

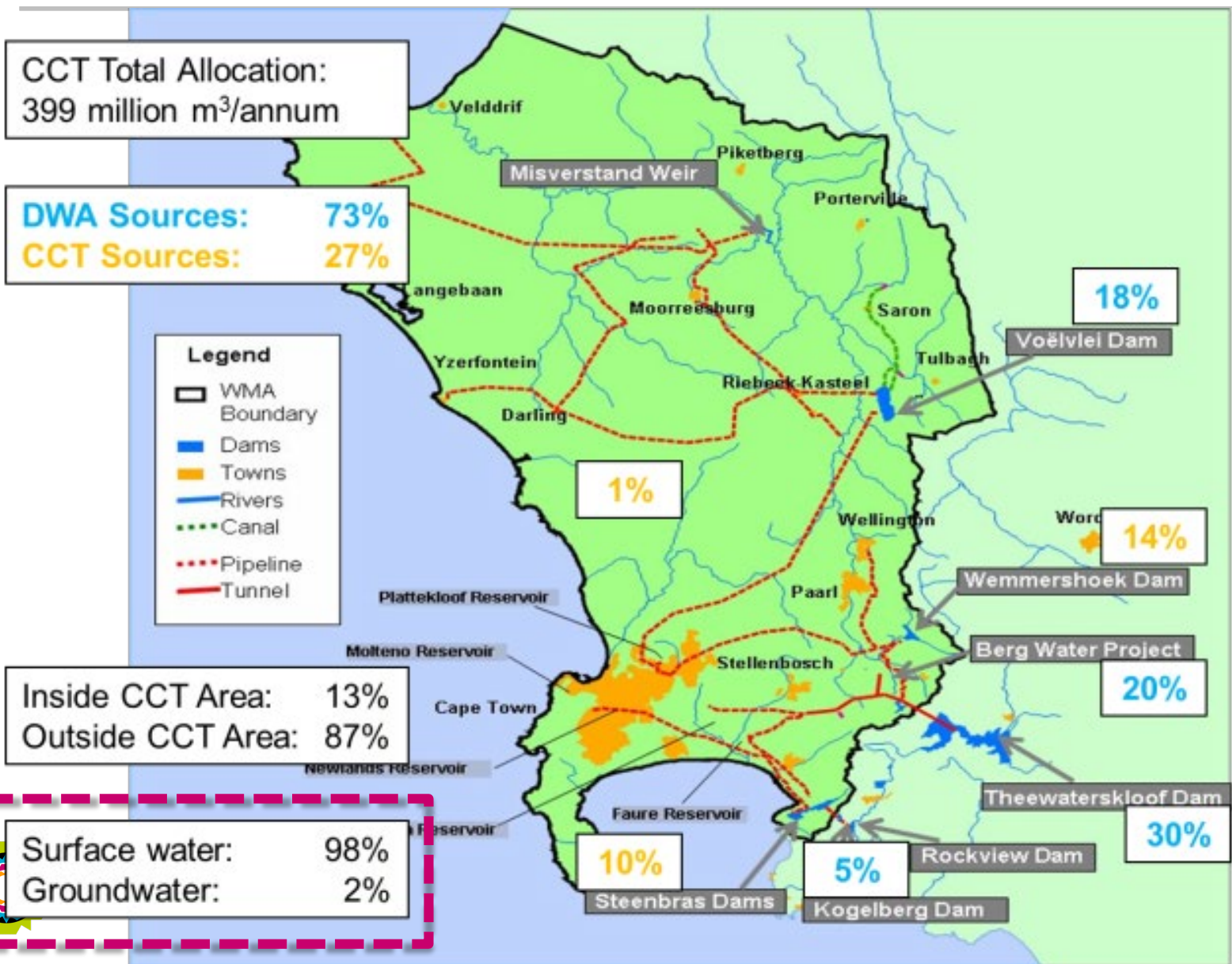
SAGCC Webinar- Sustainable Water Management



CITY OF CAPE TOWN
ISIXEKO SASEKAPA
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Christopher Norman & Keith Olsen
Water and Sanitation
19 February 2025

Where does Cape Town get its water from?

