GreenCape

Building water resilience in the City of Cape Town

through the Faure New Water Scheme

Main insights

The City of Cape Town is investing in resilient capital infrastructure projects to ensure energy, water and food security for industry and residents and accelerate the transition to a carbon neutral economy.

The City's ambitious R120 billion 10-year project pipeline investment includes major projects to build water and energy security, with approximately 40% of the pipeline aiming to contribute to strengthening Cape Town's ability to respond to climatic shock events in the future.

As part of this project pipeline, the City aims to add 300 million litres of water per day from new, diversified sources by 2030. The recent Cape Town drought highlighted that a new relationship with water is needed, including finding alternative sources of water.

This resulted in the formation of Cape Town's Water Strategy (Our Shared Water Future) and the New Water Programme under Commitment 3 of the water strategy, sufficient, reliable water from diverse sources.

The New Water Programme includes augmentation from surface water, ground water, water reuse and desalination.

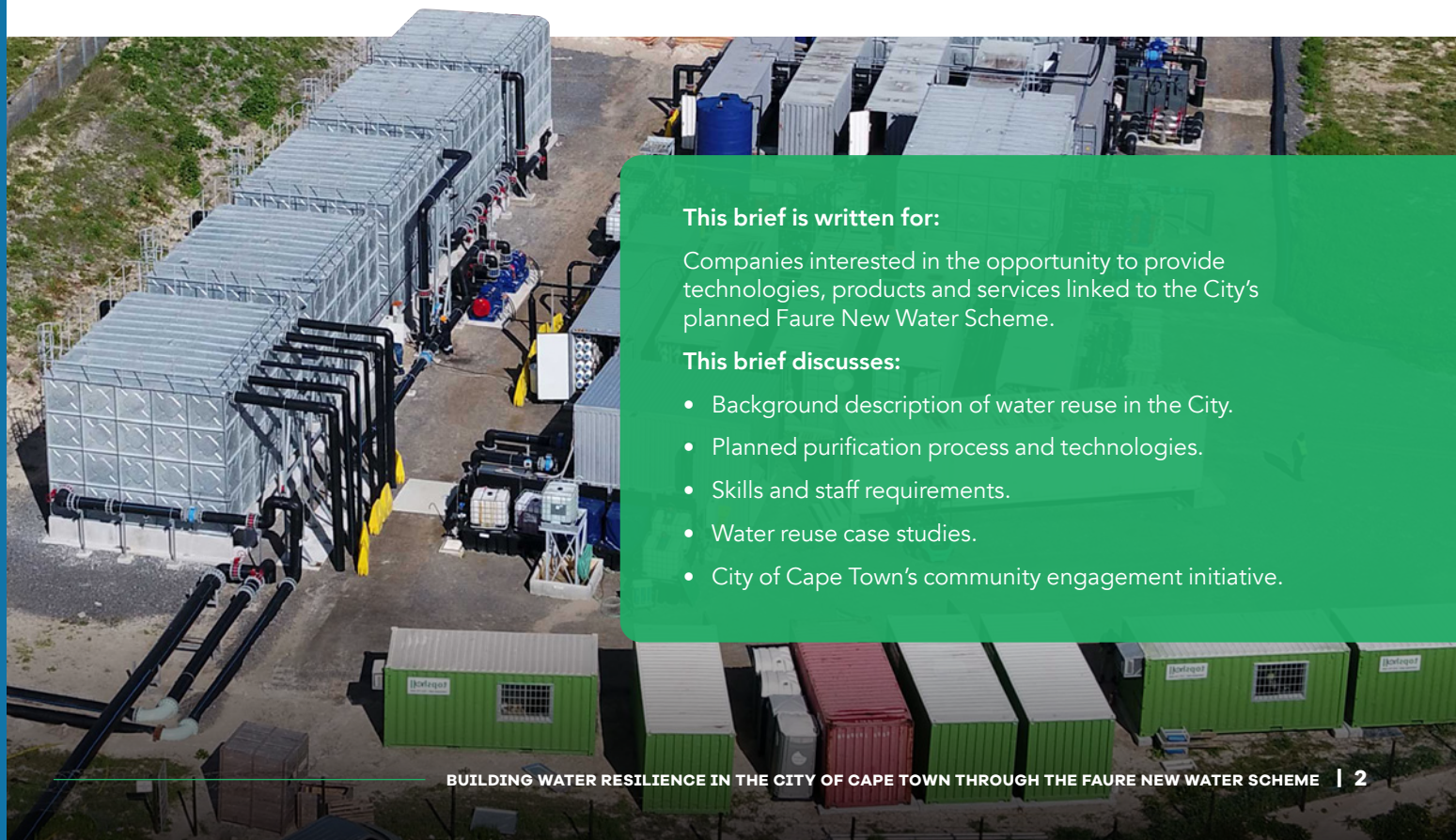
A large-scale reuse project, the Faure New Water Scheme (NWS) is being planned and designed and is expected to be commissioned by 2030.

