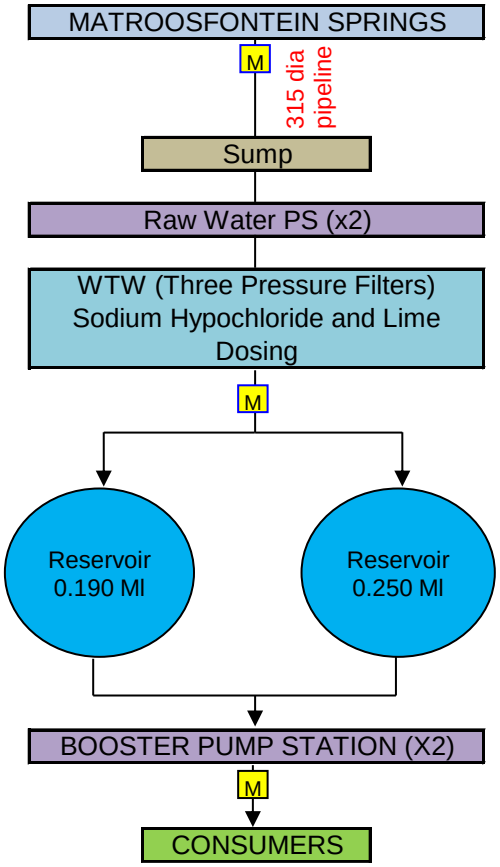


Aurora



Eendekuil

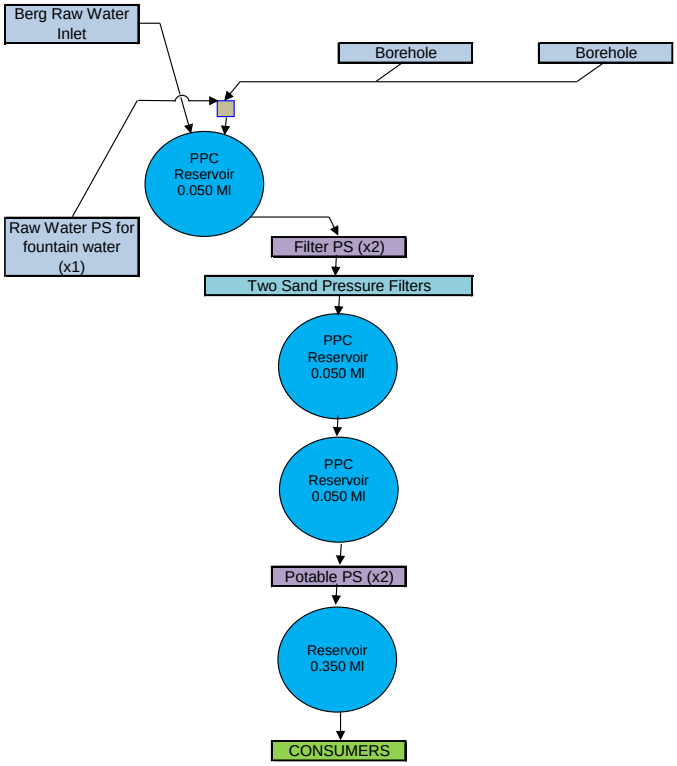
Redelinghuys: Bulk raw water gravitates to the Redelinghuys WTW from the Matroosfontein Springs via a 315mm diameter pipeline. A new bulk water meter was installed at the springs. The WTW consists of three pressure filters, with sodium hypochlorite and lime dosing. Final treated water from the WTW is pumped to the two storage reservoirs with a total capacity of 0.440 Ml, from where it gravitates to the consumers in Redelinghuys.



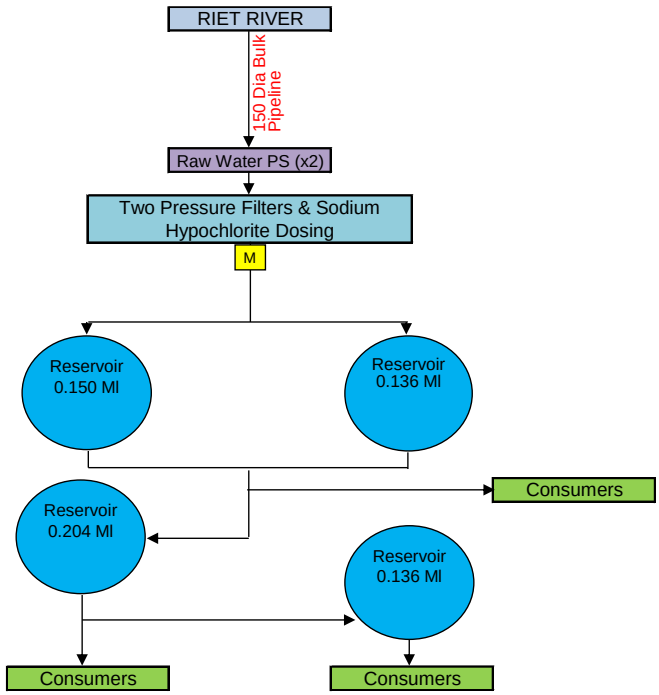
The towns managed by the Moravian Church, for which Bergrivier Municipality only provides a support service, are as follows:

Wittewater: The town relies on surface water abstracted from the local stream and a fountain that also feed the stream. Groundwater is also pumped from two boreholes to the WTW. The WTW consists of two sand pressure filters that treat the raw water, before the potable water is pumped to the town's main storage reservoir with a storage capacity of 0.350 Ml.

Goedverwacht: Raw water is abstracted from the Riet River and distributed via a 150mm diameter pipeline to the WTW. The WTW consists of two pressure filters with sodium hypochlorite dosing. From there the treated water is distributed to four reservoirs, with a total capacity of 0.626 Ml. Potable water gravitates from these reservoirs to the consumers in Goedverwacht.



Wittewater



Goedverwacht

The water services levels of the respective settlements are illustrated in the context of its adequacy (as per WSDP Guide Framework definitions), and further summarised in Section C.2 of this Water Services Audit Report. Due to its categorization in terms of adequacy, a single settlement may be categorized in terms of more than one adequacy definition (example a portion of the households may receive adequate services whilst the remainder may have a specific infrastructure 'upgrade' or 'refurbishment' need).

The tables below give an overview of the major **water infrastructure** components, for the various distribution systems, in Bergrivier Municipality's Management Area.

A.3.1: Existing main water infrastructure (Resources and WTWs)			
Water Distribution System	Bulk Supply	WTWs and Treatment Processes	
	Resources	WTW (Capacity in Ml/d)	Processes
Porterville	Voorberg Mountain Stream and two Springs	2.270	Flow measurement, Stabilisation (Calcium Carbonate), Chemical Dosing (Activated Carbon), Filtration (Four pressure sand filters), Disinfection (Chlorine gas)
Piketberg	Berg River and Voëlvlei Spring	3.150	Flow measurement, Chemical dosing (Aluminium Sulphate), Sedimentation (Horizontal flow clarifiers and one circular clarifier), Filtration (Rapid gravity sand filters), Stabilisation (Calcium Carbonate), Disinfection (Chlorine gas)
Wittewater	Mountain Stream, Fountain and Two Boreholes	Unknown	Filtration (Two pressure sand filters)
Goedverwacht	Riet River	Unknown	Filtration (Two pressure sand filters), Disinfection (Sodium Hypochlorite)
Velddrif	Berg River (Withoogte Bulk Scheme)	-	-
Dwarskersbos	Berg River (Withoogte Bulk Scheme)	-	-
Aurora	Four Boreholes	0.200	Chemical dosing (Sodium Carbonate), Filtration (Ten pressure sand filters), Disinfection (Sodium Hypochlorite)
Eendekuil	Waboomfontein River and Spring and Borehole	0.200	Flow measurement, Filtration on bulk supply pipeline (Two pressure sand filters), Package Plant (Ultra filtration unit), Stabilisation (Calcium Carbonate), Disinfection (Sodium Hypochlorite)
Redelinghuys	Matroosfontein Springs	0.260	Flow measurement, Filtration (Three pressure sand filters), Stabilisation (Calcium Carbonate), Disinfection (Sodium Hypochlorite)

The table below gives a summary of the existing capacities and current flows at each of the WTWs (Ml/d).

Table A.3.2: Existing capacities and flows at each of the WTWs (Ml/d)					
WTW	Existing Hydraulic Capacity	Peak Month Average Daily Flow	Average Daily Flow (Jul 2021 – Jun 2022)	Required Treatment Capacity (1.5 x AADD10yr)	2021/2022 Water Quality Network Failures (SANS0214:2015)
Porterville	2.270	1.728 (Feb)	1.272	2.326	Turbidity, pH
Piketberg	3.150	2.830 (Feb)	2.006	4.209	Turbidity, E.Coli, Total Coliforms
Aurora	0.200	0.175 (Feb)	0.126	0.219	Sodium, Chloride
Eendekuil	0.200	0.241 (Jan)	0.173	0.428	Turbidity
Redelinghuys	0.260	0.210 (Feb)	0.160	0.279	Turbidity

A.3.3: Existing main water infrastructure (Reticulation, Pump Stations and Reservoirs)						
Water Distribution System	Water Distribution Networks		Number of Water PS		Reservoirs and Water Towers	
	Bulk	Internal	Raw Water	Potable Water	Number of Reservoirs & Water Towers	Total Storage in Ml
	km	km	Number of PS	Number of PS		
Porterville	3.565	32.750	1	1	3	3.985
Piketberg	19.400	54.130	1	4	2	5.700
Wittewater	0.546	6.640	1	1	4	0.500
Goedverwacht	1.839	14.570	1	-	4	0.626
Velddrif	-	87.325	-	1	5	10.500
Dwarskersbos	-	15.605	-	1	3	1.128
Aurora	2.633	12.945	-	1	2	0.550
Eendekuil	13.436	7.180	-	-	1	0.400
Redelinghuys	3.208	8.515	-	1	2	0.440

A.3.3: Existing main water infrastructure (Reticulation, Pump Stations and Reservoirs)						
Water Distribution System	Water Distribution Networks		Number of Water PS		Reservoirs and Water Towers	
	Bulk	Internal	Raw Water	Potable Water	Number of Reservoirs & Water Towers	Total Storage in Ml
	km	km	Number of PS	Number of PS		
Total Bergrivier	**44.627**	**239.660**	**4**	**10**	**26**	**23.829**

The table below gives an overview of the major **sewerage infrastructure** components, for the various drainage systems, in Bergrivier Municipality's Management Area.

A.3.4: Existing main sewerage infrastructure						
Sewer Drainage Systems	WWTWs and Treatment Processes			Sewer Drainage Network		Number of Sewer PS
	Hydraulic Capacity	Organic Capacity	Treatment Processes	Rising	Gravity	
	Ml/d	kg COD/d		km	km	
Porterville	1.500	1 701	Activated Sludge: Inlet works, Biological Reactor, Secondary Settling Tank, Chlorination, Sludge Treatment	0	28.100	-
Piketberg	3.150	2 022	Activated Sludge: Inlet works, Biological Reactor, Two Secondary Settling Tanks, Chlorination, Sludge Treatment (Dams)	0.900	45.900	2
Velddrif	1.995	3 200	Activated Sludge: Inlet works, Biological Reactor, Two Secondary Settling Tanks, Chlorination, Sludge Treatment	15.500	34.000	49 *
Dwarskersbos	0.294	Unknown	Oxidation Ponds: Inlet works, Lined Primary, Secondary and Tertiary Ponds.	5.200	6.300	7 *
Eendekuil	0.140	Unknown	Oxidation Ponds: Inlet works, Lined Primary-, Secondary- and Tertiary Pond	1.500	2.400	2
Total Bergrivier				**23.100**	**116.700**	**58**

Note: No sewerage infrastructure in Wittewater, Goedverwacht, Aurora and Redelinghuys
* New sewer pump stations in Velddrif and Dwarskersbos still to be added.

The table below gives a summary of the existing hydraulic design capacities and current flows at each of the WWTWs, as well as the final effluent quality compliance percentages for the 2021/2022 financial year (Ml/d).

Table A.3.5: Existing hydraulic design capacities and flows at each of the WWTWs (Ml/d)						
WWTW	Existing Hydraulic Capacity	Peak Month Average Daily Flow	Average Daily Flow (2021/2022)	Average Wet Weather Flow	Average Daily Flow as a % of Design Capacity	Final Effluent Compliance for 2021/2022 *against Authorisation*
Porterville	1.500	1.412 (Jun)	0.724	0.654	48.27%	Microbiological: 33.3% Chemical: 79.2% Physical: 91.7% *General Limits*
Piketberg	3.150	Unknown	1.711	Unknown	54.32%	Microbiological: 25.0% Chemical: 75.0% Physical: 86.1% *General Limits*
Velddrif	1.995	Unknown	1.567	Unknown	78.55%	Microbiological: 16.7% Chemical: 29.2% Physical: 47.2% *Licence Limits*
Dwarskersbos	0.294	Unknown	0.151	Unknown	51.36%	Microbiological: 100.0% Chemical: 83.3% Physical: 29.2% *General Limits (Irrigation)*

Table A.3.5: Existing hydraulic design capacities and flows at each of the WWTWs (Ml/d)						
WWTW	**Existing Hydraulic Capacity**	**Peak Month Average Daily Flow**	**Average Daily Flow (2021/2022)**	**Average Wet Weather Flow**	**Average Daily Flow as a % of Design Capacity**	**Final Effluent Compliance for 2021/2022 *against Authorisation***
Eendekuil	0.140	Unknown	0.088	Unknown	62.57%	Microbiological: 100.0% Chemical: 83.3% Physical: 100.0% *General Limits (Irrigation)*

The organic design capacities of the activated sludge WWTWs and the current loadings at these WWTWs are indicated in the table below.

Table A.3.6: Existing organic design capacities and historical loadings at the activated sludge WWTWs							
WWTW	**Organic Design Capacity (kg COD/d)**	**2021/2022**		**2020/2021**		**2019/2020**	
		Average Load (kg COD/d)	**% of Design Capacity**	**Average Load (kg COD/d)**	**% of Design Capacity**	**Average Load (kg COD/d)**	**% of Design Capacity**
Porterville	1 701	1 157	68.0%	1 166	68.5%	642	37.7%
Piketberg	2 022	1 546	76.5%	2 015	99.7%	1 476	73.0%
Velddrif	3 200	2 469	77.2%	1 792	56.0%	2 805	87.7%

The 2011 Census data indicated that there was an extensive migration into the Municipal Area. The population figure for Bergrivier Municipality in 2001 was 46 327 persons. This figure increased substantially to 61 898 persons in 2011. The Community Survey of 2016 from Statistics South Africa estimate the 2016 population for Bergrivier Municipality at 67 474 persons and the permanent households at 19 072, at an average household size of 3.54 persons per household.

The 2021 Socio-Economic Profile for Bergrivier Municipality (Western Cape Government) estimate the 2021 population for Bergrivier Municipality at 74 042 persons and the 2020 households at 18 462. The population is estimated to increase to 77 713 by 2025, which equates to an average annual growth of 1.2%.

The 2021/2022 population for the various water distribution systems were estimated by applying the annual growth rates as indicated in the table below. The current population figures and the annual population growth percentages used in the WSDP Performance- and Water Services Audit Report are aligned with the figures used in DWS's GeoDatabase. The future estimated annual population growth percentages, as listed in the table below, were agreed with the Civil Services and Community Services Departments during January 2014.

Table A.3.7: Estimated future annual population growth percentages, population and households per distribution system			
Distribution System	**Estimated future annual Population Growth %**	**Projected 2021/2022 Persons**	**Projected 2021/2022 Households**
Porterville	1.50%	8 190	2 262
Piketberg	1.75%	14 363	3 473
Wittewater	0.50%	891	200
Goedverwacht	2.00%	2 412	657
Velddrif	5.00%	17 946	5 900
Dwarskersbos	3.50%	945	298
Aurora	1.00%	638	220
Eendekuil	2.00%	1 865	462
Redelinghuys	0.50%	603	146
Farms	1.50%	29 675	7 151
Total	**2.28%**	**77 528**	**20 769**

The tables below give an overview of the projected population and permanent number of households and the water and sanitation service levels in Bergrivier Municipality's Management Area.

Table A.3.8: Water Services Overview (Water)

Settlement Type	2011/2012 Households	2011/2012 Population	2021/2022 Households	2021/2022 Population	Water category: Adequate: Formal	Adequate: Informal	Adequate: Sahred Services	Water resources needs only	O&M needs only	Infrastructure needs only	Infrastructure & O&M needs	Infrastructure, O&M & Resource need	No Services: Informal	No Services: Formal
URBAN														
Metropolitan Area					**Adequate**			**Below RDP**					**None**	
Sub-Total	**0**	**0**	**0**	**0**										
Formal Town					**Adequate**			**Below RDP**					**None**	
Porterville	1 949	7 057	2 262	8 190	P		P							
Piketberg	2 920	12 075	3 473	14 363	P		P							
Wittewater	190	848	200	891	P		P							
Goedverwacht	539	1 979	657	2 412	P		P							
Velddrif	3 622	10 677	5 900	17 946	P		P							
Dwarskersbos	211	670	298	945	P		P							
Aurora	199	578	220	638	P		P							
Eendekuil	379	1 530	462	1 865	P		P							
Redelinghuys	139	574	146	603	P		P							
Sub-Total	**10 148**	**35 988**	**13 618**	**47 853**										
Townships					**Adequate**			**Below RDP**					**None**	
Sub-Total	**0**	**0**	**0**	**0**										
Informal Settlements					**Adequate**			**Below RDP**					**None**	
Velddrif	85	340	0	0										
Sub-Total	**85**	**340**	**0**	**0**										
Working towns & service centres					**Adequate**			**Below RDP**					**None**	
Sub-Total	**0**	**0**	**0**	**0**										
Sub-Total: (Urban)	**10 233**	**36 328**	**13 618**	**47 853**										
RURAL														
Rural / Farming					**Adequate**			**Below RDP**					**None**	
Farms	6 162	25 570	7 151	29 675	P		P							P
Sub-Total	**6 162**	**25 570**	**7 151**	**29 675**										
Informal Settlements					**Adequate**			**Below RDP**					**None**	
Sub-Total	**0**	**0**	**0**	**0**										
Sub-Total (Rural)	**6 162**	**25 570**	**7 151**	**29 675**										
TOTAL	**16 395**	**61 898**	**20 769**	**77 528**										

Table A.3.9: Water Services Overview (Sanitation)

Settlement Type	2011/2012 Households	2011/2012 Population	2021/2022 Households	2021/2022 Population	Sanitation category: Adequate: Formal	Adequate: Informal	Adequate: Sahred Services	Water resources needs only	O&M needs only	Infrastructure needs only	Infrastructure & O&M needs	Infrastructure, O&M & Resource need	No Services: Informal	No Services: Formal
URBAN														
Metropolitan Area					**Adequate**			**Below RDP**					**None**	
Sub-Total	**0**	**0**	**0**	**0**										
Formal Town					**Adequate**			**Below RDP**					**None**	
Porterville	1 949	7 057	2 262	8 190	P		P							
Piketberg	2 920	12 075	3 473	14 363	P		P							
Wittewater	190	848	200	891	P		P							
Goedverwacht	539	1 979	657	2 412	P		P							
Velddrif	3 622	10 677	5 900	17 946	P		P							
Dwarskersbos	211	670	298	945	P		P							
Aurora	199	578	220	638	P		P							
Eendekuil	379	1 530	462	1 865	P		P							
Redelinghuys	139	574	146	603	P		P							
Sub-Total	**10 148**	**35 988**	**13 618**	**47 853**										
Townships					**Adequate**			**Below RDP**					**None**	
Sub-Total	**0**	**0**	**0**	**0**										
Informal Settlements					**Adequate**			**Below RDP**					**None**	
Velddrif	85	340	0	0										
Sub-Total	**85**	**340**	**0**	**0**										
Working towns & service centres					**Adequate**			**Below RDP**					**None**	
Sub-Total	**0**	**0**	**0**	**0**										
Sub-Total: (Urban)	**10 233**	**36 328**	**13 618**	**47 853**										
RURAL														
Rural / Farming					**Adequate**			**Below RDP**					**None**	
Farms	6 162	25 570	7 151	29 675	P		P							P
Sub-Total	**6 162**	**25 570**	**7 151**	**29 675**										
Informal Settlements					**Adequate**			**Below RDP**					**None**	
Sub-Total	**0**	**0**	**0**	**0**										
Sub-Total (Rural)	**6 162**	**25 570**	**7 151**	**29 675**										
TOTAL	**16 395**	**61 898**	**20 769**	**77 528**										

B. WSDP PERFORMANCE REPORT

B.1. WSDP Reference and Status

Bergrivier Municipality's WSDP was updated according to the DWS's 2014 WSDP format and was approved by Council on the 25th of October 2016. The Municipality plans to update the WSDP during the 2022/2023 financial year for the next five-year WSDP Cycle (2022-2027), according to DWS's new WSDP website guidelines.

Table B.1.1: WSDP and Reporting Reference

Nr	WSDP Title and Reference	Status	Date	WSDP Year	Financial Year	Reporting year
	WSDP IDP Sector Input Report, eWSDP, Module 2: Base Data and Compliance Data and Module 3: Strategies	Drafted:	Jul'16	Year 1	2017/16	Year - 4
		Comment submit:	After Oct'16	Year 2	2018/19	Year - 3
		Finalised:	After Comments	Year 3	2019/20	Year - 2
		Adopted:	25/10/2016	Year 4	2020/21	Year - 1
		Published:	25/10/2016	**Year 5**	**2021/22**	Year 0

Legend:

- Past Financial Years
- Previous Financial Year (financial year of reporting)
- Future Years

B.2. Performance on Water Services Objectives and Strategies

The IDP is the Municipality's single most strategic document that drives and directs all implementation and related processes. The Municipality's budget is developed based on the priorities, programmes and projects of the IDP, after which a Service Delivery and Budget Implementation Plan (SDBIP) is developed, to ensure that the organisation actually delivers on the IDP targets.

The SDBIP is the process plan and performance indicator / evaluation for the execution of the budget. The SDBIP is being used as a management, implementation and monitoring tool that assists and guide the Executive Mayor, Councillors, Municipal Manager, Senior Managers and the community. The plan serves as an input to the performance agreements of the Municipal Manager and Directors. It also forms the basis for the monthly, quarterly, mid-year and the annual assessment report and performance assessments of the Municipal Manager and Directors.

Finally, the Annual Report, of which the Water Services Audit Report forms a part, records the success or otherwise of the previous year's implementation.

The table below gives an overview of the Municipality's performance on the water and sanitation objectives and strategies per WSDP topic, as taken from the SDBIP.

Table B.2.1: Performance on Water Services Objectives and Strategies per WSDP Topic

Nr	Objective / Strategy	Key Performance Indicator	Inclusion (yes/no)		WSDP Year 1		WSDP Year 2		WSDP Year 3		WSDP Year 4		WSDP Year 5	
					FY 1	2017/18	FY 2	2018/19	FY 3	2019/20	FY 4	2020/21	FY 5	2021/22
			WSDP	IDP	Target	Actual	Target	Actual	Target	Actual	Target	Actual	Target	Actual
WSDP Topic 1: Administration														
	Compilation of monthly report in prescribed format	Number of monthly reports submitted to Technical Committee	-	-	12	12	12	12						
WSDP Topic 2: Demographics														
WSDP Topic 3: Service levels														
	Number of formal households that receive piped water that is connected to the municipal water infrastructure network as at 30 June	Number of households which are billed for water or have prepaid meters as at 30 June	-	-			9 238	9 168			9 218	9 533		
	Number of formal households connected to the municipal wastewater network for sewerage service, irrespective of the number of closets (toilets) at 30 June	Number of households which are billed for sewerage at 30 June	-	-			7 346	7 458			7 508	7 526		
	Provide free basic water to indigent households	Number of households receiving free basic water	-	-			1 800	1 988			1 950	2 128		
	Provide free basic sanitation to indigent households	Number of households receiving free basic sanitation	-	-			1 600	1 758			1 650	1 886		
WSDP Topic 4: Socio economic														
	Reports on EPWP Grant	Number of Reports	-	-	1	1								
	Reports on FTE achieved	FTE achieved	-	-	41	72								
	Number EPWP jobs created	Jobs created	-	-	132	455								
TL41	Create full time equivalents (FTE's) ito EPWP programme by 30 June	Number of FTE's created by 30 June	Yes	Yes	36	91	61	142	61	142	65	105	65	108.6
WSDP Topic 5: Water Services Infrastructure														
	95% of MIG funding allocated for the financial year to build a new WWTW in Porterville by 30 June 2018	% of MIG funding allocated for the financial year to build a new WWTW in Porterville by 30 June 2018	-	-	95%	100%	95%	100%						
	Construction of WWTW in Porterville	% Capital budget spent	-	-	95%	100%								
	Report the acquisition of new assets that must be taken up in the asset register to SCM Unit	% of assets registered within one month of receipt of asset	-	-	100%	100%								
	New water standby pumps	% Capital budget spent	-	-	0%	100%								
	Telemetry - Water	% Capital budget spent	-	-	0%	0%								
	Capital Switchgear and pumps - Velddrif	% Capital budget spent	-	-	0%	0%								
	Sewerage standby pumps	% Capital budget spent	-	-	0%	0%								
	Replace water meters	% Capital budget spent	-	-	0%	0%								
	Purchase new borehole pumps	% Capital budget spent	-	-	0%	0%								
WSDP Topic 6: Operation Maintenance														
WSDP Topic 7: Associated services														
WSDP Topic 8: Conservation and Demand management														
TL31	Limit unaccounted for water by 30 June	% unaccounted water by 30 June	Yes	Yes	10%	6.98%	10%	9.42%	10%	13.80%	10%	15.90%	12%	15.10%
	Research the development of a strategy for innovative methods to manage droughts and water supply and submit research paper to EMC by 30 June 2018.	Paper submitted	-	-	1	1								
	Monitor water losses on a monthly basis	No of monthly reports on water losses	-	-	12	12								
	Repair / replace faulty water meters on list received from Finance within 2 working days	% meters repaired within 5 working days (Subject to availability of material from suppliers)	-	-	100%	100%								
	Replace redundant meters	% capital budget spent	-	-	0%	0%								
	Submit a water augmentation plan by 30 June 2020 to Executive Mayoral Committee	Number of water augmentation plans submitted to Executive Mayoral Committee by 30 June 2020	-	-					1	10				

Table B.2.1: Performance on Water Services Objectives and Strategies per WSDP Topic

Nr	Objective / Strategy	Key Performance Indicator	Inclusion (yes/no)		WSDP Year 1		WSDP Year 2		WSDP Year 3		WSDP Year 4		WSDP Year 5	
					FY 1	2017/18	FY 2	2018/19	FY 3	2019/20	FY 4	2020/21	FY 5	2021/22
			WSDP	IDP	Target	Actual	Target	Actual	Target	Actual	Target	Actual	Target	Actual
WSDP Topic 9: Water Resources														
	Compile a draft Infrastructure Growth Plan, inclusive of a Water Augmentation Plan, and submit by 30 June 2021 to Executive Mayoral Committee	Number of Draft Infrastructure Growth Plans, inclusive of a Water Augmentation Plan, submitted to Executive Mayoral Committee by 30 June 2021	-	-							1	1		
	Monitor potable water quaility (SANS 241 standards) in perusal of blue drop requirements	No of monthly reports on water quality results and publication thereof on website within 10 days after month end	-	-	12	12								
	Monitor waste water quality in perusal of green drop requirements	No of monthly reports on waste water quality results and publication thereof on website within 10 days after month end	-	-	12	12								
TL38	95% water quality level obtained as per SANS 241 physical & micro parameters as at 31 December and 30 June	% water quality level as at 31 December and 30 June	Yes	Yes	95%	98%	95%	100%	95%	97%	95%	99%	95%	98%
WSDP Topic 10: Financial profile														
TL33	95% of MIG conditional grant spent by 30 June to upgrade infrastructure	% of MIG conditional grant spent by 30 June	Yes	Yes	95%	100%	95%	99.9%	95%	99.9%	95%	81%	95%	100%
TL35	95% of the capital budget of Directorate Technical Services spent by 30 June	% of capital budget of Directorate Technical Services spent by 30 June	Yes	Yes			95%	90.97%	95%	92.16%	95%	86.99%	95%	95.77%
	Develop 3 separate cost reflective tariffs model for water, sewer and refuse charges and submit to Finance Portfolio Committee by 31 March 2021	Number of cost reflective tariff models developed and submitted to Finance Portfolio Committee by 31 March 2021	-	-							3	3		
WSDP Topic 11: Institutional Arrangements profile														
	Monitor performance of all long term service providers and take the necessary actions to improve performance on a quarterly basis	Number of Service Provider Performance Reports	-	-	4	4								
	Cost effective and productive management of personnel	Number of monthly meetings held with subordinates	-	-	12	12								
	Availability of standby personnel 24 hours per day according to standby list	% Of standby personnel available	-	-	100%	100%								
	Develop a maintenance plan in respect of all current infrastructure and submitted to Technical Portfolio Committee by 30 June 2020	Number of maintenance plans developed in respect of all current infrastructure and submitted to Technical Services Portfolio Committee by 30 June 2020	-	-					1	1				
TL45	Revision of the maintenance plan in respect of all current infrastructure and submit via Technical Portfolio Committee to EMC before 28 February 2021	Number of maintenance plans revised in respect of all current infrastructure and submitted to Technical Services via Portfolio Committee by 28 February 2021	No	Yes							1	1	1	1
WSDP Topic 12: Social and Customer service requirements														
TL43	Ensure continuous upkeep op the electronic contract register on IMIS and submit bi-annual reports to the Municipal Manager after Director has verified reports and signed it off	Number of reports of contract register submitted to the Municipal Manager by 30 June 2021 after Director verified report and signed it off	No	Yes							2	2	1	1
TL42	100% of all complaints registered on IMIS are being attended to within the Directorate and completed before the end of the month following the date on which the complaint was lodged.	% of complaints registered on IMIS being attended to within the Directorate and completed before the end of the month following the date on which the complaint was lodged.	No	Yes	100%	100%			100%	75%	100%	100%	100%	100%
WSDP Topic 13: Needs development plan														

Legend:

	Past Financial Years
	Previous Financial Year (financial year of reporting)
	Future Years

The following water and sanitation related investigations were successfully completed during the last financial year.

- The WSDP Performance- and Water Services Audit Report for the 2020/2021 financial year was finalised and approved by Council as part of the Annual Report. The NRW water balance models were updated for each of the distribution systems (Up to the end of June 2021) as part of the Water Services Audit Process.

- Bergrivier Municipality continues with the implementation of their Drinking Water Quality and Effluent Quality Sampling Programmes (Both Operational and Compliance Monitoring). Sample results are loaded on a monthly basis onto DWS's IRIS. All the WTWs and WWTWs are registered on the IRIS website.

- The Asset Register was updated to include all the water and sewerage capital projects completed during the 2021/2022 financial year.

- Fourth Dam Safety Evaluation Report was done for the Porterville Irrigation Dam, Ingerop, April 2022.

- Second Dam Safety Evaluation Report was done for the Eendekuil Raw Water Dams (North and South), Ingerop, April 2022.

- Water Safety Plan was done for the Withoogte bulk water distribution system by the West Coast District Municipality (Velddrif and Dwarskersbos).

- A detail WTW Process Audit was done for the Withoogte WTW by the West Coast District Municipality (Velddrif and Dwarskersbos).

- Detail WWTW Process Audits were compiled for all the WWTWs.

The Municipality also received the following awards / acknowledgements:

- **Bergrivier Municipality's performed well with regard to DWS's 2021 Blue Drop Progress Assessment (Drinking Water Process and Quality). The Blue Drop Risk Ratings for all six systems fall in the low-risk category (<50%).** The risk ratings were determined based on the following system specific risk indicators.
  - Design capacity;
  - Operational capacity;
  - Water Quality Compliance;
  - Technical Skills; and
  - Water Safety Plans.

- **Bergrivier Municipality delivered an impressive performance with a Green Drop score improvement from 44% in 2013 to 72% in 2021.** The Green Drop Scores for the five WWTWs and drainage systems were between 59% and 81%. The Wastewater Risk Ratings were at low risk (<50%) for the Porterville-, Dwarskersbos- and Eendekuil WWTW and at medium risk for the Piketberg- and Velddrif WWTW (50% - <70%).

B.3. Status of Water Services Projects

Bergrivier Municipality completed the following water and sewerage capital projects during the last financial year.

Table B.3.1: Water Services Projects Status and Performance

Nr	Project Title and Description	Inclusion		Total Project Cost R'000	Project Progress (%)	Year 0 Performance - FY2021/22			Funding Source(s)	Project Category / Type	Planned Period		Project Status	Actual Completion Year
		WSDP	IDP			FY Budget R'000	Expended R'000	%			From FY	To FY		
1	WC/WDM interventions	Yes	Yes	R6 540	58.12%	R289	R288	100%	Own funding	Water	2017/2018	2022/2023	In Progress	-
2	Replace water meters	Yes	Yes	R2 642	100.00%	R1 000	R999	100%	Borrowing	Water	2011/2012	2021/2022	Completed	2021/2022
3	Replace redundant meters	Yes	Yes	R2 057	48.95%	R98	R98	100%	Own funding	Water	2015/2016	2024/2025	In Progress	-
4	Pumps (Standby)	Yes	Yes	R1 686	85.17%	R233	R232	100%	Own funding	Water	2014/2015	2024/2025	In Progress	-
5	Water renewals	Yes	Yes	R19 027	6.58%	R1 100	R1 091	99%	Borrowing	Water	2016/2017	2024/2025	In Progress	-
6	Furniture and Equipment - Water	Yes	Yes	R100	77.10%	R15	R14	97%	Own funding	Water	2011/2012	2024/2025	In Progress	-
7	Tools	Yes	Yes	R248	67.71%	R8	R6	76%	Own funding	Water	2011/2012	2024/2025	In Progress	-
8	Security at Reservoirs / Pump Stations	No	Yes	R989	49.46%	R225	R225	100%	Own funding	Water	2019/2020	2023/2024	In Progress	-
9	Upgrade Piketberg WTW	Yes	Yes	R196	100.00%	R232	R196	85%	Own funding	Water	2021/2022	2021/2022	Completed	2021/2022
10	Dam Safety Reports	Yes	Yes	R48	100.00%	R48	R48	100%	Own funding	Water	2021/2022	2021/2022	Completed	2021/2022
11	Pipe Replacement programme	Yes	Yes	R2 029	100.00%	R2 114	R2 113	100%	Own funding and Borrowing	Water	2020/2021	2021/2022	Completed	2021/2022
12	Sewer renewals	Yes	Yes	R871	55.24%	R120	R112	93%	Own funding	Sewerage	2016/2017	2024/2025	In Progress	-
13	Telemetry	Yes	Yes	R1 263	55.67%	R150	R150	100%	Own funding	Sewerage	2015/2016	2024/2025	In Progress	-
14	Telemetry and pump stations	Yes	Yes	R1 798	63.85%	R209	R195	93%	Own funding	Sewerage	2011/2012	2024/2025	In Progress	-
15	Sewerage standby pumps	Yes	Yes	R1 927	48.10%	R147	R147	100%	Own funding	Sewerage	2011/2012	2024/2025	In Progress	-
16	Furniture and Equipment - Sewerage	Yes	Yes	R101	78.24%	R10	R10	96%	Own funding	Sewerage	2011/2012	2024/2025	In Progress	-
17	Tools	Yes	Yes	R200	69.95%	R19	R17	90%	Own funding	Sewerage	2011/2012	2024/2025	In Progress	-
18	Fencing Sewer Pump Stations	Yes	Yes	R1 102	63.70%	R286	R286	100%	Own funding	Sewerage	2018/2019	2024/2025	In Progress	-
19	VD Pumpline and Pumpstation	Yes	Yes	R6 129	100.00%	R2 530	R2 212	87%	MIG	Sewerage	2019/2020	2021/2022	Completed	2021/2022
20	Refurbishment and upgrade of WWTW	Yes	Yes	R3 885	100.00%	R494	R1 023	207%	Own funding	Sewerage	2019/2020	2021/2022	Completed	2021/2022
21	Inlet Works (Green Drop Requirement)	No	Yes	R234	100.00%	R60	R56	93%	Borrowing	Sewerage	2020/2021	2021/2022	Completed	2021/2022
22	Fencing WWTW	Yes	Yes	R726	79.35%	R354	R354	100%	Own funding	Sewerage	2020/2021	2022/2023	In Progress	-
23	WSIG PV Waste Water Treatment Works	Yes	Yes	R5 735	100.00%	R4 348	R4 227	97%	National Government WSIG	Sewerage	2020/2021	2021/2022	Completed	2021/2022
24	WSIG PB Waste Water Treatment Works	No	Yes	R344	100.00%	R1 388	R344	25%	National Government WSIG	Sewerage	2021/2022	2021/2022	Completed	2021/2022
25	Replace rising mains in pump stations	No	Yes	R694	53.88%	R196	R141	100%	Own funding	Sewerage	2020/2021	2024/2025	In Progress	-
26	Security at WWTW	Yes	Yes	R308	18.81%	R24	R24	100%	Own funding	Sewerage	2020/2021	2024/2025	In Progress	-
27	Security Fence at Irrigation dam	Yes	Yes	R1 098	63.56%	R698	R698	100%	Own funding	Sewerage	2021/2022	2022/2023	In Progress	-
Total				**R61 978**		**R16 393**	**R15 303**	**93%**						

B.4. Past Financial Year Water Services Projects Impact Declaration

The impacts of the water and sewerage capital projects, which were implemented by Bergrivier Municipality in the previous financial year, were as follows:

Table B.4.1: Past Financial Year Project Impact Declaration

Nr	Project Title and Description	Project Category	Settlements which benefitted	Nr Beneficiaries		Impact Declaration
				Households	Population	
1	WC/WDM interventions	WC/WDM	Management Area	-	-	Reduce NRW and Water Losses
2	Replace water meters	WC/WDM	Management Area	400	1399	Reduce NRW and Water Losses
3	Replace redundant meters (Porterville)	WC/WDM	Porterville	39	142	Reduce NRW and Water Losses
4	Pumps (Standby)	Water pump stations	Management Area	-	-	Ensure adequate water supply and pressure
5	Water renewals	Other	Management Area	-	-	Ensure adequate operation and maintenance of existing water infrastructure
6	Furniture and Equipment - Water	Other	Management Area	-	-	Ensure adequate furniture and equipment for operational personnel
7	Tools	Other	Management Area	-	-	Ensure adequate operation and maintenance of existing water infrastructure
8	Security at Reservoirs / Pump Stations	Security	Management Area	-	-	Improve security at water infrastructure to prevent possible vandalism and to reduce water quality security risks
9	Upgrade Iceberg WTW	WTW	Iceberg	3473	14363	Ensure adequate water treatment capacity and compliance with SANS241:2015 water quality limits
10	Dam Safety Reports	WC/WDM	Management Area	-	-	Ensure compliance with dam safety requirements for raw water storage dams
11	Pipe Replacement programme	WC/WDM	Management Area	70	246	Reduce Water Losses and ensure adequate water pipeline capacity
12	Sewer renewals	Other	Management Area	-	-	Ensure adequate operation and maintenance of existing sewerage infrastructure
13	Telemetry	Other	Management Area	-	-	Monitoring of sewer pump stations and WWTW flows
14	Telemetry and pump stations (Eldrin)	Sewer Pump Stations	Eldrin	-	-	Monitoring of sewer pump stations
15	Sewerage standby pumps (Eldrin)	Sewer Pump Stations	Eldrin	-	-	Ensure adequate pump capacity, in order to prevent any possible spillages
16	Furniture and Equipment - Sewerage	Other	Management Area	-	-	Ensure adequate furniture and equipment for operational personnel
17	Tools	Other	Management Area	-	-	Ensure adequate operation and maintenance of existing sewerage infrastructure
18	Fencing Sewer Pump Stations (Eldrin)	Security	Eldrin	-	-	Improve security at sewer pump stations to prevent possible vandalism
19	VD Pump line and Pumpstation (Eldrin)	Drainage network	Eldrin	200	608	Provide higher level of sanitation services to formal households. Ensure adequate pump capacity
20	Refurbishment and upgrade of WWTW	WWTW	Management Area	2262	8190	Ensure adequate wastewater treatment capacity and compliance with authorisation limits for quality discharge
21	Inlet Works (Green Drop Requirement)	Other	Management Area	-	-	Work towards Green Drop Compliance for WWTWs and drainage networks
22	Fencing WWTW	Security	Management Area	-	-	Improve security at WWTWs to prevent possible vandalism and drowning risks
23	WSIG PV Waste Water Treatment Works	WWTW	Porterville	2262	8190	Increase treatment capacity and ensure compliance with final effluent quality.
24	WSIG PB Waste Water Treatment Works	WWTW	Iceberg	3473	14363	Increase treatment capacity and ensure compliance with final effluent quality.
25	Replace rising mains in pump stations	Sewer Pump Stations	Eldrin	-	-	Ensure adequate pump capacity, in order to prevent any possible spillages
26	Security at WWTW	Security	Management Area	-	-	Improve security at WWTWs to prevent possible vandalism and drowning risks
27	Security Fence at Irrigation dam	Security	Management Area	-	-	Improve security at WWTWs to prevent possible vandalism and drowning risks
TOTAL				**12179**	**47500**	

C. WATER SERVICES AUDIT REPORT

C.1. Quantity of Water Services Provided (Water Balance)

Detail IWA Water Balances are available for each of the water distribution systems (towns) in Bergrivier Municipality's Management Area. The graph below gives an overview of the average daily raw water supplied to all the towns.

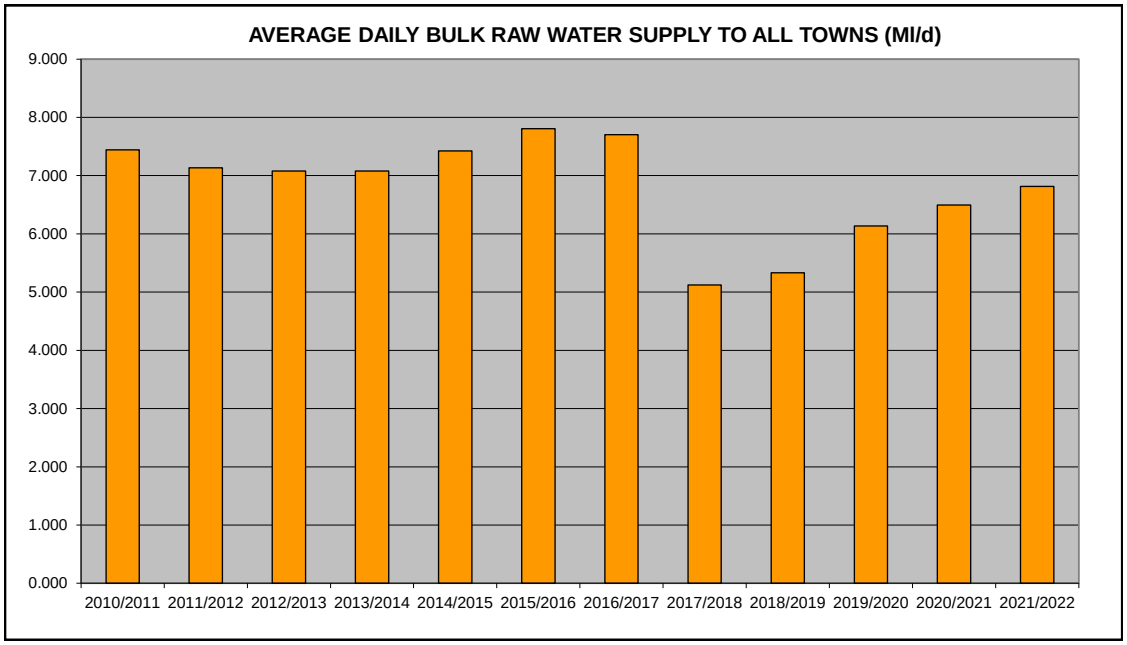


Figure C.1.1: Average daily bulk raw water supply to all the towns in Bergrivier Municipality

The graph below gives an overview of the system input volume and NRW for the various distribution systems in Bergrivier Municipality's Management Area.

