BERGRIVIER MUNICIPALITY

Annual Water Services Development Plan Performance- and Water Services Audit Report

as directed by the Water Services Act (Act 108 of 1997) and the Regulations relating to Compulsory National Standards and Measures to Conserve Water

FY 2020/2021
26 October 2021

BERGRIVIER MUNICIPALITY

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BERGRIVIER MUNICIPALITY

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Approval	Final 2020/2021 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 P07671 - BERGRIVIER MUNICIPALITY: ANNUAL WSDP PERFORMANCE AND WATER SERVICES AUDIT REPORT FOR 2020/2021

REV	DESCRIPTION	ORIG	REVIEW	IX ENGINEERS APPROVAL	DATE	CLIENT APPROVAL	DATE
Draft	Draft issued for external review	R Kuffner	JT Human		21/10/2021		21/10/2021
		Author	A Reviewer	Approval		Approval	
Final	Final Report for Council approval	R Kuffner	JT Human		26/10/2021		26/10/2021
		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).

The COVID-19 Pandemic also had a negative impact on the provision of water and sanitation services in Bergrivier Municipality during the last financial year, which included the following.

- The duration of construction work for capital projects took longer, because companies had to adapt their construction plans to ensure the work continues safely and sometimes with fewer workers.
- Operational personnel had to be issued with PPE and received training on good hygiene practices to prevent the spread of COVID-19.
- Addressing complaints and response to queries sometimes took longer, because fewer personnel were available. Personnel that tested positive or that were in contact with a person with COVID-19 had to go in quarantine, which impacted negatively on service delivery.
- Shifts of Process Controllers at the Water and Wastewater Treatment Plans had to be adjusted if the Operational Personnel or the Process Controllers at the plants tested positive for COVID-19.

Bergrivier Municipality's Vulnerability Index for 2021 was indicated as 0.22 "Low Vulnerability" for the 2021 Municipal Strategic Self-Assessment (MuSSA). The only areas of concern from the 2021 assessment were for Financial Asset Management (50%) and Information Management (IT) (35%) for which the vulnerability levels were indicated as high and extreme respectively.

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 twelve 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 2020/2021 financial year, was R2.595 million (59.1% of the budget) for the water infrastructure projects and R6.289 million (74.1% 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 2020/2021 was -1.35 %/a. The overall NRW for all the systems for the 2020/2021 financial year was 364.487 Ml, which is a respectable 16.5%. The overall water losses were 360.068 Ml (16.3%).

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 (Supply to 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 "Excellent" for 2020/2021, except the "Operational Efficiency" and "Acute Health Microbiological" indicators for Piketberg that were categorised as "Unacceptable".

The overall percentages compliance of the water quality samples taken over the period July to June for the last two 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 two financial years										
Distribution System	Acute Health				Chronic Health		Aesthetic		Operational Efficiency	
	Chemical		Microbiological							
	20/21	19/20	20/21	19/20	20/21	19/20	20/21	19/20	20/21	19/20
All Systems	100.0%	100.0%	98.0%	99.8%	100.0%	99.3%	99.0%	99.6%	95.6%	94.4%

The overall percentage compliances of the final effluent samples taken over the period July to June for the last two 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 two financial years						
WWTW	Microbiological		Chemical		Physical	
	20/21	19/20	20/21	19/20	20/21	19/20
All WWTWs	77.3%	62.1%	74.6%	71.4%	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"

BERGRIVIER MUNICIPALITY

WATER SERVICES AUDIT FOR 2020/2021

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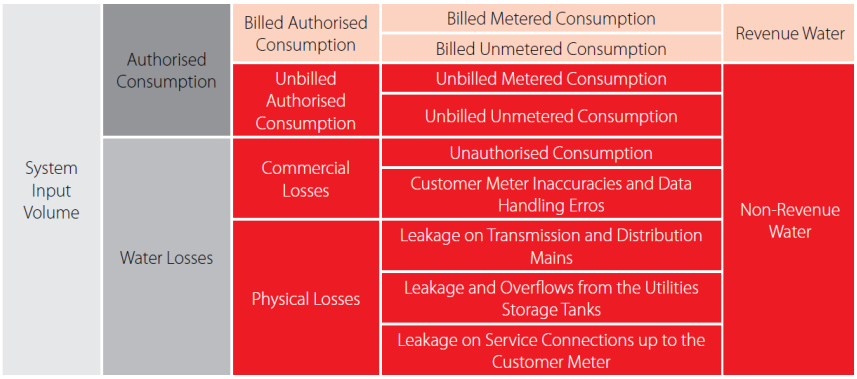
ABBREVIATIONS AND DEFINITIONS

ADWF	Average Dry Weather Flow
AIDS	Acquired Immune Deficiency Syndrome
BDS	Blue Drop System
BH	Borehole
BPT	Bulk Pressure Tank
C	Chemical
CAH	Chemical Acute Health
CCH	Chemical Chronic Health
CES	Community Engineering Services
CF	Consequence of Failure
CFO	Chief Financial Officer
CNA	Chemical Non-Health Aesthetic
COD	Chemical Oxygen Demand
CPM	Contract Programme Manager
CRC	Current Replacement Cost
CRR	Cumulative Risk Ratio
D	Disinfectant
DWQ	Drinking Water Quality
DWS	Department of Water and Sanitation
EIA	Environmental Impact Assessment
EPWP	Expanded Public Works Programme
ESETA	Energy and Water Services Sector Education and Training Authority
ESKOM	Electricity Supply Commission
GAMAP	General Accepted Municipal Accounting Practice
GIS	Geographic Information Systems
HIV	Human Immunodeficiency Virus
IAM	Infrastructure Asset Management
ICT	Information and Communications Technology
IDP	Integrated Development Plan
IDZ	Industrial Development Zone
ILI	Infrastructure Leakage Index
IMP	Incident Management Protocol
IMQS	Infrastructure Management Query System
IRIS	Integrated Regulatory Information System
IRP	Integrated Resource Planning
IWA	International Water Association
km^2	Square Kilometre
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
MAR	Mean Annual Runoff
MFMA	Municipal Finance Management Act
MIG	Municipal Infrastructure Grant
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
NGA	National Groundwater Archive
NGDB	National Groundwater Database
NQF	National Qualifications Framework
NRW	Non-Revenue Water
O	Operational
O&M	Operation and Maintenance
PAT	Progress Assessment Tool
PRP	Pipe Replacement Prioritisation
PRV	Pressure Reducing Valve
PS	Pump Station
RDP	Reconstruction and Development Programme
RR	Risk Rating
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
TMG	Table Mountain Group
Unk	Unknown
VAT	Value Added Tax
VIP	Ventilated Improved Pit
WARMS	Water Authorisation Registration and Management System
WCDM	West Coast District Municipality
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
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 2020/2021

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 2020/2021 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 2020/2021 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 2019/2020 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 2020) 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 2020/2021 financial year.

- Pipe Replacement Prioritisation Study was completed for the Piketberg and Porterville water distribution systems, GLS Consulting, March 2021.

- Groundwater Management Plan was completed for Redelinghuys, GEOSS Report No: 2021/03-29, 31 March 2021.

- Geohydrological Assessment and Borehole Siting report was completed for Eendekuil, GEOSS Report No: 2021/03-09, 19 March 2021. The aim of the study was to locate optimal targets for drilling of boreholes for groundwater abstraction on municipality-owned property.

- Bergrivier Local Municipality Water Augmentation prefeasibility study for the town of Piketberg was completed, ACE Consulting, March 2021.

- Bergrivier Municipality Water Conservation and Demand Management Plan was completed, 2020/21, ACE Consulting, April 2021.

- Water Services Infrastructure Grant (WSIG) Project Business Plan was completed for the Maturation River for the Piketberg WWTW, Phase IV, April 2021.

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 2020/2021 number of formal water consumers in Bergrivier Municipality was 9 562. The average annual growth in the number of water consumers over the period 2013/2014 to 2020/2021 was 1.8%. 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 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 actual operational and maintenance expenditure and income for the last five financial years for water and sanitation services is summarised in the table below:

Operational and maintenance expenditure and income for water and sanitation services						
Service	**Expenditure / Income**	**Actual 20/21**	**Actual 19/20**	**Actual 18/19**	**Actual 17/18**	**Actual 16/17**
Water	Expenditure	R19 205 696	R21 304 717	R20 167 157	R20 478 535	R20 772 362-34
	Income	-R35 054 863	-R30 870 115	-R26 209 734	-R21 255 934	-R35 105 263-77
	Surplus / Deficit	**R15 849 167**	**R9 565 398**	**R6 042 577**	**R777 399**	**R14 332 901-43**
Sanitation	Expenditure	R13 100 560	R12 679 726	R10 622 981	R9 987 129	R11 739 421-87
	Income	-R22 569 830	-R16 509 629	-R15 624 739	-R28 958 707	-R16 578 073-16
	Surplus / Deficit	**R9 469 270**	**R3 829 903**	**R5 001 758**	**R18 971 578**	**R4 838 651-29**

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 "Excellent" for the 2020/2021 financial year, except the "Operational Efficiency" and "Acute Health Microbiological" indicators for Piketberg that were categorised as "Unacceptable" (According to the SANS 241:2015 classification).**

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							
	20/21	19/20	20/21	19/20	20/21	19/20	20/21	19/20	20/21	19/20
Porterville	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.8%	97.0%	96.7%
Piketberg	100.0%	100.0%	93.8%	100.0%	100.0%	100.0%	97.1%	98.8%	89.4%	88.2%
Dwarskersbos	100.0%	100.0%	97.9%	100.0%	100.0%	97.9%	100.0%	100.0%	98.1%	98.4%
Velddrif	100.0%	100.0%	99.1%	100.0%	100.0%	98.3%	100.0%	100.0%	99.1%	97.9%
Aurora	100.0%	100.0%	85.5%	100.0%	100.0%	100.0%	97.0%	99.7%	94.7%	90.8%
Eendekuil	100.0%	100.0%	98.6%	98.7%	100.0%	98.6%	100.0%	99.7%	95.1%	90.8%
Redelinghuys	100.0%	100.0%	98.6%	100.0%	100.0%	97.2%	99.3%	98.9%	98.9%	96.7%
Overall Compliance	**100.0%**	**100.0%**	**98.0%**	**99.8%**	**100.0%**	**99.3%**	**99.0%**	**99.6%**	**95.6%**	**94.4%**

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 2020 to June 2021.

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 2020/2021
Porterville	8 069	2	9.6
Piketberg	14 116	2.8	9.3
Velddrif	17 091	3.4	9.6
Dwarskersbos	913	2	3.8
Aurora	632	2	5.4
Eendekuil	1 828	2	5.8
Redelinghuys	600	2	5.8
Total	**43 249**	**16.2**	**49.3**

It can be noted from the above table that the number of monthly E.Coli samples taken by the Municipality during the 2020/2021 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 two 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 two financial years						
WWTW	Microbiological		Chemical		Physical	
	20/21	19/20	20/21	19/20	20/21	19/20
Dwarskersbos	100.0%	100.0%	88.9%	91.7%	33.3%	20.8%
Eendekuil	100.0%	83.3%	100.0%	58.3%	100.0%	100.0%
Piketberg	44.4%	40.0%	77.8%	73.3%	92.6%	83.3%
Porterville	100.0%	41.7%	81.3%	75.0%	91.7%	88.9%
Velddrif	44.4%	41.7%	55.6%	63.9%	70.4%	83.3%
Overall Compliance	**77.3%**	**62.1%**	**74.6%**	**71.4%**	**78.9%**	**77.3%**

Water Conservation and Water Demand Management

A new WC/WDM Strategy was drafted for Bergrivier Municipality during the last 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 2020/2021 was -1.35 %/a.

The overall percentage of NRW for all the internal distribution systems was a respectable 16.5% for the 2020/2021 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**	**20/21**	**Record : Prior (Ml/a)**				
				19/20	**18/19**	**17/18**	**16/17**	**15/16**
Porterville	Treatment Losses	Volume	45.681	45.414	80.321	Unknown	Unknown	Unknown
		Percentage	9.8%	9.8%	17.0%	Unknown	Unknown	Unknown
	NRW	Volume	61.015	45.158	78.733	18.704	97.301	97.391
		Percentage	14.5%	10.8%	20.0%	5.3%	19.5%	18.9%
	Water Losses	Volume	60.171	44.323	77.947	18.000	96.305	96.362
		Percentage	14.3%	10.6%	19.8%	5.1%	19.3%	18.7%
	ILI		**1.70**	**1.14**		**0.47**	**2.50**	**2.57**
	The Municipality needs to work towards a target of 7.5% for the Treatment Losses. The NRW and Water Losses increased over the last financial year, but the percentages of less than 15% are still excellent for the system. The current ILI value is also excellent.							
Piketberg	Treatment Losses	Volume	60.076	49.042	40.069	104.210	136.169	126.485
		Percentage	7.50%	7.50%	7.50%	19.17%	16.25%	14.60%
	Bulk Distribution Losses	Volume	36.990	11.680	0.070	11.850	1.259	8.831
		Percentage	5.0%	1.9%	0.0%	2.7%	0.2%	1.2%
	NRW	Volume	150.126	116.729	113.793	50.231	93.754	69.401
		Percentage	20.9%	17.9%	18.8%	9.5%	11.3%	8.3%
	Water Losses	Volume	148.687	115.426	112.583	49.171	92.102	67.721
		Percentage	20.7%	17.7%	18.6%	9.3%	11.1%	8.1%
	ILI		**2.17**	**1.46**		**0.63**	**1.17**	**0.85**
	The current treatment losses is an estimate and the Municipality need to ensure that the raw water 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 increased a little over the last financial year. The Municipality needs to work towards percentages of less than 20% for the NRW and Water Losses. The current ILI value is also good.							
Velddrif	NRW	Volume	82.662	126.550	16.774	5.184	44.615	103.854
		Percentage	10.3%	15.6%	2.7%	0.8%	4.5%	10.4%
	Water Losses	Volume	81.062	124.927	15.552	3.914	42.619	101.850
		Percentage	10.1%	15.4%	2.5%	0.6%	4.3%	10.2%
	ILI		**2.20**	**2.47**		**0.08**	**0.90**	**2.19**
	The NRW and Water Losses were reduced during the last financial year. The current NRW and Water Losses of almost 10% for the system is excellent and the Municipality need to keep the percentages below 15%. The current ILI value is also good.							
Dwarskersbos	NRW	Volume	24.669	16.821	18.490	5.928	0.172	4.860
		Percentage	23.4%	19.5%	25.3%	10.0%	0.2%	4.7%
	Water Losses	Volume	24.458	16.649	18.344	5.809	-0.018	4.652
		Percentage	23.2%	19.3%	25.1%	9.8%	0.0%	4.5%
	ILI		**4.71**	**3.04**		**1.15**	**0.00**	**0.85**
	The NRW and Water Losses increased over 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 and the Municipality needs to work towards an ILI of between 2 and 4.							
Aurora	Treatment Losses	Volume	4.117	7.879	7.686	3.476	8.261	2.068
		Percentage	9.4%	18.3%	19.8%	11.1%	13.9%	4.2%

Treatment Losses, NRW, Water Losses and ILIs for the various water distribution systems								
Description	**Component**	**Unit**	**20/21**	**Record : Prior (Ml/a)**				
				19/20	**18/19**	**17/18**	**16/17**	**15/16**
	NRW	Volume	9.862	3.957	4.485	4.408	10.345	1.090
		Percentage	24.9%	11.2%	14.4%	15.8%	20.2%	2.3%
	Water Losses	Volume	9.783	3.887	4.423	4.352	10.243	0.996
		Percentage	24.7%	11.0%	14.2%	15.6%	20.0%	2.1%
	ILI		**1.05**	**0.38**		**0.44**	**1.03**	**0.03**
	The NRW and Water Losses increased over 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 1.05 however indicates an excellent system and the Municipality need to keep the ILI levels between 1 and 2.							
Eendekuil	Treatment Losses	Volume	-21.164	-10.423	-2.190	-16.429	-7.754	-14.022
		Percentage	-38.8%	-16.4%	-3.8%	-30.0%	-8.9%	-16.8%
	NRW	Volume	22.580	22.195	13.674	22.223	27.450	26.295
		Percentage	29.8%	30.0%	22.6%	31.2%	28.8%	27.0%
	Water Losses	Volume	22.428	22.047	13.553	22.081	27.260	26.100
		Percentage	29.6%	29.8%	22.4%	31.0%	28.6%	26.8%
	ILI		**4.16**	**3.96**		**4.05**	**4.96**	**4.69**
	The NRW and Water Losses were high for the last two 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 in order to accurately calculate the treatment losses. It also suggested that a bulk raw water meter be installed at the source in order to determine the bulk distribution losses. The current NRW and Water Losses of almost 30% for the last two financial years are high and needs to be reduced to levels below 25%. The ILI of above 4 also indicates a poor ILI level 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	9.379	10.534	3.959	1.243	3.209	5.741
		Percentage	16.6%	21.9%	10.5%	3.5%	6.5%	10.6%
	NRW	Volume	13.573	11.352	9.626	6.992	7.850	14.012
		Percentage	28.7%	30.2%	28.5%	20.5%	17.1%	29.0%
	Water Losses	Volume	13.479	11.277	9.558	6.924	7.758	13.915
		Percentage	28.5%	30.0%	28.3%	20.3%	16.9%	28.8%
	ILI		**4.93**	**4.29**		**3.16**	**4.25**	**7.33**
	The bulk distribution losses of above 10% 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. It is also suggested that a bulk raw water meter be installed at the source in order to determine the bulk distribution losses and the treatment losses, which currently can't be calculated. The current NRW and Water Losses of almost 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 and the Municipality needs to work towards an ILI of between 2 and 4.							
Total	**NRW**	**Volume**	**364.487**	**342.762**	**255.575**	**113.670**	**281.487**	**316.903**
		Percentage	**16.5%**	**16.2%**	**14.1%**	**6.7%**	**10.8%**	**11.9%**
	Water Losses	**Volume**	**360.068**	**338.536**	**251.960**	**110.251**	**276.269**	**311.596**
		Percentage	**16.3%**	**16.0%**	**13.9%**	**6.5%**	**10.6%**	**11.7%**
	ILI		**2.15**	**2.06**		**0.53**	**1.34**	**1.54**
	The overall NRW and Water Losses stayed roughly the same for the last two financial years. 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 2.15 for all the systems 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 2021).

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	R103 057 871		R63 268 530	61.39%	
Sewerage Infrastructure	R90 185 445		R68 630 879	76.10%	
Remaining Useful Life (Opening Costs)					
Asset Type	**0 – 5 yrs**	**6 – 10 yrs**	**11 – 15 yrs**	**16 – 20 yrs**	**> 20 yrs**
Water Infrastructure	R205 433	R12 737 661	R640 958	R10 544 803	R78 929 016
Sewerage Infrastructure	R145 025	R21 985 133	R4 276 709	R5 873 850	R57 904 728
Age Distribution (Opening Costs)					
Asset Type	**0 – 5 yrs**	**6 – 10 yrs**	**11 – 15 yrs**	**16 – 20 yrs**	**> 20 yrs**
Water Infrastructure	R21 660 822	R4 390 712	R9 723 501	R11 824 278	R55 458 558
Sewerage Infrastructure	R38 218 371	R18 839 041	R11 970 590	R5 691 254	R15 466 189
Condition Grading (Opening Costs)					
Asset Type	**0 – 5 yrs**	**6 – 10 yrs**	**11 – 15 yrs**	**16 – 20 yrs**	**> 20 yrs**
Water Infrastructure	R13 604 225	R50 192 239	R37 473 719	R1 211 170	R576 518
Sewerage Infrastructure	R22 025 858	R42 782 226	R22 907 720	R2 048 822	R420 819

The Opening Costs and Carrying Values in the above table indicate that 38.61% of the value of the water infrastructure and 23.90% 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 R0.350 million. The asset renewal needs for the **water infrastructure assets** over the next 10 years is R1.294 million per year. The reinvestment required is R0.205 million in the first 5 years and R12.738 million in the second 5-year period. The age of 53.8% of the water infrastructure assets is greater than 20 years. The asset renewal needs for the **sewerage infrastructure assets** over the next 10 years is R2.213 million per year. The reinvestment required is R0.145 million in the first 5 years and R21.985 million in the second 5-year period. The age of 17.1% of the sewerage infrastructure assets is greater than 20 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 Geohydroloigcal 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 last 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 2020/2021 requirement (%)**	**Low Annual Growth on 2020/2021 requirement (%)**	**WSDP Projection Model**
Porterville	711.385 (Y)	2041 (2%)	> 2045 (1%)	> 2045
Piketberg	945.075 (A)	2023 (4%)	2025 (3%)	2030
Velddrif	1 295.460 (L)	2036 (3%)	2044 (2%)	2031
Dwarskersbos	143.940 (L)	2030 (3%)	2035 (2%)	2036
Aurora	64.964 (Y) *	2035 (2.5%)	2045 (1.5%)	2032
Eendekuil	116.435 (Y)	2036 (2%)	2030 (3%)	> 2045
Redelinghuys	577.109 (Y)	> 2045 (2%)	> 2045 (1%)	> 2045

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 2021 was indicated as 0.22 "Low Vulnerability" for the 2021 Municipal Strategic Self-Assessment (MuSSA). The vulnerability levels of all the KPIs for the 2021 assessment were low, except for Operation and Maintenance of Assets (69%) and Financial Asset Management (50%) for which the vulnerability levels were indicated as moderate and high respectively. The only extreme vulnerability level was for Information Management (35.0%).

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 2020/2021

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 2020/2021 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 2020/2021 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 2020/2021 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 2020/2021 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.

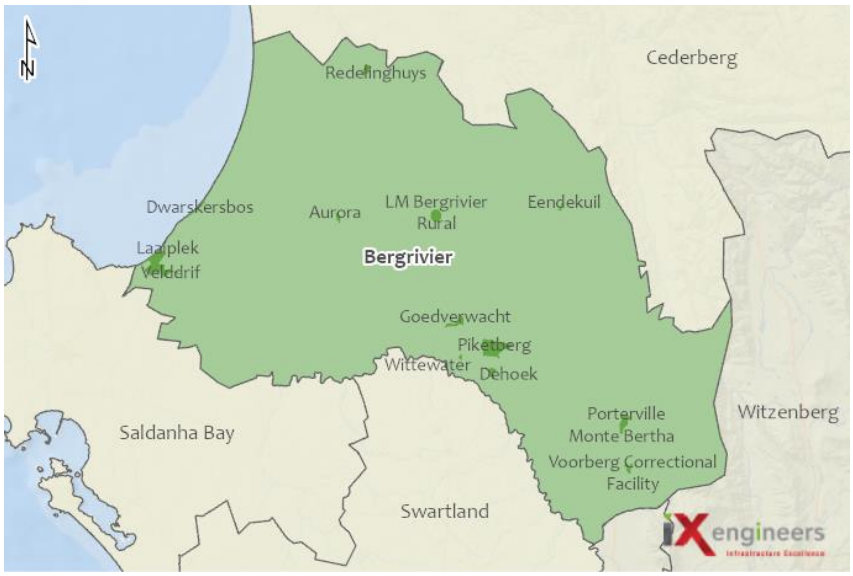


Figure A.1.2: Bergrivier Municipality’s Management Area

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. Redlinghuys 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.

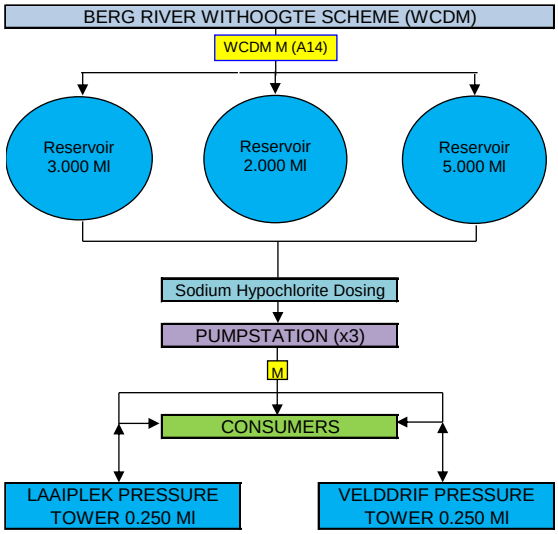
Bergrivier Municipality's Management Area includes the following areas (***Water Distribution Systems***):

- 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

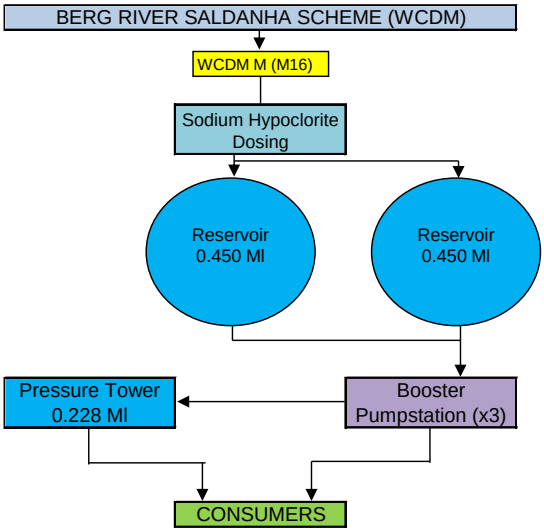
The West Coast District Municipality supplies bulk potable water to Velddrif and Dwarskersbos. Bergrivier Municipality provides bulk potable water to all the other towns and settlements.

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.

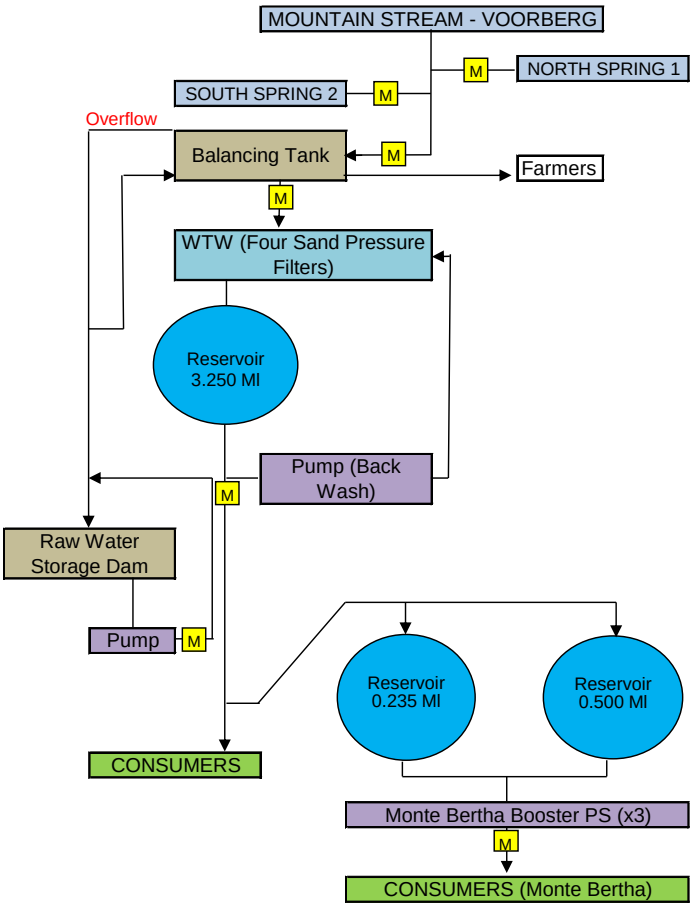


Velddrif

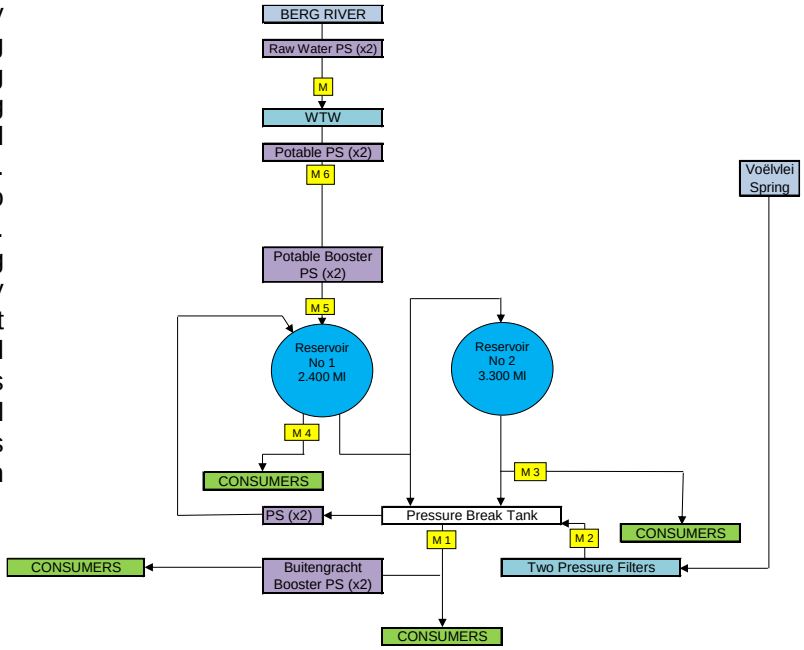


Dwarskersbos

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.