The proposed Faure New Water Scheme includes a new advanced water purification plant with a multi-barrier process that will include tertiary wastewater polishing treatment, ozonation, biologically activated carbon filtration, granular activated carbon filtration, ultrafiltration, ultraviolet light - advanced oxidation, and disinfection.

This represents an opportunity for interested companies to provide technologies, products and services linked to the planned reuse scheme. In addition, ~70 direct jobs will be created at the facility, requiring a range of skills and qualifications.

Globally, water reuse for drinking-quality water is a growing trend, with several schemes already implemented locally, regionally and internationally.

Public education and clear communication are crucial to address concerns and establish a basis for transparency and trust.



This brief is written for:

Companies interested in the opportunity to provide technologies, products and services linked to the City's planned Faure New Water Scheme.

This brief discusses:

- Background description of water reuse in the City.
- Planned purification process and technologies.
- Skills and staff requirements.
- Water reuse case studies.
- City of Cape Town's community engagement initiative.

Acronyms

BAC	Biologically activated carbon
CAS	Conventional activated sludge
GAC	Granular activated carbon
MBR	Membrane bioreactor
MIR	Market intelligence report
ML/d	Mega litres per day
NWS	New Water Scheme
WTP	Water treatment plant
WRP	Water reclamation plant
WWTW	Wastewater treatment works

1 Context

Securing a reliable supply of water in the future, and providing quality sanitation services, are essential to enable a life of hope and dignity for communities, as well as to support Cape Town's businesses and most essential industries. As committed in the Cape Town Water Strategy, the City is actively facilitating the transition of Cape Town over time into a water-sensitive city with diverse water resources, diversified infrastructure and one that makes optimal use of storm water and urban waterways for the purposes of flood control, aquifer recharge, water reuse, and recreation, and is based on sound ecological principles.

This will be done through new incentives and regulatory mechanisms as well as through the way the City invests in new infrastructure. As detailed in the Infrastructure Report, the City's New Water Programme aims to add 300 million litres of water per day from new sources by 2030. By 2040, around 25% of Cape Town's water is expected to be sourced from desalination, groundwater, and reuse through the New Water Programme. The committed programme is designed to balance risk and cost. If less capacity is built, the risk of severe water restrictions will increase. If more capacity is built, the risk is further reduced, but the cost increases. The proposed programme aims to reduce risk at an affordable price.

Water reuse is an important part of the planned programme to diversify its water sources. A demonstration plant was commissioned to allow the City to gain experience in operating advanced water purification processes in a South African and Cape Town context.

A large-scale reuse project, the Faure New Water Scheme (NWS) is being planned and designed. The detailed design phase has been completed and the City is investigating the best option for the implementation and operation of the project through a Section 78 process of the Municipal Systems Act, 32 of 2000. The construction is expected to start in financial year 2026/2027 and the plant is expected to be commissioned in 2030.