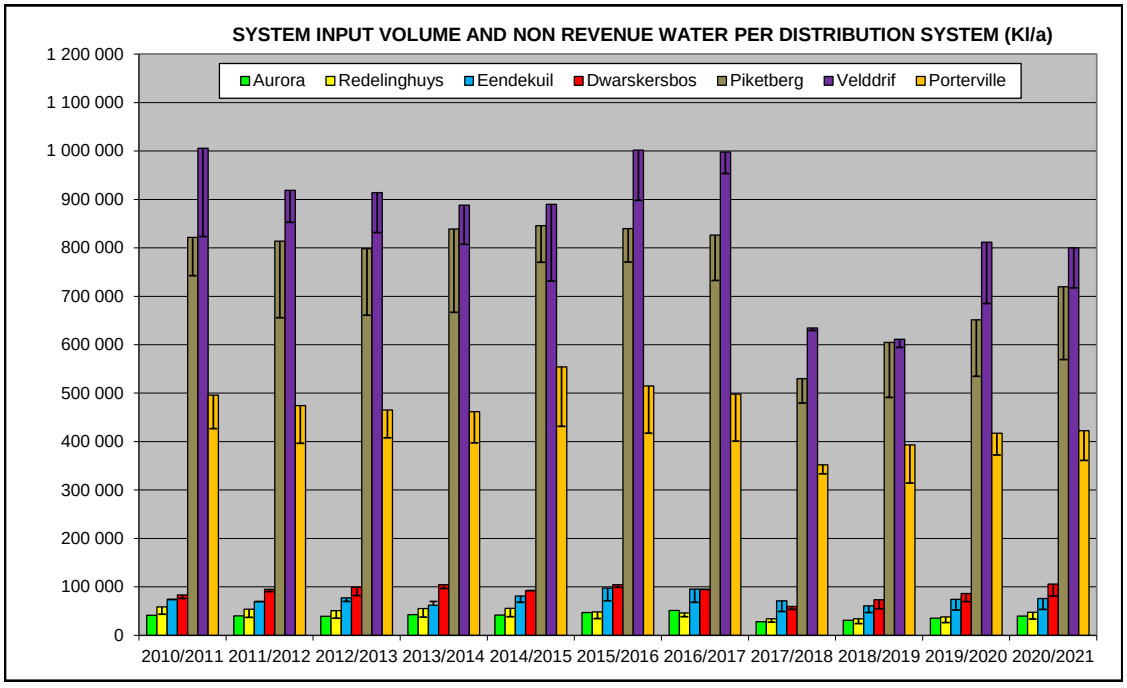


Figure C.1.2: System input volumes and NRW for the various distribution systems

The severe impact of the 2015 to 2017 drought on the total water requirements of the various towns can be noted from the previous two graphs and the table below. The total raw water requirement for all the towns came down from 7.702 Ml/d in 2016/2017 to 5.121 Ml/d in 2017/2018, with a steady recovery over the last four financial years. A significant part of this effort related to the Municipality's WC/WDM initiatives to reduce the overall water requirements and to reduce the NRW and Water Losses for the various systems.

Quantity of water provided by the WSA

All water sources are supplied with bulk water meters and accurate records are kept of all bulk water meter readings. The table below gives a summary of the total bulk raw water supplied to the various towns within Bergrivier Municipality's Management Area.

Table C.1.1: Bulk water supply to the various towns

Distribution System	Source	21/22	Record : Prior (Ml/a)				
			20/21	19/20	18/19	17/18	16/17
Porterville	Voorberg Mountain Stream and two Fountains	464.219	467.864	462.667	473.286	380.720	538.254
Piketberg	Berg River and Voëlvlei Spring	762.006	816.653	712.195	645.058	645.878	963.636
Velddrif	Withoogte Scheme (Berg River)	953.371	800.185	811.611	611.198	634.758	997.973
Dwarskersbos	Withoogte Scheme (Berg River)	117.381	105.625	86.058	73.096	59.366	94.801
Aurora	Boreholes	45.914	43.793	43.074	38.802	31.380	59.354
Eendekuil	Waboomfontein Spring and Borehole	90.158	84.198	82.304	67.234	79.036	105.960
Redelinghuys	Matroosfontein Spring	54.140	52.458	41.818	37.551	37.901	51.118
Total		**2 487.189**	**2 370.776**	**2 239.727**	**1 946.225**	**1 869.039**	**2 811.096**

Notes for bulk water supply volume:

Porterville - System Input Volume plus 7.5% losses for treatment and bulk distribution up to 2017/2018

Piketberg - System Input Volume plus 7.5% losses for treatment and bulk distribution

Redelinghuys and Eendekuil - System Input Volume plus 10.0% losses for treatment and bulk distribution

Siemens bulk water meter for Porterville WTW

Bulk water meter on inlet of 2.4 Ml Piketberg reservoir

Bulk water meter at Eendekuil WTW (System Input Volume)

Endress & Hauser bulk raw water meter for Aurora

The table below gives an overview of the quantity of water services provided / water balance for all the distribution systems in Bergrivier Municipality's Management Area.

Table C.1.2: Quantity of Water Services Provided / Water Balance								
WSDP Ref. #	Regulations Ref. #	Description	m^3 per annum			Ml/d		
			Year 0	Year - 1	Year - 2	Year 0	Year - 1	Year - 2
			FY2021/22	FY2020/21	FY2019/20	FY2021/22	FY2020/21	FY2019/20
		RAW WATER						
7.2.1		Surface water purchased	0	0	0	0.00	0.00	0.00
7.1 / 7.2.2		Surface water abstracted	2,441,275	2,326,983	2,196,653	6.69	6.38	6.02
7.1 / 7.2.3		Ground water abstracted	45,914	43,793	43,074	0.13	0.12	0.12
7.2.14		Effluent recycled	0	0	0	0.00	0.00	0.00
7.2.4		*less* Raw water supplied to others	0	0	0	0.00	0.00	0.00
7.2.5		**Sub-Total: Raw Water supplie**	**2,487,189**	**2,370,776**	**2,239,727**	**6.81**	**6.50**	**6.14**
	10.2 (g) (i)	**BULK WATER SUPPLY**						
7.2.6		Volume of water treated	1,294,282	1,304,436	1,215,631	3.55	3.57	3.33
7.2.7	10.2 (a) (ii)	Purchased treated water	1,070,752	905,810	897,669	2.93	2.48	2.46
7.2.7A		Ground water not treated	0	0	0	0.00	0.00	0.00
7.2.6A		*less* Treated water supplied to others	0	0	0	0.00	0.00	0.00
		Sub-Total: System Input Volume	**2,365,034**	**2,210,246**	**2,113,300**	**6.48**	**6.06**	**5.79**
		WATER CONSUMPTION						
7.2.8.1		Billed Metered:	2,001,282	1,845,759	1,770,538	5.48	5.06	4.85
	10.2 (a) (i)	Domestic	1,443,628	1,384,458	1,295,840	3.96	3.79	3.55
	10.2 (a) (i)	Commercial	339,868	263,884	297,173	0.93	0.72	0.81
	10.2 (a) (i)	Industrial						
	10.2 (a) (i)	Municipal, Others & Farms	217,786	197,417	177,525	0.60	0.54	0.49
7.2.8.2		Billed Unmetered	0	0	0	0.00	0.00	0.00
	10.2 (a) (i)	Domestic	0	0	0	0.00	0.00	0.00
	10.2 (a) (i)	Commercial	0	0	0	0.00	0.00	0.00
	10.2 (a) (i)	Industrial	0	0	0	0.00	0.00	0.00
	10.2 (a) (i)	Municipal, Others & Farms	0	0	0	0.00	0.00	0.00
7.2.8.3		Unbilled Metered	0	0	0	0.00	0.00	0.00
7.2.8.4		Unbilled Unmetered	4,730	4,420	4,227	0.01	0.01	0.01
	10.2 (g) (i)	**Sub-Total: Authorized consumption**	**2,006,012**	**1,850,179**	**1,774,765**	**5.50**	**5.07**	**4.86**
		UNACCOUNTED FOR WATER						
7.3.1		Raw water bulk loss	122,155	160,530	126,427	0.33	0.44	0.35
7.2.3/7.2.4		Billing losses	4,730	4,420	4,227	0.01	0.01	0.01
7.2.5		Apparent losses	46,673	46,809	44,010	0.13	0.13	0.12
7.2.5.1		Illegal connections	7,180	7,201	6,771	0.02	0.02	0.02
7.2.5.2		Inaccurate meters	35,902	36,007	33,854	0.10	0.10	0.09
7.2.5.3		Data errors	3,590	3,601	3,385	0.01	0.01	0.01
7.2.6		Real losses	312,349	313,258	294,526	0.86	0.86	0.81
	10.2 (g) (ii)	**Sub-Total: Unaccounted for water**	**359,022**	**360,067**	**338,535**	**0.98**	**0.99**	**0.93**
		WASTEWATER TREATMENT						
7.2.9	10.2 (a) (iii)	Total received at WWTW	1,547,796	1,461,542	1,396,314	4.24	4.00	3.83
7.2.11		Total discharged	1,273,140	1,204,215	1,154,669	3.49	3.30	3.16
7.2.13		Returned to environment	842,584	790,793	763,515	2.31	2.17	2.09
7.2.14		Recycled	430,557	413,422	391,154	1.18	1.13	1.07
	10.2 (a) (iv)	**Quantity of water supplied not discharged to WWTWs**	**458,216**	**388,637**	**378,451**	**1.26**	**1.06**	**1.04**

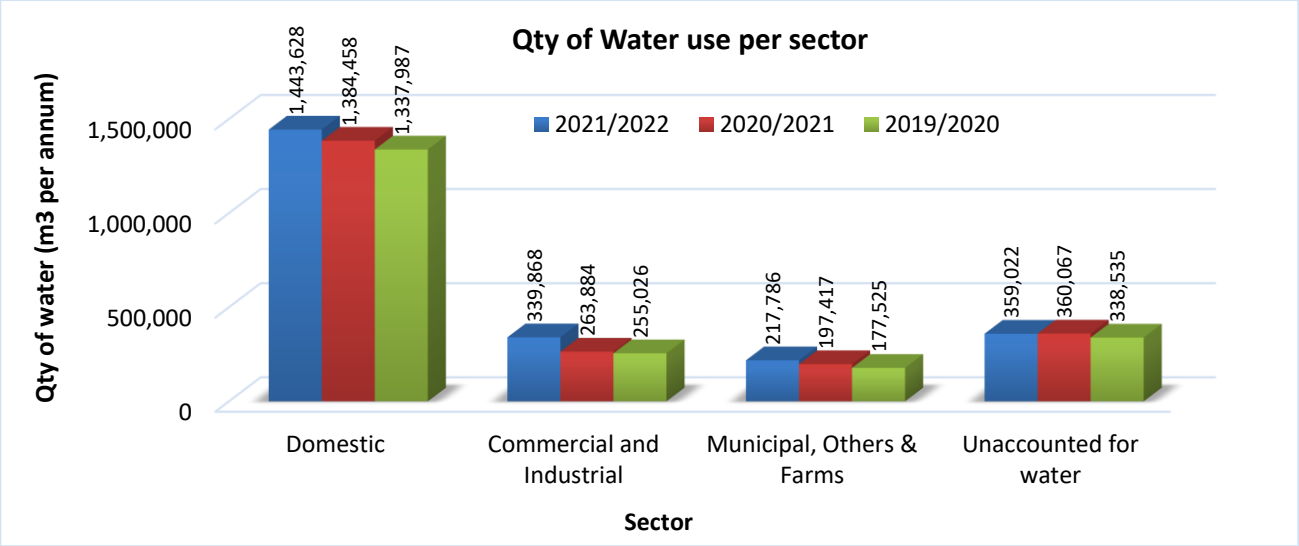


Figure C.1.3: Quantity of water services provided / water balance

Graphs of the water usage per sector for the various distribution systems within Bergrivier Municipality's Management Area are included as part of the IWA water balance models included in Annexure A. The table below gives a summary of the billed metered consumption per sector for the various towns for each of the financial years.

Table C.1.3: Quantity of water used by each user sector (Ml/a)

Town	Year	Residential	Commercial	Industrial	Municipal	Other	Farms	Total
Porterville	10/11	350.457		0.000	48.111	27.945	0.000	426.513
	11/12	343.145		0.000	29.762	23.551	0.000	396.458
	12/13	348.739		0.000	35.899	23.090	0.000	407.728
	13/14	344.642		0.000	34.259	18.544	0.000	397.445
	14/15	369.694		0.000	47.415	14.393	0.000	431.502
	15/16	344.709		0.000	50.295	22.311	0.000	417.315
	16/17	336.796		0.000	42.003	21.785	0.000	400.584
	17/18	288.529		0.000	28.666	16.267	0.000	333.462
	18/19	224.708	33.236		29.714	26.574	0.000	314.232
	19/20	283.298	30.711		39.556	18.530	0.000	372.095
	20/21	284.018	33.513		21.379	22.258	0.000	361.168
	21/22	286.658	34.544		25.821	28.112	0.000	375.135
Piketberg	10/11	556.872		46.645	77.427	27.713	33.740	742.397
	11/12	529.574		46.091	36.341	27.356	16.383	655.745
	12/13	535.191		52.164	36.869	23.713	12.834	660.771
	13/14	537.741		59.737	40.672	24.841	4.190	667.181
	14/15	576.465		66.681	92.816	30.724	3.368	770.054
	15/16	549.345		51.974	116.572	29.556	23.152	770.599
	16/17	515.156		45.827	96.779	30.060	44.632	732.454
	17/18	361.223		38.114	16.707	25.805	37.738	479.587
	18/19	321.294	73.813		32.570	30.691	32.758	491.126
	19/20	381.277	83.525		18.471	29.792	21.679	534.744
	20/21	396.284	72.938		31.996	24.628	43.615	569.461
	21/22	407.322	97.307		32.568	29.831	31.170	598.198
Velddrif	10/11	732.709		0.000	88.182	2.651	0.000	823.542
	11/12	771.785		0.000	77.721	3.332	0.000	852.838
	12/13	734.087		0.000	93.591	3.904	0.000	831.582
	13/14	712.122		0.000	90.847	4.358	0.000	807.327

Table C.1.3: Quantity of water used by each user sector (Ml/a)								
Town	**Year**	**Residential**	**Commercial**	**Industrial**	**Municipal**	**Other**	**Farms**	**Total**
	14/15	653.515		0.000	71.219	6.577	0.000	731.311
	15/16	816.634		0.000	71.283	10.271	0.000	898.188
	16/17	866.968		0.000	71.051	15.339	0.000	953.358
	17/18	598.415		0.000	21.512	9.647	0.000	629.574
	18/19	479.885	92.628		15.704	5.510	0.697	594.424
	19/20	485.826	176.413		19.126	2.824	0.872	685.061
	20/21	541.178	147.076		25.757	2.733	0.779	717.523
	21/22	580.048	197.218		37.479	2.897	0.985	818.627
Dwarskersbos	10/11	73.205		0.000	2.693	0.000	0.000	75.898
	11/12	86.991		0.000	2.973	0.000	0.000	89.964
	12/13	78.524		0.000	3.464	0.000	0.000	81.988
	13/14	93.539		0.000	2.953	0.000	0.000	96.492
	14/15	89.800		0.000	2.456	0.000	0.000	92.256
	15/16	93.713		0.000	5.658	0.000	0.000	99.371
	16/17	88.454		0.000	6.175	0.000	0.000	94.629
	17/18	50.440		0.000	2.959	0.000	0.039	53.438
	18/19	49.778	0.808		3.570	0.000	0.450	54.606
	19/20	64.820	0.529		3.442	0.000	0.446	69.237
	20/21	75.632	1.367		3.455	0.000	0.502	80.956
	21/22	80.834	1.711		8.720	0.000	0.516	91.781
Aurora	10/11	33.858		0.000	12.620	0.000	0.000	46.478
	11/12	33.797		0.000	11.796	0.000	0.000	45.593
	12/13	33.606		0.000	6.500	0.000	0.000	40.106
	13/14	31.227		0.000	5.880	0.000	0.000	37.107
	14/15	37.690		0.000	7.268	0.000	0.000	44.958
	15/16	38.065		0.000	7.631	0.000	0.000	45.696
	16/17	32.060		0.000	8.688	0.000	0.000	40.748
	17/18	23.124		0.000	0.372	0.000	0.000	23.496
	18/19	22.511	0.408		0.560	3.152	0.000	26.631
	19/20	22.612	0.415		5.298	2.913	0.000	31.238
	20/21	24.762	1.284		0.938	2.830	0.000	29.814
	21/22	27.479	1.828		0.643	3.044	0.000	32.994
Eendekuil	10/11	48.095		0.449	2.120	2.223	21.222	74.109
	11/12	45.515		0.261	2.321	1.524	19.977	69.598
	12/13	43.612		0.314	1.966	2.572	21.463	69.927
	13/14	44.863		0.271	2.043	2.107	20.319	69.603
	14/15	45.796		0.273	1.201	4.228	16.783	68.281
	15/16	49.237		0.327	1.459	4.132	16.053	71.208
	16/17	50.401		0.373	2.294	1.893	12.953	67.914
	17/18	36.169		0.339	0.796	1.631	9.974	48.909
	18/19	31.579	3.195		1.046	1.141	9.875	46.836
	19/20	38.044	3.700		0.297	1.532	8.306	51.879
	20/21	40.040	4.455		0.705	0.774	7.224	53.198
	21/22	39.446	5.211		0.615	1.323	6.691	53.286
Redelinghuys	10/11	33.419		0.000	0.000	10.088	0.000	43.507
	11/12	30.244		0.000	0.000	6.589	0.000	36.833
	12/13	28.967		0.000	0.000	6.146	0.000	35.113
	13/14	31.122		0.000	0.000	6.272	0.000	37.394
	14/15	32.513		0.000	0.055	5.517	0.000	38.085
	15/16	28.917		0.000	0.157	5.270	0.000	34.344
	16/17	30.842		0.000	0.191	7.123	0.000	38.156

Table C.1.3: Quantity of water used by each user sector (Ml/a)								
Town	**Year**	**Residential**	**Commercial**	**Industrial**	**Municipal**	**Other**	**Farms**	**Total**
	17/18	22.741		0.000	0.182	4.196	0.000	27.119
	18/19	18.061	1.475		1.875	2.759	0.000	24.170
	19/20	19.963	1.880		2.439	2.002	0.000	26.284
	20/21	22.544	3.251		3.547	4.297	0.000	33.639
	21/22	21.841	2.049		4.987	2.384	0.000	31.261
TOTAL	**10/11**	**1 828.615**		**47.094**	**231.153**	**70.620**	**54.962**	**2 232.444**
	11/12	**1 841.051**		**46.352**	**160.914**	**62.352**	**36.360**	**2 147.029**
	12/13	**1 802.726**		**52.478**	**178.289**	**59.425**	**34.297**	**2 127.215**
	13/14	**1 795.256**		**60.008**	**176.654**	**56.122**	**24.509**	**2 112.549**
	14/15	**1 805.473**		**66.954**	**222.430**	**61.439**	**20.151**	**2 176.447**
	15/16	**1 920.620**		**52.301**	**253.055**	**71.540**	**39.205**	**2 336.721**
	16/17	**1 920.677**		**46.200**	**227.181**	**76.200**	**57.585**	**2 327.843**
	17/18	**1 380.641**		**38.453**	**71.194**	**57.546**	**47.751**	**1 595.585**
	18/19	**1 147.816**	**205.563**		**85.039**	**69.827**	**43.780**	**1 552.025**
	19/20	**1 295.840**	**297.173**		**88.629**	**57.593**	**31.303**	**1 770.538**
	20/21	**1 384.458**	**263.884**		**87.777**	**57.520**	**52.120**	**1 845.759**
	21/22	**1 443.628**	**339.868**		**110.833**	**67.591**	**39.362**	**2 001.282**

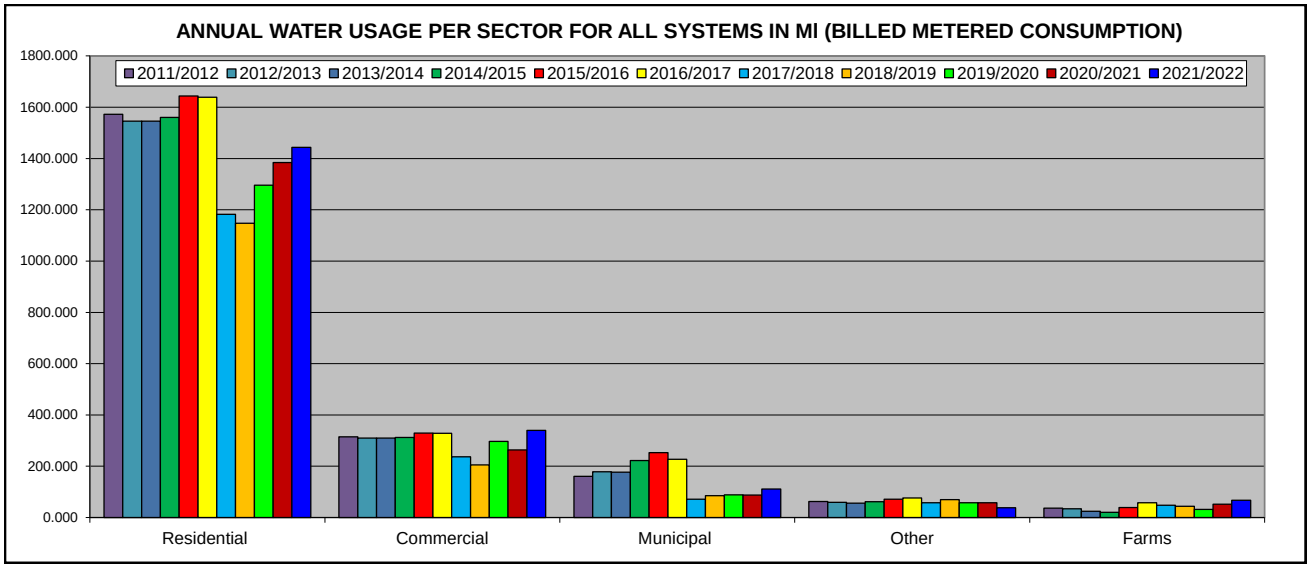


Figure C.1.4: Annual water usage per sector for all systems (Billed metered consumption)

Quantity of effluent received at the WWTWs (Ml/a):

The influent received at the Porterville-, Piketberg-, Eendekuil- and Velddrif WWTW is metered. No flow meter readings were however available for the 2021/2022 financial year for the Velddrif- and Piketberg WWTW, due to vandalism and damaged flow meters. The influent received at the Velddrif- and Piketberg WWTW were therefore calculated as a percentage of the system input volume. The influent received at the Dwarskersbos WWTW is not metered and was calculated as a percentage of the billed metered consumption data. The flow at the Eendekuil sewer PS is also very low and the influent received at the Eendekuil WWTW was therefore also calculated as a percentage of the billed metered consumption data.

The hydraulic and organic design capacities of the various WWTWs and the monthly flows and organic loads at the various plants, as well as the rainfall are included in Annexure A. The table below gives an overview of the annual volume of effluent received at the various WWTWs.

Table C.1.4: Annual volume of effluent received at the various WWTWs

WWTW	21/22	Record : Prior (Ml/a)				
		20/21	19/20	18/19	17/18	16/17
Porterville	264.195	*253.310**	*250.352**	*235.779**	212.643	250.359
Piketberg	*624.537**	*647.628**	*586.326**	*544.427**	737.271	887.273
Velddrif	*572.023**	*480.111**	*486.967**	*366.719**	279.270	287.420
Eendekuil	*31.972***	*31.919***	*31.127***	*28.102***	*29.345***	*40.748***
Dwarskersbos	55.069**	48.574**	*41.542***	*32.764***	*32.063***	*56.777***
Total	**1 547.796**	**1 461.542**	**1 396.314**	**1 207.791**	**1 290.592**	**1 552.577**

Note: * *Estimated from System Input Volume (60% for Porterville WWTW, 90% for Piketberg WWTW and 60% for Velddrif WWTW)*
** *Estimated from billed metered consumption data (60%)*

Quantity of treated effluent returned to the water resource system:

The quantity of effluent treated by industrial consumers on their own premises and re-used by them is not known at this stage. All effluent discharged into the Municipal sewer system is however treated at the existing WWTWs and the current effluent re-used practices are as follows:

Table C.1.5: Current effluent re-used practices at the various WWTWs

WWTWs	Current effluent re-used practices
Porterville	On-site stream leading to farmer's irrigation dam
Piketberg	Irrigation of town sport fields: Cricket, Rugby and Soccer and golf course. Irrigation of school fields.
Velddrif	Irrigation of Rugby field, Golf course, Cricket field and Bowls field (Licence number: 12/9/11/L436/9 - section 5)
Eendekuil	Evaporate, but final effluent also run-off to farm dam for irrigation purposes
Dwarskersbos	Evaporate, but final effluent can also be pumped to farm for irrigation purposes

C.2. Water Services Delivery Profile

The National Norms and Standards for Domestic Water and Sanitation Services, as published in the Government Gazette No.41100 of 8 September 2017, makes provision for the following norms and standards for levels of water supply and sanitation services:

Table C.2.1: Norms and standards for levels of water supply services

Full level of service: People access and pay for more than 90 l/c/d at high pressure.	Interim **Full**	**Full provision**: People access a minimum of 50 l/c/d of SANS241 quality water on demand at the boundary of the yard, metered and tariffed.
Middle level of service: People access and pay for 51-90 l/c/d at medium pressure.	Interim **Upper**	**Upper provision**: People access a maximum of 90 l/c/d of SANS241 quality water from an improved source at the boundary of the yard, metered and tariffed.
	Interim **Intermediate**	Intermediate provision: People access more than 50 l/c/d but less than 90 l/c/d of SANS241 quality water from an improved source at the boundary of the yard, metered and tariffed.
Minimum level of service: People access 25-50 l/c/d at low to medium pressure, use of more than 25 l/c/d is paid for.	Interim **Basic Plus**	**Basic Plus provision**: People access more than 25 l/c/d but less than 50 l/c/d of SANS241 quality water from an improved source at the boundary of the yard, metered and tariffed.
	Interim **Basic**	**Basic provision**: People access a minimum of 25 l/c/d of SANS241 quality water from an improved source at the boundary of the yard, metered and tariffed.
	Interim **Free Basic**	**Free basic provision**: People access a minimum of 25 l/c/d of SANS241 quality water from an improved source at the boundary of the yard, metered.
	Intermittent	**Intermittent provision**: People access a minimum of 1500 l/household/week of acceptable quality water on a weekly basis within 100m, which is metered.
Bulk service: Source of potable water to be provided to people, which is metered in all circumstances.		
No service / provision = backlog: People access water from insecure or unimproved sources, or sources that are too distant, too time consuming or are of poor quality.		

Interim provision: People access a minimum of 25 l/c/d of acceptable quality water within 24 hours of disruption, normal service to be restored within 7 days.

Table C.2.2: Norms and standards for levels of sanitation services

Hygiene promotion; Prevention of pollution; Re-use / recycle; Operation and Maintenance; Metering and tariffing; Solid Waste Management; Asset Management

Full level: Full concern for human health, environment and sustainability of interconnected systems.	**Full services**	**In-house facility**: Storm water, wastewater/excreta, greywater, solid waste are collected and managed to achieve maximum benefits from treatment and re-use of water and nutrients.
		In-house facility: Access to a pleasant, safe, reliable and properly maintained facility for 24 hours a day, with control of nutrients in human excreta, wastewater and greywater.
Basic level: Remove excreta from the environment through treatment, pathogen reduction, resource recovery and nutrient reuse.	**Free basic services**	**Toilet with functional hand washing facility in the yard**: Access to a pleasant, safe and reliable facility for 24 hours a day, including privacy, personal safety and shelter through a subsidy for free. Maintenance of the facility is for free and is the responsibility of services provider.
	Basic services	**Toilet with functional hand washing facility in the yard**. Access to a pleasant, safe and reliable facility for 24 hours a day, including privacy, personal safety and shelter through a capital subsidy. Maintenance of the facilities is not for free and is the responsibility of the household / owner.
Interim level: Blocking the spread of faecal-oral diseases through proper excreta containment at a fixed point.	**Excreta containment**	**Household, shared or communal toilets with functional hand washing facilities**: Access to safe, reliable and properly maintained toilet and hand washing facility, free of charge, within 200m of the dwelling, which at a minimum safely contains human excreta. Maintenance is the responsibility of the services provider. To be phased out by 2030.
No service / provision = backlog: People practice open defecation or access an unimproved sanitation facility, such as pit toilets and bucket toilets. To be completely eliminated by 2030.		

Proper disposal, clean platform, vector and rodent control, resource use and health protection.

Emergency level: People access pleasant, safe, reliable and properly maintained improved toilets and hand washing facility on the premises in close proximity to the temporary dwelling within 24 hours and for duration of event.

C.2.1. User Connection Profile

The total number of user connections in each user sector, for the consumers provided with water services by Bergrivier Municipality, is as follows (June 2022).

Table C.2.1.1: User Connection Profile (Water Services)

WSDP Ref. #	Category of users	Water Services						
		Year 0 FY2021/22		Year - 1 FY2020/21		Year - 2 FY2019/20		New Connections Year 0 FY2020/21
		Nr	%	Nr	%	Nr	%	Nr
	RESIDENTIAL (DOMESTIC)							
3.3	Metered: Uncontrolled	9,214	94%	9,007	94%	8,804	94%	207
3.3	Metered: Controlled	0	0%	0	0%	0	0%	0
	Unmetered (Flat rate)	0	0%	0	0%	0	0%	0
	Communal water supply	0	0%	0	0%	0	0%	0
	Sub-Total: Residential	**9,214**	**94%**	**9,007**	**94%**	**8,804**	**94%**	**207**
	EDUCATION							
3.3	Schools	20	0%	20	0%	20	0%	0
	Tertiary educaton facilities	0	0%	0	0%	0	0%	0
	Sub-Total: Education	**20**	**0%**	**20**	**0%**	**20**	**0%**	**0**
	HEALTH							
3.3	Clinics	10	0%	10	0%	10	0%	0
3.3	Hospitals	2	0%	2	0%	2	0%	0
3.3	Health Centres	0	0%	0	0%	0	0%	0
	Sub-Total: Health	**12**	**0%**	**12**	**0%**	**12**	**0%**	**0**
	INSTITUTIONAL							
	Public Institutions	123	1%	114	1%	100	1%	9
3.3	Magistrate Offices	3	0%	3	0%	3	0%	0
3.3	Police Stations	5	0%	5	0%	5	0%	0
3.3	Prisons	1	0%	1	0%	1	0%	0
	etc	0	0%	0	0%	0	0%	0
	Sub-Total: Institutional	**132**	**1%**	**123**	**1%**	**109**	**1%**	**9**
	INDUSTRIAL							
3.3	Dry industries	46	0%	46	0%	46	0%	0
3.3	Wet industries	9	0%	9	0%	9	0%	0
	Sub-Total: Industrial	**55**	**1%**	**55**	**1%**	**55**	**1%**	**0**
	COMMERCIAL							
3.3	Businesses	274	3%	271	3%	266	3%	3
3.3	Office Buildings (Incl. with Businesses)	0	0%	0	0%	0	0%	0
	Sub-Total: Commercial	**274**	**3%**	**271**	**3%**	**266**	**3%**	**3**
	MINING							
	Mining	0	0%	0	0%	0	0%	0
	Sub-Total: Commercial	**0**	**0%**	**0**	**0%**	**0**	**0%**	**0**
	OTHER							
	Agriculture: raw water	29	0%	27	0%	28	0%	2
	Other	47	0%	47	0%	46	0%	0
	Sub-Total: Other	**76**	**1%**	**74**	**1%**	**74**	**1%**	**2**
	TOTAL	**9,783**	**100%**	**9,562**	**100%**	**9,340**	**100%**	**221**

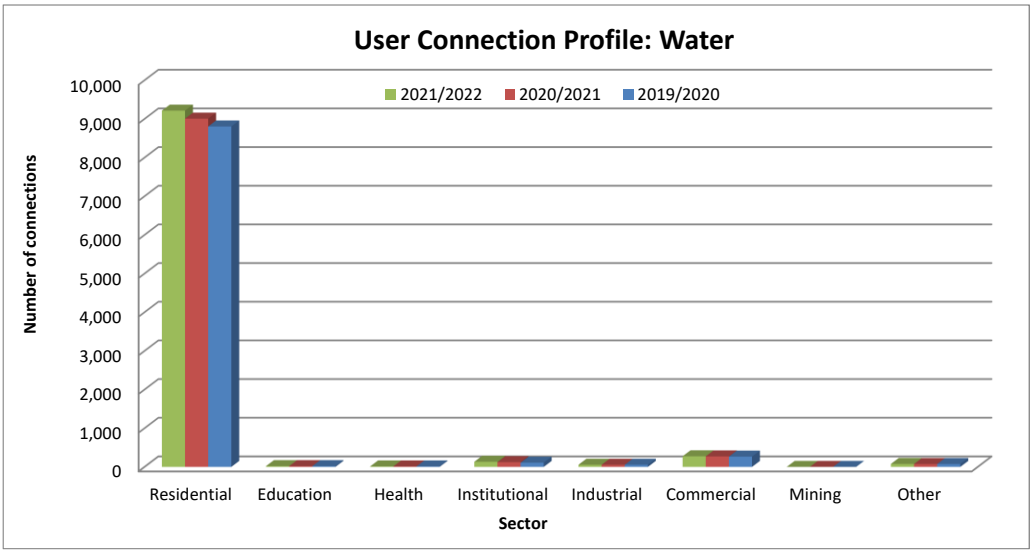


Figure C.2.1.1: User connection profile for water

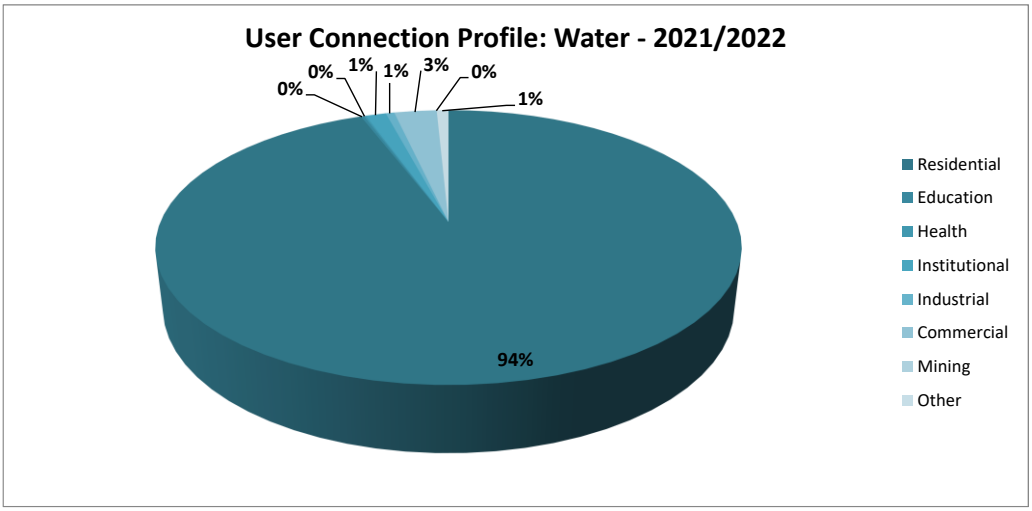


Figure C.2.1.2: User connection distribution for water – Year 2021/2022

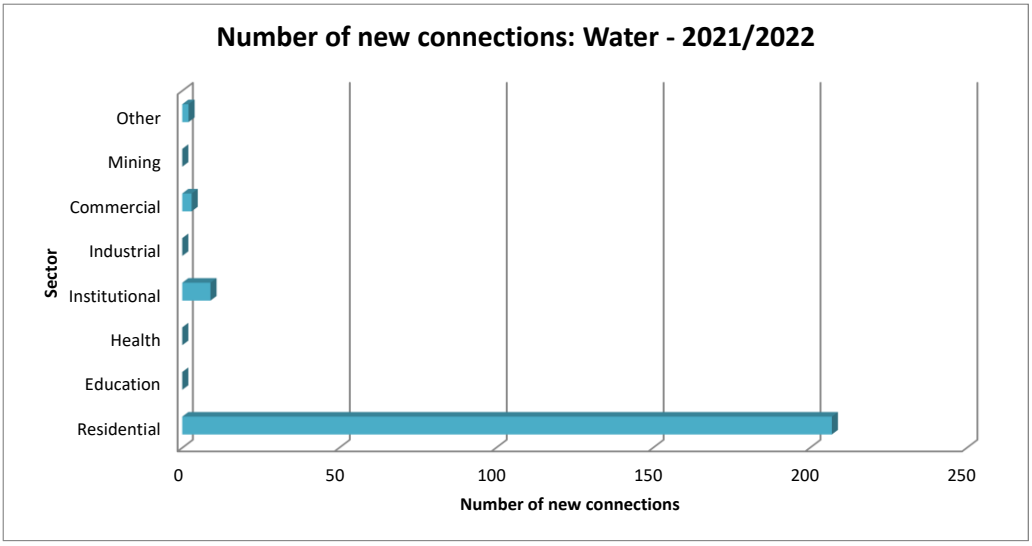


Figure C.2.1.3: Number of new water connections provided during 2021/2022

Table C.2.1.2: User Connection Profile (Wastewater Services)								
WSDP Ref. #	Category of users	Wastewater Services						
		Year 0 FY2021/22		Year - 1 FY2020/21		Year - 2 FY2019/20		New Connections Year 0 FY2020/21
		Nr	%	Nr	%	Nr	%	Nr
	RESIDENTIAL (DOMESTIC)							
3.3	Metered: Uncontrolled	9,214	94%	9,007	94%	8,804	94%	207
3.3	Metered: Controlled	0	0%	0	0%	0	0%	0
	Unmetered (Flat rate)	0	0%	0	0%	0	0%	0
	Communal water supply	0	0%	0	0%	0	0%	0
	Sub-Total: Residential	**9,214**	**94%**	**9,007**	**94%**	**8,804**	**94%**	**207**
	EDUCATION							
3.3	Schools	20	0%	20	0%	20	0%	0
	Tertiary educaton facilities	0	0%	0	0%	0	0%	0
	Sub-Total: Education	**20**	**0%**	**20**	**0%**	**20**	**0%**	**0**
	HEALTH							
3.3	Clinics	10	0%	10	0%	10	0%	0
3.3	Hospitals	2	0%	2	0%	2	0%	0
3.3	Health Centres	0	0%	0	0%	0	0%	0
	Sub-Total: Health	**12**	**0%**	**12**	**0%**	**12**	**0%**	**0**
	INSTITUTIONAL							
	Public Institutions	123	1%	114	1%	100	1%	9
3.3	Magistrate Offices	3	0%	3	0%	3	0%	0
3.3	Police Stations	5	0%	5	0%	5	0%	0
3.3	Prisons	1	0%	1	0%	1	0%	0
	etc	0	0%	0	0%	0	0%	0
	Sub-Total: Institutional	**132**	**1%**	**123**	**1%**	**109**	**1%**	**9**
	INDUSTRIAL							
3.3	Dry industries	46	0%	46	0%	46	0%	0
3.3	Wet industries	9	0%	9	0%	9	0%	0
	Sub-Total: Industrial	**55**	**1%**	**55**	**1%**	**55**	**1%**	**0**
	COMMERCIAL							
3.3	Businesses	274	3%	271	3%	266	3%	3
3.3	Office Buildings (Incl. with Businesses)	0	0%	0	0%	0	0%	0
	Sub-Total: Commercial	**274**	**3%**	**271**	**3%**	**266**	**3%**	**3**
	MINING							
	Mining	0	0%	0	0%	0	0%	0
	Sub-Total: Commercial	**0**	**0%**	**0**	**0%**	**0**	**0%**	**0**
	OTHER							
	Agriculture: raw water	29	0%	27	0%	28	0%	2
	Other	47	0%	47	0%	46	0%	0
	Sub-Total: Other	**76**	**1%**	**74**	**1%**	**74**	**1%**	**2**
	TOTAL	**9,783**	**100%**	**9,562**	**100%**	**9,340**	**100%**	**221**