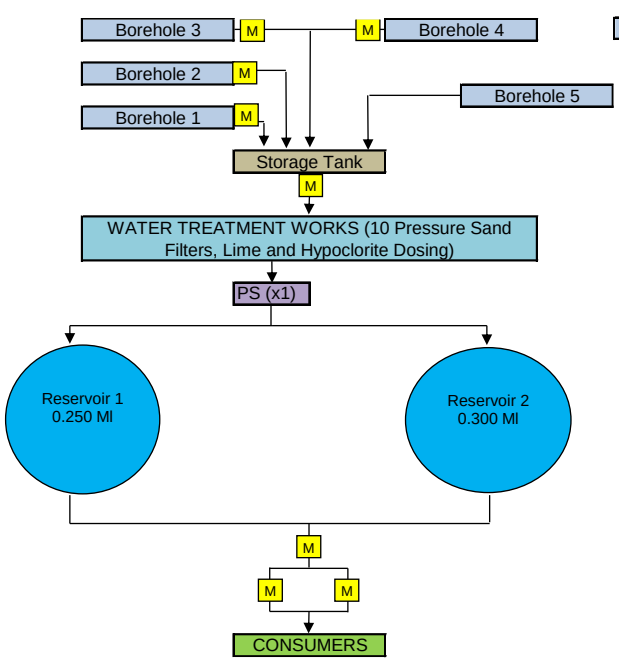


Piketberg: Bulk raw water is primarily supplied to Piketberg from the Berg River. Water is pumped from the Berg River pump station to the Piketberg WTW, where the water is treated and the final water is pumped to the town. Piketberg is allowed to abstract up to 0.704 million m³/a from the Berg River. Bulk water is also supplied to Piketberg from the Voëlvlei Spring, with roughly 11% of Piketberg's total system input volume for the last four 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.

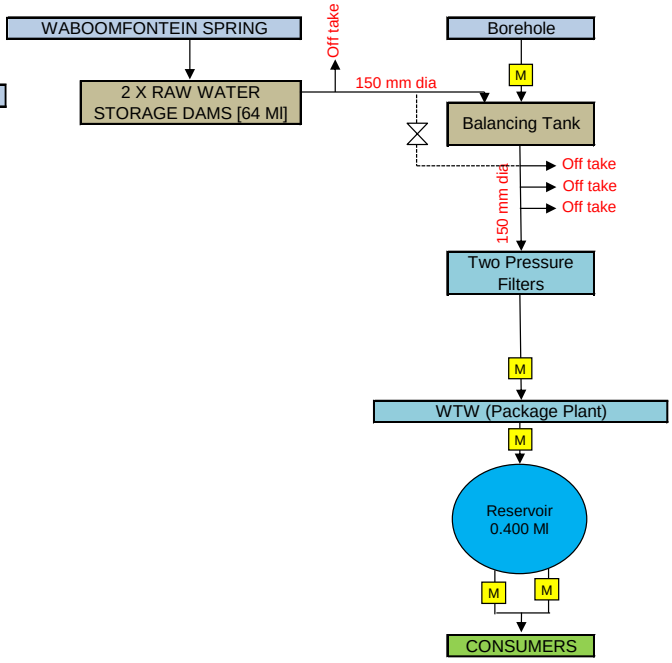


Aurora: Bulk raw water supply to Aurora is from four production boreholes. The water is pumped from the boreholes to the Aurora WTW for treatment. The WTW consists of ten pressure sand filters, with soda-ash dosing. The treated water from the WTW is pumped to the town's two reservoirs with a total storage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

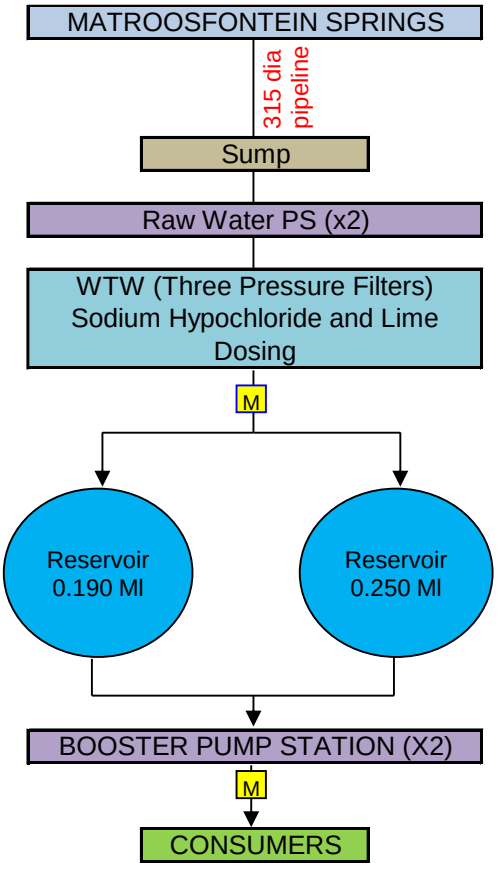


Aurora



Eendekuil

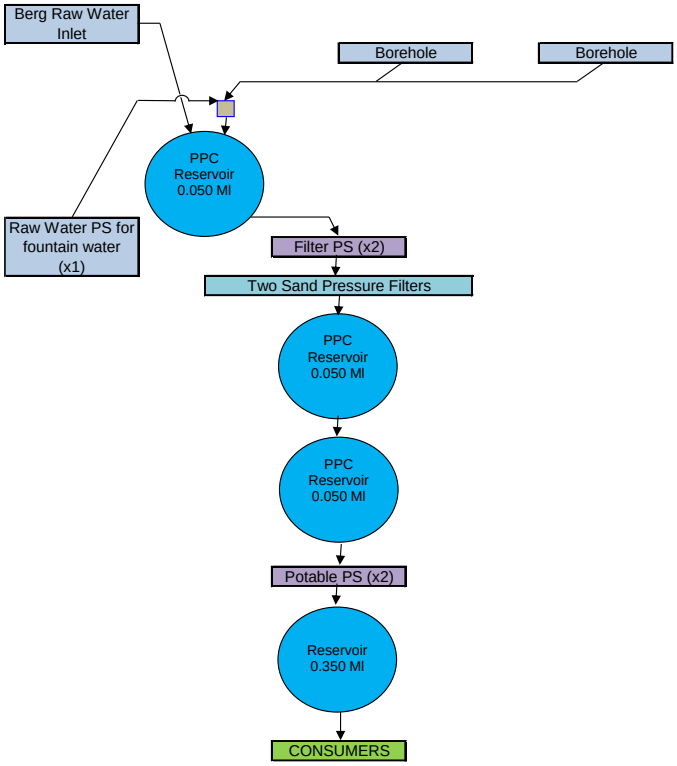
Redelinghuys: Bulk raw water gravitates to the Redelinghuys WTW from the Matroosfontein Springs via a 315mm diameter pipeline. The WTW consists of three pressure filters, with sodium hypochlorite and lime dosing. Final treated water from the WTW is pumped to the two storage reservoirs with a total capacity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



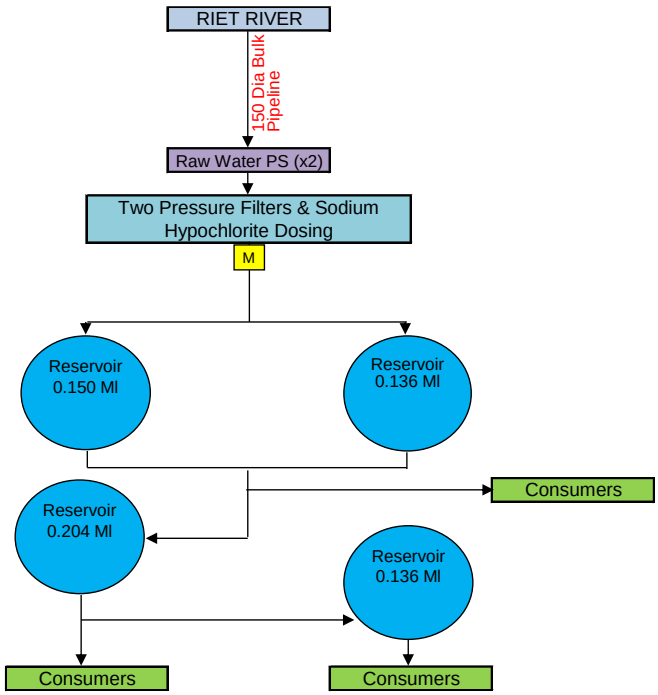
The towns managed by the Moravian Church, for which Bergrivier Municipality only provides a support service, are as follows:

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 2020 – Jun 2021)	Required Treatment Capacity (1.5 x AADD10yr)	2020/2021 Water Quality Failures (SANS0214:2015)
Porterville	2.270	1.600 (Jan 2021)	1.282	2.344	-
Piketberg	3.150	2.856 (Jan 2021)	2.195	4.510	Aluminium, Turbidity, E.Coli, Iron (Aesthetic), Total Coliform Count
Aurora	0.200	0.173 (Feb 2021)	0.120	0.209	Turbidity (Operational), Chloride, Sodium
Eendekuil	0.200	0.218 (Feb 2021)	0.150	0.400	Turbidity (Operational)
Redelinghuys	0.260	0.221 (Jan 2021)	0.155	0.270	-

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

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		
Eendekuil	13.436	7.180	-	-	1	0.400
Redelinghuys	3.208	8.515	-	1	2	0.440
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

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 2020/2021 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 (2020/2021)	Average Wet Weather Flow	Average Daily Flow as a % of Design Capacity	Final Effluent Compliance for 2020/2021 *against Authorisation*
Porterville	1.500	0.996 (Jun 21)	0.560	0.846	37.33%	Microbiological: 100.0% Chemical: 81.3% Physical: 91.7% *General Limits*
Piketberg	3.150	Unknown	1.774	Unknown	56.32%	Microbiological: 44.4% Chemical: 77.8% Physical: 92.6% *General Limits*
Velddrif	1.995	Unknown	1.315	Unknown	65.91%	Microbiological: 44.4% Chemical: 55.6% Physical: 70.4% *Licence Limits*
Dwarskersbos	0.294	Unknown	0.133	Unknown	45.24%	Microbiological: 100.0% Chemical: 88.9% Physical: 33.3% *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 (2020/2021)**	**Average Wet Weather Flow**	**Average Daily Flow as a % of Design Capacity**	**Final Effluent Compliance for 2020/2021 *against Authorisation***
Eendekuil	0.140	Unknown	0.087	Unknown	62.14%	Microbiological: 100.0% Chemical: 100.0% Physical: 100.0% *General Limits (Irrigation)*

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 2020 Socio-Economic Profile for Bergrivier Municipality (Western Cape Government) estimate the 2020 population for Bergrivier Municipality at 73 531 persons. The population is estimated to increase to 78 453 by 2024, which equates to an average annual growth of 1.63%.

The 2020/2021 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.3.6: Estimated future annual population growth percentages, population and households per distribution system			
Distribution System	**Estimated future annual Population Growth %**	**Projected 2020/2021 Persons**	**Projected 2020/2021 Households**
Porterville	1.50%	8 069	2 228
Piketberg	1.75%	14 116	3 413
Wittewater	0.50%	887	199
Goedverwacht	2.00%	2 365	644
Velddrif	5.00%	17 091	5 619
Dwarskersbos	3.50%	913	288
Aurora	1.00%	632	218
Eendekuil	2.00%	1 828	453
Redelinghuys	0.50%	600	145
Farms	1.50%	29 236	7 046
Total	**2.3%**	**75 738**	**20 253**

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.3.7: Water Services Overview (Water)

Settlement Type	2011/2012 Households	2011/2012 Population	2020/2021 Households	2020/2021 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	2,228	8,069	P		P							
Piketberg	2,920	12,075	3,413	14,116	P		P							
Wittewater	190	848	199	887	P		P							
Goedverwacht	539	1,979	644	2,365	P		P							
Velddrif	3,622	10,677	5,619	17,091	P		P							
Dwarskersbos	211	670	288	913	P		P							
Aurora	199	578	218	632	P		P							
Eendekuil	379	1,530	453	1,828	P		P							
Redelinghuys	139	574	145	600	P		P							
Sub-Total	**10,148**	**35,988**	**13,207**	**46,502**										
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**	**13,207**	**46,502**										
RURAL														
Rural / Farming					Adequate			Below RDP					None	
Farms	6,162	25,570	7,046	29,236	P		P							P
Sub-Total	**6,162**	**25,570**	**7,046**	**29,236**										
Informal Settlements					Adequate			Below RDP					None	
Sub-Total	**0**	**0**	**0**	**0**										
Sub-Total (Rural)	**6,162**	**25,570**	**7,046**	**29,236**										
TOTAL	**16,395**	**61,898**	**20,253**	**75,738**										

Table A.3.8: Water Services Overview (Sanitation)

Settlement Type	2011/2012 Households	2011/2012 Population	2020/2021 Households	2020/2021 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	2,228	8,069	P		P							
Piketberg	2,920	12,075	3,413	14,116	P		P							
Wittewater	190	848	199	887	P		P							
Goedverwacht	539	1,979	644	2,365	P		P							
Velddrif	3,622	10,677	5,619	17,091	P		P							
Dwarskersbos	211	670	288	913	P		P							
Aurora	199	578	218	632	P		P							
Eendekuil	379	1,530	453	1,828	P		P							
Redelinghuys	139	574	145	600	P		P							
Sub-Total	**10,148**	**35,988**	**13,207**	**46,502**										
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**	**13,207**	**46,502**										
RURAL														
Rural / Farming					Adequate			Below RDP					None	
Farms	6,162	25,570	7,046	29,236	P		P							P
Sub-Total	**6,162**	**25,570**	**7,046**	**29,236**										
Informal Settlements					Adequate			Below RDP					None	
Sub-Total	**0**	**0**	**0**	**0**										
Sub-Total (Rural)	**6,162**	**25,570**	**7,046**	**29,236**										
TOTAL	**16,395**	**61,898**	**20,253**	**75,738**										

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 (2017-2022 WSDP First Cycle).

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	2016/17	Year - 4
		Comment submit:	After Oct'16	Year 2	2017/18	Year - 3
		Finalised:	After Comments	Year 3	2018/19	Year - 2
		Adopted:	25/10/2016	Year 4	2019/20	Year - 1
		Published:	25/10/2016	**Year 5**	**2020/21**	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	2016/17	FY 2	2017/18	FY 3	2018/19	FY 4	2019/20	FY 5	2020/21
			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	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	Yes	Yes					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	Yes	Yes					7,346	7,458			7,508	7,526
	Provide free basic water to indigent households	Number of households receiving free basic water	Yes	Yes					1,800	1,988			1,950	2,128
	Provide free basic sanitation to indigent households	Number of households receiving free basic sanitation	Yes	Yes					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						
	Create full time equivalents (FTE's) ito EPWP programme by 30 June	Number of FTE's created by 30 June	Yes	Yes	36	83	36	91	61	142	61	142	65	105
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%	409%	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%	100%	100%						
	New water standby pumps	% Capital budget spent	-	-	100%	88%	0%	100%						
	Telemetry - Water	% Capital budget spent	-	-	100%	0%	0%	0%						
	Capital Switchgear and pumps - Velddrif	% Capital budget spent	-	-	100%	60%	0%	0%						
	Sewerage standby pumps	% Capital budget spent	-	-	100%	100%	0%	0%						
	Replace water meters	% Capital budget spent	-	-	100%	100%	0%	0%						
	Purchase new borehole pumps	% Capital budget spent	-	-	100%	100%	0%	0%						
WSDP Topic 6: Operation Maintenance														
WSDP Topic 7: Associated services														
WSDP Topic 8: Conservation and Demand management														
	Limit unaccounted for water to 10% by 30 June	% unaccounted water by 30 June	Yes	Yes	10%	9.93%	10%	6.98%	10%	9.42%	10%	13.80%	10%	15.90%
	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	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%	100%	100%						
	Replace redundant meters	% capital budget spent	-	-	100%	100%	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	2016/17	FY 2	2017/18	FY 3	2018/19	FY 4	2019/20	FY 5	2020/21
			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	No	Yes									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	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	12	12						
	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%	96%	95%	98%	95%	100%	95%	97%	95%	99%
WSDP Topic 10: Financial profile														
	95% of MIG conditional grant spent by 30 June to upgrade infrastructure	% of MIG conditional grant spent by 30 June 2018	Yes	Yes	95%	105%	95%	100%	95%	99.9%	95%	99.9%	95%	81%
	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%
	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	No	Yes									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	4	4						
	Cost effective and productive management of personnel	Number of monthly meetings held with subordinates	-	-	12	12	12	12						
	Availability of standby personnel 24 hours per day according to standby list	% Of standby personnel available	-	-	100%	100%	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		
	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
WSDP Topic 12: Social and Customer service requirements														
	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
	100% of all complaints registered on IMIS are being attended to within one week after complaint was lodged	% of complaints registered on IMIS being attended to within one week after complaint was lodged	No	Yes	100%	100%	100%	100%			100%	75%	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 2019/2020 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 2020) 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 2020/2021 financial year.

- Pipe Replacement Prioritisation Study was completed for the Piketberg and Porterville water distribution systems, GLS Consulting, March 2021.

- Groundwater Management Plan was completed for Redelinghuys, GEOSS Report No: 2021/03-29, 31 March 2021.

- Geohydrological Assessment and Borehole Siting report was completed for Eendekuil, GEOSS Report No: 2021/03-09, 19 March 2021. The aim of the study was to locate optimal targets for drilling of boreholes for groundwater abstraction on municipality-owned property.

- Bergrivier Local Municipality Water Augmentation prefeasibility study for the town of Piketberg was completed, ACE Consulting, March 2021.

- Bergrivier Municipality Water Conservation and Demand Management Plan was completed, 2020/21, ACE Consulting, April 2021.

- Water Services Infrastructure Grant (WSIG) Project Business Plan was completed for the Maturation River for the Piketberg WWTW, Phase IV, April 2021.

The following awards / acknowledgements were also received by the Municipality:

- The Municipality's overall Blue Drop score came down from 90.60% for 2012 to 63.79% for 2014 (The last assessment completed by the DWS). The highest blue drop score was 72.93% for Porterville and the lowest blue drop score was 49.29% for Eendekuil. The DWS mentioned that Bergrivier 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.

  The overall 2014 Risk Rating for Bergrivier Municipality is 52%. This risk value is based on Process Control RR, Drinking Water Quality RR and Risk Management RR, with scores above 50% (medium to critical risks) for Process Control in 4 of the 6 systems and Drinking Water Quality in 3 of the 6 systems.

- The overall Green Drop Score of the Municipality came down from 70.00% in 2011 to 44.21% in 2013 and was performing below average with regard to wastewater quality management. The highest Green Drop Score of 62.60% was for the Porterville WWTW and drainage system and the lowest Green Drop Score of 24.23% was for the Eendekuil WWTW and drainage system. The Green Water Services Audit revealed substantial shortcomings in the areas of risk- and asset management, as well as effluent quality.

The CRRs decreased in two of the systems (Dwarskersbos and Eendekuil) and stayed roughly the same for Piketberg, Porterville and Velddrif during the 2013/2014 Green Drop Progress Reporting in 2014. Upgrades to the system have been made, resulting in improved compliance at most plants. However, the Velddrif and Eendekuil plants are not meeting standards. A W_2RAP is in place and are being implemented to ensure that high-risk areas are abated. Flows are monitored at each site, with the exception of Dwarskersbos, which receive low flow to the pond system. All indicators are that Bergrivier is showing PROGRESS against the CRR rating over the 2011 to 2012 assessment year. The team is congratulated for their preparedness and positive contribution to the PAT assessments.

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	Year 0 Performance - FY2020/21			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	R12,209	R2,356	R1,172	50%	Own funding	Water	2017/2018	2022/2023	In Progress	-
2	Replace water meters	Yes	Yes	R3,143	R676	R676	100%	Borrowing	Water	2011/2012	2023/2024	In Progress	-
3	Replace redundant meters	Yes	Yes	R1,459	R344	R246	71%	Own funding	Water	2015/2016	2023/2024	In Progress	-
4	Pumps (Standby)	Yes	Yes	R1,504	R85	R90	106%	Own funding	Water	2014/2015	2023/2024	In Progress	-
5	Water renewals	Yes	Yes	R1,511	R52	R51	98%	Own funding	Water	2016/2017	2023/2024	In Progress	-
6	Furniture and Equipment - Water	Yes	Yes	R102	R10	R8	77%	Own funding	Water	2011/2012	2023/2024	In Progress	-
7	Tools	Yes	Yes	R237	R25	R23	91%	Own funding	Water	2011/2012	2023/2024	In Progress	-
8	Telemetry - Water	Yes	Yes	R925	R168	R138	82%	Own funding	Water	2016/2017	2023/2024	In Progress	-
9	Security at Reservoirs / Pump Stations	No	Yes	R915	R212	R136	64%	Own funding	Water	2019/2020	2023/2024	In Progress	-
10	Replace asbestos pipes and valves	Yes	Yes	R350	R13	R0	0%	Own funding	Water	2020/2021	2022/2023	In Progress	-
11	Replace Mains from Source	No	Yes	R200	R100	R100	100%	Own funding	Water	2020/2021	2021/2022	In Progress	-
12	Replace floor of WTW	No	Yes	R39	R50	R39	77%	Own funding	Water	2020/2021	2020/2021	Completed	2020/2021
13	Pipe Replacement programme	Yes	Yes	R1,017	R300	-R83	-28%	Borrowing	Water	2020/2021	2023/2024	In Progress	-
14	Sewer renewals	Yes	Yes	R759	R120	R273	228%	Own funding	Sewerage	2016/2017	2023/2024	In Progress	-
15	Telemetry	Yes	Yes	R1,064	R240	R229	95%	Own funding	Sewerage	2015/2016	2023/2024	In Progress	-
16	Switchgear and pumps	Yes	Yes	R1,858	R207	R69	33%	Own funding	Sewerage	2011/2012	2023/2024	In Progress	-
17	Telemetry and pump stations	Yes	Yes	R1,534	R245	R236	96%	Own funding	Sewerage	2011/2012	2023/2024	In Progress	-
18	Sewerage standby pumps	Yes	Yes	R1,730	R243	R203	84%	Own funding	Sewerage	2011/2012	2023/2024	In Progress	-
19	Furniture and Equipment - Sewerage	Yes	Yes	R103	R8	R6	77%	Own funding	Sewerage	2011/2012	2023/2024	In Progress	-
20	Tools	Yes	Yes	R182	R10	R6	64%	Own funding	Sewerage	2011/2012	2023/2024	In Progress	-
21	Fencing Sewer Pump Stations	No	Yes	R1,416	R232	R232	100%	Own funding	Sewerage	2018/2019	2023/2024	In Progress	-
22	VD Pumpline and Pumpstation	Yes	Yes	R4,405	R4,499	R2,243	50%	MIG	Sewerage	2019/2020	2021/2022	In Progress	-
23	Inlet Works (Green Drop Requirement)	No	Yes	R179	R345	R179	52%	Own funding	Sewerage	2020/2021	2020/2021	Completed	2020/2021
24	Fencing WWTW	Yes	Yes	R552	R223	R222	100%	Own funding	Sewerage	2020/2021	2022/2023	In Progress	-
25	Chlorine Contact Channels	No	Yes	R5,380	R400	R380	95%	Borrowing	Sewerage	2020/2021	2023/2024	In Progress	-
26	Inlet Works (Green Drop Requirement)	No	Yes	R236	R300	R236	79%	Borrowing	Sewerage	2020/2021	2020/2021	Completed	2020/2021
27	WSIG PV Waste Water Treatment Works	No	Yes	R1,508	R1,388	R1,508	109%	National Government	Sewerage	2020/2021	2020/2021	Completed	2020/2021
28	Replace rising mains in pump stations	No	Yes	R653	R0	R233	100%	Own funding	Sewerage	2020/2021	2023/2024	In Progress	-
29	Security at WWTW	Yes	Yes	R294	R34	R34	99%	Own funding	Sewerage	2020/2021	2023/2024	In Progress	-
Total				**R45,464**	**R12,884**	**R8,884**	**69%**						

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	270	1011	Reduce NRW and Water Losses
3	Replace redundant meters (Porterville)	WC/WDM	Porterville	98	356	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	Telemetry - Water (Velddrif)	WC/WDM	Velddrif	-	-	Monitoring water levels and water usage
9	Security at Reservoirs / Pump Stations	Security	Management Area	-	-	Improve security at water infrastructure to prevent possible vandalism and to reduce water quality security risks
10	Replace asbestos pipes and valves (Piketberg)	WC/WDM	Piketberg	-	-	Project was not started
11	Replace Mains from Source (Eendekuil)	Source	Eendekuil	1828	453	Ensure adequate supply from source
12	Replace floor of WTW (Aurora)	WTW	Aurora	-	-	Refurbishment of WTW
13	Pipe Replacement programme	WC/WDM	Management Area	-	-	Project was not started
14	Sewer renewals	Other	Management Area	-	-	Ensure adequate operation and maintenance of existing sewerage infrastructure
15	Telemetry	Other	Management Area	-	-	Monitoring of sewer pump stations and WWTW flows
16	Switchgear and pumps	Sewer Pump Stations	Management Area	-	-	Ensure adequate pump capacity, in order to prevent any possible spillages
17	Telemetry and pump stations (Velddrif)	Sewer Pump Stations	Velddrif	-	-	Monitoring of sewer pump stations
18	Sewerage standby pumps (Velddrif)	Sewer Pump Stations	Velddrif	-	-	Ensure adequate pump capacity, in order to prevent any possible spillages
19	Furniture and Equipment - Sewerage	Other	Management Area	-	-	Ensure adequate furniture and equipment for operational personnel
20	Tools	Other	Management Area	-	-	Ensure adequate operation and maintenance of existing sewerage infrastructure
21	Fencing Sewer Pump Stations (Velddrif)	Security	Velddrif	-	-	Improve security at sewer pump stations to prevent possible vandalism
22	VD Pumpline and Pumpstation (Velddrif)	Drainage network	Velddrif	200	608	Provide higher level of sanitation services to formal households. Ensure adequate pump capacity
23	Inlet Works (Green Drop Requirement)	Other	Management Area	-	-	Work towards Green Drop Compliance for WWTWs and drainage networks
24	Fencing WWTW	Security	Management Area	-	-	Improve security at WWTWs to prevent possible vandalism and drowning risks
25	Chlorine Contact Channels (Piketberg)	WWTW	Piketberg	-	-	Ensure final effluent compliance wrt Microbiological requirements.
26	Inlet Works (Green Drop Requirement)	WWTW	Velddrif	-	-	Refurbishment of inlet works at WWTW
27	WSIG PV Waste Water Treatment Works	WWTW	Porterville	-	-	Increase treatment capacity and ensure compliance with final effluent quality.
28	Replace rising mains in pump stations	Sewer Pump Stations	Velddrif	-	-	Ensure adequate pump capacity, in order to prevent any possible spillages
29	Security at WWTW	Security	Management Area	-	-	Improve security at WWTWs to prevent possible vandalism and drowning risks
TOTAL				**2397**	**2427**	

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 supply to all the towns.