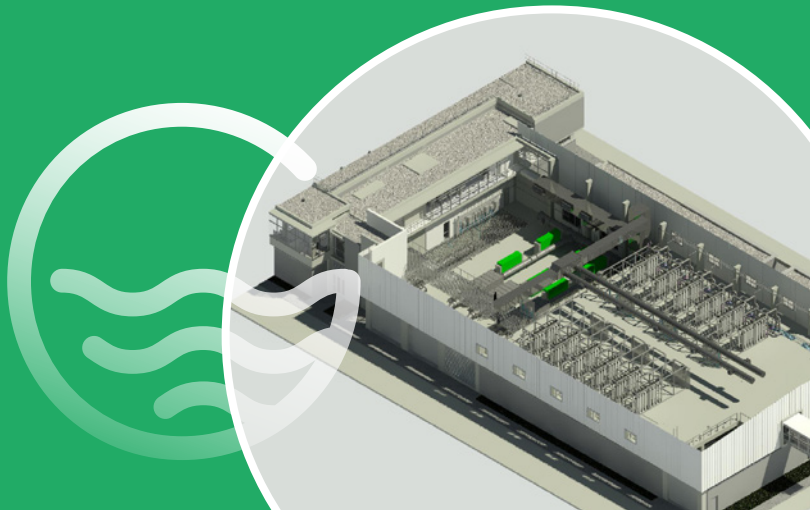
In the Cape Town context, water reuse refers to the purification of treated wastewater through a multi-barrier advanced purification process to produce drinking-quality water. This can supplement the bulk water supply. Leading cities around the world are considering or using water reuse as a reliable, cost-effective and sustainable means of providing for their growing water needs.

2 **Faure New Water Scheme:** Planned purification process and technologies

The planned Faure New Water Scheme (Faure NWS) is a purified recycled drinking water scheme that includes a new advanced water purification plant that will supply drinking water to Cape Town.

The scheme will receive treated wastewater from the Zandvliet Wastewater Treatment Works (WWTW), which has recently been upgraded to modernise and improve its performance and to provide additional capacity for the growing community that it serves. As part of the Faure NWS, additional tertiary treatment processes will be added to polish the conventional activated sludge (CAS) process water to a quality that is suitable as a source for the Faure NWS.

These processes will include fine rotary cloth filtration, and biofiltration for nitrate and fine particle removal. The tertiary treated CAS process water will be blended with treated water from the newly upgraded membrane bioreactor (MBR) process, and will be pumped to a new advanced water purification plant, to be located at the existing Faure Water Treatment Plant (WTP) campus 5 km away.



The advanced purification plant will produce up to 100 ML/d of clean drinking water (equipped for 70ML/d in Phase 1). The multi-barrier purification plant will include ozonation, biological activated carbon filtration, granular activated carbon filtration, ultrafiltration, ultraviolet advanced oxidation, and disinfection, as shown in **Figure 1**. Equipment for these technologies will be required from the market, together with services, consumables and materials that support the purification processes, see link.

The purified water will be blended with water from Theewaterskloof and Steenbras Upper Dam, to augment the raw water feed to Faure WTP at a maximum blend ratio of 33%. The City's bulk water distribution network will be upgraded to allow flexibility to distribute the drinking water from the Faure WTP broadly across the City.