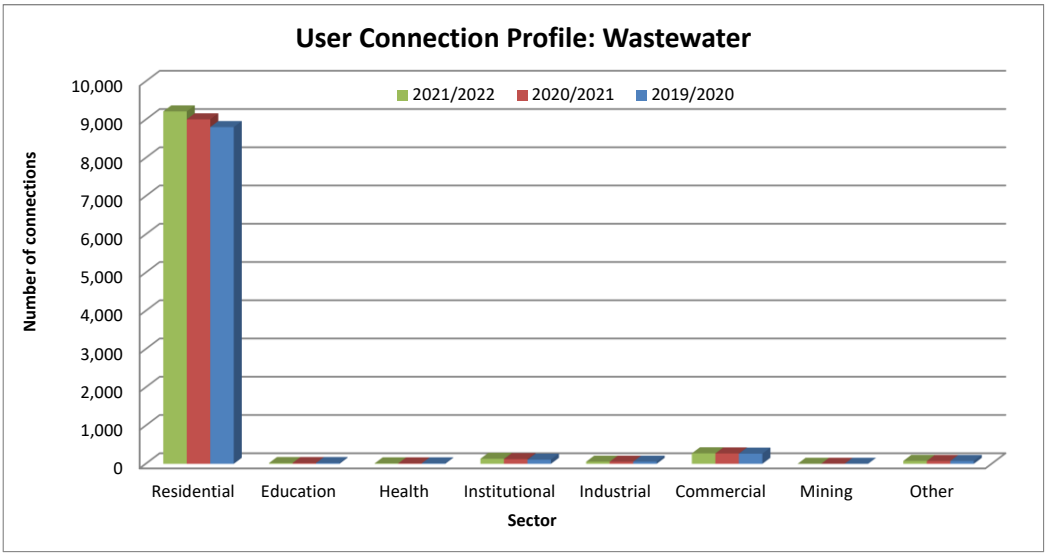


Figure C.2.1.4: User connection profile for wastewater

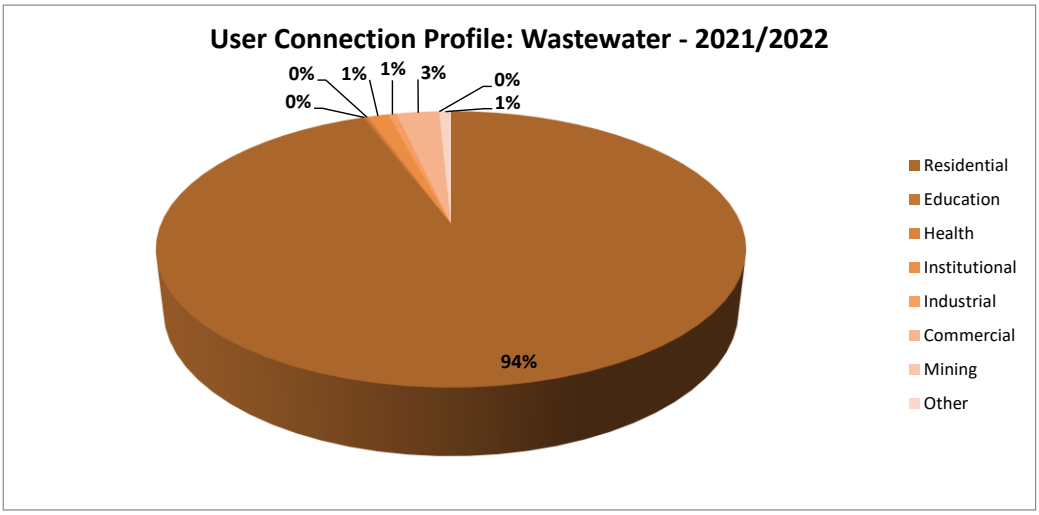


Figure C.2.1.5: User connection distribution for wastewater – Year 2021/2022

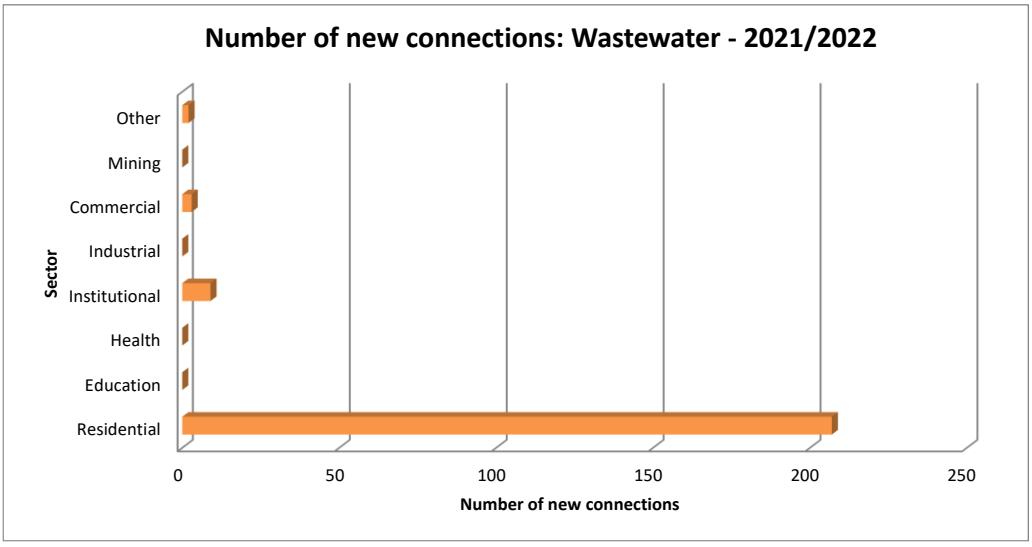


Figure C.2.1.6: Number of new wastewater connections provided during 2021/2022

The number of user connections in each user sector, for the various distribution systems in Bergrivier Municipality's Management Area, is as follows:

Table C.2.1.3: Number of user connections in each user sector per town								
Town	**Year**	**Residential**	**Commercial**	**Industrial**	**Municipal**	**Other**	**Rural**	**Total**
Porterville	13/14	1 589		-	-	-	-	**1 589**
	14/15	1 595		-	-	-	-	**1 595**
	15/16	1 588		-	-	-	-	**1 588**
	16/17	1 656		-	-	-	-	**1 656**
	17/18	1 657		-	-	-	-	**1 657**
	18/19	1 542	50		19	15	-	**1 626**
	19/20	1 590	57		18	15	-	**1 680**
	20/21	1 584	57		20	15	-	**1 676**
	21/22	1 625	59		14	15	-	**1 713**
Piketberg	13/14	2 441		50	-	-	-	**2 491**
	14/15	2 512		53	-	-	-	**2 565**
	15/16	2 500		54	-	-	-	**2 554**
	16/17	2 462		53	-	-	-	**2 515**
	17/18	2 424		49	-	-	-	**2 473**
	18/19	2 321	133		50	21	7	**2 532**
	19/20	2 302	133		48	20	7	**2 510**
	20/21	2 333	137		52	22	8	**2 552**
	21/22	2 361	138		56	23	8	**2 586**
Velddrif	13/14	3 228		-	-	-	-	**3 228**
	14/15	3 288		-	-	-	-	**3 288**
	15/16	3 373		-	-	-	-	**3 373**
	16/17	3 467		-	-	-	-	**3 467**
	17/18	3 552		-	-	-	-	**3 552**
	18/19	3 577	78		49	4	9	**3 717**
	19/20	3 680	82		54	4	6	**3 826**
	20/21	3 823	84		53	3	6	**3 969**
	21/22	3 909	84		61	2	6	**4 062**
Dwarskersbos	13/14	353		-	-	-	-	**353**
	14/15	373		-	-	-	-	**373**
	15/16	406		-	-	-	-	**406**
	16/17	423		-	-	-	-	**423**
	17/18	440		-	-	-	-	**440**
	18/19	477	4		6	-	7	**494**
	19/20	493	5		6	-	5	**509**
	20/21	527	8		6	-	5	**546**
	21/22	582	9		6	-	4	**601**
Aurora	13/14	250		-	-	-	-	**250**
	14/15	251		-	-	-	-	**251**
	15/16	252		-	-	-	-	**252**
	16/17	250		-	-	-	-	**250**
	17/18	245		-	-	-	-	**245**
	18/19	228	15		5	2	-	**250**
	19/20	236	15		5	1	-	**257**
	20/21	239	17		6	1	-	**263**
	21/22	227	15		4	1	-	**247**
Eendekuil	13/14	343		4	-	-	-	**347**
	14/15	349		4	-	-	-	**353**
	15/16	350		5	-	-	-	**355**

Table C.2.1.3: Number of user connections in each user sector per town								
Town	**Year**	**Residential**	**Commercial**	**Industrial**	**Municipal**	**Other**	**Rural**	**Total**
	16/17	345		5	-	-	-	**350**
	17/18	343		3	-	-	-	**346**
	18/19	321	22		4	3	11	**361**
	19/20	318	22		4	3	10	**357**
	20/21	310	16		3	3	8	**340**
	21/22	313	17		3	3	11	**347**
Redelinghuys	13/14	182		-	-	-	-	**182**
	14/15	187		-	-	-	-	**187**
	15/16	193		-	-	-	-	**193**
	16/17	193		-	-	-	-	**193**
	17/18	193		-	-	-	-	**193**
	18/19	182	7		5	3	-	**197**
	19/20	185	7		6	3	-	**201**
	20/21	191	7		15	3	-	**216**
	21/22	197	7		20	3	-	**227**
TOTAL	**13/14**	**8 386**		**54**	**-**	-	**-**	**8 440**
	14/15	**8 555**		**57**	**-**	-	**-**	**8 612**
	15/16	**8 662**		**59**	**-**	-	**-**	**8 721**
	16/17	**8 796**		**58**	**-**	-	**-**	**8 854**
	17/18	**8 854**		**52**	**-**	-	**-**	**8 906**
	18/19	**8 648**	**309**		**138**	**48**	**34**	**9 177**
	19/20	**8 804**	**321**		**141**	**46**	**28**	**9 340**
	20/21	**9 007**	**326**		**155**	**47**	**27**	**9 562**
	21/22	**9 214**	**329**		**164**	**47**	**29**	**9 783**

Table C.2.1.4: Total number of consumer units per town and percentage annual growth from 2014/2015 to 2021/2022									
Distribution System	**Annual Growth % (14/15 – 21/22)**	**21/22**	**20/21**	**19/20**	**18/19**	**17/18**	**16/17**	**15/16**	**14/15**
Porterville	1.02%	1 713	1 676	1 680	1 626	1 657	1 656	1 588	1 595
Piketberg	0.12%	2 586	2 552	2 510	2 532	2 473	2 515	2 554	2 565
Velddrif	3.07%	4 062	3 969	3 826	3 717	3 552	3 467	3 373	3 288
Dwarskersbos	7.05%	601	546	509	494	440	423	406	373
Aurora	-0.23%	247	263	257	250	245	250	252	251
Eendekuil	-0.24%	347	340	357	361	346	350	355	353
Redelinghuys	2.81%	227	216	201	197	193	193	193	187
TOTALS	**1.84%**	**9 783**	**9 562**	**9 340**	**9 177**	**8 906**	**8 854**	**8 721**	**8 612**

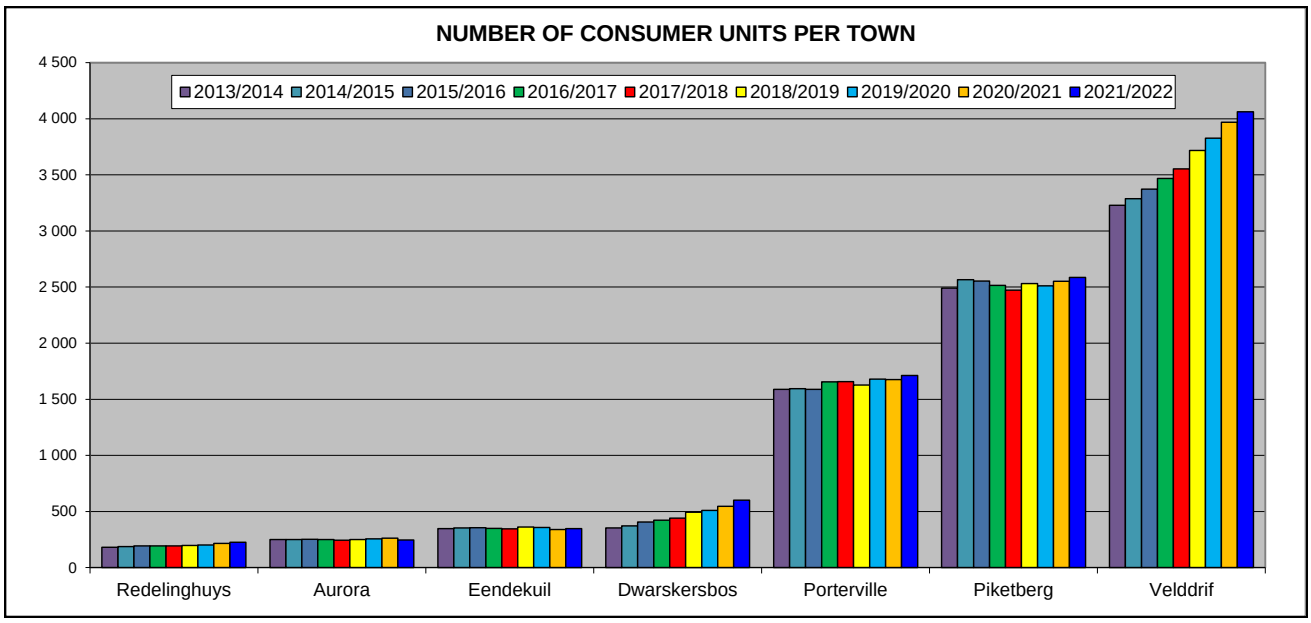


Figure C.2.1.7: Number of consumer units per town for the last nine financial years.

The number of new water and sanitation connection made:

256 New water connections and 228 new sewer connections were provided during the 2021/2022 financial year, according to the financial records. These numbers are different from the number with which the average number consumer units increased from 2020/2021 to 2021/2022, as calculated from the financial data. The actual number of new water and sewer connections provided will not always correspond 100% with the average number of consumer units, because some erven can already have a connection and then the consumer only apply at a later stage to be connected to the system.

Table C.2.1.5: Total number of new water and sanitation connections for 2018/2019 to 2021/2022

Distribution System	New Water Connections				Water Meters Replaced				Water Meters Tested				New Sewer Connections			
	21/22	20/21	19/20	18/19	21/22	20/21	19/20	18/19	21/22	20/21	19/20	18/19	21/22	20/21	19/20	18/19
Porterville	11	8	6	6	177	42	108	6	6	2	4	4	11	6	7	6
Piketberg	13	9	10*	5	62	60	Unk	18	1	1	Unk	0	13	9	5*	7
Velddrif and Dwarskersbos	220	169	86	117	435	297	127	213	6	10	Unk	7	204	155	59*	93
Aurora	0	0	5*	5	15	8	Unk	22	0	0	Unk	0	0	0	0	0
Eendekuil	0	3	0	2	0	6	6	2	0	0	0	0	0	2	0	2
Redelinghuys	12	11	6	24	0	0	0	34	0	0	0	0	0	0	0	0
TOTALS	**256**	**200**	**113**	**159**	**689**	**413**	**241**	**295**	**13**	**13**	**4**	**11**	**228**	**172**	**71**	**108**

Notes: The 2018/2019 data in the above table was taken from the 2018/2019 Water Services Audit Report
* Estimated

The Municipality has a water meter replacement programme in place where old/dysfunctional water meters are replaced. Approximately 1 000 meters need to be replaced in Piketberg and Velddrif each and approximately 150 meters in Redelinghuys. 350 New smart water meters were installed in Velddrif during the 2020/2021 financial year.

C.2.2. Residential Water Services Delivery Access Profile

The residential water services delivery access profile is presented below and is aligned with the format proposed for the Municipal Annual Report as contemplated in the MFMA. It is emphasized that this access profile does not consider quality or adequacy of services as presented in the next section.

All the formal households in the urban areas of Bergrivier Municipality's Management Area are provided with water connections inside the erven. Informal areas are supplied with shared services as an intermediary measure. Bergrivier Municipality is committed to work with the private landowners to ensure that at least basic water and sanitation services are provided to those households in the rural areas with existing services still below RDP standard.

The table below gives an overview of the residential water services delivery access profile of Bergrivier Municipality.

Table C.2.2.1: Residential Water Services Delivery Access Profile: Water

Census Category	Description	Year 0 FY2021/22		Year - 1 FY2020/21		Year - 2 FY2019/20	
		Nr	%	Nr	%	Nr	%
	WATER (ABOVE MIN LEVEL)						
Piped (tap) water inside dwelling/institution	House connections	15,935	75%	15,609	76%	15,288	76%
Piped (tap) water inside yard	Yard connections	4,949	23%	4,723	23%	4,582	23%
Piped (tap) water on community stand: distance less than 200m from dwelling/institution	Standpipe connection < 200 m	128	1%	128	1%	128	1%
	Sub-Total: Minimum Serivce Level and Above	**21,012**	**100%**	**20,460**	**100%**	**19,998**	**100%**
	WATER (BELOW MIN LEVEL)						
Piped (tap) water on community stand: distance between 200m and 500m from dwelling/institution	Standpipe connection: > 200 m < 500 m	12	0%	12	0%	12	0%
Piped (tap) water on community stand: distance between 500m and 1000m (1km) from dwelling /institution	Standpipe connection: > 500 m < 1 000 m	5	0%	5	0%	5	0%
Piped (tap) water on community stand: distance greater than 1000m (1km) from dwelling/institution	Standpipe connection: > 1 000 m	6	0%	6	0%	6	0%
No access to piped (tap) water	No services	76	0%	76	0%	76	0%
	Sub-Total: Below Minimum Service Level	**99**	**0%**	**99**	**0%**	**99**	**0%**
	Total number of households	**21,111**	**100%**	**20,559**	**100%**	**20,097**	**100%**

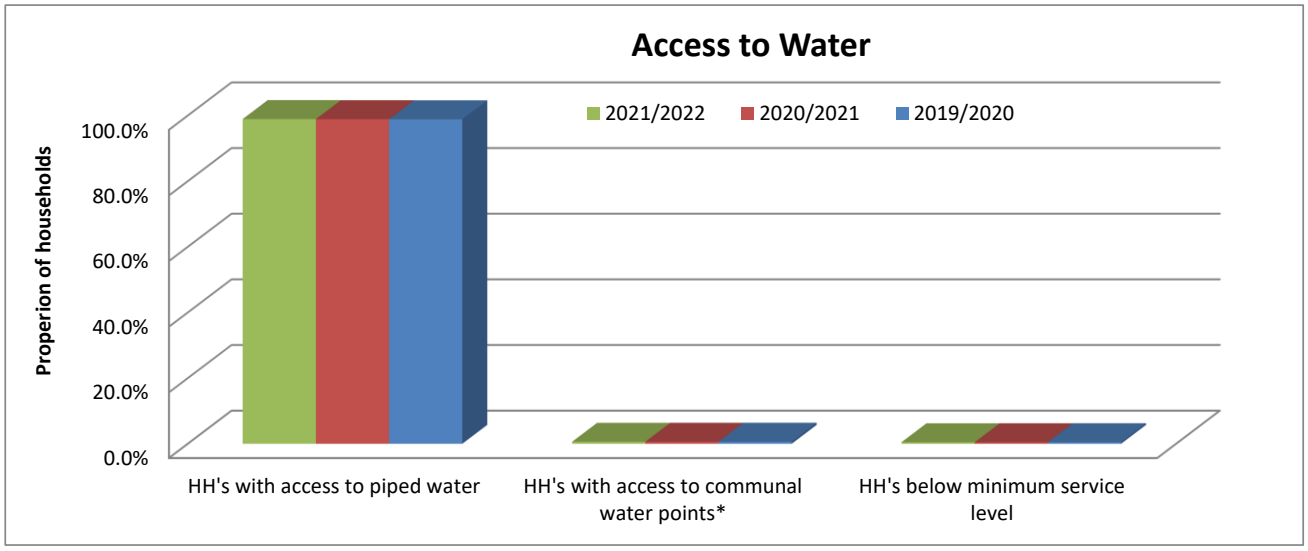


Figure C.2.2.1: Household water access profile

Number of households provided with water through communal water services:

The National Norms and Standards for Domestic Water and Sanitation Services, as published in the Government Gazette No.41100 of 8 September 2017, include the following interim water and sanitation services:

Table C.2.2.2: Interim water and sanitation services (National Norms and Standards for Domestic Water and Sanitation Services)
Intermittent provision of water at a minimum level of water supply services
• A minimum volume of 1 500 litres of potable water shall be made available to a household per week. • The water provided shall comply with the SANS241 quality standards. • The access/delivery point shall be at a minimum a communal standpipe, or a storage facility in the yard (water container, yard tank, roof tank) of at least a volume of 1 500 litres. • In the case of a communal standpipe, it shall be within a reasonable walking distance of no more than 100m from the farthest household. • In the case of a storage facility in the yard (water container, yard tank, roof tank), it shall be refilled by a water tanker with potable water at least once a week. • The water shall be made available for 52 weeks per year. • All water use and/or supply shall be metered, but not tariffed. • Maintenance of the infrastructure for this level of service is the responsibility of the WSA. • Point-of-use water treatment systems and methods shall be advocated. • Efforts shall be made to ensure user acceptance and understanding for this level of service. • Users shall be educated in effective water use and hygiene. • This level of service shall be phased out by 2030 to comply with the National Development Plan's requirement of providing a basic service of at least a yard connection for water.
Interim sanitation services (Communal and shared facilities)

• Users shall be consulted on the siting and design, and the responsible cleaning and maintenance of shared toilets. Clean toilets are more likely to be frequently used.
• Plumbing in and for communal and shared facilities needs to be more robust than that installed on private premises, and shall comply with the general principles of the National Building Regulations. Precautions need to be taken in the design against vandalism, theft and misuse.
• Efforts shall be made to provide people living with chronic illnesses, such as HIV and AIDS, with easy access to a toilet as they frequently suffer from chronic diarrhoea and reduced mobility.
• Where possible, communal and shared toilets must be provided with lighting, or users provided with torches. The input of the users must be sought with regard to ways of enhancing the safety of users.
• Efforts to build a sense of communal ownership and pride of possession shall be made so that cooperation is voluntarily given or assured by peer pressure.
• Sufficient sanitation facilities shall be provided for the number of users
  ➢ Communal toilet: Toilet seats – 1 seat per 50 users; Urinal units – 1 unit per 100 users; Hand washing – 1 basin per 10 toilet seats.
  ➢ Shared toilet mostly used all the time: Toilet seats – 1 seat per 20 users; Urinal units – 1 unit per 50 users; Hand washing – 1 basin per 4 toilet seats.
• Shared and communal facilities shall have separate toilet blocks for men and women with separate entries; waste bins with lids in toilet block for women – emptied once a week and disposed of appropriately; urinal facilities for men; seats for children in the section for women; waiting / circulating area; separate washing cubicles for men and women; facility to store large volumes of water (water-borne sanitation); appropriate wastewater disposal system; and store room for keeping the cleaning material / equipment.

There are no informal areas in the urban areas of Bergrivier Municipality's Management Area and the only areas where communal water services are currently still in use is on some of the farms in the rural areas.

The existing residential water service levels in Bergrivier Municipality's Management Area are estimated as follows:

Table C.2.2.3: Residential water service levels (Residential Consumer Units)											
Service Level	**Piketberg**	**Porterville**	**Velddrif**	**Dwarskersbos**	**Aurora**	**Wittewater**	**Redelinghuys**	**Eendekuil**	**Goedverwacht**	**Farms**	**Total**
No Water Services	0	0	0	0	0	2 [2)]	0	0	0	74 [2)]	76
Below RDP: Infrastructure Upgrade	0	0	0	0	0	0	0	0	0	0	0
Below RDP: Infrastructure Extension	0	0	0	0	0	0	0	0	0	23 [3)]	23
Below RDP: Infrastructure Refurbishment	0	0	0	0	0	0	0	0	0	0	0
Below RDP: O&M Needs	0	0	0	0	0	0	0	0	0	0	0
Below RDP: Water Resource Needs	0	0	0	0	0	0	0	0	0	0	0
Below RDP: Infrastructure and O&M Needs	0	0	0	0	0	0	0	0	0	0	0
Below RDP: Infrastructure, O&M and Water Resource Needs	0	0	0	0	0	0	0	0	0	0	0
Total Basic Need (RDP)	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**97**	**99**
Below Housing Interim [4)]	0	0	0	0	0	0	0	0	0	0	0
Adequate Housing Permanent [5)]	0	0	0	0	0	0	0	0	0	0	0
Total Housing Need	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Standpipes	0	0	0	0	0	2	0	0	2	124	128
Yard Connections [6)]	1 112	637	1 991	0	0	0	0	149	0	1 060	4 949
House Connections [1)]	2 361	1 625	3 909	582	227	196	197	313	655	5 870	15 935
Total Adequate	**3 473**	**2 262**	**5 900**	**582**	**227**	**198**	**197**	**462**	**657**	**7 054**	**21 012**
Total per Area	**3 473**	**2 262**	**5 900**	**582**	**227**	**200**	**197**	**462**	**657**	**7 151**	**21 111**

Notes: 1) Number of residential consumer units for the various towns for 2021/2022, as calculated from the financial data.

2) Census 2011: Number of households with no access to piped (tap) water 74 and 2

3) Census 2011: Number of households with communal services (200m – 500m) 12, (500m – 1000m) 5 and (>1000m) 6.

4) Below Housing Interim in the above table is the number of households in informal areas without basic water services.

5) Adequate Housing Permanent in the above table is the number of households in informal areas with communal water services. Municipality confirmed there are no informal areas in their area.

6) Projected number of residential households (2021/2022) – Number of residential consumers units (2021/2022) = Estimated number of backyard dwellers

The Municipality provides sanitation services to all towns in its area of jurisdiction with the exception of Goedverwacht, Wittewater and De Hoek, which are private towns. All the urban households within the Municipality's area of jurisdiction have access to minimum sanitation service levels. The table below gives an overview of the residential sanitation services delivery access profile of Bergrivier Municipality.

Table C.2.2.4: Residential Water Services Delivery Access Profile: Sanitation

Census Category	Description	Year 0 FY2021/22		Year - 1 FY2020/21		Year - 2 FY2019/20	
		Nr	%	Nr	%	Nr	%
	SANITATION (ABOVE MIN LEVEL)						
Flush toilet (connected to sewerage system)	Waterborne	11,188	53%	10,825	53%	10,504	52%
	Waterborne: Low Flush	0	0%	0	0%	0	0%
Flush toilet (with septic tank)	Septic tanks / Conservancy	8,712	41%	8,523	41%	8,382	42%
Chemical toilet	Non-waterborne (above min. service level)	35	0%	35	0%	35	0%
Pit toilet with ventilation (VIP)		83	0%	83	0%	83	0%
Other / Communal Services		0	0%	0	0%	0	0%
	Sub-Total: Minimum Serivce Level and Above	**20,018**	**95%**	**19,466**	**95%**	**19,004**	**95%**
	SANITATION (BELOW MIN LEVEL)						
Pit toilet without ventilation	Pit toilet	36	0%	36	0%	36	0%
Bucket toilet	Bucket toilet	177	1%	177	1%	177	1%
Other toilet provision (below min. service level	Other	364	2%	364	2%	364	2%
No toilet provisions	No services	516	2%	516	3%	516	3%
	Sub-Total: Below Minimum Service Level	**1,093**	**5%**	**1,093**	**5%**	**1,093**	**5%**
	Total number of households	**21,111**	**100%**	**20,559**	**100%**	**20,097**	**100%**

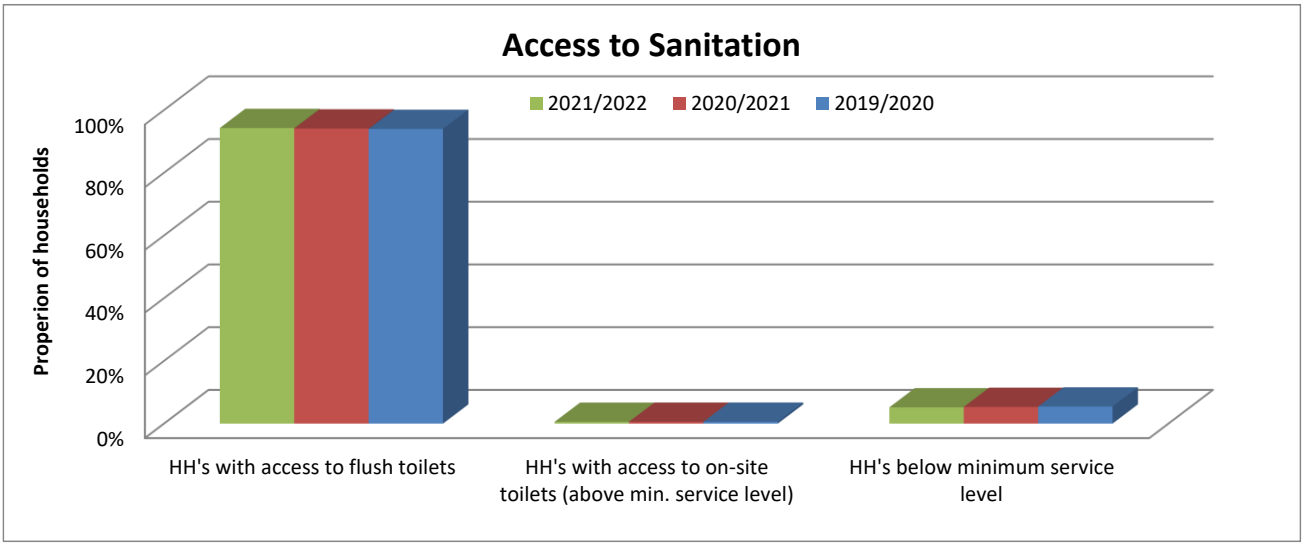


Figure C.2.2.2: Household sanitation access profile

The Municipality upgraded their WWTWs and sewer networks in order to provide a better quality of effluent and to increase the capacity of the WWTWs to accommodate the future developments, subject to available funding. One of the most recent projects is the upgrading of the Porterville WWTW. The sanitation service levels within the various towns can be described as follows:

- Aurora and Redelinghuys: The entire towns of Aurora and Redelinghuys are serviced by septic tank systems. The goal of the Municipality is to upgrade the towns to a waterborne sewer system, which include new WWTWs to treat the generated sewage.

- Dwarskersbos: Approximately 30% - 40% of the households in Dwarskersbos are serviced through septic tanks. The upgrading of the septic tank systems to a waterborne sewer system including incorporation into the existing waterborne network is ongoing.

- Eendekuil: Approximately 25% - 35% of the households in Eendekuil are serviced through septic tanks. The upgrading of the septic tank systems to a waterborne sewer system including incorporation into the existing waterborne network is ongoing.

- Piketberg and Porterville: All households in these two towns are connected to the waterborne sewer system. The Municipality completed the upgrading of the Porterville WWTW, due to various developments over the last number of years.

- Velddrif: Approximately 20% - 25% of the households in Velddrif are serviced through septic tanks. The upgrading of the septic tank systems to a waterborne sewer system including incorporation into the existing waterborne network is ongoing.

The existing residential sanitation service levels in Bergrivier Municipality's Management Area are estimated as follows:

Table C2.2.5: Residential sanitation service levels (Residential Consumer Units)											
Service Levels	**Piketberg**	**Porterville**	**Velddrif**	**Dwarskersbos**	**Aurora**	**Wittewater**	**Redelinghuys**	**Eendekuil**	**Goedverwacht**	**Farms**	**Total**
No Sanitation Services [3)]	0	0	0	0	0	0	0	0	10	506	516
Below RDP: Infrastructure Upgrade [4)]	0	0	0	0	0	24	0	0	70	518	612
Below RDP: Infrastructure Extension	0	0	0	0	0	0	0	0	0	0	0
Below RDP: Infrastructure Refurbishment	0	0	0	0	0	0	0	0	0	0	0
Below RDP: O&M Needs	0	0	0	0	0	0	0	0	0	0	0
Below RDP: Water Resource Needs	0	0	0	0	0	0	0	0	0	0	0
Below RDP: Infrastructure and O&M Needs	0	0	0	0	0	0	0	0	0	0	0
Below RDP: Infrastructure, O&M and Water Resource Needs	0	0	0	0	0	0	0	0	0	0	0
Total Basic Need (RDP)	**0**	**0**	**0**	**0**	**0**	**24**	**0**	**0**	**80**	**1 024**	**1 128**
Below Housing Interim [5)]	0	0	0	0	0	0	0	0	0	0	0
Adequate Housing Permanent [6)]	0	0	0	0	0	0	0	0	0	0	0
Total Housing Need	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Non Waterborne	0	0	0	0	0	30	0	0	9	44	83
Waterborne Low Flush	0	0	0	0	0	0	0	0	0	0	0
Septic Tanks / Conservancy [1)]	0	0	1 157	194	227	146	197	140	568	6 082	8 712
Waterborne WWTW	3 473	2 262	4 743	388	0	0	0	322	0	0	11 188
Total Adequate [2)]	**3 473**	**2 262**	**5 900**	**582**	**227**	**176**	**197**	**462**	**577**	**6 127**	**19 983**
Total per Area	**3 473**	**2 262**	**5 900**	**582**	**227**	**200**	**197**	**462**	**657**	**7 151**	**21 111**

1) Waterborne Low Flush, Septic Tanks and Conservancy tanks as agreed with the Municipality during January 2014, as part of DWS's Backlog Eradication Strategy process.

2) House Connections for 2021/2022 were projected from the 2011 Census data, except for Dwarskersbos, Aurora and Redelinghuys where the number of consumer units as calculated from the financial system were used. The Backyard dwellers are included in these figures.

3) Census 2011: Number of households with no toilet facility 506 + 10.

4) Census 2011: Number of households with existing buckets 131 + 39 +7, chemical toilets 23 + 12, pit toilets without ventilation 30 +2 + 4 and "other" 334 + 29 +1.

5) Below Housing Interim in the above table is the number of households in informal areas without basic sanitation services.

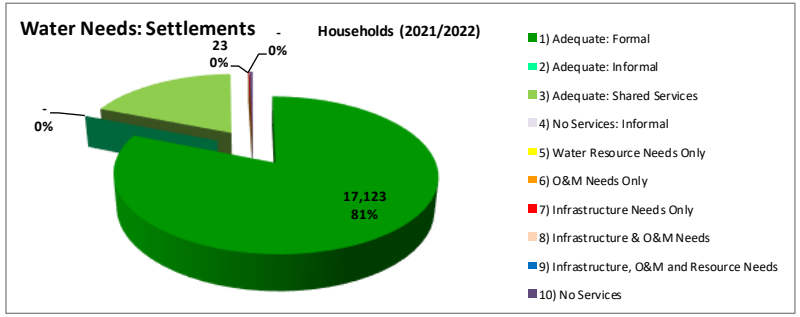
6) Adequate Housing Permanent in the above table is the number of households in informal areas with communal ablution facilities. Municipality confirmed there are no informal areas in their area.

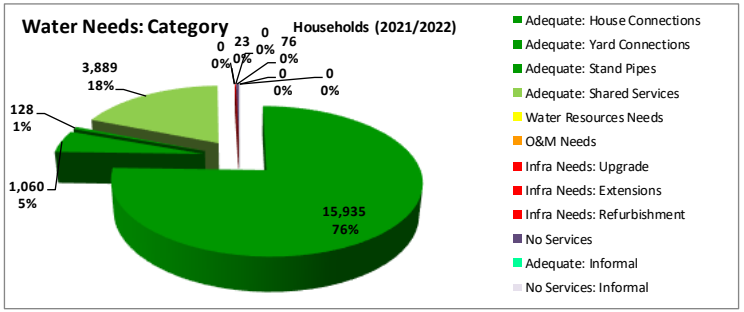
C.2.3. Residential Water Services Delivery Adequacy Profile

The existing residential water service levels in Bergrivier Municipality's Management Area are estimated as follows:

Table C.2.3.1: Residential Water Services Ddelivery Adequacy Profile (Water)

Water Categorisation	Number of settlements	FORMAL																		INFORMAL			
		Adequate								Water Resource needs		O & M Needs		Infrastructure Needs						No services		Adequate		No services	
		House Connections		Yard Connections		Stand Pipes		Shared Services						Upgrades		Extensions		Refurbishment							
		HH	%	HH	%	HH	%	HH	%	HH	%	HH	%	HH	%	HH	%	HH	%	HH	%	HH	%	HH	%
1	37	15,935	100%	1,060	100%	128	100%																		
2	0																								
3	10							3,889	100%																
4	0																								
5	0																								
6	0																								
7	3															23	100%								
8	0																								
9	0																								
10	3																			76	100%				
Total Household Interventions required		15,935		1,060		128		3,889		0		0		0		23		0		76		0		0	



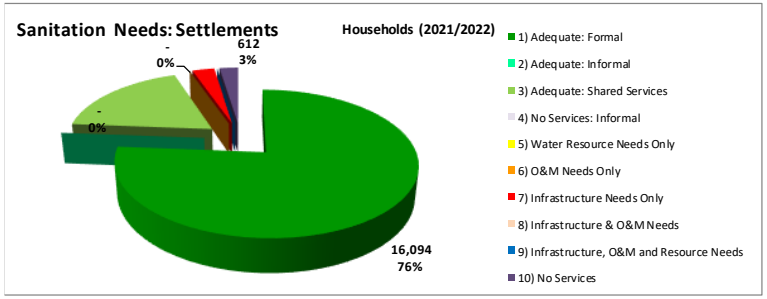


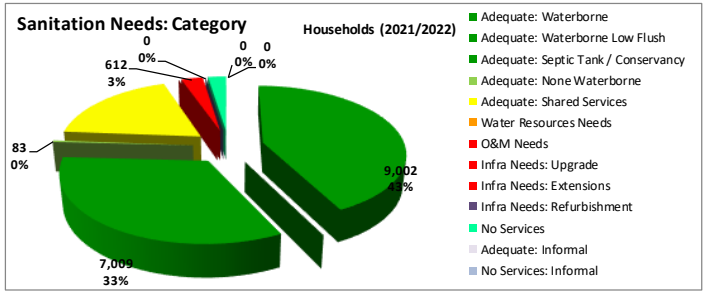
1	Adequate	3	Adequate: Shared services	5	Water Resources Needs **Only**	7	Infrastructure Needs **Only**	9	Infrastructure, O&M & Resource Needs
2	Adequate: Informal	4	No Services: Informal	6	O & M Needs **Only**	8	Infrastructure& O&M needs	10	No Services

The existing residential sanitation service levels in Bergrivier Municipality's Management Area are estimated as follows:

Table C.2.3.2: Residential Water Services Delivery Adequacy Profile (Sanitation)

Water Categorisation	Number of settlements	FORMAL																				INFORMAL			
		Adequate										Water Resource needs		O & M Needs		Infrastructure Needs						No services		Adequate		No services	
		Waterborne		Waterborne Low flush		Septic Tank/ Conservancy		None Waterborne		Shared Services						Upgrades		Extensions		Refurbishment							
		HH	%	HH	%	HH	%	HH	%	HH	%	HH	%	HH	%	HH	%	HH	%	HH	%	HH	%	HH	%	HH	%
1	37	9,002	100%			7,009	100%	83	1																		
2	0																										
3	10									3,889	100%																
4	0																										
5	0																										
6	0																										
7	3															612	100%										
8	0																										
9	0																										
10	3																					516	100%				
Total Household Interventions required		9,002		0		7,009		83		3,889		0		0		612		0		0		516		0		0	





1	Adequate	3	Adequate: Shared services	5	Water Resources Needs **Only**	7	Infrastructure Needs **Only**	9	Infrastructure, O&M & Resource Needs
2	Adequate: Informal	4	No Services: Informal	6	O & M Needs **Only**	8	Infrastructure& O&M needs	10	No Services

C.3. Cost Recovery and Free Basic Services

C.3.1. Tariffs

The water tariff structures for Bergrivier Municipality for the 2021/2022 financial year and the previous four financial years are summarised in the table below (Include VAT).

Table C.3.1: Water tariffs for 2021/2022 and the previous four financial years

Consumer/Description	Category	21/22	20/21	19/20	18/19	17/18
Availability Fee (Water per erven per year)		R982-30	R940-00	R887-00	R837-00	R783-00
Test of Meters		R363-66	R348-00	R328-00	R309-00	R289-00
Basic Monthly Charge - Residential		R65-65	R63-00	R60-00	R57-00	R53-64
Basic Monthly Charge – Commercial / Industrial / Institutional	<50mm	R65-65	-	-	-	-
	<100mm	R196-94	-	-	-	-
	<150mm	R328-23	-	-	-	-
	<200mm	R459-52	-	-	-	-
Residential	0 – 6 kl	R8-79	R8-62	R8-41	R7-77	R7-58
	7 – 13 kl	R18-59	R18-23	R17-79	R16-44	R16-04
	14 – 20 kl	R22-05	R21-63	R21-10	R19-51	R19-03
	21 – 35 kl	R27-52	R26-99	R26-33	R24-34	R23-75
	36 – 50 kl	R33-35	R32-72	R31-92	R29-50	R28-78
	51 kl +	R44-45	R43-60	R42-54	R39-32	R38-36
Commercial (Included residential consumers up to 2016/2017)	0 – 6 kl	R8-78	R8-62	R8-41	R7-77	R7-58
	7 – 20 kl	R21-43	R17-36	R16-94	R15-66	R15-28
	21 – 50 kl	R22-99	R17-36	R16-94	R15-66	R15-28
	51 – 100 kl	R25-24	R20-00	R19-51	R18-04	R17-60
	101 – 200 kl	R26-44	R21-02	R20-51	R18-96	R18-50
	201 – 1 000 kl	R25-24	R22-12	R21-58	R19-95	R19-46
	1 000 – 1 500 kl	R22-99	R18-79	R18-33	R16-95	R16-53
	1 501 – 2 000 kl	R18-03	R15-95	R15-56	R14-38	R14-03
	> 2 000 kl	R16-22	R13-51	R13-18	R12-19	R11-89
Sport Clubs / Schools / Welfare Organisations	0 – 500 kl	R9-84	R9-42	R9-42	R8-50	R8-50
	501 kl +	R14-48	R13-86	R13-86	R12-50	R12-50
Municipal Usage	0 – 500 kl	R9-84	R9-42	R9-42	R8-50	R8-50
	501 kl +	R14-48	R13-86	R13-86	R12-50	R12-50
Consumers outside previous municipal area	0 – 500 kl	R9-84	R9-42	R9-42	R8-50	R8-50
	501 kl +	R14-48	R13-86	R13-86	R12-50	R12-50
New connection		R3 621-97	R3 466-00	R3 270-00	R3 085-00	R2 885-00
Changing from 15mm to 20mm		R1 838-16	R1 759-00	R1 659-00	R1 565-00	R1 464-00

The sewerage tariff structures for Bergrivier Municipality for the 2021/2022 financial year and the previous four financial years are summarised in the table below (Include VAT).

Table C.3.2: Sewerage tariffs for 2021/2022 and the previous four financial years

Consumer/Description	Category	21/22	20/21	19/20	18/19	17/18
Availability Fee (Sewer per erven per year)		R1 826-66	R1 748-00	R1 649-00	R1 556-00	R1 455-00
All Towns	Residential: Standard charge per connection / residential unit.	R189-15	R181-00	R173-00	R163-00	R153-00
	Residential: Standard charge per connection / single residential unit	R189-15	-	-	-	-
	Residential: For each additional residential unit on a single plot.	R189-15	-	-	-	-
	Residential: “Skakelhuise” for	R189-15	-	-	-	-

Table C.3.2: Sewerage tariffs for 2021/2022 and the previous four financial years						
Consumer/Description	**Category**	**21/22**	**20/21**	**19/20**	**18/19**	**17/18**
	each unit on a plot.					
	Flats: Per residential flat in block of flats.	R189-15	-	-	-	-
	Old age homes: Per separate unit	R189-15	-	-	-	-
	Old age homes: Per unit/room with own ablution facilities	R47-27	-	-	-	-
	Old age homes: Per toilet/urinal in shared bathrooms	R37-82	-	-	-	-
Institutional	Usage charge per property / business unit	R189-15	-	-	-	-
	Additional usage charge for each toilet / urinal more than 4 on the property	R63-03	-	-	-	-
Commercial	Usage charge per property / commercial unit	R189-15	-	-	-	-
	Additional usage charge for each toilet / urinal more than 4 on the property	R63-03	-	-	-	-
	Per self-catering unit on property	R189-15	-	-	-	-
Septic Tanks: Velddrif / Aurora (7Kl Tanker)	During office hours	R442-04	R423-00	R399-00	R376-00	R352-00
	After office hours	R724-19	R693-00	R654-00	R617-00	R577-00
	Sundays / Public Holidays	R1 271-77	R1 217-00	R1 148-00	R1 083-00	R1 013-00
Septic Tanks: Eendekuil / Redelinghuys	During office hours	R184-97	R177-00	R167-00	R158-00	R148-00
Septic Tanks: Aurora	During office hours	-	-	-	R158-00	R148-00
Septic Tanks: Outside previous municipal area	During office hours	R724-19	R693-00	R654-00	R617-00	R577-00
	After office hours	R1 644-83	R1 574-00	R1 485-00	R1 401-00	R1 310-00
	Sundays / Public Holidays	R2 543-53	R2 434-00	R2 296-00	R2 166-00	R2 026-00
	Outside town boundaries per km from WWTW	R11-50	R11-00	R10-00	R9-00	R8-00
New connection same side of road		R1 610-00	R1 048-00	R989-00	R933-00	R873-00
New connection on other side of road		R3 220-00	R2 098-00	R1 979-00	R1 867-00	R1 746-00
Removal of blockages on private properties (Inside Municipal area)	Mon-Fri (Office hours)	R410-69	R393-00	R371-00	R350-00	-
	Mon – Sat (After hours)	R528-77	R506-00	R477-00	R450-00	-
	Sundays and Public Holidays	R939-46	R899-00	R848-00	R800-00	-
Other	Sale of treated effluent at WWTW (per Kl)	R1-00	R1-00	R1-00	R1-00	-
	Discharge sewage at WWTW (per Kl)	R35-53	R34-00	R32-00	R30-00	-
	Emptying of chemical toilets (per toilet/drum)	R53-30	R51-00	R48-00	R45-00	-

C.3.2. Metering, Billing and Free Basic Services

Service charges relating to water are based on consumption and a basic charge as per Council resolution. Meters are read on a monthly basis and are recognised as revenue when invoiced. Provisional estimates of consumption are made monthly when meter readings have not been performed. The provisional estimates of consumption are recognised as revenue when invoiced. Adjustments to provisional estimates of consumption are made in the invoicing period in which meters have been read. These adjustments are recognised as revenue in the invoicing period. Services relating to sanitation (sewerage) are recognised on a monthly basis in arrears by applying the approved tariff to each property. Tariffs are determined per category of property usage. In the case of residential property, a fixed monthly tariff is levied and in the case of commercial property, a tariff is levied based on the number of sewerage connections on the property. Service charges are based on a basic charge as per Council resolution.