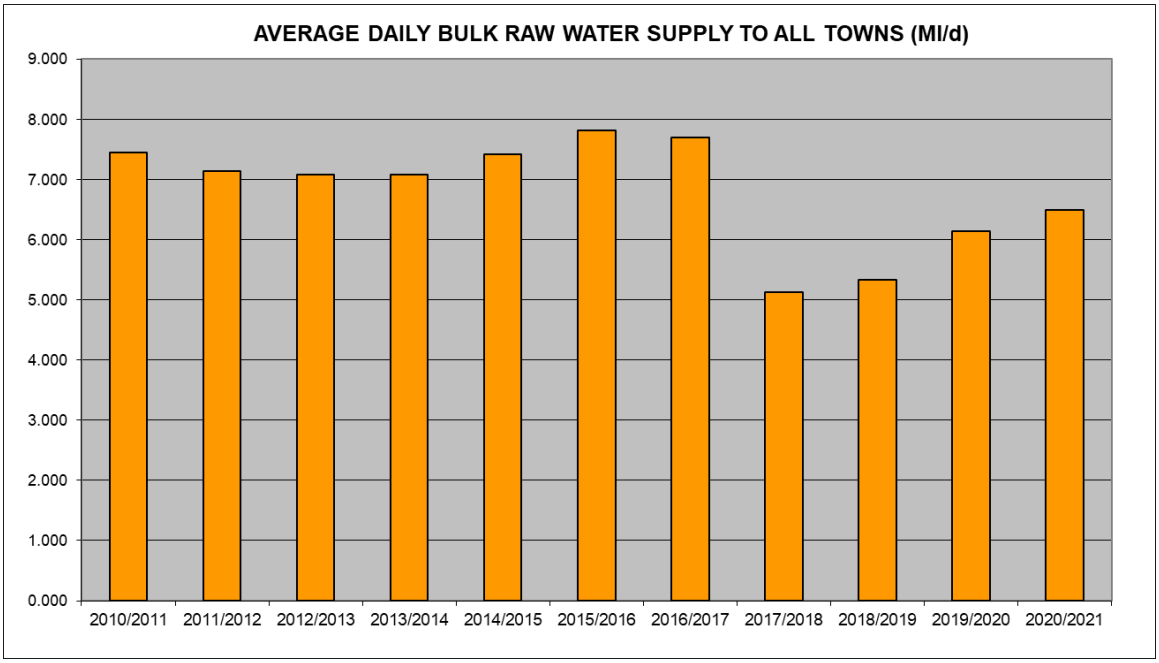


Figure C.1.1: Average daily bulk raw water supply to all the towns in Bergrivier Municipality

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

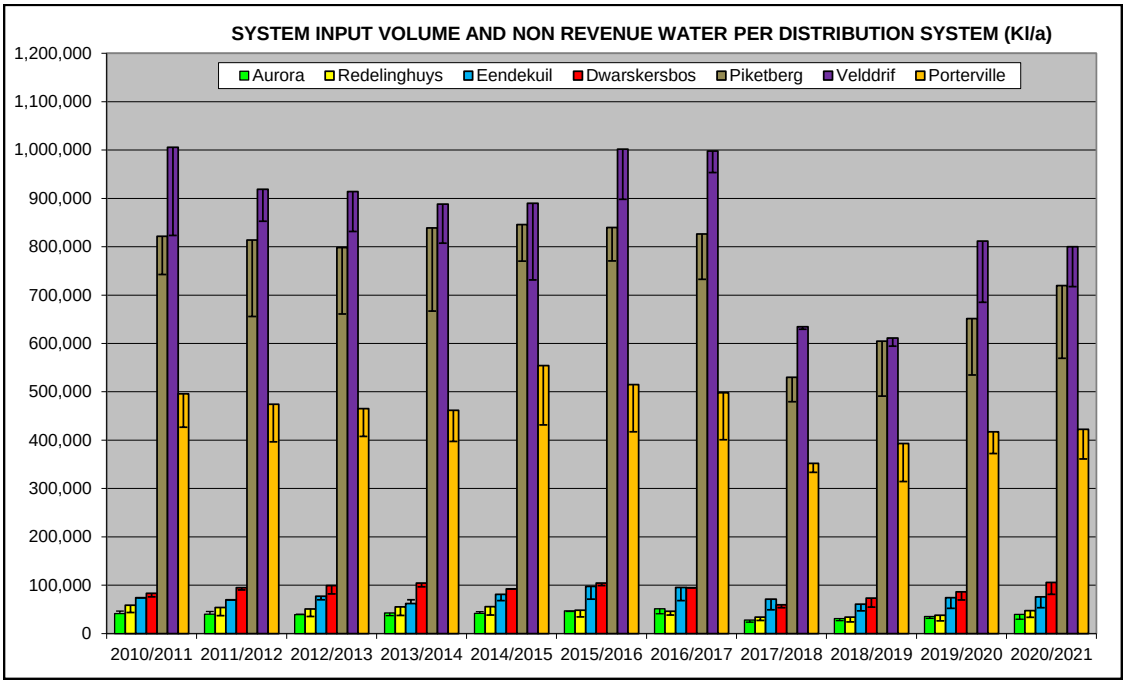


Figure C.1.2: System input volumes and NRW for the various distribution systems

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 three 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

The table below gives a summary of the total bulk raw water supply to the various towns within Bergrivier Municipality's Management Area.

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

Distribution System	Source	20/21	Record : Prior (Ml/a)				
			19/20	18/19	17/18	16/17	15/16
Porterville	Voorberg Mountain Stream and two Fountains	467.864	462.667	473.286	380.720	538.254	556.439
Piketberg	Berg River and Voëlvlei Spring	816.653	712.195	645.058	645.878	963.636	975.316
Velddrif	Withoogte Scheme (Berg River)	800.185	811.611	611.198	634.758	997.973	1 002.042
Dwarskersbos	Withoogte Scheme (Berg River)	105.625	86.058	73.096	59.366	94.801	104.231
Aurora	Boreholes	43.793	43.074	38.802	31.380	59.354	48.854
Eendekuil	Waboomfontein Spring and Borehole	84.198	82.304	67.234	79.036	105.960	108.337
Redelinghuys	Matroosfontein Spring	52.458	41.818	37.551	37.901	51.118	53.729
Total		**2 370.776**	**2 239.727**	**1 946.225**	**1 869.039**	**2 811.096**	**2 848.948**

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

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
			FY2020/21	FY2019/20	FY2018/19	FY2020/21	FY2019/20	FY2018/19
		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	2,326,983	2,196,653	1,907,422	6.38	6.02	5.23
7.1 / 7.2.3		Ground water abstracted	43,793	43,074	38,802	0.12	0.12	0.11
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**	**2,370,776**	**2,239,727**	**1,946,224**	**6.50**	**6.14**	**5.33**
	10.2 (g) (i)	**BULK WATER SUPPLY**						
7.2.6		Volume of water treated	1,304,436	1,215,631	1,123,306	3.57	3.33	3.08
7.2.7	10.2 (a) (ii)	Purchased treated water	905,810	897,669	684,294	2.48	2.46	1.87
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	**2,210,246**	**2,113,300**	**1,807,600**	**6.06**	**5.79**	**4.95**
		WATER CONSUMPTION						
7.2.8.1		Billed Metered:	1,845,759	1,770,538	1,552,025	5.06	4.85	4.25
	10.2 (a) (i)	Domestic	1,384,458	1,295,840	1,147,816	3.79	3.55	3.14
	10.2 (a) (i)	Commercial	263,884	297,173	205,563	0.72	0.81	0.56
	10.2 (a) (i)	Industrial						
	10.2 (a) (i)	Municipal, Others & Farms	197,417	177,525	198,646	0.54	0.49	0.54
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	4,420	4,227	3,615	0.01	0.01	0.01
	10.2 (g) (i)	**Sub-Total: Authorized consumption**	**1,850,179**	**1,774,765**	**1,555,640**	**5.07**	**4.86**	**4.26**
		UNACCOUNTED FOR WATER						
7.3.1		Raw water bulk loss	160,530	126,427	138,624	0.44	0.35	0.38
7.2.3/7.2.4		Billing losses	4,420	4,227	3,615	0.01	0.01	0.01
7.2.5		Apparent losses	46,809	44,010	32,755	0.13	0.12	0.09
7.2.5.1		Illegal connections	7,201	6,771	5,039	0.02	0.02	0.01
7.2.5.2		Inaccurate meters	36,007	33,854	25,196	0.10	0.09	0.07
7.2.5.3		Data errors	3,601	3,385	2,520	0.01	0.01	0.01
7.2.6		Real losses	313,258	294,526	219,205	0.86	0.81	0.60
	10.2 (g) (ii)	**Sub-Total: Unaccounted for water**	**360,067**	**338,535**	**251,960**	**0.99**	**0.93**	**0.69**
		WASTEWATER TREATMENT						
7.2.9	10.2 (a) (iii)	Total received at WWTW	1,461,542	1,396,314	1,207,791	4.00	3.83	3.31
7.2.11		Total discharged	1,204,215	1,154,669	1,001,583	3.30	3.16	2.74
7.2.13		Returned to environment	790,793	763,515	663,236	2.17	2.09	1.82
7.2.14		Recycled	413,422	391,154	338,347	1.13	1.07	0.93
	10.2 (a) (iv)	**Quantity of water supplied not discharged to WWTWs**	**388,637**	**378,451**	**347,849**	**1.06**	**1.04**	**0.95**

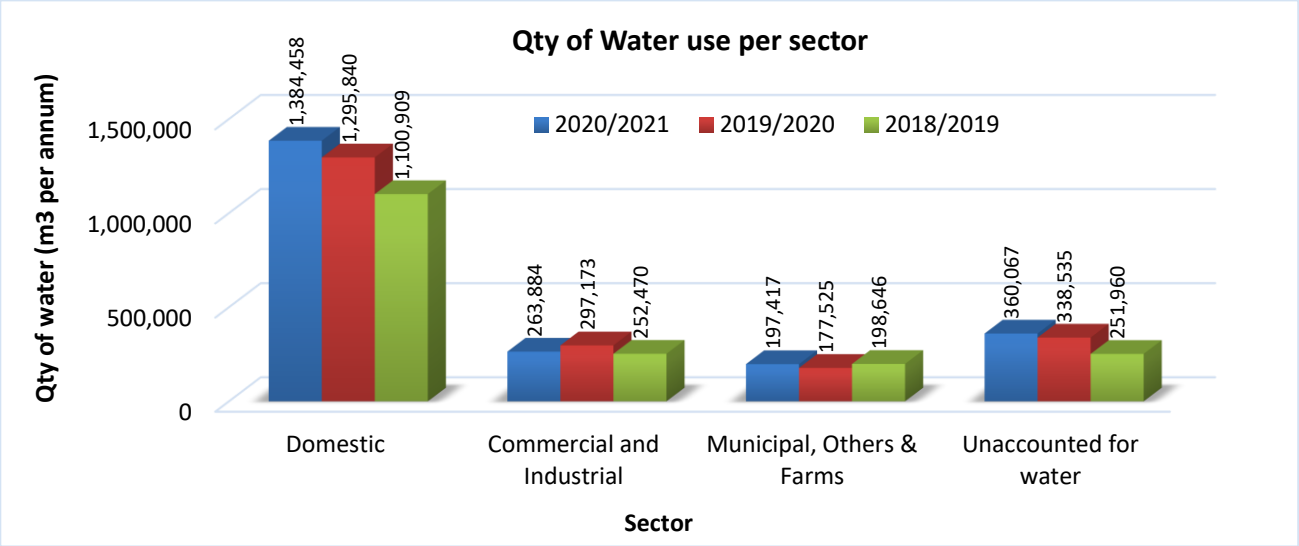


Figure C.1.3: Quantity of water services provided / water balance

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
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
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
	14/15	653.515		0.000	71.219	6.577	0.000	731.311

Table C.1.3: Quantity of water used by each user sector (Ml/a)								
Town	**Year**	**Residential**	**Commercial**	**Industrial**	**Municipal**	**Other**	**Farms**	**Total**
	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
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
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
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
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
	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
TOTAL	**10/11**	**1 828.615**		**47.094**	**231.153**	**70.620**	**54.962**	**2 232.444**

Table C.1.3: Quantity of water used by each user sector (Ml/a)								
Town	**Year**	**Residential**	**Commercial**	**Industrial**	**Municipal**	**Other**	**Farms**	**Total**
	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**

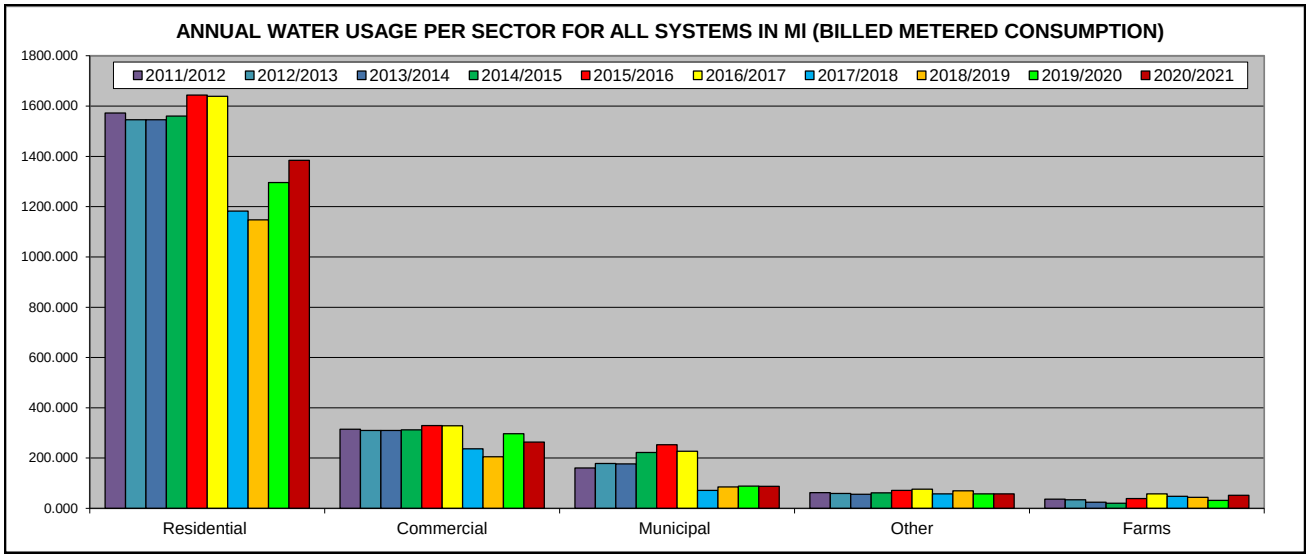


Figure C.1.4: Annual water usage per sector for all systems (Billed metered consumption)

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 2020/2021 financial year for the Velddrif- and Piketberg WWTW, due to vandalism and damaged flow meters. Accurate flow readings were only available for an eight month period for the Porterville WWTW, due to the upgrade of the works. The influent received at the Porterville-, Piketberg- and Velddrif 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	20/21	Record : Prior (Ml/a)				
		19/20	18/19	17/18	16/17	15/16
Porterville	*253.310**	*250.352**	*235.779**	212.643	250.359	230.070
Piketberg	*647.628**	*586.326**	*544.427**	737.271	887.273	888.253
Velddrif	*480.111**	*486.967**	*366.719**	279.270	287.420	277.040
Eendekuil	*31.919***	*31.127***	*28.102***	*29.345***	*40.748***	*42.725***
Dwarskersbos	48.574**	*41.542***	*32.764***	*32.063***	*56.777***	*59.623***
Total	**1 461.542**	**1 396.314**	**1 207.791**	**1 290.592**	**1 552.577**	**1 497.711**

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.		

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.		

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 2021).

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

WSDP Ref. #	Category of users	Water Services						
		Year 0 FY2020/21		Year - 1 FY2019/20		Year - 2 FY2018/19		New Connections Year 0 FY2020/21
		Nr	%	Nr	%	Nr	%	Nr
	RESIDENTIAL (DOMESTIC)							
3.3	Metered: Uncontrolled	9,007	94%	8,804	94%	8,648	94%	203
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	**9,007**	**94%**	**8,804**	**94%**	**8,648**	**94%**	**203**
	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	114	1%	100	1%	97	1%	14
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	**123**	**1%**	**109**	**1%**	**106**	**1%**	**14**
	INDUSTRIAL							
3.3	Dry industries	46	0%	46	0%	46	1%	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	271	3%	266	3%	254	3%	5
3.3	Office Buildings (Incl. with Businesses)	0	0%	0	0%	0	0%	0
	Sub-Total: Commercial	**271**	**3%**	**266**	**3%**	**254**	**3%**	**5**
	MINING							
	Mining	0	0%	0	0%	0	0%	0
	Sub-Total: Commercial	**0**	**0%**	**0**	**0%**	**0**	**0%**	**0**
	OTHER							
	Agriculture: raw water	27	0%	28	0%	34	0%	-1
	Other	47	0%	46	0%	48	1%	1
	Sub-Total: Other	**74**	**1%**	**74**	**1%**	**82**	**1%**	**0**
	TOTAL	**9,562**	**100%**	**9,340**	**100%**	**9,177**	**100%**	**222**

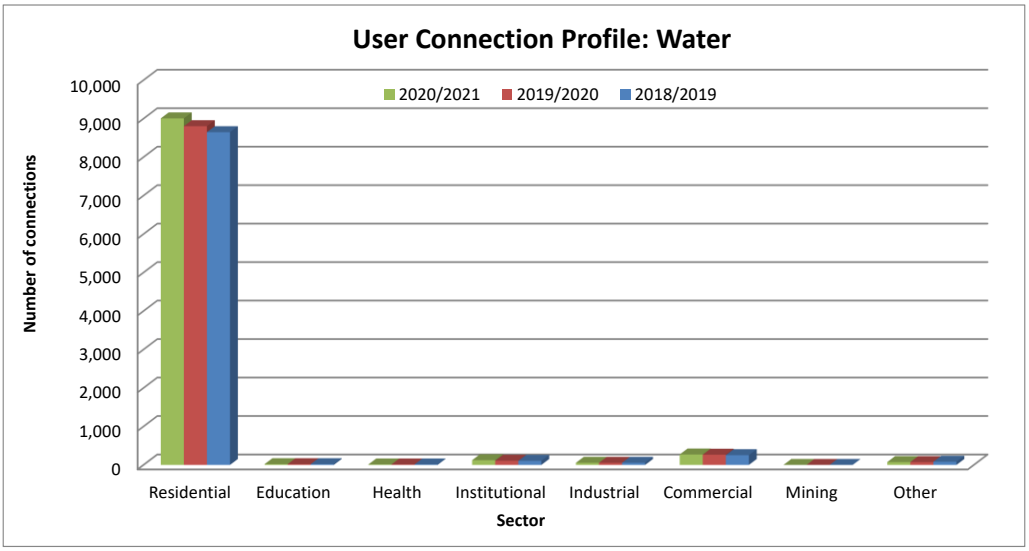


Figure C.2.1.1: User connection profile for water

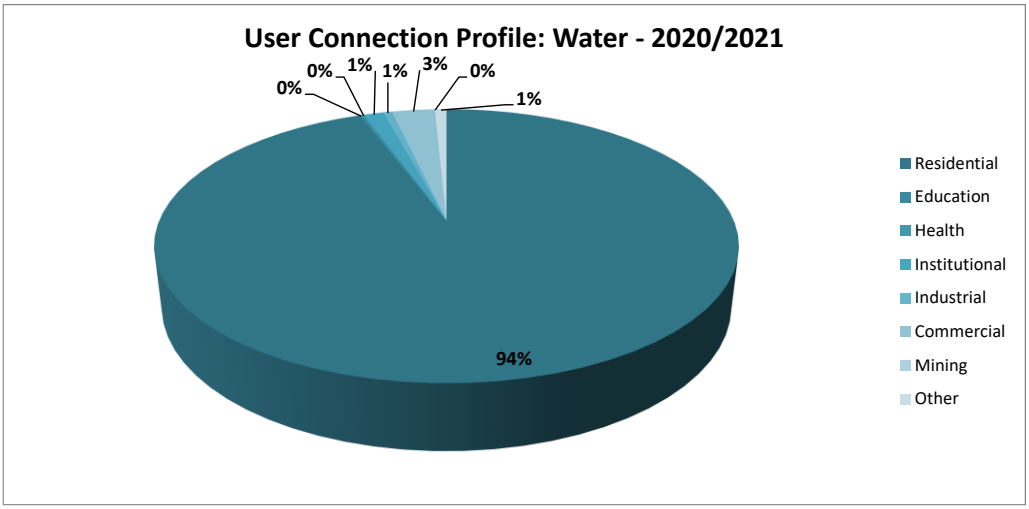


Figure C.2.1.2: User connection distribution for water – Year 2020/2021

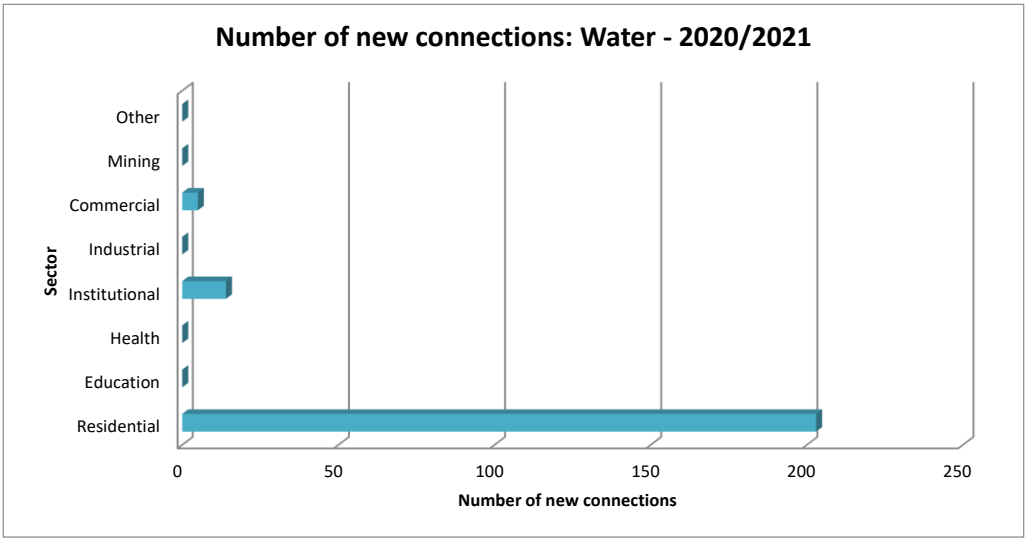


Figure C.2.1.3: Number of new water connections provided during 2020/2021

Table C.2.1.2: User Connection Profile (Wastewater Services)								
WSDP Ref. #	Category of users	Wastewater Services						
		Year 0 FY2020/21		Year - 1 FY2019/20		Year - 2 FY2018/19		New Connections Year 0 FY2020/21
		Nr	%	Nr	%	Nr	%	Nr
	RESIDENTIAL (DOMESTIC)							
3.3	Metered: Uncontrolled	9,007	94%	8,804	94%	8,648	94%	203
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	**9,007**	**94%**	**8,804**	**94%**	**8,648**	**94%**	**203**
	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	114	1%	100	1%	97	1%	14
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	**123**	**1%**	**109**	**1%**	**106**	**1%**	**14**
	INDUSTRIAL							
3.3	Dry industries	46	0%	46	0%	46	1%	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	271	3%	266	3%	254	3%	5
3.3	Office Buildings (Incl. with Businesses)	0	0%	0	0%	0	0%	0
	Sub-Total: Commercial	**271**	**3%**	**266**	**3%**	**254**	**3%**	**5**
	MINING							
	Mining	0	0%	0	0%	0	0%	0
	Sub-Total: Commercial	**0**	**0%**	**0**	**0%**	**0**	**0%**	**0**
	OTHER							
	Agriculture: raw water	27	0%	28	0%	34	0%	-1
	Other	47	0%	46	0%	48	1%	1
	Sub-Total: Other	**74**	**1%**	**74**	**1%**	**82**	**1%**	**0**
	TOTAL	**9,562**	**100%**	**9,340**	**100%**	**9,177**	**100%**	**222**