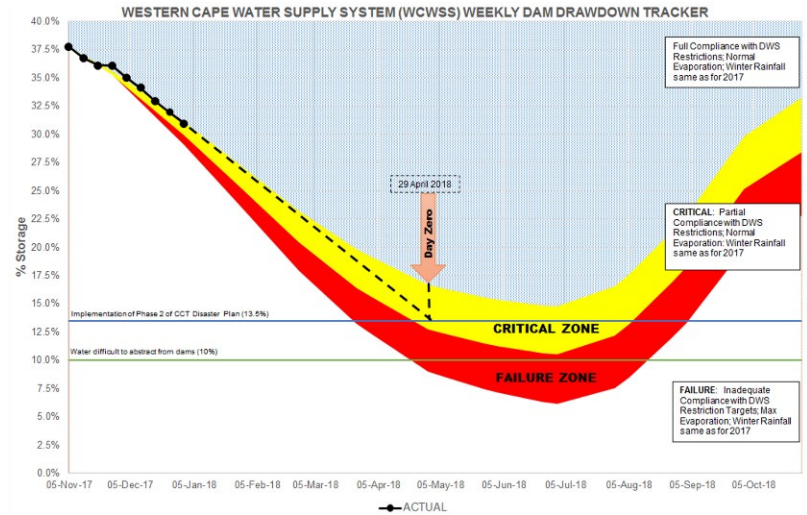


Day Zero was a possibility

Day Zero now likely to happen – new emergency measures

STATEMENT BY THE CITY'S EXECUTIVE MAYOR PATRICIA DE LILLE

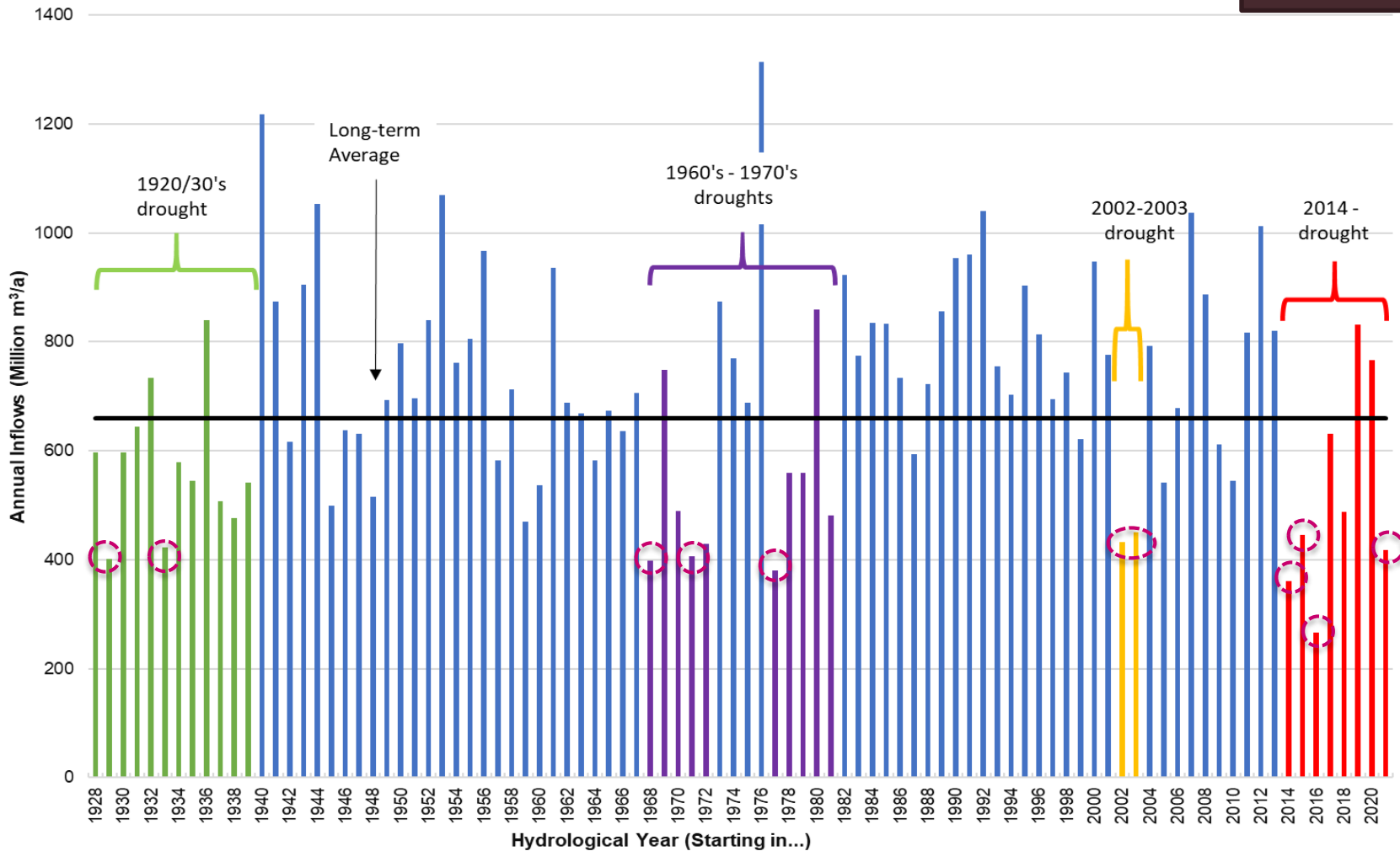
18 January 2018



Runoff into the WCWSS dams

Cape Town is prone to droughts

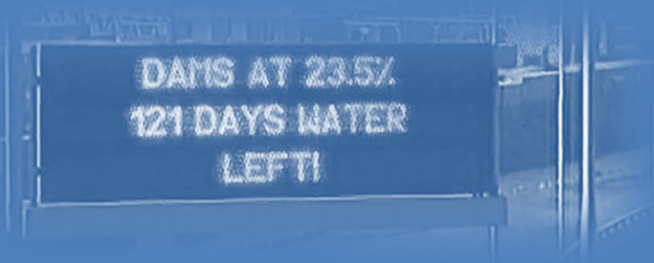
Day zero was a wake-up call. Cape Town will experience this, and possibly worse, in future



2014-2018 drought a 1-in-590 year event

The City of Cape Town drought response

Water Conservation



Encouraging water saving behaviour

Water Demand Management



Technical interventions to reduce water loss

Augmentation



Establishing new sources of water

Disaster Planning



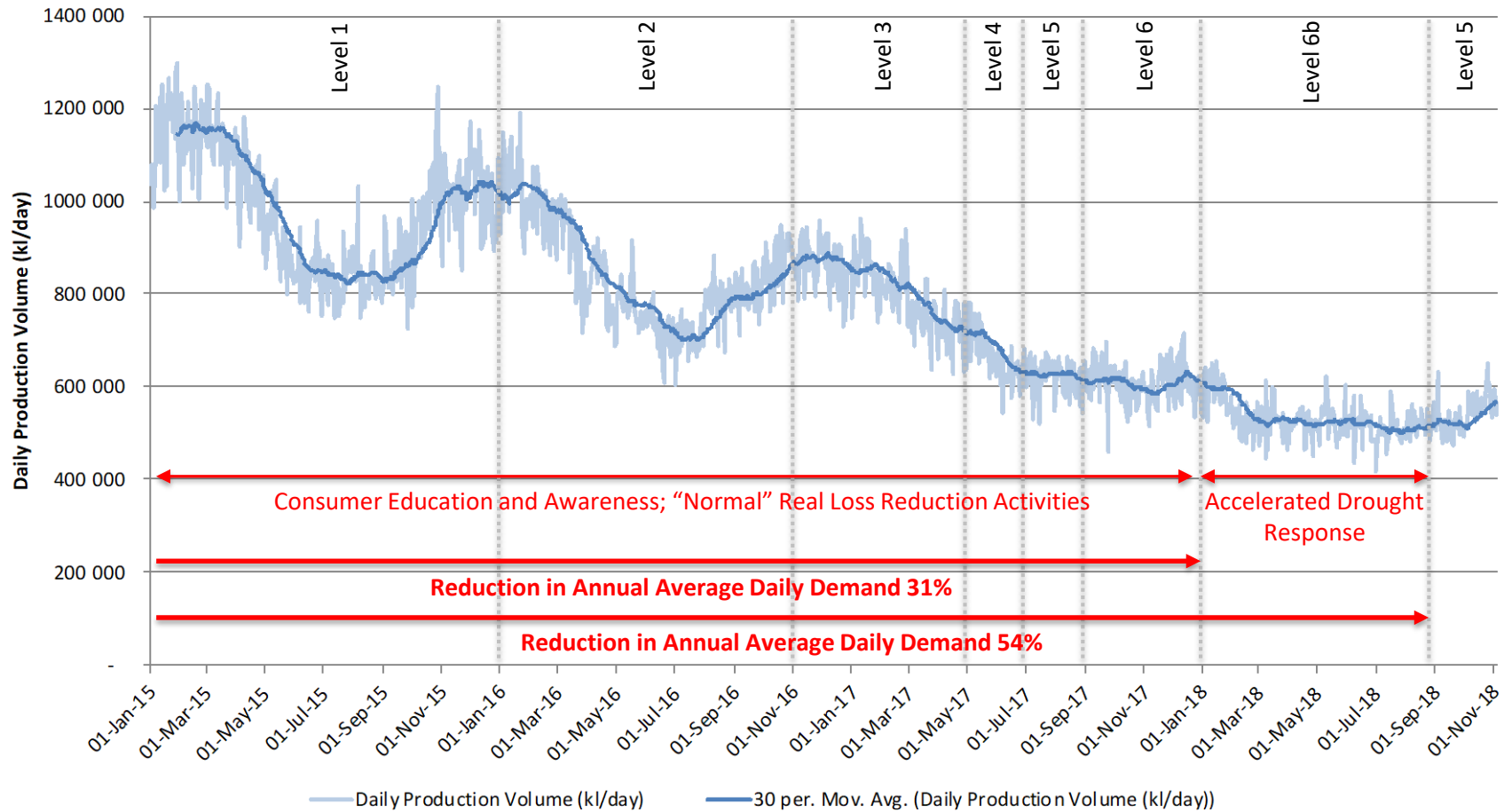
A plan in place for a worst case



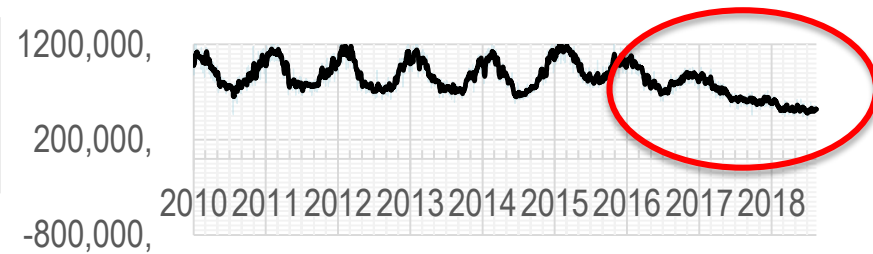
Monitoring Consumption per Restriction Level

What happened?

City of Cape Town Historical Daily Production Volumes

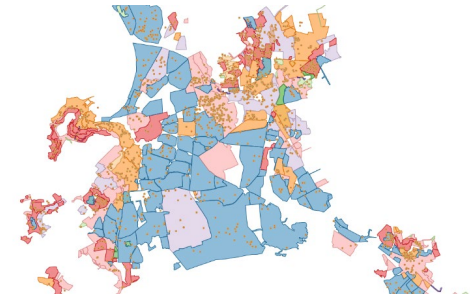


In Summary: Demand reduction was achieved through:



Physical demand management activities

- Aggressive pressure management
- Water Management Devices and leak repair
- Alternative non-potable water resources