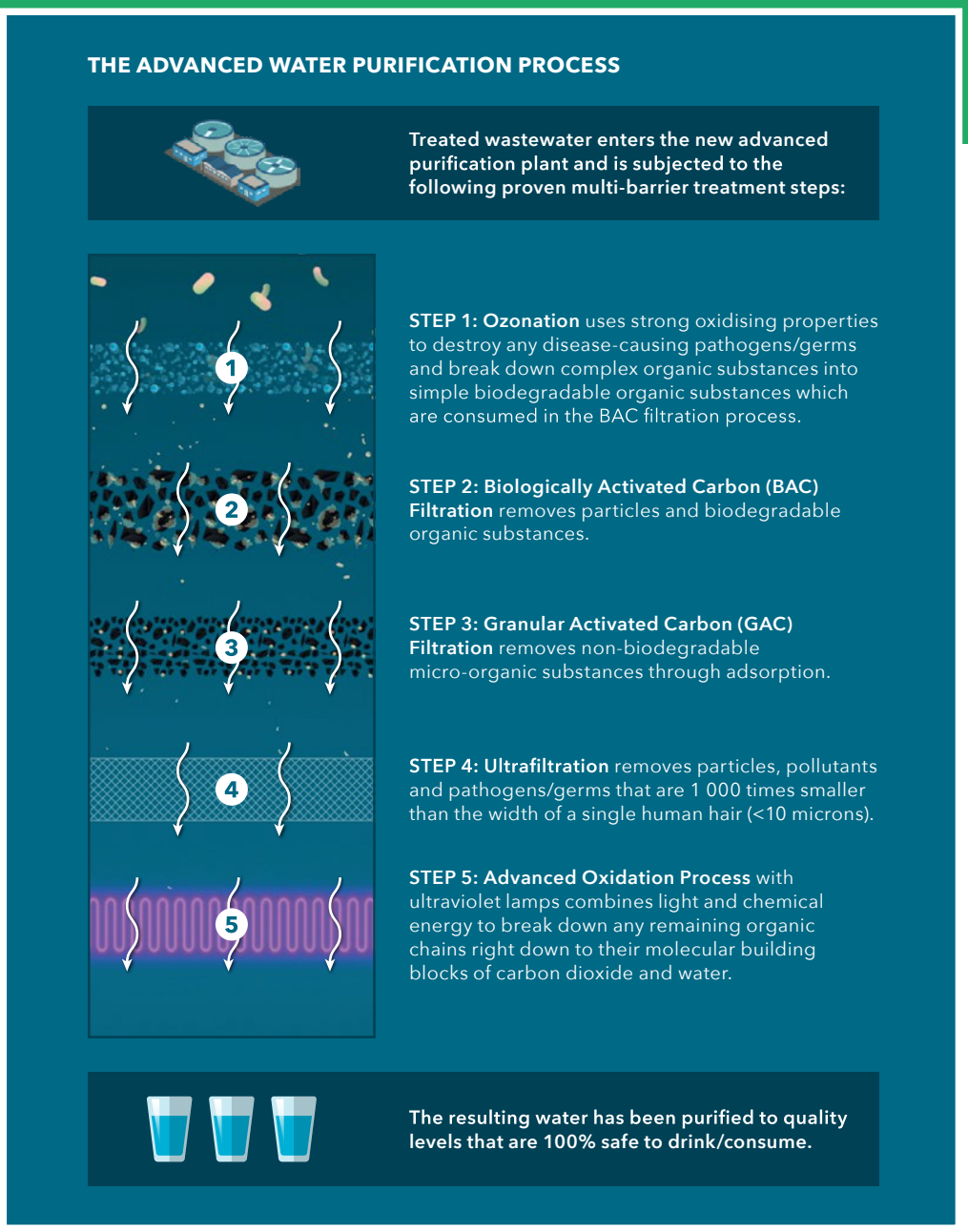


Figure 1: The advanced multi-barrier purification process at the Faure New Water Scheme (Source: City of Cape Town Water Reuse Booklet)

The Faure NWS will be designed and operated in accordance with international best practice and associated water safety protocols. The planning and design is being guided by an advisory panel comprising experts in various disciplines that are relevant to the project. To ensure the process operates correctly, each step will be validated and verified with online monitoring systems and an on-site commercial laboratories[1], for which technologies, services and supplies will be required from the market.

1 The City of Cape Town currently publishes drinking water quality results for all its water supply sources on an annual and quarterly basis on its website. This will include the Faure NWS.

3 Skills and staff requirements for the operation of the plant

The Faure NWS is expected to create ~70 new direct jobs at the facility. **Table 1** lists various employment opportunities and skills that will be required for the operation of the advanced water treatment plant at the Faure NWS. Additional indirect jobs are expected to be created along the value change of technology, product and service providers that service the scheme.

Table 1: Staff and skills required for the operation of Faure NWS (Source: City of Cape Town)

		FAURE NWS LABOUR
JOB FUNCTION	**NO.**	**RELEVANT QUALIFICATIONS**
Plant Manager	1	Relevant B-degree / Honours / Masters
Senior Superintendent	1	Trade tested Artisan / Tech or Professional Tertiary Qualification
Shift Supervisors	4	Grade 12 (with mathematics) and relevant classification - probably Grade VI
Operators (8-hour shifts) - Principal Process Controller	4	Trade tested Artisan / Tech or Professional Tertiary Qualification
Operators (8-hour shifts) - Senior Process Controller	4	Grade 12 (with mathematics) and relevant classification - probably Grade V
Operators (8-hour shifts) - Process Controller	4	Grade 12 (with mathematics) and relevant classification - probably Grade IV
Operators (8-hour shifts) - Process Operator	4	Grade 12 (with mathematics) and relevant classification - probably Grade III
Engineering and Scientific Staff	5	Process engineers with post-graduate qualification in aquatic chemistry, microbiological systems, etc.
Mechanical Foreman	4	Qualified Artisan
Mechanical Technician	8	Qualified Artisan
Electrical Foreman	4	Qualified Artisan
Electrical Technician	8	Qualified Artisan
General Labourers	5	Basic Literacy
Administrative Staff	4	Suitable qualifications ranging from Grade 10 to National Diploma
Receptionist	1	Grade 12
Cleaners	4	Basic Literacy
Driver	1	Basic Literacy and relevant License
	66	

4 Water reuse trends and case studies

Globally, water reuse is a growing trend, as shown in **Figure 2**.