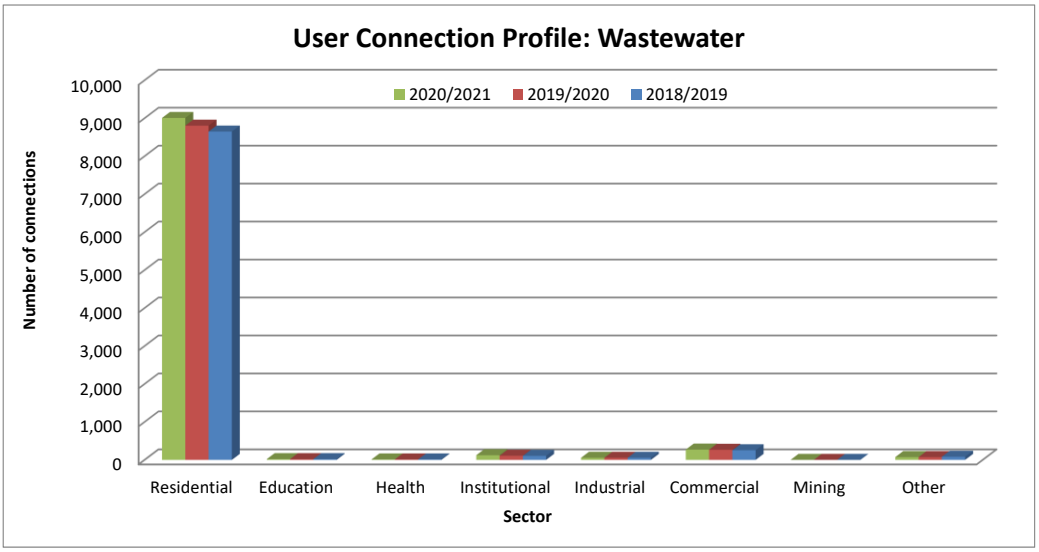


Figure C.2.1.4: User connection profile for wastewater

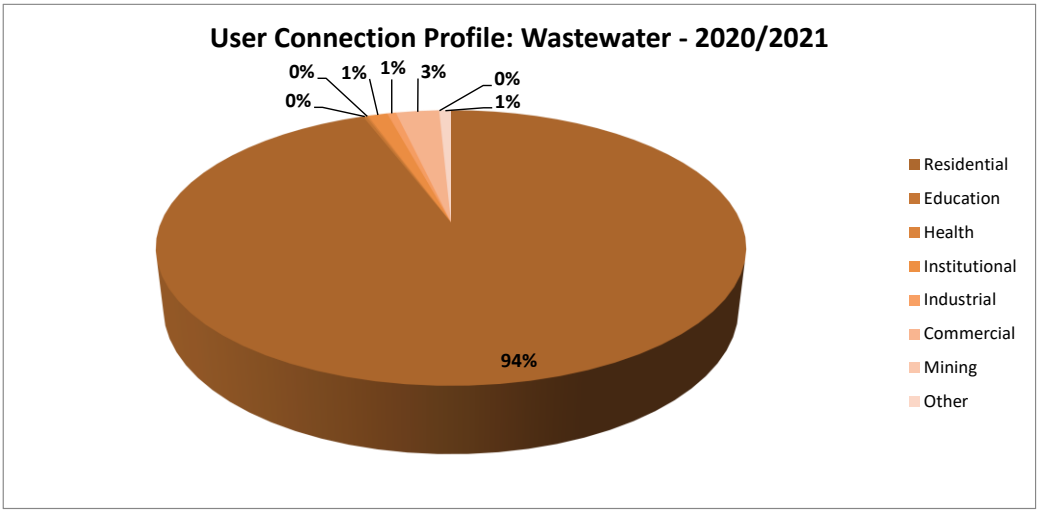


Figure C.2.1.5: User connection distribution for wastewater – Year 2020/2021

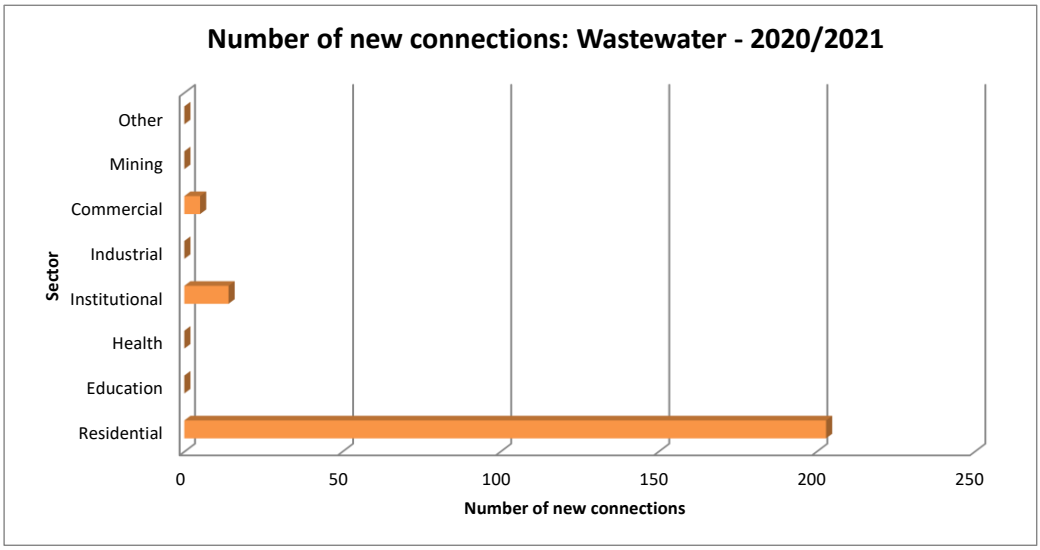


Figure C.2.1.6: Number of new wastewater connections provided during 2020/2021

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**
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**
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**
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**
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**
Eendekuil	13/14	343		4	-	-	-	**347**
	14/15	349		4	-	-	-	**353**
	15/16	350		5	-	-	-	**355**
	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**

Table C.2.1.3: Number of user connections in each user sector per town								
Town	**Year**	**Residential**	**Commercial**	**Industrial**	**Municipal**	**Other**	**Rural**	**Total**
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**
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**

Table C.2.1.4: Total number of consumer units per town and percentage annual growth from 2013/2014 to 2020/2021									
Distribution System	**Annual Growth % (13/14 – 20/21)**	**20/21**	**19/20**	**18/19**	**17/18**	**16/17**	**15/16**	**14/15**	**13/14**
Porterville	0.76%	1 676	1 680	1 626	1 657	1 656	1 588	1 595	1 589
Piketberg	0.35%	2 552	2 510	2 532	2 473	2 515	2 554	2 565	2 491
Velddrif	3.00%	3 969	3 826	3 717	3 552	3 467	3 373	3 288	3 228
Dwarskersbos	6.43%	546	509	494	440	423	406	373	353
Aurora	0.73%	263	257	250	245	250	252	251	250
Eendekuil	-0.29%	340	357	361	346	350	355	353	347
Redelinghuys	2.48%	216	201	197	193	193	193	187	182
TOTALS	**1.80%**	**9 562**	**9 340**	**9 177**	**8 906**	**8 854**	**8 721**	**8 612**	**8 440**

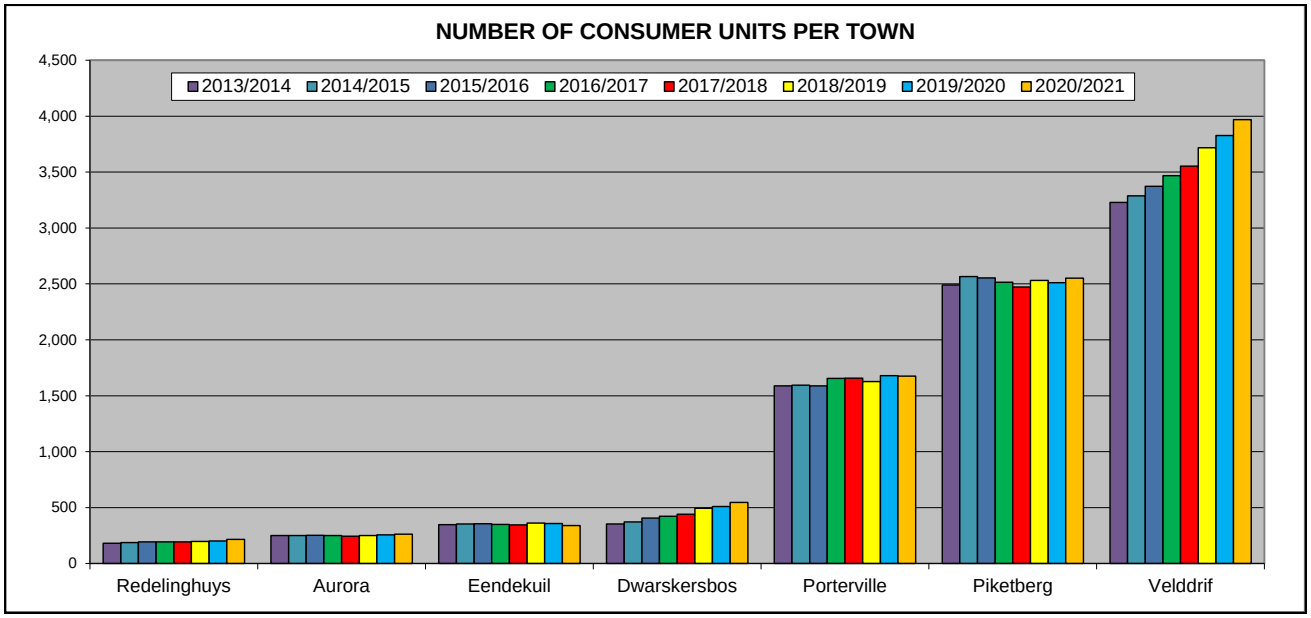


Figure C.2.1.7: Number of consumer units per town for the last eight financial years.

The number of new water and sanitation connection made:

200 New water connections and 172 new sewer connections were provided during the 2020/2021 financial year, according to the financial records. These numbers are different from the number with which the average number consumer units increased from 2019/2020 to 2020/2021, 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 2017/2018 to 2020/2021

Distribution System	New Water Connections				Water Meters Replaced				Water Meters Tested				New Sewer Connections			
	20/21	19/20	18/19	17/18	20/21	19/20	18/19	17/18	20/21	19/20	18/19	17/18	20/21	19/20	18/19	17/18
Porterville	8	6	6	6	42	108	6	417	2	4	4	0	6	7	6	1
Piketberg	9	10*	5	10	60	Unk	18	45	1	Unk	0	0	9	5*	7	8
Velddrif and Dwarskersbos	169	86	117	83	297	127	213	137	10	Unk	7	0	155	59*	93	25
Aurora	0	5*	5	0	8	Unk	22	14	0	Unk	0	0	0	0	0	0
Eendekuil	3	0	2	2	6	6	2	3	0	0	0	0	2	0	2	1
Redelinghuys	11	6	24	4	0	0	34	0	0	0	0	0	0	0	0	0
TOTALS	**200**	**113**	**159**	**105**	**413**	**241**	**295**	**616**	**13**	**4**	**11**	**0**	**172**	**71**	**108**	**35**

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 last 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 FY2020/21**		**Year - 1 FY2019/20**		**Year - 2 FY2018/19**	
		Nr	**%**	**Nr**	**%**	**Nr**	**%**
	WATER (ABOVE MIN LEVEL)						
Piped (tap) water inside dwelling/institution	House connections	15,609	76%	15,288	76%	15,016	77%
Piped (tap) water inside yard	Yard connections	4,723	23%	4,582	23%	4,348	22%
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	**20,460**	**100%**	**19,998**	**100%**	**19,492**	**99%**
	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**	**1%**
	Total number of households	**20,559**	**100%**	**20,097**	**100%**	**19,591**	**100%**

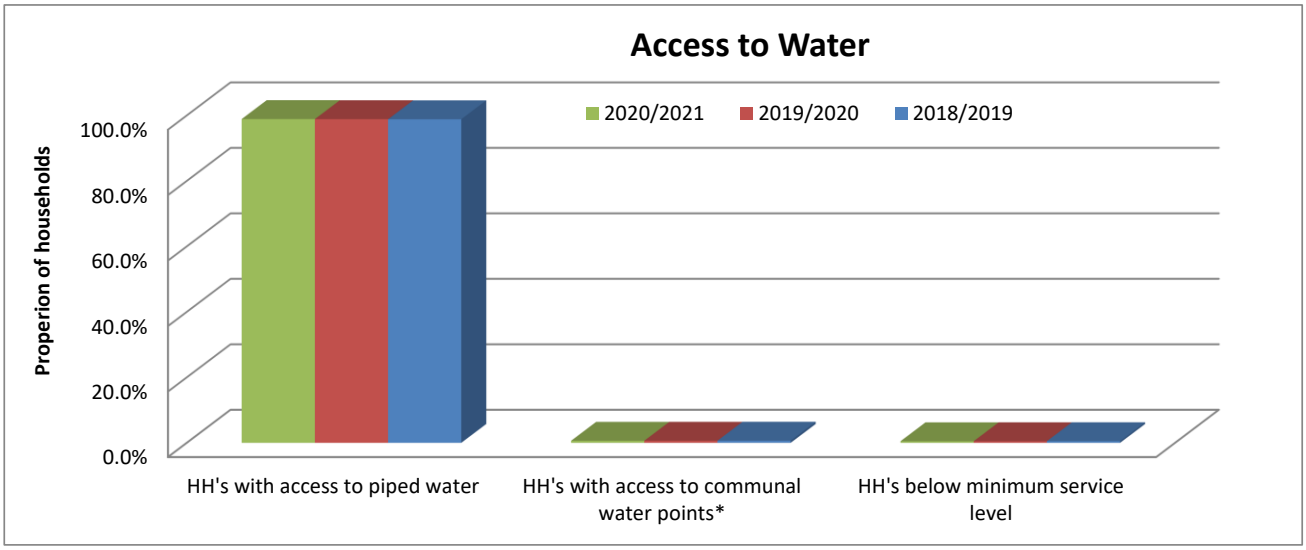


Figure C.2.2.1: Household water access profile

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)]	1 080	644	1 796	0	0	0	0	143	0	1 060	4 723
House Connections [1)]	2 333	1 584	3 823	527	239	195	191	310	642	5 765	15 609
Total Adequate	**3 413**	**2 228**	**5 619**	**527**	**239**	**197**	**191**	**453**	**644**	**6 949**	**20 460**
Total per Area	**3 413**	**2 228**	**5 619**	**527**	**239**	**199**	**191**	**453**	**644**	**7 046**	**20 559**

Notes: 1) Number of residential consumer units for the various towns for 2020/2021, 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 (2020/2021) – Number of residential consumers units (2020/2021) = 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 FY2020/21		Year - 1 FY2019/20		Year - 2 FY2018/19	
		Nr	%	Nr	%	Nr	%
	SANITATION (ABOVE MIN LEVEL)						
Flush toilet (connected to sewerage system)	Waterborne	10,825	53%	10,504	52%	10,125	52%
	Waterborne: Low Flush	0	0%	0	0%	0	0%
Flush toilet (with septic tank)	Septic tanks / Conservancy	8,523	41%	8,382	42%	8,255	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	**19,466**	**95%**	**19,004**	**95%**	**18,498**	**94%**
	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	3%	516	3%	516	3%
	Sub-Total: Below Minimum Service Level	**1,093**	**5%**	**1,093**	**5%**	**1,093**	**6%**
	Total number of households	**20,559**	**100%**	**20,097**	**100%**	**19,591**	**100%**

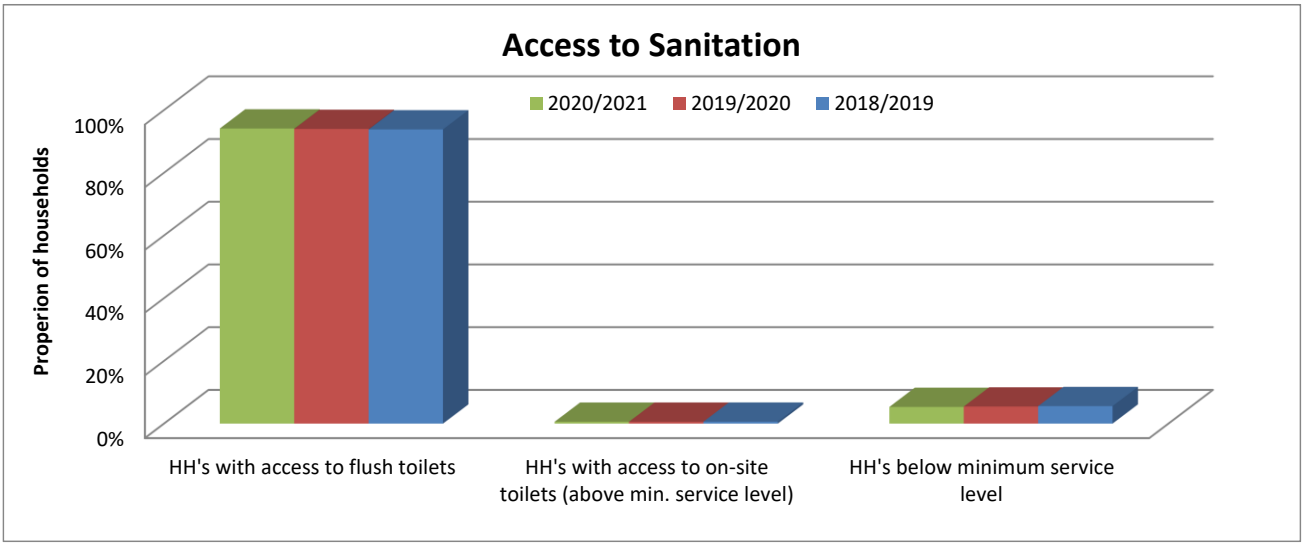


Figure C.2.2.2: Household sanitation access profile

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	1 102	176	239	145	191	137	555	5 978	8 523
Waterborne WWTW	3 413	2 228	4 517	351	0	0	0	316	0	0	10 825
Total Adequate [2)]	**3 413**	**2 228**	**5 619**	**527**	**239**	**175**	**191**	**453**	**564**	**6 022**	**19 431**
Total per Area	**3 413**	**2 228**	**5 619**	**527**	**239**	**199**	**191**	**453**	**644**	**7 046**	**20 559**

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 2020/2021 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.

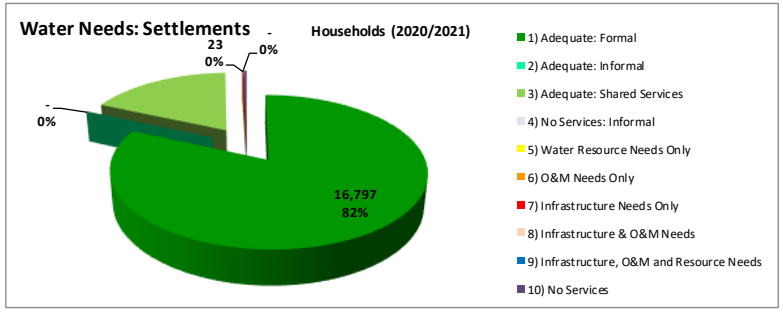
6) Adequate Housing Permanent in the above table is the number of households in informal areas with communal ablution facilities. Municipality confirmed there are no informal areas in their area.

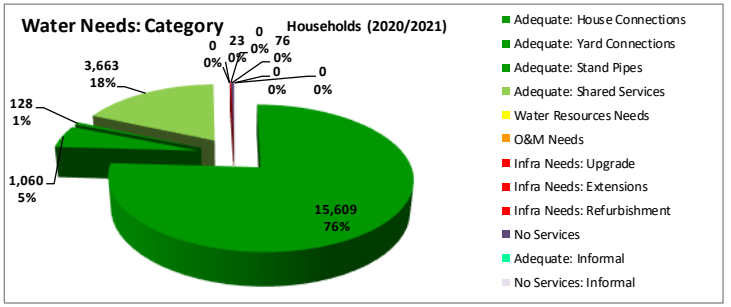
C.2.3. Residential Water Services Delivery Adequacy Profile

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	15,609	100%	1,060	100%	128	100%																		
2	0																								
3	10							3,663	100%																
4	0																								
5	0																								
6	0																								
7	3															23	100%								
8	0																								
9	0																								
10	3																			76	100%				
Total Household Interventions required		15,609		1,060		128		3,663		0		0		0		23		0		76		0		0	



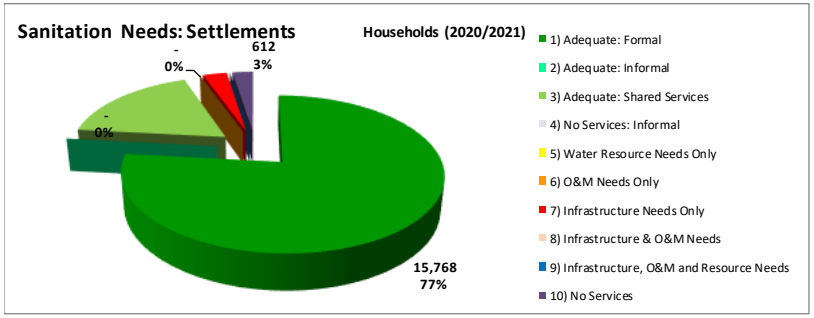


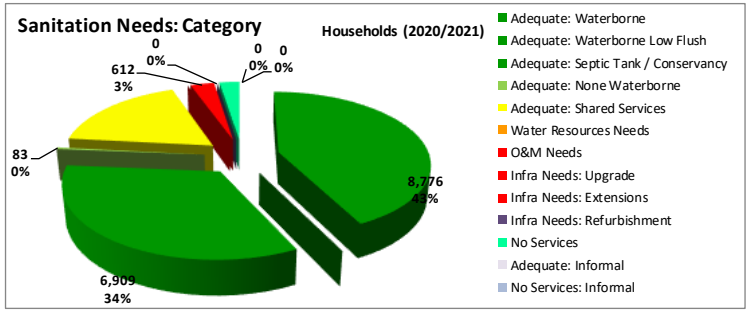
1	Adequate	3	Adequate: Shared services	5	Water Resources Needs **Only**	7	Infrastructure Needs **Only**	9	Infrastructure, O&M & Resource Needs
2	Adequate: Informal	4	No Services: Informal	6	O & M Needs **Only**	8	Infrastructure& O&M needs	10	No Services

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	8,776	100%			6,909	100%	83	1																		
2	0																										
3	10									3,663	100%																
4	0																										
5	0																										
6	0																										
7	3															612	100%										
8	0																										
9	0																										
10	3																					516	100%				
Total Household Interventions required		8,776		0		6,909		83		3,663		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 2020/2021 financial year and the previous four financial years are summarised in the table below (Include VAT).

Table C.3.1: Water tariffs for 2020/2021 and the previous four financial years

Consumer/Description	Category	20/21	19/20	18/19	17/18	16/17
Availability Fee (Water per erven per year)		R940-00	R887-00	R837-00	R783-00	R726-00
Test of Meters		R348-00	R328-00	R309-00	R289-00	R268-00
Basic Monthly Charge		R63-00	R60-00	R57-00	R53-64	R47-00
Residential	0 – 6 kl	R8-62	R8-41	R7-77	R7-58	-
	7 – 13 kl	R18-23	R17-79	R16-44	R16-04	-
	14 – 20 kl	R21-63	R21-10	R19-51	R19-03	-
	21 – 35 kl	R26-99	R26-33	R24-34	R23-75	-
	36 – 50 kl	R32-72	R31-92	R29-50	R28-78	-
	51 kl +	R43-60	R42-54	R39-32	R38-36	-
Commercial (Included residential consumers up to 2016/2017)	0 – 6 kl	R8-62	R8-41	R7-77	R7-58	R6-57
	7 – 20 kl	R17-36	R16-94	R15-66	R15-28	R13-25
	21 – 50 kl	R17-36	R16-94	R15-66	R15-28	R13-25
	51 – 100 kl	R20-00	R19-51	R18-04	R17-60	R15-25
	101 – 200 kl	R21-02	R20-51	R18-96	R18-50	R16-03
	201 – 1 000 kl	R22-12	R21-58	R19-95	R19-46	R16-86
	1 000 – 1 500 kl	R18-79	R18-33	R16-95	R16-53	R14-33
	1 501 – 2 000 kl	R15-95	R15-56	R14-38	R14-03	R12-17
	> 2 000 kl	R13-51	R13-18	R12-19	R11-89	R10-30
Sport Clubs / Schools / Welfare Organisations	0 – 500 kl	R9-42	R9-42	R8-50	R8-50	R6-00
	501 kl +	R13-86	R13-86	R12-50	R12-50	
Municipal Usage	0 – 500 kl	R9-42	R9-42	R8-50	R8-50	R6-00
	501 kl +	R13-86	R13-86	R12-50	R12-50	
Consumers outside previous municipal area	0 – 500 kl	R9-42	R9-42	R8-50	R8-50	R6-00
	501 kl +	R13-86	R13-86	R12-50	R12-50	
New connection		R3 466-00	R3 270-00	R3 085-00	R2 885-00	R2 674-00
Changing from 15mm to 20mm		R1 759-00	R1 659-00	R1 565-00	R1 464-00	R1 357-00

The sewerage tariff structures for Bergrivier Municipality for the 2020/2021 financial year and the previous four financial years are summarised in the table below (Include VAT).

Table C.3.2: Sewerage tariffs for 2020/2021 and the previous four financial years

Consumer/Description	Category	20/21	19/20	18/19	17/18	16/17
Availability Fee (Sewer per erven per year)		R1 748-00	R1 649-00	R1 556-00	R1 455-00	R1 348-00
Fixed monthly standard charge per connection / resident unit (Waterborne).		R181-00	R173-00	R163-00	R153-00	R142-00
Septic Tanks: Velddrif	During office hours	R423-00	R399-00	R376-00	R352-00	R326-00
	After office hours	R693-00	R654-00	R617-00	R577-00	R535-00
	Sundays / Public Holidays	R1 217-00	R1 148-00	R1 083-00	R1 013-00	R939-00
Septic Tanks: Eendekuil / Redelinghuys	During office hours	R177-00	R167-00	R158-00	R148-00	R137-00
Septic Tanks: Aurora	During office hours	R177-00	R167-00	R158-00	R148-00	R137-00
Septic Tanks: Outside previous municipal area	During office hours	R693-00	R654-00	R617-00	R577-00	R535-00
	After office hours	R1 574-00	R1 485-00	R1 401-00	R1 310-00	R1 214-00

Table C.3.2: Sewerage tariffs for 2020/2021 and the previous four financial years						
Consumer/Description	**Category**	**20/21**	**19/20**	**18/19**	**17/18**	**16/17**
	Sundays / Public Holidays	R2 434-00	R2 296-00	R2 166-00	R2 026-00	R1 878-00
	Outside town boundaries per km from WWTW	R11-00	R10-00	R9-00	R8-00	R7-00
New connection same side of road		R1 048-00	R989-00	R933-00	R873-00	R809-00
New connection on other side of road		R2 098-00	R1 979-00	R1 867-00	R1 746-00	R1 618-00

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
			FY2020/21	FY2019/20	FY2018/19
	UNITS SUPPLIED (as per water services access profile)				
10.2 (b) (i)	Household water connections (house and yard connections)	Nr	**20,332**	**19,870**	**19,364**
10.2 (b) (iv)	Household sewerage connections	Nr	**19,348**	**18,886**	**18,380**
	METERING				
	Metered Water Connections (aligned with Table C2.1)				
	Residential	Nr	9,007	8,804	8,648
	Commercial / Business	Nr	271	266	254
	Industrial	Nr	55	55	55
	Government / Institutional	Nr	155	141	138
	etc.	Nr	74	74	82
	Sub-Total: Metered Water Connections	**Nr**	**9,562**	**9,340**	**9,177**
	Proportion of metered connections (residential)*	%	44%	44%	45%
	Total number of meters	Nr	**9,562**	**9,340**	**9,177**
10.2 (b) (vi)	Total number of new connections (aligned with Table C.2.1)	Nr	222	163	52
10.2 (e) (i)	Total number of new meters installed	Nr	222	163	52
	Proportion of new connections, metered	%	100.0%	100.0%	100.0%
	Number of meters tested	Nr	13	4	11
10.2 (e) (ii)	Proportion of meters tested to total number of meters	%	0.1%	0.0%	0.1%
	Number of meters replaced	Nr	413	241	295
10.2 (e) (ii)	Proportion of meters replaced to total number of meters	%	4.3%	2.6%	3.2%
	BILLING				
	Customer billing (water and sewerage)		**Nr**	**Nr**	**Nr**
	Residential	Nr	9,007	8,804	8,648
	Commercial / Business	Nr	271	266	254
	Industrial	Nr	55	55	55
	Government / Institutional	Nr	155	141	138
	etc.	Nr	74	74	82
	Sub-Total: Customers billed	Nr	**9,562**	**9,340**	**9,177**
	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	2,128	1,860	1,988
10.2 (b) (v)	Free Basic Sanitation	Nr	1,886	1,635	1,758
	Proportion of Free Basic Services				
	Water	%	24%	21%	23%
	Sewerage	%	10%	9%	10%

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
		FY2020/21	FY2019/20	FY2018/19
	INCOME	**R'000**	**R'000**	**R'000**
	Billed			
	Water reticulation / provision	R 32,778	R 28,752	R 24,348
	Sewerage / wastewater	R 18,944	R 13,415	R 12,899
	Sub-Total: Billed	**R 51,721**	**R 42,167**	**R 37,246**
	Collections			
	Water reticulation / provision	R 35,539	R 27,061	R 23,746
	Sewerage / wastewater	R 23,089	R 14,416	R 14,550
	Sub-Total: Collections	**R 58,628**	**R 41,477**	**R 38,296**
	Equitable share income			
	Water reticulation / provision	R 2,277	R 2,118	R 1,862
	Sewerage / wastewater	R 3,626	R 3,095	R 2,726
	Sub-Total: Equitable share income	**R 5,903**	**R 5,213**	**R 4,588**
	EXPENDITURE (O&M)	**R'000**	**R'000**	**R'000**
	Water services	R 19,206	R 21,305	R 20,167
	Sewerage / wastewater services	R 13,101	R 12,680	R 10,623
	Total: Water Services O&M	**R 32,306**	**R 33,984**	**R 30,790**
	COST RECOVERY ANALYSIS / RATIO'S	**%**	**%**	**%**
10.2 (d) (ii)	**Billed as % of Cost**			
	Water	183%	145%	130%
	Sewerage	172%	130%	147%
	Total	**160%**	**124%**	**121%**
10.2 (d) (iii)	**Unrecovered as % of Cost**			
	Water services	-3%	18%	12%
	Sewerage / wastewater services	-4%	17%	10%
	Total	**-3%**	**17%**	**11%**

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.