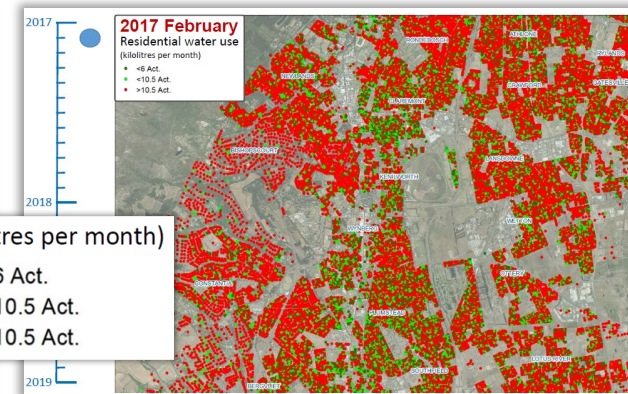
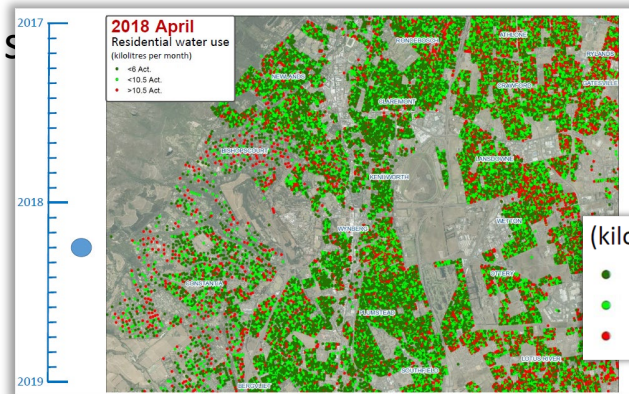
Economic incentives

- Progressive pricing linked to four restriction levels (up to January 2018)
- Punitive drought pricing from February 2018 (level 6)



Communications

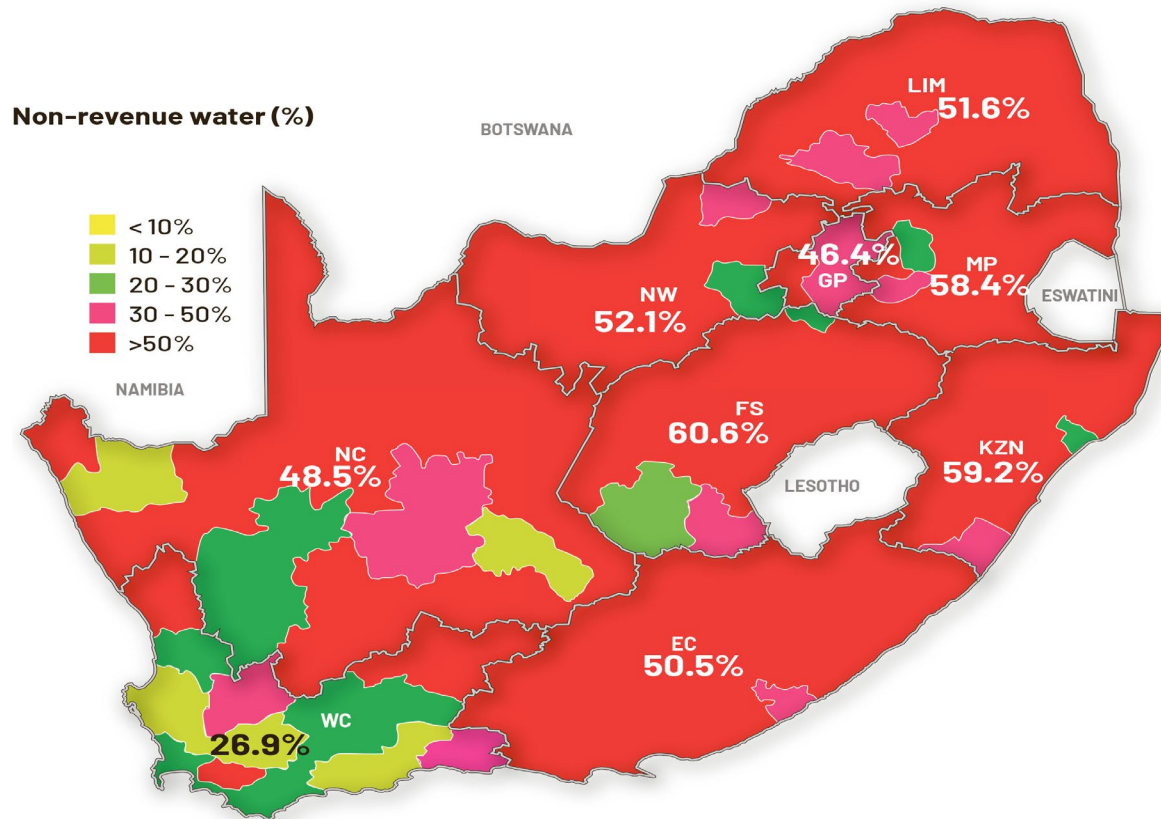
- Intensive 2 year campaign, s
Day Zero messaging



NON-REVENUE WATER & WATER LOSSES



Non-Revenue Water & Water Losses:



- Non-revenue water (leaks, illegal connections, metering errors etc.)
- Water losses is the largest contributor to NRW
- Well managed and maintained CoCT network
- CoCT Non-revenue water DWS 2023 stats = 20% (water losses 15%)



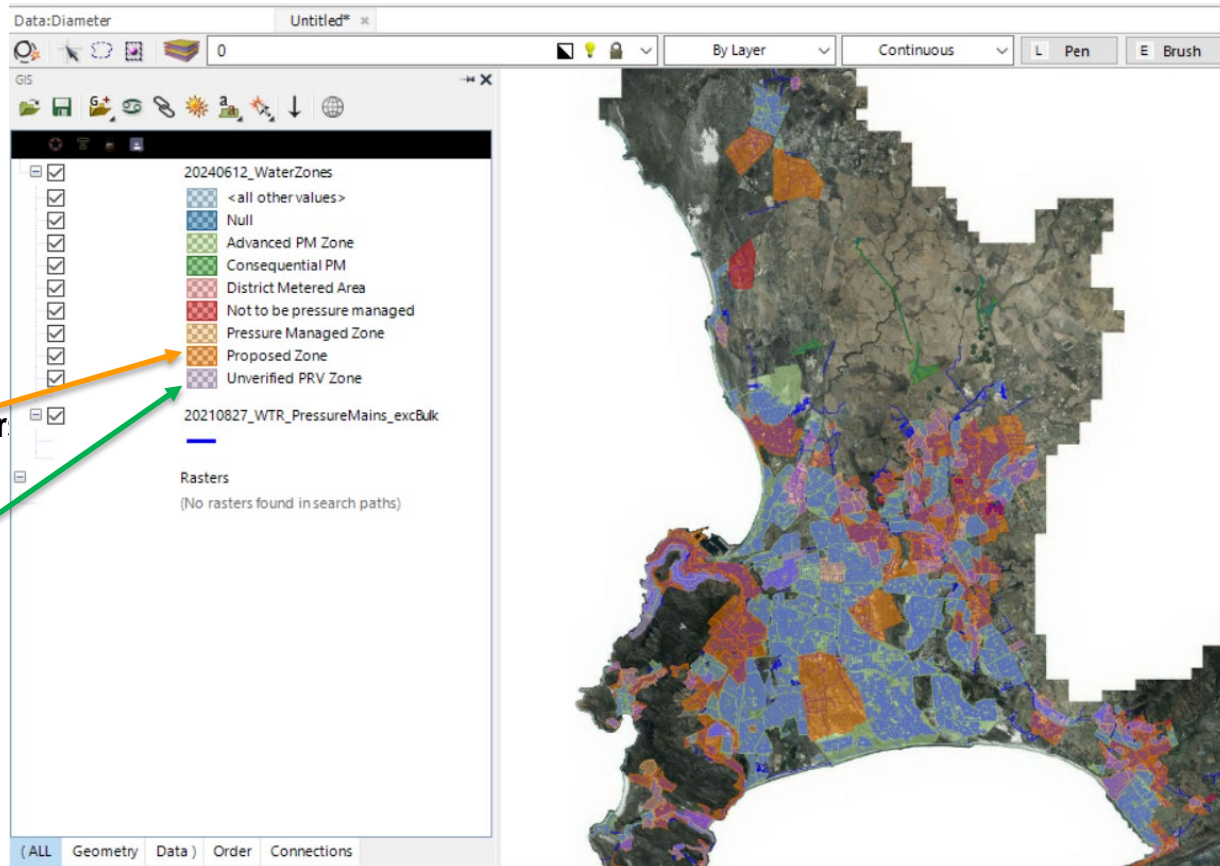
Zone Management Plan

Basic CCT Water Zone Stats:

- Advanced PM Zone = 148 (5800km)
- Fixed outlet PMZ = 67 (992km)
- Unverified Zones = 23 (345km)
- Consequential zone= 3 (15km)
- DMAs = 23 (272km)
- Booster Zones= 9 (48km)

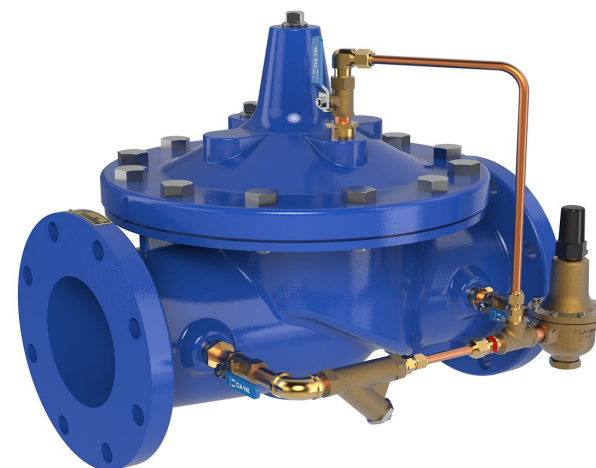
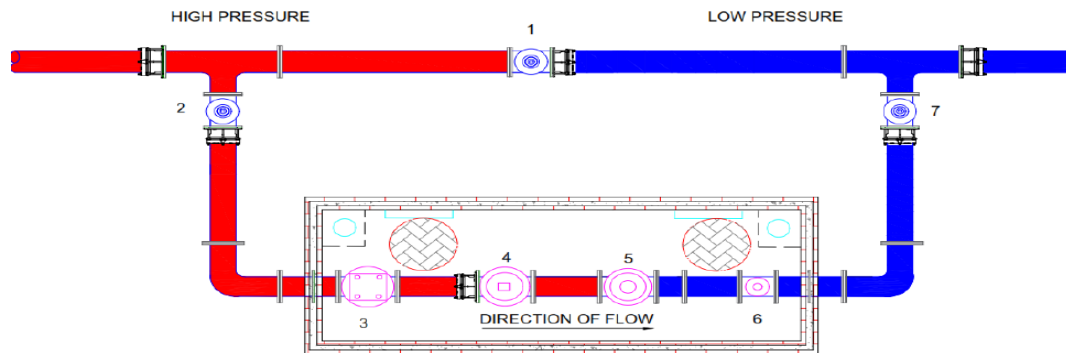
Estimated 2600km of network planned for sectorisation/DMA over next 10 year

Unverified zones to be formalized, with zone meters and related infrastructure as required, after verifications



Pressure Management Zones

No.	OBJECTIVE	BASELINE	TARGET
3	Water Zones Implementation (New DMA and PMZ)	Existing Zone coverage 70% of water network	<ul style="list-style-type: none"> -7 New Zone Design (320 km) PSP - Current 170 PMZ to be expanded -12 New Zone Construction -Supply & Installation of New loggers and Controller (12sites) -Smart pressure controllers

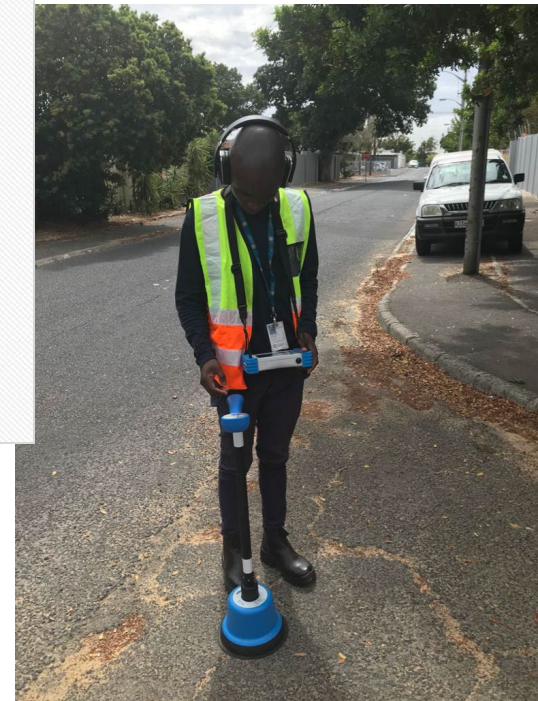
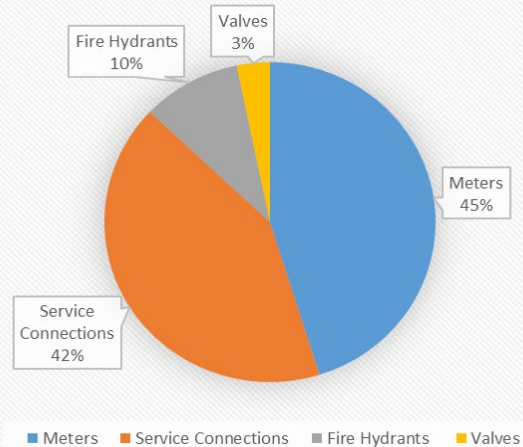


Leak Detection/Maintenance/Meter Replacement

No.	OBJECTIVE	BASELINE	TARGET
1	Conduct Leak detection (visible and non-visible)	Leak detection plan for FY2023/24	5 500km visual surveys and non-visible at 10 zones



Visual Leak Detection Summary



IWA Water Balance:

IWA Water Balance (Bulk and Reticulation system)			12 months ending in Jun 2024				
System	Input Value	Billed	City of Cape Town component		IWA component		Revenue W
			Authorized	235 113 185	74.6%	External billings	
SV	240 537 219	76.4%	Internal billings	187 856 733 59.6%	Billed Metered	187 856 733 59.6%	74.6%
			Formal unmetered FBS (<=6kl/m)	2 081 808 0.7%	Billed Unmetered	15 253 807 4.8%	
			Informal Settlements FBS (<=6kl/m)	13 171 999 4.2%	Unbilled Metered	0 0.0%	Non-Revenue Water
			n/a	0 0.0%			
			Formal unmetered (est >6kl/m)	4 857 552 1.5%			
			Informal settlements (>6kl/m) n/a	85 601 0.0%			
			Bulk mains flushing	59 945 0.0%			
			Retic mains flushing	165 893 0.1%			
			Bulk reservoir cleaning	255 043 0.1%			
			Retic reservoir cleaning (Currently unavailable)	0 0.0%			
Firefighting (Currently unavailable)	0 0.0%						
Losses	74 431 636	23.6%	Unauthorised (% calc)	3 016 301 1.0%	Unauthorised	3 016 301 1.0%	NRW
			Metering losses (% calc)	11 149 953 3.5%			
			Data losses (% calc)	0 0.0%	Meter & data losses	11 149 953 3.5%	79 855 670
			Reported Bulk res leaks, overflows & evaporation	63 338 0.0%			
			Retic reservoir leaks & overflows (Unavailable)	0 0.0%	Unavoidable Real	18 486 014 5.9%	
			Reported Bulk pipe bursts	34 941 0.0%	Losses (UARL)		
			Reported retic pipe bursts	1 317 384 0.4%			
			Located Bulk leaks	84 591 0.0%	Potentially avoidable	41 779 368 13.3%	
			Reported leaks Retic	1 620 345 0.5%	real losses		
			Water balance remainder (assumed real losses)	57 144 783 18.1%			
Apparent	14 166 254	4.5%			25.4%		
Current Annual Real Losses	60 265 382	19.1%					
CARL							

Key interventions to reduce NRW:

- Pressure management
- Leak detection and repairs
- Bulk and customer water meter replacement
- Installation of automated metering infrastructure
- Pipe replacement