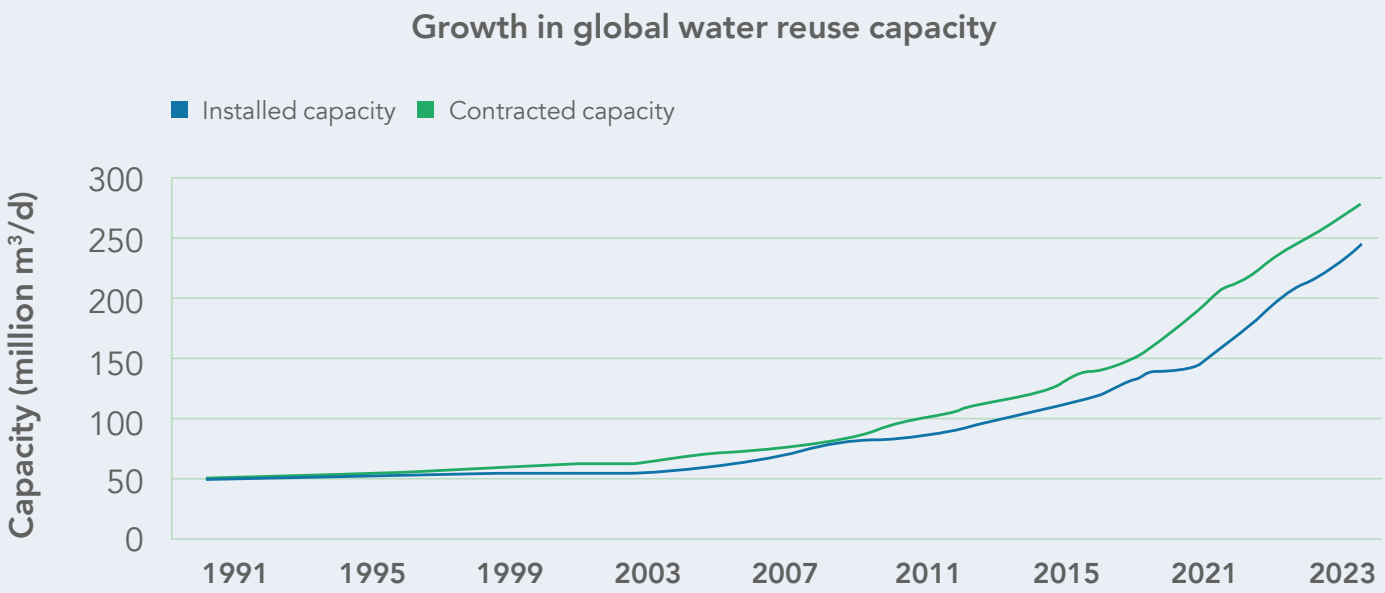


Figure 2: Global trend of water reuse capacity
(Source: Global Water Intelligence www.globalwaterintel.com)

The global water reuse market is expected to grow to ~$30 billion by 2030 (double the value in 2021), see **Figure 3**.