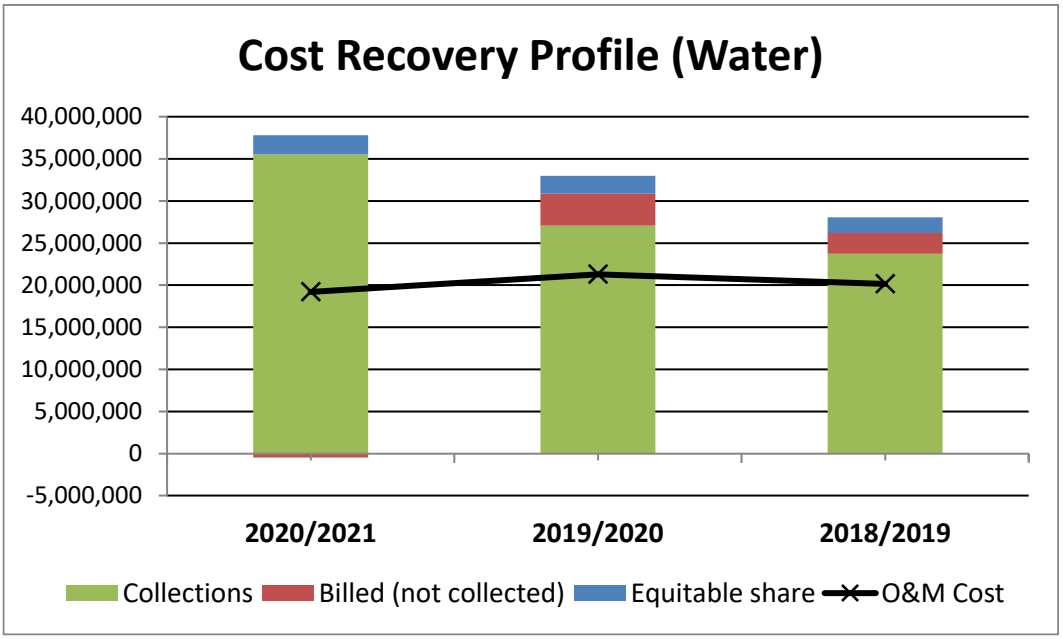


Figure C.3.3.1: Revenue collection and cost recovery profile (Water)

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.

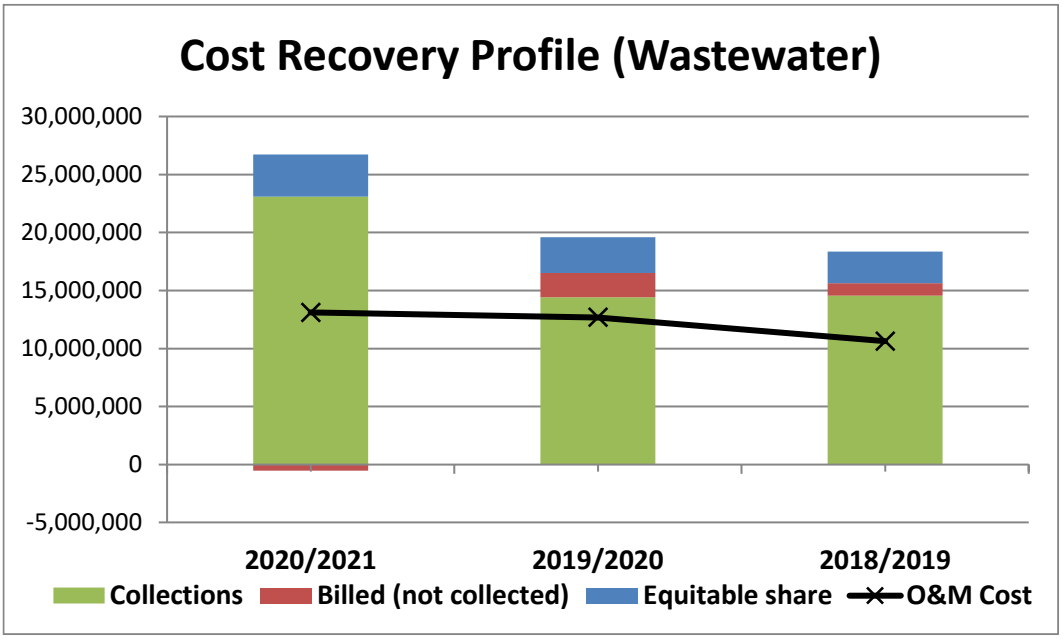


Figure C.3.3.2: Revenue collection and cost recovery profile (Wastewater)

Bergrivier Municipality's Operational and Maintenance Budget for water services for the four financial years up to 2016/2017 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 four years up to 2016/2017				
Description	**Record : Prior**			
	Actual 16/17	**Actual 15/16**	**Actual 14/15**	**Actual 13/14**
EXPENDITURE				
Employee Related Costs	R4 487 377-80	R3 687 337-17	R2 852 773-78	R2 512 220-73
Repairs and Maintenance	R534 540-55	R641 995-23	R867 445-65	R526 522-57
Capital Costs and Other	R921 025-50	R3 804 135-46	R3 571 610-79	R3 290 447-20
General Expenses	R14 829 418-49	R11 306 148-25	R10 330 814-92	R10 160 615-02
Total Expenditure	**R20 772 362-34**	**R19 439 616-11**	**R17 622 645-14**	**R16 489 805-52**
INCOME				
Total Income	**-R35 105 263-77**	**-R41 302 944-69**	**-R38 793 306-82**	**-R21 182 113-66**
Nett Surplus / Deficit	**R14 332 901-43**	**R21 863 328-58**	**R21 170 661-68**	**R4 692 308-14**

The 2017/2018 to 2020/2021 Operational and Maintenance Budget for water services is summarised in the table below.

Table C.3.3.3: Operational and Maintenance budget for water services for 2017/2018 to 2020/2021					
Cost Centre	**Cost Centre**	**Actual 20/21**	**Actual 19/20**	**Actual 18/19**	**Actual 17/18**
EXPENDITURE					
Water Distribution	4511	R17 557 739	R19 269 155	R17 757 253	R17 791 230
Water Treatment	4512	R1 647 957	R2 035 562	R2 409 903	R2 687 305
Total Expenditure		**R19 205 696**	**R21 304 717**	**R20 167 157**	**R20 478 535**
INCOME					
Water Distribution	4511	-R35 054 863	-R30 870 115	-R26 209 734	-R21 255 934
Total Income		**-R35 054 863**	**-R30 870 115**	**-R26 209 734**	**-R21 255 934**
Nett Surplus / Deficit		**R15 849 167**	**R9 565 398**	**R6 042 577**	**R777 399**

Bergrivier Municipality's Operational and Maintenance Budget for sanitation services for the four financial years up to 2016/2017 is summarised in the table below. A more detail breakdown of the sanitation operational budgets is also included in Annexure E.

Table C.3.3.4: Operational and Maintenance budget for sanitation services for the four years up to 2016/2017				
Description	**Record : Prior**			
	Actual 16/17	**Actual 15/16**	**Actual 14/15**	**Actual 13/14**
EXPENDITURE				
Employee Related Costs	R2 056 728-70	R2 104 451-34	R1 884 958-33	R1 919 258-55
Repairs and Maintenance	R623 195-59	R500 008-61	R466 857-57	R310 615-04
Capital Costs and Other	R381 830-50	R3 638 885-17	R1 028 259-40	R2 498 102-46
General Expenses	R8 677 667-08	R3 485 384-03	R3 337 283-18	R3 632 017-36
Total Expenditure	**R11 739 421-87**	**R9 728 729-15**	**R6 717 358-48**	**R8 359 993-41**
INCOME				
Total Income	**-R16 578 073-16**	**-R18 266 193-46**	**-R18 005 379-38**	**-R27 065 082-86**
Nett Surplus / Deficit	**R4 838 651-29**	**R8 537 464-31**	**R11 288 020-90**	**R18 705 089-45**

The 2017/2018 to 2020/2021 Operational and Maintenance Budget for sanitation services is summarised in the table below.

Table C.3.3.5: Operational and Maintenance budget for sanitation services for 2017/2018 to 2020/2021					
Cost Centre	**Cost Centre**	**Actual 20/21**	**Actual 19/20**	**Actual 18/19**	**Actual 17/18**
EXPENDITURE					
Sewerage	4291	R11 804 735	R9 706 526	R7 457 534	R6 861 154
Waste Water Treatment	4292	R1 295 825	R2 973 200	R3 125 975	R3 125 975
Total Expenditure		**R13 100 560**	**R12 679 726**	**R10 622 981**	**R9 987 129**
INCOME					
Sewerage	4291	-R22 569 830	-R16 509 629	-R15 624 739	-R28 958 707
Total Income		**-R22 569 830**	**-R16 509 629**	**-R15 624 739**	**-R28 958 707**
Nett Surplus / Deficit		**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 for the last ten financial years.

Table C.3.3.6: Consumer debtors per service for the last ten financial years							
Year	**General debit/credit**	**Services: Old**	**Electricity**	**Water**	**Sewerage**	**Refuse Removal**	**Total**
2011/2012	-R1 118 140-39	R106 007-16	R6 598 115-16	R4 604 543-09	R3 139 549-26	R5 123 607-35	R18 453 681-63
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

The total debtors of Bergrivier Municipality and the debtors for water and sewerage services increased over the last number of years. The graph below gives an overview of the total consumer debtors for the last ten financial years.

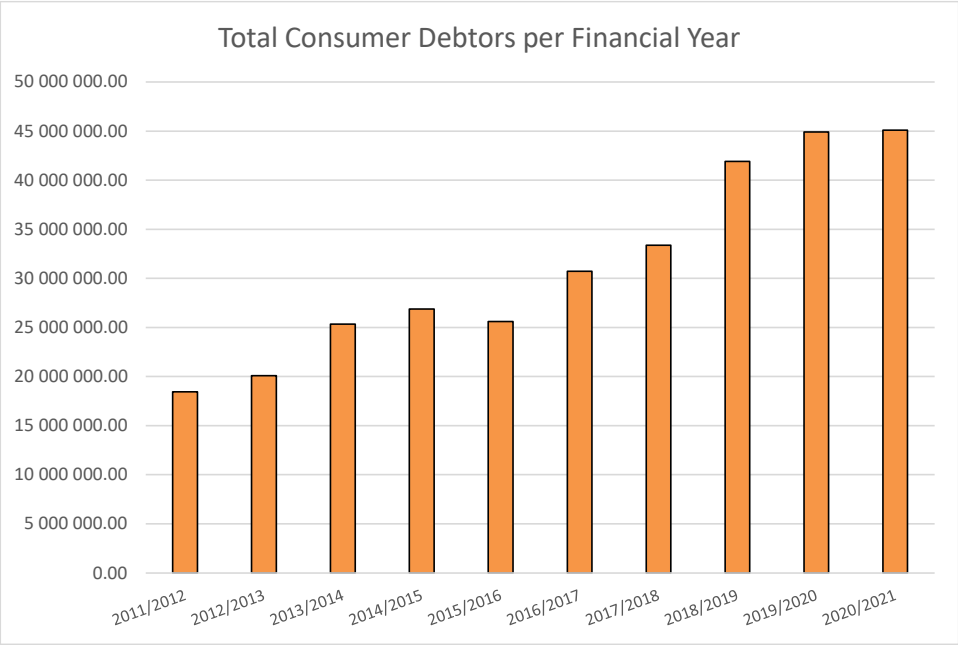


Figure C.3.3.3: Total consumer debtors per financial year

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

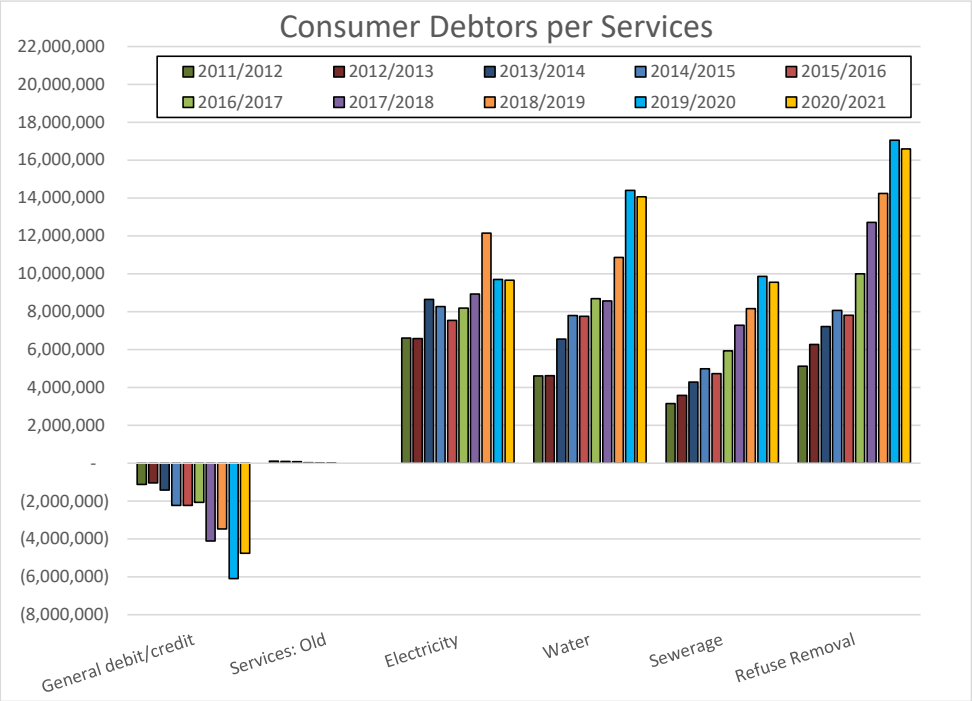


Figure C.3.3.4: Consumer debtors per service

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	FY2020/21	FY2019/20	FY2018/19		FY2020/21	FY2019/20	FY2018/19
	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	-				
	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)	-	-	14
	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)	-	-	14
	Velddrif Municipal Office	Yes	Yes	Yes	Zinc as Zn (mg/l)	-	-	14
	Velddrif Eigelaars Slaghuis	-	-	Yes	Iron as Fe (µg/l)	-	-	14
					Manganese as Mn (µg/l)	-	-	14
					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
					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

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

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	FY2020/21	FY2019/20	FY2018/19		FY2020/21	FY2019/20	FY2018/19
	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)	14	14	14
	Velddrif Reservoir (Reservoir 1)	Yes	Yes	Yes	Total Dissolved Solids (mg/l)	14	14	14
					Magnesium as Mg (mg/l)	14	14	14
	Chloride and Sodium was not sampled in Aurora, Velddrif and Dwarskersbos				Chloride as Cl- (mg/l)	14	14	14
					Zinc as Zn (mg/l)	-	-	14
					Iron as Fe (µg/l)	-	-	14
					Manganese as Mn (µg/l)	-	-	14
					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

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

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 2020 to June 2021.

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 2020/2021
Porterville	8 069	2	9.6
Piketberg	14 116	2.8	9.3
Velddrif	17 091	3.4	9.6
Dwarskersbos	913	2	3.8
Aurora	632	2	5.4
Eendekuil	1 828	2	5.8
Redelinghuys	600	2	5.8
Total	**43 249**	**16.2**	**49.3**

It can be noted from the above table that the number of monthly E.Coli samples taken by the Municipality during the 2020/2021 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	FY2020/21	FY2019/20	FY2018/19		FY2020/21	FY2019/20	FY2018/19
1	Dwarskersbos	Yes	Yes	Yes	**Microbiological**			
2	Eendekuil	Yes	Yes	Yes	E.Coli (count per 100mℓ)	-	30	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

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

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 FY2020/21						Year -1 FY2019/20						Year -2 FY2018/19					
		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	Information not available on IRIS						Information not available on IRIS						Information not available on IRIS					
	Nr submitted																		
	Annual %																		
Monitoring compliance	Average %																		
Certified Data	Average %	100%	100%	100%	100%	100%	100%	100%	0%	100%	100%	100%	100%	100%	0%	100%	100%	100%	100%
In-Time Submission	Annual %	100%	100%	100%	100%	100%	100%	79%	0%	78%	78%	79%	78%	79%	0%	80%	80%	80%	80%
Wastewater Quality																			
		M	C	P	O			M	C	P	O			M	C	P	O		
Monitoring Compliance	Average %	92%	81%	82%	-			100%	38%	55%	-			100%	40%	53%	-		
Certified Data	Average %	100%	100%	100%	-			100%	98%	99%	-			100%	99%	99%	-		
In-Time Submission	Average %	100%	100%	100%	-			68%	63%	67%	-			61%	54%	59%	-		

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
			FY2020/21	FY2019/20	FY2018/19
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
			FY2020/21	FY2019/20	FY2018/19
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 %	85%	64%	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 launched the blue and green drop certification, with regard to drinking water quality and wastewater quality management, at the Municipal Indaba during September 2008. Blue drop status is awarded to those towns that comply with 95% criteria on drinking water quality management. The Blue Drop Certification programme is in its eleventh year of existence and promised to be the catalyst for sustainable improvement of South African drinking water quality management in its entirety. The blue drop performance of Bergrivier Municipality is summarised as follows in the DWS's 2014 Blue Drop Report (last assessment):

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%**

Table C.4.1.9: DWS's 2014 Blue Drop Risk Ratings for Bergrivier Municipality

Municipal Blue Drop Risk Rating	52%

The overall 2014 Risk Rating for Bergrivier is 52%, which translates into the 9th worst performance (or position 17 out of 25 WSAs) in the Western Cape. Note that this value is based on the 3 specific areas indicated below and shows concerns (medium to critical risks) for Process Control (which risks reflect compliance in terms of draft Regulation 813) in 4 of the 6 systems; Drinking Water Quality in 3 out of the 6 systems; and Risk Management in none of 6 systems.

Assessment Area	Aurora	Eendekuil	Piketberg	Porterville	Redelinghuys	Velddrif
2014						
Blue Drop Risk Rating (2014)	**51.2%**	**52.0%**	**65.8%**	**52.2%**	**76.3%**	**32.2%**
Process Control RR	64.7%	47.1%	64.1%	62.2%	82.4%	43.9%
Drinking Water Quality RR	40.7%	70.4%	70.4%	40.7%	70.4%	40.7%
Risk Management RR	34.8%	34.8%	34.8%	34.8%	34.8%	39.1%
2013						

Table C.4.1.9: DWS's 2014 Blue Drop Risk Ratings for Bergrivier Municipality						
Municipal Blue Drop Risk Rating						**52%**
Blue Drop Risk Rating (2013)	**31.3%**	**55.6%**	**50.3%**	**36.9%**	**56.7%**	**13.2%**
Process Control RR	41.2%	76.5%	56.4%	48.6%	58.8%	31.7%
Drinking Water Quality RR	11.1%	11.1%	40.7%	11.1%	40.7%	11.1%
Risk Management RR	73.9%	73.9%	82.6%	73.9%	82.6%	30.4%
2012						
Blue Drop Risk Rating (2012)	**54.1%**	**66.0%**	**80.2%**	**62.8%**	**63.9%**	**78.3%**
Process Control RR	76.5%	94.1%	94.9%	78.4%	76.5%	80.5%
Drinking Water Quality RR	11.1%	11.1%	11.1%	11.1%	33.3%	11.1%
Risk Management RR	52.2%	43.5%	52.2%	52.2%	52.2%	21.7%

The average residential daily consumption (l/p/d) for the last seven 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 seven financial years.

Distribution System	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019	2019/2020	2020/2021		
	Average Daily Billed Metered Residential and Commercial Consumption (l/p/d)				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**	8 069	778.132	**96**
Piketberg	**123**	**115**	**106**	**73**	**63**	**74**	14 116	1 085.710	**77**
Velddrif *	**155**	**156**	**166**	**110**	**72**	**77**	17 091	1 412.155	**83**
Dwarskersbos *	**285**	**290**	**260**	**160**	**114**	**180**	913	181.363	**199**
Aurora	**173**	**173**	**145**	**103**	**100**	**99**	632	67.841	**107**
Eendekuil	**77**	**82**	**82**	**57**	**50**	**58**	1 828	109.699	**60**
Redelinghuys	**153**	**135**	**143**	**105**	**82**	**92**	600	61.764	**103**
All Systems	**136**	**140**	**136**	**95**	**77**	**84**	**43 249**	**3 793.036**	**88**

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 also completed their Third Order Assessment of Municipal Waste Water Treatment Plants, DWS's Green Drop Report for 2013, which provides a scientific and verifiable status of municipal wastewater treatment. 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 2013 Green Drop Report:

Table C.4.1.11: Green Drop Performance of the Municipality (DWS's 2013 Green Drop Report)	
Average Green Drop Score	**2009 – 11.00%, 2011 – 70.00%, 2013 - 44.21%**

Regulatory Impression: Bergrivier Local Municipality's performance is not on par with the Regulator's expectations. The significant decline in the municipal Green Drop score from 70% (2011) to 44.2% indicates that the gains of 2011 have not been carried forward. The Regulator finds it hard to justify the current performance of the municipality, given that a skilled and competent supervisory structure is in place, albeit shortcomings in the support structures were observed. The score awarded to Bergrivier also impacts on the Provincial Green Drop score for Western Cape, and the municipality is to realise that not only does the score fails the good that has been done in the municipality, but also in the region.

The Green Water Services Audit revealed substantial shortcomings in the areas of risk- and asset management, as well as effluent quality. As risk management and effluent quality comprises of 45% of the total Green Drop score, this is possibly the areas that the municipality need to focus going forward. The mismatch between the good site inspection score 79% and the 62% Green Drop score (see Porterville site assessment) suggest that the municipality has indeed evidence of good practice, but that such evidence has not been organised to represent the municipality to its full potential. The Regulatory wish to encourage the municipality to return to its previous benchmark and build on the good work previously achieved.

The decline in the Green Drop score is reflected in the CRR ratings as well, with 2 plants having moved from a low risk to a high-risk position.

Green Drop findings:

1. Three (3) of five (5) plants do not keep operational logbooks at the sites, whilst two (2) plants do not have O&M manuals in place
2. Despite good registration status of supervisor/s, the Process Controllers category is lacking.
3. Two (2) of the plants do not have evidence of design capacity and are not monitoring the inflow to the plants, which compromise the daily operation of the plants and medium term forward planning. The awarding of -40% attest to the seriousness of this default
4. Despite a good attempt to maintain best practice in compliance monitoring, none of the systems have succeeded in presenting operational monitoring regimes. This in part, could be the reason why better effluent quality has not been achieved.
5. The W_2RAP has been drafted, but is of sub-standard quality and does not represent a forward thinking and acting process to guide planning and implementation actions and resources. No incident management protocol is available. No signature by the Municipal Manager and/or CFO could be presented.
6. All systems failed in terms of asset registers, condition of assets, as well as cost pertaining to collection and treatment of sewage in the municipality. This again affects the ability to set tariffs and enhance revenue practices.
7. Four (4) of five (5) systems failed in terms of proof that pump stations are being maintained, and that all wastewater reaches the treatment plant.

Site Inspection Score: Porterville WWTW 70%

GREEN DROP REPORT CARD					
Key Performance Area	**Porterville**	**Dwarskersbos**	**Velddrif**	**Eendekuil**	**Piketberg**
Process Control and Maintenance Skills	**76**	**42**	**56**	**42**	**71**
Monitoring Programme	**83**	**83**	**75**	**59**	**88**
Submission of Results	**100**	**100**	**100**	**100**	**100**
Effluent Quality Compliance	**66**	**10**	**10**	**10**	**34**
Risk Management	**25**	**25**	**25**	**25**	**25**
Local Regulation	**24**	**24**	**24**	**24**	**24**
Treatment Capacity	**66**	**-40**	**66**	**-40**	**26**
Asset Management	**38**	**13**	**13**	**13**	**13**
Bonus Scores	7.54	6.75	9.63	2.07	9.09
Penalties	3.48	3.60	3.60	3.60	3.60
Green Drop Score (2013)	**62.60%**	**32.48%**	**40.91%**	**24.23%**	**48.94%**
Green Drop Score (2011)	**81.50%**	**73.30%**	**58.40%**	**38.00%**	**73.80%**
Green Drop Score (2009)	**16.60%**	**11.00%**	**5.00%**	**NA (0%)**	**11.00%**
System Design Capacity (Ml/d)	1.088	NI (1)	0.97	NI (1)	3.15
Capacity Utilisation (% ADWF i.t.o. Design Capacity)	66.36%	151.00%	60.00%	151.00%	74.29%
Resource Discharged into	Golf course	Golf course	Golf course	Golf course	Golf course
Microbiological Compliance	83.33%	75.00%	41.67%	58.33%	50.00%
Chemical Compliance	93.75%	70.83%	29.17%	29.17%	68.75%

GREEN DROP REPORT CARD					
Key Performance Area	**Porterville**	**Dwarskersbos**	**Velddrif**	**Eendekuil**	**Piketberg**
Physical Compliance	100.00%	33.33%	61.11%	75.00%	91.67%
Overall Compliance	94.79%	57.29%	42.71%	50.00%	75.00%
Wastewater Risk Rating (2012)	**41.20%**	**52.90%**	**58.80%**	**58.80%**	**58.80%**
Wastewater Risk Rating (2013)	**41.18%**	**76.47%**	**58.82%**	**76.47%**	**58.82%**

The 2014 Green Drop Risk Profile Progress Report of the DWS is further the product of a "gap" year, whereby progress is reported in terms of the improvement or decline in the risk position of the particular WWTW, as compared to the previous year's risks profile. This tool to collect, assess and report the risk profile is called the Green Drop Progress Assessment Tool (PAT). The PAT progress assessment period was done on compliance data and actions during 1 July 2012 – 30 June 2013, which represents the year immediately following the Green Drop 2013 assessment period. The results for Bergrivier Municipality were summarised as follow in DWS's 2014 Green Drop Risk Profile Progress Report.