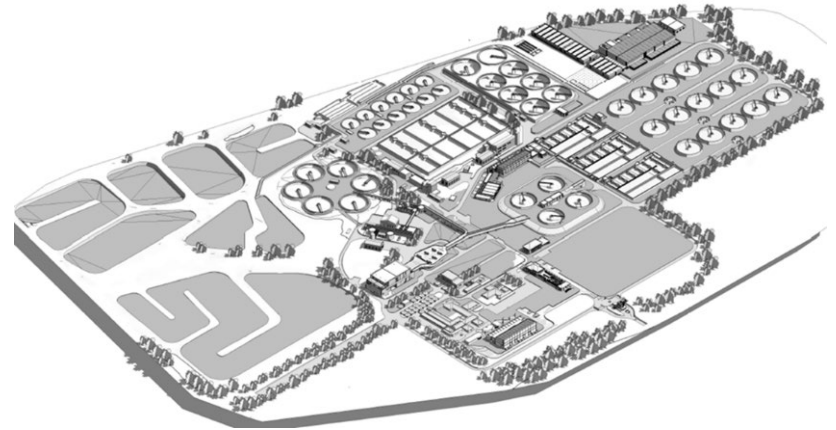


W&S CAPITAL INVESTMENT PROGRAMME

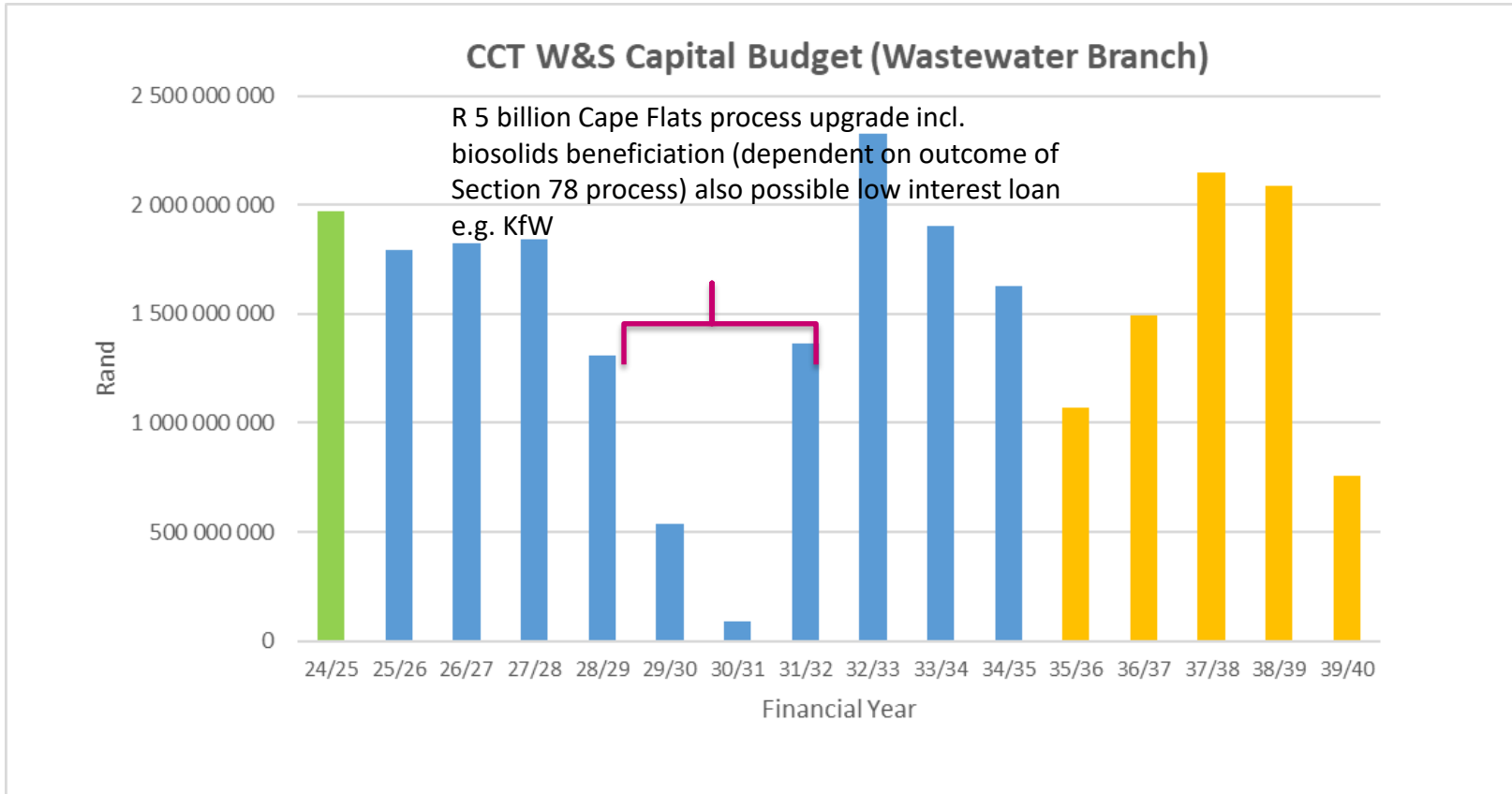


Ambitious W&S Capital Investment Programme

- Approximately **R 120 billion** committed to the City's 10-year infrastructure pipeline, with W&S receiving largest investment of **42%**
 - i. Investment in New Water Programme and additional and alternative water resources,
 - ii. W&S infrastructure upgrades, replacement and rehabilitation
 - iii. Reduce overload conditions on some existing WWTW and eliminate treatment constraint in WWTW catchment,
 - iv. Provide sufficient capacity to allow for the expansion of population, commerce and industry into the future, and
 - v. Most importantly, to improve treated effluent quality over time in line with the City's Water Strategy

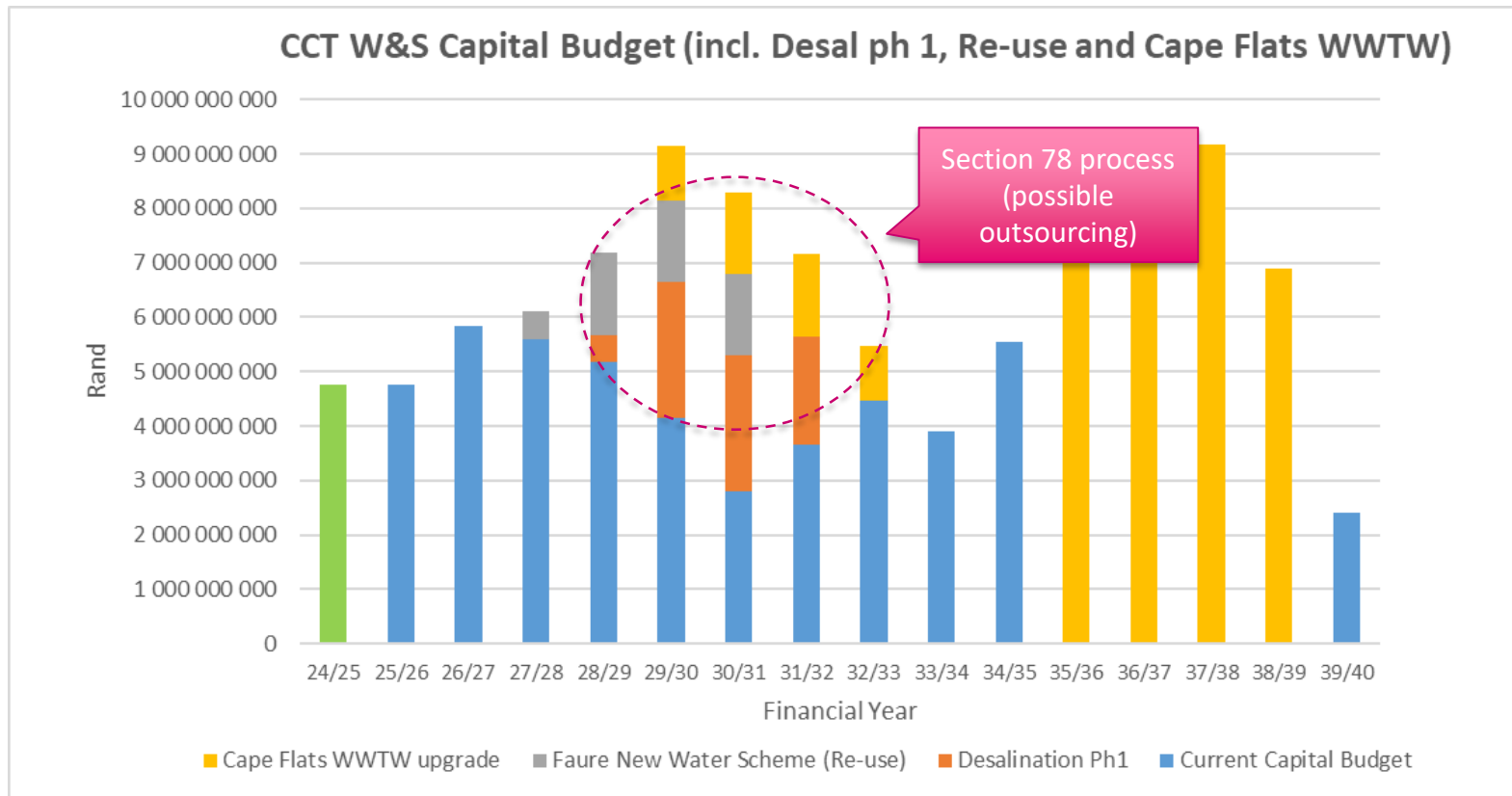


Capital budget Wastewater Branch



Note: Excludes approx. R 5 billion Cape Flats upgrade (incl biosolids beneficiation (around 29/30 and 30/31)) and any replacement of marine outfalls with conventional WWTWs