The table below gives an overview of the metering, billing and free basic services of Bergrivier Municipality.

Table C.3.2.1: Overview of Metering, Billing and Free Basic Services

Regulations Ref. #	Description	Unit	Year 0	Year - 1	Year - 2
			FY2021/22	FY2020/21	FY2019/20
	UNITS SUPPLIED (as per water services access profile)				
10.2 (b) (i)	Household water connections (house and yard connections)	Nr	**20 884**	**20 332**	**19 870**
10.2 (b) (iv)	Household sewerage connections	Nr	**19 900**	**19 348**	**18 886**
	METERING				
	Metered Water Connections (aligned with Table C2.1)				
	Residential	Nr	9 214	9 007	8 804
	Commercial / Business	Nr	274	271	266
	Industrial	Nr	55	55	55
	Government / Institutional	Nr	164	155	141
	etc.	Nr	76	74	74
	Sub-Total: Metered Water Connections	**Nr**	**9 783**	**9 562**	**9 340**
	Proportion of metered connections (residential)*	%	44%	44%	44%
	Total number of meters	Nr	**9 783**	**9 562**	**9 340**
10.2 (b) (vi)	Total number of new connections (aligned with Table C.2.1)	Nr	221	222	163
10.2 (e) (i)	Total number of new meters installed	Nr	221	222	163
	Proportion of new connections, metered	%	100.0%	100.0%	100.0%
	Number of meters tested	Nr	13	13	4
10.2 (e) (ii)	Proportion of meters tested to total number of meters	%	0.1%	0.1%	0.0%
	Number of meters replaced	Nr	689	413	241
10.2 (e) (ii)	Proportion of meters replaced to total number of meters	%	7.0%	4.3%	2.6%
	BILLING				
	Customer billing (water and sewerage)		**Nr**	**Nr**	**Nr**
	Residential	Nr	9 214	9 007	8 804
	Commercial / Business	Nr	274	271	266
	Industrial	Nr	55	55	55
	Government / Institutional	Nr	164	155	141
	etc.	Nr	76	74	74
	Sub-Total: Customers billed	Nr	**9 783**	**9 562**	**9 340**
	Proportion of bills to metered connections	%	**100%**	**100%**	**100%**
	Residential	%	100%	100%	100%
	Commercial / Business	%	100%	100%	100%
	Industrial	%	100%	100%	100%
	Government / Institutional	%	100%	100%	100%
	etc.	%	100%	100%	100%
	FREE BASIC SERVICES				
	Nr customers receiving:				
	Free Basic Water	Nr	1 916	2 128	1 860
10.2 (b) (v)	Free Basic Sanitation	Nr	1 709	1 886	1 635
	Proportion of Free Basic Services				
	Water	%	21%	24%	21%
	Sewerage	%	9%	10%	9%

Note: * All residential consumers in the urban areas of Bergrivier Municipality's Management Area are metered. The "Water Services Access Profile" however includes the consumers on the farms and the backyard dwellers on formal erven in the urban areas. Backyard dwellers use the service of the main house, which is metered. Consumers on the farms utilise their own water sources, which is not metered by the Municipality, therfore the 40% - 50% compliance in the above table.

C.3.3. Revenue Collection and Cost Recovery

The table and figures below give an overview of Bergrivier Municipality's water services revenue collection and cost recovery.

Table C.3.3.1: Overview of Water Services Revenue Collection and Cost Recovery				
Regulations Ref. #	Description	Year 0	Year - 1	Year - 2
		FY2021/22	FY2020/21	FY2019/20
	INCOME	**R'000**	**R'000**	**R'000**
	Billed			
	Water reticulation / provision	R 37,186	R 32,778	R 28,752
	Sewerage / wastewater	R 21,232	R 18,944	R 13,415
	Sub-Total: Billed	**R 58,418**	**R 51,721**	**R 42,167**
	Collections			
	Water reticulation / provision	R 39,709	R 35,539	R 27,061
	Sewerage / wastewater	R 21,554	R 23,089	R 14,416
	Sub-Total: Collections	**R 61,263**	**R 58,628**	**R 41,477**
	Equitable share income			
	Water reticulation / provision	R 2,211	R 2,277	R 2,118
	Sewerage / wastewater	R 3,574	R 3,626	R 3,095
	Sub-Total: Equitable share income	**R 5,785**	**R 5,903**	**R 5,213**
	EXPENDITURE (O&M)	**R'000**	**R'000**	**R'000**
	Water services	R 22,961	R 19,206	R 21,305
	Sewerage / wastewater services	R 8,509	R 13,101	R 12,680
	Total: Water Services O&M	**R 31,471**	**R 32,306**	**R 33,984**
	COST RECOVERY ANALYSIS / RATIO'S	**%**	**%**	**%**
10.2 (d) (ii)	**Billed as % of Cost**			
	Water	172%	183%	145%
	Sewerage	292%	172%	130%
	Total	**186%**	**160%**	**124%**
10.2 (d) (iii)	**Unrecovered as % of Cost**			
	Water services	-1%	-3%	18%
	Sewerage / wastewater services	38%	-4%	17%
	Total	**9%**	**-3%**	**17%**

The figure below gives an overview of the revenue collection and cost recovery profile for water services for Bergrivier Municipality for the last three financial years.

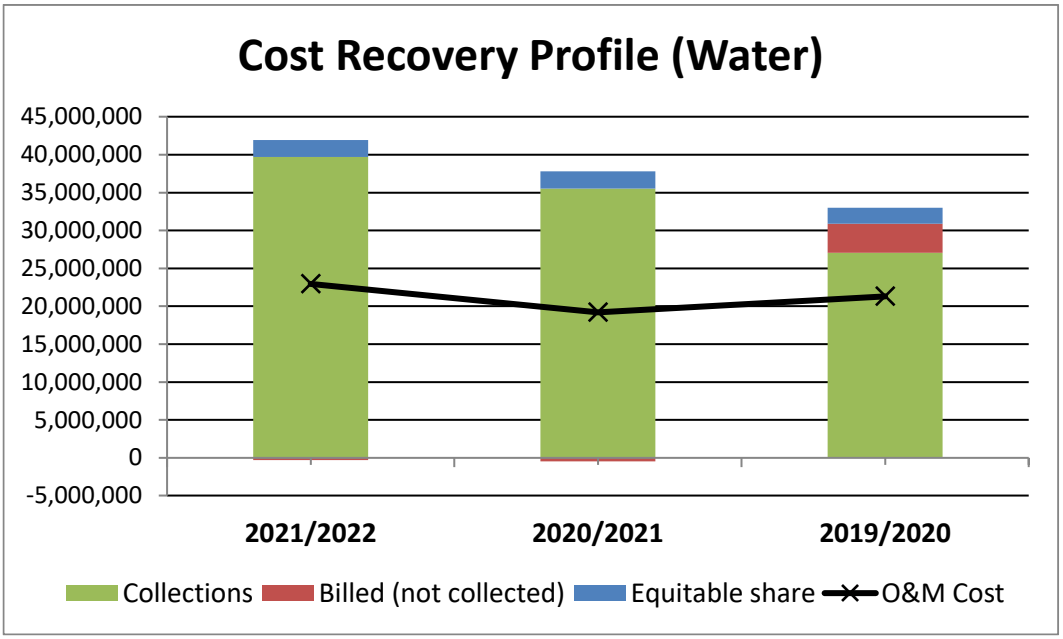


Figure C.3.3.1: Revenue collection and cost recovery profile (Water)

The figure below gives an overview of the revenue collection and cost recovery profile for wastewater services for Bergrivier Municipality for the last three financial years.

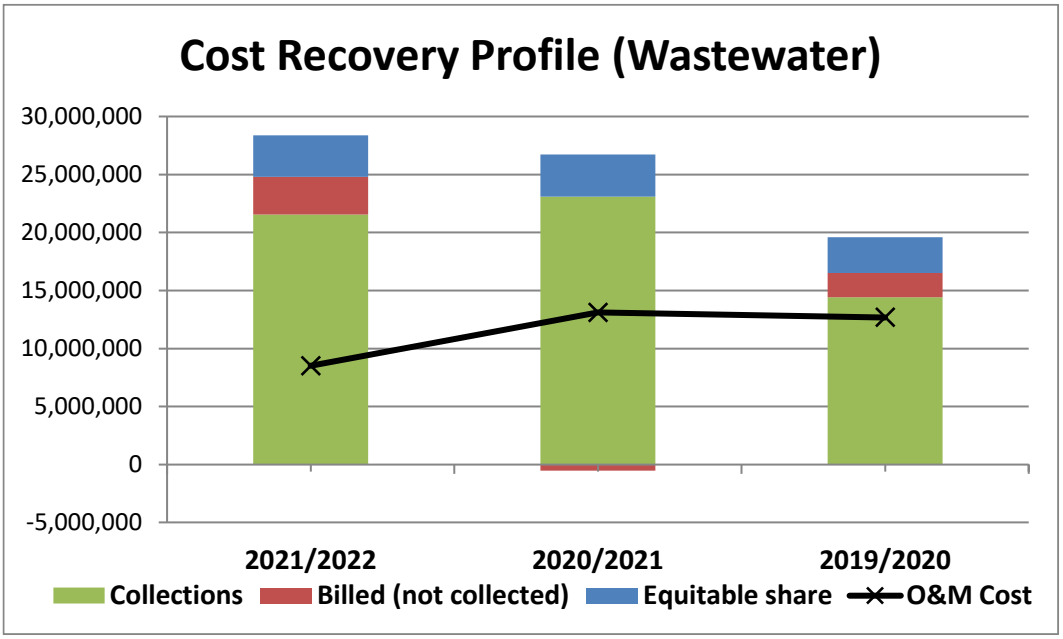


Figure C.3.3.2: Revenue collection and cost recovery profile (Wastewater)

Bergrivier Municipality's Operational and Maintenance Budget for water services for the last five financial years is summarised in the table below. A more detail breakdown of the water operational budgets are also included in Annexure E.

Table C.3.3.2: Operational and Maintenance budget for water services for the last five financial years						
Cost Centre	**Cost Centre**	**Actual 21/22**	**Actual 20/21**	**Actual 19/20**	**Actual 18/19**	**Actual 17/18**
EXPENDITURE						
Water Distribution	4511	R21 251 310	R17 557 739	R19 269 155	R17 757 253	R17 791 230
Water Treatment	4512	R1 709 966	R1 647 957	R2 035 562	R2 409 903	R2 687 305
Total Expenditure		**R22 961 276**	**R19 205 696**	**R21 304 717**	**R20 167 157**	**R20 478 535**
INCOME						
Water Distribution	4511	-R39 397 815	-R35 054 863	-R30 870 115	-R26 209 734	-R21 255 934
Total Income		**-R39 397 815**	**-R35 054 863**	**-R30 870 115**	**-R26 209 734**	**-R21 255 934**
Nett Surplus / Deficit		**R16 436 539**	**R15 849 167**	**R9 565 398**	**R6 042 577**	**R777 399**

Bergrivier Municipality's Operational and Maintenance Budget for sanitation services for the last five financial years is summarised in the table below. A more detail breakdown of the sanitation operational budgets are also included in Annexure E.

Table C.3.3.3: Operational and Maintenance budget for sanitation services for the last five financial years						
Cost Centre	**Cost Centre**	**Actual 21/22**	**Actual 20/21**	**Actual 19/20**	**Actual 18/19**	**Actual 17/18**
EXPENDITURE						
Sewerage	4291	R6 883 913	R11 804 735	R9 706 526	R7 457 534	R6 861 154
Waste Water Treatment	4292	R1 625 347	R1 295 825	R2 973 200	R3 165 447	R3 125 975
Total Expenditure		**R8 509 260**	**R13 100 560**	**R12 679 726**	**R10 622 981**	**R9 987 129**
INCOME						
Sewerage	4291	-R24 805 573	-R22 569 830	-R16 509 629	-R15 624 739	-R28 958 707
Total Income		**-R24 805 573**	**-R22 569 830**	**-R16 509 629**	**-R15 624 739**	**-R28 958 707**
Nett Surplus / Deficit		**R16 296 313**	**R9 469 270**	**R3 829 903**	**R5 001 758**	**R18 971 578**

The table below gives an overview of the analysis of the consumer debtors per service for the last ten financial years.

Table C.3.3.4: Consumer debtors per service for the last ten financial years							
Year	**General debit/credit**	**Services: Old**	**Electricity**	**Water**	**Sewerage**	**Refuse Removal**	**Total**
2012/2013	-R1 048 856-15	R94 337-51	R6 575 726-66	R4 623 040-89	R3 572 291-82	R6 260 353-61	R20 076 894-34
2013/2014	-R1 420 973-12	R71 576-70	R8 640 727-30	R6 550 646-49	R4 286 155-33	R7 213 767-20	R25 341 899-90
2014/2015	-R2 235 527-48	R23 066-42	R8 263 989-97	R7 797 917-44	R4 977 280-90	R8 063 592-38	R26 890 319-63
2015/2016	-R2 238 376-49	R10 902-76	R7 538 802-32	R7 746 652-56	R4 732 364-99	R7 810 512-25	R25 600 858-39
2016/2017	-R2 068 504-90	R9 478-72	R8 184 231-09	R8 682 944-98	R5 924 987-56	R9 993 744-10	R30 726 881-55
2017/2018	-R4 106 808-50	-	R8 926 044-36	R8 568 907-98	R7 278 300-88	R12 710 916-47	R33 377 361-19
2018/2019	-R3 481 911-96	-	R12 143 779-88	R10 856 894-99	R8 157 679-87	R14 243 816-36	R41 920 259-14
2019/2020	-R6 097 796-98	-	R9 701 294-57	R14 405 529-96	R9 856 552-96	R17 046 794-00	R44 912 374-51
2020/2021	-R4 756 052-17	-	R9 653 272-64	R14 058 927-39	R9 546 819-97	R16 584 826-76	R45 087 794-59
2021/2022	-R5 985 057.63	-	R14 492 413-80	R13 770 187-85	R11 587 461-46	R17 715 797-72	R51 580 803-20

The total debtors of Bergrivier Municipality increased over the last number of years. The debtors for water services decreased during the last financial year, but for sewerage services the debtors increased. The graph below gives an overview of the total consumer debtors for the last eleven financial years.

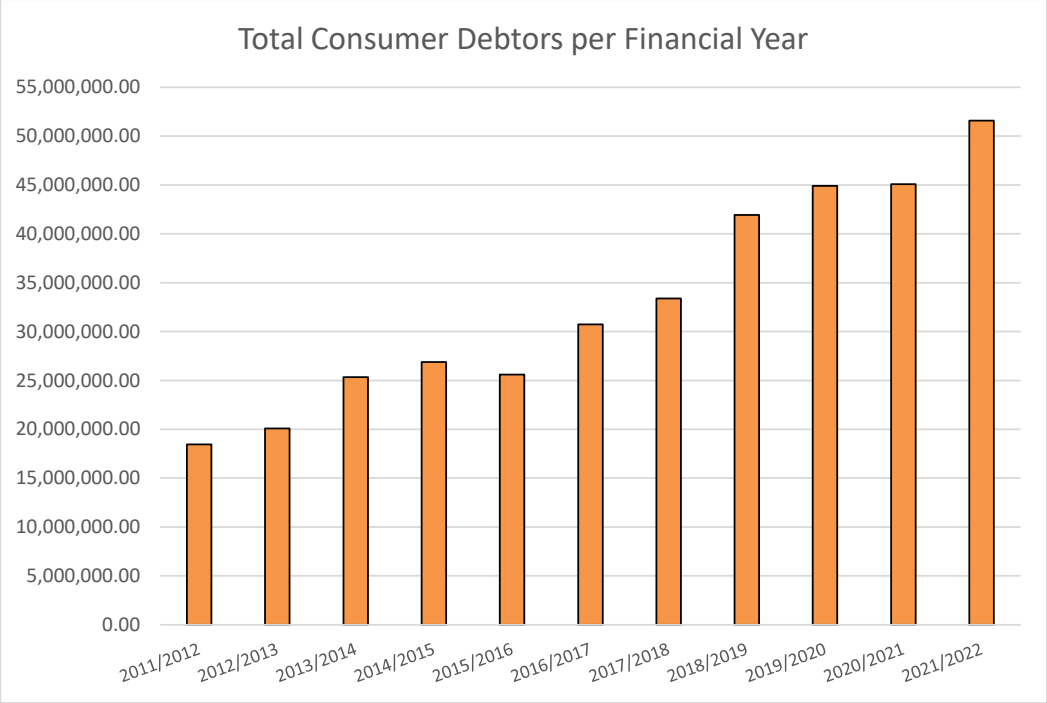


Figure C.3.3.3: Total consumer debtors per financial year

The graph below gives an overview of the consumer debtors per service for the last eleven financial years.

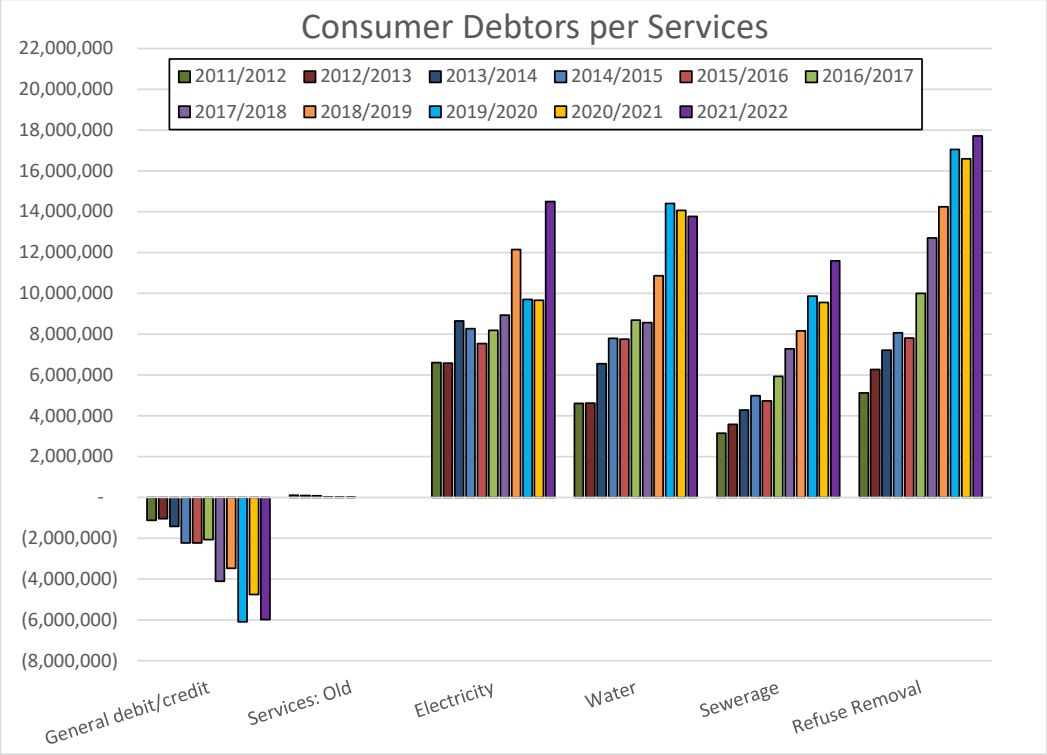


Figure C.3.3.4: Consumer debtors per service

C.4. Water Quality

C.4.1. Sampling Programme

Bergrivier Municipality continues with the implementation of their comprehensive drinking water sampling programme for their formal water supply schemes, which includes schemes supplied by surface water, groundwater and potable bulk water supplied by the West Coast District Municipality. The current compliance monitoring is done by an accredited external laboratory. The Municipality continuously strive to provide good quality water and strive to achieve Blue Drop Status for all their water supply networks.

The two tables below give an overview of the Bergrivier Municipality's water quality compliance sampling programmes for their water networks and WTWs.

Table C.4.1.1: Sampling Programme for Potable Water Quality - Network

Treated Water Schemes: Piketberg, Porterville, Eendekuil, Redelinghuys, Velddrif, Aurora

Registered Sites per Scheme		Active (yes/no)			Determinands per Category	Frequency (days)		
		Year 0	Year-1	Year-2		Year 0	Year-1	Year-2
#	Name	FY2021/22	FY2020/21	FY2019/20		FY2021/22	FY2020/21	FY2019/20
	Piketberg Community Centre (WWBMPB-001)	Yes	Yes	Yes	**Microbiological (Health)**			
	Piketberg Municipal Offices (WWBMPB-003)	Yes	Yes	Yes	E.Coli (Count per 100 ml)	14	14	14
	Piketberg Electrical Store	Yes	Yes	Yes				
	Aurora Municipal Office (WWBMAU-001)	Yes	Yes	Yes	**Aesthetic**			
	Eendekuil Municpal Office (WWBMEK-001)	Yes	Yes	Yes	Conductivity at 25°C (mS/m)	14	14	14
	Porterville Municipal Office (WWBMPV-001)	Yes	Yes	Yes	Colour	14	14	14
	Porterville Sew age Plant Drinking Water (WWBRPV-002)	Yes	Yes	Yes	Sodium as Na (mg/l)		-	-
	Porterville Library	Yes	Yes	Yes	Total Dissolved Solids (mg/l)	14	14	14
	Redelinghuys Municipal Office (WWBMRH-001)	Yes	Yes	Yes	Magnesium as Mg (mg/l)	14	14	14
	Velddrif Civic Centre (Noordhoek Saal)	Yes	Yes	Yes	Chloride as Cl- (mg/l)	-	-	-
	Velddrif Municipal Office	Yes	Yes	Yes	Zinc as Zn (mg/l)	-	-	-
					Iron as Fe (µg/l)	-	-	-
					Manganese as Mn (µg/l)	-	-	-
					Operational			
					pH at 25°C	14	14	14
					Turbidity	14	14	14
					Aluminium as Al (µg/l)	14	14	14
					Heterotrophic Plate Count count per 1ml	14	14	14
					Total Coliform Count per 100 ml	-	-	-
					Disinfectant Residual			
					Free Chlorine	14	14	14
					Chemical (Health)			
					Fluoride as F- (mg/l)	-	-	-
					Not in STD / Limit Set			
					Calcium as Ca (mg/l)	14	14	14
					Langelier Saturation Index	14	14	14
					Total Alkalinity (as CaCO3)	14	14	14
					Total Hardness (as CaCO3)	14	14	14

Table C.4.1.2: Sampling Programme for Potable Water Quality - WTW								
Treated Water Schemes: Piketberg, Porterville, Eendekuil, Redelinghuys, Velddrif, Aurora, Dwarskersbos								
Registered Sites per Scheme		Active (yes/no)			Determinands per Category	Frequency (days)		
		Year 0	Year-1	Year-2		Year 0	Year-1	Year-2
#	Name	FY2021/22	FY2020/21	FY2019/20		FY2021/22	FY2020/21	FY2019/20
	Aurora - WTW Final (WWBRAU-003)	Yes	Yes	Yes	**Microbiological (Health)**			
	Eendekuil WTW Final (WWBREK-003)	Yes	Yes	Yes	E.Coli (Count per 100 ml)	14	14	14
	Piketberg WTW Final (WWBRPB-009)	Yes	Yes	Yes				
	Porterville WTW Final (WWBRPV-004)	Yes	Yes	Yes	**Aesthetic**			
	Redelinghuys WTW (WWBRPH-001)	Yes	Yes	Yes	Conductivity at 25°C (mS/m)	14	14	14
	Storage				Colour	14	14	14
	Dwarskersbos Reservoir (WWBRVD-009)	Yes	Yes	Yes	Sodium as Na (mg/l)	30	30	30
	Velddrif Reservoir (Reservoir 1)	Yes	Yes	Yes	Total Dissolved Solids (mg/l)	14	14	14
					Magnesium as Mg (mg/l)	14	14	14
	Chloride was not sampled in Porterville, Velddrif and Dwarskersbos				Chloride as Cl- (mg/l)	30	30	30
	Sodium was not sampled in Velddrif and Dwarskersbos				Zinc as Zn (mg/l)	-	-	-
	Fluoride was monthly sampled only in Porterville				Iron as Fe (µg/l)	-	-	-
					Manganese as Mn (µg/l)	-	-	-
					Operational			
					pH at 25°C	14	14	14
					Turbidity	14	14	14
					Aluminium as Al (µg/l)	14	14	14
					Heterotrophic Plate Count count per 1ml	14	14	14
					Total Coliform Count per 100 ml	14	14	14
					Disinfectant Residual			
					Free Chlorine	14	14	14
					Chemical (Health)			
					Fluoride as F- (mg/l)	-	-	-
					Not in STD / Limit Set			
					Calcium as Ca (mg/l)	14	14	14
					Langelier Saturation Index	14	14	14
					Total Alkalinity (as CaCO3)	14	14	14
					Total Hardness (as CaCO3)	14	14	14

The table below indicates the compliance of the E.Coli monitoring frequency in the water distributions systems of Bergrivier Municipality, in terms of the minimum requirements of SANS 0241:2015 (Table 2). The period assessed was for samples taken from July 2021 to June 2022.

Table C.4.1.3: Bergrivier Municipality's compliance of the monthly E.Coli monitoring frequency in the water distributions systems in terms of the minimum requirements of SANS 241-2:2015 (Table 2).			
Distribution System	**Population served**	**Required number of monthly samples (SANS 241-2:2015: Table 2)**	**Average number of monthly microbiological compliance samples taken by the Bergrivier Municipality during 2021/2022**
Porterville	8 190	2	10.1
Piketberg	14 363	2.9	10.6
Velddrif	17 946	3.6	10.6
Dwarskersbos	945	2	4.5
Aurora	638	2	6.3
Eendekuil	1 865	2	6.2
Redelinghuys	603	2	6.3
Total	**44 550**	**16.5**	**54.6**

It can be noted from the above table that the number of monthly E.Coli samples taken by the Municipality during the 2021/2022 financial year was more than the required number of samples for all the water distribution systems.

The table below gives an overview of Bergrivier Municipality's compliance sampling programme for wastewater (final effluent) quality, as compiled from the final effluent compliance sample results.

Table C.4.1.4: Sampling Programme for Wastewater Effluent Quality

Registered Sites		Active			Determinands per Category	Frequency (days)		
		Year 0	Year-1	Year-2		Year 0	Year-1	Year-2
#	Name	FY2021/22	FY2020/21	FY2019/20		FY2021/22	FY2020/21	FY2019/20
1	Dwarskersbos	Yes	Yes	Yes	**Microbiological**			
2	Eendekuil	Yes	Yes	Yes	E.Coli (count per 100mℓ)	-	-	30
3	Piketberg	Yes	Yes	Yes	Faecal Coliforms (count per 100mℓ)	30	30	-
4	Porterville	Yes	Yes	Yes				
5	Velddrif	Yes	Yes	Yes	**Chemical**			
					Ammonia Nitrogen (mg/ℓ as N)	30	30	30
					Nitrate Nitrogen (mg/ℓ as N)	30	30	30
					Nitrite Nitrogen (mg/ℓ as N)	30	30	-
					Ortho Phosphate (mg/ℓ as P)	30	30	-
					COD (mg/ℓ) Filtered	30	30	-
					COD (mg/ℓ) Unfiltered	30	30	30
					Free Chlorine (mg/ℓ)	30	30	30
					Physical			
					Electrical Conductivity (mS/m)	30	30	30
					pH	30	30	30
					Total Suspended Solids (mg/ℓ)	30	30	30

The table below gives an overview of the compliance of the Municipality with regard to their Water Quality and Wastewater Quality Sampling Programmes, as taken from the DWS IRIS.

Table C.4.1.5: Compliance to the Sampling Programme (s)

Measurable / Enabling Factor	Unit	Year 0 FY2021/22						Year -1 FY2020/21						Year -2 FY2019/20					
		MAH	CAH	CCH	CNA	O	D	MAH	CAH	CCH	CNA	O	D	MAH	CAH	CCH	CNA	O	D
Potable Water Quality																			
Supply system submissions	Nr registered / Nr submitted / Annual %	Information not available on IRIS						Information not available on IRIS						Information not available on IRIS					
Monitoring compliance	Average %																		
Certified Data	Average %	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	0%	100%	100%	100%	100%
In-Time Submission	Annual %	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	79%	0%	78%	78%	79%	78%
Wastewater Quality																			
		M	C	P	O			M	C	P	O			M	C	P	O		
Monitoring Compliance	Average %	100%	100%	89%	0%			92%	81%	82%	-			100%	38%	55%	-		
Certified Data	Average %	100%	100%	100%	0%			100%	100%	100%	-			100%	98%	99%	-		
In-Time Submission	Average %	100%	99%	100%	0%			100%	100%	100%	-			68%	63%	67%	-		

Legend **MAH**: Microbiological Acute Health; **CAH**: Chemical Acute Health; **CCH**: Chemical Chronic Health; **CNA**: Chemical Non Health Aesthetic; **O**: Operational; **D**: Disinfectant

Legend Wastewater **M**: Microbiological; **C**: Chemical; **P**: Physical; **O**: Operational

The table below gives an overview of the water quality monitoring from the WSDP Guide Framework perspective.

Table C.4.1.6: Water Quality Monitoring Overview from WSDP Guide Framework Perspective					
WSDP Ref #	Measurable / Enabling Factor	Unit	Year 0	Year - 1	Year - 2
			FY2021/22	FY2020/21	FY2019/20
6.3	**Water Supply and Quality**				
6.3.2	Process Control in place	yes/total WTW in %	100%	100%	100%
6.3.3	Monitoring Programme in place	yes/total schemes in %	100%	100%	100%
6.3.4	Sample Analysis Credibility	Average %	100%	100%	100%
9.2	**Monitoring**				
9.2.1	% of water abstracted monitored: Surface water	Q monitored / Q abstracted in %	100%	100%	100%
9.2.2	% of water abstracted monitored: Ground water	Q monitored / Q abstracted in %	100%	100%	100%
9.2.3	% of water abstracted monitored: External Sources (Bulk purchase)	Q monitored own / Q purchased in %	100%	100%	100%
9.2.6	Water quality for formal schemes? (1: daily, 2: weekly, 3: monthly, 4: annually, 5: never)	frequency	Monthly	Monthly	Monthly
9.2.7	Water quality for rudimentary schemes? (1: daily, 2: weekly, 3: monthly, 4: annually, 5: never)	frequency	N/A	N/A	N/A
9.2.9	Is the number sufficient in accordance to the SANS241 requirements?	yes/no	Yes	Yes	Yes
9.3	**Water Quality**				
	Is there a water safety plan in place?	yes/no	Yes	Yes	Yes
9.3.1	Reporting on quality of water taken from source: urban & rural	yes/total schemes in %	100%	100%	100%
9.3.5	Quality of water taken from source: urban - % monitored by WSA self?	monitored by WSA / total schemes in %	100%	100%	100%
9.3.6	Quality of water taken from source: rural - % monitored by WSA self?	monitored by WSA / total schemes in %	N/A	N/A	N/A
9.3.9	Are these results available in electronic format?	yes/no	Yes	Yes	Yes

The table below gives an overview of the wastewater quality monitoring from the WSDP Guide Framework perspective.

Table C.4.1.7 : Wastewater Quality Monitoring Overview from WSDP Guide Framework Perspective					
WSDP Ref #	Measurable / Enabling Factor	Unit	Year 0	Year - 1	Year - 2
			FY2021/22	FY2020/21	FY2019/20
5.3.1	**Monitoring and Sample Failure**				
5.3.1.1	Compliance Monitoring: % of tests performed as required by general limits /special limits/ license requirements (Average % over previous 12 months)	Annual %	97%	85%	64%
5.3.1.2	Operational: % of tests performed as required by general limits /special limits/ license requirements (Average % over previous 12 months)	Annual %	Not captured on IRIS and recorded by Process Controllers at each of the WWTW		
6.4	**Wastewater Supply and Quality**				
6.4.2	Process Control in place	yes/total WWTW in %	57%	57%	57%
6.4.3	Monitoring Programme in place	yes/total WWTW in %	78%	78%	78%
6.4.4	Sample Analysis Credibility	Average %	100%	100%	100%
9.2	**Monitoring**				
9.2.10	Is the number sufficient in accordance to licences?	yes/no	Yes	Yes	Yes
9.3	**Water Quality**				
	Is there a wastewater risk abatement plan in place?	yes/no	Yes	Yes	Yes
9.3.2	Monitor quality of water returned to the resource: urban	yes/total WWTW in %	Yes	Yes	Yes
9.3.3	Monitor quality of water returned to the resource: rural	yes/total WWTW in %	N/A	N/A	N/A
9.3.7	Quality of water returned to resource: urban - % monitored by WSA self?	monitored by WSA / urban WWTW in %	Yes	Yes	Yes
9.3.8	Quality of water returned to resource: rural - % monitored by WSA self?	monitored by WSA / rural WWTW in %	N/A	N/A	N/A
9.3.9	Are these results available in electronic format?	yes/no	Yes	Yes	Yes

DWS's Blue Drop Process

The DWS completed the Blue Drop PAT process for the WSAs in 2021. Blue drop status is awarded to those towns that comply with 95% criteria on drinking water quality management. The blue drop performance of Bergrivier Municipality was summarised as follows in the DWS's 2014 Blue Drop Report, which was the last complete assessment done by the DWS.

Table C.4.1.8: Blue Drop Performance of the Municipality (DWS's 2014 Blue Drop Report)	
Municipal Blue Drop Score	**2011 – 85.20%, 2012 – 90.60% and 2014 - 63.79%**

Regulatory Impression: The improvements observed in the previous assessments have not been demonstrated during this assessment cycle. A significant and substantial decrease in Municipal Score for Bergrivier Local Municipality is noted across each water system.

A number of areas are identified where the Bergrivier Local Municipality and their bulk water supplier for Velddrif, the West Coast District Municipality, should implement actions to improve compliance. These include:

- The system specific Water Safety Plan should be informed by the recommendations of the process audit, the results of the full SANS assessment of the raw, final water and distribution system, operational and compliance monitoring and non-conformance to the water quality limits. The Municipality is encouraged to align their Water Safety Plan for Velddrif with the Water Safety Plan for the Withoogte WTW managed by the West Coast District Municipality, which has not been updated since 2011. Evidence of the planning process and implementation of corrective actions to mitigate significant risks, should be maintained.
- Based on the water quality monitoring data, a risk based monitoring programme that complies with the requirements of SANS 241 with regard to sampling points and coverage of the distribution system, frequency of analyses and the determinants analysed, should be developed and implemented.
- The IMP should be updated to be risk based and aligned with limits set out in the latest version of SANS:241. This must be communicated to all relevant stakeholders to ensure the appropriate response to any incidents.
- All compliance monitoring data should be timeously uploaded to the BDS.
- Budget and expenditure information should be compiled for each water system.
- Operational flows at the treatment plants should be recorded daily and monitored against design capacity.
- Water balances should be completed for each water system and initiatives developed and implemented to reduce non-revenue water.

Of concern is the poor microbiological compliance in the systems of Eendekuil, Piketberg and Redelinghuys. This needs to be addressed urgently to ensure that water supplied to the community meets the drinking water quality criteria to prevent health impacts. High failures of turbidity, aluminium and residual chlorine levels indicate that improved operational practices may be required.

Based on the above Audit results, the DWS has serious concerns on the poor microbiological drinking water quality and the resultant risk to consumers of the Eendekuil, Piketberg and Redelinghuys water supply systems. These concerns have to be addressed as a matter of urgency and drinking water quality results and appropriate actions must be communicated to consumers should the water be found to be unfit for human consumption.

The Bergrivier Local Municipality was well prepared for the assessment and demonstrated a positive approach to the Blue Drop Certification Programme. Consequently, it is anticipated that through acknowledgement of the identified gaps that progressive improvement in compliance will once again be achieved in future assessments.

Site Inspection Report: Piketberg and Porterville WTWs Score:

Piketberg WTW: 87%

Porterville WTW: 85%

The site inspection impression at the Piketberg WTW was considered to be very good. Areas for improvement include the installation of standby equipment for flocculent dosing and chlorination.

The site inspection impression at the Porterville WTW was considered to be very good.

Performance Area	Aurora	Eendekuil	Piketberg	Porterville	Redelinghuys	Velddrif
Water Services Provider(s)	**Bergrivier LM**	**Bergrivier LM**	**Bergrivier LM**	**Bergrivier LM**	**Bergrivier LM**	**West Coast DM**
Water Safety Planning	24.85	21.18	24.33	22.40	23.63	18.99
Treatment Process Management	6.80	4.00	6.00	6.80	6.00	6.00
DWQ Compliance	23.25	6.75	6.75	22.65	6.75	24.23
Management Accountability	7.30	7.30	7.75	7.75	7.75	7.60
Asset Management	5.78	4.41	5.25	8.33	4.41	7.11
Use Efficiency, Loss Management	0.23	0.23	0.23	0.23	0.23	0.23
Bonus Scores	2.86	6.75	6.71	4.78	6.00	4.57
Penalties	1.50	1.32	0.00	0.00	0.00	1.75
Blue Drop Score (2014)	**69.56%**	**49.29%**	**57.01%**	**72.93%**	**54.76%**	**66.96%**
Blue Drop Score (2012)	90.98%	90.16%	87.52%	95.00%	73.34%	97.57%
Blue Drop Score (2011)	77.88%	76.15%	68.78%	78.21%	52.69%	93.15%
Blue Drop Score (2010)	58.69%	57.81%	62.19%	62.19%	54.19%	67.38%
System Design Capacity (Ml/d)	0.200	0.200	3.000	3.900	0.300	75.400
Operational Capacity (% i.t.o. Design)	100%	80%	71%	36%	NI	80%
Average daily consumption (l/p/d)	30.8	266.7	214.1	175.0	500.0	N/A
Microbiological Compliance (%)	**99.9%**	**80.0%**	**90.9%**	**99.9%**	**82.6%**	**98.8%**
Chemical Compliance (%)	**99.9%**	**99.9%**	**99.9%**	**99.9%**	**99.9%**	**99.9%**

Bergrivier Municipality also received their 2022 Blue Drop Risk Ratings early this year, as calculated from the 2021 assessment done by the DWS.

Table 4.1.9: BDRR for the Bergrivier Municipality (2022)

WSA Overview

All the Water Supply Systems at this WSA (Aurora WSS, Eendekuil WSS, Piketberg WSS, Poterville WSS, Redelinghuys WSS and Velddrif WSS) falls in the low-risk category.

Criteria A – The design capacity information for all the Water Supply Systems was provided except for Velddrif WSS. The absence of design capacity information is an indication of the lack of flow management and absence of Treatment Works Classification.

Criteria B – The Aurora WSS, Piketberg WSS, Poterville WSS and Redelinghuys WSS are operating within their design capacities. The Eendekuil WSS is operating above its design capacity and there is no operational capacity information provided for the Velddrif WSS which makes both WSS non-compliant, and this must be addressed by the WSA.

Criteria C – All the Water Supply Systems achieved excellent compliance for Microbiological compliance (>98%), except for Piketberg WSS. All the Water Supply Systems have achieved excellent compliance for Microbiological Monitoring compliance (>80%) and Chemical Monitoring compliance (>80%). The Poterville WSS, Redelinghuys WSS and Velddrif WSS achieved excellent compliance for Chemical compliance (>98%) and Aurora WSS, Eendekuil WSS, and Piketberg WSS indicated adequate compliance for Chemical compliance The average Water Quality Monitoring results for the Water Supply Systems at this WSA revealed excellent performance and compliance.

Criteria D – All the Water Supply Systems indicated insufficient presence of the relevant process control staff and maintenance teams which makes them non-compliant.

Criteria E – All the Water Supply Systems indicated the absence of an implementation of a Water Safety Plan & development of risk-based water quality monitoring programmes as outlined in SANS 241.

The Regulator encourages the WSA and WSP to urgently implement the following recommendations to ensure delivery of safe drinking water for all consumers:

A and B: Verification of design capacity for the Water Supply Systems that have not provided the design capacity.

A and B: Installation of calibrated inflow meters to verify operational capacity.

Ca: Implementation of corrective measures in the event of microbiological and chemical failures to always ensure delivery of safe drinking water.

Cb: Implementation of monitoring programmes with sufficient samples based on population size as outlined in SANS 241:2015.

D: Appointment of suitably qualified staff (supervisors, process controllers and maintenance teams) aligned to set criteria.

E: Development of Water Safety Plan as per SANS 241:2015 and WHO guidelines including risk assessment of entire supply system, water quality evaluation based on full SANS 241:2015 analysis of raw and final water, development of risk-based monitoring programmes, and implementation of mitigating measures to address all medium and high risks.

Assessment Areas	Aurora	Eendekuil	Piketberg	Poterville	Redelinghuys	Velddrif
Bulk / WSP						
A: Total Design Capacity (Ml/d)	0.200	0.200	3.150	2.270	0.260	N/I
B: % Operational Capacity in terms of design	55%	90.5%	63.5%	57.27%	53.85%	N/I
C1a: % Microbiological Compliance	100%	98.7%	95.8%	99%	100%	100%
C1b: % Microbiological Monitoring Compliance	100%	100%	100%	100%	100%	100%
C2a: % Chemical Compliance	96.4%	97%	92.9%	98.1%	99.3%	99.4%
C2b: % Chemical Monitoring Compliance	97.1%	97.1%	97.1%	97.1%	97.1%	97.1%
D: % Technical Skills	8.3%	16.7%	16.7%	8.3%	16.7%	8.3%
E: % Water Safety Plan Status	0%	0%	0%	0%	0%	0%
% BDRR/BDRR max	**16.1%**	**15.6%**	**32.0%**	**22.9%**	**14.3%**	**49.9%**

The average residential daily consumption (l/p/d) for the last eight financial years, as calculated from the IWA Water Balances for each of the water distribution systems, are summarised in the table below.