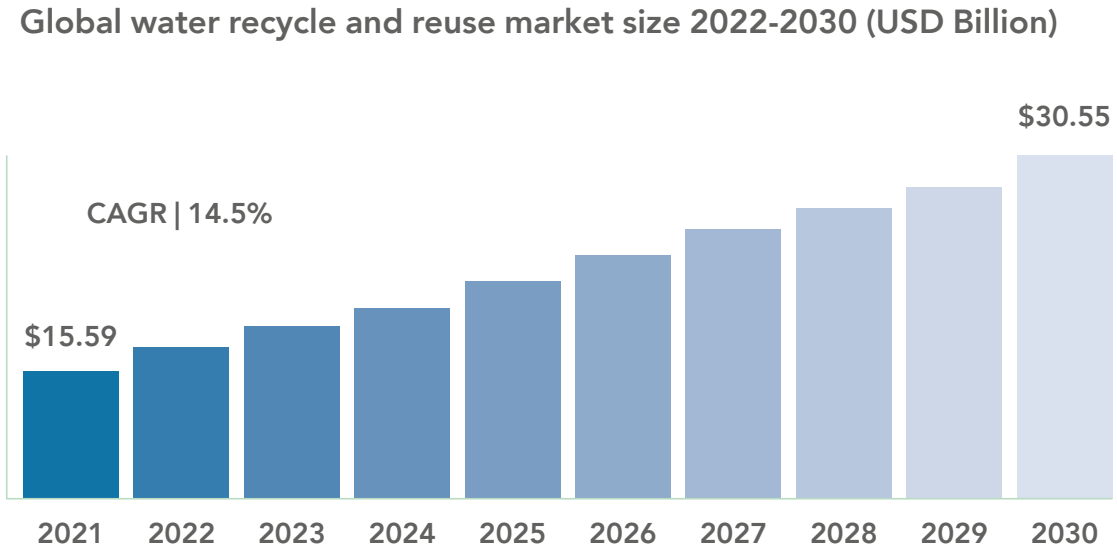


Figure 3: Global water reuse market size 2022-2030
(Source: Adapted from www.fnfresearch.com)

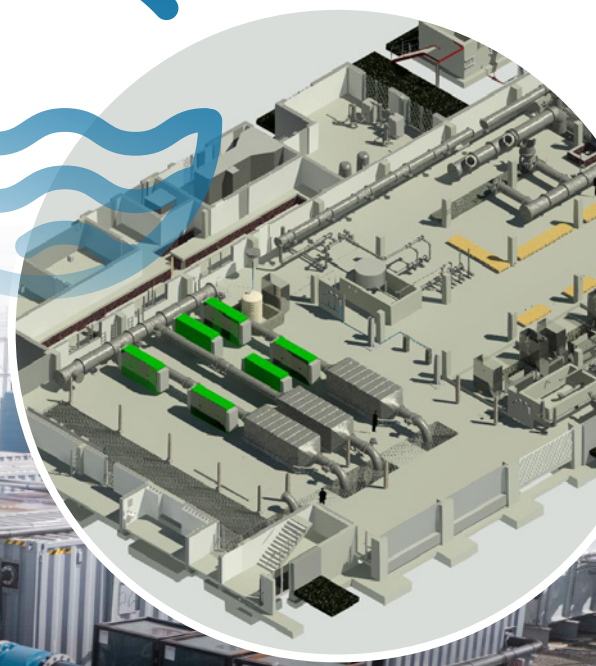
Water reuse for drinking-quality water has already been successfully implemented in many major cities and states across the world, including in the Unites States (California, Colorado, New Mexico, Texas and Virginia), Australia (Perth) and Singapore. African cities have also been involved in leading the way in water reuse, including Beaufort West, Ballito, and Windhoek (Namibia) where it has been operating for more than 50 years. In Cape Town, at the Old Mutual Park office complex in Pinelands, ~10 000 people have been using purified water from the on-site reuse plant on a daily basis since 2018. The internationally acclaimed Windhoek scheme is the oldest purified recycled drinking water scheme in the world. It was started when Namibia was effectively part of South Africa, and it was SA research and professional input that helped to bring it about.

Beaufort West's Water Reclamation Plant (WRP) was built in 2010 when the town's main water supply, the Gamka Dam, dried up during a severe drought. It became operational in January 2011 and has a capacity of 2.3 ML/d. The WRP uses wastewater from the Beaufort West Wastewater Treatment Plant as its raw water source (Marais and Dürckheim, 2011). The plant has a multi barrier design to ensure the safety of the drinking water.

The Balito water recycling plant, with a capacity of 3 ML/d, was constructed and commissioned in August 2016, following the 2014 droughts in KwaZulu-Natal. The plant was upgraded in 2018 to a capacity of 4 ML/d and currently supplies reuse water to communities in the Ballito area.