Capital budget incl Desal Ph1, Re-use and Cape Flats WWTW upgrade



Projects moved onto Operating budget

Current Projects

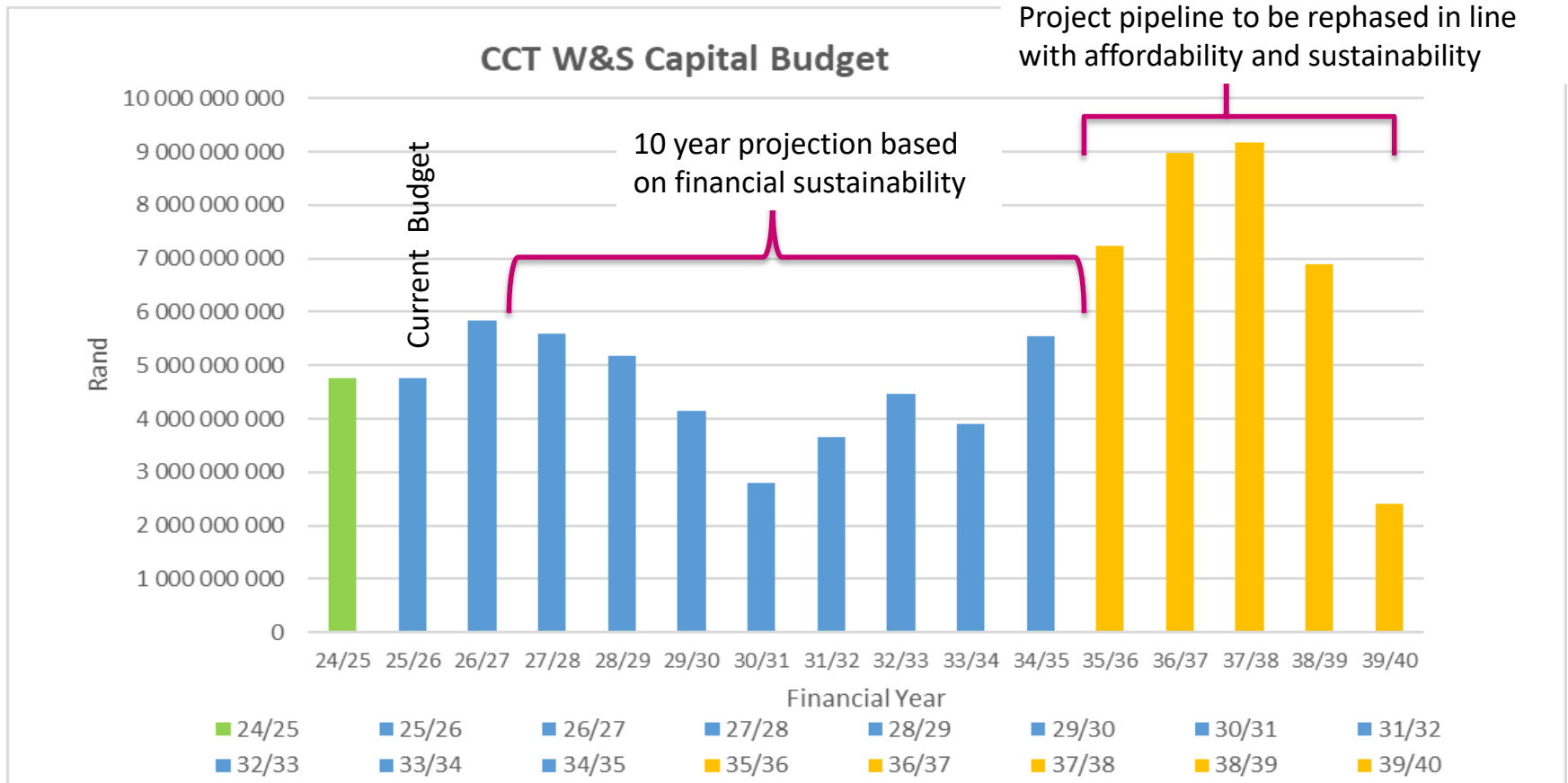
- Desalination Phase 1
- Faure New Water Scheme (Direct Re-use)
- Cape Flats WWTW upgrade incl. biosolids beneficiation

Future Project

- Desalination Phase 2
- Desalination and Faure New Water Scheme registered with National Treasury as a potential PPP
- Section 78 (3) Feasibility process has commenced for all current projects
- Public participation due to commence



CCT Current Capital Budget for Water and Sanitation



WATER RESOURCE AUGMENTATION



Diversification of Water Resources

WHERE DOES CAPE TOWN GET ITS WATER FROM, AND HOW WILL THIS CHANGE?

Cape Town gets almost all of its water from the Western Cape Water Supply System (WCWSS). This is an integrated system providing water for both urban and agricultural use. In a “normal” year, Cape Town uses about 60% of the available water, and agriculture uses about 30%.

Supply to Cape Town is dominated by surface water sources. The bulk of the water supplied in the supply area is from surface water sources, which rely on winter rains. Rainfall varies significantly across the area and between years.

The surface water system comprises six large dams and a number of smaller ones. The City owns three of the six large dams. The other dams are owned by National Government. Total storage of the six large dams is approximately 900 million kilolitres.

The WCWSS is managed by the national Department of Water and Sanitation (DWS) in partnership with the City. DWS is responsible for water resources regulation (making allocations and monitoring abstraction) as well as for water resources planning. DWS and the City jointly manage the operation of the complex, interconnected system of dams, pipelines, tunnels and related infrastructure.

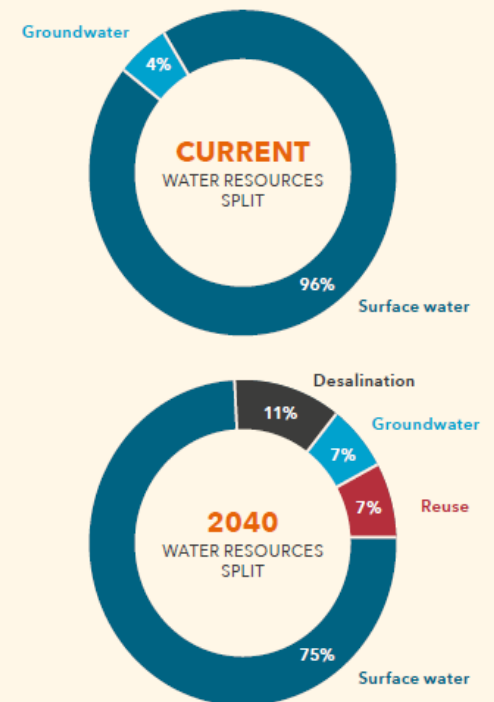
A WCWSS water resource reconciliation study was completed in 2007. The study explored future water demand and supply, and proposed interventions to ensure that supply exceeds demand. DWS produces regular status updates, of which the most recent was in 2016. (The 2018 update is in progress.)

An annual operating analysis informs operating rules and restrictions. The hydrological year ends on 30 October, when DWS, in consultation with water users, makes a decision on operating rules for the system for the hydrological year ahead.

The WCWSS steering committee makes recommendations. The committee, which comprises water users, meets annually to review the status (and other) reports submitted and make recommendations on interventions, including new supply schemes.

