



Annual Water Conservation Report

2022-23

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08/2023

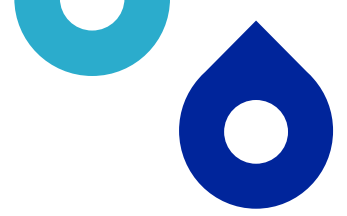
Sydney
WATER



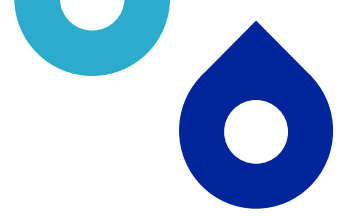
Acknowledgement of Country

Sydney Water respectfully acknowledges the Traditional Custodians of the land and waters on which we work, live and learn. We pay respect to Elders past and present.





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7. Glossary and Acronyms

7.1 Glossary

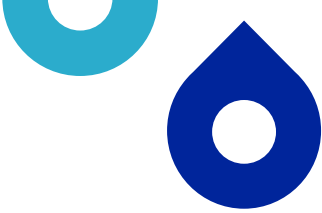
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Executive summary

Water conservation is one of Sydney Water's key focus areas, delivering to the NSW Government's Greater Sydney Water Strategy (GSWS) principle of 'using what we have better'. Water conservation makes our drinking water supply go further and can delay the timing of investment in new large-scale drinking water supply sources such as dams and desalination.

Sydney Water has developed a 5-year water conservation plan to achieve the water savings outlined in the GSWS. Our diverse and adaptive baseline water conservation program has the capability to deliver the water saving aspirations identified in the GSWS and scale efforts in times of drought. Initiatives that fall under the program are designed to be economically viable and environmentally sustainable and ensure value for customers and the community.

The continuous planning and delivery of water conservation activities, water efficiency, leakage reduction and recycled water, is critical to ensure our water resources are used efficiently and improve our resilience to drought when water supply is constrained. The delivery of efficient water conservation programs is also a part of our Operating Licence, reflective of our customer's views and government policy.

This report outlines the achievements of water conservation activities undertaken in the past year, as well as outlining the 5-year plan and how it meets the reporting requirements under our Operating Licence.

In 2022-23, Sydney Water supplied 524,171 million litres (ML) of drinking water to residential customers, non-residential customers and for use in our system operations across Greater Sydney, Illawarra, and Blue Mountains. This was a slight increase from 2021-22, following a return to drier weather conditions over the first half of 2023.

Sydney Water invested \$10.1 million in the Water Conservation Program in 2022-23:

- \$5.1 million was invested into water-efficiency programs, which saved 1,485 ML of water through established and pilot projects focused on residential and non-residential customers. Water savings almost doubled from the previous year's 733 ML, as the program continued to mature and new initiatives were introduced.
- \$1.8 million was invested into research and innovation projects focused on developing knowledge and testing new products to improve water efficiency, leakage and recycled water programs. We have also continued to invest in data and analytics to support monitoring and decision-making for water conservation programs.

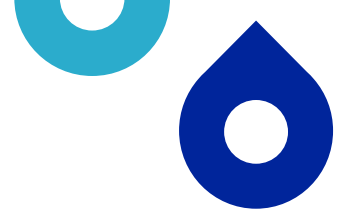
Increasing customer and community awareness around water usage and behavioural changes which can improve water efficiency remains a core focus of our water conservation program. Consumers' attitudes and behaviour towards water, including usage within and outside of the home, can be correlated to water literacy - the level of knowledge of water sources and water management. Sydney Water has a dual focus on improving water literacy, through targeted education programs in schools and community events, along with campaigns which aim to increase awareness regarding personal water use and implementing practices which conserve water.

Sydney Water invested \$35.9 million in the operation of recycled water schemes, producing around 40,000 million litres of recycled water in 2022-23, resulting in a reduction in drinking water demand of around 12,000 million litres. Although slightly higher than production in 2021-22, wetter weather and lower demand from irrigation customers resulted in lower recycled water volumes compared with the longer term average. Sydney Water has also continued to invest in major work and renewals on our larger schemes to maximise recycled water production in the coming years.

Leakage management programs ensure Sydney Water manages drinking water supply efficiently, minimising water loss from our assets. The rolling 12-month leakage result of 129 ML/d is outside the range of the Economic Level of Leakage (ELL) band due to a significant step change in the three quarters, Q4 21-22 to Q2 22-23. Water leakage has returned to normal levels over the first half of 2023 (Q3 and Q4 of the reporting period). Sydney Water invested \$2.4 million in proactive programs and \$40 million responding to, and repairing, leaks and breaks.



Introduction



1. Introduction

Water plays an important role in our city, supporting the economy and communities. Sydney Water will service an additional 1 million people by 2040 and nearly 2 million more by 2050, according to Department of Planning and Environment projections. As Greater Sydney continues to grow, continuing to provide sufficient water to meet all customer and community needs is a challenge, heightened by increased climate variability. The Greater Sydney Water Strategy (GSWS), developed by the Department of Planning and Environment (DPE) in partnership with Sydney Water and WaterNSW, flagged a response to this challenge including upgraded drinking water supply, integrated water cycle management and water conservation.

One of the key principles from the GSWS is the need to ‘use what we have better’. Water conservation focuses on this principle, which makes our drinking water supply go further and can delay the timing of investment in new large-scale drinking water supply sources.

Sydney Water has developed a diverse and adaptive baseline water conservation program that has the capability to deliver the water saving aspirations identified in the GSWS and scale efforts in times of drought. Initiatives that fall under the program are designed to be economically viable and environmentally sustainable and ensure value for customers and the community.

The continuous planning and delivery of water conservation activities is critical to ensure our water resources are used efficiently and improve our resilience to drought when water supply is constrained.

The delivery of efficient water conservation programs is also a part of our Operating Licence, reflective of our customer views and Government policy.

Our approach to water conservation is based on delivering the following objectives:



Figure 1 Water Conservation Program Objectives

This report outlines the achievements of Sydney Water in delivering our 2022-23 Water Conservation Plan and the forward plan for water conservation, in accordance with Section 3 of our Operating Licence 2019-2023¹ and Reporting Manual¹ 2.1.1.

¹ Appendix A outlines how this report meets specific requirements in the Operating Licence Reporting Manual

In 2022-23, the Water Conservation Program included six focus areas:

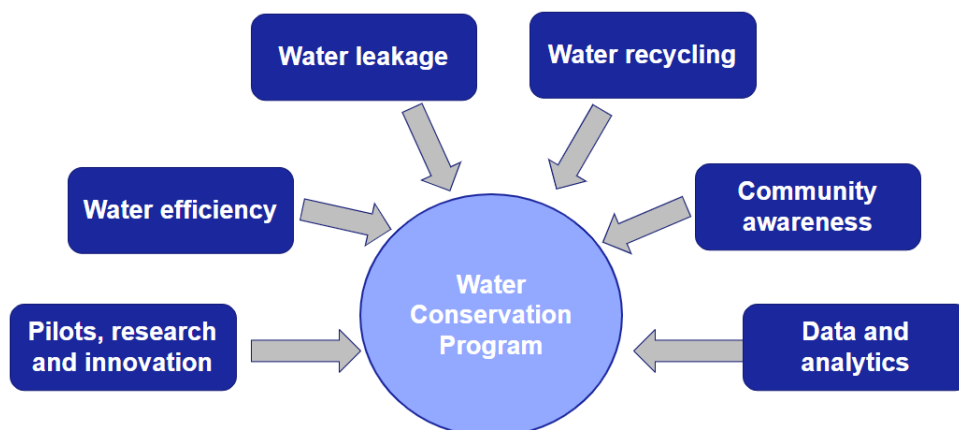


Figure 2 Water Conservation Program focus areas

Water efficiency: Develop and deliver programs that drive the adoption of water efficient behaviours, products, and services, to help residential and non-residential customers use water more efficiently and effectively, reducing water consumption and demand for drinking water for non-drinking purposes.

Water leakage: Develop and deliver water leakage management and maintenance programs that reduce water loss in the Sydney Water network, including leak repairs and proactive leak detection programs.

Water recycling: Reduce demand on drinking water sources. Water recycling ranges from large-scale wastewater recycling to sewer mining and stormwater harvesting.

Community awareness: Increase awareness through behavioural change campaigns, customer engagement and community education.

Pilots, research, and innovation: Investigate innovation, emerging technologies and pilot customer programs which may broaden the Water Conservation Program and increase its effectiveness.

Data and analytics: Develop and improve data and analytics capability to provide data-driven insights to inform and support the development and delivery of program.

Overview of the program



2. Overview of the program

2.1 Alignment to strategy

Our strategy

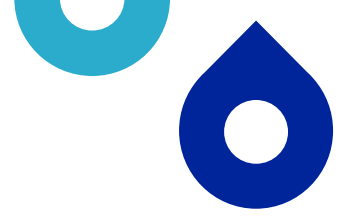
Sydney Water aspires to our vision of creating a better life with world-class water services to deliver thriving, liveable and sustainable cities across Greater Sydney (Figure 3). In doing so, it aims to address five key strategic challenges – growing cities, climate change, customer expectations, emerging technology and unpredictable events. 'Our water is used efficiently' is a key direction of the Resilient and Reliable Water Supply Strategic Blueprint.

Our Strategy considers what our customers expect of us. In our recent customer engagement program 'Our Water Our Voice' our customers highlighted four key water conservation activities as priorities:

- Enhancing the water network's resilience to drought through building more water recycling and/or desalination capacity (Priority 4).
- Reducing water loss by minimising leaks and breaks in Greater Sydney's pipe networks (Priority 5).
- Increasing water savings and reducing usage through community-based water saving programs (Priority 6).
- Reducing water loss to the ocean by improving stormwater management, storage, and capture (Priority 8).



Figure 3 Sydney Water's strategy



NSW Water Strategy

The NSW Water Strategy highlights the role for increased investment in water system efficiency, water conservation and demand management to:

- delay the timing and reduce the scale of investment in new supply infrastructure; and
- contribute to the sustainability of long-term supplies as populations increase and build community and water-supply resilience to drought.

As a result of this strategy, DPE have developed a state-wide water-efficiency framework, water efficiency policy and an adaptive water efficiency program aimed at supporting collaboration, capacity building, policy and a whole of water-cycle focus. This has shaped the direction for water conservation in the Greater Sydney Water Strategy (GSWS).

Greater Sydney Water Strategy

The GSWS, released by the NSW Government in August 2022, establishes the key directions for urban water management for a sustainable, productive, and liveable Greater Sydney region. Sydney Water has been working with the DPE, WaterNSW and other government agencies to implement the GSWS, which has replaced the Metropolitan Water Plan.

Action 2.1 of the GSWS calls for a 'concentrated focus on water conservation and efficiency'. It directs Sydney Water and DPE to 'develop and maintain a detailed 5-year water efficiency plan consistent with the long-term water efficiency goals for Sydney to save 38GL/year of drinking water by 2030 and 49 GL/year by 2040'.

This report summarises the current plan to deliver on these targets.

2.2 Program governance

The Water Conservation Program has continued to mature in 2022-23, with improvements to program governance, cost management, monitoring and control. Key improvements included:

- centralised budget management and embedding of the Enterprise Portfolio and Program Management structure to allow individual project managers to control and monitor project costs while providing visibility over the Water Conservation Program.
- improved project reporting and governance, maturing the role of the Water Conservation Program Control Board (WCPCB).
 - The WCPCB manages program risks and issues and tracks costs, developing actions and adjusting the program as necessary at its monthly meetings. The WCPCB reports directly to Sydney Water's General Manager of Governance and Assurance, who is the program's Executive Sponsor and reports directly to the Managing Director (Figure 4).
- coordinated responsibility for all Water Conservation Programs to ensure externally and internally facing water efficiency programs are aligned, including strategy and enterprise planning, research and innovation, data and analytics, behaviour change, water efficiency, water leakage and recycled water.

The Independent Pricing and Regulatory Tribunal (IPART) Audit of Sydney Water's Operating Licence found the Water Conservation Program to be compliant in 2021-22.

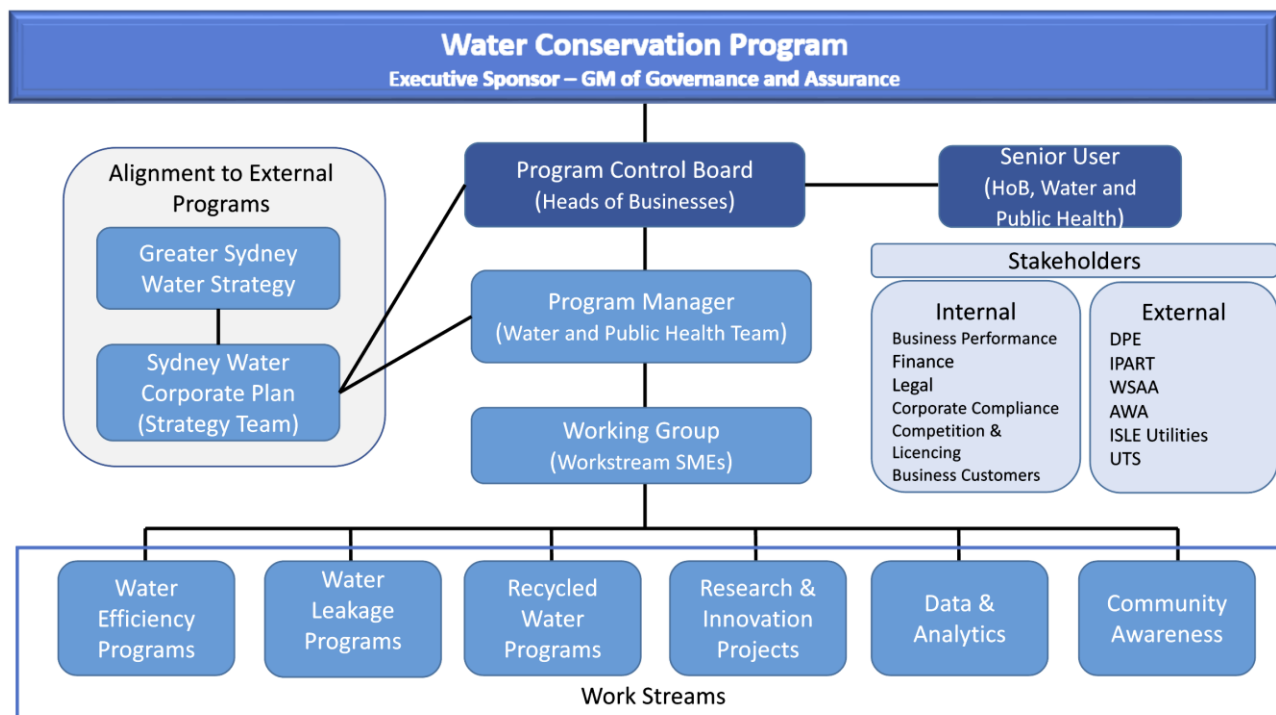


Figure 4 Water Conservation Program governance structure

2.3 Operationalising projects

2.3.1 Program lifecycle

Each project progresses through various stages of the program lifecycle to one of three outcomes:

1. advances to the next stage of the program lifecycle to become an established program
2. is included in a program of drought-activated initiatives
3. is closed because it has not demonstrated benefit or value for our customers and communities.