Table C.4.1.12: DWS's 2014 Green Drop Risk Profile Progress Report results for Bergrivier Municipality					
Assessment Areas	**Porterville**	**Dwarskersbos**	**Velddrif**	**Eendekuil**	**Piketberg**
Technology	Activated sludge and mechanical aeration Lagoons	Anaerobic ponds/ Facultative ponds Anaerobic digestion	Biological (trickling) filters Anaerobic digestion	Anaerobic ponds/ Facultative ponds Anaerobic digestion	Activated sludge and mechanical aeration Lagoons
Design Capacity (Ml/d)	1.2	0.294	0.97	0.14	3.15
Operational flow (% of Design Capacity)	66.7%	17.0%	63.9%	71.4%	62.2%
Microbiological Compliance	75.0%	33.0%	8.0%	33.0%	50.0%
Chemical Compliance	83.3%	62.5%	27.0%	33.3%	56.3%
Physical Compliance	97.3%	39.0%	53.0%	64.0%	89.0%
Annual Average Effluent Quality Compliance	**85.2%**	**44.8%**	**29.3%**	**43.4%**	**65.1%**
Wastewater Risk Rating (%CRR/CRR$_{max}$)	**41.2%** (↓)	52.9% (↑)	58.8% (↓)	58.8% (↓)	58.8% (↓)
Highest Risk Area	Effluent quality	Low flow to plant	Effluent quality (disinfection)	Effluent / sludge management	Effluent quality / sludge management
Risk Abatement Process	Final W_2RAP	Final W_2RAP	Final W_2RAP	Final W_2RAP	Final W_2RAP
Capital & Refurbishment expenditure in 2010/2011	R 100 000	R 0	R 300 000	R 0	R 8 087 000
Description of Projects' Expenditure	Replace and repair aerators/pumps	N/A	Replace sewerage pumps and install new telemetry	N/A	Upgrade of WWTW to double up the capacity
Wastewater Risk Abatement Planning	Bergrivier produced a simple W_2RAP in-house which uses the CRR 2009 as baseline values and then identify the risks and mitigation measures to reduce the various elements of the CRR (A,B,C,D) in the period >2010. Further work would be required to add more intelligence to the approach, however, this provides for a meaningful 1st phase to risk abatement,				
Additional Notes	Significant effort has been made to address key risk areas, as can be seen by the allocation of financial resources.				

Regulatory Impression

The municipality was well prepared and aim to raise the Green Drop score by a further 10% (from 72%) for the 2012/13 year. Upgrades to the systems have been made, resulting in improved compliance at most plants. However, the Velddrif and Eendekuil plants are not meeting standards. A W_2RAP is in place and are being implemented to ensure that high-risk areas are abated. Flows are monitored at each site, with the exception of Dwarskersbos, which receive low flow to the pond system. All indicators are that Berg River is showing PROGRESS against the CRR rating over the 2011 to 2012 assessment year. The team is congratulated for their preparedness and positive contribution to the PAT assessments.

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 FY2020/21						Year -1 FY2019/20						Year -2 FY2018/19					
			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	558	39	541	1548	1859	360	554	0	378	1493	1843	355	423	0	309	1224	1444	292
n/a		Nr Failures	8	0	6	29	91	313	1	0	0	11	85	317	25	0	0	6	79	252
n/a		Compliance %	99%	100%	99%	98%	95%	13%	100%	0%	100%	99%	95%	11%	94%	0%	100%	100%	95%	14%
n/a	Samples frequency	Total	546	15	354	354	546	354	554	0	355	355	556	355	423	0	292	292	423	292
n/a		Nr Failures	292	15	153	153	292	153	366	0	165	165	366	165	253	0	122	122	253	122
n/a		Compliance %	47%	0%	57%	57%	47%	57%	34%	0%	54%	54%	34%	54%	40%	0%	58%	58%	40%	58%
n/a	Sites compliance	Total	189	14	182	182	189	182	179	0	179	179	179	179	141	0	137	137	141	137
n/a		Nr Failures	83	14	76	76	83	76	84	0	84	84	84	84	67	0	63	63	67	63
n/a		Compliance %	56%	0%	58%	58%	56%	58%	53%	0%	53%	53%	53%	53%	52%	0%	54%	54%	52%	54%
6.3	**Water Supply and Quality**																			
6.3.6	Blue Drop Status	last year certified by DWS	New Blue Drop PAT still to be done						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%						68%						67%					

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 2020 to June 2021 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 2020 to June 2021

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**
Conductivity	86	82	62	19	41	42	42
Total Alkalinity (as $CaCO_3$)	86	82	62	19	41	42	42
Aluminium (as Al)	90	86	65	20	43	44	44
Total Hardness (as $CaCO_3$)	85	81	61	18	40	41	41
Magnesium (as Mg)	86	82	62	19	41	42	42
Langelier Saturation Index	86	82	62	19	41	42	42
Turbidity	90	86	65	20	43	44	44
pH (at 25°C)	90	86	65	20	43	44	44
Free Chlorine	90	86	65	20	45	44	44
Calcium (as Ca)	86	82	62	19	41	42	42
E.Coli	115	111	115	46	65	69	69
Heterotrophic Plate Count	115	111	115	46	67	69	69
Total Dissolved Solids	68	82	62	19	41	47	42
Colour	68	82	62	19	41	42	42
Calcium Hardness	61	62	46	12	28	24	29
Magnesium Hardness	61	62	46	12	28	24	29
Chloride (as Cl)	1	12	1	1	5	12	12
Fluoride (as F)	9	5	4	2	3	3	3
Iron (as Fe)	5	1	7	1	1	1	1
Total Coliform Count	26	26	57	27	24	21	26
Sodium (as Na)	11	12	1	1	5	12	12
Potassium (as K)	1	1	1	1	1	1	1
Zinc (as Zn)	1	1	1	1	1	1	1
Ammonia Nitrogen (as N)	1	1	1	1	1	1	1
Nitrate & Nitrite Nitrogen (as N)	1	1	1	1	1	1	1
Nitrate as N	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 2020 to June 2021							
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
Sulphate (as $SO4^{2-}$)	1	1	1	1	1	1	6
Manganese (as Mn)	5	1	1	1	1	1	1
Antimony (as Sb)	1	1	1	1	1	1	1
Arsenic (as As)	1	1	1	1	1	1	1
Cadmium (as Cd)	1	1	1	1	1	1	1
Chromium (as Cr)	1	1	1	1	1	1	1
Copper (as Cu)	1	1	1	1	1	1	1
Lead (as Pb)	1	1	1	1	1	1	1
Mercury (as Hg)	1	1	1	1	1	1	1
Nickel (as Ni)	1	1	1	1	1	1	1
Selenium (as Se)	1	1	1	1	1	1	1
Uranium (as U)	1	1	1	1	1	1	1
Cyanide	1	1	1	1	1	1	1
Total Organic Carbon	1	1	1	1	1	1	1
Chloroform	1	1	1	1	1	1	1
Bromoform	1	1	1	1	1	1	1
Dibromochloromethane	1	1	1	1	1	1	1
Bromodichloromethane	1	1	1	1	1	1	1
Combined Trihalomethanes	1	1	1	1	1	1	1
Microcystin	1	1	1	1	1	1	1
Phenols	1	1	1	1	1	1	1
Somatic Coliphages	1	1	1	1	1	1	1
Giardia Species	1	1	1	1	1	1	1
Cryptosporidium Species	1	1	1	1	1	1	1
Monochloramine	1	1	1	1	1	1	1
Barium	1	1	1	1	1	1	1
Boron	1	1	1	1	1	1	1
Total number of samples	**1 452**	**1 434**	**1 180**	**412**	**760**	**784**	**799**

The water quality performance indicators of all the water distribution systems in Bergrivier Municipality was categorised as "Excellent" for 2020/2021, except the "Operational Efficiency" and "Acute Health Microbiological" indicators for Piketberg 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)**	
	2020/2021	**2019/2020**	**2020/2021**	**2019/2020**	**2020/2021**	**2019/2020**
Porterville						
Acute Health Chemical	No (Excellent)	No (Excellent)	100.0%	100.0%	-	-
Acute Health Microbiological	No (Excellent)	No (Excellent)	100.0%	100.0%	-	-
Chronic Health	No (Excellent)	No (Excellent)	100.0%	100.0%	-	-
Aesthetic	No (Excellent)	No (Excellent)	100.0%	99.8%	-	-

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)	
	2020/2021	2019/2020	2020/2021	2019/2020	2020/2021	2019/2020
Operational Efficiency	No (Excellent)	No (Excellent)	97.0%	96.7%	-	-
Piketberg						
Acute Health Chemical	No (Excellent)	No (Excellent)	100.0%	100.0%	-	-
Acute Health Microbiological	Yes (Unacceptable)	No (Excellent)	93.8%	100.0%	Monthly	-
Chronic Health	No (Excellent)	No (Excellent)	100.0%	100.0%	-	-
Aesthetic	No (Excellent)	No (Excellent)	97.1%	98.8%	-	-
Operational Efficiency	Yes (Unacceptable)	Yes (Unacceptable)	89.4%	88.2%	Monthly	Monthly
Dwarskersbos						
Acute Health Chemical	No (Excellent)	No (Excellent)	100.0%	100.0%	-	-
Acute Health Microbiological	No (Excellent)	No (Excellent)	97.9%	100.0%	-	-
Chronic Health	No (Excellent)	No (Excellent)	100.0%	97.9%	-	-
Aesthetic	No (Excellent)	No (Excellent)	100.0%	100.0%	-	-
Operational Efficiency	No (Excellent)	No (Excellent)	98.1%	98.4%	-	-
Velddrif						
Acute Health Chemical	No (Excellent)	No (Excellent)	100.0%	100.0%	-	-
Acute Health Microbiological	No (Excellent)	No (Excellent)	99.1%	100.0%	-	-
Chronic Health	No (Excellent)	No (Excellent)	100.0%	98.3%	-	-
Aesthetic	No (Excellent)	No (Excellent)	100.0%	100.0%	-	-
Operational Efficiency	No (Excellent)	No (Excellent)	99.1%	97.9%	-	-
Aurora						
Acute Health Chemical	No (Excellent)	No (Excellent)	100.0%	100.0%	-	-
Acute Health Microbiological	No (Excellent)	No (Excellent)	98.5%	100.0%	-	-
Chronic Health	No (Excellent)	No (Excellent)	100.0%	100.0%	-	-
Aesthetic	No (Excellent)	No (Excellent)	97.0%	99.7%	-	-
Operational Efficiency	No (Excellent)	No (Excellent)	94.7%	96.4%	-	-
Eendekuil						
Acute Health Chemical	No (Excellent)	No (Excellent)	100.0%	100.0%	-	-
Acute Health Microbiological	No (Excellent)	No (Excellent)	98.6%	98.7%	-	-
Chronic Health	No (Excellent)	No (Excellent)	100.0%	98.6%	-	-
Aesthetic	No (Excellent)	No (Excellent)	100.0%	99.7%	-	-
Operational Efficiency	No (Excellent)	No (Good)	95.1%	90.8%	-	-
Redelinghuys						
Acute Health Chemical	No (Excellent)	No (Excellent)	100.0%	100.0%	-	-
Acute Health Microbiological	No (Excellent)	No (Excellent)	98.6%	100.0%	-	-
Chronic Health	No (Excellent)	No (Excellent)	100.0%	97.2%	-	-
Aesthetic	No (Excellent)	No (Excellent)	99.3%	98.9%	-	-
Operational Efficiency	No (Excellent)	No (Excellent)	98.9%	96.7%	-	-

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**				**Year-1**				**Year-2**				
			FY2020/21				**FY2019/20**				**FY2018/19**				
			M	**C**	**P**	**O**	**M**	**C**	**P**	**O**	**M**	**C**	**P**	**O**	
	Results per the Integrated Regulatory Information System														
n/a	Regulatory compliance	Total	56	172	243	-	37	64	126	-	36	70	124	-	
n/a		Nr Failures	28	89	69	-	16	38	47	-	8	33	49	-	
n/a		Compliance %	50%	48%	72%	-	57%	41%	63%	-	78%	53%	60%	-	
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 %	50%	52%	28%	-	43%	59%	37%	-	22%	47%	40%	-	
6.3	**Water Supply and Quality**														
6.4.6	Green Drop Status	last year certified by DWS	Green Drop assessment still to be done				No Green Drop assessment was done by DWS				No Green Drop assessment was 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 two 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 two financial years		
WWTW	**2020/2021 (Faecal Coliforms)**	**2019/2020 (E.Coli)**
Dwarskersbos	100.0%	100.0%
Eendekuil	100.0%	83.3%
Piketberg	44.4%	40.0%
Porterville	100.0%	41.7%
Velddrif	44.4%	41.7%
Total	**77.3%**	**62.1%**

Table 4.2.7: Percentage Chemical compliance of the compliance samples taken at the various WWTWs for the last two financial years										
WWTW	**2020/2021**					**2019/2020**				
	Ammonia	**Nitrites & Nitrates**	**COD**	**Ortho Phosphate**	**Overall**	**Ammonia**	**Nitrites & Nitrates**	**COD**	**Ortho Phosphate**	**Overall**
Dwarskersbos	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	100.0%	N/A	**100.0%**	N/A	N/A	58.3%	N/A	**58.3%**
Piketberg	22.2%	100.0%	100.0%	88.9%	**77.8%**	20.0%	100.0%	100.0%	-	**73.3%**
Porterville	50.0%	100.0%	100.0%	75.0%	**81.3%**	58.3%	83.3%	83.3%	-	**75.0%**
Velddrif	11.1%	100.0%	66.7%	44.4%	**55.6%**	33.3%	100.0%	58.3%	-	**63.9%**
Total	**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 two financial years								
WWTW	**2020/2021**				**2019/2020**			
	pH	**Electrical Conductivity**	**Total Suspended Solids**	**Overall**	**pH**	**Electrical Conductivity**	**Total Suspended Solids**	**Overall**
Dwarskersbos	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%**
Piketberg	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%	66.7%	**88.9%**
Velddrif	100.0%	44.4%	66.7%	**70.4%**	100.0%	50.0%	100.0%	**83.3%**
Total	**93.2%**	**65.9%**	**76.9%**	**78.9%**	**87.9%**	**60.3%**	**88.2%**	**77.3%**

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 FY2020/21	Year - 1 FY2019/20	Year - 2 FY2018/19
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 FY2020/21			Year-1 FY2019/20			Year-2 FY2018/19		
		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	533	36	522	657	35	606	Information was not included in the 2018/2019 Water Services Audit Report		
	Nr of failures	11	0	0	1	0	6			
	Failure %	2.1%	0.0%	0.0%	0.2%	0.0%	1.0%			
	Nr reported	11	0	0	1	0	6			
	Reported % of failure	100%	100%	100%	100%	100%	100%			
Failures in terms of Samples	Total	533	36	522	657	35	606			
	Nr of failures	11	0	0	1	0	6			
	Failure %	2.1%	0.0%	0.0%	0.2%	0.0%	1.0%			
	Nr reported	11	0	0	1	0	6			
	Reported % of failure	100%	100%	100%	100%	100%	100%			
Failures in terms of Sites	Total	533	36	522	657	35	606			
	Nr of failures	11	0	0	1	0	6			
	Failure %	2.1%	0.0%	0.0%	0.2%	0.0%	1.0%			
	Nr reported	11	0	0	1	0	6			
	Reported % of failure	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	
			2020/21		2019/20		2018/19		2020/21		2019/20		2018/19	
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	9,562	100%	9,340	100%	9,177	100%	0	0%	0	0%	0	0%
7.1.1.3		Reticulation leaks fixed	132	100%	117	100%	134	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	5,498	57.5%	5,371	57.5%	5,277	57.5%	0	0%	0	0%	0	0%
7.1.2.2		300 kPa - 600 kPa	1,205	12.6%	1,177	12.6%	1,156	12.6%	0	0%	0	0%	0	0%
7.1.2.3		600 kPa - 900 kPa	2,429	25.4%	2,372	25.4%	2,331	25.4%	0	0%	0	0%	0	0%
7.1.2.4	10.2.b.iii	> 900 kPa	430	4.5%	420	4.5%	413	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	413	4%	241	3%	295	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	9,562	100%	9,340	100%	9,177	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 last 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 2020/2021 was -1.35 %/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	20/21	Record : Prior (Ml/a)				
				19/20	18/19	17/18	16/17	15/16
Porterville	Treatment Losses	Volume	45.681	45.414	80.321	Unknown	Unknown	Unknown
		Percentage	9.8%	9.8%	17.0%	Unknown	Unknown	Unknown
	NRW	Volume	61.015	45.158	78.733	18.704	97.301	97.391
		Percentage	14.5%	10.8%	20.0%	5.3%	19.5%	18.9%
	Water Losses	Volume	60.171	44.323	77.947	18.000	96.305	96.362
		Percentage	14.3%	10.6%	19.8%	5.1%	19.3%	18.7%
	ILI		**1.70**	**1.14**		**0.47**	**2.50**	**2.57**
	The Municipality needs to work towards a target of 7.5% for the Treatment Losses. The NRW and Water Losses increased over the last financial year, but the percentages of less than 15% are still excellent for the system. The current ILI value is also excellent.							
Piketberg	Treatment Losses	Volume	60.076	49.042	40.069	104.210	136.169	126.485
		Percentage	7.50%	7.50%	7.50%	19.17%	16.25%	14.60%
	Bulk Distribution Losses	Volume	36.990	11.680	0.070	11.850	1.259	8.831
		Percentage	5.0%	1.9%	0.0%	2.7%	0.2%	1.2%
	NRW	Volume	150.126	116.729	113.793	50.231	93.754	69.401
		Percentage	20.9%	17.9%	18.8%	9.5%	11.3%	8.3%
	Water Losses	Volume	148.687	115.426	112.583	49.171	92.102	67.721
		Percentage	20.7%	17.7%	18.6%	9.3%	11.1%	8.1%
	ILI		**2.17**	**1.46**		**0.63**	**1.17**	**0.85**
	The current treatment losses is an estimate and the Municipality need to ensure that the raw water 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 increased a little over the last financial year. The Municipality needs to work towards percentages of less than 20% for the NRW and Water Losses. The current ILI value is also good.							
Velddrif	NRW	Volume	82.662	126.550	16.774	5.184	44.615	103.854
		Percentage	10.3%	15.6%	2.7%	0.8%	4.5%	10.4%
	Water Losses	Volume	81.062	124.927	15.552	3.914	42.619	101.850
		Percentage	10.1%	15.4%	2.5%	0.6%	4.3%	10.2%
	ILI		**2.20**	**2.47**		**0.08**	**0.90**	**2.19**
	The NRW and Water Losses were reduced during the last financial year. The current NRW and Water Losses of almost 10% for the system is excellent and the Municipality need to keep the percentages below 15%. The current ILI value is also good.							
Dwarskersbos	NRW	Volume	24.669	16.821	18.490	5.928	0.172	4.860
		Percentage	23.4%	19.5%	25.3%	10.0%	0.2%	4.7%
	Water Losses	Volume	24.458	16.649	18.344	5.809	-0.018	4.652
		Percentage	23.2%	19.3%	25.1%	9.8%	0.0%	4.5%
	ILI		**4.71**	**3.04**		**1.15**	**0.00**	**0.85**
	The NRW and Water Losses increased over 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 and the Municipality needs to work towards an ILI of between 2 and 4.							
Aurora	Treatment Losses	Volume	4.117	7.879	7.686	3.476	8.261	2.068
		Percentage	9.4%	18.3%	19.8%	11.1%	13.9%	4.2%
	NRW	Volume	9.862	3.957	4.485	4.408	10.345	1.090
		Percentage	24.9%	11.2%	14.4%	15.8%	20.2%	2.3%

Table C.5.2: Treatment Losses, NRW, Water Losses and ILIs for the various water distribution systems								
Description	**Component**	**Unit**	**20/21**	**Record : Prior (Ml/a)**				
				19/20	**18/19**	**17/18**	**16/17**	**15/16**
	Water Losses	Volume	9.783	3.887	4.423	4.352	10.243	0.996
		Percentage	24.7%	11.0%	14.2%	15.6%	20.0%	2.1%
	ILI		**1.05**	**0.38**		**0.44**	**1.03**	**0.03**
	The NRW and Water Losses increased over 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 1.05 however indicates an excellent system and the Municipality need to keep the ILI levels between 1 and 2.							
Eendekuil	Treatment Losses	Volume	-21.164	-10.423	-2.190	-16.429	-7.754	-14.022
		Percentage	-38.8%	-16.4%	-3.8%	-30.0%	-8.9%	-16.8%
	NRW	Volume	22.580	22.195	13.674	22.223	27.450	26.295
		Percentage	29.8%	30.0%	22.6%	31.2%	28.8%	27.0%
	Water Losses	Volume	22.428	22.047	13.553	22.081	27.260	26.100
		Percentage	29.6%	29.8%	22.4%	31.0%	28.6%	26.8%
	ILI		**4.16**	**3.96**		**4.05**	**4.96**	**4.69**
	The NRW and Water Losses were high for the last two 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 in order to accurately calculate the treatment losses. It also suggested that a bulk raw water meter be installed at the source in order to determine the bulk distribution losses. The current NRW and Water Losses of almost 30% for the last two financial years are high and needs to be reduced to levels below 25%. The ILI of above 4 also indicates a poor ILI level 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	9.379	10.534	3.959	1.243	3.209	5.741
		Percentage	16.6%	21.9%	10.5%	3.5%	6.5%	10.6%
	NRW	Volume	13.573	11.352	9.626	6.992	7.850	14.012
		Percentage	28.7%	30.2%	28.5%	20.5%	17.1%	29.0%
	Water Losses	Volume	13.479	11.277	9.558	6.924	7.758	13.915
		Percentage	28.5%	30.0%	28.3%	20.3%	16.9%	28.8%
	ILI		**4.93**	**4.29**		**3.16**	**4.25**	**7.33**
	The bulk distribution losses of above 10% 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. It is also suggested that a bulk raw water meter be installed at the source in order to determine the bulk distribution losses and the treatment losses, which currently can't be calculated. The current NRW and Water Losses of almost 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 and the Municipality needs to work towards an ILI of between 2 and 4.							
Total	**NRW**	**Volume**	**364.487**	**342.762**	**255.575**	**113.670**	**281.487**	**316.903**
		Percentage	**16.5%**	**16.2%**	**14.1%**	**6.7%**	**10.8%**	**11.9%**
	Water Losses	**Volume**	**360.068**	**338.536**	**251.960**	**110.251**	**276.269**	**311.596**
		Percentage	**16.3%**	**16.0%**	**13.9%**	**6.5%**	**10.6%**	**11.7%**
	ILI		**2.15**	**2.06**		**0.53**	**1.34**	**1.54**
	The overall NRW and Water Losses stayed roughly the same for the last two financial years. 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 2.15 for all the systems 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 2020/2021.

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 2020/2021.

Water Balance Component	Porterville	Piketberg	Velddrif	Dwarskers-bos	Aurora	Eendekuil	Redelinghuys
System Input Volume	690	773	552	530	413	611	599
Average Billed Metered Cons.	590	611	495	406	311	429	427
Non-Revenue Water	100	161	57	124	103	182	172

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: 1) Supply to the school along upper Kloof

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
				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
	Total	**0.110**	**18.65**

Table C.5.5: Length and average head of water pipelines			
Town	**Zone**	**Length (km)**	**Average Head**
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**

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. Two new PRVs were installed in Piketberg during the 2015/2016 financial year. A new PRV was also installed in Porterville during the 2016/2017 financial year. 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.
		Reduction of illegal connections.
		Management of meter readings.
B.1	Promote efficient use of water to consumers and	Generic consumer awareness campaign.

Table C.5.6: Bergrivier Municipality's Water Conservation and Demand Management Plan: Objectives and Strategies		
No	**Objective**	**Strategy**
	customers.	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 2021).

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

Asset Type	Opening Costs	Carrying Values	Carrying Values / Opening Costs
Boreholes	R712 538	R410 044	57.55%
Bulk Mains	R10 937 517	R6 929 932	63.36%
Reticulation Pipeline	R16 389 415	R10 661 478	65.05%
Pump Stations	R6 718 067	R3 652 015	54.36%
Reservoirs	R43 651 437	R30 891 026	70.77%
WTWs	R11 420 312	R7 599 074	66.54%
Dams and Weirs	R13 228 585	R3 124 961	23.62%
Total	**R103 057 871**	**R63 268 530**	**61.39%**

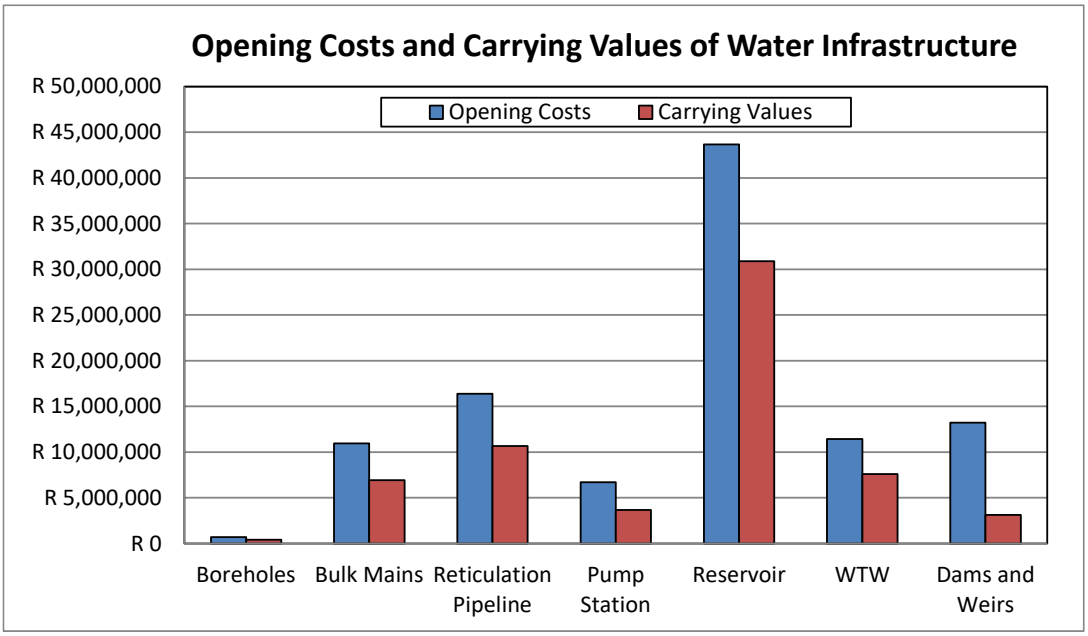


Figure C.6.1: Opening costs and carrying values of the water infrastructure

The previous table indicates that 38.61% 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	R60 701	R361 679	R283 961	R3 331	R2 866
Bulk Mains	R0	R1 342 170	R10 694	R3 039 506	R6 545 147
Reticulation Pipeline	R144 732	R4 644 953	R3 047	R3 967 661	R7 629 022
Pump Stations	R0	R3 354 318	R122 098	R1 598 624	R1 643 027
Reservoirs	R0	R892 893	R114 827	R1 220 870	R41 422 847
WTWs	R0	R1 915 891	R105 759	R621 644	R8 777 018
Dams and Weirs	R0	R225 757	R572	R93 167	R12 909 089
Total	**R205 433**	**R12 737 661**	**R640 958**	**R10 544 803**	**R78 929 016**