Table C.4.1.10: Average residential daily consumption (l/p/d) for the last eight financial years.

Distribution System	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019	2019/2020	2020/2021	2021/2022		
	Average Daily Billed Metered Residential Consumption (l/p/d)							Estimated Permanent Population	Aver. Daily Billed Metered Residential Consumption (kl)	Average Daily Billed Metered Residential Consumption (l/p/d)
Porterville	**137**	**126**	**121**	**102**	**79**	**98**	**96**	8 190	785.364	**96**
Piketberg	**123**	**115**	**106**	**73**	**63**	**74**	**77**	14 363	1 115.951	**78**
Velddrif *	**155**	**156**	**166**	**110**	**72**	**77**	**83**	17 946	1 489.216	**83**
Dwarskersbos *	**285**	**290**	**260**	**160**	**114**	**180**	**199**	945	197.861	**209**
Aurora	**173**	**173**	**145**	**103**	**100**	**99**	**107**	638	75.285	**118**
Eendekuil	**77**	**82**	**82**	**57**	**50**	**58**	**60**	1 865	108.071	**58**
Redelinghuys	**153**	**135**	**143**	**105**	**82**	**92**	**103**	603	59.838	**99**
All Systems	**136**	**140**	**136**	**95**	**77**	**84**	**88**	**44 550**	**3 831.586**	**86**

Note: * The average residential billed metered consumptions in the above table for Velddrif and Dwarskersbos are for the period July to June each financial year, excluding the period November to February.

DWS's Green Drop Process

The DWS completed the new Green Drop assessment for the WSAs in 2021 and the results were received early in 2022. Green drop status is awarded to those WSAs that comply with 90% criteria on key selected indicators on wastewater quality management. The green drop performance of Bergrivier Municipality is summarised as follows in the DWS's 2022 Green Drop Report.

Table 4.1.11: Green Drop Performance of the Bergrivier Municipality (DWS's 2022 Green Drop Report)	
Average Green Drop Score	**2009 – 11.0%, 2011 – 70.0%, 2013 – 44.0%, 2021 – 72.0%**

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: Dwarskersbos WWTW upgrades through WSIG funding.

The Piketberg WWTW was inspected to verify the Green Drop audit findings (**Technical Site Assessment: Piketberg WWTW 66%):**

- 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.

Table 4.1.11: Green Drop Performance of the Bergrivier Municipality (DWS's 2022 Green Drop Report)

- 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.

GREEN DROP REPORT CARD						
Key Performance Area	**Weight**	**Piketberg**	**Porterville**	**Velddrif**	**Eendekuil**	**Dwarskersbos**
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
2021 Green Drop Score		**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)		3.150	1.500	1.992	0.1400	0.294
Design Capacity Utilisation (%)		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% of CRRmax)						
2011 CRR (%)		**58.8%**	**41.2%**	**58.8%**	**52.9%**	**52.9%**
2013 CRR (%)		**58.8%**	**41.2%**	**58.8%**	**76.5%**	**76.5%**
2021 CRR (%)		**58.8%**	**47.1%**	**64.7%**	**35.3%**	**29.4%**

C.4.2. Water Quality Compliance

The table below gives an overview of Bergrivier Municipality's water quality compliance, as taken from the DWS IRIS.

Table C.4.2.1: Overview of Water Quality Compliance

WSDP Ref #	Measurable / Enabling Factor	Unit	Year 0 FY2021/22						Year -1 FY2020/21						Year -2 FY2019/20					
			MAH	CAH	CCH	CNA	O	D	MAH	CAH	CCH	CNA	O	D	MAH	CAH	CCH	CNA	O	D
	Results per the Integrated Regulatory Information System																			
n/a	Analysis compliance	Total	569	47	563	1664	1912	373	558	39	541	1548	1859	360	554	0	378	1493	1843	355
n/a		Nr Failures	16	0	8	29	127	309	8	0	6	29	91	313	1	0	0	11	85	317
n/a		Compliance %	97%	100%	99%	98%	93%	17%	99%	100%	99%	98%	95%	13%	100%	0%	100%	99%	95%	11%
n/a	Samples frequency	Total	555	19	366	366	555	366	546	15	354	354	546	354	554	0	355	355	556	355
n/a		Nr Failures	292	19	162	162	292	162	292	15	153	153	292	153	366	0	165	165	366	165
n/a		Compliance %	47%	0%	56%	56%	47%	56%	47%	0%	57%	57%	47%	57%	34%	0%	54%	54%	34%	54%
n/a	Sites compliance	Total	184	18	181	181	184	181	189	14	182	182	189	182	179	0	179	179	179	179
n/a		Nr Failures	76	18	73	73	76	73	83	14	76	76	83	76	84	0	84	84	84	84
n/a		Compliance %	59%	0%	60%	60%	59%	60%	56%	0%	58%	58%	56%	58%	53%	0%	53%	53%	53%	53%
6.3	**Water Supply and Quality**																			
6.3.6	Blue Drop Status	last year certified by DWS	2022 Blue Drop PAT						No Blue Drop assessment was done by DWS						No Blue Drop assessment was done by DWS					
9.3	**Water Quality**																			
9.3.10	% Time (days) within SANS 241 standards	Average of analysis compliance %	84%						84%						68%					

Legend **MAH**: Microbiological Acute Health; **CAH**: Chemical Acute Health; **CCH**: Chemical Chronic Health; **CNA**: Chemical Non Health Aesthetic; **O**: Operational; **D**: Disinfectant

The table below gives an overview of the number of compliance samples taken over the period July to June for the last three financial years for the various water distribution networks.

Table C.4.2.2: Number of water quality compliance samples taken throughout the various water distribution systems over the period July to June for the last three financial years																					
Number of Sampling points of Bergrivier Municipality within the distribution systems (WTW Included)	4			4			3			2			2			2			2		
Parameter Sampled	**Porterville**			**Piketberg**			**Velddrif**			**Dwarskersbos**			**Aurora**			**Eendekuil**			**Redelinghuys**		
	21/22	**20/21**	**19/20**	**21/22**	**20/21**	**19/20**	**21/22**	**20/21**	**19/20**	**21/22**	**20/21**	**19/20**	**21/22**	**20/21**	**19/20**	**21/22**	**20/21**	**19/20**	**21/22**	**20/21**	**19/20**
Conductivity	96	86	91	94	82	90	72	62	68	25	19	25	48	41	49	48	42	49	48	42	49
Total Alkalinity (as $CaCO_3$)	96	86	91	94	82	90	72	62	68	25	19	25	48	41	49	48	42	49	48	42	49
Aluminium (as Al)	96	90	91	94	86	90	72	65	68	25	20	25	48	43	49	48	44	49	48	44	49
Total Hardness (as $CaCO_3$)	95	85	90	93	81	89	71	61	67	24	18	24	47	40	48	47	41	48	47	41	48
Magnesium (as Mg)	96	86	91	94	82	90	72	62	68	25	19	25	48	41	49	48	42	49	48	42	49
Langelier Saturation Index	96	86	90	94	82	89	72	62	67	25	19	24	48	41	48	48	42	48	48	42	48
Turbidity	96	90	91	94	86	90	72	65	68	25	20	25	48	43	49	48	44	49	48	44	49
pH (at 25°C)	96	90	91	94	86	90	72	65	68	25	20	25	48	43	49	48	44	49	48	44	49
Free Chlorine	96	90	91	94	86	90	72	65	68	25	20	25	48	45	49	48	44	49	48	44	49
Calcium (as Ca)	96	86	91	94	82	90	72	62	68	25	19	25	48	41	49	48	42	49	48	42	49
E.Coli	121	115	117	127	111	118	127	115	125	54	46	53	75	65	76	74	69	77	76	69	77
Heterotrophic Plate Count	121	115	117	122	111	118	125	115	125	51	46	53	74	67	76	74	69	77	75	69	77
Total Dissolved Solids	96	68	24	94	82	90	72	62	68	25	19	25	48	41	49	48	47	49	48	42	49
Colour	96	68	24	94	82	90	72	62	68	25	19	25	48	41	49	48	42	49	48	42	49
Calcium Hardness	95	61	0	93	62	0	71	46	0	24	12	0	47	28	0	36	24	0	47	29	0
Magnesium Hardness	95	61	0	93	62	0	71	46	0	24	12	0	47	28	0	36	24	0	47	29	0
Chloride (as Cl)	1	1	1	10	12	25	1	1	1	1	1	1	12	5	1	12	12	25	12	12	25
Fluoride (as F)	12	9	1	1	5	1	1	4	1	1	2	1	1	3	1	1	3	1	1	3	1
Iron (as Fe)	12	5	1	1	1	1	1	7	25	1	1	1	1	1	1	1	1	1	1	1	1
Total Coliform Count	26	26	28	30	26	30	54	57	82	29	27	30	27	24	28	27	21	29	28	26	29
Sodium (as Na)	12	11	24	10	12	25	1	1	1	1	1	1	12	5	1	12	12	25	12	12	25
Potassium (as K)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Zinc (as Zn)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Ammonia Nitrogen (as N)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Nitrate & Nitrite Nitrogen (as N)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Nitrate as N	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Table C.4.2.2: Number of water quality compliance samples taken throughout the various water distribution systems over the period July to June for the last three financial years																					
Number of Sampling points of Bergrivier Municipality within the distribution systems (WTW Included)	4			4			3			2			2			2			2		
Parameter Sampled	**Porterville**			**Piketberg**			**Velddrif**			**Dwarskersbos**			**Aurora**			**Eendekuil**			**Redelinghuys**		
Nitrite as N	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Sulphate (as $SO4^{2-}$)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	12	6	1
Manganese (as Mn)	1	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Antimony (as Sb)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Arsenic (as As)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Cadmium (as Cd)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Chromium (as Cr)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Copper (as Cu)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Lead (as Pb)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Mercury (as Hg)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Nickel (as Ni)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Selenium (as Se)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Uranium (as U)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Cyanide	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Total Organic Carbon	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Chloroform	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Bromoform	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Dibromochloromethane	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Bromodichloromethane	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Combined Trihalomethanes	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Microcystin	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Phenols	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Somatic Coliphages	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Giardia Species	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Cryptosporidium Species	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Monochloramine	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Barium	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Boron	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Total number of samples	**1 679**	**1 452**	**1 278**	**1 647**	**1 434**	**1 429**	**1 348**	**1 180**	**1 207**	**518**	**412**	**446**	**904**	**760**	**803**	**881**	**784**	**854**	**918**	**799**	**854**

The water quality performance indicators of all the water distribution systems in Bergrivier Municipality was categorised as either "Good" or "Excellent" for 2020/2021, except the "Acute Health Microbiological" indicators for Piketberg and Dwarskersbos and the "Operational Efficiency" indicator for Eendekuil that were categorised as "Unacceptable". The water quality compliance sample results are included in Annexure D for each of the distribution systems. The overall percentage of compliance of the water quality samples taken over the period July to June for the last two financial years is summarised in the table below per distribution system. The additional monitoring required by Bergrivier Municipality for determinands identified during the risk assessment exceeding the SANS 241:2015 numerical limits are also included in the table.

Table C.4.2.3: Percentage compliance of the water quality samples for the period July to June for the last two financial years

Performance Indicator	Performance Indicator categorised as unacceptable Yes / No (Table 4 of SANS 241-2:2015)		% Sample Compliance according to SANS 241-2015 Limits		Frequency of Additional Monitoring due to failure (Table 3 of SANS 241-2:2015)	
	2021/2022	2020/2021	2021/2022	2020/2021	2021/2022	2020/2021
Porterville						
Acute Health Chemical	No (Excellent)	No (Excellent)	100.0%	100.0%	-	-
Acute Health Microbiological	No (Excellent)	No (Excellent)	99.2%	100.0%	-	-
Chronic Health	No (Excellent)	No (Excellent)	100.0%	100.0%	-	-
Aesthetic	No (Excellent)	No (Excellent)	99.7%	100.0%	-	-
Operational Efficiency	No (Excellent)	No (Excellent)	94.9%	97.0%	-	-
Piketberg						
Acute Health Chemical	No (Excellent)	No (Excellent)	100.0%	100.0%	-	-
Acute Health Microbiological	Yes (Unacceptable)	Yes (Unacceptable)	86.0%	93.8%	Monthly	Monthly
Chronic Health	No (Excellent)	No (Excellent)	100.0%	100.0%	-	-
Aesthetic	No (Excellent)	No (Excellent)	98.8%	97.1%	-	-
Operational Efficiency	No (Good)	Yes (Unacceptable)	90.6%	89.4%	-	Monthly
Dwarskersbos						
Acute Health Chemical	No (Excellent)	No (Excellent)	100.0%	100.0%	-	-
Acute Health Microbiological	Yes (Unacceptable)	No (Excellent)	87.5%	97.9%	Monthly	-
Chronic Health	No (Excellent)	No (Excellent)	100.0%	100.0%	-	-
Aesthetic	No (Excellent)	No (Excellent)	100.0%	100.0%	-	-
Operational Efficiency	No (Excellent)	No (Excellent)	96.2%	98.1%	-	-
Velddrif						
Acute Health Chemical	No (Excellent)	No (Excellent)	100.0%	100.0%	-	-
Acute Health Microbiological	No (Good)	No (Excellent)	96.9%	99.1%	-	-
Chronic Health	No (Excellent)	No (Excellent)	100.0%	100.0%	-	-
Aesthetic	No (Excellent)	No (Excellent)	99.8%	100.0%	-	-
Operational Efficiency	No (Excellent)	No (Excellent)	98.3%	99.1%	-	-
Aurora						
Acute Health Chemical	No (Excellent)	No (Excellent)	100.0%	100.0%	-	-
Acute Health Microbiological	No (Excellent)	No (Excellent)	98.7%	98.5%	-	-
Chronic Health	No (Excellent)	No (Excellent)	100.0%	100.0%	-	-
Aesthetic	No (Excellent)	No (Excellent)	95.6%	97.0%	-	-
Operational Efficiency	No (Excellent)	No (Excellent)	98.6%	94.7%	-	-
Eendekuil						
Acute Health Chemical	No (Excellent)	No (Excellent)	100.0%	100.0%	-	-
Acute Health Microbiological	No (Excellent)	No (Excellent)	100.0%	98.6%	-	-
Chronic Health	No (Excellent)	No (Excellent)	100.0%	100.0%	-	-
Aesthetic	No (Excellent)	No (Excellent)	99.4%	100.0%	-	-
Operational Efficiency	Yes (Unacceptable)	No (Excellent)	89.5%	95.1%	Monthly	-
Redelinghuys						
Acute Health Chemical	No (Excellent)	No (Excellent)	100.0%	100.0%	-	-

Table C.4.2.3: Percentage compliance of the water quality samples for the period July to June for the last two financial years						
Performance Indicator	Performance Indicator categorised as unacceptable Yes / No (Table 4 of SANS 241-2:2015)		% Sample Compliance according to SANS 241-2015 Limits		Frequency of Additional Monitoring due to failure (Table 3 of SANS 241-2:2015)	
	2021/2022	2020/2021	2021/2022	2020/2021	2021/2022	2020/2021
Acute Health Microbiological	No (Good)	No (Excellent)	96.2%	98.6%	-	-
Chronic Health	No (Excellent)	No (Excellent)	98.6%	100.0%	-	-
Aesthetic	No (Excellent)	No (Excellent)	99.1%	99.3%	-	-
Operational Efficiency	No (Excellent)	No (Excellent)	96.0%	98.9%	-	-

The table below gives an overview of the five categories under which the risks posed by micro-organism, physical or aesthetic property or chemical substance of potable water is normally classified:

Table C.4.2.4.: Four categories under which the risks posed by micro-organism, physical or aesthetic property or chemical substance of potable water is normally classified	
Category	Risk
Acute Health	Determinand that poses an immediate unacceptable health risk if present at concentration values exceeding the numerical limits specified in this part of SANS 241.
Aesthetic	Determinand that taints water with respect to taste, odour and colour and that does not pose an unacceptable health risk if present at concentration values exceeding the numerical limits specified in SANS 241.
Chronic Health	Determinand that poses an unacceptable health risk if ingested over an extended period if present at concentration values exceeding the numerical limits specified in SANS 241.
Operational	Determinand that is essential for assessing the efficient operation of treatment systems and risks from infrastructure

The table below gives an overview of Bergrivier Municipality's wastewater quality compliance, as taken from the DWS IRIS.

Table C.4.2.5: Overview of Wastewater Quality Compliance															
WSDP Ref #	Measurable / Enabling Factor	Unit	Year 0 FY2021/22				Year-1 FY2020/21				Year-2 FY2019/20			
			M	C	P	O	M	C	P	O	M	C	P	O
	Results per the Integrated Regulatory Information System													
n/a	Regulatory compliance	Total	60	228	263	0	56	172	243	-	37	64	126	-
n/a		Nr Failures	47	128	77	0	28	89	69	-	16	38	47	-
n/a		Compliance %	22%	44%	71%	-	50%	48%	72%	-	57%	41%	63%	-
n/a	Operational compliance	Total	Not captured on IRIS and recorded by Process Controllers at each of the WWTW											
n/a		Nr Failures												
n/a		Compliance %												
5.3.1	**Monitoring and Sample Failure**													
5.3.1.3 5.3.1.4 5.3.1.5	Average % of sample failure	Failure %	78%	56%	29%	-	50%	52%	28%	-	43%	59%	37%	-
6.3	**Water Supply and Quality**													
6.4.6	Green Drop Status	last year certified by DWS	2022 Green Drop Assessment				No Green Drop assessment w as done by DWS				No Green Drop assessment w as done by DWS			

Legend **M**: Microbiological; **C**: Chemical; **P**: Physical; **O**: Operational

The final effluent quality compliance sample results are included in Annexure D for each of the WWTWs. The overall Microbiological, Chemical and Physical compliance percentages of the final effluent samples taken over the last three financial years at the Dwarskersbos-, Eendekuil-, Piketberg-, Porterville- and Velddrif WWTW is summarised in the table below (General Limits).

Table 4.2.6: Percentage Microbiological compliance of the compliance samples taken at the various WWTWs for the last three financial years

WWTW	2021/2022 (Faecal Coliforms)	2020/2021 (Faecal Coliforms)	2019/2020 (E.Coli)
Dwarskersbos	100.0%	100.0%	100.0%
Eendekuil	100.0%	100.0%	83.3%
Piketberg	25.0%	44.4%	40.0%
Porterville	33.3%	100.0%	41.7%
Velddrif	16.7%	44.4%	41.7%
Total	**55.0%**	**77.3%**	**62.1%**

Table 4.2.7: Percentage Chemical compliance of the compliance samples taken at the various WWTWs for the last three financial years

WWTW	2021/2022					2020/2021					2019/2020				
	Ammonia	Nitrites & Nitrates	COD	Ortho Phosphate	Overall	Ammonia	Nitrites & Nitrates	COD	Ortho Phosphate	Overall	Ammonia	Nitrites & Nitrates	COD	Ortho Phosphate	Overall
Dwarskersbos	N/A	N/A	83.3%	N/A	**83.3%**	N/A	N/A	88.9%	N/A	**88.9%**	N/A	N/A	91.7%	N/A	**91.7%**
Eendekuil	N/A	N/A	83.3%	N/A	**83.3%**	N/A	N/A	100.0%	N/A	**100.0%**	N/A	N/A	58.3%	N/A	**58.3%**
Piketberg	50.0%	100.0%	66.7%	83.3%	**75.0%**	22.2%	100.0%	100.0%	88.9%	**77.8%**	20.0%	100.0%	100.0%	-	**73.3%**
Porterville	66.7%	83.3%	91.7%	75.0%	**79.2%**	50.0%	100.0%	100.0%	75.0%	**81.3%**	58.3%	83.3%	83.3%	-	**75.0%**
Velddrif	0.0%	91.7%	0.0%	25.0%	**29.2%**	11.1%	100.0%	66.7%	44.4%	**55.6%**	33.3%	100.0%	58.3%	-	**63.9%**
Total	**38.9%**	**91.7%**	**65.0%**	**61.1%**	**64.3%**	**26.9%**	**100.0%**	**90.9%**	**69.2%**	**74.6%**	**38.2%**	**94.1%**	**77.6%**	**-**	**71.4%**

Table 4.2.8: Percentage Physical compliance of the compliance samples taken at the various WWTWs for the last three financial years

WWTW	2021/2022				2020/2021				2020/2021			
	pH	Electrical Conductivity	Total Suspended Solids	Overall	pH	Electrical Conductivity	Total Suspended Solids	Overall	pH	Electrical Conductivity	Total Suspended Solids	Overall
Dwarskersbos	58.3%	0.0%	N/A	**29.2%**	66.7%	0.0%	N/A	**33.3%**	41.7%	0.0%	N/A	**20.8%**
Eendekuil	100.0%	100.0%	N/A	**100.0%**	100.0%	100.0%	N/A	**100.0%**	100.0%	100.0%	N/A	**100.0%**
Piketberg	100.0%	75.0%	83.3%	**86.1%**	100.0%	88.9%	88.9%	**92.6%**	100.0%	50.0%	100.0%	**83.3%**
Porterville	100.0%	100.0%	75.0%	**91.7%**	100.0%	100.0%	75.0%	**91.7%**	100.0%	100.0%	66.7%	**88.9%**
Velddrif	100.0%	25.0%	16.7%	**47.2%**	100.0%	44.4%	66.7%	**70.4%**	100.0%	50.0%	100.0%	**83.3%**
Total	**91.7%**	**60.0%**	**58.3%**	**71.8%**	**93.2%**	**65.9%**	**76.9%**	**78.9%**	**87.9%**	**60.3%**	**88.2%**	**77.3%**

The recommendations from the detail WWTW Process Audits (July 2020 - June 2021), as completed during the 2021/2022 financial year, are summarised in the table below.

Table C.4.2.9: Recommendations from the detail WWTW Process Audits

WWTW	Recommendation
Dwarskersbos	• Repair flow meter as a matter of urgency. • Recirculation of the final pond to the inlet of the first pond could improve plant performance further. • Investigate the origin of the influent containing high Conductivities. • Lime should be used to cover each layer of screenings in the trench in order to prevent unpleasant odours and fly-breeding. • Remove screenings daily. • Screenings should be kept in a bin to dry prior to burial.

Table C.4.2.9: Recommendations from the detail WWTW Process Audits	
WWTW	**Recommendation**

	• Cover the grit in the trench with a layer of lime.
	• Grit should be removed regularly.
	• Investigate the flooding of the grit channels and possible blockages in the line between the inlet and pond.
	• Install an inflow and outflow meter.
	• Flow meter readings should be recorded daily once the meter has been installed.
	• Investigate blockages in line to pond.
	• Clean out excess sludge to create more free capacity in this pond.
	• Clean inlet and outlet weirs regularly and ensure they are free from debris and dead birds.
	• Implement additional disinfection such as HTH tablets to ensure complete disinfection.
	• The flow at Dwarskersbos WWTW is below 500 m^3/d. The effluent should therefore comply with "Irrigation Limits up to 500 m^3/d". Confirm the compliance limits with DWS as the General Limit is too stringent for oxidation pond systems.
	• Register the Process Controller with DWS.
	• Distribute Safety Meeting minutes to staff.
	• Record-keeping is required. All incidents should be recorded.
	• Register staff with DWS.
	• The plant should be visited daily in order to clean screens and detritus channels.
	• A Class I Process Controller should be available.
	• Signs at the gate should be erected indicating Municipality Name, "No Swimming", etc.
	• A First Aid kit should be available on site.
	• The plastic liner is extremely slippery when wet. Install life buoys on the banks of the ponds (at least two per pond).
	• Workers must work in pairs, in case of accidents.
	  ➢ Implement a Visitors Log book.
	  ➢ Implement applicable signage at life buoys, once the latter has been implemented.
	  ➢ The gates should be locked at all times to ensure no unauthorized entry.

Eendekuil	• The performance of the system could be further improved by recirculating final pond effluent to the inlet of the first (facultative) pond at a rate of 3-5 l/sec. • Investigate the origin of the raw sewage with high influent Conductivity. • The flow meter should be calibrated and a Calibration Certificate should be kept on site. • An outflow meter should be installed. This is a requirement by DWS. • The loading rates on the ponds should be determined. • The flow at Eendekuil WWTW is below 500 m^3/d. The effluent should therefore comply with "Irrigation Limits up to 500 m^3/d". Confirm the compliance limits with DWS as the General Limit is too stringent for oxidation pond systems. • Ensure that the correct testing parameter templates are updated on the GDS to ensure that compliance percentages are correct. • Record all quantities of screenings being removed. • A Class I Process Controller and a Class V Superintendent should be available. • A First Aid kit should be available on site and kept in the newly constructed office. • Implement signboard indicating: No Swimming and No Eating • Maintain present mode of operation.
Piketberg	• Keep Calibration Certificates on site of WWTW. • Repair outflow meter. • Calibrate outflow meter once installed. • Install new outflow meter. • Record outflow meter readings daily as well once meter has been installed. • Investigate the origin of the raw sewage with high Conductivities. • After every screenings disposal, a layer of lime should be evenly spread on top of the screenings to prevent fly-breeding and odour development. • It is highly recommended that the following parameters be tested monthly to ensure proper evaluation of the bioreactors' performance: pH, COD (filtered and unfiltered), Ammonia Nitrogen, Volatile Suspended Solids, Diluted Sludge Volume Index and Dissolved Oxygen. • Increase ATML recycle to anoxic zone to assist with denitrification when necessary. • Excess sludge should be wasted regularly in order to control the MLSS concentration in the range 4000-6000 mg TSS/l. • The Process Controller should monitor the sludge settleability daily and maintain the recommended volumetric mixed liquor suspended solids concentration. • To successfully maintain a viable biological population and to maintain the proper concentration of solids, the system requires continuous observation and monitoring by the Process Controller.

Table C.4.2.9: Recommendations from the detail WWTW Process Audits	
WWTW	**Recommendation**
	• Include monthly Volatile Suspended Solids testing on bioreactor samples. • Clarifiers should be sampled for monthly analysis to evaluate the performance of these units. • Sampling and analysis of RAS samples should be performed monthly and evaluate the sludge return rate and make adjustments as necessary. • Ensure 0.25 mg/l Free Chlorine in the final effluent at all times to ensure adequate disinfection. • Clear weeds and reeds around contact tank area. • Consider the installation of pepper spray alarms to discourage criminal activity. • Dissolved Oxygen meter should be available for monitoring of oxygen levels in the aeration basins. • Ensure that a Class V is available to oversee operations per shift. • A First Aid kit with a contents register should be kept on site. • Eye wash shower should be installed at the chlorine room. • Staff should attend chlorine handling training. • Fire extinguisher should be available on site and should be serviced annually. • Replace safety gear once chlorine room has been refurbished. • Introduce a so-called “buddy-buddy” system to ensure staff work in pairs in case of an emergency/accident. • Clean the area around the chlorine contact tanks and maturation river.
Porterville	• Calibration Certificates or copies thereof should be kept on site. • Investigate the ingress of industrial effluent into the wastewater treatment works. • Calculate daily flows. • Investigate the difference recorded between inlet and outlet flows. • It is highly recommended that the following parameters to be tested monthly to ensure proper evaluation of the bioreactors’ performance: pH, COD (filtered and unfiltered), Ammonia Nitrogen, Volatile Suspended Solids, Diluted Sludge Volume Index, Dissolved Oxygen, Nitrate/Nitrite Nitrogen. • Excess sludge should be wasted regularly in order to control the MLSS concentration in the range 4000-6000 mg TSS/l. • The Process Controller should monitor the sludge settleability daily and maintain a constant mixed liquor suspended solids concentration. • To successfully maintain a viable biological population and to maintain the proper concentration of solids, the system requires continuous observation and monitoring by the Process Controller. • Include monthly Volatile Suspended Solids testing on bioreactor samples. • Clarifiers should be sampled for monthly analysis to evaluate the performance of these units. • Sampling and analysis of RAS samples should be performed monthly and evaluate the sludge return rate and make adjustments as necessary. • Records should be kept of the quantity of sludge wasted. • Lagoons should be cleaned. • Remove the weeds from the ponds. • Ensure 0.25 mg/l Free Chlorine in the final effluent at all times. • Regularly clean out the chlorine contact tank to ensure there are no solids in the tank. • No Plant Operation book available. An Operation Manual should be available for Process Controllers. • Process Controllers should be registered with DWS and certificates should be displayed at the WWTW. • Calibrate the inline pH meter to ensure accurate readings. • Fit an inline pH meter at the new bioreactor. • Register staff as Process Controllers with DWS. • A Class V Supervisor should oversee operations. • Send staff on short courses, when available. • On-the-job training should continue.
Velddrif	• Investigate the origin of the high influent Conductivity. • Chemical dosing of Ferric Chloride should be considered to reduce levels of Phosphorus. • Repair the mechanical screen. • Repair degritters. • The flow meter should be replaced. Flow meters must be calibrated annually. • An outflow meter should be installed. This is a requirement by DWS. • Inflow and outflow meter readings should be recorded daily once meters are installed. • The pump should be replaced as a matter of urgency. • Consider testing more parameters of this unit. This will help evaluate the performance of this unit. • Excess sludge should be wasted regularly in order to control the MLSS concentration in the range 4000-6000 mg TSS/l.

Table C.4.2.9: Recommendations from the detail WWTW Process Audits	
WWTW	**Recommendation**
	• The Process Controller should monitor the sludge settleability daily and maintain a constant mixed liquor suspended solids concentration. • Include Volatile Suspended Solids testing monthly. • The valve at the division box should be replaced as a matter of urgency. • Repair the scraper. • Adequate sludge return rates should be maintained. • Monitoring the thickness of the RAS is highly recommended. • The amount of sludge wasted should be recorded. • Clean the vegetation in and around the sludge beds. • Ensure 0.25 mg/l Free Chlorine in the final effluent at all times to ensure satisfactory disinfection. • Repair the leak detector alarm. • Repair chlorine dosing pump. • Refurbish chlorine room. • Replace the breathing apparatus set. • More taps should be installed. • Replace doors and security gates at chlorine room. • Water supply to shower should be implemented. • Replace stolen pH meter to facilitate pH measurements on Raw Sewage, Aeration Tank, Settling Tank and Final Effluent daily. • Record Dissolved Oxygen readings daily. • Chlorine residuals should be monitored daily. • Implement new daily record sheets. • Register staff as Process Controllers with DWS. • A Class III Process Controller should be available at each shift. • Appoint additional staff members. • Fire extinguisher should be available on site. • First Aid kit with contents register should be available on site. • Implement an emergency eye wash. • Connect water to the shower. • Hand-soap should be provided for hygiene purposes. • The fence should be repaired and access to the site should be controlled.

C.4.3. Incident Management

Bergrivier Municipality's Maintenance Team mainly performs their own repair and preventative maintenance work to the equipment and infrastructure of the Municipality, except when specialised repair work is required, in which case the work is sub-contracted to approved sub-contractors on the municipal database.

Water Safety Plans for the various distribution systems are in place. W_2RAPs for the various WWTWs are also in place. The W_2RAP is an all-inclusive risk analysis tool by which risks associated with the management of collection, treatment and disposal of wastewater, are identified and rated (quantified). The identified risks can then be managed according to its potential impacts on the receiving environment / community / resource.

The Water Safety Plan and W_2RAP Teams of Bergrivier Municipality are committed to meet regularly to review the implementation of all the aspects of the Water Safety Plan and W_2RAP to ensure that they are still accurate and to determine whether the field assessments need updates or modifications and whether the Incident Response Management Protocol is still adequate. In addition to the regular three-year review, the Water Safety Plan and W_2RAP will also be reviewed when, for example, a new water source is developed, major treatment improvements are planned and brought into use, or after a major incident.

An Incident Response Management Protocol is in place and forms part of Bergrivier Municipality's Water Safety Plan and W_2RAP. The Incident Response Management Protocol entails that certain reactive procedures are followed when an incident occurs, such as when a malfunction of the treatment processes occurs due to power failures, faulty equipment, adverse weather conditions or human error.

Table C.4.3.1: Incident Management and Reporting Overview					
WSDP Ref #	Measurable / Enabling Factor	Unit	Year 0 FY2021/22	Year - 1 FY2020/21	Year - 2 FY2019/20
6.3	**Water Supply and Quality**				
6.3.1	Incident Management Protocol in place	yes/total schemes in %	Yes / 100%	Yes / 100%	Yes / 100%
6.3.5	Failure Response Management in place	yes/total schemes in %	Yes / 100%	Yes / 100%	Yes / 100%
6.4	**Waste Water Supply and Quality**				
6.4.1	Incident Management Protocol in place	yes/total schemes in %	Yes / 100%	Yes / 100%	Yes / 100%
6.4.5	Failure Response Management in place	yes/total schemes in %	Yes / 100%	Yes / 100%	Yes / 100%

Table C.4.3.2: Water Quality Incident Reporting Compliance (Health Oriented)										
Measurable / Enabling Factor	Unit	Year 0 FY2021/22			Year-1 FY2020/21			Year-2 FY2019/20		
		Acute Health Micriobiological	Acute Health Chemical	Chronic Health	Acute Health Micriobiological	Acute Health Chemical	Chronic Health	Acute Health Micriobiological	Acute Health Chemical	Chronic Health
Failures in terms of Analysis	Total nr	668	53	625	533	36	522	657	35	606
	Nr of failures	34	0	1	11	0	0	1	0	6
	Failure %	5.1%	0.0%	0.2%	2.1%	0.0%	0.0%	0.2%	0.0%	1.0%
	Nr reported	34	0	1	11	0	0	1	0	6
	Reported % of failure	100%	100%	100%	100%	100%	100%	100%	100%	100%
Failures in terms of Samples	Total	668	53	625	533	36	522	657	35	606
	Nr of failures	34	0	1	11	0	0	1	0	6
	Failure %	5.1%	0.0%	0.2%	2.1%	0.0%	0.0%	0.2%	0.0%	1.0%
	Nr reported	34	0	1	11	0	0	1	0	6
	Reported % of failure	100%	100%	100%	100%	100%	100%	100%	100%	100%
Failures in terms of Sites	Total	668	53	625	533	36	522	657	35	606
	Nr of failures	34	0	1	11	0	0	1	0	6
	Failure %	5.1%	0.0%	0.2%	2.1%	0.0%	0.0%	0.2%	0.0%	1.0%
	Nr reported	34	0	1	11	0	0	1	0	6
	Reported % of failure	100%	100%	100%	100%	100%	100%	100%	100%	100%

C.5. Water Conservation and Water Demand Management

The table below gives an overview of the WC/WDM activities implemented by Bergrivier Municipality.

Table C.5.1: Overview of WC/WDM Activities

WSDP Ref. #	Regulations Ref. #	Description	Urban Settlements						Rural Settlements					
			Year 0		Year - 1		Year - 2		Year 0		Year - 1		Year - 2	
			2021/22		2020/21		2019/20		2021/22		2020/21		2019/20	
7.1.1	10.2.g.iii	**REDUCING UNACCOUNTED FOR WATER AND WATER INEFFICIENCIES**												
		Number of customers where the following activities have been pursued:	Nr	% of total	Nr	% of total	Nr	% of total	Nr	% of total	Nr	% of total	Nr	% of total
7.1.1.1		Night flow metering	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
7.1.1.2		Day flow metering	9 783	100%	9 562	100%	9 340	100%	0	0%	0	0%	0	0%
7.1.1.3		Reticulation leaks fixed	63	100%	132	100%	117	100%	0	0%	0	0%	0	0%
7.1.1.4		Illegal connections formalized	0	0%	0	100%	0	100%	0	0%	0	0%	0	0%
7.1.1.5		Un-metered connections, metered	0	0%	0	100%	0	100%	0	0%	0	0%	0	0%
7.1.2	10.2.g.iii	**REDUCING HIGH PRESSURES FOR RESIDENTIAL CONSUMERS**												
		Number of residential consumers with water supply pressure of:	Nr	% of total	Nr	% of total	Nr	% of total	Nr	% of total	Nr	% of total	Nr	% of total
7.1.2.1		< 300 kPa	5 625	57.5%	5 498	57.5%	5 371	57.5%	0	0%	0	0%	0	0%
7.1.2.2		300 kPa - 600 kPa	1 233	12.6%	1 205	12.6%	1 177	12.6%	0	0%	0	0%	0	0%
7.1.2.3		600 kPa - 900 kPa	2 485	25.4%	2 429	25.4%	2 372	25.4%	0	0%	0	0%	0	0%
7.1.2.4	10.2.b.iii	> 900 kPa	440	4.5%	430	4.5%	420	4.5%	0	0%	0	0%	0	0%
7.1.3	10.2.g.iii	**LEAK AND METER REPAIR PROGRAMMES**												
		Number of consumer units targeted by:	Nr	% of total	Nr	% of total	Nr	% of total	Nr	% of total	Nr	% of total	Nr	% of total
7.1.3.1		Leak repair assistance programme	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
7.1.3.2	10.2.g.iv	Retro-fitting of water inefficient toilets	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
7.1.3.3		Meter repair programme	689	7%	413	4%	241	3%	0	0%	0	0%	0	0%
7.1.4	10.2.g.iii	**CONSUMER / END-USE DEMAND MANAGEMENT: PUBLIC INFO AND EDUCATION PROGRAMMES**												
			Nr	% of total	Nr	% of total	Nr	% of total	Nr	% of total	Nr	% of total	Nr	% of total
7.1.4.1		Number of schools targeted by education programmes	10	50%	10	50%	10	50%	0	0%	0	0%	0	0%
7.1.4.2		Number of consumers (people) targeted by public information programmes	9 783	100%	9 562	100%	9 340	100%	0	0%	0	0%	0	0%

Quantity of water unaccounted for (Ml/year):

A new WC/WDM Strategy was drafted for Bergrivier Municipality during the 2020/2021 financial year. The implementation of the WC/WDM measures by Bergrivier Municipality were extremely successful, especially over the drought period. The average annual growth percentage in total raw water requirements for Bergrivier Municipality over the period 2010/2011 to 2021/2022 was -0.80 %/a. The table below gives a summary of the treatment losses, bulk distribution losses, NRW, water losses and ILIs for the various distribution systems in Bergrivier Municipality's Management Area.

Table C.5.2: Treatment Losses, NRW, Water Losses and ILIs for the various water distribution systems

Description	Component	Unit	21/22	Record : Prior (Ml/a)				
				20/21	19/20	18/19	17/18	16/17
Porterville	Treatment Losses	Volume	35.989	45.681	45.414	80.321	Unknown	Unknown
		Percentage	7.8%	9.8%	9.8%	17.0%	Unknown	Unknown
	NRW	Volume	53.095	61.015	45.158	78.733	18.704	97.301
		Percentage	12.4%	14.5%	10.8%	20.0%	5.3%	19.5%
	Water Losses	Volume	52.239	60.171	44.323	77.947	18.000	96.305
		Percentage	12.2%	14.3%	10.6%	19.8%	5.1%	19.3%
	ILI		**1.46**	**1.70**	**1.14**		**0.47**	**2.50**
	The current Treatment Losses of less than 10% is good. The NRW and Water Losses were reduced during the last financial year. The current NRW and Water Losses percentages of less than 15% are good and these levels should be maintained. The current ILI value is also excellent.							
Piketberg	Treatment Losses	Volume	54.926	60.076	49.042	40.069	104.210	136.169
		Percentage	7.50%	7.50%	7.50%	7.50%	19.17%	16.25%
	Bulk Distribution Losses	Volume	13.150	36.990	11.680	0.070	11.850	1.259
		Percentage	1.9%	5.0%	1.9%	0.0%	2.7%	0.2%
	NRW	Volume	95.732	150.126	116.729	113.793	50.231	93.754
		Percentage	13.8%	20.9%	17.9%	18.8%	9.5%	11.3%
	Water Losses	Volume	94.344	148.687	115.426	112.583	49.171	92.102
		Percentage	13.6%	20.7%	17.7%	18.6%	9.3%	11.1%
	ILI		**1.36**	**2.17**	**1.46**		**0.63**	**1.17**
	The current treatment losses are an estimate and the Municipality need to ensure that the raw water readings before the treatment plant is recorded. The historical bulk distribution losses of less than 5% is good and needs to be maintained at these levels. The NRW and Water Losses were reduced during the last financial year. The current NRW and Water Losses percentages of less than 15% are good and these levels should be maintained. The current ILI value is also excellent.							
Velddrif	NRW	Volume	134.744	82.662	126.550	16.774	5.184	44.615
		Percentage	14.1%	10.3%	15.6%	2.7%	0.8%	4.5%
	Water Losses	Volume	132.837	81.062	124.927	15.552	3.914	42.619
		Percentage	13.9%	10.1%	15.4%	2.5%	0.6%	4.3%
	ILI		**3.54**	**2.20**	**2.47**		**0.08**	**0.90**
	The NRW and Water Losses increased during the last financial year. The current NRW and Water Losses of less than 15% are however still good. The Municipality needs to keep the NRW and Water Losses percentages below 15%. The current ILI value is good and no urgent action is required, but the NRW and Water Losses should however be monitored carefully.							
Dwarskersbos	NRW	Volume	25.600	24.669	16.821	18.490	5.928	0.172
		Percentage	21.8%	23.4%	19.5%	25.3%	10.0%	0.2%
	Water Losses	Volume	25.365	24.458	16.649	18.344	5.809	-0.018
		Percentage	21.6%	23.2%	19.3%	25.1%	9.8%	0.0%
	ILI		**4.60**	**4.71**	**3.04**		**1.15**	**0.00**
	The NRW and Water Losses were reduced during the last financial year. The current percentages of less than 25% are still acceptable, but the Municipality needs to work towards percentages of less than 20% for the NRW and Water Losses. The ILI of above 4 however indicates a poor ILI level, which requires attention and the Municipality needs to work towards an ILI of between 2 and 4.							
Aurora	Treatment Losses	Volume	3.660	4.117	7.879	7.686	3.476	8.261
		Percentage	8.0%	9.4%	18.3%	19.8%	11.1%	13.9%
	NRW	Volume	9.260	9.862	3.957	4.485	4.408	10.345

Table C.5.2: Treatment Losses, NRW, Water Losses and ILIs for the various water distribution systems								
Description	**Component**	**Unit**	**21/22**	**Record : Prior (Ml/a)**				
				20/21	**19/20**	**18/19**	**17/18**	**16/17**
		Percentage	21.9%	24.9%	11.2%	14.4%	15.8%	20.2%
	Water Losses	Volume	9.175	9.783	3.887	4.423	4.352	10.243
		Percentage	21.7%	24.7%	11.0%	14.2%	15.6%	20.0%
	ILI		**1.02**	**1.05**	**0.38**		**0.44**	**1.03**
	The NRW and Water Losses were reduced during the last financial year. The current percentages of less than 25% are still acceptable, but the Municipality needs to work towards percentages of less than 20% for the NRW and Water Losses. The ILI of 1.02 however indicates an excellent system and the Municipality need to keep the ILI levels between 1 and 2.							
Eendekuil	Treatment Losses	Volume	-18.150	-21.164	-10.423	-2.190	-16.429	-7.754
		Percentage	-28.8%	-38.8%	-16.4%	-3.8%	-30.0%	-8.9%
	NRW	Volume	27.856	22.580	22.195	13.674	22.223	27.450
		Percentage	34.3%	29.8%	30.0%	22.6%	31.2%	28.8%
	Water Losses	Volume	27.694	22.428	22.047	13.553	22.081	27.260
		Percentage	34.1%	29.6%	29.8%	22.4%	31.0%	28.6%
	ILI		**5.07**	**4.16**	**3.96**		**4.05**	**4.96**
	The NRW and Water Losses further increased during the last financial year and were high for the last three financial years. The raw water meter at the WTW register less than the two potable water meters after the WTW. The raw water meter needs to be calibrated to accurately calculate the treatment losses. It also suggested that a bulk raw water meter be installed at the source to determine the bulk distribution losses. The current NRW and Water Losses of roughly 30% for the last three financial years are high and needs to be reduced to levels below 25%. The ILI of above 4 also indicates a poor ILI level, which requires attention and the Municipality needs to work towards an ILI of between 2 and 4.							
Redelinghuys	Treatment Losses	Volume	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
		Percentage	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
	Bulk Distribution Losses	Volume	9.565	9.379	10.534	3.959	1.243	3.209
		Percentage	16.4%	16.6%	21.9%	10.5%	3.5%	6.5%
	NRW	Volume	17.465	13.573	11.352	9.626	6.992	7.850
		Percentage	35.8%	28.7%	30.2%	28.5%	20.5%	17.1%
	Water Losses	Volume	17.368	13.479	11.277	9.558	6.924	7.758
		Percentage	35.6%	28.5%	30.0%	28.3%	20.3%	16.9%
	ILI		**6.18**	**4.93**	**4.29**		**3.16**	**4.25**
	The bulk distribution losses of above 15% for the last three financial years between the WTW (System Input Volume) and the outlet of the reservoir is high and needs to be investigated. A bulk raw water meter was installed at the source in order to determine the bulk distribution losses and the treatment losses in the future. The current NRW and Water Losses of 35% are high and needs to be reduced to levels below 25%. The ILI of above 4 also indicates a poor ILI, which requires attention level and the Municipality needs to work towards an ILI of between 2 and 4.							
Total	**NRW**	**Volume**	**363.752**	**364.487**	**342.762**	**255.575**	**113.670**	**281.487**
		Percentage	**15.38%**	**16.5%**	**16.2%**	**14.1%**	**6.7%**	**10.8%**
	Water Losses	**Volume**	**359.022**	**360.068**	**338.536**	**251.960**	**110.251**	**276.269**
		Percentage	**15.18%**	**16.3%**	**16.0%**	**13.9%**	**6.5%**	**10.6%**
	ILI		**2.11**	**2.15**	**2.06**		**0.53**	**1.34**
	The overall NRW and Water Losses were reduced during the last financial year. The percentages of just above 15% are excellent and the Municipality needs to work towards a target percentage of 15% for the NRW. The current ILI value of 2.11 for the systems combined is good.							