Governance throughout the program lifecycle ensures that Sydney Water only invests in projects and programs that provide value and meet the objectives of the program.

The program lifecycle starts with ideation and comes to fruition with established programs. Projects are assessed through project stage gates, where their value proposition is tested, to ensure that only programs providing value for our customers are progressed. Through periodic reviews, programs are closed if they are not providing value.

Ideation

Ideas that align with the Water Conservation project objectives are accepted for assessment. These ideas form the pipeline for research and innovation projects and pilots. Ideas are assessed as needed. Our subject matter experts discuss whether an idea has the potential to add value to the project. The primary and preferred method of receiving ideas is via Sydney Water's Hype Innovation Platform, which is used for innovation and collaboration within Sydney Water and with our stakeholders. We use the platform to run innovation challenges and business-improvement hackathons.

Research, innovation, and pilot

Viable ideas are developed and designed with feasibility testing in small-scale, short-term trials. A methodology and approach to measure and report on benefits is developed to understand the water-saving potential.

Initiatives must be:

- desirable with an acceptable balance of cost, benefit and risk
- viable, confirming the project can be delivered
- achievable, demonstrating the project can deliver the desired outcomes and benefits

An assessment is completed at the end of each research and innovation project or pilot to assess whether it should proceed to the early lifecycle stage or be implemented as an established program. To progress, the project or pilot must demonstrate that key performance measures have been met, that it meets ELWC (Economic Level of Leakage), if appropriate, and that it is scalable as a viable market option. Recommendations to move the project or pilot onto an early lifecycle or established program are put forward to the WCPCB. The proposal will be prioritised and will be subject to funding availability.

If the project is unsuccessful, it will either be closed or put on hold for consideration under drought conditions.

Early lifecycle

Projects and pilots with complexity and/or uncertainty in design, development or delivery, benefit from an early lifecycle stage where the market appetite, savings, costs, benefits, and assumptions can be verified (either a longer timeframe or increased sample, or both).

Early lifecycle projects often assess benefits at a larger scale than research and innovation projects and pilots. Benefits and findings can inform business cases to fund the initiative as an established program. Key performance indicators and benefits such as water savings, potential to reduce leakage (economic level of leakage) and ELWC are tracked throughout early lifecycle projects, with projects ceasing if they do not meet targets or present value. Early lifecycle projects only progress to established programs if they meet the measures and demonstrate that they can be scaled sustainably to a wider offering.

Established program

Established programs are included in the forward program, providing a commitment to deliver with targets, for a minimum of five years. Results are reported in the annual Water Conservation Report and are auditable during the annual operating licence audit.

Regular reviews and continuous improvement are undertaken so programs adapt to market changes, with the view to maximise water saving outcomes.

Drought activated initiatives

Programs assessed as not economically viable may be selected as drought-activated initiatives. Having projects plan-ready reduces lead time during drought.

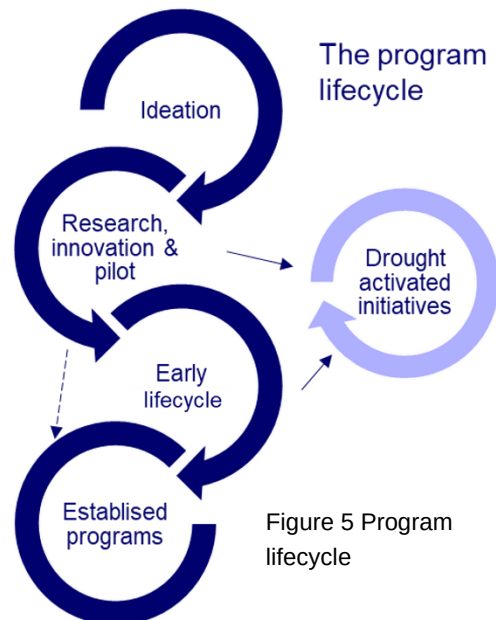


Figure 5 Program lifecycle

2.3.2 Project lifecycle

Below is the high-level project lifecycle that reflects the standard process for individual projects. A project may go through some or all of these stages.

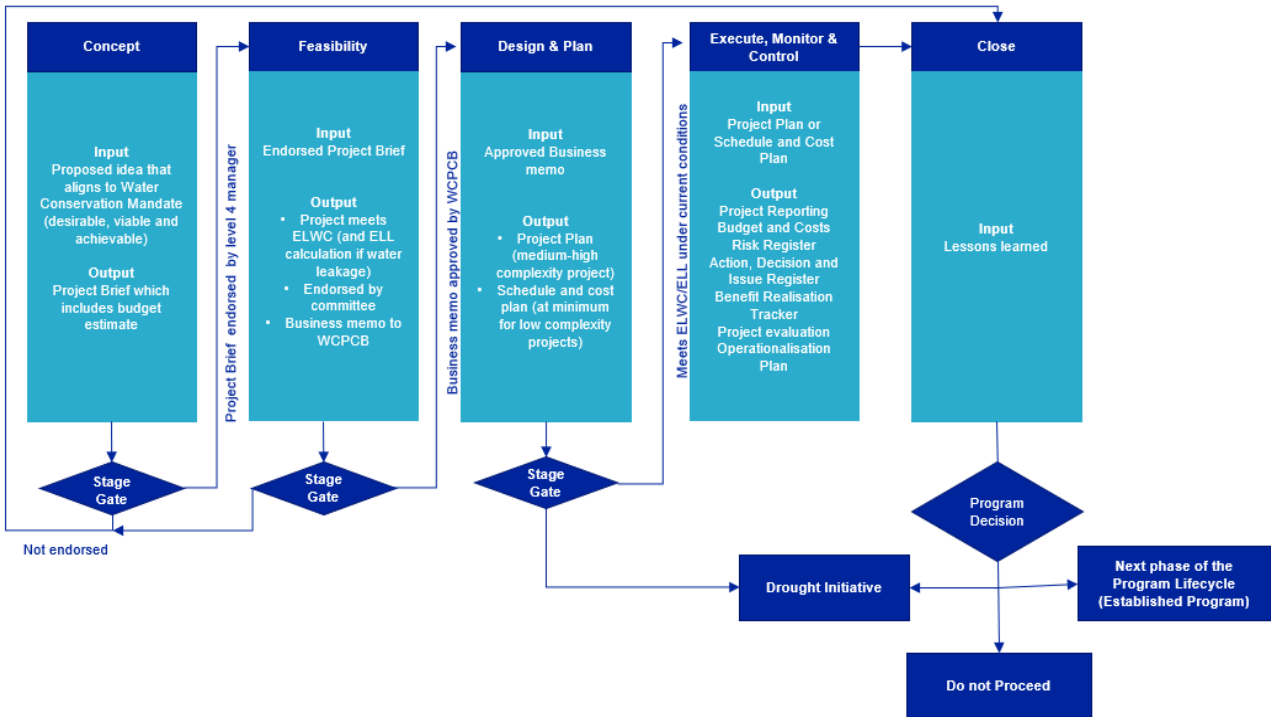


Figure 6 Project lifecycle

An aerial photograph of a coastal city, likely Sydney, Australia, featuring a large island with prominent cliffs and dense vegetation. The city is visible in the background, nestled between the water and the land. The sky is clear and blue.

2022-23 performance



3. 2022-23 Performance

3.1 Water use

In 2022-23, 524 billion litres of water were supplied to residential customers, non-residential customers and for system operations across Greater Sydney, Illawarra, and Blue Mountains. This is slightly more than was used in 2021-22, as wet weather started to abate. Table 1 summarises the key water use statistics for 2022-23 and 2021-22.

Table 1 Breakdown of water use in 2022-23

	2022-23	2021-22
Total water use ²	524,171 million litres	508,740 million litres
- Metered residential	67%	67%
- Metered Non-residential	21%	20%
Leakage	9%	8%
- Economic level of leakage 108 ± 16 ML/d	(129 million litres per day)	(121 million litres per day)
Non-metered water (excluding leaks) ³	3.4%	3%
Observed average water use per person	275 litres per person per day (100 thousand litres a year)	269 litres per day (98 thousand litres a year)
Weather corrected average water use per person	280 litres per person per day (102 thousand litres a year)	279 litres per day (102 thousand litres a year)
Observed average residential water use per person	178 litres per day (65 thousand litres a year)	180 litres per day (66 thousand litres a year)
Volume of drinking water saved by using recycled water	11,912 million litres	12,700 million litres
Volume of water sourced from recycled water (in megalitres)	39,783 million litres	37,700 million litres

The weather-corrected average per capita demand of 280 L/d has remained lower than it was prior to the introduction of water restrictions in response to the 2019 drought. This is a result of ongoing water-wise behaviours from restrictions during the previous drought, impacts from the COVID-19 pandemic, campaigns and water efficiency programs which are estimated to have reduced the demand for drinking water in 2022-23 by around 9% ⁴. (Figure 7, Figure 8, Figure 9).

² Includes treated drinking water supply only. Note that, in addition to this, unfiltered (raw) water is also supplied to specific customers in the order of 2,167 ML

³ Includes billed unmetered consumption, unbilled unmetered consumption, unauthorised consumption and customer meter under registration.

⁴ Compared to expected demand under average weather conditions.

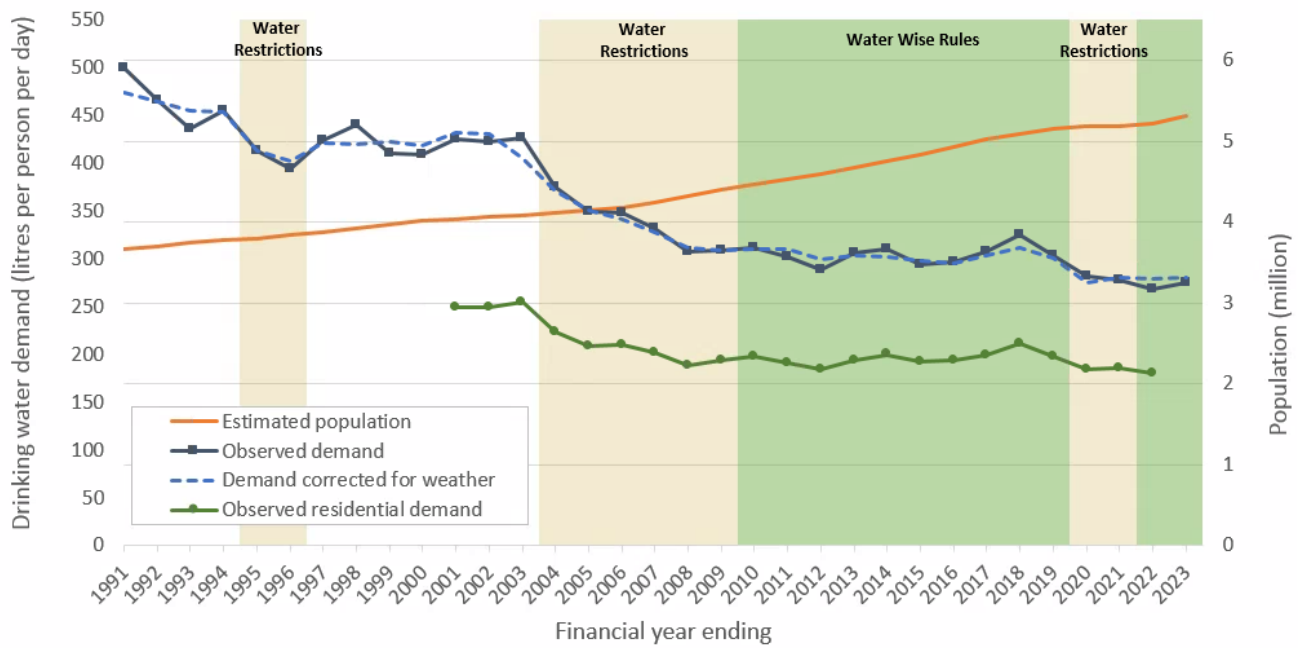


Figure 7 Demand for drinking water (observed and weather corrected in gigalitres) and population growth over time

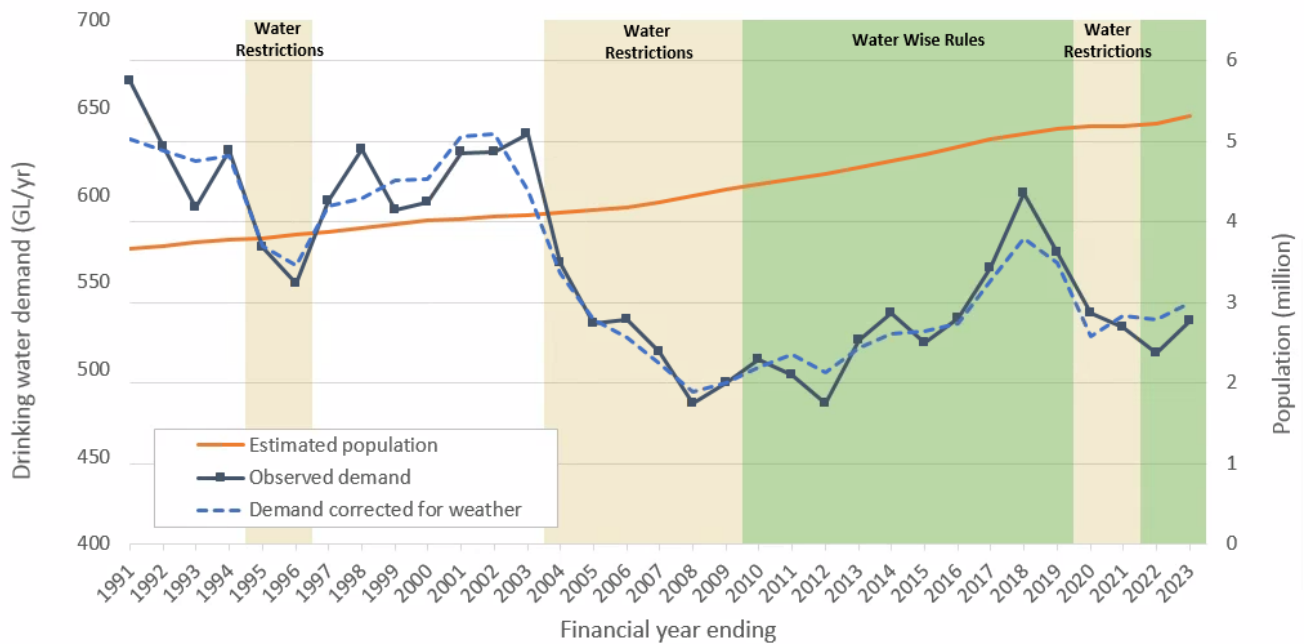
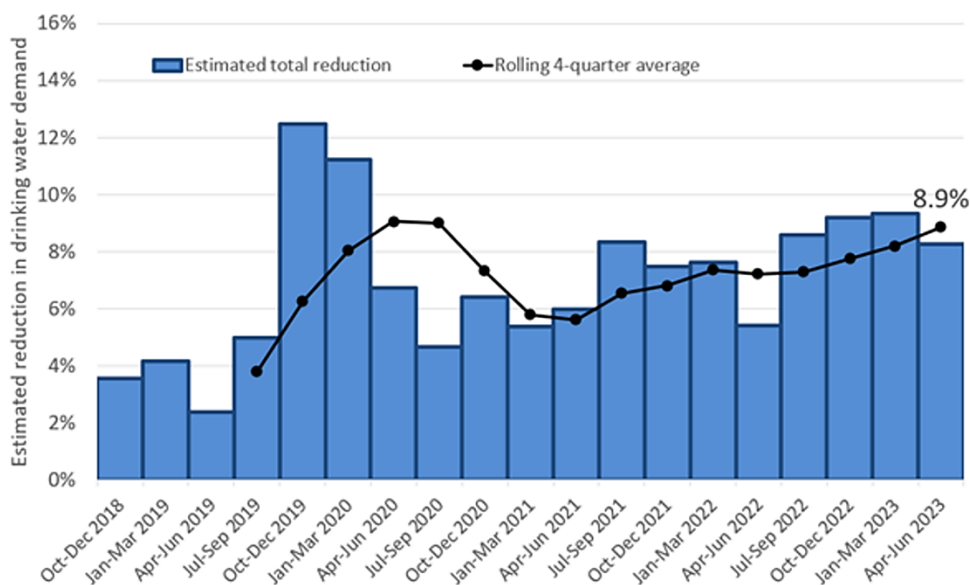