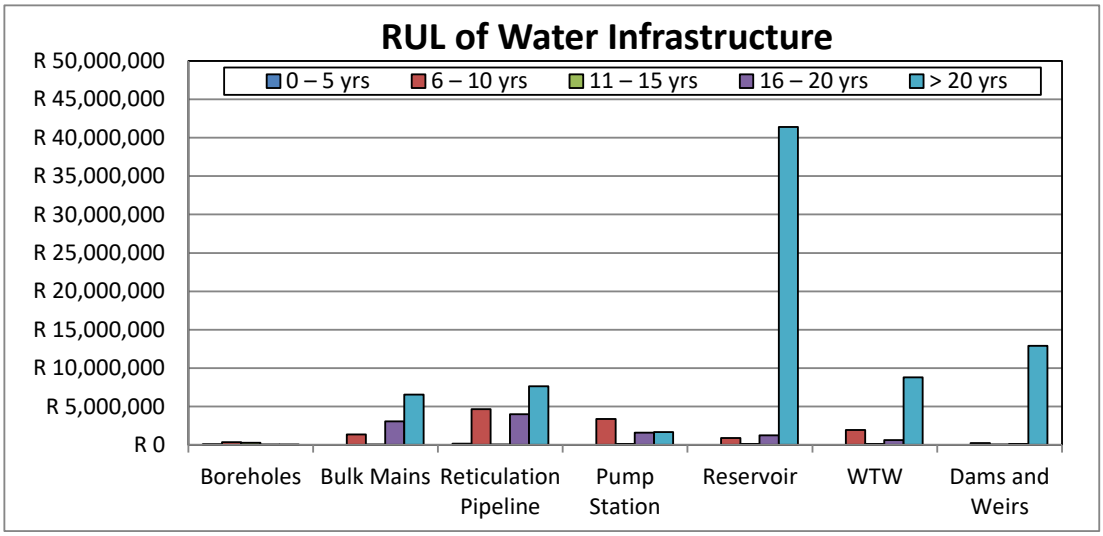


Figure C.6.2: Remaining Useful Life of the water infrastructure

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	R147 714	R376 848	R148 700	R0	R39 276
Bulk Mains	R1 801 928	R501 535	R1 811 036	R4 299 098	R2 523 920
Reticulation Pipeline	R4 408 586	R1 462 532	R3 128 498	R3 110 179	R4 279 620
Pump Stations	R800 648	R1 026 374	R2 364 124	R2 525 875	R1 046
Reservoirs	R9 833 496	R0	R736 115	R119 592	R32 962 234
WTWs	R4 668 450	R1 023 423	R1 535 028	R1 412 670	R2 780 741
Dams and Weirs	R0	R0	R0	R356 864	R12 871 721
Total	**R21 660 822**	**R4 390 712**	**R9 723 501**	**R11 824 278**	**R55 458 558**

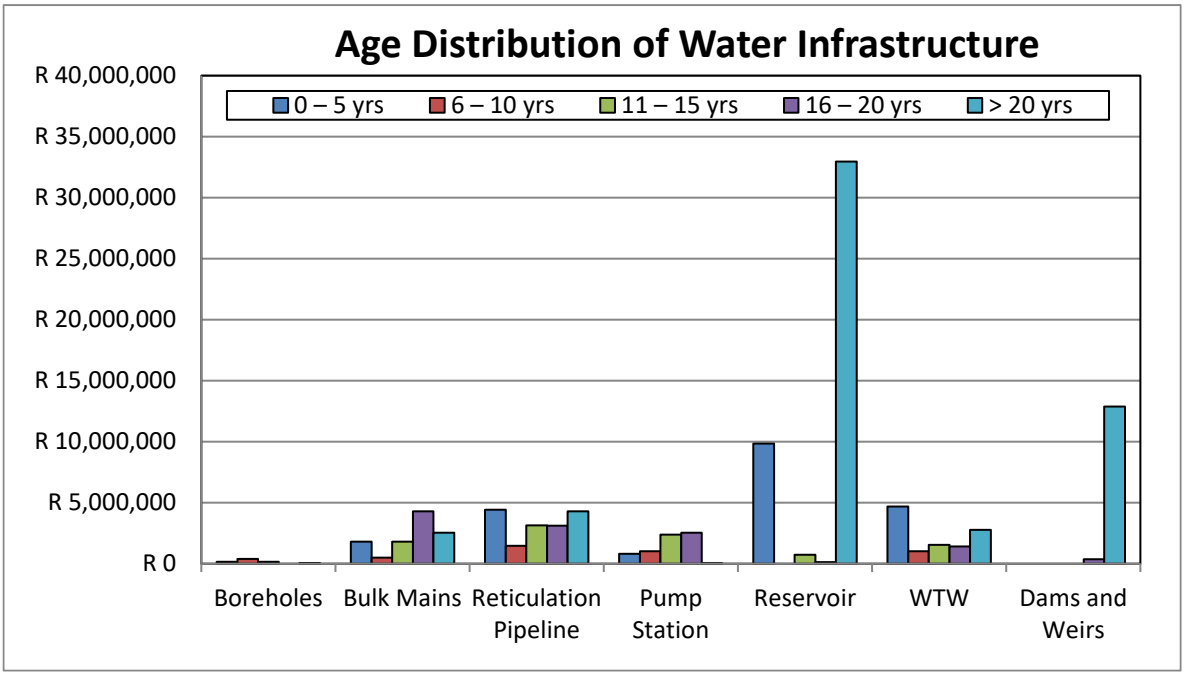


Figure C.6.3: Age distribution of the water infrastructure

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

Table C.6.3: Overview of the condition grading by facility type for the water infrastructure (Opening Costs)					
Asset Type	**Very Good**	**Good**	**Fair**	**Poor**	**Very Poor**
Boreholes	R60 701	R72 278	R578 539	R1 020	R0
Bulk Mains	R4 957 189	R1 230 586	R3 587 387	R794 499	R367 856
Reticulation Pipeline	R4 673 213	R4 840 223	R6 382 911	R284 406	R208 662
Pump Stations	R758 274	R3 113 908	R2 779 730	R66 155	R0
Reservoirs	R1 715 058	R33 865 668	R8 005 621	R65 090	R0
WTWs	R1 420 712	R6 820 829	R3 178 771	R0	R0
Dams and Weirs	R19 078	R248 747	R12 960 760	R0	R0
Total	**R13 604 225**	**R50 192 239**	**R37 473 719**	**R1 211 170**	**R576 518**

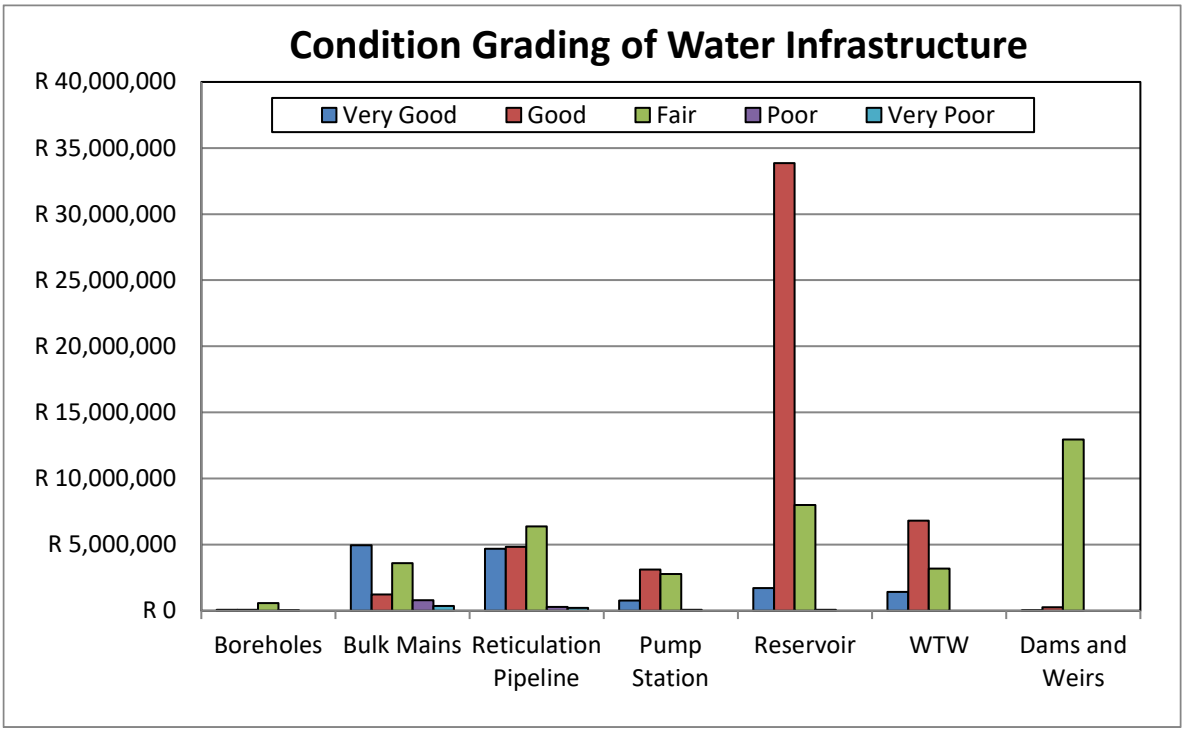


Figure C.6.4: Condition grading of the water infrastructure

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 2021).

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	R15 385 172	R9 045 295	58.79%
Sewer Reticulation Pipelines	R19 843 098	R15 072 235	75.96%
Porterville WWTW (0001)	R30 341 286	R27 082 598	89.26%
Velddrif WWTW (0002)	R12 749 578	R10 197 541	79.98%
Eendekuil WWTW (0003)	R269 582	R143 936	53.39%
Piketberg WWTW (0004)	R11 596 729	R7 089 274	61.13%
Totals	**R90 185 445**	**R68 630 879**	**76.10%**

The previous table indicates that 23.90% of the value of the sewerage infrastructure has been consumed.

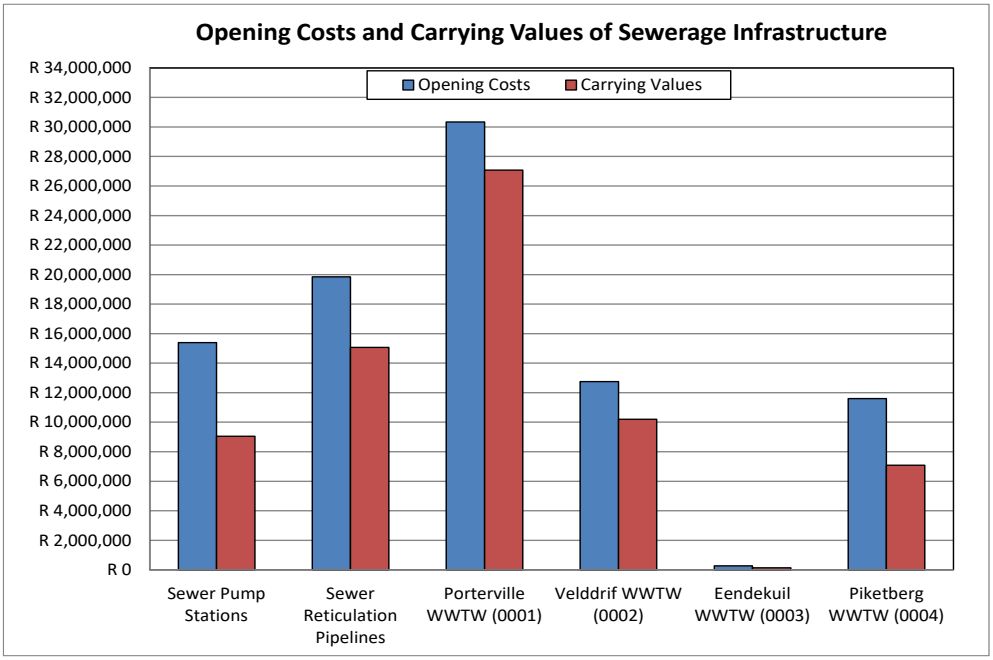


Figure C.6.5: Opening costs and carrying values of the sewerage infrastructure

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	R145 025	R9 471 353	R568 120	R548 946	R4 651 728
Sewer Reticulation Pipelines	R0	R0	R1 565 224	R1 569 162	R16 708 712
Porterville WWTW (0001)	R0	R6 395 290	R907 560	R797 711	R22 240 725
Velddrif WWTW (0002)	R0	R2 190 443	R910 957	R1 835 868	R7 812 310
Eendekuil WWTW (0003)	R0	R38 778	R0	R148 439	R82 365
Piketberg WWTW (0004)	R0	R3 889 269	R324 848	R973 724	R6 408 888
Totals	**R145 025**	**R21 985 133**	**R4 276 709**	**R5 873 850**	**R57 904 728**

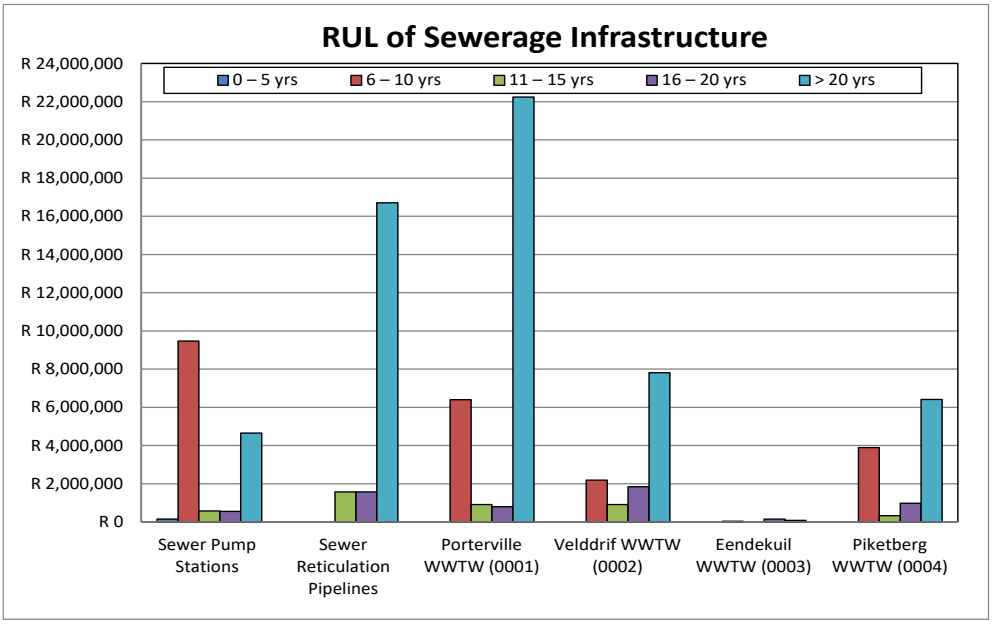


Figure C.6.6: Remaining Useful Life of the sewerage infrastructure

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	R4 701 317	R810 986	R5 857 297	R942 252	R3 073 320
Sewer Reticulation Pipelines	R5 368 479	R974 265	R3 204 671	R3 018 882	R7 276 801
Porterville WWTW (0001)	R27 189 950	R76 229	R0	R969 197	R2 105 910
Velddrif WWTW (0002)	R464 287	R10 368 885	R1 544 553	R371 853	R0
Eendekuil WWTW (0003)	R0	R0	R0	R269 582	R0
Piketberg WWTW (0004)	R494 338	R6 608 676	R1 364 069	R119 488	R3 010 158
Totals	**R38 218 371**	**R18 839 041**	**R11 970 590**	**R5 691 254**	**R15 466 189**

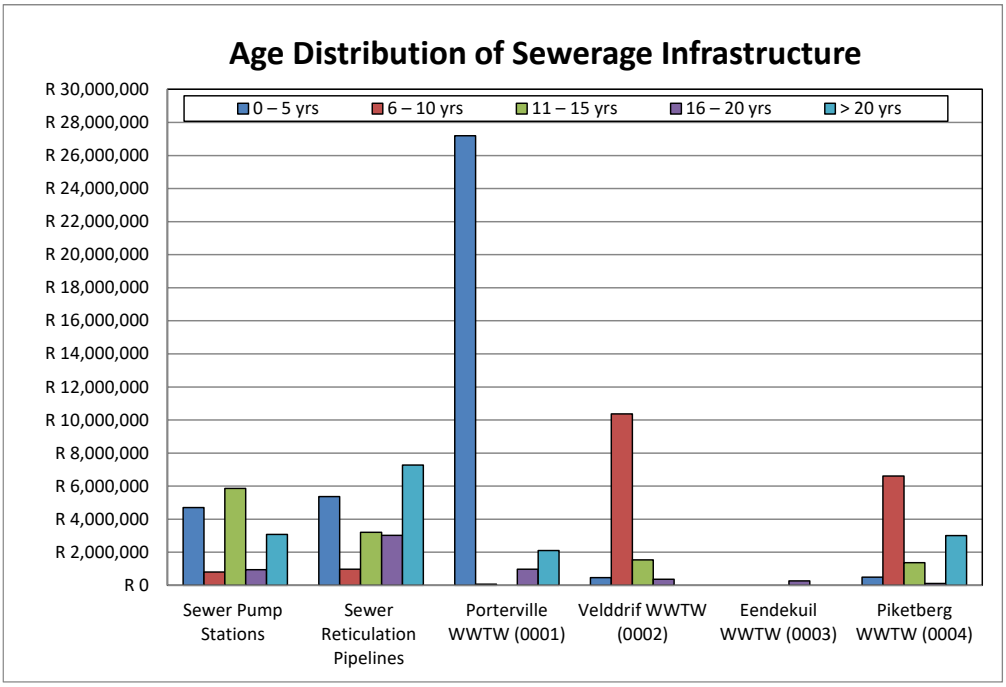


Figure C.6.7: Age distribution of the sewerage infrastructure

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	R3 103 658	R7 043 571	R4 874 437	R162 140	R201 366
Sewer Reticulation Pipelines	R6 229 194	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)	R197 354	R6 630 104	R5 493 969	R208 698	R219 453
Eendekuil WWTW (0003)	R0	R0	R269 582	R0	R0
Piketberg WWTW (0004)	R0	R4 229 765	R7 276 151	R90 813	R0
Totals	**R22 025 858**	**R42 782 226**	**R22 907 720**	**R2 048 822**	**R420 819**

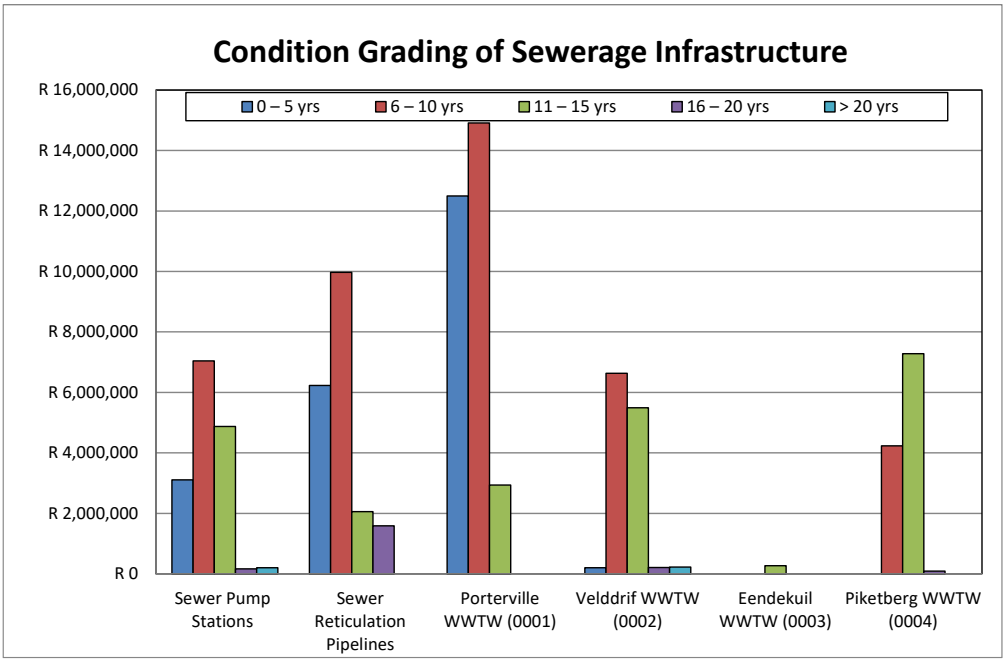


Figure C.6.8: Condition grading of the sewerage infrastructure

The Opening Costs of the water and sewerage infrastructure that will need to be replaced over the next five years (RUL <5 yrs) is R0.350 million. The asset renewal needs for the **water infrastructure assets** over the next 10 years is R1.294 million per year. The reinvestment required is R0.205 million in the first 5 years and R12.738 million in the second 5-year period. The age of 53.8% of the water infrastructure assets is greater than 20 years. The asset renewal needs for the **sewerage infrastructure assets** over the next 10 years is R2.213 million per year. The reinvestment required is R0.145 million in the first 5 years and R21.985 million in the second 5-year period. The age of 17.1% of the sewerage infrastructure assets is greater than 20 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. Any failures that are observed, complemented by the findings of the programmed inspections and checks, are then dealt with through

Table C.7.1: Types of planned and unplanned preventative and corrective maintenance implemented by Bergrivier Municipality	
	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 and Safety Plans	Compliance to safety requirements. Safety equipment and maintenance thereof. Existence of safety plan where required.	Adequate: Water Safety Plans and W_2RAPs are in place for all 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. Incident Management Protocols, as included in the

Table C.7.2: Bergrivier Municipality's Operation and Maintenance Assessments and Plans		
Element	**Assessment Criteria**	**Status Quo**
	Existence of contingency plan where required.	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 2021), 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 2021		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	2020/2021
Boreholes	R712 538	R410 044	R1 100 000	R22 000	R16 500	R2 322 204
Bulk & Ret. Pipelines	R27 326 932	R17 591 410	R206 670 000	R4 133 400	R3 100 050	
Pump Stations	R6 718 067	R3 652 015	R17 743 000	R354 860	R266 145	
Reservoirs, Dams & Weirs	R56 880 022	R34 015 987	R50 133 000	R1 002 660	R751 995	
WTWs	R11 420 312	R7 599 074	R38 705 000	R774 100	R580 575	R1 075
Sub Total Water	**R103 057 871**	**R63 268 530**	**R314 351 000**	**R6 287 020**	**R4 715 265**	**R2 323 279**
Sewer Pump Stations	R15 385 172	R9 045 295	R23 600 000	R472 000	R354 000	R3 169 628
Sewer Reticulation Pipelines	R19 843 098	R15 072 235	R144 168 000	R2 883 360	R2 162 520	
Porterville WWTW (0001)	R30 341 286	R27 082 598	R17 055 000	R341 100	R255 825	R3 449
Velddrif WWTW (0002)	R12 749 578	R10 197 541	R23 117 000	R462 340	R346 755	
Eendekuil WWTW (0003)	R269 582	R143 936	R3 405 000	R68 100	R51 075	
Piketberg WWTW (0004)	R11 596 729	R7 089 274	R35 172 000	R703 440	R527 580	
Dwarskersbos WTW	-	-	R5 879 000	R117 580	R88 185	
Sub Total Sewerage	**R90 185 445**	**R68 630 879**	**R252 396 000**	**R5 047 920**	**R3 785 940**	**R3 173 077**
Total Water and Sewerage	**R193 243 316**	**R131 899 409**	**R566 747 000**	**R11 334 940**	**R8 501 205**	**R5 496 356**

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	20/21	19/20	18/19	17/18	16/17	15/16
Water	R2 594 725	R1 824 448	R1 083 070	R1 839 330	R5 334 755	R12 588 501
Sewerage	R6 289 300	R6 095 250	R12 958 020	R13 264 557	R2 168 427	R3 542 882
Total	**R8 884 025**	**R7 919 698**	**R14 041 089**	**R15 103 887**	**R7 503 182**	**R16 131 383**

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 2045 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 2020/2021 requirement (%)	Low Annual Growth on 2020/2021 requirement (%)	WSDP Projection Model
Porterville	711.385 (Y)	2041 (2%)	> 2045 (1%)	> 2045
Piketberg	945.075 (A)	2023 (4%)	2025 (3%)	2030
Velddrif	1 295.460 (L)	2036 (3%)	2044 (2%)	2031
Dwarskersbos	143.940 (L)	2030 (3%)	2035 (2%)	2036
Aurora	64.964 (Y) *	2035 (2.5%)	2045 (1.5%)	2032
Eendekuil	116.435 (Y)	2036 (2%)	2030 (3%)	> 2045
Redelinghuys	577.109 (Y)	> 2045 (2%)	> 2045 (1%)	> 2045

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

The future water requirement projection models include the future projections up to 2045 and were calibrated by using historic billed metered consumption data and bulk metered abstraction data. 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)				
		2025	2030	2035	2040	2045
Porterville	1% Annual Growth	491.730	516.813	543.176	570.883	600.004
	2% Annual Growth	516.560	570.324	629.683	695.221	767.580
	WSDP Model	**491.729**	**525.740**	**563.419**	**605.311**	**652.062**
	Yield surplus (+) / shortfall (-)	**+219.656**	**+185.645**	**+147.966**	**+106.074**	**+59.323**
Piketberg	3% Annual Growth	946.725	1 097.513	1 272.319	1 474.966	1 709.890
	4% Annual Growth	993.583	1 208.846	1 470.746	1 789.387	2 177.063
	WSDP Model	**857.552**	**934.576**	**1 020.756**	**1 117.447**	**1 226.236**
	Allocation surplus (+) / shortfall (-)	**+87.523**	**+10.499**	**-75.681**	**-172.372**	**-281.161**
Velddrif	2% Annual Growth	883.469	975.421	1 076.944	1 189.033	1 312.788
	3% Annual Growth	927.634	1 075.382	1 246.662	1 445.223	1 675.410
	WSDP Model	**977.224**	**1 196.595**	**1 469.518**	**1 809.692**	**2 234.413**
	Licence surplus (+) / shortfall (-)	**+318.236**	**+98.865**	**-174.058**	**-514.232**	**-938.953**
Dwarskersbos	2% Annual Growth	116.619	128.756	142.157	156.953	173.289
	3% Annual Growth	122.448	141.951	164.560	190.770	221.155

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)**				
		2025	**2030**	**2035**	**2040**	**2045**
	WSDP Model	**114.777**	**126.175**	**139.097**	**153.765**	**170.438**
	Licence surplus (+) / shortfall (-)	**+29.163**	**+17.765**	**+4.843**	**-9.825**	**-26.498**
Aurora	1.5% Annual Growth	47.177	50.824	54.751	58.983	63.541
	2.5% Annual Growth	49.548	56.059	63.425	71.760	81.190
	WSDP Model	**49.786**	**59.456**	**71.587**	**86.864**	**106.165**
	Yield surplus (+) / shortfall (-)	**+15.178**	**+5.508**	**-6.623**	**-21.900**	**-41.201**
Eendekuil	2% Annual Growth	92.961	102.637	113.319	125.113	138.135
	3% Annual Growth	97.608	113.155	131.177	152.071	176.291
	WSDP Model	**86.836**	**91.852**	**97.345**	**103.358**	**109.937**
	Yield surplus (+) / shortfall (-)	**+29.599**	**+24.583**	**+19.090**	**+13.077**	**+6.498**
Redelinghuys	1% Annual Growth	66.086	69.457	73.000	76.724	80.638
	2% Annual Growth	69.423	76.649	84.627	93.435	103.159
	WSDP Model	**62.934**	**63.922**	**65.113**	**66.521**	**68.161**
	Yield surplus (+) / shortfall (-)	**+514.175**	**+513.187**	**+511.996**	**+510.588**	**+508.948**

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.

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 m³/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 m³ 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 m³ of storage would be required over and above the readily available 0.5 million m³ 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 m³/a for the Withoogte supply area, which is to be increased to 30.3 million m³/a by 2033, and to 6.39 million m³/a for the Swartland supply area (to be increased to 11.1 million m³/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:

Short-Term (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 (Municipality comment).