Note: Infrastructure Leakage Index (ILI) for Developed Countries = **1 – 2 Excellent (Category A)**, **2 – 4 Good (Category B)**, **4 – 8 Poor (Category C)** and > **8 – Very Bad (Category D)**

Category A = No specific intervention required.

Category B = No urgent action required although should be monitored carefully.

Category C = Requires attention

Category D = Requires immediate water loss reduction interventions

The Infrastructure Leakage Index (ILI) is also included in the previous table, which is the most recent and preferred performance indicator for comparing leakage from one system to another. It is a non-dimensional index representing the ratio of the current real leakage and the "Unavoidable Annual Real Losses". A high ILI value indicates a poor performance with large potential for improvement while a small ILI value indicates a well-managed system with less scope for improvement. The parameters used to calculate the ILIs for the various distribution systems are included in the Models in Annexure B. Attaining an ILI = 1 is a theoretical limit which is the minimum water loss in an operational water reticulation system. A value of less than 1 should not occur since this implies that the actual leakage is less than the theoretical minimum level of leakage.

The table below gives an overview of the System Input Volume, Average Billed Metered Consumption and Non-Revenue Water in litre per connection per day for the various water distribution systems for the 2021/2022 financial year.

Table C.5.3: System input volume, average billed metered consumption and non-revenue water in litre per connection per day for the various water distribution systems for 2021/2022.

Water Balance Component	Porterville	Piketberg	Velddrif	Dwarskers-bos	Aurora	Eendekuil	Redelinghuys
System Input Volume	685	735	643	535	469	641	588
Average Billed Metered Cons.	600	634	552	418	366	421	377
Non-Revenue Water	85	101	91	117	103	220	211

Piketberg is the town with the highest system input volume and average billed metered consumption per connection per day, because it is main town of Bergrivier Municipality and the town with the biggest commercial centre. Eendekuil is the town with the highest non-revenue water per connection per day.

Number of consumers connected to a water reticulation system where pressures rise above 900 kPa at the consumer connection are as follows:

A large section of the water network in the Municipal area consists of ageing Asbestos Cement (AC) pipes, which is a significant contributing factor in causing leaking and bursting of water pipes. Approximately 60% of Redelinghuys, 55% of Porterville, 71% of Eendekuil and 50% of Dwarskersbos water network consist of AC pipes. The Municipality is replacing these pipes with uPVC pipes on an ongoing basis subject to the availability of funds (Implementation of Pipeline Replacement Programme).

The table below indicate the potential savings on bulk water supply for each town within the Bergrivier Management Area, through the implementation of pressure management. The towns that should consider pressure management as a measure of water demand management (where the % potential saving > 3% of the total water demand), as identified in the Bergrivier Municipality WDM Strategy developed by CES, are also indicated in the table below.

Table C.5.4: Potential savings on bulk water supply through the implementation of pressure management and the existing average operating pressures, static pressures and residual pressures in the various towns

Town (Average Operating Pressure)	WDM Strategy Febr. 2008		Water Master Plan June 2015	
	Saving Potential (Ml/year)	Pressure Management Priority	Static Pressures	Residual Pressure
Porterville (48m)	13.520 (3%)	Low	No areas where pressures exceed 90m.	Within the 24m – 90m criteria for the complete town.
Piketberg (63m)	33.572 (6%)	Medium	Large area where the pressure exceed 90m. 1) Most of the region east of Lang Street, excluding the three areas with PRVs. 2) The lower end of the pumped supply zone on the western edge of Buitengracht Street.	Pressure higher than 90m: 1) Industrial area east of the N7 near Piketco. 2) Triangular area at the intersection of Ou Hoof- and Die Trek streets on the west side of the N7, only lower end of Hoop Street. 3) The northern part of the fountain supply pipe, Waterkant Street, no user connections on this pipe. Pressure lower than 24m:

Table C.5.4: Potential savings on bulk water supply through the implementation of pressure management and the existing average operating pressures, static pressures and residual pressures in the various towns				
Town (Average Operating Pressure)	WDM Strategy Febr. 2008		Water Master Plan June 2015	
	Saving Potential (Ml/year)	Pressure Management Priority	Static Pressures	Residual Pressure
				1) Supply to the school along upper Kloof Street, a large user. 2) Supply to the sports ground east of Lang Street, an un-metered connection. 3) At the intersection between Buitengracht street and Tilla lane, close to 24m.
Wittewater (51m)	-	-	No areas where pressures exceed 90m. Static pressure below 24m occurs on the northern edge of the west bank side (reaching 13m) and the eastern road on the east bank (18m).	Residual pressures follow the same pattern with the northern edge of the west bank side (reaching 12m) and the eastern road on the east bank (17m)
Goedverwacht (48m)	-	-	No areas where pressures exceed 90m.	Well within the design limits.
Velddrif (26m)	50.244 (6%)	Medium	No areas where pressures exceed 90m.	Pressure lower than 24m at the following areas: 1) Laaiplek / Harbour area reaching a lowest pressure of 17.5m at River Street. 2) The network upgrading since the 2005 water master plan relieved the previous low pressure experienced in Port Owen area.
Dwarskersbos (19m)	-	-	No areas where pressures exceed 90m. Static pressure below 24m occurs for the complete Dwarskersbos. If the booster pump is directed to the network instead of the water tower alone, static pressure can go as high as 36m over the entire network.	Below the design criteria level for the complete town. The pressure drops to 22m at the northern edge of town in the new Kersbos development, which is the furthest from the pressure tower.
Aurora (55m)	4.282 (10%)	High	No areas where pressures exceed 90m.	Below the design criteria level at the north-eastern corner. The pressure drops to 10m.
Eendekuil (32m)	0 (0%)	Low	No areas where pressures exceed 90m.	Below the design criteria level for most of the southern and eastern higher lying areas. The pressure drop to 7.5m at the eastern edge of town.
Redelinghuys (5m without booster)	6.351 (11%)	High	No areas where pressures exceed 90m.	Below 24m in almost 60% of the town. The lowest pressure (16.5m) occurs at the southern corner of the town. Even the topographically lowest north-western corner of town has a residual pressure of 23.5m indicating that friction losses are the main concern.

The updated Water Master Plans will be consulted in conjunction with the WC/WDM Strategy to identify further areas where pressure reduction can be implemented. The table below gives an overview of the length of water pipelines and the average head for the different water distribution zones (Water Master Plan 2015).

Table C.5.5: Length and average head of water pipelines			
Town	Zone	Length (km)	Average Head
Bulk			
Piketberg	Voëlvlei Fountain	8.764	65.34
	Piketberg Upper Reservoir	0.467	17.88
	Total	**9.231**	**62.94**
Velddrif	Velddrif Reservoir	0.087	3.22
	Total	**0.087**	**3.22**
Dwarskersbos	Dwarskersbos Tower	0.110	18.65

Table C.5.5: Length and average head of water pipelines			
Town	**Zone**	**Length (km)**	**Average Head**
	Total	**0.110**	**18.65**
Reticulation			
Porterville	Monte Bertha Booster	9.589	53.73
	Monte Bertha Reservoir	0.153	8.01
	Porterville PRV	24.104	41.29
	Porterville Reservoir	1.398	19.16
	Total	**35.244**	**43.65**
Piketberg	Bergrivier Bulk Supply	7.499	46.86
	Voëlvlei Fountain	2.864	45.39
	Piketberg Upper Booster	0.416	39.55
	Piketberg Upper Reservoir	7.467	51.31
	Piketberg BPT PRV 1	3.943	41.84
	Piketberg Upper PRV 3	3.690	63.80
	Piketberg Industrial PRV	2.781	49.63
	Piketberg Lower PRV 1	11.207	52.04
	Piketberg BPT	14.905	67.74
	Piketberg Upper PRV 2	0.622	55.51
	Piketberg Upper PRV 1	0.180	51.63
	Piketberg Lower Reservoir	3.425	53.36
	Piketberg Lower PRV 3	0.015	64.68
	Piketberg Lower PRV 2	5.058	45.68
	Total	**64.072**	**54.17**
Velddrif	Velddrif Booster	87.226	18.54
	Total	**87.226**	**18.54**
Dwarskerbos	Dwarskersbos Tower	15.479	17.25
	Total	**15.479**	**17.25**
Aurora	Aurora Reservoir	12.914	49.85
	Total	**12.914**	**49.85**
Eendekuil	Eendekuil Reservoir	7.177	-5.07
	Total	**7.177**	**-5.07**
Redelinghuys	Redelinghuys booster	8.430	70.46
	Redelinghuys reservoir	0.038	2.14
	Total	**8.468**	**70.15**

Two new PRVs were installed in Piketberg during the 2021/2022 financial year and an additional three new PRVs will be installed in Piketberg during the 2022/2023 financial year.

Demand management activities undertaken:

Bergrivier Municipality tries to keep their water losses below 15%. Bergrivier Municipality has no dedicated funding for WC/WDM measures, but most of the current WC/WDM measures are done through the Municipality's O&M budget. PRVs are in place in Porterville and Piketberg to reduce pressures within the various networks and all water pump stations are provided with standby pumps. Internal plumbing leaks are also repaired at low-income households on an ad-hoc basis.

Bergrivier Municipality implements the following WC/WDM measures to keep the NRW and water losses as low as possible.

- Reduce number of estimates for billed metered consumption or try to never estimate values (Monthly reading of all consumer water meters);

- Budget to replace old asbestos pipelines (Plot areas with the highest number of pipe bursts and use IMQS (database system) to identify specific areas). Continue with the implementation of the pipeline replacement programme.

- Continue with the implementation of pressure management measures (PRVs, Pressure management systems/Taps, etc.)
- Water meter audit – To determine which meters need to be replaced first, as well as determining the age and the accuracy of the meters.
- The use of telemetry systems and the correct installation of telemetry systems at strategic places (Data collection / monitoring, improved metering system and control, accurate flow monitoring, early warning system).
- Replacement of bulk, industrial and residential water meters on a regular basis. Replacement of faulty and old water meters and meters that became redundant (Implementation of Meter Management and Replacement Programme);
- Ensure all Municipal buildings are metered, as well as public open public spaces (If not known, determine and budget / install).
- Monthly reporting of WC/WDM measures.
- The logical identification of zones and the installation of bulk and residential water meters for monitoring, specific in problematic areas.
- Raise public awareness on WC/WDM measures (Pamphlets, Schools, Notice signs that indicate savings / losses.
- Try continuously to improve timelines for the calculation of losses (administrative losses).
- Install data loggers to determine MNFs in order to identify areas with high water losses.

DWS's scorecard for assessing the potential for WC/WDM efforts, as completed for Bergrivier Municipality, is included in Annexure A. The aim of the scorecard was to establish areas where the municipality has made good progress in relation to WC/WDM and where there is still room for improvement. It can be seen from the Scorecard that there are 25 questions each of which carries a maximum of 4 points providing a possible maximum score of 100. If the Municipality has the specific item completely under control, it receives the maximum points and if it is neglecting the item completely it receives no points. There are various levels between the maximum and the minimum number of points assigned to the municipality for each item depending on the level of completeness or lack thereof. **The status quo score for Bergrivier Municipality is 73 out of 100 suggesting that the Municipality is making good progress with regard to the implementation of specific WC/WDM activities.**

Bergrivier Municipality's Water Conservation and Demand Management Plan (2020/2021) includes the following objectives and strategies.

Table C.5.6: Bergrivier Municipality's Water Conservation and Demand Management Plan: Objectives and Strategies

No	Objective	Strategy
A.1	Reduce and maintain low levels of water losses through the reticulation system.	Pressure reduction
		Establishment of reticulation leak detection teams.
A.2	Reduce and maintain low levels of non-revenue demand by consumers.	Water demand management in low-income areas.
		Implementation of debt management policy.
A.3	Adopt and implement proactive O&M measures.	Rehabilitation of the network system.
		Preventative maintenance of the system.
		Passive leakage control.
		Develop a uniform O&M policy.
A.4	Reduce and maintain low levels of billing and metering losses.	Data validation.
		Meter management and replacement program.
		Resolving billing exception reports.
		Management of large consumers.

Table C.5.6: Bergrivier Municipality's Water Conservation and Demand Management Plan: Objectives and Strategies		
No	**Objective**	**Strategy**
		Reduction of illegal connections.
		Management of meter readings.
B.1	Promote efficient use of water to consumers and customers.	Generic consumer awareness campaign.
		Domestic consumer education campaign.
		School education.
		Special events.
		Establishment of horticultural and plumbing forums.
		Develop a webpage.
B.2	Regulate and enforce the prevention of wastage of water.	Revision the current by-laws
		Enforcement of bylaws and restrictions
		Establishment of registration of plumbers
		Establishment of a municipal court
B.3	Ensure the efficient use of water in new developments and connections.	Incentive schemes for new developments.
		Revising engineering standards and development policies.
		Development of incentives for new customers.
		Sustainable delivery for new consumers
B.4	Introduce more equitable tariffs and informative billing.	Revise Water Services tariffs and structure
		Informative billing for customers.
		Monitoring of demand.
		Introduction of a voluntary insurance scheme.
B.5	Capacitate consumers to be more water efficient including leak repair and retrofitting.	Plumbing retrofit program
		Promotion of water-wise gardening.
		Voluntary water audits for domestic consumers.
		Support programme for large consumers.
B.6	Reduce and maintain low levels of inefficient water use by the Municipality.	Water reduction by the parks department
		Reduction of water in Municipal owned buildings.
C.1	Maximise the use of treated effluent	Operations, maintenance and management of treated
C.2	Promote alternate water resources and technologies.	Rain harvesting
		Borehole extraction
		Grey water reuse
		Unconventional water sources
C.3	Conserve existing water resources.	The working for water program
		Catchment management
		Clean up rivers campaign
		Drought management policy
C.4	Ensure the quality of treated effluent is of suitable standards and operated efficiently.	Treated effluent of suitable standards and operated efficiently.
D.1	Establish appropriate management areas and monitor the unaccounted for water.	Establish district management areas.
		Monthly determination of the components of NRW.
D.2	Ensure there is information and policies to support decision making.	Management Information System (MIS).
		Installation and upgrading of telemetry system.
		End use and consumer behaviour research.
		Decision making policies on WCWDM.
D.3	Ensure all decisions are in terms of Integrated Resource Planning (IRP).	Ensure the use of IRP principles for water resource planning.
		Review the impact of WCWDM on proposed new bulk infrastructure.
D.4	Monitor the impact of WC/WDM measures and KPIs.	Monitor the impact of WCWDM measures.
		KPI and benchmarks on WCWDM.
E.1	Ensure adequate financial resources.	Establishment of a WCWDM fund.
		Funding and joint ventures.
E.2	Ensure adequate human resources and processes.	Development of a suitable WCWDM section
		Development of WCWDM working procedures and responsibilities
E.3	Ensure adequate transparency, stakeholder buy in and commitment.	Political and management buy-in.
		Partnerships and cooperation with other institutions.
		Transparency and public participation.

The recommendations of the WC/WDM Strategy are as follows:

- The municipality must implement the strategy as the immediate option and review after a period of five years.
- WC/WDM must be advertised and continuously propagated.
- A budget should be allocated to WC/WDM, which is generated by extra revenue from water restriction tariffs or the savings achieved or the sale of treated effluent.
- WC/WDM should intensify over the next few years.
- Effluent treatment strategy must be fully implemented to generate income from effluent sales.
- All effluent sales revenue should be allocated to the WC/WDM budget.
- The finance department should estimate the financial impact of WC/WDM initiatives and the savings should be allocated to the WC/WDM budget.
- Human resource requirements must be addressed for the successful implementation of WC/WDM especially in a small municipality like Bergrivier Municipality where one person may hold more than one portfolio.
- The WC/WDM Strategy should be reviewed timeously to incorporate more accurate data and to reprioritise the various programs.
- A more accurate forecasting model for future consumption should be developed in conjunction with best international practices and Management Information Systems.

Progress made with the installation of water efficient devices:

No further progress was made during the last financial year on the installation of water efficient devices at the various municipal buildings.

C.6. Water Services Asset Management

Bergrivier Municipality's Asset Register also needs to include the CRC of all the water and sewerage infrastructure. The Municipality also needs to ensure that all the existing water and sewerage infrastructure are included in the current Asset Register. The tables below give an overview of the water and sewerage assets currently included in the Asset Register.

Water Infrastructure: The opening costs and carrying values of the water infrastructure included in Bergrivier Municipality's current Asset Register is summarised in the table below (June 2022).

Table C.6.1: Opening costs and carrying values of the water infrastructure

Asset Type	Opening Costs	Carrying Values	Carrying Values / Opening Costs
Boreholes	R1 445 736	R1 017 629	70.39%
Bulk Mains	R10 988 194	R6 802 687	61.91%
Reticulation Pipeline	R21 238 671	R14 937 435	70.33%
Pump Stations	R6 804 731	R3 375 835	49.61%
Reservoirs	R43 862 568	R30 526 902	69.60%
WTWs	R11 933 387	R7 736 078	64.83%
Dams and Weirs	R13 258 517	R2 967 811	22.38%
Total	**R109 531 804**	**R67 364 377**	**61.50%**

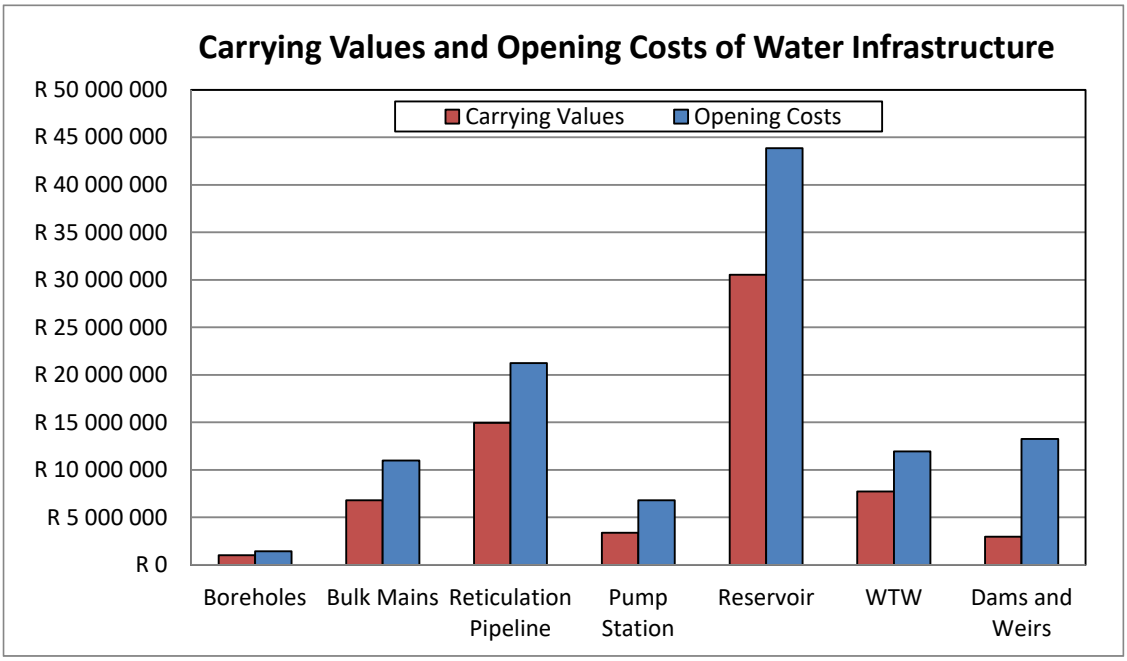


Figure C.6.1: Carrying Values and Opening Costs of the water infrastructure

The previous table indicates that 38.50% of the value of the water supply infrastructure has been consumed.

The table and graph below give an overview of the RUL by facility type for the water infrastructure.

Table C.6.2: Overview of the remaining useful life by facility type for water infrastructure (Opening Costs)

Asset Type	0 – 5 yrs	6 – 10 yrs	11 – 15 yrs	16 – 20 yrs	> 20 yrs
Boreholes	R400 705	R43 625	R283 961	R0	R717 445
Bulk Mains	R118 149	R440 215	R778 567	R678 756	R8 972 507
Reticulation Pipeline	R1 940 645	R2 403 711	R1 538 442	R3 047	R15 352 826
Pump Stations	R1 705 891	R511 143	R1 401 231	R242 642	R2 943 824
Reservoirs	R401 650	R186 304	R415 334	R574 606	R42 284 674
WTWs	R1 032 094	R1 422 730	R812 163	R168 372	R8 498 028
Dams and Weirs	R114 243	R29 932	R112 085	R4 700	R12 997 557
Total	**R5 713 377**	**R5 037 660**	**R5 341 783**	**R1 672 123**	**R91 766 861**

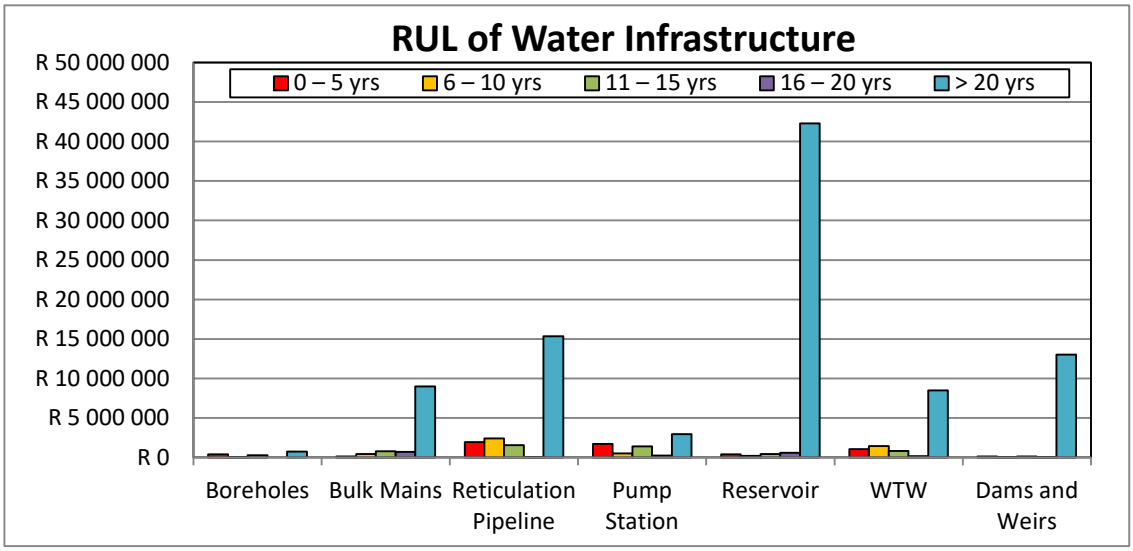


Figure C.6.2: Remaining Useful Life of the water infrastructure

The table and graph below give an overview of the age distribution by facility type for the water infrastructure.

Table C.6.3: Overview of the age distribution by facility type for the water infrastructure (Opening Costs)					
Asset Type	**0 – 5 yrs**	**6 – 10 yrs**	**11 – 15 yrs**	**16 – 20 yrs**	**> 20 yrs**
Boreholes	R866 177	R391 583	R148 700	R0	R39 276
Bulk Mains	R193 292	R1 864 001	R2 107 883	R0	R6 823 018
Reticulation Pipeline	R8 309 724	R1 370 982	R4 046 895	R1 617 605	R5 893 465
Pump Stations	R801 305	R879 251	R2 597 255	R19 398	R2 507 522
Reservoirs	R10 044 627	R0	R736 115	R119 442	R32 962 384
WTWs	R924 376	R4 523 455	R2 292 145	R655 785	R3 537 626
Dams and Weirs	R29 932	R0	R0	R0	R13 228 585
Total	**R21 169 433**	**R9 029 272**	**R11 928 993**	**R2 412 230**	**R64 991 876**

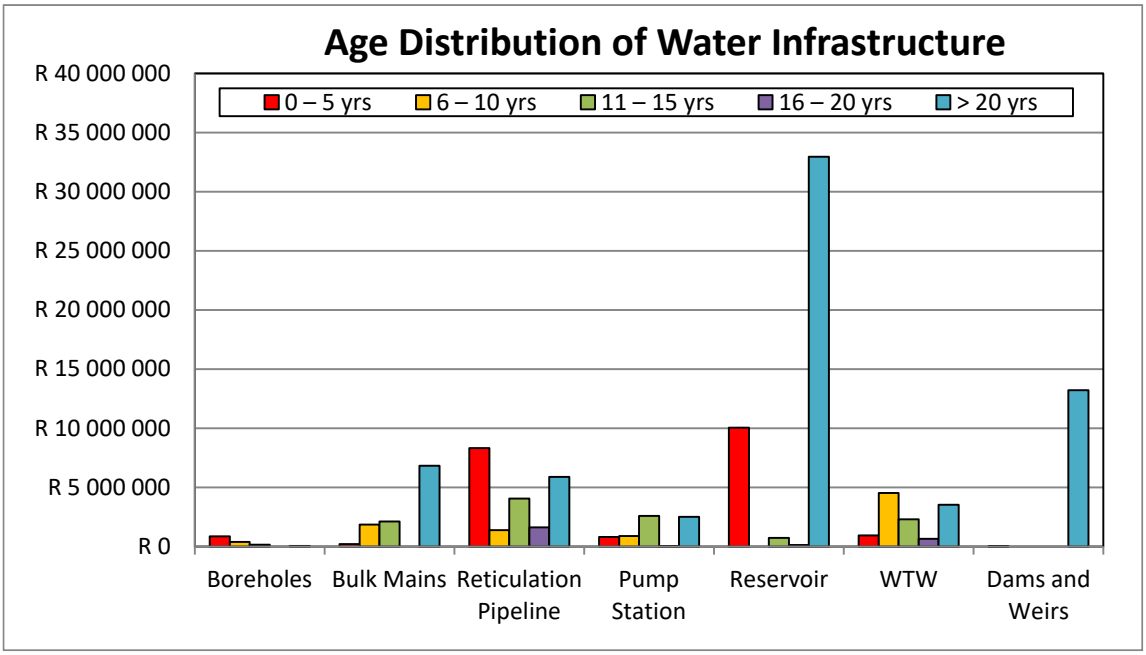


Figure C.6.3: Age distribution of the water infrastructure

The table and graph below give an overview of the condition grading by facility type for the water infrastructure.

Table C.6.4: Overview of the condition grading by facility type for the water infrastructure (Opening Costs)					
Asset Type	**Very Good**	**Good**	**Fair**	**Poor**	**Very Poor**
Boreholes	R793 900	R72 278	R578 539	R1 019	R0
Bulk Mains	R5 007 866	R1 230 586	R3 587 387	R794 499	R367 856
Reticulation Pipeline	R9 522 468	R4 840 223	R6 382 911	R284 406	R208 663
Pump Stations	R844 938	R3 113 908	R2 779 730	R66 155	R0
Reservoirs	R1 926 188	R33 865 668	R8 005 621	R65 091	R0
WTWs	R1 933 787	R6 820 829	R3 178 771	R0	R0
Dams and Weirs	R49 010	R248 747	R12 960 760	R0	R0
Total	**R20 078 157**	**R50 192 239**	**R37 473 719**	**R1 211 170**	**R576 519**

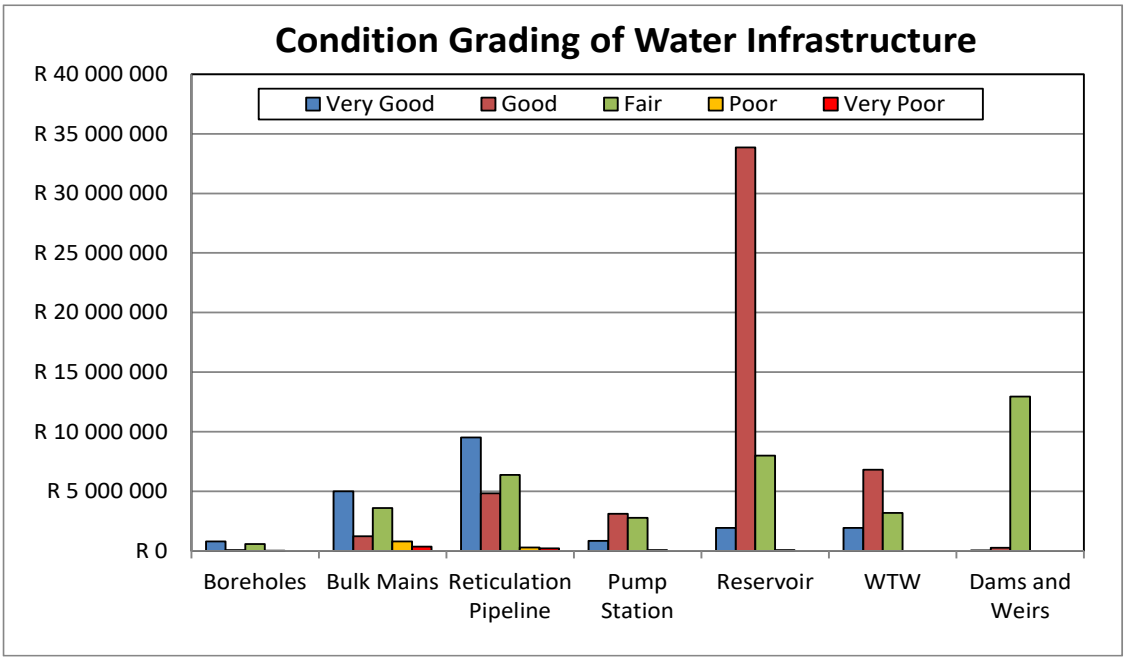


Figure C.6.4: Condition grading of the water infrastructure

Sewerage Infrastructure: The opening costs and carrying values of the sewerage infrastructure included in Bergrivier Municipality's current Asset Register is summarised in the table below (June 2022).

Table C.6.5: Opening costs and carrying values of all sewerage infrastructure

Asset Type	Opening Costs	Carrying Values	Carrying Values / Opening Costs
Sewer Pump Stations	R19 517 432	R12 110 807	62.05%
Sewer Reticulation Pipelines	R22 964 885	R17 949 030	78.16%
Porterville WWTW (0001)	R30 341 286	R26 764 633	88.21%
Velddrif WWTW (0002)	R13 764 404	R11 030 560	80.14%
Eendekuil WWTW (0003)	R269 582	R140 481	52.11%
Piketberg WWTW (0004)	R11 827 937	R7 113 917	60.15%
Totals	**R98 685 526**	**R75 109 428**	**76.11%**

The previous table indicates that 23.89% of the value of the sewerage infrastructure has been consumed.

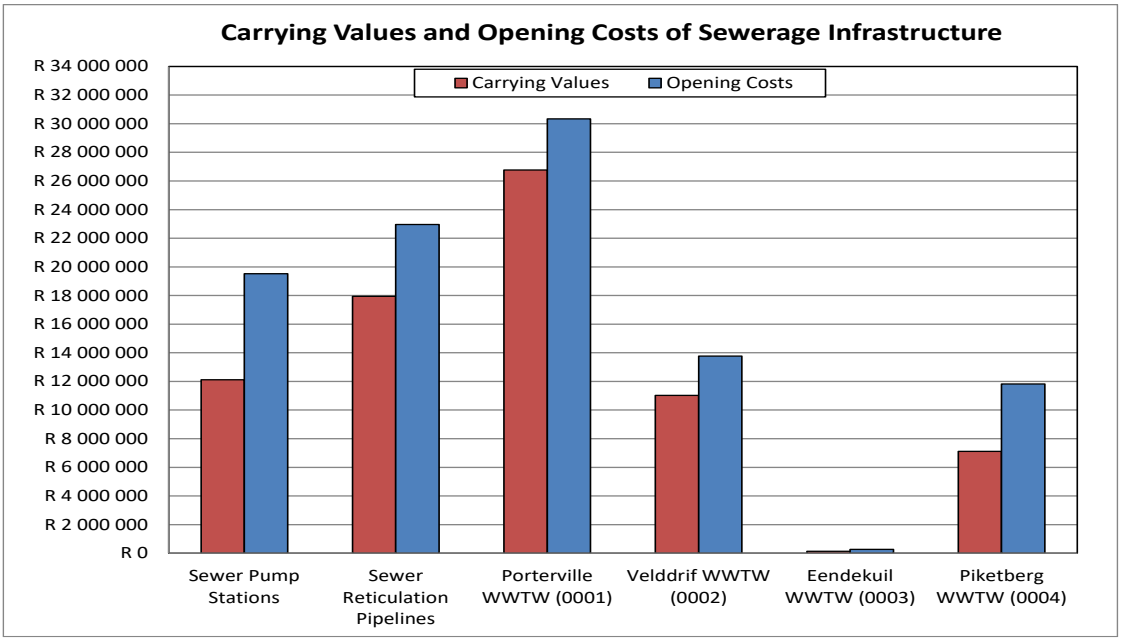


Figure C.6.5: Carrying Values and Opening Costs of the sewerage infrastructure

The following tables and graphs give an overview of the RUL by facility type for the sewerage infrastructure.

Table C.6.6: Overview of the RUL by facility type for the sewerage infrastructure (Opening Costs)

Asset Type	0 – 5 yrs	6 – 10 yrs	11 – 15 yrs	16 – 20 yrs	> 20 yrs
Sewer Pump Stations	R5 462 672	R2 515 924	R3 458 019	R714 076	R7 366 741
Sewer Reticulation Pipelines	R0	R0	R0	R1 587 172	R21 377 713
Porterville WWTW (0001)	R234 543	R141 630	R6 217 082	R34 949	R23 713 082
Velddrif WWTW (0002)	R285 554	R1 196 912	R976 485	R379 697	R10 925 756
Eendekuil WWTW (0003)	R0	R0	R38 778	R0	R230 804
Piketberg WWTW (0004)	R335 291	R851 029	R2 465 226	R237 229	R7 939 162
Totals	**R6 318 060**	**R4 705 495**	**R13 155 590**	**R2 953 123**	**R71 553 258**

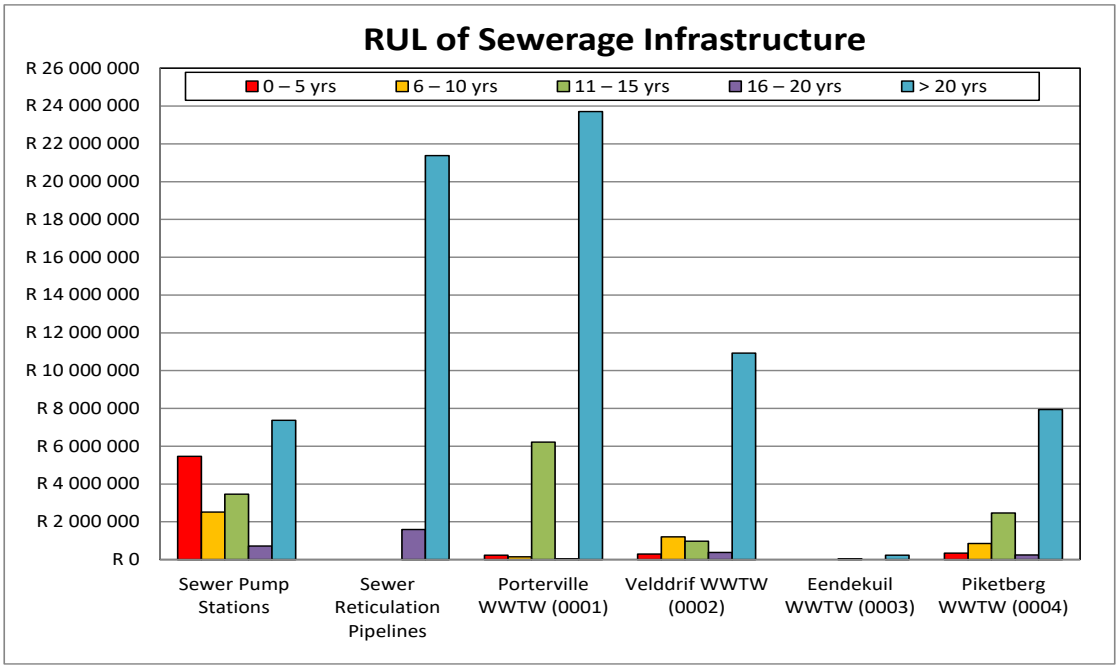


Figure C.6.6: Remaining Useful Life of the sewerage infrastructure

The table below give's an overview of the age distribution per facility for the sewerage infrastructure.

Table C.6.7: Overview of the age distribution by facility type for the sewerage infrastructure (Opening Costs)					
Asset Type	**0 – 5 yrs**	**6 – 10 yrs**	**11 – 15 yrs**	**16 – 20 yrs**	**> 20 yrs**
Sewer Pump Stations	R8 693 680	R499 220	R1 016 905	R5 775 518	R3 532 109
Sewer Reticulation Pipelines	R7 975 647	R826 170	R3 473 082	R1 454 555	R9 235 431
Porterville WWTW (0001)	R25 647 391	R1 618 788	R0	R422 225	R2 652 882
Velddrif WWTW (0002)	R1 210 781	R10 552 263	R1 629 507	R371 853	R0
Eendekuil WWTW (0003)	R0	R0	R0	R0	R269 582
Piketberg WWTW (0004)	R725 547	R6 044	R7 966 701	R81 102	R3 048 543
Totals	**R44 253 046**	**R13 502 485**	**R14 086 195**	**R8 105 253**	**R18 738 547**

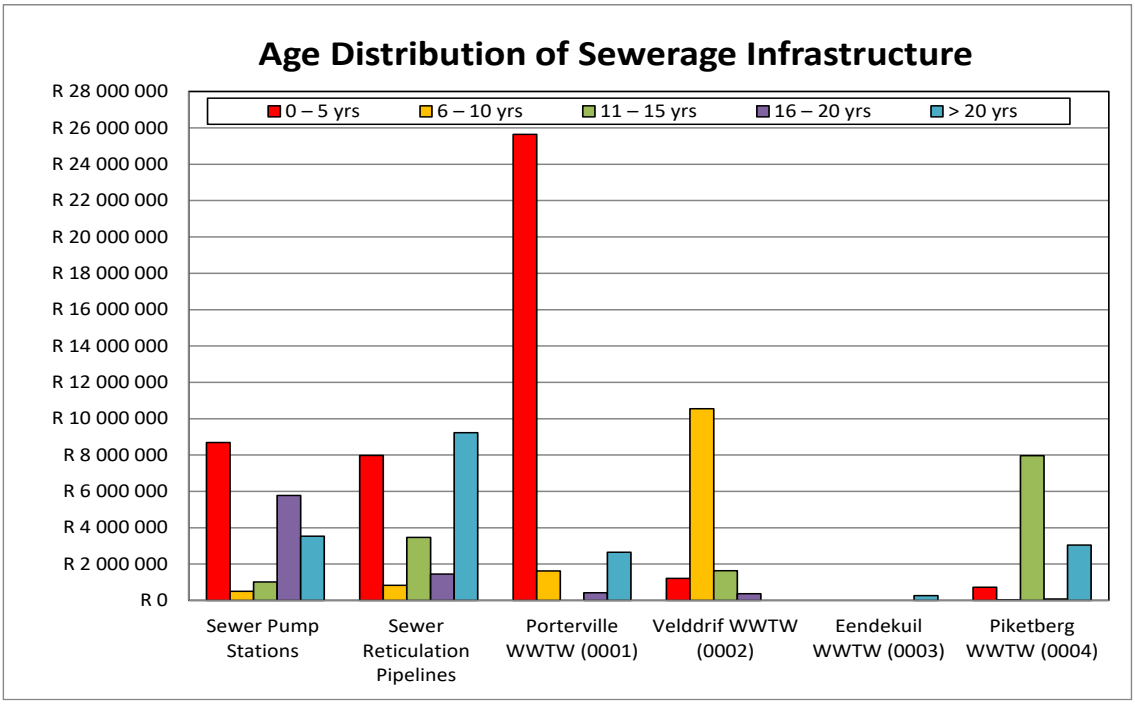


Figure C.6.7: Age distribution of the sewerage infrastructure

The table below give's an overview of the condition grading per facility for the sewerage infrastructure.