Figure 8 Demand for drinking water (observed and weather-corrected in litres per person per day) and population growth over time



Note: The estimated total reduction includes the impact of water efficiency programs, campaigns, restrictions, prices increases and COVID-19

Figure 9 Reduction in drinking water demand resulting from restrictions, campaigns, efficiency programs, price increases and COVID-19 impacts

3.2 Water conservation program

In 2022-23, Sydney Water's water conservation program delivered 1,473 ML of water savings through established and pilot projects focused on residential and non-residential customers (Table 2). This was an increase of 674 ML in water savings over the previous year, as the program continues to mature.

Overall, the program exceeded its annual target and was within the planned budget, with continuous review and adjustment undertaken as part of program governance. This meant that deviation in the delivery of individual projects in the program, under/over delivery due to a number of factors, was managed at a program level.

The effectiveness of the individual projects and measures in the program are continuously tracked and reviewed monthly by the WCPCB. The decision to cease projects or re-shape and re-target offerings was also made at this level. For example, a review of WaterFix Small Business recommended closure of the project. Further analysis is being undertaken to develop more effective programs for this customer segment.

The achievements of each project delivered under the Water Conservation Program in 2022-23 is outlined in Table 2, with further details provided in Section 5.1.

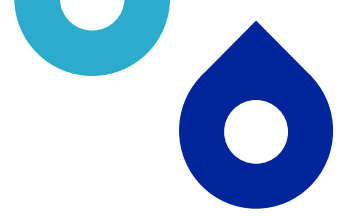


Table 2 Water efficiency programs delivered in 2022-23

Name	Status	Program delivery cost \$/kL ⁵	Economic cost \$/kL ⁶	Meets ELWC	Target annual savings (ML)	Actual annual savings (ML)	Program Investment (\$M)	Participants
WaterFix® Residential	Established	\$1.20	<\$0	Yes	180	190	3.5	9515
WaterFix® Concealed Leaks	Established	<\$0	<\$0	Yes	136	393	0.18	159
PlumbAssist®	Established	\$0.86	\$0.02	Yes	33	34	0.07	436
WaterFix® Strata	Established	\$0.08	<\$0	Yes	180	212	0.90	1452
WaterFix® Commercial	Pilot	\$0.08	<\$0	Yes	157	245	0.16	7
WaterFix® Small Business	Closed	\$0.01	<\$0	Yes	14	14	0.07	96
Online monitoring	Established	\$0.03	<\$0	N/A	91	381	0.1	34
WaterFix® Schools	Early Lifecycle	\$4.22	\$3.39	N/A	37	4	0.02	3
Water Savings Partnership	Closed	N/A	N/A	N/A	-	0.39	0.04	267
Water Efficiency Audit Grants	Pilot	N/A	N/A	N/A	-	0.02	0.03	1
Total Water Efficiency Programs					828	1473	5.1	

⁵ Levelised cost of delivering the program, considering the net cost to implement and the volume of water savings expected to be delivered over the life of the intervention.

⁶ Social economic assessment of costs and benefits using the Economic Level of Water Conservation method.

3.3 Water leakage

Leakage management is a form of water conservation that ensures Sydney Water manages drinking water supply efficiently, minimising water loss from our network while conveying water supply to customers. In 2022-23 we invested \$42.4 million in leakage management programs:



Investing \$40m in ongoing response to main breaks and customer reported leaks, with a focus on minimising customer and community impacts and water loss

- Reduced response times for customer reported leaks
- Customers reported more than 9,800 potential leaks over the past 12 months with an average 800 potential leaks reported each month



Pro-active Leak Detection

- Around \$2.4m was invested in the inspection of 13,923 kms of water pipes for leaks. This included embedding and expanding our leak detection dog program and leveraging Sydney Water teams for inspections.
- We also continued to use our network monitoring and control system (IICATS) to look for unusual water usage patterns, continuously monitoring around 5,000 kms of our water pipes. This enables near to real-time statistical analysis based identification of leaks and pressure surges, raising alarms for analytics and response teams to address issues

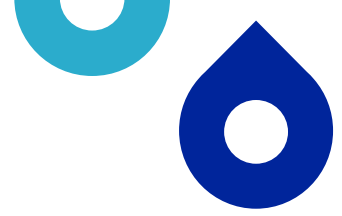


Ongoing research, innovation and data analytics to find better ways of targeting leak detection programs and repairing leaks. We have invested in improvements in the monitoring and measurement of water use to improve our measurement of water loss.



Investing in the early lifecycle and broader deployment of lift & shift and semi-permanent acoustic sensors as part of pro-active leak detection

At the end of the financial year 2022-23, water leakage was estimated at 129 ML/d (rolling 12 month performance), which is an increase compared with 2021-22 from 121.5 ML/d. This change is the result of a marked increase in leakage between Q4



2021-22 and Q2 2022-23. However, a similar step back down to more normal levels of 121 ML/d in Q3 2022-23 and 113.1 ML/d in Q4 2022-23 has occurred.

Measures which usually correlate strongly to leakage performance did not experience a similar trend over this time, suggesting the recent increased leakage may be in part due to underlying issues with data capture, given that leakage is an estimate. The last time leakage was at this level was in a severe drought, where customer-reported leaks and backlog of jobs were both significantly higher than was the case for the recent spike. Neither of these measures varied significantly over the period of the recent peak in leakage.

The calculation of leakage uses a range of different inputs with varying accuracy, including dozens of flow meters and more than 2 million customer meters. Other components of water use are unmetered, manually reported or assumed using international standards or representative data, including the use of water for fire services, construction and in Sydney Water's operations.

A detailed analysis has been undertaken to check the underlying inputs to confirm potential cause(s). This has established:

- correlation with an increase in billing estimates and consecutive zero-meter readings.
- correlation with increased Sydney Desalination Plant production and a significant water storage (Potts Hill reservoir) being taken offline for maintenance work.

Sydney Water is undertaking further improvement of the water balance and leakage calculation to ensure sources of variation are clearly understood, including manual data collection and assumptions used in the estimate. The first stage is to integrate all data into an Enterprise Data Platform, which will automate the calculation and enable a move towards more detailed analysis of leakage performance within the water supply network. This will assist in improving the effectiveness and efficiency of leak detection initiatives.

Refer to Section 5.5 for more details regarding the specific programs and initiatives relating to leakage management in Sydney Water.

3.4 Recycled water

Maximising the volume of recycled water produced by our Water Resource Recovery Facilities (WRRF) results in conservation of drinking water. Recycled water production increased to 40 GL in 2022-23. Recycled water production remained impacted by wetter weather resulting in reduced demand from irrigation customers and lower production from some of our schemes due to ongoing major work and renewals. The volume of drinking water saved from producing recycled water was 12 GL, in line with 2021-22. We invested \$35.9m in the operation of our recycled water schemes.

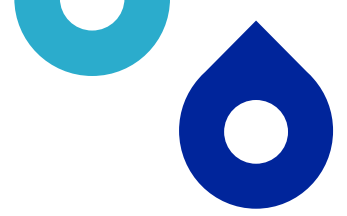
We also continued to invest in reviewing opportunities to expand recycled water where financially viable, including development servicing, partnering with customers (e.g., industrial, agricultural and irrigation water users) and developing and introducing new products (e.g. Hydraloop) to improve customer water efficiency.

Refer to Section 5.6 for more details regarding the specific programs and initiatives relating to Sydney Water's recycled water management and Appendix C for recycled water production data.

3.5 Behavioural change programs

Our behavioural change campaigns set out to inform, engage and educate with the objective of increasing the level of awareness and, in turn, consciousness regarding personal water use and the impact this can have on conservation.

Refer to Section 5.2 for more details regarding the specific programs and initiatives relating to behavioural change programs.



3.6 Supporting programs

Research and innovation, including pilot trials and early lifecycle development, are key components of the Water Conservation program. Sydney Water's investment into research and innovation aims to better understand water's interaction with other aspects of the environment with a view to helping our customers use water more efficiently and, ultimately, save water. Sydney Water invested \$1.8 million on research and innovation water-conservation programs in 2022-23. In-home water efficiency and reuse technologies, commercial and industrial water technologies and water use for greening and cooling were key focus areas.

Refer to Section 5.3 for more details on our research and innovation programs and initiatives.

Data and analytics underpin and support monitoring and decision-making for water conservation. Sydney Water focuses on improving monitoring, data and analysis to provide insights to support leakage management, operational decisions and our customers in water efficiency programs.

Refer to Section 5.4 for more details on data and analytics programs.

Forward plan



4. Forward plan

4.1 Water conservation plan for 2023-24

Table 3 Water efficiency activities planned for 2023-24

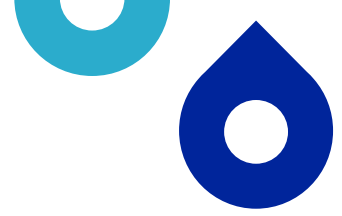
Activities					Target 2023-24		
Name	Status	Program delivery cost \$/kL ⁷	Economic cost \$/kL ⁸	Meets ELWC	Average annual savings (ML) ⁹	Investment (\$M)	Participants
PlumbAssist®	Established	\$2.44	< \$0	Yes	50	0.5	400
Water Efficiency Audit Grants	Pilot	\$2.12	< \$0	Yes	20	0.05	5
Inefficient Washing Machine Replacement	Early Lifecycle	\$1.86	< \$0	Yes	25	0.25	1250
WaterFix® Commercial	Established	\$2.12	< \$0	Yes	250	0.03	25
WaterFix® Concealed Leaks	Established	\$2.44	< \$0	Yes	240	0.18	300
WaterFix® Residential	Established	\$2.50	< \$0	Yes	180	3.50	8,750
WaterFix® Schools	Early Lifecycle	\$2.12	< \$0	Yes	350	0.08	100
WaterFix® Strata	Established	\$2.50	< \$0	Yes	280	1.3	2,200
Online Monitoring	Established	\$1.86	< \$0	Yes	300	0.35	225
CENRA	Pilot	\$1.86	< \$0	Yes	225	0.27	756
Leakage improvement analysts	Supporting activities	N/A	N/A	N/A	N/A	0.9	N/A
Research & Innovation	Supporting activities	N/A	N/A	N/A	N/A	1.8	N/A
Data & Analytics	Supporting activities	N/A	N/A	N/A	N/A	0.2	N/A
Water Conservation Field Team	Supporting activities	N/A	N/A	N/A	N/A	1.7	N/A
Governance & project management	Supporting activities	N/A	N/A	N/A	N/A	0.56	N/A
Totals:					1,920	\$11.6M*	

* The investment of \$11.6M is funded by the Water Conservation Fund annual budget of \$10M plus revenue to offset additional expenditure.

⁷ Levelised cost of delivering the program, considering the net cost to implement and the volume of water savings expected to be delivered over the life of the intervention.

⁸ Social economic assessment of costs and benefits using the Economic Level of Water Conservation method.

⁹ Numbers have been rounded.



Leakage

Sydney Water's leakage management plan for 2023-24 includes improving the targeting of proactive leak detection work and improving the tools used for this work. The delivery of the Enterprise Data Platform leakage component is anticipated to be completed in 2023. This will allow leakage to be monitored at a local system (eg supply or pressure zone) level. Combined with improving the level of flow meter coverage in our networks, this would significantly improve the targeting and effectiveness of proactive field leak detection work.

Investigation of district metering has commenced looking at opportunities for further flow monitoring in the network to drive leakage programs.

Further refinement of leak detection tools, including embedding acoustic lift and shift sensors and use of machine learning approaches can further improve the effectiveness of leak detection.

The active leak detection target for 2023-24 remains at 21,000 km inspection with a \$2.2 million budget.

Improving the water balance calculation is an ongoing focus area. This includes improving our measurement of operational water use through the roll-out of smart standpipes and installation of digital metering at water resource recovery plants. Additionally, the roll-out of digital customer metering could contribute to improvements in the water balance and the estimation of leakage over time. We continue to explore this potential in 2023-24.

Recycled Water

Sydney Water's recycled water production target for 2023-24 remains at 42GL across all of our schemes. Ongoing effort is required to maximise production, and the target reflects the forecast of drier weather and increased customer demand. Key renewals to improve longer term performance to be delivered in 2023-24 include North Head WRRF recycled water plant renewal work and Wollongong WRRF membrane renewals. Some renewals may reduce recycled water production in the short term during completion of work.

Sydney Water is committed to managing recycled water quality and ensuring protection of public health through all recycled water schemes. This includes ongoing recycled water quality monitoring, performance and risk reviews and engagement with recycled water customers and NSW Health.

We also continue to explore opportunities for additional recycled water use through partnering with customers and in servicing growth for existing schemes, including the Rouse Hill residential scheme.

Behavioural change

Our behavioural change campaigns will continue to target increasing the level of awareness and, in turn, consciousness regarding personal water usage and the impact this can have. This includes ongoing community engagement e.g., media campaigns, educational material, our website, community events and ongoing operation of our popular Wonders of Water van.