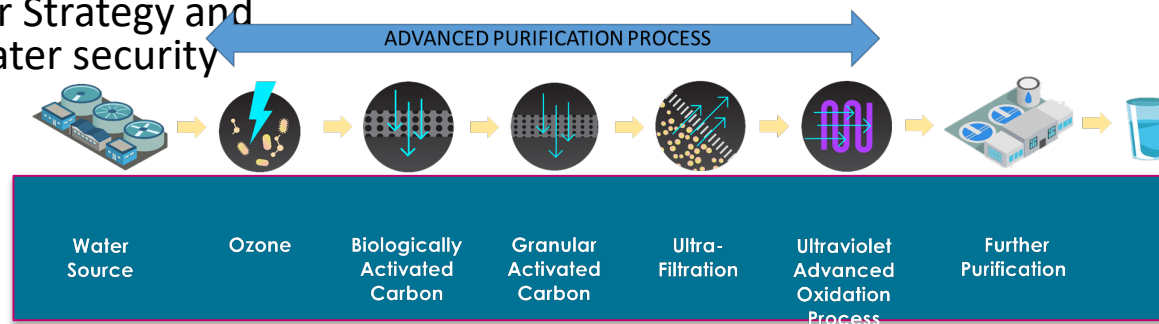
Additional supply was planned for 2022. At the time of drafting this strategy, the next water augmentation scheme was the Lower Berg River augmentation scheme. The scheme would add 23 million cubic metres per year into the WCWSS and was due for completion in 2022 (Status Report May 2016).

FIGURE 6: HOW CAPE TOWN'S WATER SUPPLY SYSTEM WILL CHANGE



The Faure New Water Scheme (Direct Re-use) – possible PPP

- **Estimated R 3.2 Billion**
- **Design Capacity Increase:** 70 - 100 MI/d
- Direct Water Re-use (will be largest direct re-use plant in world when built) – part of Water Strategy
- **Source Water: Receives source water from the upgraded Zandvliet WWTW**
- Currently going through a Section 78(3) assessment
- International / local independent advisory panel has reviewed all designs and reports through the WRC
- Anticipated completion FY 2030/2031
- Part of the City of Cape Town's Water Strategy and New Water Programme to ensure water security



Cape Flats Managed Aquifer Recharge Scheme (Indirect Re-use)

- Mechanical dewatering of sludge and the production of biogas through anaerobic digestion, which will be converted to green energy
- **Source water for Managed Aquifer Recharge (MAR) scheme.** Capacity of 40 to 60 MI/d.
- Exploring feasibility of external service delivery mechanism and alternative funding model (e.g. PPP model etc.) – Section 78(3)
- Estimated completion in FY 32/33
- Part of the City of Cape Town's Water Strategy and New Water Programme to ensure water security



Desalination



Option



Capacity: approx. 70 to 150 ML/d
Completion : approx. February 2030



Strategic Advantages



WASTEWATER TREATMENT



Challenges at Wastewater Treatment Works

Challenges

Load shedding



WWTW very energy intensive. Generator capacity unable to run the whole process 24/7 as is limited to key processes. Impacts on treated effluent compliance.

Historical underinvestment in WwTW

Capacity challenges, aging infrastructure

Mechanical equipment maintenance, availability and failures



Equipment failures may cause spills, reduce treatment capacity or cause increased wear / breakdowns on downstream infrastructure

Ingress into the sewer network



The WwTW has to accept all the flow it receives as there is no way of bypassing flow elsewhere. This can cause flooding at the inlet works (pollution incident) or overload conditions within other unit treatment processes.

Challenges at Wastewater Treatment Works

Challenge

Sewer misuse



Large objects find their way into the sewer network, and can cause serious damage to inlet works lifting screw pumps. Screw pump failure can cause wastewater to spill from the Works inlet sump or back up into the sewer network and spill at the lowest manholes.

Illegal dumping / discharges



Industries illegally dump / discharge substances to sewer that either overwhelm screens / grit removal infrastructure or poison the biology that effects the treatment process.

Corrosive environment



The wastewater treatment environment can be very corrosive to civil infrastructure as well as mechanical and electrical equipment, resulting in premature failure of infrastructure.



Challenges at Wastewater Treatment Works

Challenge

Informality



Liquid waste stream generated (grey water). Needs to be accounted for in plant upgrade programme. Will be expensive due to increased hydraulic loads
Low Flow Diversions ?

Innovation: Wastewater Sludge Treatment / Disposal

- Wastewater sludges have been regarded purely as a waste product in the past, however the City is now moving towards beneficiation of / nutrient recovery (circular economy) from wastewater sludges
- Three regionalised biosolids beneficiation facilities (BBF) to be provided during the next 20 years;
- Each BBF will serve a number of surrounding 'donor' WwTW;
- Facilities will consist of:
 - Sludge pre-treatment (thermal hydrolysis)
 - High rate anaerobic digestion
 - Nutrient recovery
 - Dewatering
 - Power generation

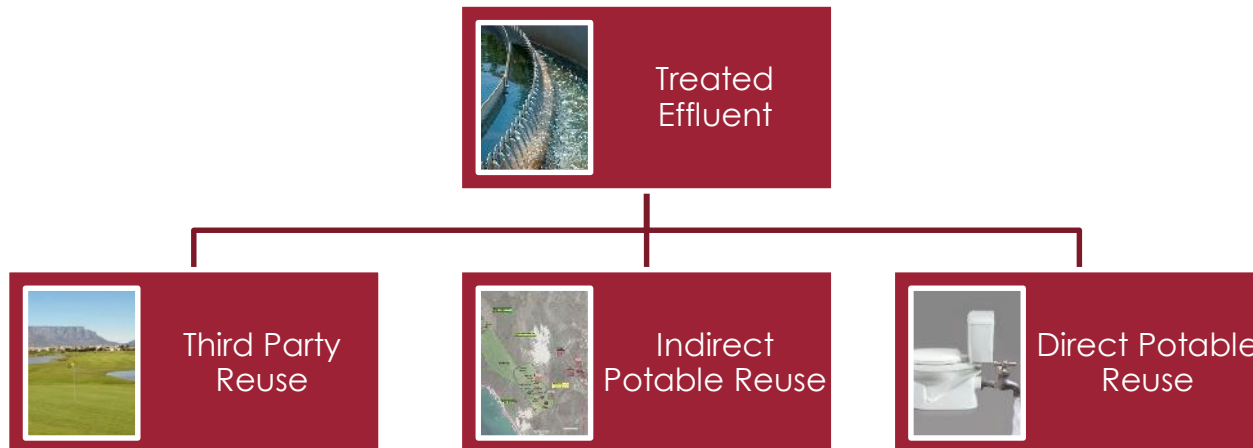


Innovation: Treated Effluent Reuse

- Historically, treated effluent from WwTWs were mostly disposed of to the respective receiving water bodies.
- Water scarcity has however necessitated a shift towards recognising the value of the treated effluent produced at WwTWs.
- Water Re-use is a key component of the City of Cape Town's Water Strategy



Making progress possible. Together.



Treated Effluent Reuse: Third Party non-potable

- CoCT sells treated effluent to third party users who replace potable water use with treated effluent for:
 - Industrial process water
 - Irrigation
 - Toilet / urinal flushing
 - Construction (mixing concrete, dust suppression, etc.)
- Metered collection points are installed at most WwTW for collection by tanker
- Treated effluent networks have been installed in some catchments (e.g. Athlone, Bellville) where the treated effluent is piped to the end user via a metered connection
- Sale of treated effluent and provision / expansion of the treated effluent network is administered by the Water Demand Management Branch.