Table C.6.8: Overview of the condition grading by facility type for the sewerage infrastructure (Opening Costs)					
Asset Type	**Very Good**	**Good**	**Fair**	**Poor**	**Very Poor**
Sewer Pump Stations	R7 235 918	R7 043 571	R4 874 437	R162 140	R201 366
Sewer Reticulation Pipelines	R9 350 981	R9 971 332	R2 055 401	R1 587 171	R0
Porterville WWTW (0001)	R12 495 652	R14 907 454	R2 938 180	R0	R0
Velddrif WWTW (0002)	R1 212 180	R6 630 104	R5 493 969	R208 698	R219 453
Eendekuil WWTW (0003)	R0	R0	R269 582	R0	R0
Piketberg WWTW (0004)	R231 208	R4 229 765	R7 276 151	R90 813	R0
Totals	**R30 525 939**	**R42 782 226**	**R22 907 720**	**R2 048 822**	**R420 819**

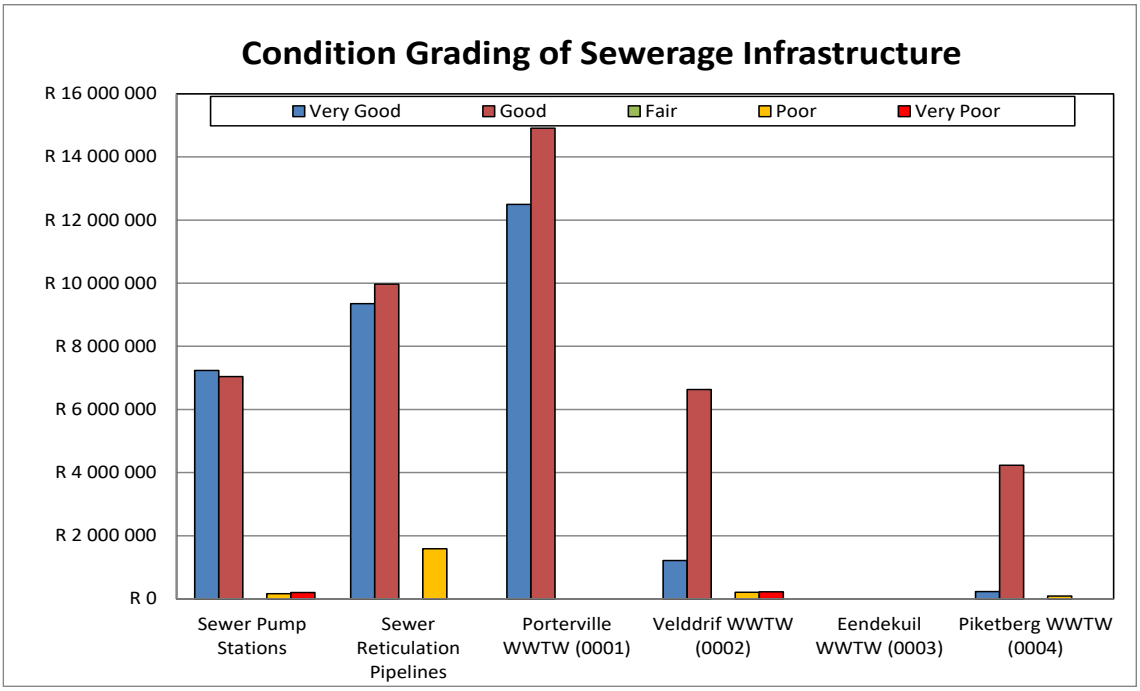


Figure C.6.8: Condition grading of the sewerage infrastructure

The Opening Costs of the water and sewerage infrastructure that will need to be replaced over the next five years (RUL <5 yrs) is R12.031 million. The asset renewal needs for the **water infrastructure assets** over the next ten years is R2.278 million per year. The reinvestment required is R5.713 million in the first five years and R5.038 million in the second five-year period. The age of 59.3% of the water infrastructure assets is greater than twenty years. The asset renewal needs for the **sewerage infrastructure assets** over the next ten years is R1.102 million per year. The reinvestment required is R6.318 million in the first five years and R4.705 million in the second five-year period. The age of 19.0% of the sewerage infrastructure assets is greater than twenty years.

Some of the key challenges of Bergrivier Municipality are to identify adequate funds for the rehabilitation and maintenance of their existing infrastructure, which is critical to ensure the sustainability of the services that are provided by the Municipality. It is important for the Municipality to secure adequate funding for major refurbishment, replacement and maintenance work, the provision of bulk infrastructure and development of additional sources to keep up with the high demand for services.

C.7. Water Services Operation and Maintenance

Bergrivier Municipality practices the following planned and unplanned preventative and corrective maintenance, as summarised in the table below.

Table C.7.1: Types of planned and unplanned preventative and corrective maintenance implemented by Bergrivier Municipality	
Design-out Maintenance: Design-out Maintenance originates on the drawing board and is aimed at improving the operation, reliability or capacity of equipment. The engineer follows a life cycle approach to infrastructure development.	
Preventative Maintenance: Preventative maintenance is based on planning. For example, breakdowns at a plant can be reduced to a minimum if it is planned that all wearing parts are to be replaced before they fail.	Systematic (Periodic Maintenance): Systematic maintenance is periodic maintenance where the servicing of equipment takes place at regular intervals, either in accordance with a time schedule or on the basis of predetermined units of use, to eliminate possible causes of failure before a breakdown occurs. Systematic maintenance requires a servicing schedule, which is based on the manufacturer's guidelines for equipment. Condition-based (Predictive) Maintenance: Condition-based maintenance is predictive maintenance based on regularly inspecting equipment and infrastructure in order to assess the state of wear and tear.

Table C.7.1: Types of planned and unplanned preventative and corrective maintenance implemented by Bergrivier Municipality	
	Any failures that are observed, complemented by the findings of the programmed inspections and checks, are then dealt with through corrective action, so as to avoid breakdowns or the deterioration of a condition that could pose a safety hazard.
Corrective or Breakdown Maintenance: It is important to work methodically to keep repair time as short as possible. Good work preparation, use of correct (and well maintained) tools and equipment, and gathering and processing of all data relevant to the repairs helps to avoid downtime, eliminate mistakes and improve operational conditions.	Planned (Scheduled Repairs) Unplanned repairs guided by Troubleshooting: Troubleshooting is used when poor condition causes either total or partial stoppages, or when operations take place under intolerable conditions.

Bergrivier Municipality's operation and maintenance assessments and plans for their water and sewerage infrastructure are indicated in the table below.

Table C.7.2: Bergrivier Municipality's Operation and Maintenance Assessments and Plans		
Element	**Assessment Criteria**	**Status Quo**
Resources		
Staff	Sufficient staff numbers. Competency level of staff at all levels. Level of service provided by staff. Empowerment and training (Adequately trained for position, Safety regulation and Commitment). Responsibility allocation (organisational structure) and acceptance thereof.	Below minimum requirement: Additional Process Controllers need to be appointed to comply with the legislative requirements with regard to the number and Class of Process Controllers per WTW and WWTWs. Work Place Skills Programme is compiled annually to ensure adequate training of staff.
External Resources	Need for external resource providers. Competency level and value for money. Management and control over these providers.	Adequate: Service Level Agreement is in place with the West Coast District Municipality for the provision of bulk potable water to Velddrif and Dwarskersbos.
Spare Parts	Adequate materials provisioning. Store management (Sufficient stock kept, stock control and delivery time).	Adequate: Municipality ensures adequate spare parts are available in their stores for possible failures or breakdowns. Monitored by the Technical Services Directorate.
Tools and Equipment	Adequate tools and equipment provided. Control and maintenance.	Adequate: Municipality ensures adequate tools and equipment are available. Monitored by the Technical Services Directorate.
Budget	Adequate budget provided. Budget control. Identification and documentation of needs. Budget preparation and motivation.	Adequate: Required Financial Strategies, Policies and Systems are in place to ensure proper budget control.
Information		
Manuals	Existence of manuals (operation / maintenance or manufacturer). Record keeping / safekeeping and control. Utilisation of manuals by staff.	Below minimum requirement: O&M Manuals are in place for some of the WTWs and WWTWs, but not for all the other water and sewerage infrastructure. The Manuals at the treatment plants are also used by the Process Controllers.
Asset Register	Existence of an asset register. Maintenance / updating of asset register. Accessibility of information. Control over assets. Stock taking.	Below minimum requirement: The current Asset Register for the water and sewerage infrastructure indicates the Openings Costs and the Carrying Values. The RUL, Age and Condition of the infrastructure are also included in the Asset Register. The Asset Register is updated annually. The CRC of the water and sewerage infrastructure also needs to be indicated. An Asset Management Plan needs to be compiled to ensure efficient, effective and optimal management, operation and maintenance of all assets.
As-built Information	Existence of as-built drawings. Existence of important reports e.g. design reports etc. Record keeping / safekeeping and control. Accessibility of information. Updating of records.	Adequate: As-built information is available for all the water and sewerage infrastructure. The information is also included in the IMQS of the Municipality. The information is regularly updated when the Water and Sewer Master Plans are updated.
Tools and Equipment	Existence of information on tools and equipment. Record keeping / safekeeping and control. Accessibility of information.	Adequate: Managed by the Operational Personnel at the various Municipal stores. Monitored by the Technical Services Directorate.
Contingency	Compliance to safety requirements.	Adequate: Water Safety Plans and W_2RAPs are in place for all

Table C.7.2: Bergrivier Municipality's Operation and Maintenance Assessments and Plans		
Element	**Assessment Criteria**	**Status Quo**
and Safety Plans	Safety equipment and maintenance thereof. Existence of safety plan where required. Existence of contingency plan where required.	the areas. The Water Safety Plans need to be updated. WTW and WWTW Process Audits are done as part of the upgrading of the plants. Detail WWTW Process Audits were also done during the 2021/2022 financial year. Incident Management Protocols, as included in the Water Safety Plans and W_2RAPs.
Activity Control and Management		
Procedures	Existence of procedures for all activities. Existence of policies – standardisation, quality, operational and maintenance, etc. Correctness of procedures – if in place.	Adequate: Required Procedures and Policies are in place. Procedures and Policies with regard to the water and sewerage infrastructure are managed by the Technical Services Directorate.
Record Keeping	Existence of record keeping system. Process of data. Actions activated.	Adequate: Record keeping of information required for the Monthly Reports are kept up to date. The record keeping of certain information is also linked to specific water and sanitation KPIs in the SDBIP. Municipality to continue to implement recommended O&M Control Sheets for groundwater, surface water, bulk water and reticulation networks and fittings, WTWs, WWTWs, water and sewer PSs, reservoirs, remote monitoring and control systems and bulk and sewer drainage networks.
Quality Controls	Quality management plan. Quality assurance. Quality control (Inspections, Control charts, trend analysis). Process adjustment and rework. Quality improvement.	Adequate: Required quality control mechanisms are in place to ensure high quality of materials and to ensure that all work carried out on the water and sewerage infrastructure is of a high quality. The Technical Services Directorate monitors all work carried out by Consultants and Contractors.
Risk Management	Risk management planning. Risk identification. Risk probability and impact assessment. Risk response planning. Risk monitoring and control.	Adequate: Required Risk Management Protocols are in place, which is followed by the personnel. Potential risks/incidents and control measure to reduce or manage these risks were identified as part of the Water Safety Plan and W_2RAP processes.
Reporting	Production and activity reporting (Completeness, evaluation and action activation). Management reporting (Completeness and evaluation and action activation). Performance monitoring.	Adequate: The Manager for Civil Engineering Services report on a monthly basis to Management and the Council on all the required water and sanitation information. A SDBIP is also in place, linked to specific water and sanitation KPIs, which allows for proper performance monitoring.

Pipe bursts and other serious damage to pipes immediately interrupts services to the affected area and is rapidly addressed by Bergrivier Municipality. O&M is a continuous process for Bergrivier Municipality involving various activities, with the ultimate purpose of delivering good quality services to all customers at all times and keeping the percentage of water lost through pipe bursts and other serious damage to pipes as low as possible. Bergrivier Municipality's O&M Plan depends on a range of factors such as the age and condition of the water supply system, requirements of the Municipality and DWS as the regulating authority, the availability of staff, plant, equipment, spares, money and other resources.

Bergrivier Municipality has standby teams available after hours and over weekends, besides the planned and scheduled O&M activities, in order to allow for unscheduled responses to service breakdowns due to mal-functioning equipment, vandalism, emergency situations, etc. This allows Bergrivier Municipality to be able to quickly assess service breakdowns and re-allocate staff and resources to do unscheduled repairs, and then quickly return to the regular and scheduled O&M activities. The Municipality ensures that sufficient repair materials, consumables and back-up equipment are also readily available for any potential breakdowns.

A budget of approximately 2% of the total asset value per annum should be allocated towards the replacement of existing infrastructure. In the case of the operations and maintenance of the systems, a budget of approximately 1% to 2% of the value of the system is typically required to ensure that the systems remain in good condition.

The table below gives an overview opening costs and carrying values of the water and sewerage infrastructure included in Bergrivier Municipality's Asset Register (June 2022), as well as the CRC of the water and sewerage infrastructure as included in the WSDP. The recommended budgets for the replacement of the existing infrastructure and the operation and maintenance of the existing infrastructure, based on the CRC of the assets in the WSDP, are also indicated.

Table C.7.3: Recommended budgets for the replacement and the operation and maintenance of the existing water and sewerage infrastructure

Asset Type	Asset Register June 2022		CRC (WSDP: 2017)	Recommended Annual Replacement Budget (Best Practice)	Recommended Annual O&M Budget (Best Practice)	Bergrivier Actual Depreciation and Amortisation Expenditure
	Opening Costs	Carrying Values		2.0% of CRC	1.5% of CRC	2021/2022
Boreholes	R1 445 736	R1 017 629	R1 100 000	R22 000	R16 500	R0
Bulk & Ret. Pipelines	R32 226 865	R21 740 122	R206 670 000	R4 133 400	R3 100 050	
Pump Stations	R6 804 731	R3 375 835	R17 743 000	R354 860	R266 145	
Reservoirs, Dams & Weirs	R57 121 085	R33 494 713	R50 133 000	R1 002 660	R751 995	
WTWs	R11 933 387	R7 736 078	R38 705 000	R774 100	R580 575	R0
Sub Total Water	**R109 531 804**	**R67 364 377**	**R314 351 000**	**R6 287 020**	**R4 715 265**	**R0**
Sewer Pump Stations	R19 517 432	R12 110 807	R23 600 000	R472 000	R354 000	R0
Sewer Reticulation Pipelines	R22 964 885	R17 949 030	R144 168 000	R2 883 360	R2 162 520	
Porterville WWTW (0001)	R30 341 286	R26 764 633	R17 055 000	R341 100	R255 825	R0
Velddrif WWTW (0002)	R13 764 404	R11 030 560	R23 117 000	R462 340	R346 755	
Eendekuil WWTW (0003)	R269 582	R140 481	R3 405 000	R68 100	R51 075	
Piketberg WWTW (0004)	R11 827 937	R7 113 917	R35 172 000	R703 440	R527 580	
Dwarskersbos WWTW	-	-	R5 879 000	R117 580	R88 185	
Sub Total Sewerage	**R98 685 526**	**R75 109 428**	**R252 396 000**	**R5 047 920**	**R3 785 940**	**R0**
Total Water and Sewerage	**R208 217 330**	**R142 473 805**	**R566 747 000**	**R11 334 940**	**R8 501 205**	**R0**

Most of the major replacement of old water and sewerage infrastructure in Bergrivier Municipality is done through the Municipality's annual capital budget. The capital budget however also includes new infrastructure. The table below gives an overview of the total historical water and sewerage capital expenditure for the last six financial years.

Table C.7.4: Historical water and sewerage capital expenditure

Infrastructure	21/22	20/21	19/20	18/19	17/18	16/17
Water	R5 309 759	R2 594 725	R1 824 448	R1 083 070	R1 839 330	R5 334 755
Sewerage	R9 993 484	R6 289 300	R6 095 250	R12 958 020	R13 264 557	R2 168 427
Total	**R15 303 243**	**R8 884 025**	**R7 919 698**	**R14 041 089**	**R15 103 887**	**R7 503 182**

A **pipe replacement study** was performed for the Piketberg and Porterville water distribution systems (March 2021). The project entailed the verification of system data, establishment of a computer model for the pipe replacement network, calibration of the computer model, work shopping of the relevant factors and weights applied in the analysis and performing the analysis. The pipe replacement potential was determined for each of the pipelines in the water distribution systems by assessing the likelihood of failure (LF) and the consequence of failure (CF).

The independent factors and their weight factors used are summarised in the tables below.

Table C.7.5: The independent factors and the weight factors used to determine the water Pipe Replacement Potential

Likelihood of Failure Property	Weight	Weight (%)	Consequence of Failure Property	Weight	Weight (%)
Nominal diameter (mm)	8	17.4%	High cost to consumer due to high water pressure (m)	7	26.9%
Reserve water pressure ratio	9	19.6%	High cost to consumer due to flow (l/s)	4	15.4%
Catalogue remaining useful life (yr)	6	13.0%	High repair cost	0	0.0%
Master Plan Item	7	15.2%	Flooding due to geography	0	0.0%
Assessed condition	0	0.0%	Strategic location	8	30.8%
Failure frequency (breaks/km/yr)	9	19.6%	Network redundancy (l/s)	7	26.9%
Leakage volume (l/min/km)	0	0.0%	Pavement management system alignment	0	0.0%
Undesired material	7	15.2%			
Geology	0	0.0%			
		100.0%			100.0%

The total pipe replacement potential was calculated for each pipeline as an index

PRP = LF x CF (In the range of 1 to 25)

The replacement value for the top 100 pipes to be replaced in Piketberg and Porterville is R14.872 million. The location of pipe failures should be recorded with accurate GPS coordinates or with the Wadiso link number. It is recommended that pipe replacement in Bergrivier Municipality is performed in accordance with the PRP values. Pipes with the highest PRP values should be considered to be replaced first. The table below gives an overview of these pipes.

Table C.7.6: Top fifty water pipes in the Piketberg and the Porterville water distribution systems to be replaced based on PRP

Area	System and PRP%	Length (m)	Replacement Cost
Piketberg BPT	Piketberg Pipes with PRP > 95.93 %	3 938.49	R3 365 081
Piketberg BPT PRV 1		878.68	R725 789
Piketberg Industrial PRV		790.13	R652 651
Piketberg Lower PRV 1		970.05	R801 264
Piketberg Lower Reservoir		513.09	R552 410
Piketberg Upper Reservoir		912.18	R753 461
Subtotal		**8 002.62**	**R6 850 656**
Monte Bertha Booster	Porterville Pipes with PRP > 87.34 %	1 640.45	R1 355 008
Porterville PRV		6 515.47	R6 506 805
Porterville Reservoir		118.28	R160 030
Subtotal		**8 274.20**	**R8 021 843**
Total		**16 276.82**	**R14 872 499**

C.8. Water Resources

The Western Cape experienced a severe drought over the period 2015 to 2017, with some relief during the 2018 to 2021 winter months. The drought over the period 2015 to 2017 reduced the safe yield of the WCWSS (Velddrif and Dwarskersbos) and the Municipality's own existing surface and groundwater resources. The Municipality therefore continue with their WC/WDM measures to lower the current and future water requirements and investigations of augmentation options for the existing water resources.

Future water requirement projection models were developed for each of the towns within Bergrivier Municipality's Management Area, which are included in Annexure C. IWA Water Balance models with graphs of the total water requirements (bulk raw water volumes, system input volumes and billed metered consumption), peak month factors, annual treatment losses, NRW and water losses per town and water usage per sector are included in Annexure A.

The future water requirement projection models include the future projections up to 2046 and were calibrated by using the historical IWA Water balance data. The percentage of NRW was determined for each of the distribution systems and growth in future water requirement was based on agreed population and growth figures. The table below gives an overview of the years in which the annual water requirement will exceed the allocations, licence volumes or sustainable yields of the various resources.

Table C.8.1: Years in which the annual water requirement will exceed the allocations, licence volumes or yields from the various water resources

Distribution System	Allocation (A) / Yield (Y) / Licence (L) (Ml/a)	High Annual Growth on 2021/2022 requirement (%)	Low Annual Growth on 2021/2022 requirement (%)	WSDP Projection Model
Porterville	711.385 (Y)	2042 (2%)	> 2046 (1%)	> 2046
Piketberg	945.075 (A)	2026 (4%)	2028 (3%)	2033
Velddrif	1 295.460 (L)	2031 (3%)	2036 (2%)	2029
Dwarskersbos	143.940 (L)	2028 (3%)	2031 (2%)	2032
Aurora	64.964 (Y) *	2034 (2.5%)	2042 (1.5%)	2029
Eendekuil	116.435 (Y)	2029 (3%)	2033 (2%)	> 2046
Redelinghuys	577.109 (Y)	> 2046 (2%)	> 2046 (1%)	> 2046

Notes: * Safe yield of existing four production boreholes (Exclude safe yield of newly drilled Au BH6)

The projected future water requirements are indicated in the table below for each of the distribution systems.

Table C.8.2: Projected future water requirements and allocation, licence or yield volumes surplus (+) / shortfall (-) based on WSDP model

Distribution System	Model	PROJECTED FUTURE WATER REQUIREMENTS (Ml/a)				
		2026	2031	2036	2041	2046
Porterville	1% Annual Growth	487.899	512.787	538.944	566.435	595.329
	2% Annual Growth	512.535	565.880	624.778	689.805	761.600
	WSDP Model	487.437	525.535	567.912	615.213	668.202
	Yield surplus (+) / shortfall (-)	**+223.948**	**+185.850**	**+143.473**	**+96.172**	**+43.183**
Piketberg	3% Annual Growth	883.374	1 024.072	1 187.181	1 376.268	1 595.471
	4% Annual Growth	927.097	1 127.955	1 372.330	1 669.649	2 031.383
	WSDP Model	828.024	906.386	994.741	1 094.666	1 208.023
	Allocation surplus (+) / shortfall (-)	**+117.051**	**+38.689**	**-49.666**	**-149.591**	**-262.948**
Velddrif	2% Annual Growth	1 052.599	1 162.154	1 283.112	1 416.659	1 564.106
	3% Annual Growth	1 105.218	1 281.251	1 485.321	1 721.894	1 996.147
	WSDP Model	1 147.309	1 391.595	1 692.832	2 064.990	2 525.573
	Licence surplus (+) / shortfall (-)	**+148.151**	**-96.135**	**-397.372**	**-769.530**	**-1 230.113**
Dwarskersbos	2% Annual Growth	129.598	143.087	157.979	174.422	192.576
	3% Annual Growth	136.077	157.750	182.876	212.003	245.770
	WSDP Model	128.861	140.296	153.132	167.563	183.812
	Licence surplus (+) / shortfall (-)	**+15.079**	**+3.644**	**-9.192**	**-23.623**	**-39.872**

Table C.8.2: Projected future water requirements and allocation, licence or yield volumes surplus (+) / shortfall (-) based on WSDP model						
Distribution System	**Model**	**PROJECTED FUTURE WATER REQUIREMENTS (Ml/a)**				
		2026	**2031**	**2036**	**2041**	**2046**
Aurora	1.5% Annual Growth	49.462	53.285	57.403	61.840	66.619
	2.5% Annual Growth	51.947	58.774	66.497	75.235	85.122
	WSDP Model	55.298	67.621	83.241	103.087	128.357
	Yield surplus (+) / shortfall (-)	**+9.666**	**-2.657**	**-18.277**	**-38.123**	**-63.393**
Eendekuil	2% Annual Growth	99.541	109.902	121.340	133.970	147.913
	3% Annual Growth	104.518	121.165	140.463	162.835	188.770
	WSDP Model	93.221	96.934	101.141	105.865	111.135
	Yield surplus (+) / shortfall (-)	**+23.214**	**+19.501**	**+15.294**	**+10.570**	**+5.300**
Redelinghuys	1% Annual Growth	68.072	71.544	75.193	79.029	83.060
	2% Annual Growth	71.509	78.952	87.169	96.242	106.258
	WSDP Model	62.248	61.787	61.586	61.632	61.919
	Yield surplus (+) / shortfall (-)	**+514.860**	**+515.322**	**+515.523**	**+515.477**	**+515.190**

Note: Velddrif and Dwarskersbos - Bulk potable water is supplied by the West Coast DM from the WCWSS. The system is currently under pressure to meet future water requirements. Next augmentation scheme needs to be implemented.

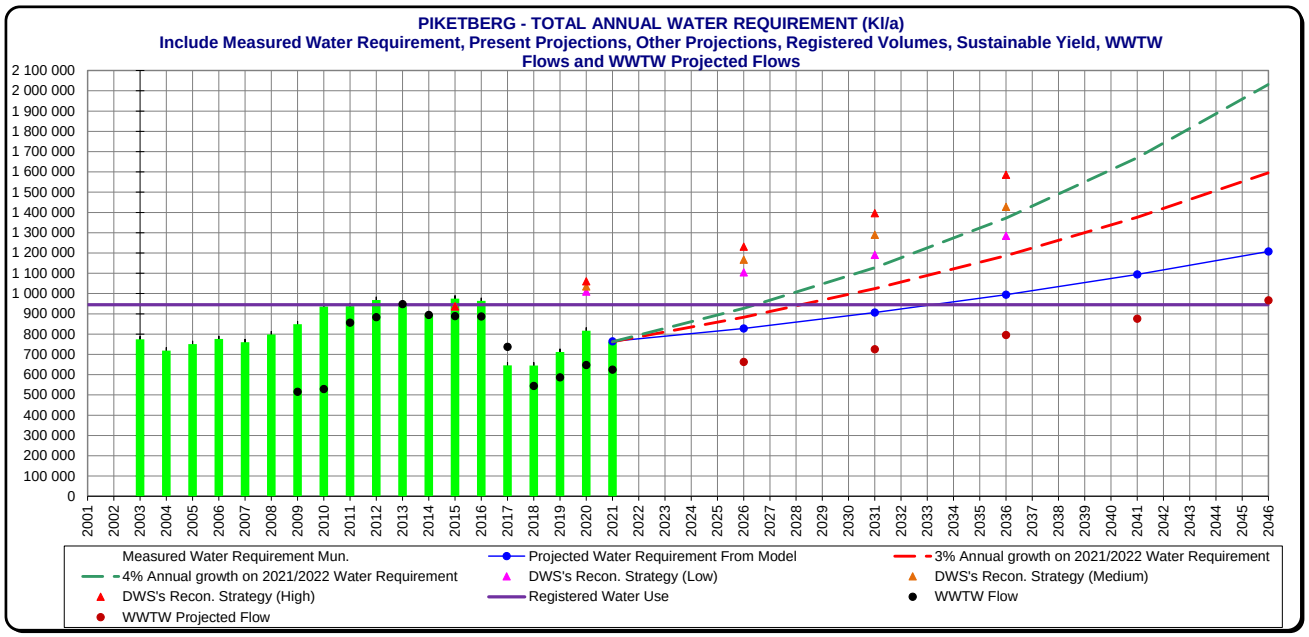


Figure C.8.1: Future water requirement projections for the Piketberg water distribution system

Porterville: The yield from the existing water resources is adequate for the medium to long-term future water requirements of the town.

Piketberg: A Geohydrological investigation was completed for Piketberg during the 2017/2018 financial year. Five boreholes were drilled. The blowout yields ranged between 0.3 l/s and 5 l/s and based on the blow yields only two boreholes were considered for yield testing (PG1 and PG4). The recommendations from the exploration phase of the project for the two boreholes were as follows:

BH PG1:

- The borehole can be pumped at 0.5 l/s for 24 h/day (43m³/day) or 1.5 l/s for 12 h/day (65 m³/day);
- Pump to be installed at 250 mbgl; and
- Water quality is good although Fluoride is at 1.5 mg/l and should require treatment.

BH PG2:

- The borehole collapsed after drilling and additional casing needs to be installed; and
- Conduct aquifer test.

The additional recommendations were as follows:

- Investigate area close to the Piketberg Secondary School;
- Investigate the De Hoek fault along the pipeline servitude;
- Investigate the De Hoek fault along the R399;
- Flow meters to measure total water use should be installed;
- Automatic data loggers should be installed to record the water level;
- A low-level cut-off switch should be installed 5 m above the pump intakes; and
- The water use needs (not exceeding 20 m^3/d) to be registered with the DWS.

A Water Augmentation Prefeasibility Study for the town of Piketberg was also completed during the last financial year. The following four options were investigated at prefeasibility level.

- Option 1: A pipeline from the Misverstand Dam wall to the Piketberg WTW. Lay a new 8.86km pipeline along the Berg River to Piketberg WTW from the Misverstand dam.
- Option 2: A pipeline from the current Berg River abstraction to a new holding dam on farmland, which is then treated as required.
- Option 3: A pipeline from current Berg River abstraction to the unused PPC cement quarry.
- Option 4: A pipeline from Withoogte WTW to Piketberg WTW (18km), purchasing potable water for resale. The proposed pipeline is routed along the N7 road.

The following recommendations were made, based on the conclusions of the preliminary feasibility study.

- Option 1 is economically the most feasible and would present the least challenges to implement, it is recommended that this option be further investigated.
- Options 2 and 3 would require an investigation into a PPP process, which include the following details.
  - Who acquires the management of the dam.
  - Who performs the municipal function for or on behalf of a municipality and acquires the management or use of municipal property for its own commercial purposes.
  - Upon whom is the substantial financial, technical and operational risks.
  - What benefit does the land owner accrue by way of water usage from the dam.

Velddrif and Dwarskersbos: In order to ensure sustainable economic development in the West Coast region the West Coast District Municipality started with a comprehensive study in 2007 to identify a sustainable long-term alternative water source for the region, in order to ensure sustainable economic development. Various alternative sources and combinations thereof were evaluated and eventually a 25.5 Ml/day sea water desalination plant in the Saldanha Bay area was identified as the most beneficial alternative, to be developed in 3 phases (8.5 Ml/d for each phase) as the water requirements grow.

Desalination: The West Coast District Municipality previously proposed to construct and operate a sea water desalination plant in the Saldanha Bay area using sea water reverse osmosis (SWRO) technology. The intake capacity of the plant will be approximately 60 Ml/d (21.9 million Ml/a) producing 25.5Ml/d (9.3 million Ml/a) at final capacity. Approximately 36 Ml/d (13 million Ml/a) brine will be discharged into the sea. It will have a lifespan of 25 years with the potential of an extended lifespan.

It was proposed that the plant be constructed in three phases of 8.5 Ml/d each to reach the full capacity by 2026. All infrastructure however will be constructed for the full capacity in the first construction phase.

The environmental screening and technical evaluation reduced the ten possible sites, which were originally identified, to two proposed sites to be evaluated, i.e. the site at Arcelor Mittal in the Industrial Development Zone (IDZ) of Saldanha Bay and a site in Danger Bay. The Danger Bay site was identified as the most suitable site and the EIA approval was obtained during August 2013 for this site and the concomitant bulk infrastructure.

The proposed desalination plant and bulk infrastructure will cost an estimated R500 million, R300 million more than the original cost estimate. The first phase will include the construction of the desalination plant with a capacity of 8.5 Ml per day and the bulk infrastructure, with a capacity of 25.5 Ml per day. The desalination plant will be upgraded in three phases of 8.5Ml per day up to the final capacity of 25.5 Ml per day. Funding of this plant is currently a major challenge, as the West Coast District Municipality is not in a position to co-fund a project of this extent.

The levels of salinity in the Berg River have increased dramatically to the point where the level of assurance of 98% cannot be reached without major engineering effort. Urgent measuring devices must be put in place to monitor the Berg River, to find the reason for the high salinity readings and to mitigate these circumstances. Additional factors will have to be addressed through further investigations to determine the sources of contamination and to include these in the management options at Misverstand.

Increase storage at Withoogte: Although the modelling results from the 'Analysis of Management Options at Misverstand Weir" to mitigate the potential impact on salinity of the Berg Water Project and Voëlvlei Augmentation Scheme (DWS, 2007) indicated that the incremental impact of the Berg Water Project and the Voëlvlei Augmentation Scheme could be mitigated through the provision of an additional 250 000 m^3 of off-channel storage capacity, the re-analysis showed that the desired 98% level of assurance would not be achievable. To obtain a 98% level of assurance an additional 0.7 million m^3 of storage would be required over and above the readily available 0.5 million m^3 at Withoogte.

Increased treatment capacity at Withoogte (Subject to available water from the Berg River)

Water from the Berg River is pumped to the Withoogte WTW from the Misverstand Weir. The current capacity of the WTW is 72 Ml/day, which is already critical and needs to be increased to be able to meet the future water requirements. The potable water gravitates to the Besaansklip reservoir at Vredenburg from Withoogte and it was established that the ultimate design capacity of the pipeline is 105 Ml/day. The Withoogte WTW therefore needs to be upgraded from the current 72 Ml/day to 105 Ml/day to be able to accommodate the full design flow of the pipeline. The allocation from the WCWSS therefore has to allow an additional 33 Ml/day increase in allocation and an extension to the WTW to treat a total of 105 Ml/day. This demand will be reached by 2032 when a sea water desalination plant will have to be in operation to supply the future requirement i.e. 31 Ml/day until 3045.

The West Coast District Municipality applied to the DWS in December 2013 to increase the allocation from the System to initially 18.087 million m^3/a for the Withoogte supply area, which is to be increased to 30.3 million m^3/a by 2033, and to 6.39 million m^3/a for the Swartland supply area (to be increased to 11.1 million m^3/a by 2033). The current raw water abstraction Licence No. 01/G10F/A/5903 of October 2017 list the following volumes allocated to the respective WSAs, which include operational, treatment and bulk conveyance losses.

Table C.8.3: Volumes allocated to the respective WSAs in Licence No. 01/G10F/A/5903

Name	Resource Name	WSA	Maximum Volume (Ml/a)
Withoogte from Misverstand Weir	Berg River	Saldanha LM	20 427.000
		Swartland LM	1 573.600
		Berg River LM	1 439.400
Swartland from Voëlvlei Dam	Berg River	Swartland LM	7 900.000
		Drakenstein LM	300.000
Langebaan Aquifer Boreholes 1 & 2	Langebaan Aquifer	Saldanha Bay LM	675.000
Langebaan Aquifer Boreholes 3 & 4		Saldanha Bay LM	675.000
Total Allocation for the West Coast District Municipality			**32 990.000**
Total Allocation for the West Coast District Municipality from the WCWSS			**31 640.00**

Aurora: A number of geohydrological assessments were completed for Aurora during the 2019/2020 financial year. A new borehole (Au BH6) was drilled and the existing boreholes and the new borehole were yield testing during late February and early March 2020. The yield test data indicates that the municipality may sustainably abstract 80.732 Ml/a (Excluding Au BH5) from the aquifer system. The quality of the newly drilled borehole decreased substantially after it collapsed below end of casing at a depth of 62 mbgl. As the stronger "fresher" water strikes occurred at the deeper depths, it is a possibility that those fractures have been cut off by the collapse.

During the camera logging phase of the project, the current production boreholes all displayed instability issues, with boreholes being drilled into a highly fractured formation and cavities were observed at some of the fracture zones. The cavities contained loose rocks which can fall into the borehole (wedging in the pump) and also carrying the risk of complete collapse of the borehole. Due to the structural issues that were highlighted during the camera logging exercise of the Aurora production boreholes, it is recommended that all the production boreholes are re-habilitated. The new borehole collapsed shortly after drilling and the current production boreholes are all in very poor condition and at great risk of collapse. The poor construction of boreholes Au_Bh2 and Au_BH6 (which actually collapsed) reduced the yields of the boreholes greatly.

The Groundwater Management Plan for Aurora list the following recommendations to promote the sustainability of Aurora's boreholes:

<u>Short-Term</u> (To be completed by July 2020)

- It is recommended that the four current boreholes and Au BH6 are reamed out (drilled again within the open borehole) to clear the obstructions and blow out the fractures / cavities. Then uPVC casing needs to be installed in all production boreholes to bottom of the boreholes with an end cap, centralizers and gravel pack. uPVC casing must be solid until the first fractures at which point the casing will be slotted to allow water to pass through while still supplying stability to the boreholes. The annulus must be back filled with 3-7mm gravel. This will prevent future collapse and greatly improve the sustainability of the town's water supply.

- Installing the correct size of pumps in the production boreholes. Pumps should not be oversized and only be capable of abstracting the recommended abstraction volume at a continuous pumping schedule to reduce iron oxidation.

- Installing cut-off switches 1 m above the borehole pumps (Au_BH1, Au_BH2, Au_BH3 and Au_BH4).

- Installing observation pipes (Au_BH1, Au_BH2, Au_BH3 and Au_BH4).

- Rehabilitation of borehole site: checking and fixing wiring issues, borehole cover, piping, fixing leaks (for all production boreholes).

- Internal project manager appointed, budget allocated and sourcing company identified to proceed with the procurement of a water level dipmeter and field chemistry kit that would enable the borehole maintenance team to collect monthly monitoring data.

Long-Term (To be completed by December 2020)

- Equipping Au BH6 (Pump installed according to GEOSS's recommendations and installation of bulk flowmeter, pressure gauge, observation pipe, cut off switch 1m above borehole depth, secure electrical wiring box and a sampling tap).

- The procurement and equipping of all production boreholes with water level loggers.

- Continuation and streamlining of monthly borehole visits to measure water levels and EC and pH, as well as noting the bulk flow meter readings.

- Adequate budget plan should be set to ensure that on an annual basis, sufficient budget will be available for supplying consumables such as calibration fluids and allowing the municipality to quickly attend to broken infrastructure issues such as broken flow meters, sampling taps and broken dip meters.

- Visual inspection of pipelines and repairing leaks.

- Annual auditing report done by a specialist that has reviewed all the data collected on a monthly and quarterly basis to optimize and improve groundwater use and ensuring sustainability of water supply.

Eendekuil: The yield from the existing water resources is adequate for the medium to long-term future water requirements of the town. A Geohydrological Assessment and Borehole siting was completed for Eendekuil during the last financial year. Two areas of interest have been delineated for drilling of water supply boreholes. These areas are based on the 1:250 000 geological map series and information obtained from the current town supply borehole. Two inferred faults (within the Porterville Formation) cross cut the approximate municipal servitude location. The servitude is registered to the municipality for the purpose of the water supply pipeline running from the slopes of the Piketberg Mountain to the water treatment works just outside town. The dimensions of the servitude land at these areas of interest should be considered for drilling of water supply boreholes.

Redelinghuys: The yield from the existing water resources is adequate for the medium to long-term future water requirements of the town. A Groundwater Management Plan was completed for Redelinghuys during the last financial year. The recommendations to the current management and monitoring include the following:

- The infrastructure that provides water for Redelinghuys must be maintained and upgraded as required to prevent any water losses.

- It is recommended that a water level logger be permanently installed into the bottom of the distribution weir to monitor flow. Staff should also note the flow meter readings on each of the production boreholes during their daily visits to the weir.

- The monitor data from the production boreholes should also be acquired from the farming company.

- Water quality control needs to be conducted in the following four ways:
  - Annual SANS0241 testing of the raw and treated water.
  - The two weekly laboratory testing of selected parameters for both the raw and treated water.
  - Weekly microbiological testing.
  - Daily monitoring of selected parameters of the treated water.

Current water quality monitoring is efficient and should be continued as is. Redelinghuys water use is "still to be determined" therefore it is recommended that a water use licence is applied for to ensure that the town's water use is authorised. It is recommended that flow, quality and water level monitoring data be analysed by a geohydrologist bi-annually.

The DWS is currently busy with the updating of the All Towns Reconciliation Strategies for the Western Cape. The table below gives an overview of the recommended potential future water resources, as included in the 2016 All Towns Reconciliation Strategies, for the towns in Bergrivier Municipality.

Table C.8.4: Potential future water resources for the various towns (Summary of DWS's All Towns Reconciliation Strategies)

Distribution System	Recommended Summary Options
Porterville	**The current water sources have adequate supply to cater for the medium and longer term future water requirements under all scenarios. The following sources are identified as potential sources to augment the water supply, in order of priority and implementation sequence:** • Continue with the implementation of the existing WC/WDM measures to reduce the non-revenue water and water losses. • Development of alternative groundwater resources, when required.
Piketberg	**The current allocated water sources have inadequate supply to cater for the future water requirements under all scenarios. The following sources are identified as potential sources to augment the water supply, in order of priority and implementation sequence:** • Continue with the full-implementation of the existing WC/WDM Strategy. • Increased allocation from the Berg River (WCWSS). • Groundwater development.
Velddrif	**The current water sources do not have adequate supply to cater for the short, medium and longer term future water requirements under all growth scenarios. The following sources are identified as potential sources to augment the water supply, in order of priority and implementation sequence:** • Continue with the implementation of the existing WC/WDM Strategy to keep the water losses and non-revenue water low and achieve savings in water consumption. • Increased allocation from the WCWSS. • Incremental groundwater development. • Desalination of seawater
Dwarskersbos	**The current water sources do not have adequate supply to cater for the short, medium and longer term future water requirements under all growth scenarios. The following sources are identified as potential sources to augment the water supply, in order of priority and implementation sequence:** • Continue with the implementation of the existing WC/WDM Strategy in order to keep the water losses and non-revenue water low and achieve savings in water consumption. • Increasing the allocation to the West Coast District Municipality from the WCWSS. • Incremental groundwater development. • Desalination of seawater.
Aurora	**It is not known whether the current water sources have adequate supply to cater for the medium and longer-term future water requirements, as their yields are unknown. It is recommended that the yields of all available sources be determined before any other interventions are considered. The following sources are identified as potential sources to augment the water supply, if the existing yield is not adequate, in order of priority and implementation sequence:** • Continue with the implementation of the existing WC/WDM Strategy in order to reduce the existing water losses and non-revenue water even further. • Incremental groundwater development. • Link up with the Saldanha Regional Scheme at Velddrif.
Eendekuil	**The current water sources have adequate supply to cater for the medium and longer-term future water requirements under a high-growth scenario until 2030.** Pending the outcome of a detailed groundwater study and the future development of Eendekuil, it is not recommended at this stage to develop surface water resources by constructing an additional dam. Should the boreholes not yield any water and growth takes place in Eendekuil, the construction of a new dam in the Diepkloof catchment area or the construction of an additional dam to store water from the Waboom River should be investigated in detail. **The following sources are identified as potential sources to augment the current water supply, in order of priority and implementation sequence:** • Continue with the full implementation of the existing WC/WDM Strategy. • Incremental groundwater development. • Recharge of aquifers from the Kruismans Stream, when required.
Redelinghuys	**The current water sources have inadequate supply to cater for the medium and longer term future water requirements. The following sources are identified as potential sources to augment the current water supply, in order of priority and implementation sequence:** • Continue with the full implementation of WC/WDM measures to reduce water losses and non-revenue water. • Incremental groundwater development.

C.9. Water Services Institutional Arrangements and Customer Services

Bergrivier Municipality is the WSA for the entire Municipal Management Area. A Service Level Agreement is in place with the West Coast District Municipality for the provision of bulk potable water to Velddrif and Dwarskersbos.

Bergrivier Municipality's WSDP was updated according to the previous WSDP format and submitted to the Council for approval on the 25th of October 2016. The Municipality plans to update the WSDP in the nearby future for the next five-year WSDP cycle (2022-2027), according to DWS's new WSDP requirements. A WSDP Performance- and Water Services Audit Report is compiled annually and taken to Council with the Annual Report. Water Services By-laws are also in place and was promulgated.

The education of users where sanitation facilities are upgraded to waterborne systems is on-going. This is primarily implemented during the low-income housing developments and informing users of the appropriate use of and routine maintenance of such facilities.