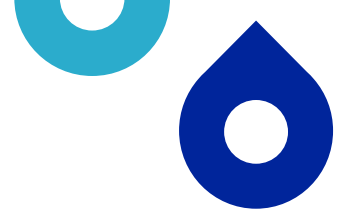
Research and Innovation

Sydney Water is planning to invest \$1.1 million into research and innovation in the 2023-24 year. This area will continue to focus on in-home water efficiency and reuse technologies, commercial and industrial water technologies and water use and interactions on the environment including the area of greening and cooling.

Data & Analytics

Improving accuracy of data sources and data integration into Sydney Water's systems are a focus area for 2023-24 including:

- improved accuracy of operational water use through digital metering for Sydney Water's plants and deployment of smart standpipes to measure water usage in the field
- ongoing focus on improving monitoring of customer water usage through deployment of digital water meters, which can improve demand forecasting and provide insights to customers which can help them save water. continuous improvement in the measurement of the effectiveness of water conservation projects.



- leveraging improved data sources for the identification of water conservation opportunities.

4.2 Water conservation plan – 5-year plan

In collaboration with DPE, we have developed a joint plan to save 38 billion litres of drinking water a year by 2030 (Figure 10) to deliver on the water savings outlined in the GSWS. Water savings will be achieved through a mix of traditional customer and community programs, improving our operational water use including leak management and exploring emerging opportunities from digital metering, water policy and a changing market. Forecast water savings from these activities are summarised in Table 4. In addition to the new savings identified, our water- wise behavioural change and community education programs will continue to support the plan through improved awareness of the importance of water and drought risk, as well as promoting water efficient practices.

This plan will be reviewed and adapted annually to consider the performance of initiatives, emerging opportunities, budgets, resources and alignment to strategic outcomes.

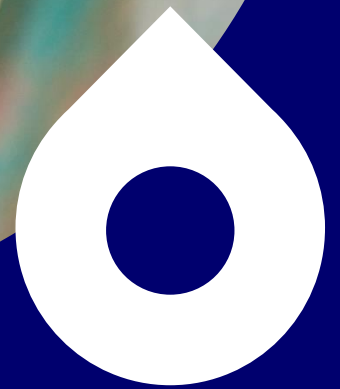
Our water is used efficiently				
What this means	As climate change makes relying on rainfall dependent water sources an emerging service risk, we will build resilience through rainfall independent supplies, improved interconnections between systems and demand management. Our investment in water conservation will yield at least 38GLA of drinking water saved every year by 2030.			
What customers say	Our customers have told us through Our Water Our Voice (2023) engagement program that 'Reducing water loss by minimising leaks and breaks in Greater Sydney's pipe networks' and 'Increasing water savings and reducing usage through community-based water saving programs' are their fourth and fifth highest priorities respectively for water services.			
Deliver customer & community programs	Support policy & market change	Encourage water wise behaviour	Lead by example	Monitor water conservation benefits
Actions we will take: We will deliver programs to reduce water waste and increase the water efficiency of existing homes, businesses and the community inside and outside of drought. - WaterFix Residential program - PlumbAssist program - Non-residential programs	Actions we will take: We will work with DPE to make best practice the new mainstream by driving change in policy, regulations and standards. DPE policy support for water efficient buildings, products and approaches, eg. BASIX, NABERS	Actions we will take: We will build water literacy within the community and provide information to customers to help them make water wise choices. - Digital metering program supported with customer water use interaction tools - Multichannel customer engagement programs such as 'Turn It Off Bob' engagement program and website content - Targeted engagement programs	Actions we will take: We will develop a water conservation mindset and demonstrate our commitment to minimise water use and waste ourselves and by others. - Active leakage detection of 15,000km of mains per year - Proactive inspection and repairs - Management and repair of leaks/breaks (reactive maintenance) - Capital renewal of water network (CIP)	Actions we will take: We will measure performance of our initiatives, pricing and benefits of other initiatives between projected and actual demand as programs are implemented and bills change. - Dampened water demand from expected bill increases and digital metering - Ensure our recycled water schemes are operating efficiently to offset drinking water demand - Continuously improve and optimise our water conservation program
Our measures of success: We expect at least 6GLA water savings by 2030	Our measures of success: - We expect 2GLA savings from policy implementation by 2030 - We expect 5GLA saved by 2030 from price changes	Our measures of success: - We expect 11GLA saved by 2030 from metering - Our historic savings of 20GLA preserved through customer engagement	Our measures of success: We will meet our Economic Level of Leakage (ELL) target by 2025. Note: the current ELL is 108ML/D $\pm$ 16ML/D	Our measures of success: - Our water conservation program delivers value for money - We will monitor differences between projected and actual demand and report quarterly

Figure 10: Sydney Water - Water Conservation 5 Year Plan

Table 4 Water efficiency plan for 2023-24 to 2027-28 based on the current value of water¹⁰

Activities	Meets ELWC	New Water Savings (ML/year)					Total Demand reduction by 2027-28 (ML/yr)
		2023-24	2024-25	2025-26	2026-27	2027-28	
WaterFix® Residential	Yes	180	180	180	180	180	900
WaterFix® Strata	Yes	280	280	280	280	280	1,400
PlumbAssist®	Yes	50	50	50	50	50	250
WaterFix® Concealed Leaks	Yes	240	240	240	240	240	1,200
WaterFix® Commercial	Yes	250	250	250	250	250	1,250
Online Monitoring	Yes	300	300	300	300	300	1,500
WaterFix Schools (pilot)	Yes	350	350	300	150	150	1,300
Water Efficiency Audit Grants (pilot)	Yes	20	20	20	20	20	100
CENRA (pilot)	Yes	225	715	1,030	1,500	755	4,225
Inefficient washing machine replacement (early lifecycle)	Yes	25	100	100	100	100	425
Sub-total	-	1,920	2,300	2,800	3,000	2,300	12,500
Emerging opportunities							
<i>Encourage water wise behaviour</i>	N/A	-	-	1,000	1,000	1,000	3,000
<i>Support policy and market change</i>	N/A	-	-	5,000	0	0	5,000
<i>Lead by example</i>	N/A	-	-	-	-	-	-
<i>Customer & Community Programs</i>	N/A	-	-	-	-	-	-
Total	-	1,920	2,300	8,800	4,000	3,300	20,500

¹⁰ Numbers have been rounded



Water conservation program



5. Water conservation program

5.1 Water efficiency programs

5.1.1 WaterFix® Residential

The WaterFix Residential is a water efficiency program that provides assistance to residents of Greater Sydney to reduce and save water through leak repairs, replacement of inefficient fittings with more efficient devices and completion of a general water audit conducted by a qualified plumber. Before any works commence that will incur cost based on our Schedule of Rates, the plumber seeks approval for the quoted works from the customer.

The program is offered at a subsidised call-out fee of \$33 and a pensioner rebate of \$11.

This program offers the following:

- checking homes for leaking taps and fittings
- supply and installation of new showerheads with 4-star WELS
- supply and installation of new toilets
- supply and installation of different types of taps.

WaterFix Residential can save up to 20kL per appointment per household per year.

Program implementation

- WaterFix Residential is an Established Program, which has been in operation for more than 10 years. The program has been successful in consistently delivering efficient water savings outcomes which meet ELWC and will continue as an established program.
- The program targets residential properties that are individually metered.

5.1.2 Waterfix® Concealed Leaks

WaterFix Concealed Leaks is a specialised leak detection and repair service for hidden leaks on residential and strata properties.

Concealed or hidden leaks are often difficult to find as they are commonly underground or within walls or roof cavities and require specialist skills and equipment. The program allows for customers to pay for this service through their water bill with the option to defer payments. If a concealed leak cannot be found, customers do not have to pay for the service. This provides customers with assurance and a reliable, affordable leak-detection and repair service.

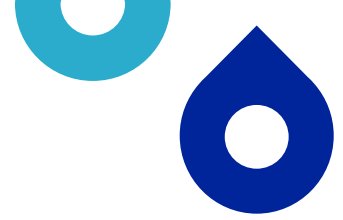
Program implementation

- WaterFix Concealed Leaks is an Established Program which has been in operation since the late 1990s. The program has been successful in consistently delivering efficient water savings outcomes which meet ELWC and will continue as an established program.
- The program targets concealed leaks on residential and strata properties.

5.1.3 PlumbAssist®

The PlumbAssist program is a subsidised service that provides emergency and essential plumbing repairs and maintenance to customers in hardship.

To access the program, customers must be assessed as eligible by a case manager from Sydney Water's Customer Care team. The program ensures that customers have access to basic services, such as water, hot water, and drainage, and that they have



sustainable water consumption through installation of efficient devices and minor and concealed leak repairs, decreasing customer costs.

Customers who participate also receive support and case management from the Customer Care team.

Program implementation

- PlumbAssist is an established program which has been in operation since 2011–12. The program has been successful in consistently delivering efficient water savings outcomes which meet ELWC and will continue as an established program.
- The program targets residential customers experiencing hardship.
- Multiple hidden major leaks were repaired and an increased number of hot water systems were replaced resulting in substantial water savings.
- Customer feedback was positive, receiving an overall customer experience score of 9.7/10.
- 2022-23 saw an increased call on PlumbAssist services for hot water systems.

5.1.4 Inefficient Washing Machine Replacement (new)

A pilot program targeting washing machines and the communal laundries at Land and Housing multi-unit properties was conducted between June and September 2022, replacing 3,385 inefficient washing machines with water and energy-efficient machines. The program was run jointly by Sydney Water and the DPE.

Following an assessment of the pilot, Sydney Water has developed a new initiative to provide a rebate for the replacement of inefficient washing machines. The project aims to remove inefficient washing machines from active use and replace them with water-efficient washing machines. A thorough review of the project model, targets, water savings and economic assessment was completed in 2022-23. The project was assessed to meet ELWC and will be delivered as a pilot in 2023-24.

5.1.5 WaterFix® Strata

The Waterfix Strata program is a specialised water efficiency-focused service that provides strata-titled and multi-unit dwellings with a water savings solution which can save thousands of litres of water each year. The service builds on the successful Waterfix Residential service and allows Strata-titled properties with a single meter to access a water saving program. Waterfix Strata aims to make each residential unit and common area within the building water-efficient, delivering the service over consecutive days. The program offers the following:

- a desktop benchmark assessment, detailed water efficiency inspection and a quotation for proposed work project management, appointment coordination and logistics
- datalogger installation and monitoring services as required
- holistic service including minor leak repairs, concealed leak detection and repairs and the installation of water-efficient taps, toilets, and showerheads
- various payment options are available, including upfront payments, deferred payments and a performance agreement. Under the performance agreement, water bills are kept at the average previous level until the value of the water savings pays for the costs of the service, so no upfront payment is required
- The WaterFix Strata service achieves an average reduction in buildings' water use of 30%.

Program Implementation

- The program has been successful in consistently delivering efficient water savings outcomes which meet ELWC and will continue as an established program.
- The program targets water efficiency and concealed leaks on strata and multi-unit properties.



5.1.6 WaterFix® Commercial

Waterfix Commercial is an expansion of the successful Waterfix Strata program. It offers a specialised Waterfix water efficiency service to deliver large scale, cost-effective water savings for inefficient commercial buildings. Typical customers include hotels, motels, shopping centres and nursing homes. The service includes:

- a desktop assessment, detailed water efficiency assessment against benchmarks, inspection, and quotation for the consideration of high-water users
- project management, appointment coordination and logistics
- datalogger installation and monitoring services
- a quote for all plumbing works which include minor leak repairs, concealed leak detection and repairs, plus the installation of water efficient taps, toilets, and showerheads
- various payment options are available and can include a performance agreement

The program provides a scalable solution enabling water savings, with a triple bottom-line focus: Economic (cost of water and energy).

- Environmental (water conservation).
- Sustainable Building benefits for the commercial customer.

The program is a stepped process which provides predictability to customers and provides a data driven, evidence-based assessment of water usage efficiency which informs whether water conservation measures are necessary.

The program also provides water usage insights which enables customer behavioural change (e.g., such as turning off irrigation systems). Working with commercial customers has also grown Sydney Water's reputation with this customer segment as a water conservation authority. customers.

Program implementation

- Waterfix Commercial is an established program and will continue deliver water savings in 2023-24.
- The program targets water efficiency and concealed leaks on commercial properties.

5.1.7 WaterFix® Small Business

Waterfix Small Business is a water efficiency program that provides assistance to small to medium businesses. The assistance aims to reduce their water consumption through leak repairs and replacement of inefficient fittings with more efficient devices. The service includes:

- a plumber completes an on-site water-efficiency assessment, then recommends and provides a quote for improvements
- following customer approval, the plumber completes the necessary work
- Sydney Water contributes up to \$750 towards the cost of the work.

Program implementation

- Waterfix Small Business commenced as a pilot program in 2020-21. Following an assessment of the program, it has not been undertaken and the program is not included in the forward plan.
- The program targeted water efficiency for small businesses.
- A Phase 2 pilot program commenced in November 2022. Customer uptake was unstable and hindered by competitive neutrality, the state election, and difficulty in targeting small business owners.

- The program was recently reviewed due to its low uptake, high cost and low water savings. A levelised cost analysis was undertaken based on several assumptions around water savings from different measures and uptake of Phase 2 (November 22-May 23). While the program meets ELWC's total economic value of water, it does not meet direct and indirect levelised costs.

5.1.8 Online Monitoring

Previous business water efficiency audits have identified that leaks account for an average of 10-20% of total water use. Online monitoring can help businesses easily detect any unusual water usage to save money and water.

The online monitoring program is a subsidised service available to non-residential customers which includes the provision of a datalogger and access to an online monitoring platform. Online monitoring is key to early leak detection and is one of the easiest and most effective tools to monitor and manage a site's water use. It allows business to understand how, where and when they use water and establish trends. This helps a business identify and address unusual water use from leaks and malfunctioning processes early, saving water and money.

Program implementation

- The Online Monitoring program commenced as a pilot in 2021 and progressed into an early lifecycle program in 2022-23. During the pilot and early lifecycle stages, the program was successful in delivering efficient water savings outcomes which meet ELWC. The program will continue as an early lifecycle program in 2023-24.
- The program targets commercial customers.
- Online monitoring installed 31 data loggers across 22 business and industrial sites in 2022-23. A total of 31 anomalies were identified and fixed. The program is estimated to have saved 398 ML of water.
- Satisfied customers who participated in the online monitoring program have returned to extend their subscription for a third year.

5.1.9 Waterfix® Schools

Schools are one of the largest water-using customer types for Sydney Water. Schools are assessed by using student numbers to calculate the school's average water usage per student and then compared to a typical daily water use benchmark. Schools with a high benchmarked water use per student can then save both water and money by participating in the Waterfix Schools Program. The service includes;

- Free desktop assessment
- Installation of a data logger on the main meter to analyse water usage.
- On-site audit.
- Report outlining ways to save water.
- Obligation-free quote on works to make the school more water efficient (tap and toilet leak repairs, installing water efficient devices and optimising rainwater systems).