CURRENT WASTEWATER PROJECTS



The Upgrading & Expansion of the Potsdam WWTW

- **Estimated R 5.2 Billion Capital Upgrade**
- **Design Capacity Increase:** 47 - 100 MI/d ADWF
- One of the largest infrastructure projects in the CoCT
- Uses advanced ultrafiltration membrane technology to produce high quality treated effluent for reuse
- Reduces reliance on potable water network through production of non-potable alternative water resource
- Extends the life of existing treatment modules
- Estimated completion in FY 27/28

Your No.2 is our No.1



The Upgrading & Expansion of the Athlone WWTW – Phase 1

- **Estimated R450 Million Capital Upgrade**
- Initial phase of infrastructure large upgrade programme
- Prepares the plant to accommodate future upgrade phases
- Refurbishment and process upgrade of existing infrastructure
- Reconfigure treatment processes
- Electrical and instrumentation upgrades
- Extend life of existing plant and improve treated effluent quality
- Estimated completion in FY 2025/26



The Refurbishment and Extension of the Bellville WWTW

- **Estimated R 170 Million Capital Upgrade**
- Refurbishment of the biological reactors and associated mechanical & electrical equipment
- Reconfiguration from the current reactor MLE process to a UCT process
- Improve effluent quality
- Reduce electrical consumption (energy efficiency)
- Estimated completion in FY 2026/27



The Westfleur WWTW Aeration & Blower Replacement

- **Estimated R 260 million Capital Upgrade**
- To provide new blowers and reactor aeration system
- To improve the performance of the plant as well as improving the treated effluent quality
- Reduce electrical consumption (energy efficiency)
- Estimated completion in FY 26/27



IMMINENT PLANNED WASTEWATER PROJECTS



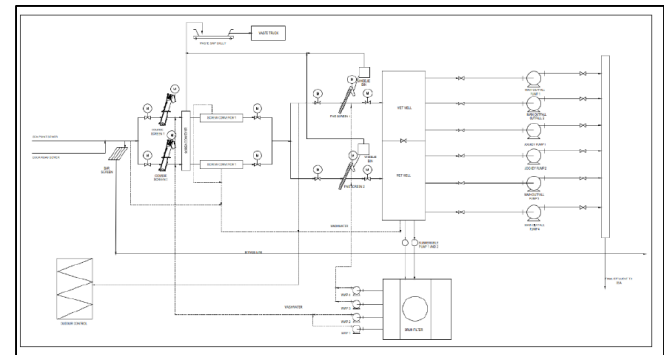
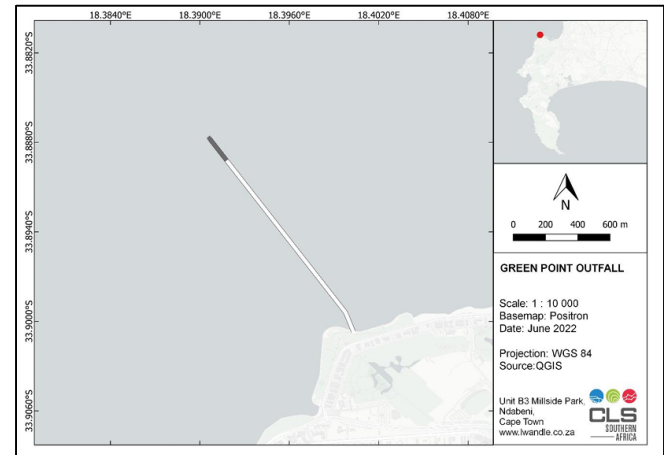
The Upgrading of the Wildevoelvlei WWTW Dewatering

- **Estimated R 200 million Capital Upgrade**
- Upgraded sludge dewatering facility and associated mechanical and electrical equipment
- Upgrading of pre-screening equipment and improved efficiency of downstream processes
- Improving reactor mixing and aeration to ensure a better quality treated effluent
- Estimated start of construction in FY 24/25
- Estimated completion in FY 26/27



The Refurbishment of the Marine Outfalls

- **Estimated R 110 million Capital Refurbishment**
- The City has three marine outfalls which have been functioning for between 32 to 48 years: Camps Bay marine outfall (1977), Hout Bay marine outfall (1993) and Green Point marine outfall (1993)
- Refurbishment of the existing marine outfalls infrastructure, including pump stations
- Enhanced pre treatment solids removal through more efficient mechanical equipment
- Estimated start of construction in FY 25/26
- Estimated completion in FY 26/27



The Upgrading & Expansion of the Macassar WWTW

- **Estimated R 4.7 Billion Capital Upgrade**
- **Design Capacity Increase: 40 - 80 MI/d ADWF**
- Uses advanced technology to produce biogas, through the digestion of sludge, which will be converted to green energy
- Increased and improved treated effluent quality for the existing non-potable reuse network
- Remove capacity limitations and unlock development in the catchment
- Preservation and protection of the sensitive Eerste River Estuary
- Estimated start of construction in FY 25/26
- Estimated completion in FY 29/30



The Upgrading & Expansion of the Mitchells Plain WWTW

- **Estimated R 1.6 Billion Capital Upgrade**
- **Design Capacity Increase: 35 - 50 MI/d ADWF**
- Remove capacity limitations on the existing process, increase treatment capacity to cater for flows from future development in the catchment
- Upgraded treatment process resulting in improved treated effluent quality
- Future Coastal Discharge Permit
- Estimated start of construction in FY 30/31
- Estimated completion in FY 34/35



The Upgrading & Expansion of the Athlone WWTW – Phase 2

- **Estimated R 3.8 Billion Capital Upgrade**
- **Design Capacity Increase:** 105 - 155 MI/d ADWF
- Increase treatment capacity to cater for flows from future development in the catchment
- Improved treated effluent quality and increased volume for the existing non-potable reuse network
- PH 2A: Capacity expansion (new inlet works, activated sludge train, dewatering, disinfection)
- PH 2B: Capacity expansion (primary settling tanks, activated sludge train, UV disinfection)
- Estimated start of construction in FY 2031/32
- Estimated completion:
 - Phase 2A: FY 2034/35
 - Phase 2B: FY 2038/39



The Upgrading & Expansion of the Cape Flats WWTW

- **Estimated R 5 Billion Capital Upgrade**
- **Design Capacity Increase:** 200 - 250 MI/d ADWF
- Largest WWTW in the CoCT
- Increase treatment capacity, improve treated effluent quality, upgrade all infrastructure
- Mechanical dewatering of sludge and the production of biogas through anaerobic digestion, which will be converted to green energy
- Regionalized bio-solids beneficiation facility
- Source water for Managed Aquifer Recharge (MAR) scheme
- Exploring feasibility of external service delivery mechanism and alternative funding model (e.g. PPP model etc.)

- Estimated start of construction in FY 30/31
- Estimated completion in FY 37/38



The Upgrading of the Borchards Quarry WWTW

- **Estimated R 400 million Capital Upgrade**
- Construction of new Inlet Works
- Pond rehabilitation
- Improved odour removal system
- Ablution Facilities
- Estimated start of construction in FY 31/32
- Estimated completion in FY 34/35



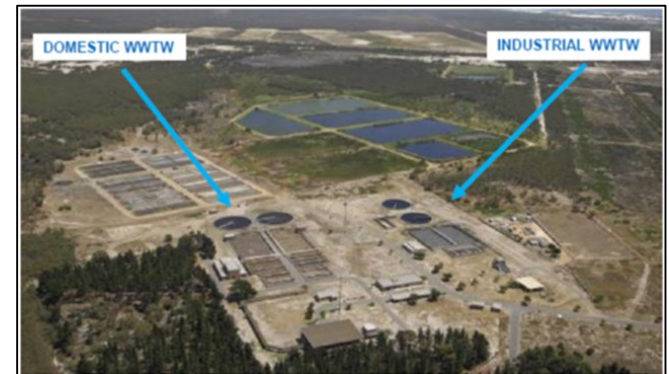
The Construction of the Bellville WWTW Inlet Works

- **Estimated R 600 million Capital Upgrade**
- New Inlet Works to accommodate increased catchment flows
- Protection of the Membrane Plant to improve re-use water quality for adjacent industry
- Pond rehabilitation
- Prevention of overflows during flood events
- Estimated start of construction in FY 31/32
- Estimated completion in FY 33/34



The Capacity Expansion of the Westfleur WWTW

- **Estimated R 1 Billion Capital Upgrade**
- **Design Capacity Increase: 14 - 27 MI/d ADWF**
- Upgrading of sludge dewatering facility for the Domestic and Industrial plant
- Increasing the overall domestic works capacity from 14 MI/d to 18 MI/d
- Increasing the overall industrial works capacity from 6 MI/d to 9 MI/d
- Addition of Primary Settling
- Improved effluent quality
- Estimated start of construction in FY 31/32
- Estimated completion in FY 34/35





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Thank You

Making progress possible. Together.