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

Distribution System	Option	Potential
Porterville	Re-use of water	• Re-use of water from the WWTW can only be allowed if the existing works is able to provide a 95% assurance of supply in terms of quality requirements. • The final treated effluent from the WWTW is currently discharged into an on-site stream that leads to a farmer’s irrigation dam. The re-use of treated effluent onsite is an option for the Porterville WWTW. According to the Land Purchase Agreement of 1972, the Knoetzen family has the right to use the final effluent discharged from the WWTW and they intend to carry on using all the final effluent discharged from the WWTW.
	Groundwater	• There are two springs at the foothills of the Porterville Mountains registered in the WARMS database, with a 6 l/s and 7 l/s estimated yield, respectively. Some boreholes drilled into the Malmesbury shale are scattered around the town. Borehole yields can go up to 1.2 l/s, according to the NGA. • Considering the limited available surface water resources, groundwater is likely to be the most suitable alternative option. The TMG sandstones and the Malmesbury shale bear a similar potential for groundwater development whereas the TMG is currently used to a lower degree. This unit in general presents a good aquifer system with typical yields of 10 l/s – 20 l/s and a good water quality.

Table C.8.4: Potential future water resources for the various towns (DWS's All Towns Reconciliation Strategies)		
Distribution System	**Option**	**Potential**
	Surface Water	• Supply from the Berg River or Voëlvlei Dam: These water resources are already over allocated and to provide the required infrastructure would be costly and the operation and maintenance cost will also be high. • Surface water resources in the vicinity of Porterville and the construction of an additional dam near Porterville: A detailed hydrological study must be undertaken to ensure the optimal utilization of the various streams from the mountains above Porterville. It seems that a substantial quantity of water is available during the winter months, which could be stored and used to augment the water supply of Porterville. • Purchasing of water rights: The purchasing of water rights of the current resources could be an economical option, as the water quality is high and all the necessary infrastructure is already in place.
	Other Sources	• Rainwater harvesting is not a suitable option for the area because the mean annual precipitation is considered too low.
	Summary	**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	Re-use of water	• Water re-use may be seen as a suitable intervention for Piketberg, provided that the Bergrivier Municipality can provide a 95% assurance of supply in terms of quality requirements. • A portion of the final effluent is currently re-used for the irrigation of the cricket, rugby and soccer town sport fields and the golf course.
	Groundwater	• Boreholes in the immediate surroundings of the town are few. These boreholes were drilled into the Malmesbury rocks and are registered in the NGDB with yields of up to 2.9 l/s. Further north (about 7 km) borehole density is much higher. Yields of the boreholes drilled into the TMG are generally much higher, exceeding 7 l/s in places. There are about 76 existing boreholes in the TMG rocks of the Piketberg Mountains according to the DWS's National Groundwater Database (NGDB). Statistics from 35 boreholes show an average yield of 2.3 l/s. • The groundwater potential for the whole catchment is generally higher for the intergranular and fractured Malmesbury rocks, but these are also the ones that are currently being used to a much higher degree than the TMG aquifers. In addition, catchment G30H only comprises TMG rocks towards its margin in the area around Piketberg whereas the Malmesbury rocks are spread over the whole catchment area. Therefore, the TMG rocks in the nearby Piketberg Mountains are deemed a potential source for groundwater development in future. • There would appear to be 4 approaches to developing groundwater in this area: ➢ Drilling into or adjacent to the De Hoek Fault. This fault has an effective length of approximately 25 km. ➢ Drilling into the Peninsula Formation where targets are accessible. Many of these targets may already be exploited by existing private boreholes. ➢ Drilling into subsidiary NW-SE trending fault splays in the lower-lying northern slopes of the Piketberg Mountains (i.e. on the farms). ➢ Drilling through the Cenozoic sand cover into the Piekenierskloof Formation to the north-west of the strategy area. • The mean annual volume of recharge to this unit is approximately 8.0 million m^3/a during periods of normal rainfall, which is expected to decline to 5.6 million m^3/a during droughts. The long-term sustainable yield of the unit is estimated at 4.5 million m^3/a, although it may only be possible to safely abstract 3.1 million m^3/a during drier periods. The quantity and quality of the groundwater from the Piketberg unit makes it suitable for development as part of a bulk water supply, which would also supply towns such as Piketberg, Moorreesburg, Koringberg and Aurora. It is, however, important to note that existing groundwater use in this unit may be substantial and that this has not been factored into the estimated available resources of 4.5 million m^3/a.
	Surface Water	The following surface water options may be potential sources for this town: • Piketberg obtains most of its water out of the Berg River from the WCWSS. A License application for an increased allocation from the Berg River (WCWSS) should be submitted to the DWS. • An off-channel storage dam in one of the small non-perennial streams located close to Piketberg is a possibility to utilise the unused winter irrigation water use rights. This water should be bought through a water trading process.

Table C.8.4: Potential future water resources for the various towns (DWS's All Towns Reconciliation Strategies)		
Distribution System	**Option**	**Potential**
	Other Sources	• Rainwater harvesting is not a suitable option for the area because the Mean Annual Precipitation is considered too low.
	Summary	**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	Re-use of water	• Water re-use may be seen as a suitable intervention for Velddrif, provided that the Municipality can provide a 95% assurance of supply in terms of quality requirements. The potential re-use option must be considered for Velddrif in the medium to long-term. • The final treated effluent from the WWTW is currently re-used for the irrigation of the rugby field, golf course, cricket field and bowls field.
	Groundwater	• The town of Velddrif is located at the mouth of the Groot Berg River with significant river alluvium in its surroundings. • Just south of the Groot Berg River there is a large patch of the Langebaan Formation comprising locally bedded and cross-bedded consolidated to unconsolidated limestone and lime-rich sand. The Langebaan Formation is considered a major aquifer system with generally good groundwater potential referred to as the Langebaan Road aquifer system. However, in this area the thickness of this aquifer is limited to less than 20 m. • The tertiary intergranular deposits in the area generally bear a great potential for groundwater development in the area but it is not clear whether the limited thickness of these strata allows the abstraction of volumes relevant for municipal water supply. Further hydrogeological information and / or investigation are required to assess the feasibility of groundwater use for drinking water purposes in the area.
	Surface Water	The following surface water options may be potential sources for this town: • Velddrif is located at the mouth of the Berg River. Due to the ecological sensitivity of the area and the poor water quality, direct abstraction from the Berg River is not an option for Velddrif. An increase in the allocation from the Berg River to the West Coast District Municipality is much more likely. • The West Coast District Municipality completed various studies for the augmentation of their existing bulk water sources and also applied to the DWS for an increased allocation from the Berg River. • The Voëlvlei Dam is under stress to meet the projected requirements and thus various options to augment its yield have been considered. It is essential that the portion of the safe yield of the Voëlvlei Dam allocated to Velddrif as part of the West Coast DM's license be determined and included in the Service Level Agreement, in order to make more accurate shortfall projections. This action should be the first priority when considering alternative sources.
	Other Sources	• Rainwater harvesting is not a suitable option for the area because the mean annual precipitation is considered too low. • A desalination plant with a capacity of 25.5 Ml/d is at present under consideration as part of the long-term planning for the West Coast area. If implemented, such a plant will provide relief to possible water shortages at Velddrif due to the integrated system operated by the West Coast DM.
	Summary	**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	Re-use of water	• The re-use of treated effluent is not a feasible option for Dwarskersbos, considering the current treatment process at the WWTW as well as the limited volumes of treated effluent available. • Effluent evaporates from the ponds, but the works has an alternative to irrigate kikuyu grass when there is excess effluent from the last pond. A pump station for irrigation is located below the last pond.

Table C.8.4: Potential future water resources for the various towns (DWS's All Towns Reconciliation Strategies)		
Distribution System	**Option**	**Potential**
	Groundwater	• The Quaternary sands in the area form a shallow, unconfined, intergranular aquifer. The underlying Malmesbury Group is not considered to form an aquifer. Median borehole yields in the area are low, ranging from 0.1 to 0.5 l/s • Although the potential of the intergranular aquifer is high, the saturated thickness of the aquifer is insufficient for abstracting reasonable quantities of groundwater. Further, the groundwater quality is such that it cannot be used for domestic supply purposes without treatment. It is therefore concluded that the underlying aquifer is not of regional significance, and can only be used at a local scale for garden irrigation and stock watering purposes.
	Surface Water	• There are no major surface water resources near Dwarskersbos. • The West Coast District Municipality completed various studies for the augmentation of their existing bulk water sources and also applied to the DWS for an increased allocation from the Berg River. • The Voëlvlei Dam is under stress to meet the projected future requirements and thus various options to augment its yield have been considered. It is essential that the portion of the safe yield of the Voëlvlei Dam allocated to Dwarskersbos as part of the West Coast DM's license be determined and included in the Service Level Agreement, in order to make more accurate shortfall projections. This action should be the first priority when considering alternative sources.
	Other Sources	• Rainwater harvesting is not a suitable option for the area because the mean annual precipitation is considered too low. • Desalination of seawater is a feasible option specifically to address the peak holiday requirements. This option should be investigated further, specific for Dwarskersbos. • A desalination plant with a capacity of 25.5 Ml/d is at present under consideration as part of the long-term planning for the West Coast area. If implemented, such a plant will provide relief to possible water shortages at Dwarskersbos due to the integrated system.
	Summary	**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	Re-use of water	• Re-use of treated effluent is currently not a feasible option in Aurora as there is no water-borne sanitation system in place.
	Groundwater	• There are numerous boreholes, mostly in the area north-northwest of Aurora, registered in the NGA. Usually borehole yields range below 2 l/s. One borehole drilled into the Peninsula sandstone, however, is registered with a yield of 5 l/s. • The town itself is underlain by an extensive quaternary sand layer, which is part of the Adamboerskraal Aquifer System. The safe yield and licensed abstraction of the municipal boreholes and spring are unknown. It is essential that these be determined in order to perform a more accurate prediction of the future water scenario in Aurora. • The potential for groundwater use is very high for the intergranular aquifers. The number for the TMG aquifers is very small because they only constitute a small proportion of the catchment surface. However, since Aurora is located at the transition between intergranular deposits and the TMG outcrops, both might be a reasonable option for groundwater development. • There are two target options: ➢ The quaternary sand: an aquifer system with possible yields of 2 – 5 l/s, but sensitive to abstraction and periods of low rainfall and susceptible to contamination. The advantages of use of this system are ease of access and development. ➢ Fractured sandstone of the Peninsula Formation. This unit generally presents a good aquifer system with typical yields of 10 l/s – 20 l/s and a good water quality. • The report Development Potential of the Groundwater Resources of the WCDM [4] states the groundwater quality in the Cenozoic deposits to the north of the Papkuils River (Aurora) as generally good (50 – 170 mS/m) due to significant lateral inflows of fresh groundwater from the TMG aquifer system between Aurora and Piketberg.
	Surface Water	• There are limited local surface water resources available in the area but it can be linked to the Saldanha Regional Scheme at Velddrif.

Table C.8.4: Potential future water resources for the various towns (DWS's All Towns Reconciliation Strategies)		
Distribution System	**Option**	**Potential**
	Other Sources	• Rainwater harvesting is not a suitable option for the area because the mean annual precipitation is considered too low.
	Summary	**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	Re-use of water	• Eendekuil is not entitled to use the minimal effluent from the Eendekuil WWTW. If any, it is used by the neighbouring farmer as part of the land agreement for the WWTW. • The re-use of treated effluent is further not a feasible option for Eendekuil, considering the current treatment process at the WWTW as well as the limited volumes of treated effluent available.
	Groundwater	• On the 1:500 000 hydrogeological map the intergranular and fractured aquifer is reported to show a low average borehole yield of 0.1 to 0.5 l/s. Water quality is low, too, with an electrical conductivity of 300 to 1 000 mS/m. Groundwater recharge is 25 to 37 mm/a (medium). • There are a few boreholes registered in the NGA in the area around Eendekuil. The registered yields are in the order of 1.2 l/s. • There is a high groundwater potential for the intergranular and fractured Malmesbury rocks. The limiting factor for development of this source is the low borehole yields most likely caused by low hydraulic conductivity of the shale. The groundwater potential of the quaternary deposits is assessed significantly lower. This aquifer system shows available yields of 2 – 5 l/s, but is sensitive to abstraction and periods of low rainfall and susceptible to contamination. The advantages of use of this system are ease of access and development. The TMG only exhibits a potential of 1.38 million m^3/a. However, this unit in general presents a good aquifer system with typical yields of 10 l/s – 20 l/s and a good water quality. • Borehole density and yields increase significantly towards the west. There is intensive groundwater use along the foothills of the outcrops of the TMG about 8km west. The adjacent tertiary deposits also seem to be more practicable for groundwater development. To assess the options of groundwater usage for municipal supply in the Eendekuil area in detail, further hydrogeological investigation is required.
	Surface Water	Eendekuil is currently supplied with water from the Waboom River and the Waboomfontein Spring. Apart from the Waboom dams, it seems that all other existing dams are privately owned and that no water in these dams is available to Eendekuil. The current water supply will meet the future water requirements until 2030. Should the high-growth scenario be realised, the following surface water options may be potential sources for this town: • The Kruismans Stream runs alongside Eendekuil. The Stream appears to be non-perennial and, therefore, the potential for abstraction is probably quite limited. An option to consider is to use water from the above-mentioned stream to recharge the aquifers in the surrounding area. This will require a hydrological analysis of the stream, and recharge potential of the aquifer. • The two options to provide additional water storage at the Waboom dams are to construct an additional dam adjacent to the existing two dams or to increase the wall height of the existing dams. There might be surplus water in years with above average rainfall and the additional storage could be created for this water and for storing water from the fountains. • The Diepkloof catchment area is 2.9 km^2, which is slightly larger than the Waboom dams' catchment area. The estimated MAR for this catchment is approximately 115 000 m^3/a. It will however be difficult to intercept peak flows if a dam is not constructed within the river. The Diepkloof catchment could supply, in terms of the future Eendekuil requirement, a significant portion of the required water, but the following must be noted: ➢ The possible construction of a dam will be in an area defined as a water stressed area; ➢ The dam will be constructed on private land; ➢ A license must be obtained to abstract water, alter the water course and store water, and ➢ A comprehensive Environmental Impact Assessment must be undertaken. An advantage of this option is however that a dam will be constructed in close proximity to the proposed pressure break tank of the existing bulk system. Only limited additional infrastructure would therefore be required to connect to the existing bulk supply system.

Table C.8.4: Potential future water resources for the various towns (DWS's All Towns Reconciliation Strategies)		
Distribution System	**Option**	**Potential**
	Other Sources	• Rainwater harvesting is not a suitable option for the area because the mean annual precipitation is considered too low.
	Summary	**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	Re-use of water	• Water re-use is not a suitable option as there is no water-borne sanitation system in the town.
	Groundwater	• There are a few boreholes in the immediate surroundings of the town with unregistered geology and yield. Another borehole about 2.5 km north-east was drilled into the Peninsula Formation and has a registered yield of 2.4 l/s. • There are several NGA entries in the area of Matroozefontein about 3.5 km south-east with registered yields of up to 20 l/s. • The available target options are: ➢ The quaternary sand: an aquifer system with possible yields of 2 – 5 l/s, but sensitive to abstraction and periods of low rainfall and susceptible to contamination. Water quality is reported to be good (0-70 mS/m) and groundwater recharge is low (37-50 mm/a). The advantages of use of this system are ease of access and development. ➢ Fractured sandstone of the Peninsula or Piekenierskloof Formation in the northern or western outcrop. This unit in general presents a good aquifer system with typical yields of 10 l/s – 20 l/s and a good water quality. • There is no detailed information on the nature of the springs used for water supply.
	Surface Water	• Redelinghuys is located on the Verlorevlei Wetland. It is unlikely that surface water abstraction will be possible due to the sensitive ecology of the wetland.
	Other Sources	• Rainwater harvesting is not a suitable option for the area because the mean annual precipitation is considered too low.
	Summary	**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. 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 in low cost income areas where sanitation facilities are upgraded to waterborne systems is on-going. This is primarily focussed at 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 2021 across the eighteen key service areas, as identified through the Municipal Strategic Self-Assessment of Water Services process.

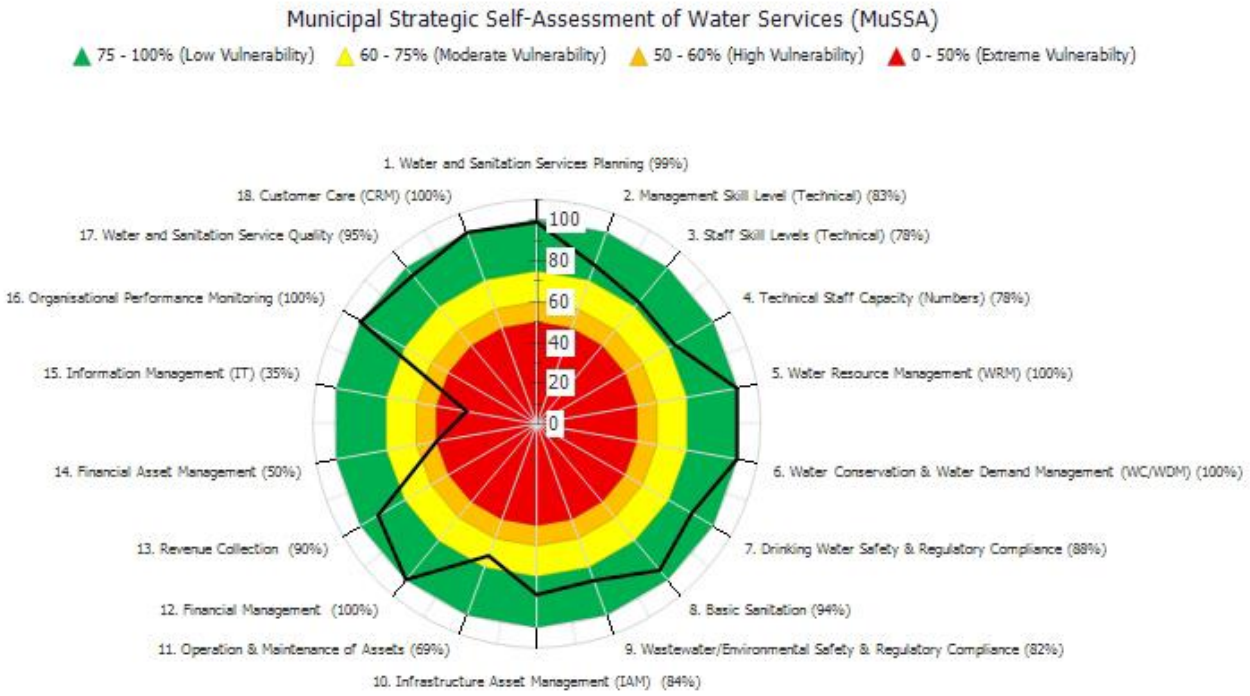


Figure C.9.1: Spider diagram of the vulnerability levels of Bergrivier Municipality for 2021

The only areas of concern evident from the 2021 assessment is Financial Asset Management (50.0%) and Information Management (IT) (35%). The overall vulnerability index of Bergrivier Municipality is 0.22 for the 2021 assessment (Low 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 (95.0%)**
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 (100.0%)**
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 (99.0%)**
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 (100.0%)**
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 (89.0%)**
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 (82.0%)**
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 (84.0%)**
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.	**Extreme (35.0%)**
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	**High (50.0%)**

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.	
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 (83.0%)**
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).	**Low (78.0%)**
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.	**Low (78.0%)**

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 2020/2021 financial year.

Table C.9.2: Training provided during the 2020/2021 financial year (Workplace Skills Plan)
Training Programme
National Certificate: Water and Wastewater Process Controller NQF3
Chainsaw
Cherry Picker
Grader Operator
Pay Day
Tree Felling

Table C.9.2: Training provided during the 2020/2021 financial year (Workplace Skills Plan)
Training Programme
Assets Training
Minimum Competency Training (Busy with training)
Stock Control
Code 10 Learner and Drivers Licence (Busy with training)

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.

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.

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	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**
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**

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**
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**
Repair pipe bursts	Repair of burst water pipelines	-	1	-	-	-	-	-	**1**
Other	Other water complaints (Not specified)	-	1	-	-	-	-	-	**1**
Pipelines water	Inspect / repair of faulty water pipelines	3	-	-	-	-	-	-	**3**
Stop-cock	Inspect / Repair leaking stop-cocks	1	2	-	-	-	-	-	**3**
Water Pressure	Inspect / Test water pressure	-	-	-	-	-	-	-	**0**
Water Quality	Inspect / Test water quality	-	-	-	-	-	-	-	**0**
Water Supply	Faulty water supply	-	-	-	-	-	-	-	**0**
Water meters	Inspect / Test / Repair / Install	2	-	1	-	-	-	-	**3**
Total for 2013/2014		**6**	**4**	**1**	**0**	**0**	**0**	**0**	**11**

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	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**
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**

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	15	-	-	-	-	-	-	**15**
Sewer manholes	Inspect / Repair manholes	1	-	-	-	-	-	-	**1**
Other	Other sewer complaints (Not specified)	-	-	-	-	-	-	-	**0**
Sewer spillage	Investigate and clean sewer spillages	-	-	-	-	-	-	-	**0**
Sewer Connections	Installation of sewer connections	-	-	-	-	1	-	-	**1**
Total 2013/2014		**16**	**0**	**0**	**0**	**1**	**0**	**0**	**17**

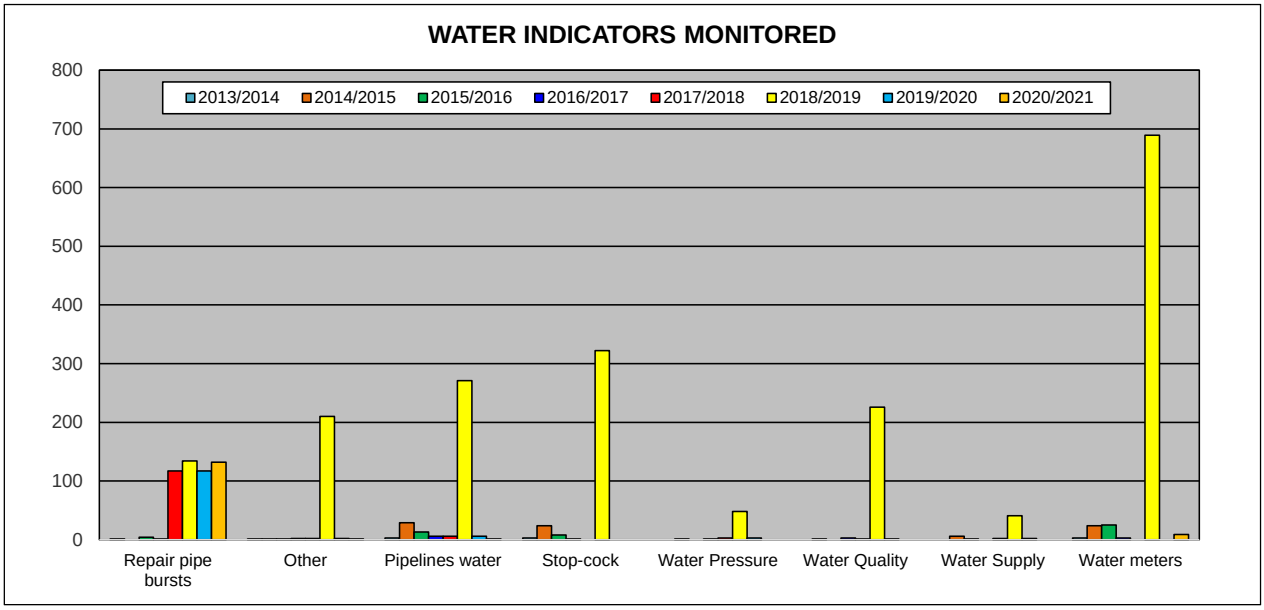


Figure C.9.2: Water indicators monitored by Bergrivier Municipality

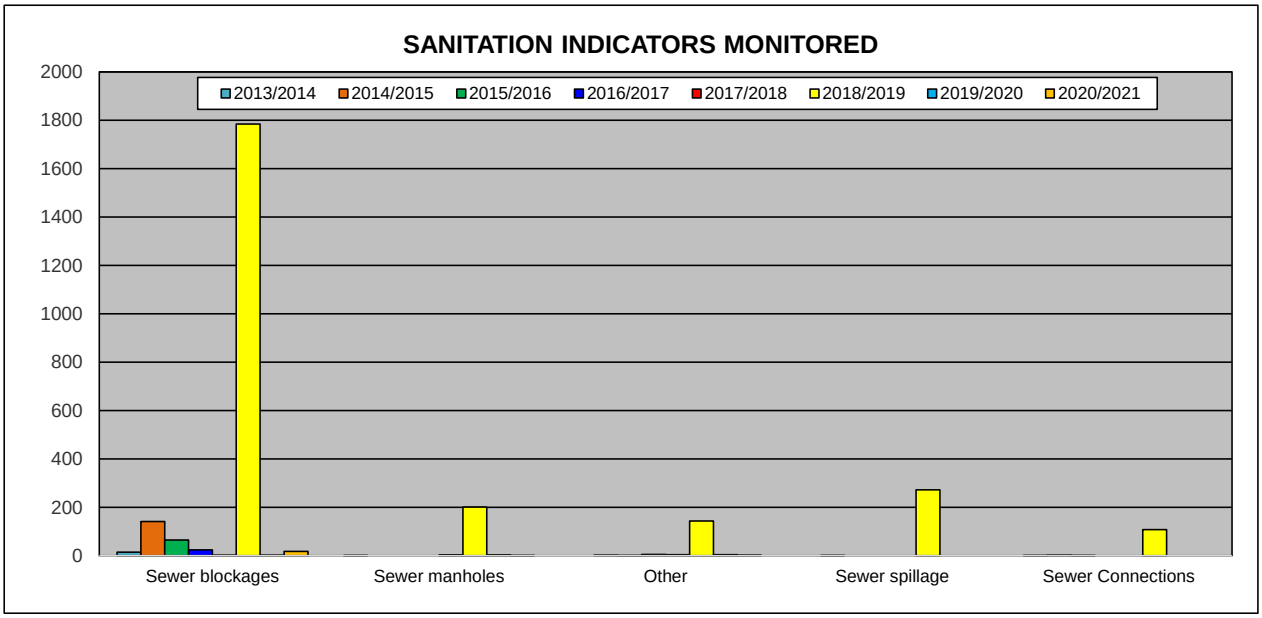


Figure C.9.3: Sanitation indicators monitored by Bergrivier Municipality

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 2020/2021 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
Name: J Breunissen
Title: Manager: Civil Engineering Services

21/10/2021
Date

Signature
Name: ~~C Koch~~ N Rossouw
Title: Director Technical Services

21/10/2021
Date

APPROVED:

Signature
Name: Adv. H Linde
Title: Municipal Manager

21/10/2021
Date

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.
- DWS's 2013 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, 2021, DWS.
- Bergrivier Municipality's Annual Water Services Development Plan Performance- and Water Services Audit Report for 2018/2019, Megaflow.
- Bergrivier Municipality's 2019/2020 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 2021.
- SDBIP of Bergrivier Municipality for 2020/2021.
- Socio-Economic Profile for Bergrivier Municipality, Provincial Treasury, 2020.
- 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	Draft 2020/2021 Water Services Audit Report		
Location Of Meeting	Bergrivier Municipality – Engineering Department	**Document No**	P07671
Chaired By	J Human	**Date of Meeting**	21 October 2021
Recorded By	iX engineers	**Time Start**	11:30
		Time Finish	13:00

Attended by:

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10.			Tel No Cell No		E-mail Fax No		
11.			Tel No Cell No		E-mail Fax No		

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)