The program also provides an online tool for schools to self-check if they are a high user and suitable for the program.

Program implementation

Waterfix Schools commenced as a pilot program in 2021-22 and will be retained as a pilot program in 2023-24.

In 2022-23, six schools signed up to the Waterfix Schools program. Water savings of 4,160 kL was achieved from implementation of the program at three schools, with a further 22,000 KL potential savings identified from the remaining three schools when they complete the water savings work.

Sydney Water has 100 public schools signed up to participate from July 2023.

We are looking at ways to better deliver the program, including aligning with DPE's State-wide Equipment (SWEP) Program Pilot and with the NSW Department of Education.

Sydney Water will also work with the development of the National Australian Built Environment Rating System for schools.

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5.1.10 Water Savings Partnership

Water Savings Partnership is a collaboration with local councils that drives mutual water conservation outcomes. The program aimed to:

- engage, educate and drive the adoption of behaviours, products and services to reduce water usage
- gather insights and build knowledge of the non-residential sector
- use insights to inform the development of new initiatives, segment studies and drought response action plans
- leverage council and customer relationships to trial new initiatives
- build capability in council to deliver mutual water conservation outcomes.

Program implementation

- The Water Savings Partnership commenced as a pilot in September 2019.
- The pilot was assessed in April 2022 as economic at - \$0.88 levelised cost and received positive customer feedback with 80% customer satisfaction and 100% customer advocacy scores, and positive feedback from participating councils who valued the partnership in driving mutual sustainability outcomes.
- With three months remaining, the pilot had achieved 112% of its KPI target for unique water efficiency assessments completed (267). However, this only achieved 52% of its water saving target, an estimated 385 kL per year in water savings.
- An assessment of the program was completed in 2022-23, which recommended the program be ceased, as it was achieving minimal water savings.

5.1.11 Pool cover rebate

The Pool Cover Rebate program targeted swimming pool owners. Over 40,000 litres of water evaporates every year from an average-sized, uncovered swimming pool in Sydney, which then requires top ups with drinking water. A pilot program commenced on 21 April 2022 and ceased on 30 September 2022. Under the program, rebates of \$200 were available to pool owners who bought approved pool covers.

Program implementation

- During the pilot, there were 130 applications approved resulting in 4.29 ML per year in water savings.
- The program was discontinued, as water savings rely on customer behaviour (i.e., use of the pool cover), which is difficult to confirm.
- Sydney Water has developed a working relationship with the Pool and Spa Association which can be further utilised to embed water-wise behaviours, particularly during drought.

5.1.12 Water efficiency audit grants

The Water Efficiency Audit Grant pilot is a positive, proactive program designed to incentivise large industries and manufacturers to reduce water use and reach environmental sustainability targets. The Water Efficiency Audit Grant provides an economical way to put best practices in place to:

- understand their site water-supply system
- identify deficiencies in the system, including leaks and wastage
- identify water and energy conservation opportunities including water reuse
- benchmark water and energy use targets
- develop water and energy use targets.



The grant, provided by Sydney Water, will partly fund the costs for a Water Efficiency Audit and potentially partially cover implementation of recommendations.

Program implementation

- The Water Efficiency Audit Grants commenced as a pilot in April 2022 and will continue to run as a pilot in 2023-24.
- The program will be further promoted through the Business Customer and Water Conservation Field Teams to improve awareness and uptake and to further understand how business customers can be supported to conserve water.

5.1.13 Water Conservation Field Team

The Water Conservation Field Team supports the implementation of the water conservation program delivering frontline customer service, water conservation education and field inspection activities.

They undertake the following activities:

- implement and conduct investigations into water-wise guidelines and water restrictions, when in place
- investigate water theft (i.e., bypassed meters, unmetered standpipes, illegal mains connections)
- support promotion and referral of water conservation customer programs
- investigate customer leakage, high usage and unexplained zero consumption meters
- conduct industry engagement activities.

They also provide support across the Water Conservation Program.

During 2022-23, the Water Conservation Field Team has worked to increase and assure metered consumption across Sydney Water's area of operations through the following achievements:

- identified and replaced 1,411 failed meters at properties recording zero water consumption. This contributes to a more accurate water balance and ensures that customers are receiving a usage signal and charge via their bill. Average water savings of 318kL per day was calculated based on the meter readings from 1502 properties pre- and post- the Field team's intervention.
- Provided field support for established and new programs such as WaterFix® Residential Program, Online Monitoring Pilot Program, Water Savings Partnerships Pilot Program and WaterFix® Small Business Pilot Program.
- Provided support for water literacy more broadly through education and direct engagement with customers



Figure 11: Water Conservation Field Team at work

5.2 Community awareness

5.2.1 Behavioural change campaign

Consumers' attitudes and behaviour towards water i.e., usage within and outside of the home can be linked to water literacy - the level of knowledge of water sources and water management.

Sydney Water's research highlights a relatively low level of water literacy, 4.9 out of 10. Education in concert with building awareness of the need to improve water literacy help create trust, engagement and a framework for activating behavioural change.

Our water conservation and wastewater campaigns set out to:

1. inform
2. engage
3. educate.

Our campaigns aim to increase awareness of personal water use as well as the positive impact this increased awareness can have on generations now and in the future.

Sydney Water's research has found a correlation between climatic events, such as floods, and customers' attitudes towards water use.

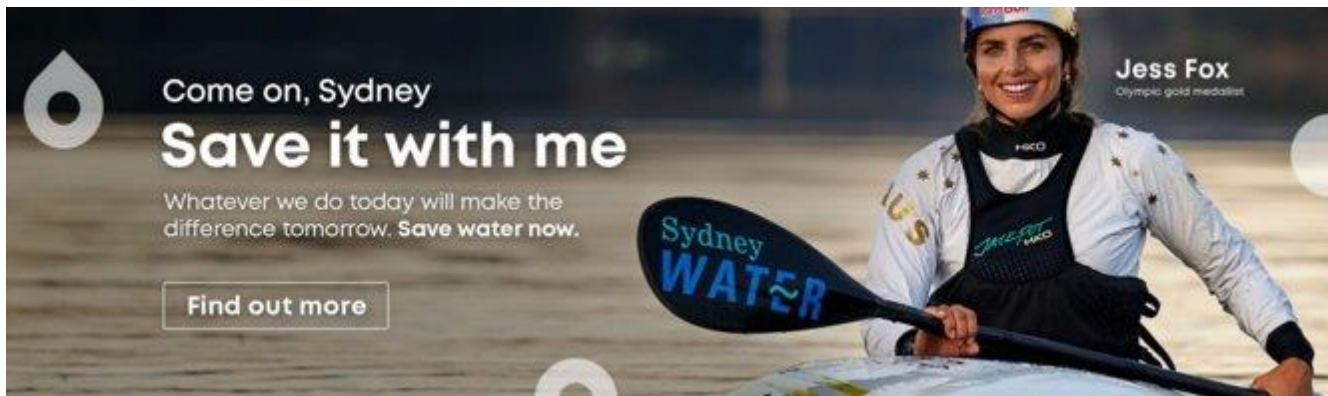
Regular and consistent messaging is paramount to maintaining a share of voice for sustainable awareness. Considered choices are made in terms of the most appropriate mediums to impactfully deliver campaigns – a combination of TV, digital, out of home, social media, traditional media, public relations and radio.



Turn it Off Bob

The 'Turn it off Bob' campaign has been seen 92 million times by Sydney Water customers, with 2 million Sydney Water customers seeing the ads on TV. The campaign has significantly increased awareness of day-to-day water usage in and around the home. The campaign's key strength is its novelty and attention-grabbing style, which supports the campaign's objectives.

In conjunction to the campaign, public relations messages were used to promote relevant water saving tips in combination with Sydney Water's initiatives to ensure a reliable supply of safe water and further reinforce water-saving behaviours.



Save it With Me

The 'Save it With Me' campaign features Olympic gold medallist, Jess Fox. The initiative uses the hashtag #saveitwithme to influence and track public discourse on water. This campaign offers an answer to the question "Why do we need to conserve water when the dam is full?" Using industry- leading social listening platforms, we can capture broader conversations around the subject, not only around our brand and campaign. We saw a significant increase in the conversations around the Sydney Water brand, drinking water, water conservation and Warragamba dam. The campaign's message was seen over 22.5 million times.

McGrath Foundation Partnership

Sydney Water has partnered with the McGrath Foundation to combine breast-cancer awareness with water conservation efforts. As part of this partnership, custom shower timers were offered at Sydney Water activations, in conjunction with Cricket NSW sponsorship including the SCG 'Pink Test'. (January 4-8)

The campaign was designed to encourage customers to take shorter showers to support a worthy cause, not just to support Sydney Water's objectives around water efficiency.

Ramadan Nights at Lakemba

Sydney Water was the Gold Sponsor of Ramadan Nights Lakemba 2023 for the first time. The activation fed into our cultural and linguistically diverse (CALD) marketing strategy, targeting Middle Eastern and Asian communities. We activated for four nights, 4:00pm-10:00pm, over the course of the event.

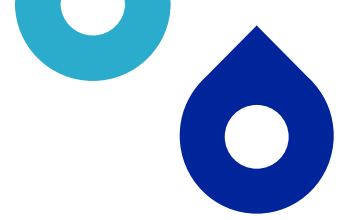
The main aim was to begin tailoring campaigns directly towards our CALD communities.

We did this through:

- giving out water bottles with QR codes that link directly to our WaterWise website www.sydneywater.com.au/waterwise
- handing out flyers in English/Arabic with WaterWise tips
- running a Service Alert sign up competition to build our database
- engaging in conversation to talk to our customers about water conservation

The event was greatly successful with:

- 1.4 million visitors at Ramadan Nights Lakemba
- 241,000 people visited when Sydney Water activated
- 2,800+ outage alert sign-ups
- 5, 700 water bottles handed out with water conservation messaging
- 3,000 English, Arabic, Traditional/Simplified and Korean water-wise tip pamphlets handed out
- 48,000 impressions on all digital OOH ads promoting water conservation and the activation
- 12.5% engagement rate on TikTok on all our Ramadan Water Conservation videos, which is double the industry average.



Royal Easter Show

We engaged with visitors, particularly on key messaging around water conservation and guide them to take part in our Sydney Water pledge.

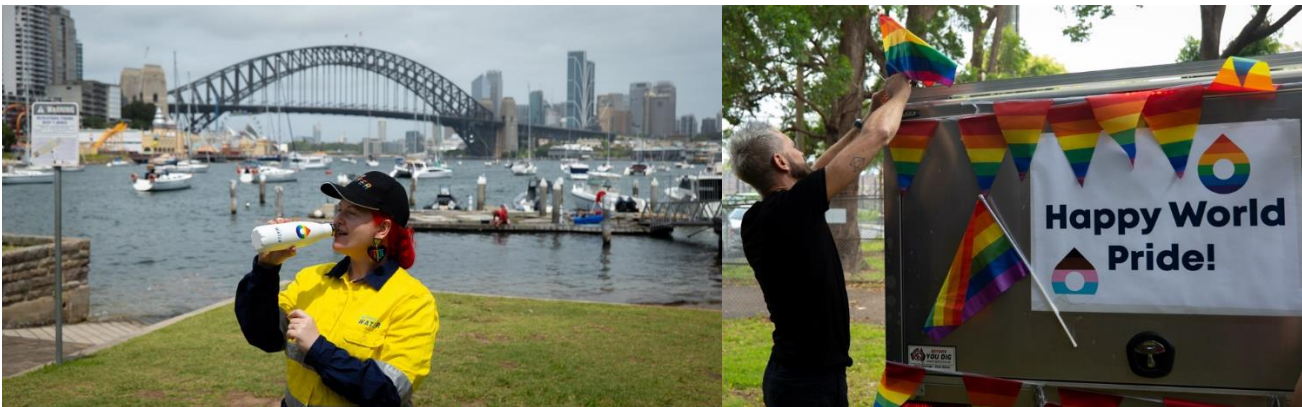
We also encouraged customers to:

- explore our 4 pillars representing each room in the home and use the water usage calculator
- engaged with the 360 video experience to take their pledge and post their video on social media
- guided visitors to play the Stop the Drop
- encouraged families with children to see our interactive fun fact kaleidoscope section
- showcased our Turn It Off Bob and Jess Fox campaigns displayed on the TV screens
- drove a sense of community and common goal
- got visitors to take the message away with them via freebies, posting their 360 video on social media and gameplay beyond the show.

World Pride

In addition to brand exposure through placement of water filling stations, Sydney Water engaged directly with the public and distributed branded water bottles at Live & Proud: Sydney World Pride Opening Concert (20,000 attendees – allocation exhausted), Pride March (50,000 attendees) and Fair Day (40,000 attendees).

At these events, Sydney Water volunteers distributed water conservation show bags branded with the rainbow Sydney Water logo; filled with a shower timer and water conservation fact sheet with a QR code linked to the Waterwise Website. World Pride issued a social media post and e-news article which included water conservation messaging.



5.2.2 Community education

The Community Education program promotes key messages within the broader context of the urban water cycle, circular economy, and water conservation.

In 2022-23, Sydney Water expanded our engagement beyond the formal educational sector. We engaged with a new cohort of stage two primary students, as well as to the broader community, at diverse events and locations, engaging with a more diverse demographic.

Wonders of Water van



Since May 2021, the WoW Discovery Van has ventured far and wide across the Sydney Water area of operations. To date, the van and Sydney Water educators have attended 73 community locations/events, with over 38,000 interactions. A further 33 events were scheduled for the second half of 2023, with additional bookings anticipated. As we continue to strengthen water literacy across the community, our key messages relate to securing a resilient and reliable future water supply, the urban water cycle and water conservation.

Purified Recycled Water Demonstration Plant and Customer Experience Centre

Construction of our Purified Recycled Water (PRW) Demonstration Plant and Discovery Centre is nearing completion, with an official launch set for 31 August 2023. Through the centre, visitors can be part of our future water-management story, while the plant will demonstrate the performance and reliability of PRW treatment technology.

By demonstrating how we can produce water that complies with the Australian Guidelines for Water Recycling (Phase 2) and exploring how this water could safely be added to our existing raw water supply (i.e., dams and rivers), our intention is to build community understanding and support for PRW.

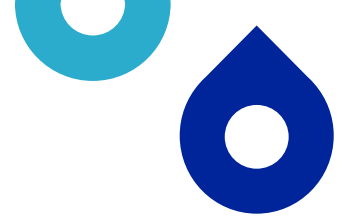
Digital learning resources

Sydney Water's education webpage attracted more than 138,900 page views throughout 2022-23. The education pages that were accessed most w pertained to wastewater treatment and recycling (14,108 views), water use and conservation (13,227 views) and water recycling (8,416 views).