Municipal Strategic Self-Assessment (MuSSA): Overseen by the DWS the MuSSA conveys an overall business health of municipal water business and serves as a key source of information around municipal performance. The MuSSA also identifies key municipal vulnerabilities that are strategically important to DWS, the Department of Cooperative Government (DCoG), National Treasury, the planning Commission/Office of the Presidency, the South African Local Government Association (SALGA) and the municipalities themselves. The MuSSA team continues to engage (1) DWS directorates and their associated programmes (e.g. Water Services Development Plan, Water Services Regulation), and (2) other sector departments and their associated programmes (e.g. LGTAS, MISA) to minimize duplication and ensure alignment. Through the tracking of current and likely future performance, the key areas of vulnerability identified, allow municipalities to effectively plan and direct appropriate resources that will also enable DWS and the sector to provide support that is more effective.

The Spider Diagram below effectively indicates the vulnerability levels of Bergrivier Municipality for 2022 across the eighteen key service areas, as identified through the Municipal Strategic Self-Assessment of Water Services process.

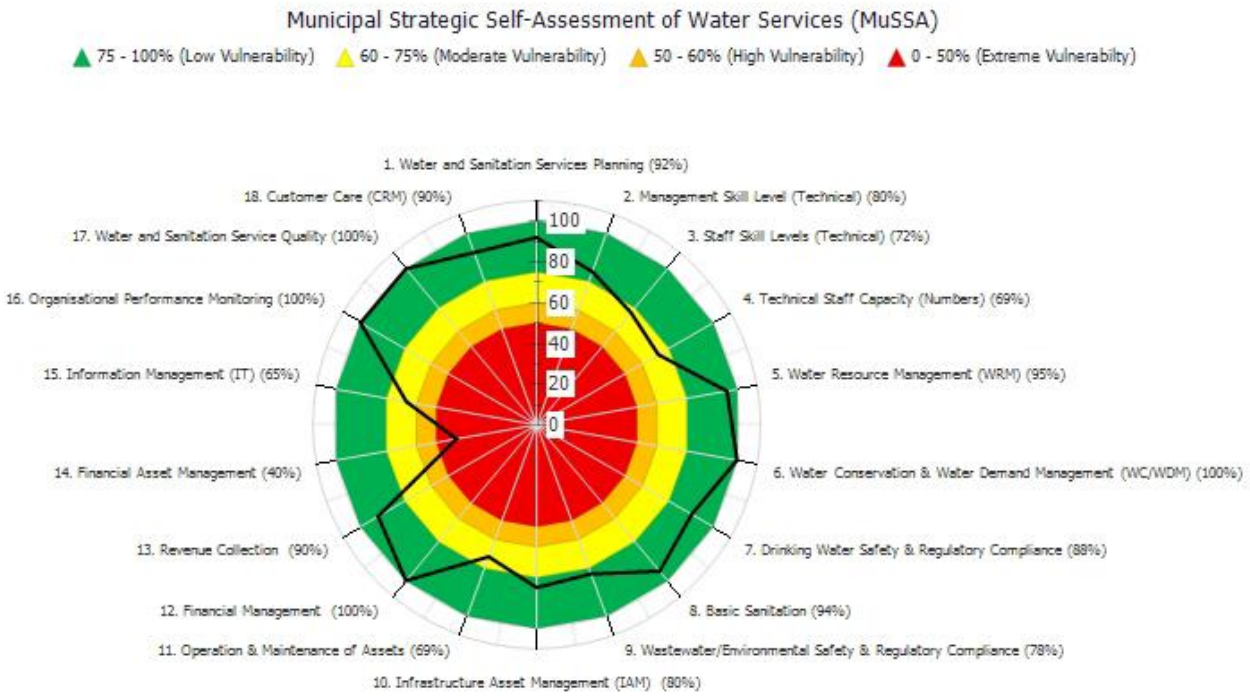


Figure C.9.1: Spider diagram of the vulnerability levels of Bergrivier Municipality for 2022

The only areas of concern evident from the 2022 assessment is Financial Asset Management (40.0%, Extreme Vulnerability). The overall vulnerability index of Bergrivier Municipality is 0.28 for the 2022 assessment (Moderate Vulnerability).

Table C.9.1: Municipal Strategic Self-Assessment (MuSSA) of Water Services for Bergrivier Municipality	
Section	**Vulnerability**
Water and Sanitation Service Quality • Critical business databases and documents (e.g. as-built drawings, records, manuals, agreements, billing/revenue collection, project and scheme management data, etc.) are current, maintained and stored in secure locations (on-site and off-site, both paper and electronic). • Customers have a functional, reliable and safe water supply system with sufficient quantity and flow, good quality and minimal interruptions. • All consumers served experience interruptions of less than 48 hours (at any given time) and a cumulative interruption time during the year of less than 15 days. • Households in your WSA experience water pressure problems (no flow/partial flow less than 10 litres / minute) (not to be confused with interruption to supply). • Customers have a functional, reliable, dignified and safe sanitation system with no blockages resulting in overflows that impact on the environment, including effective collection and treatment of faecal sludge.	**Low (100.0%)**
Customer Care • A functional customer service system manned by appropriate customer services representatives and using a complaints register, is in place to address complaints and appropriately inform customers of service interruptions, contamination of water, boil water alert, etc. • Regular municipal wide customer satisfaction surveys are conducted to determine customer satisfaction levels and inform the Customer Care Management Plan. • Please indicate what percentage of the reported water related complaints/callouts are acknowledged, including consumer response, within 24 hours. • Please indicate what percentage of the reported wastewater/sanitation related complaints/callouts are acknowledged, including consumer response, within 24 hours. • A comprehensive customer awareness programme (informing customers of water and wastewater system O&M activities, water quality, resource protection / pollution, reporting incidents / security concerns, etc.) is in place and implemented.	**Low (90.0%)**
Water and Sanitation Services Planning • Your appropriate water and sanitation services planning (e.g. WSDP) and associated master planning processes include and are aligned with appropriate Water and Sewage Master Plans, Spatial Development Framework, Water Safety Plans and Wastewater Risk Abatement Plans (W_2RAPs), and are aligned to your IDP and associated SDBIP targets. • You are implementing an up-to-date and adopted municipal water and sanitation services plan (e.g. WSDP). • Your current project list addresses existing needs / shortcomings identified through the WSDP and associated master planning process. • Project progress is monitored, tracked and reported to municipal top management / council and the Regulator (through the annual water and sanitation services report). • Projects identified through your various planning processes have been implemented in the last 3 years.	**Low (92.0%)**
Water Resource Management (WRM) • The recommendations and actions from the Reconciliation Strategies (Large Systems / All Towns) have been incorporated into your WSDP, master planning and IDP processes. • The metered quantity of water available from the resources is sufficient for your future WSA needs (at the stipulated level of abstraction and assurance of supply, and considering possible climate change impacts) (i.e. no shortage in 10 years). • The quantity of water available from the resources is sufficient for your future WSA needs (at the stipulated level of assurance of supply) (i.e. no shortage in 10 years). • The source water quality is currently acceptable for its purpose. • The trend indicates a deteriorating source water quality.	**Low (95.0%)**
WC/WDM • Your WSA has developed a council approved WC/WDM Strategy, which includes a standard water balance (e.g. modified IWA).	**Low (100.0%)**

Table C.9.1: Municipal Strategic Self-Assessment (MuSSA) of Water Services for Bergrivier Municipality	
Section	**Vulnerability**
• Please indicate your percentage Non-Revenue Water (NRW) as per the modified IWA water balance. • System input volumes (bulk) to the WSA are accurately monitored using calibrated bulk meters (e.g. check metering). • Please indicate what percentage of all connections are metered and billed (residential and non-residential (commercial, industrial, etc.)) on a monthly basis. • Your WSA is implementing appropriate intervention programmes to reduce NRW (e.g. minimisation of night flows through pressure management, removal of unlawful connections, leak detection and repairs, consumer education / awareness).	
Drinking Water Safety and Regulatory Compliance • Please indicate your microbiological drinking- water quality compliance for E.Coli (or faecal coliforms) for the communities you are monitoring for the last 12 months. • ALL your supply schemes, WTWs, process controllers, monitoring programmes, sample points, laboratories, results, procedures, protocols, etc. are managed with a suitable Water Safety Planning framework. • Council have been made aware of high risk / critical water safety plan related issues (including those identified via the Blue Drop Certification programme) that require budget and auctioning, and these issues have been actioned (where applicable). • Sufficient funds have been made available to address all these identified water safety related issues. • Required corrective actions/remedial measures to address all these identified water safety related issues have been successfully implemented.	**Low (88.0%)**
Basic Sanitation • You have formal housing areas that are not fully serviced with sanitation infrastructure. • You have informal housing or rural areas that are not fully serviced with sanitation infrastructure. • You have a detailed plan and programme to provide safe sanitation to all households (including health and hygiene education and user awareness including Water, Sanitation and Health (WASH) aspects). • Your sanitation budget is appropriate for required sanitation programmes (implementation and O&M). • You are servicing your basic sanitation facilities (e.g. pit latrines) as per safe sanitation requirements (healthy, environmentally safe, structurally sound, regularly maintained, following faecal sludge management best practices).	**Low (94.0%)**
Wastewater / Environmental Safety and Regulatory Compliance • Please indicate your treated wastewater effluent compliance for COD for your (or your service provider's) WWTWs for the last 12 months. • ALL your WWTWs, process controllers, monitoring programmes, sample points, laboratories, results, procedures, protocols, etc. are managed with a suitable waste water risk abatement framework. • Council have been made aware of all W_2RAP related issues (e.g. pollution incidents, Green Drop deficiencies) that require budget and auctioning, and these issues have been actioned (where applicable). • Sufficient funds have been made available to address all identified wastewater and environmental safety related issues. • Required corrective actions/remedial measures to address all identified wastewater and environmental safety related issues have been successfully implemented.	**Low (78.0%)**
Infrastructure Asset Management • You have an appropriate and up-to-date water and sanitation services technical Asset Register (includes asset name, location, condition, extent, remaining useful life, performance and risk). NOTE: This does only not refer to GRAP17 asset register requirements. • You have developed an appropriate Infrastructure Asset Management (IAM) Plan for your WSA. • You are implementing the IAM outcomes. • Budget allocated to implement IAM outcomes is sufficient and is being effectively spent. • You conduct annual technical assessments of your water and wastewater related systems (including sources, WTWs, WWTWs, pump stations, network, etc.) and implement required follow-up actions.	**Low (80.0%)**
Operation and Maintenance of Assets • Appropriate maintenance facility(ies) that is (are) secure and stocked with essential equipment (e.g. spare parts), plant and tools is (are) available. • Appropriate water and sanitation services infrastructure / equipment planned / preventative maintenance	**Moderate (69.0%)**

Table C.9.1: Municipal Strategic Self-Assessment (MuSSA) of Water Services for Bergrivier Municipality	
Section	**Vulnerability**
schedules are developed. • Appropriate planned / preventative maintenance is performed at all WTWs and associated reservoirs, pump stations and distribution networks. • Appropriate planned / preventative maintenance is performed at all WWTWs and associated collection systems and pump stations. • Please indicate your infrastructure repairs and maintenance costs as a function of total operating expenditure (%).	
Information Management • You have a developed, approved and implemented IT Master Systems Plan (e.g. covering 3-5 years) that addresses your IT business requirements. • You have a developed, approved and implemented ICT Technology Master Plan that addresses your current and future IT infrastructure requirements. • You have IT systems that support your full range of water and sanitation services business requirements (e.g. billing, GIS, customer care, O&M, asset management). • ICT service continuity – Adequate IT security exists with off-site back-ups / archiving of operation critical applications, databases, data, etc. routinely performed in terms of an IT disaster Recovery Plan. • You have sufficient budget and staff to keep key IT systems table and up-to-date as per IT policies and procedures.	**Moderate (65.0%)**
Organisational Performance Monitoring • Appropriate plans, policies and procedures to address Disaster Management / emergencies and other issues (safety, public participation, communication, etc.) are developed and implemented. NOTE: Although Disaster Management is a district function, LMs need to ensure they are aware of their associated roles and responsibilities and have developed a Disaster Management Framework. • An organisational performance management system is developed and implemented (i.e. effectively measure, monitor and track water and sanitation services performance indicators). • A municipal risk management framework is developed and implemented and includes monitoring and tracking of water and sanitation related risks. • Effective administration support is available to technical staff to assist with processing work orders, providing order numbers, handling correspondence, etc. • "Access to Basic Water and Sanitation Services" progress reports are frequently produced and presented to council for discussion, action and follow-up.	**Low (100.0%)**
Financial Management • Financial controls - Please state the audit opinion with regard to your last audit report on the financial statements. • Cash flow status – Please state your Cash / Cost Coverage Ratio (excluding Unspent Conditional Grants) • Your actual operating expenditure closely reflects your budgeted operating expenditure (i.e. Operating Expenditure Budget Implementation Indicator). • Your actual revenue closely reflects your budgeted operating revenue (i.e. Operating Revenue Budget Implementation Indicator). • Liabilities (Creditors) - Money is owed by your municipality to major / critical service providers (e.g. ESKOM, Water Board, largest contractors, etc.) for more than 30 days from receipt of invoice (NOTE: Ignore disputed invoices).	**Low (100.0%)**
Revenue Collection • Please indicate the frequency of actual consumer meter readings. • Net Surplus / Deficit – Please state your net surplus / deficit from water services activities for the last 12 months (NOTE: This question tests whether your WSA currently has fully cost reflective Water and Sanitation Tariffs, which take into account cost of maintenance and renewal of purification plants and networks and the cost of new infrastructure). • Revenue collections - Please state the revenue collection rate in respect to Water and Sanitation Services (%). • Revenue Growth – Please state your Water and Sanitation Services revenue growth for the last 12 months (%). • Grant dependency – Actual-operating revenue less operational grants / subsidies (e.g. equitable share) sufficiently covers actual operating expenditure.	**Low (90.0%)**
Financial Asset Management	**Extreme**

Table C.9.1: Municipal Strategic Self-Assessment (MuSSA) of Water Services for Bergrivier Municipality	
Section	**Vulnerability**
• Capital Expenditure (Municipal). Please state your municipal Capital Expenditure as a percentage of Total Expenditure (i.e. Total Operating Expenditure + Capital Expenditure). • Capital Expenditure (Water Services). Please state your Capital Expenditure on Water and Sanitation Services as a percentage of Total Capital Expenditure (Capital Expenditure (Municipal)). • Asset Renewal. Please state your Asset Renewal investment as percentage of Depreciation Costs. • Repairs and Maintenance. Please state your Repairs and Maintenance expenditure as a percentage of Property, Plant and Equipment, Investment Property (Carrying Value). • Grant funding of capital expenditure – Please state your reliance on grant funding.	**(40.0%)**
Management Skill Level (Technical) • Your council approved technical management organisational organogram meets your business requirements, and key posts are filled (e.g. Technical Director, Water Services Manager, and Sanitation Services Manager). • You have sufficient technical management and technical support staff. • Technical management and technical support staff have the correct skills / qualifications and experience as per Job Description requirements (e.g. if Job Description requires Pr Eng, Pr Tech or CPM, the staff have these qualifications). • Managers and technical support staff regularly attend appropriate water and sanitation services skills development / training to support professionalisation. • Key technical managers (e.g. Section 56 and other Senior Management) have signed and monitored Performance Agreements.	**Low (80.0%)**
Staff Skill Levels (Technical) • WTWs are operated by staff with the correct skills / qualifications and experience (as per Regulation 2834). • WWTWs are operated by staff with the correct skills / qualifications and experience (as per Regulation 2834). • Water system plumbers, mechanics and electricians have the correct skills / qualifications and experience. • Sewage system plumbers, millwrights, mechanics and electricians have the correct skills/qualifications and experience (including contractors / outsourced resources). • Staff regularly attend appropriate water services skills development / training (including safety) (e.g. ESETA courses).	**Moderate (72.0%)**
Technical Staff Capacity (Numbers) • Your council approved technical staff organisational organogram meets your business requirements, and posts are filled (i.e. Superintendent of WTWs / WWTWs and below). • WTWs are operated by the appropriate number of staff (as per Regulation 2834). • WWTWs are operated by the appropriate number of staff (as per Regulation 2834). • You have sufficient water and sewerage/sanitation network operations and repair staff/plumbers including contractors / outsourced resources (i.e. you have the appropriate number of staff). • An active mentoring/shadowing programme is in place where experienced staff train younger, inexperienced municipal staff.	**Moderate (69.0%)**

The Municipal staff is continuously exposed to training opportunities, skills development and capacity building at a technical, operations and management level in an effort to create a more efficient overall service to the users. A Workplace Skills Plan is compiled annually and the specific training needs of the personnel, with regard to water and wastewater management are determined annually. The table below gives an indication of the training interventions that were completed during the 2021/2022 financial year.

Table C.9.2: Training provided during the 2021/2022 financial year (Workplace Skills Plan)	
Training Programme	**Number of Personnel**
Water and Waste Water Process Control NQF 3	2
Water and Waste Water Treatment Process Operations NQF 2 / Process Control	5
Water and Waste Water Treatment Process Operations NQF 4	4
Water and Waste Water NQF 5	1

The WTWs and WWTWs in Bergrivier Municipality's Management Area and the Process Controllers working at these plants are registered with the DWS.

The Occupational Health and Safety Act contain provisions directing employers to maintain a safe workplace and to minimize the exposure of employees and the public to workplace hazards. It is therefore important for Bergrivier Municipality to compile a Legal Compliance Audit of all their WTWs and WWTWs, which will provide the management of Bergrivier Municipality with the necessary information to establish whether the Municipality is in compliance with the legislation or not.

Bergrivier Municipality's Organogram, which include water and sanitation services, is included in Annexure F. Bergrivier Municipality is currently effectively managing its water and sanitation services. Special focus is however required to ensure adequate rehabilitation and maintenance of the existing water and sewerage infrastructure. The Water and Sewer Master Plans guide all forward planning for water and sanitation services. The Municipality plans to updated the Water and Sewer Master Plans in the nearby future.

A comprehensive Customer Services and Complaints system is in place at Bergrivier Municipality and the Municipality has maintained a high and a very consistent level of service to its urban water consumers. After hour emergency requests are being dealt with by the control room on a twenty-four-hour basis. All water and sanitation related complaints are logged through the system in order to ensure quick response to complaints.

The table below gives an overview of the water related complaints received for the different areas for the various financial years.

Table C.9.3: Water indicators monitored by Bergrivier Municipality with regard to customer services and maintenance work

Service	Indicator	Porterville	Piketberg	Velddrif	Dwarskersbos	Aurora	Eendekuil	Redelinghuys	Total
Repair pipe bursts	Repair of burst water pipelines	45	-	-	-	-	8	10	**63**
Other	Other water complaints (Not specified)	-	-	1	-	-	-	-	**1**
Pipelines water	Inspect / repair of faulty water pipelines	1	-	-	-	-	-	-	**1**
Stop-cock	Inspect / Repair leaking stop-cocks	-	-	-	-	-	-	-	**-**
Water Pressure	Inspect / Test water pressure	-	-	1	-	-	-	-	**1**
Water Quality	Inspect / Test water quality	-	-	-	-	-	-	-	**-**
Water Supply	Faulty water supply	-	-	-	-	-	-	-	**-**
Water meters	Inspect / Test / Repair / Install	2	-	1	-	-	-	1	**4**
Total for 2021/2022		**48**	**-**	**3**	**-**	**-**	**8**	**10**	**70**
Repair pipe bursts	Repair of burst water pipelines	33	46	23	3	7	17	3	**132**
Other	Other water complaints (Not specified)	1							**1**
Pipelines water	Inspect / repair of faulty water pipelines	1							**1**
Stop-cock	Inspect / Repair leaking stop-cocks	-	-	-	-	-	-	-	**-**
Water Pressure	Inspect / Test water pressure	-	-	-	-	-	-	-	**-**
Water Quality	Inspect / Test water quality	-	-	-	-	-	-	-	**-**
Water Supply	Faulty water supply	-	-	-	-	-	-	-	**-**
Water meters	Inspect / Test / Repair / Install	7	-	1	-	-	-	1	**9**
Total for 2020/2021		**42**	**46**	**24**	**3**	**7**	**17**	**4**	**143**
Repair pipe bursts	Repair of burst water pipelines	-	-	-	-	-	-	-	-
Other	Other water complaints (Not specified)	-	1	1	-	-	-	-	**2**
Pipelines water	Inspect / repair of faulty water pipelines	-	6	-	-	-	-	-	**6**
Stop-cock	Inspect / Repair leaking stop-cocks	-	-	-	-	-	-	-	-
Water Pressure	Inspect / Test water pressure	-	-	3	-	-	-	-	**3**
Water Quality	Inspect / Test water quality	-	1	-	-	-	-	-	**1**
Water Supply	Faulty water supply	-	1	1	-	-	-	-	**2**
Water meters	Inspect / Test / Repair / Install	-	-	-	-	-	-	-	-
Total for 2019/2020		**-**	**9**	**5**	**-**	**-**	**-**	**-**	**14**
Repair pipe bursts	Repair of burst water pipelines	36	35	22	-	16	24	1	**134**

Table C.9.3: Water indicators monitored by Bergrivier Municipality with regard to customer services and maintenance work									
Service	**Indicator**	**Porterville**	**Piketberg**	**Velddrif**	**Dwarskersbos**	**Aurora**	**Eendekuil**	**Redelinghuys**	**Total**
Other	Other water complaints (Not specified)	57	-	141	3	4	5	-	**210**
Pipelines water	Inspect / repair of faulty water pipelines	36	167	22	-	16	24	6	**271**
Stop-cock	Inspect / Repair leaking stop-cocks	25	155	64	19	31	6	22	**322**
Water Pressure	Inspect / Test water pressure	16	15	1	-	6	10	-	**48**
Water Quality	Inspect / Test water quality	52	25	24	24	24	52	25	**226**
Water Supply	Faulty water supply	2	-	22	-	16	1	-	**41**
Water meters	Inspect / Test / Repair / Install	360	39	195	25	22	30	18	**689**
Total for 2018/2019 (Information from 18/19 Audit Report)		**584**	**436**	**491**	**71**	**135**	**152**	**72**	**1 941**
Repair pipe bursts	Repair of burst water pipelines	-	-	-	-	-	-	-	**-**
Other	Other water complaints (Not specified)	-	-	-	-	-	-	-	**-**
Pipelines water	Inspect / repair of faulty water pipelines	-	-	-	-	-	-	-	**-**
Stop-cock	Inspect / Repair leaking stop-cocks	1	1	-	-	-	-	3	**5**
Water Pressure	Inspect / Test water pressure	-	-	-	-	-	-	-	**-**
Water Quality	Inspect / Test water quality	-	-	-	-	-	-	-	**-**
Water Supply	Faulty water supply	-	-	-	-	-	-	2	**2**
Water meters	Inspect / Test / Repair / Install	8	-	2	-	-	-	-	**10**
Total for 2017/2018		**9**	**1**	**2**	**-**	**-**	**-**	**5**	**17**
Repair pipe bursts	Repair of burst water pipelines	-	1	-	-	-	-	-	**1**
Other	Other water complaints (Not specified)	2	-	-	-	-	-	-	**2**
Pipelines water	Inspect / repair of faulty water pipelines	6	-	-	-	-	-	-	**6**
Stop-cock	Inspect / Repair leaking stop-cocks	1	-	-	-	-	-	-	**1**
Water Pressure	Inspect / Test water pressure	-	-	-	1	-	-	-	**1**
Water Quality	Inspect / Test water quality	-	2	-	-	-	-	1	**3**
Water Supply	Faulty water supply	-	-	-	-	-	-	-	**0**
Water meters	Inspect / Test / Repair / Install	2	1	-	-	-	-	-	**3**
Total for 2016/2017		**11**	**4**	**0**	**1**	**0**	**0**	**1**	**17**
Repair pipe bursts	Repair of burst water pipelines	4	-	-	-	-	-	-	**4**
Other	Other water complaints (Not specified)	-	1	-	-	-	-	-	**1**
Pipelines water	Inspect / repair of faulty water pipelines	10	3	-	-	-	-	-	**13**
Stop-cock	Inspect / Repair leaking stop-cocks	6	-	-	-	1	-	1	**8**
Water Pressure	Inspect / Test water pressure	-	-	-	-	-	-	-	**0**
Water Quality	Inspect / Test water quality	-	-	-	-	-	-	-	**0**
Water Supply	Faulty water supply	1	-	-	-	-	-	-	**1**
Water meters	Inspect / Test / Repair / Install	13	-	11	1	-	-	-	**25**
Total for 2015/2016		**34**	**4**	**11**	**1**	**1**	**0**	**1**	**52**
Repair pipe bursts	Repair of burst water pipelines	-	-	-	-	-	-	-	**0**
Other	Other water complaints (Not specified)	1	-	-	-	-	-	-	**1**
Pipelines water	Inspect / repair of faulty water pipelines	21	7	1	-	-	-	-	**29**
Stop-cock	Inspect / Repair leaking stop-cocks	12	6	6	-	-	-	-	**24**
Water Pressure	Inspect / Test water pressure	1	-	-	-	-	-	-	**1**
Water Quality	Inspect / Test water quality	-	1	-	-	-	-	-	**1**
Water Supply	Faulty water supply	4	1	1	-	-	-	-	**6**
Water meters	Inspect / Test / Repair / Install	12	3	9	-	-	-	-	**24**
Total for 2014/2015		**51**	**18**	**17**	**0**	**0**	**0**	**0**	**86**

The table below gives an overview of the sanitation related complaints received for the different areas for the various financial years.

C.9.4: Sanitation indicators monitored by Bergrivier Municipality with regard to customer services and maintenance work									
Service	**Indicator**	**Porterville**	**Piketberg**	**Velddrif**	**Dwarskersbos**	**Aurora**	**Eendekuil**	**Redelinghuys**	**Total**
Sewer blockages	Repair blockages on main sewer pipelines up to connection points	3	-	1	-	-	-	-	**4**
Sewer manholes	Inspect / Repair manholes	2	-	2	1	-	-	-	**5**
Other	Other sewer complaints (Not specified)	-	-	3	-	1	-	-	**4**
Sewer spillage	Investigate and clean sewer spillages	-	-	-	-	-	-	-	**-**
Sewer Connections	Installation of sewer connections	-	-	1	-	-	-	-	**1**
Total for 2021/2022		**5**		**7**	**1**	**1**	**-**	**-**	**14**
Sewer blockages	Repair blockages on main sewer pipelines up to connection points	14	-	3	1	-	-	-	**18**
Sewer manholes	Inspect / Repair manholes	-	-	1	-	-	-	-	**1**
Other	Other sewer complaints (Not specified)	-	1	1	-	-	-	-	**2**
Sewer spillage	Investigate and clean sewer spillages	-	-		-	-	-	-	**-**
Sewer Connections	Installation of sewer connections	-	-	-	-	-	-	-	**-**
Total for 2020/2021		**14**	**1**	**5**	**1**	**-**	**-**	**-**	**21**
Sewer blockages	Repair blockages on main sewer pipelines up to connection points	2	-	-	-	-	-	-	**2**
Sewer manholes	Inspect / Repair manholes	1	-	2	-	-	-	-	**3**
Other	Other sewer complaints (Not specified)	1	-	1	1	1	-	-	**4**
Sewer spillage	Investigate and clean sewer spillages	-	-	-	-	-	-	-	**-**
Sewer Connections	Installation of sewer connections	-	-	-	-	-	-	-	**-**
Total for 2019/2020		**4**	**-**	**3**	**1**	**1**	**-**	**-**	9
Sewer blockages	Repair blockages on main sewer pipelines up to connection points	1 300	170	223	19	-	72	-	**1 784**
Sewer manholes	Inspect / Repair manholes	15	170	11	-	-	5	-	**201**
Other	Other sewer complaints (Not specified)	5	-	132	4	1	2	-	**144**
Sewer spillage	Investigate and clean sewer spillages	55	170	29	8	-	10	1	**273**
Sewer Connections	Installation of sewer connections	6	7	74	19	-	2	-	**108**
Total for 2018/2019 (Information from 18/19 Audit Report)		**1 381**	**517**	**469**	**50**	**1**	**91**	**1**	**2 510**
Sewer blockages	Repair blockages on main sewer pipelines up to connection points	14	4	-	-	-	-	-	**18**
Sewer manholes	Inspect / Repair manholes	-	-	-	-	-	-	-	**-**
Other	Other sewer complaints (Not specified)	1	-	-	-	-	-	-	**1**
Sewer spillage	Investigate and clean sewer spillages	-	-	-	-	-	-	-	**-**
Sewer Connections	Installation of sewer connections	1	-	-	-	-	-	-	**1**
Total 2017/2018		**16**	**4**	**-**	**-**	**-**	**-**	**-**	**20**
Sewer blockages	Repair blockages on main sewer pipelines up to connection points	14	5	3	1	-	-	1	**24**
Sewer manholes	Inspect / Repair manholes	-	-	-	-	-	-	-	**-**
Other	Other sewer complaints (Not specified)	-	1	-	-	-	-	4	**5**
Sewer spillage	Investigate and clean sewer spillages	-	-	-	-	-	-	-	**-**
Sewer Connections	Installation of sewer connections	-	-	-	-	-	-	-	**-**
Total 2016/2017		**14**	**6**	**3**	**1**	**0**	**0**	**5**	**29**
Sewer blockages	Repair blockages on main sewer pipelines up to connection points	58	3	3	-	-	-	1	**65**
Sewer manholes	Inspect / Repair manholes	-	-	-	-	-	-	-	**0**
Other	Other sewer complaints (Not specified)	-	1	-	-	-	-	-	**1**

C.9.4: Sanitation indicators monitored by Bergrivier Municipality with regard to customer services and maintenance work									
Service	**Indicator**	**Porterville**	**Piketberg**	**Velddrif**	**Dwarskersbos**	**Aurora**	**Eendekuil**	**Redelinghuys**	**Total**
Sewer spillage	Investigate and clean sewer spillages	-	-	-	-	-	-	-	**0**
Sewer Connections	Installation of sewer connections	-	1	-	-	-	-	-	**1**
Total 2015/2016		**58**	**5**	**0**	**0**	**0**	**0**	**0**	**67**
Sewer blockages	Repair blockages on main sewer pipelines up to connection points	115	19	7	-	-	-	-	**141**
Sewer manholes	Inspect / Repair manholes	-	-	-	-	-	-	-	**0**
Other	Other sewer complaints (Not specified)	1	1	-	-	-	-	-	**2**
Sewer spillage	Investigate and clean sewer spillages	-	-	-	-	-	1	-	**1**
Sewer Connections	Installation of sewer connections	-	2	-	-	-	-	-	**2**
Total 2014/2015		**116**	**22**	**7**	**0**	**0**	**1**	**0**	**146**

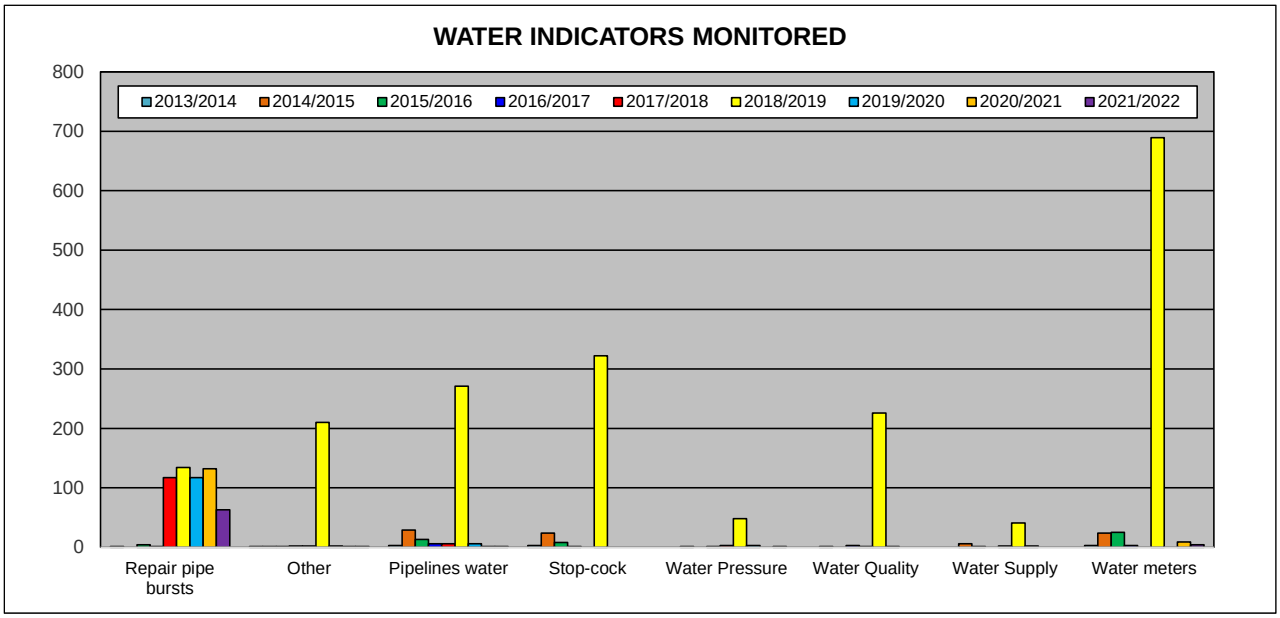


Figure C.9.2: Water indicators monitored by Bergrivier Municipality

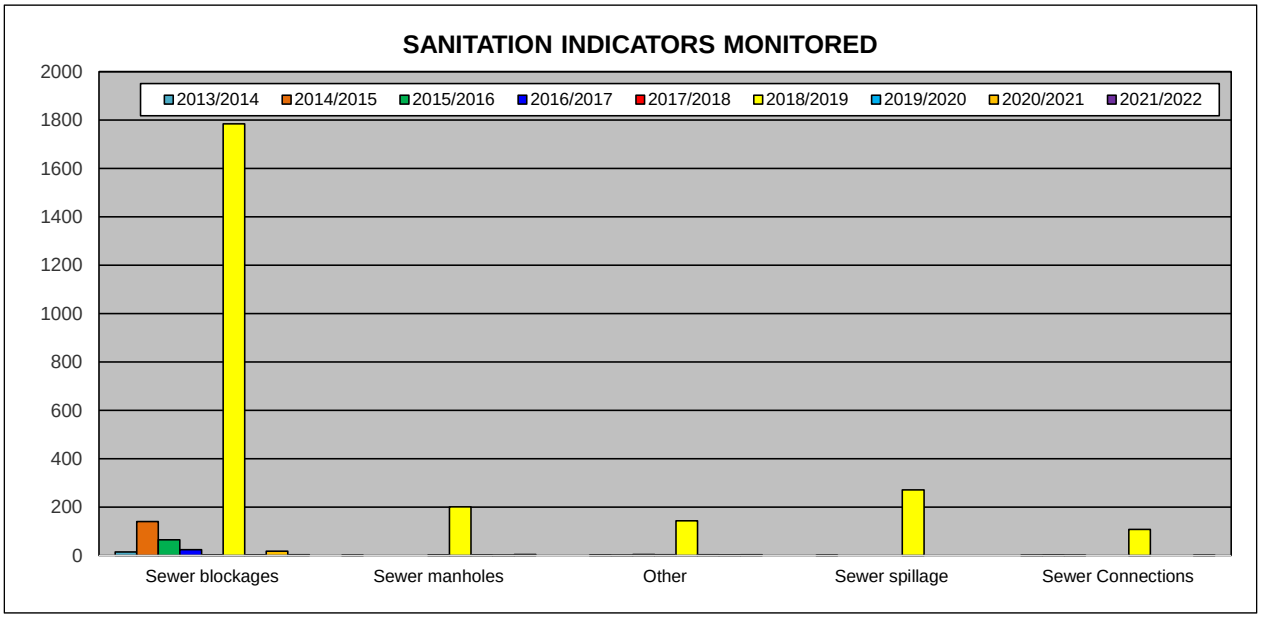


Figure C.9.3: Sanitation indicators monitored by Bergrivier Municipality

Bergrivier Municipality further developed a Client Services Charter in collaboration with various stakeholders to affirm their commitment to providing unsurpassed service delivery within the Bergrivier Municipality's Management Area. The standards for water and sewerage services, as stipulated in the Client Services Charter, are summarised in the table below:

Table C.9.5: Water and Sewerage standards as included in the Client Services Charter	
Water	
Connection	Done within five (5) working days after receipt of the completed application form.
Replacement of meters	Done within three (3) working days after the incident. Bulk meters are replaced within four (4) working days after receipt of completed application form.
Resumption of service	Within one (1) working day after payment.
Broken pipes	Repaired within one (1) working day after the incident. Repair main line broken pipes within two (2) days after the incident.
Storm damage of water source	Repaired within four (4) working days after the incident.
Sewerage	
Connection	Done within five (5) working days after receipt of the completed application form.
Collection	Done within one (1) working day after receipt of the request.
Obstruction and damage	Repaired within one (1) day after the incident.

"Community involvement and excellent client services are the building blocks of Bergrivier Municipality"

Access to safe drinking water is essential to health and is human right. Safe drinking water that complies with the SANS:241 Drinking Water specifications do not pose a significant risk to health over a lifetime of consumption, including different sensitivities that may occur between life stages. Bergrivier Municipality is therefore committed to ensure that their water quality always complies with national safety standards.

Barriers implemented by Bergrivier Municipality against contamination and deteriorating water quality include the following:

- Service Delivery Agreement between the West Coast District Municipality and Bergrivier Municipality. A Monitoring Committee with the following powers and functions are in place:
  - To co-ordinate integrated development planning in respect of the services;
  - To monitor the performance of the District Municipality in respect of service levels;
  - To monitor the implementation of this agreement;
  - To provide a forum for the local municipalities to interact with the District Municipality;
  - To accept delivery, on behalf of the Local Municipalities, of reports which the District Municipality is required to produce in terms of this agreement;
  - To consider and make recommendations to the District Municipality on the District Municipality's high level budget and key performance indicators and targets;
  - In consultation with the District Municipality, to handle, manage and make recommendations to the parties in respect of any matter related to the services which is not dealt with by this agreement;
  - To ensure that the expenses incurred by the District Municipality in respect of the services do not exceed the amount allocated therefore in the District Municipality's annual budget;
  - To formulate a written document that records the rules and procedures, which will be binding on itself, regulating the manner and legislative obligations, powers and functions to the Monitoring Committee.
- Participate in catchment management and water source protection initiatives.
- Protection at points of abstraction such as river intakes and dams (Abstraction Management).
- Correct operation and maintenance of the WTWs (Coagulation, flocculation, sedimentation and filtration).
- Protection and maintenance of the distribution systems. This includes ensuring an adequate disinfectant residual at all times, rapid response to pipe bursts and other leaks, regular cleaning of reservoirs, keeping all delivery points tidy and clean, etc.

Three other important barriers implemented by Bergrivier Municipality against poor quality drinking water that are a prerequisite to those listed above are as follows:

- A well-informed Council and municipal managers that understand the extreme importance of and are committed to providing adequate resources for continuous professional operation and maintenance of the water supply system.
- Competent managers and supervisors in the technical department who are responsible for water supply services lead by example and are passionate about monitoring and safeguarding drinking water quality.
- Well-informed community members and other consumers of water supply services that know how to protect the water from becoming contaminated once it has been delivered, that have respect for water as a precious resource and that adhere to safe hygiene and sanitation practices.

D. APPROVAL AND PUBLICATION RECORD

This Annual WSDP Performance- and Water Services Audit Report is for the 2021/2022 Financial Year and is hereby approved for submission to the Minister of the Department of Water and Sanitation, the Minister for the Department of Cooperative Governance, the Western Cape Province and to SALGA, as required by the Water Services Act, 1997. The Municipality will endeavour to publicise a summary of the report.

This report will be available for inspection at the offices of the municipality and is available on the Municipality's website. A Copy of the report is obtainable at a fee as determined by the Municipality

RECOMMENDED:

Signature — Date: 26/10/2022
Name: W Burger
Title: Acting Manager: Civil Engineering Services

Signature — Date: 26/10/2022
Name: J Breunissen
Title: Acting Director Technical Services

APPROVED:

Signature — Date: 26/10/2022
Name: Adv. H Linde
Title: Municipal Manager

REFERENCES

- SA Census Data (2011), Community Profiles.
- Water Services Act, Act 108 of 1997. Regulations under Section 9 of the Water Services Act, which include the water services audit as Section 10 of the Guidelines for Compulsory National Standards.
- DWS's Annual Water Services Development Plan Performance- and Water Services Audit Report Template, August 2014.
- DWS's 2014 Blue Drop Report and 2022 Blue Drop PAT Results.
- DWS's 2022 Green Drop Report.
- DWS's 2014 Green Drop Progress Report.
- DWS's All Towns Reconciliation Strategy Documents for each of the towns in Bergrivier Municipality's Management Area, Version 2 May 2016.
- Municipal Services Strategic Assessment (MuSSA) for Western Cape, 2022, DWS.
- Bergrivier Municipality's 2020/2021 WSDP Performance- and Water Services Audit Report, iX engineers.
- Bergrivier Municipality's Operational Budgets and Tariffs.
- Asset Register for Water and Sewerage Infrastructure Assets, June 2022.
- SDBIP of Bergrivier Municipality for 2021/2022.
- Socio-Economic Profile for Bergrivier Municipality, Provincial Treasury, 2021.
- GEOSS (2020). Groundwater Management Plan for Aurora, Western Cape, Report No: 2020/01-31. GEOSS.
- Bergrivier Local Municipality Water Augmentation Prefeasibility Study for the town of Piketberg, March 2021, ACE Consulting.
- Water Conservation and Demand Management Plan, 2020/2021, April 2021, ACE Consulting.
- Bergrivier Municipality Water Distribution System – Pipe Replacement Study, Final Report, March 2021, GLS Consulting.
- Geohydrological Assessment and Boreholes Siting at Eendekuil, West Coast, Western Cape, Report No. 2021/03-09, 19 March 2021, GEOSS.
- Groundwater Management Plan for Redelinghuys, Western Cape, Report No. 2021/03-29, 31 March 2021, GEOSS.

ATTENDANCE REGISTER (DISCUSSION OF DRAFT DOCUMENT)

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ATTENDANCE REGISTER

Meeting Subject	Bergrivier Water Services Audit		
Location Of Meeting	Bergrivier Municipality – Engineering Department	**Document No**	
Chaired By	J Human	**Date of Meeting**	26 October 2022
Recorded By	iX engineers	**Time Start**	10:00
		Time Finish	11:30

Attended by:

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			Cell No		Fax No		
11.			Tel No		E-mail		
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ANNEXURE A

Monthly Billed Metered Consumption per category user per town

Monthly number of consumer units per category per town

IWA water balance models for the various distribution systems

WTWs flows and capacities

WWTWs flows and capacities

DWS's Scorecard for assessing the potential for WC/WDM efforts

ANNEXURE B

No Drop spreadsheets and ILI for the various distribution systems

ANNEXURE C

Future water requirement projection models for the various distribution systems

ANNEXURE D

Water quality compliance sample results

Final effluent quality compliance sample results

ANNEXURE E

Water and Sanitation Operational and Maintenance Budget

ANNEXURE F

Organogram (Water and Wastewater)