The Goreangab water reclamation plant in Windhoek, Namibia, is a world-renowned pioneer in direct water reclamation. The first direct potable reuse plant was commissioned in 1968 after severe droughts in Namibia, with no other viable water sources for the City of Windhoek. The initial capacity of the Goreangab reclamation plant was 4.3 ML/d. During a drought in 1992 the plant was upgraded to a capacity of 14 ML/d (Haarhoff, 1991). During another severe drought in 1997 it was decided to build a new water reclamation plant adjacent to the existing Goreangab plant, and the New Goreangab Water Reclamation Plant was commissioned in 2002 (Menge, 2010). The plant was developed to utilise domestic wastewater from the Gammams Wastewater Treatment Plant in Windhoek and the design was based on nearly 30 years of extensive experience and local research.

The City of Cape Town has been learning from the experience of these schemes. Additionally, a demonstration plant has been operated to gain experience and expertise in water reuse[2].



2 Watch the demonstration plant video here: https://www.youtube.com/watch?v=bx544pCuSrQ

5 Community engagement and public awareness initiatives

Despite the documented benefits and safety of water reuse, some residents may remain apprehensive about drinking purified recycled drinking water. Public education and clear communication are crucial to address concerns and build trust (Muanda et al., 2017). It is important to explain the benefits of water reuse, how water safety is ensured, and to answer questions about how potential risks, such as pathogens and pharmaceuticals, are handled.

The City has undertaken a series of initiatives to engage with key stakeholders and the public and has prepared a plan for ongoing and wider engagement over the coming year.

Residents and stakeholders are also welcome to approach the City about conducting collaborative research related to water reuse[3].

6 City of Cape Town's procurement processes

GreenCape has published an industry brief on entering the South African water market, which guides readers through general water sector procurement requirements and recommendations. In addition, the following sources can be consulted for assistance when bidding on City tenders:

- The City of Cape Town's Supply Chain Management Policy.
- Relevant webpages on the City's website, such as the Tender Portal, guiding articles in City Connect, and the City's supplier database.
- Water tariffs can be accessed from the City's latest budget annexure.

3 To make an arrangement, please email water@capetown.gov.za

Next steps

For further information and support on any of the content provided here, please contact GreenCape's Water sector desk: water@green-cape.co.za

The City of Cape Town has a New Technology Platform to give the City a better understanding of innovative water sector technologies in the market. It gives companies the opportunity to present their products and services to government in a fair manner. For details on how to submit information to the committee, please contact: Water.NewTechnology@capetown.gov.za

References and useful resources

AWRCoE Knowledge Hub - Water360 A compendium of useful resources on water reuse (including case studies, research reports, fact sheets, webcasts, news stories, workshop reports, technical guides and websites). Available at: https://water360.com.au/awrce-knowledge-hub/

City of Cape Town (2021). Our Shared Water Future: Cape Town's Water Strategy, available online https://www.capetown.gov.za/general/cape-town-water-strategy – accessed March 2021.

City of Cape Town (2021) Water reuse for Cape Town, available online https://resource.capetown.gov.za/documentcentre/Documents/Graphics%20and%20educational%20material/CCT_Water_Reuse_Booklet.pdf

Haarhoff, J. 1991. Report of a site investigation conducted at the Goreangab water treatment plant from 1991-07-08 to 1991-07-16. Submitted to the City Engineer, City of Windhoek.

Marais, P. and von Dürckheim, F., 2011. Beaufort West Water Reclamation Plant: First direct (toilet-to-tap) water reclamation plant in South Africa. In 75th IMESA Conference, Northern Provinces (Vol. 63, p. 64).

Menge, J., 2010, April. Treatment of wastewater for re-use in the drinking water system of Windhoek. In Water Institute of Southern Africa Conference: Midrand, Southern Africa.

Muanda C, Cousins D, Lagardien A, Owen G and Goldin J (2017) Direct reclamation of municipal wastewater for drinking purposes. Volume 2: Investigation into institutional and social factors influencing public acceptance of reclaimed water for potable uses in South Africa. WRC Report No. TT 734/17. Water Research Commission, South Africa. November 2017

Photo credit: Zutari and the City of Cape Town

This case study was made possible thanks to the support of the City of Cape Town

For more information and support contact:

GreenCape: info@greencape.co.za | (021) 811 0250