School incursion program

In 2022-23, the Community Education team delivered direct educational learning experiences to nearly 8,000 children. Our program currently offers incursions to early learning centres, aligned to the Early Learning Framework, and primary schools aligned to NSW Syllabus (Geography and Science outcomes). Three concept streams underpin these programs:

- water literacy
- water conservation
- water future.



5.3 Research and innovation

5.3.1 Recycled water and soil interaction stage 2

This project is undertaking research to understand the impacts of recycled and stormwater for irrigated landscapes and soil interaction. There are two sites in Western Sydney at Picton and Penrith Lakes. The project explores how to improve the water holding capacity of soils, especially in degraded areas, to enhance the water retention in irrigated locations to reduce water use. The project will also review how stormwater can be better used to prevent runoff during storm events.

Project objectives and outcomes

- to inform how to improve soils and build drought resilience through the use of alternative water sources such as stormwater and recycled water
- to improve the understanding of recycled water quality and its impact on soil water storage capacity.
- to support best practice irrigation guidelines.

Project achievements

Soil samples from different sites have been compared to other soils sourced from sites with different types of water source.

5.3.2 Arboretum and recycled water project

Western Sydney, with its growing population and extreme heat, has environmental challenges when it comes to water efficiency, urban greening and cooling and overall liveability. Liveability with its increasing population, extreme heat and water demand for urban greening and cooling. Sydney Water, the Australian Botanic Gardens Mount Annan, Macquarie University and DPE are developing a 'living lab' through a geo-specific site trial to test and showcase how recycled water, smart irrigation, effective soil amendments and tree selection can enhance the urban canopy.

Project objectives and outcomes

Objectives and outcomes of this project include:

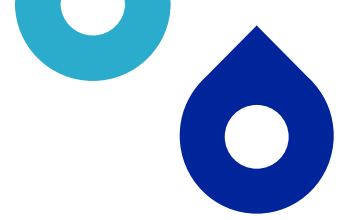
- provide local councils, government, commercial and residential customers with knowledge and training on recycled water use for urban greening, smart sensing technologies, tree selection and soil improvements
- provide insights into the effectiveness of using recycled water over potable water for irrigation of urban green space in Western Sydney
- inform councils and planners to improve growth and survival rates of tree planting for cool, green community spaces.

Project achievements

- The project has secured a grant through DPE for the installation of additional smart sensing technology to support evidence of urban cooling and greening.
- All 600 trees have been planted at the research site.
- The irrigation system has been installed and online remote access set up.

5.3.3 Hydraloop trial

Hydraloop is a new generation greywater processing system. It is modular and scalable so that all sized accommodation facilities can recycle their shower and other bathing water for toilet flushing, clothes washing and irrigation (i.e., onsite grey water reuse). BASIX planning policy currently relies heavily on rainwater tank performance, and Hydraloop presents a potential alternative to rainwater systems. At a single home scale, Sydney Water modelling suggests potential average water savings of between 31% and 48%.



Project objectives and outcomes

Objectives and outcomes of this project include:

- improved regulatory acceptance and planning policies of in-home recycled water systems
- facilitating new technology through regulatory frameworks, including approval for connection to the plumbing network and WaterMark certification
- capturing water savings data to influence BASIX policy
- monitoring performance and capturing learning to inform onsite recycled water systems.

Project achievements

- The project has regulatory endorsement to legally connect Hydraloops to the public plumbing network.
- We've installed 6 trial units in homes undergoing major renovations.
- A number of technological innovations have been achieved through the Hydraloop project, including low-cost sensors. If system faults occur, Hydraloop customers can share alerts online in real time. A similar approach could be applied to rainwater systems.

5.3.4 Smart shower timer phase 3

Water demand from showering represents 26% of average household water demand. This area remains one of the most cost-effective means of water conservation due to the combined benefits of water and energy savings.

Sydney Water is exploring a range of smart shower technologies, and this project represents a simple, low-cost approach to reducing time spent in the shower.

Phase 3 is the realisation of the previous work to prove the concept (Phase 1) and create the detailed design (Phase 2).

Project objectives and outcomes

Objectives and outcomes of this project include:

- With our new timer, we hope to achieve up to 15% reduction in shower water use.
- Our target market is residences in which the timer, which has lifespan of several years, can be attached to the shower. We aim to have several hundred timers available to test by late 2023.

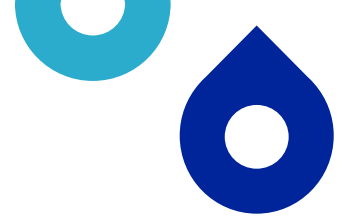
Project achievements

- We've started mass production of stage three timers to determine detailed requirements for mass production of final prototype.
- The new timer is better than the old sand timer as it automatically detects water flow through the shower arm, giving a more precise time measure of water used.

5.3.5 SIMPaCT, smart irrigation for parks and cool towns

SIMPACT is a computer-based machine learning model, or digital twin, of the Sydney Olympic Park Authority's (SOPA) vast irrigated landscape.

As a result, the sensitive landscape around Sydney Olympic Park is now irrigated by a machine-learning automated solution instead of a simpler, clock-based irrigation scheduling system. By accessing an array of Internet of Things (IoT) connected, low-cost soil and



weather sensors and Bureau of Meteorology (BOM) weather forecasts, the SIMPaCT system can revise the water balance of all 240-odd irrigation zones every few minutes and make adjustments or – if rainfall permits - eliminate the next irrigation.

Project objectives and outcomes

Objectives and outcomes of this project include:

- reduced water use; monitoring ground moisture levels and reviewing BOM forecasts optimises irrigation timing and the amount of water used. autonomous delivery through machine learning; the machine learning was able to exploit the few dry weeks during the development period to ensure we had a reasonably representative range of weather conditions to 'teach' the various mathematical models how to autonomously run the irrigation system.

Project achievements

This market leading, unique capability represents the future of landscape irrigation in Western Sydney, delivering the following:

- maximised irrigation efficiency
- maximised urban cooling during heat waves
- maintains a water budget that avoids irrigation during peak demand periods.

5.3.6 Smart Devices and Smart Homes pilot

This research initiative concluded this year after studying the potential positive impacts new digital plumbing technologies could have on customers, their communities and the environment.

Project objectives and outcomes

Objectives and outcomes of this project include:

exploring the potential insights of this technology by running a pilot in a Western Sydney office building.

conceptualise what smart homes might look like in the near future.

- Run a 2-day workshop hosted by GWA Caroma, the Institute for Sustainable Futures at the University of Technology Sydney and Sydney Water, with industry representatives considering strengths, opportunities, barriers and risks today and in 5-10 years.

Further information on the research can be found at the following links:

non-residential pilot study of smart bathroom fixtures: <https://www.uts.edu.au/isf/explore-research/projects/bathrooms-future>

visualising the future of water-smart homes:

<https://www.uts.edu.au/isf/explore-research/projects/future-water-smart-homes-greater-sydney><https://www.uts.edu.au/isf/explore-research/projects/future-water-smart-homes-greater-sydney>

Project achievements

COVID lockdowns and the gradual return to partial office-based work meant that early program results were compromised due to a lack of full building occupancy data.

Concluding remarks from the forum reports include: The recent emergence of new smart sensing technologies within building water systems present a unique opportunity for enabling the next breakthrough in water and energy efficiency for buildings.

As the technology continues to mature and the input / outputs become more sophisticated, there is a strong need for a standardised, forward-looking school of thought to shape its growth and ensure smooth integration with other IoT frameworks at individual, building



and precinct levels. The forum report also includes several research roadmaps to encourage deeper understanding of this rapidly emerging field of technological innovation.

5.4 Data and Analytics

Data and Analytics is a supporting program of work which provides data to:

- inform water restriction design
- inform drought advertising and educational campaigns
- inform other water savings programs
- estimate and measure the volume of water saved from water savings programs provide customers with information on their water usage and insights to improve water efficiency
- review water consumption patterns and behaviours over time
- provide information to water savings programs on how to best target advertisements
- integrate improved data sources, including digital sources, and provide data for effective management of programs, including leakage management.

Program implementation

- **Satellite ground movement data** was assessed as a predictive tool for locating leaks and breaks across our network. Phase 1 of this program provided positive signals of predictive strength, and we will be looking at how we may implement this to provide operational insights in the coming period.
- **Digital meters** (co-funded by the DPE, which are new high-frequency meters, were installed and positive signals achieved on customer leakage identification; these results will be tested with customers to confirm positive identification.
- **Digital meter study** will continue to inform customer end-use behaviours, with a view to assessing and extending findings to less frequent metered data to better engage with customers on water savings practices.

5.4.1 End use study

Sydney Water and DPE are partnering to undertake a customer end-use of water study.

The outputs of this study are essential for informing:

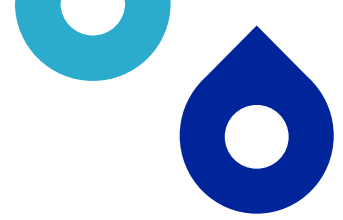
- demand forecasting for the next IPART review and other strategic submissions
- water conservation media campaigns
- DPE and Treasury review of BASIX
- targeting customer behaviour change through analytics to test whether end-use findings can be generalised to standard digital meters, potentially opening the use of smart phone applications with more widespread digital meters (or alternatively, disproving the hypothesis).

Ongoing monitoring and analysis allow Sydney Water to continue to develop relevant data.

As part of ongoing development, a model to test if the detailed end-use data can provide insights into behaviours for standard digital meters to improve customer engagement practices. We're in the process of testing this theory in the context of water leakage reported by our customers.

5.4.2 Digital metering expansion

Digital metering data will help our customers make informed decisions about how they use water and provide Sydney Water with information for asset planning.



Providing tailored, data-driven insights to customers on their water usage enables them to improve their usage behaviours, conserve water and reduce their bills. Continuous flow notifications will also help customers promptly identify leaks within their property rather than waiting for quarterly meter readings.

Sydney Water can also use digital metering to understand system performance and plan for delivery of upgrades to ensure that our customers continue to receive a high level of service.

Traditionally, quarterly metered consumption has been used in combination with flow meters, distributed at key points in Sydney's networks, to understand demand, and system performance, as well as guide activities to identify leaks. Digital meters allow data to be collated hourly rather than quarterly, providing an opportunity to significantly improve the accuracy of system analysis and, ultimately, help our customers save money on their water bills.

The program is no longer a trial. At the beginning of 2022 Sydney Water began rolling out smart metering in non-residential and residential contexts. In 2023, we continued to scale the roll-out, leveraging the existing customer metering program. The business case that justifies this segment of the roll-out is valid through June 2024.

Project achievements

- We installed 2,300 digital meters into 3 new zones.
- We productionised the issuing of leak alerts with meters automatically read every hour. Unusual use patterns can now issue automated alerts to customers.
- For non-residential mechanical meters, the project has introduced a method to retrofit digital metering which can alert Sydney Water if a meter fails. Sydney Water is in the process of systematically rolling this solution out to our top-usage customers.

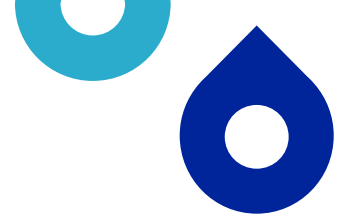
5.4.3 Digital metering data analytics to support non-residential water conservation

- Customer Engagement & Non-Residential Analytics (CENRA) is an initiative to develop analytic tools and algorithms to identify water-saving opportunities for non-residential customers. The project uses a combination of digital meters and PowerBI to provide accurate and timely usage reports to subscribers of the service. The data CENRA develops is used to:
- form a scalable foundation to engage with customers through their individual usage data and tailor insights and recommendations
- identify potable water saving opportunities for customers and share them to customers through direct communication
- identify leaks and other wastage events and support customers to resolve them
- achieve direct potable and waste-water savings during the project operating period
- improve customer sentiment and experience.

CENRA is in the pilot stage and is funded by Sydney Water's Water Conservation program. After June 2024 if the project can demonstrate adequate benefits, the intention is to promote this solution to Early Lifecycle.

Project achievements

- In 2022-23, the reporting was designed, developed and tested. The reporting is now available and was launched to customers in April 2023.
- As of July 2023, 51 customers were on-boarded.
- The CENRA program has discovered two reportable leaks using an algorithm tailored to be sensitive to individual business usage-patterns.



5.4.4 SmartPipe (Smart standpipes)



Improved measurement of water usage can result in more accurate capture of water usage, and assumptions in the leakage estimated (water balance) can be validated. This contributes to a more accurate view of system leakage and better targeting of Active Leak Detection work. This ongoing project aims to expand the deployment of smart standpipe technology to Sydney Water's maintenance crews, allowing ongoing monitoring of drinking water extracted from the network through hydrants. Monitoring is close to real time and geolocated via GPS.

Sydney Water also continues to discuss broader use of Smart Standpipes with Fire and Rescue NSW. The fire brigades have longstanding concerns with traditional metering technologies that have the potential to disrupt the flow of water. New technology in the form of compact, ultrasonic meters present no impediment to flow, and we have good reason to expect the brigades' testing to

prove successful.



Project achievements

The successful completion of the pilot program has led to approval of a business case for deployment of Smart Standpipes to Sydney Water's maintenance crews in 2023-24.

5.4.5 InSAR satellite ground movement sensing trials



Studies have shown that ground movements from interactions between the soil, weather conditions and the urban environment can cause pipe stress which leads to pipe breaks. Measurement of direct ground movement which causes pipes to break are difficult to obtain and have so far not been incorporated in Sydney Water's decision-making processes. Moreover, for the operationalisation of a predictive model, we need consistent, continuous, and large-scale data covering our entire area of operations.

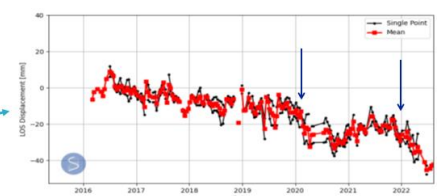
This project evaluated whether millimetric precise satellite ground movement data can help improve predictions of pipe leaks and breaks.

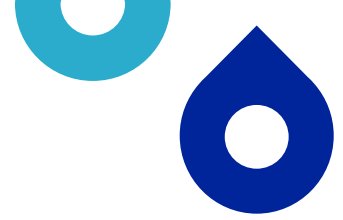
Our project partner, SatSense, derives accurate data on ground movements from radar satellites using algorithms they have developed. SatSense is already providing ground movement data to Severn Trent and Northumbrian Water to identify hotspots where pipes are more likely to burst.

Project Achievements

Phase 1 of this project is complete, and we have seen positive signs of predictability of leakage from these results.

We are assessing Phase 1 and planning for Phase 2, which will consider possible implementation pathways.





5.4.6 Water leakage research & innovation

Sydney Water is exploring multiple emerging technologies to support our efforts to reduce water leakage, including dark fibre, Interferometric Synthetic Aperture Radar (InSAR) and satellite imagery. Sydney Water is piloting several options to ascertain which of these technologies are the most appropriate for water leaks and, therefore, water conservation.

Dark fibre

The Dark fibre project explores the use of disused optic fibre to detect pipe or soil movements that can indicate a leak or break in a watermain. Sydney Water tendered this work and is partnering with a supplier to surplus telecom cables (Dark fibre) to assess the technology for detecting leaks in established networks.



Quantum sensing

This project will test the use of a quantum sensor to assess gravity measurements to identify hidden leaks i.e., where soil moisture impacts these measurements. Quantum sensing measures the change in gravity caused by a subsurface leak patch caused from a leaking pipe. Sydney Water is collaborating with the Australian National University and industry partners to assess the usefulness of the technology in detecting leak patches associated with subsurface leaks. The Australian National University and quantum-sensor start-up Nomad Atomics has validated the possibility of detecting a subsurface created leak patch.

5.5 Water leakage

Sydney Water's leakage-reduction programs target the efficient transfer of water to customers, including response to customer-reported leaks and breaks, as well as leveraging proven technology to detect hidden leaks. This work falls into four key areas:

Speed and
quality of repairs
(customer-
reported leaks)

Active leak
detection
(hidden leaks)

Pressure
management

Asset
management

These are underpinned by continuing research and innovation as well as advancing data analytics to maximise the value of activities undertaken.

Adopting an Economic Level of Leakage (ELL) based approach aims to ensure that proactive leak-reduction activities are cost effective and represent best value for our customers.

Sydney Water estimates leakage from our network through a water balance calculation using the total water supplied minus metered consumption and other known uses, adopting measured figures where possible and best estimates or industry benchmarks where required.

5.5.1 Water leakage programs

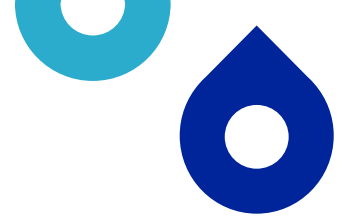
Speed and quality of repairs (customer-reported leaks)

Response to leaks & breaks

Customers, plumbers, and members of the public are encouraged to report water and wastewater leaks or breaks through our 24-hour emergency line and website. We prioritise work on our water networks based on size of the leak and level of impact as we monitor indicators such as response time, to ensure we maintain good performance.

In 2022-23, customers reported around 9,800 potential leaks and breaks. Each report was investigated to determine the cause. Of those reported, we confirmed and repaired approximately 4,800 leaks and breaks on Sydney Water's network of pipes, prioritising response to minimise community disruption and water loss. The remaining were stormwater, groundwater or water coming from customer's properties. We provide notification to customers of potential leaks on their properties and offer a concealed leak repair service.

Sydney Water is improving our response time and repair methods by:



- deploying teams to smaller geographical areas, especially in locations where higher levels of leaks occur, to minimise water loss and improve response times to visible leaks
- optimised scheduling of resources so leaks with higher water loss are prioritised
- use of innovative tools to allow repair of watermains and installation of new valves under pressure, which can avoid the need for network shutdowns and reduce the volume of water lost in draining pipework for repair.

Proactive leak detection (hidden leaks)

Proactive leak-detection activities are targeted to areas with higher water loss, based on a review of system performance. Our ability to determine network areas with higher levels of water loss depends on network monitoring and the location of flow meters.

The objective of proactive leak detection is to find and repair hidden leaks before they are reported by our customers. This saves water and reduces the likelihood the leak will result in a main break, disruption to water supply and damage to footpaths and roads.

We use field-based tools, including active leak detection field surveyors, leak detection dogs, lift and shift acoustic sensors and fixed acoustic sensors, as well as automated tools to continuously screen our networks for faults through our automated control system, IICATS.

Active Leak Detection field surveys

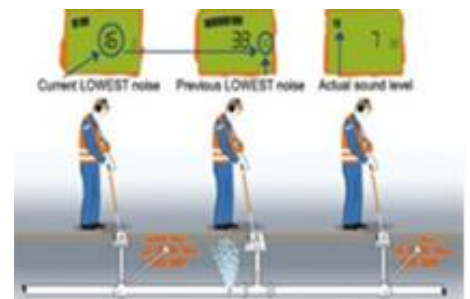
The Active Leak Detection (ALD) program identifies concealed leaks using a range of technology and devices. Most of the work is undertaken by specialist field surveyors who scan watermains using acoustic leak-detection equipment and identify hidden leaks.

In 2022-23, we surveyed 13,923 kms of watermains and identified 4,050 hidden leaks.

Leak detection dogs program

Joey is a working Springer Spaniel trained to detect drinking water leaks throughout Sydney Water's network. As a light, agile alternative to more traditional leak detection approaches, specialised trained dogs can detect leaks quickly in difficult conditions, such as bushland or challenging terrain.

During 2022-23, Joey was joined by a second dog (Hydro) and, between them, they have walked 267 km over the year and detected more than 108 water leaks that have since been repaired.



In 2022-23, the leak detection dogs transitioned from a pilot to an established and valued component of the ALD program. Joey and Hydro have also been part of Sydney Water's reactive response when required. They are particularly efficient in locating difficult-to-find leaks and are great water-conservation ambassadors.

In addition to finding leaks on Sydney Water's system, Joey and Hydro have found 22 leaks on customers' properties, enabling quick repairs which saved our customers time, water and money.

Monitoring network performance - IICATS statistical analysis

Sydney Water uses real-time monitoring of system flows and data analytics to detect unusual flow patterns. Business rules are used to review this data and target field inspections to find hidden leaks. Trials are in progress to utilise lift and shift acoustic sensors to confirm and locate leaks detected by statistical analysis.

In 2022-23, the statistical analysis techniques led to identification of 39 hidden leaks, avoiding leakage volume of 669 million litres and avoiding costs of \$1.7m.

Lift & shift acoustic sensors

Sydney Water has installed semi-permanent and lift and shift acoustic sensors in six high-density urban areas including Sydney central business district (CBD), and other prioritised zones. When combined with machine learning, over time the soundwave-based signature of a leak can be identified. In this way, acoustic sensors embedded in the system raise alarms when leaks are detected rather than relying on field surveys.

Research trials indicated that acoustic sensors could detect leaks as low as 0.01 L/s. This technology builds on proven techniques used in field surveys of networks where a leak detection specialist has a trained ear to recognise leaks as distinct from other background noise.

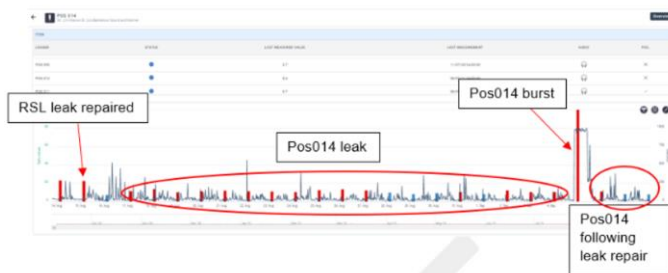
In 2022-23, Sydney Water continued to transition acoustic sensors from a pilot to an established component of the ALD program, building machine learning capability within Sydney Water.



Pressure management

Pressure management program

Pressure management can significantly reduce the risk or scale of leaks and breaks. With lower average pressures, the volume of water lost can be reduced. Sydney Water has continued to identify opportunities for reduced pressure across our network, with detailed planning in progress to develop a business case for extending pressure management.



Pressure calming

Sydney Water's Customer Hub identifies pressure spikes and directs operational intervention to minimise the impact of pressure surges. This is called pressure calming.

Pressure calming can increase asset life and reduce leaks and breaks by reducing the cyclical loading on watermain due to the normal fluctuation in pressures associated with system operation (e.g., pumps switching on and off) and/or surge incidents (e.g., pump failures or rapid valve closure).

In 2022-23, 31 pressure alarms raised, 21 faults investigated and resolved, 9 were under investigation with 1 false alarm.

Asset management

Watermain renewals

The primary drivers for watermain renewals relate to asset management (i.e., balancing maintenance with renewal costs) and maintaining continuity of supply to customers (i.e. minimising disruption). However, they also have some benefit in reducing water leakage and ongoing breaks.

In 2022-23, Sydney Water invested \$90m in renewing mains. This allows renewal of roughly 0.1% of our network spanning 22,600kms while targeting the most critical mains.

5.6 Recycled water

Sydney Water is committed to the principles of a circular economy, with recycled water playing a vital role in meeting customer and environmental water demand and reducing the use of drinking water for non-drinking purposes, such as watering the garden. We also ensure recycled-water schemes are financially viable so we continue to deliver value for our customers.

5.6.1 Existing recycled water schemes

Existing recycled water schemes produced 39.8 gigalitres of recycled water and saved 11.9 gigalitres (GL) of drinking water in 2022-23.

Production was slightly below our annual target 42GL, because of reduced demand from irrigation customers and lower recycled water production from some Water Resource Recovery Facilities due to ongoing major works and renewals.

One additional recycled water scheme, Bingara Gorge, transitioned to Sydney Water in 2022-23 and an additional customer, Taronga Zoo's koala feed plantation, was added to the Richmond Recycled Water scheme.



Table 9 Recycled Water use in 2022-23 and 2021-22

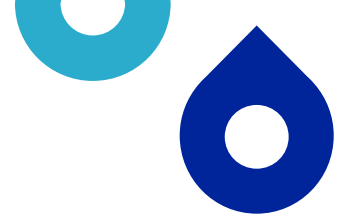
Supplied to	2022-23 annual production (GL)	2021-22 annual production (GL)
Residential, commercial, and industrial use	9.5	10.6
Environmental flows	7.7	4.6
Use at Water Resource Recovery Facilities	17.0	17.1
Irrigation of parks, sports fields, and agriculture	5.7	5.4
Total Recycled Water	39.8	37.7
Total drinking water savings	11.9	12.7

5.6.2 Exploring new opportunities

Sydney Water continues to explore opportunities for recycled water to offset drinking water use for non-drinking uses:

- with existing industrial, agricultural or irrigation customers to reduce their drinking water use
- within Sydney Water's operations, including at Water Resource Recovery Facilities (WRRFs)
- as part of broader precinct-scale, development-servicing opportunities
- continued growth within existing recycled water supply areas (e.g., Rouse Hill)
- with industries with high water usage (e.g., data centre, hydrogen projects).

Sydney Water has a pipeline of work investigating opportunities for recycled water supply to new and existing customers. These assessments progress through gateways from initiation to delivery (see section 2.3.2) aimed at ensuring value to customers and their communities. There are more than 40 studies underway at various stages of the pipeline process. We are working closely with key regulators the NSW Environmental Protection Authority and NSW Health, as well as developers, customers and other



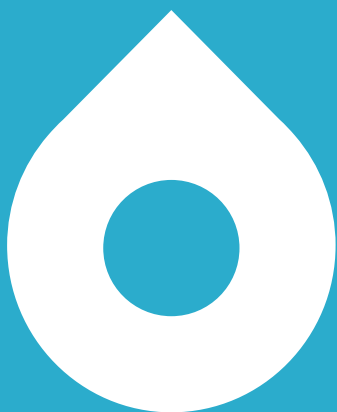
stakeholders to ensure that we have a more holistic sense of the value proposition of recycled water for customers and their communities.

5.6.3 Recycled water in servicing growth

Sydney Water continues to consider the role of recycled wastewater and stormwater as part of developing servicing solutions to support growth, greening of public spaces, water supply resilience and waterways health outcomes. The aim is to provide essential services while protecting the environment (e.g., waterway health) and enabling development of high value urban spaces for improved liveability. The use of alternative water sources, such as recycled wastewater and stormwater, enables urban greening and cooling without using limited drinking water supplies.

There are substantial greenfield and infill development areas throughout Sydney that present challenges and opportunities to leverage limited system capability and use water differently. For example, a new Water Resource Recovery Facility at Upper South Creek is being built to service the Western Sydney Aerotropolis, which provides an opportunity to supply recycled water within the Western Sydney Aerotropolis Growth Area and to the new Western Sydney International Airport.

Appendix

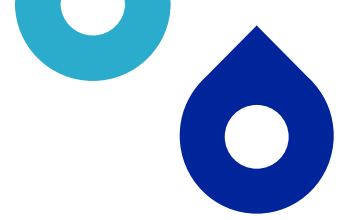


6. Appendix

6.1 Appendix A Reporting Requirements

Table 10 Annual Water Conservation Report requirements

Clause 2.1 Water Conservation Report	Location
Include information of Sydney Water's water conservation program for the previous financial year and for at least the next five financial years, including where relevant (but not limited to):	
Sydney Water's strategies, programs and projects relating (at a minimum) to water leakage, recycled water and water efficiency (Water Conservation Measures)	Section 3 Section 4 Section 5
Whether the Water Conservation Measures are economic	Section 3.2 - Table 2 Section 4.1 – Table 3 Section 4.2 - Table 4
How and when the Water Conservation Measures will be implemented	Section 4 Section 5
The targeted water users	Section 5
The expected water savings	Section 3.2 - Table 2 Section 4.1 – Table 3 Section 4.2 - Table 4
Cost of the measure per kilolitre of water saved	Section 3.2 – Table 2 Section 4.1 - Table 3 Section 4.2 – Table 4
The method to assess the effectiveness of the Water Conservation Measures	Section 3.2
The extent to which these Water Conservation Measures accord with the with the economic level of water conservation (ELWC) and the Current Economic Method	Section 3.2 - Table 2 Section 4.1 – Table 3 Section 4.2 - Table 4
Include details of all of the Water Conservation Measures relating (at a minimum) to water leakage, recycled water and water efficiency that were considered by Sydney Water in developing its water conservation program, and clearly identify those Water Conservation Measures that:	Section 2.3 Section 4 Section 5
Are economic when assessed by the Current Economic Method	Section 3.2 - Table 2 Section 4.1 – Table 3 Section 4.2 - Table 4
May become economically efficient at a later date	Section 2.3 Section 5 (pilot programs)
Sydney Water is required to implement under Licence clause 3.1.2	Section 3.2 - Table 2 Section 4.1 – Table 3 Section 4.2 - Table 4
Sydney Water has implemented	Section 3.2 -Table 2 Section 5
Sydney Water is proposing to implement at a later date (or under specific circumstances)	Section 2.3 Section 5 (pilot programs)
Describe and explain Sydney Water's progress against each of the Water Conservation Measures of its water conservation program for the previous financial year, including any deviations from the program	Section 3 Section 5
Describe and explain any changes to Sydney Water's water conservation program relative to the previous annual Water Conservation Report (where applicable)	Section 5
Outline how Sydney Water's water conservation program relates to the Metropolitan Water Plan and its progress against the Metropolitan Water Plan	Section 2



Include information on any Water Conservation Measures researched, piloted or developed for the previous financial year (including the funds spent on these activities)	Section 3.6 Section 5.1 (pilot programs) Section 5.3 Section 5.4
Include information on the water conservation performance indicators (in Appendix C) for the previous financial year; - Quantity of Drinking Water drawn by the water utility from all sources during the financial year, expressed in litres per person per day (observed) - Quantity of Drinking Water drawn by the water utility from all sources during the financial year, expressed in litres per person per day (weather corrected)	Section 3.1 – Table 1
Include the following water conservation information for the previous financial year:	
Quantity of Drinking Water drawn by Sydney Water from all sources, expressed in giganlitres per year (aggregate)	Section 3.1 – Table 1
Level of water leakage from Sydney Water's Drinking Water supply system against the economic level of leakage for that financial year (in megalitres per day)	Section 3.1 – Table 1
Volume of water sourced from Recycled Water (in megalitres)	Section 3.1 – Table 1

6.2 Appendix B Method Overview

Estimating Economic Level of Water Conservation

Under our Operating Licence 2019-23, Sydney Water is required to maintain a water conservation program consistent with the Current Economic Method and to implement water conservation measures that have been assessed as economic as determined by the Current Economic Method.

The Economic Level of Water Conservation (ELWC) methodology is our Current Economic Method for assessing whether our water conservation measures are economic. The ELWC methodology should be conducted on any of the following types of water conservation activities:

- water leakage.
- water recycling.
- water efficiency (including demand management).

Essentially, a water conservation project is assessed as economically viable under ELWC where the levelised cost is less than or equal to the value of water. The process for applying the ELWC methodology is summarised in the diagram below. Levelised cost estimates for several customer programs have been reduced as a result of incorporating additional social and environmental benefits. These include a reduction in energy, carbon and wastewater treatment demands.

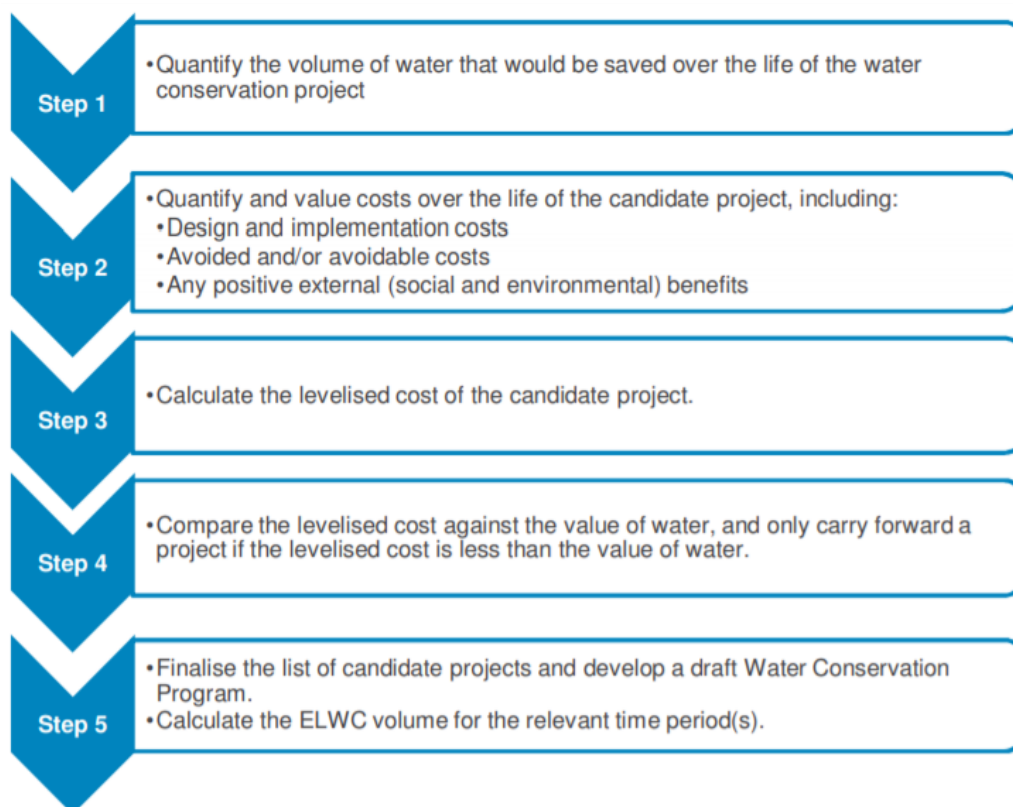


Figure 12 Economic Level of Water Conservation Process

Estimating economic level of leakage

Sydney Water aims to achieve an economic level of leakage (ELL) that balances the cost of water, system performance, customer expectations and programs. Ultimately, the approach is designed to identify and repair leaks while providing value for customers.

The ELL is the point where the cost of reducing leaks equals the value of the water saved. It is based on a least-cost model to determine the best rate of expenditure to manage leaks and this approach is based on International Water Association best practice, customised for Australian use.

The ELL target is established at the start of each year based on a mix of default values derived from statistical analysis across international water agencies, as well as current and historical asset and performance data such as length of main, increasing number of connections, water pressure, response times, leak detection costs, and the marginal cost of water.

Where possible, the forecasted prevailing climate conditions are considered in the determination of the ELL Target to gauge the changes in soil moisture and impacts on asset movement that may increase or reduce weeping joints and emerging cracks. For example, the number of forecasted breaks would be lower in non-drought-related years.

Forecasting and monitoring water savings

The volume of water savings achieved from our water conservation programs is monitored and reviewed to support an adaptive planning approach for water conservation. It also provides evidence to inform the ELWC assessment process. The table below summarises how we measure water savings from our programs.

Table 11 Program measurement

Program	Status
WaterFix® Residential	A comparison of water use by customers who participated in the WaterFix® Residential program between July 2019 and Jan 2021 and others that did not participate indicated an average reduction of around 20kL/yr. A typical customer could expect a saving of around 11kL/yr.
PlumbAssist®	Analysis of quarterly meter readings of PlumbAssist® participants between October 2019 and March 2022, indicates an average water use reduction of around 130kL/property/yr.
WaterFix® Strata	Water savings of around 127 kL/property/yr have been assumed based on actual consumption changes measured by online loggers and meter readings.
WaterFix® Concealed Leaks	Water savings are estimated using site-specific fault information provided by a specialist service provider, and a bottom-up estimation for the program impact and forward potential. Current assumed water saving per participant is 800kL/property/yr on average. Savings to be reviewed in 2023-24.
WaterFix® Commercial	Assumes average savings of 10ML/site/yr informed by savings estimated from early program participants. Savings to be reviewed at the end of the pilot in 2023-24.
Online Monitoring	Assumes average savings of 1,330kL informed by savings achieved to date in the pilot.
Inefficient Washing Machine Replacement	Assumes 20kL of savings per machine replaced based on average use comparison between efficient and inefficient washing machine use from Sydney Water's residential end use study.
WaterFix® Schools (pilot)	Assumes average savings of 3.5ML/school/yr. Savings to be reviewed once there is a sufficient number of participants for analysis.
Water Efficiency Audit Grants	Assumes average savings of 4,000kL/grant.

6.3 Appendix C Recycled Water

Table 12 displays Sydney Water's recycled water scheme's performance for the 2022-23 financial year.

Table 12 Recycled water production and drinking water savings 2022-23

Source	Recycled Water Scheme	Recycled Water Use (ML/Year)	Drinking Water Savings (ML/Year)	Type of Use
All WRRF	On-site usage - all Water Resource Recovery Facilities (WRRF)	16,951	1,849	Industrial
Bingara Gorge	Golf Course	170	128	Irrigation
Bingara Gorge	Residential	67	67	Residential
Bombo	Kiama GC, Kiama	28	21	Irrigation
Castle Hill	Castle Hill Country Club	74	55	Irrigation
Gerringong	Aorangi Farm, Gerroa	63	0	Irrigation
Liverpool	Liverpool Golf Club	15	11	Irrigation
Liverpool	Warwick Farm Racecourse	78	78	Irrigation
Picton	Carlton Farm, Picton	279	0	Irrigation
Quakers Hill	Stonecutters Ridge Golf Club, Colebee	96	72	Irrigation
Quakers Hill	Water sharing, agricultural release	365	0	Agricultural
Richmond	University of Western Sydney, Hawkesbury Campus	124	124	Irrigation
Richmond	Richmond Golf Club	52	39	Irrigation
Rosehill	Rosehill Camelia Scheme	1,465	1,465	Industrial
Rouse Hill	Rouse Hill recycled water Scheme	1,895	1,895	Residential
St Mary's	Dunheved Golf Club	53	40	Irrigation
St Mary's	Water sharing, agricultural release	2,428	0	Agricultural
St Marys AWTP	Environmental Flows	7,668	0	Environmental
West Camden	Glendon Brae Pastoral	11	0	Irrigation
West Camden	Camden Council	0	0	Irrigation
West Camden	Elizabeth Macarthur Agricultural Institute	6	6	Irrigation
West Camden	Agricultural release	1,825	0	Agricultural
West Camden	A Smart Farmer	3	0	Agricultural
Wollongong	Bluescope Steel	5,815	5,815	Industrial
Wollongong	Wollongong Golf Course	19	14	Agricultural
Wollongong	Wollongong Council	2	2	Agricultural
Wollongong	Port Kembla Coal Terminal	231	231	Industrial
All Total (ML)		39,783	11,912	

6.4 Appendix D Leak Management

Table 13 Leakage management statistics

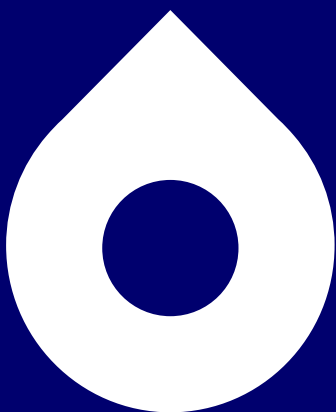
Key statistics	2022-23	2021-22	2020-21
Actual Leakage (refer Water balance)	129 ML/day	121.5 ML/day	112.5 ML/day
Economic Level of Leakage (ELL) Target ¹¹	108 ML/day	108 ML/day	108 ML/day
Number of water main breaks, bursts and leaks	4,860	4,042	4,872
Number of water main breaks, bursts and leaks per 100 km of water main	21	18	21
Average duration of an unplanned water interruption (minutes)	231	192	200
Length of mains inspected	13,923 km	15,455 km	12,000 km
Infrastructure Leakage Index (ILI)	1.44	1.37	1.31

¹¹ An uncertainty band of ± 16 ML/day exists around the forecast ELL, as leakage is determined by deduction, total system supply minus usages, and uncertainties in input figures, including meter read adjustments, result in much larger uncertainty of the final leakage volumes over the year.

Table 14 Water balance as of 30 June 2023

Water Supplied						
524,171 million litres						
Non-revenue water					Revenue water	
62,470					461,701	
Water losses			Authorised consumption			
56,875			467,296			
Real losses	Apparent losses		Unbilled authorised		Billed authorised	
46,983	9,892		5,596		461,701	
Leakage on mains	Meter inaccuracy	Unauthorised consumption	Unbilled unmetered	Unbilled metered	Billed unmetered	Billed metered
46,983 (129 ML/day)	9,368	524	5,331	265	2,662	459,039

Glossary and acronyms



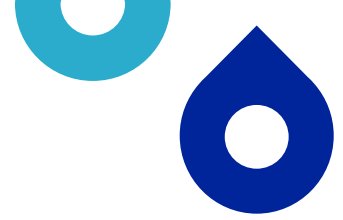
7. Glossary and Acronyms

7.1 Glossary

Building and Sustainability Index (BASIX)	State-wide planning policy ensures new residential dwellings are designed to use less drinking water and produce fewer greenhouse gas emissions by setting energy and waste reduction targets. BASIX also applies to extensions and alterations of existing residential properties.
Economic Level of Leakage	Represents the total level of leakage from the system at the point where the cost of leak reduction activities equals the savings from reduced water demand.
Greater Sydney Water Strategy	The Greater Sydney Water Strategy replaces the existing Metropolitan Water Plan 2017 and provides confidence in the security of Greater Sydney's water supply to 2040 to support economic growth, environmental protection and community wellbeing.
Levelised cost	The present value of net project costs divided by the present value of water saved, measured over the life of the project
Recycled water	Recycled water is water that has been used before and is then cleaned to remove impurities. Recycled water (sometimes called reclaimed water) comes from wastewater, which includes greywater and stormwater. Sydney Water treats recycled water to Australian Recycled Water Guidelines and NSW Health standards so that it is suitable and safe for its intended use.
Sewer mining	The extraction of wastewater upstream and/or downstream of a wastewater treatment plant for treatment and reuse as recycled water.
Stormwater harvesting	The collection, treatment, storage and use of stormwater runoff.
Water Efficiency Labelling Scheme (WELS)	National scheme that involves mandatory water efficiency rating and labelling for a range of appliances and fittings.
Water Wise Guidelines	The NSW Government has announced that Water Wise Guidelines have replaced level 1 water restrictions and apply to everyone in Sydney, the Blue Mountains and the Illawarra. This includes all residents and businesses. Water Wise Guidelines came into effect at 12:01AM on 1 December 2020 and, as of publication of this report, remain in place. The rules focus on common-sense behaviours such as watering lawns and gardens before 10 am and after 4pm using a hand-held hose fitted with a trigger nozzle, sprinklers or standard watering systems. Customers cannot allow water to run onto hard surfaces such as paths or roads.
Weather correction	The removal of year-to-year variation in water use relating to changes in weather conditions.
2017 Metropolitan Water Plan (NSW)	The 2017 Metropolitan Water Plan's overarching goal was to secure water for a liveable, growing, and resilient Greater Sydney. It established key strategies implemented over the life of the plan including optimising the way we manage the water supply systems, investing in water conservation, preparing for drought, delivering WaterSmart cities and improving river health. This plan has been replaced by the Greater Sydney Water Strategy.

7.2 Acronyms

ALD	Active Leak Detection
AWA	Australian Water Association
BASIX	Building Sustainability Index
DPE	Department of Planning and Environment
ELWC	Economic level of water conservation
ELL	Economic Level of Leakage
GSWS	Greater Sydney Water Strategy
GPS	Global positioning system



IICATS	Integrated Instrumentation Control Automation and Telemetry System
ILI	Infrastructure Leakage Index
IPART	Independent Pricing and Regulatory Tribunal NSW
ISF	Institute of Sustainable Futures
IWA	International Water Association
LGA	Local Government Area
LPD	Litres per person per day
NSW	New South Wales
PRW	Purified Recycled Water
RRWS	Resilient and Reliable Water Supply
WCFT	Water Conservation Field Team
WCPCB	Water Conservation Portfolio Control Board
WELS	Water Efficiency Labelling and Standards
WRP	Water Recycling Plant
WSAA	Water Services Association of Australia
m	metres
l	litres
kL	kilolitres
km	kilometres
ML	megalitres
GL	gigalitres