



**Water
Conservation
Report**
2021-2022

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Acknowledgement of Country

Sydney Water respectfully acknowledges First Nations people as the Traditional Custodians of the Dharawal, Gundungurra, Darkinjung, Dharug and Eora nations (Sydney, Illawarra, and the Blue Mountains) where we work, live, and learn. We pay our respect to Elders past and present, and celebrate the diversity of First Nations people, their ongoing cultures and connections to the lands and waters of NSW. We acknowledge how their lore, traditions and customs nurtured and continue to nurture the waters (salt water and sweet water) in Sydney Water's operating area, creating wellbeing for all.

First Nations communities have been listening to and caring for Country for over 65,000 years. The knowledge gained over this time provides a deep connection to country, an understanding of science and engineering as we learned about on World Engineering Day, as well as the interconnectedness of water and the environment. This knowledge has been carefully handed down in a way that is sustainable and can be practised by each generation.

Linking the natural world to cycles that indicate seasonal changes has been critical to enabling First Nations communities to thrive across one of the driest continents in the world. Our aim in this program is to learn more about these natural indicators and how they can be used in sustainable water management.



Aboriginal rock art in the World Heritage-listed Southern Blue Mountains, Gundungurra Country



Executive summary

Sydney Water's Corporate Strategy is a 10-year plan to achieve our vision: *Creating a better life with world-class water services*. The Strategy includes four strategic outcomes to be achieved over the next 10 years. Water conservation is key to the delivery of at least one of the strategic outcomes, Thriving, livable and sustainable cities. In addition, water conservation has been identified as a common connection across our blueprints for achieving our strategic outcomes: *Resilient and Reliable Water Supply, Sustainable and Smart Communities, Circular Economy and Resource Recovery and Healthy Waterways*.

Water conservation through water efficiency, leakage reduction and recycled water use is not only key to creating and contributing to thriving, liveable and sustainable cities, it also helps defer investment in new water sources by reducing the demand for drinking water for non-drinking purposes.

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

- Sustainable and efficient management of our resources
- Developing water resilient and water smart communities
- Enabling liveability outcomes for the community.

Under our Operating Licence, Sydney Water is required to deliver programs that meet the Economic Level of Water Conservation (ELWC) methodology approved by the Independent Pricing and Regulatory Tribunal (IPART) in December 2016.

The Water Conservation program has continued to mature in 2021-22, with significant improvements to the program governance to ensure we are meeting our commitments under the operating licence. We have grown the program's capability through better financial management, processes and reporting which has provided greater visibility to control the program and make better, informed decisions.

IPART found the Water Conservation program to be fully compliant in 2020-21 which was a significant improvement on the previous year. One recommendation was held over from 2019-20 which requires Sydney Water to demonstrate how benefits are assessed, including Economic Level of Water Conservation (ELWC) during the transition of programs from the research and innovation phase onto early lifecycle and established programs. Chapter 2.3.1 Program Lifecycle explains how we transition projects in the lifecycle.

The project evaluation process, supported by ELWC calculations and other data, assists with the decision to progress projects through the program lifecycle and onto the next stage, or to close or park the project for inclusion in the program at a later stage, including those activated by drought. Governance throughout the program lifecycle ensures that Sydney Water invests in projects that provide value.

In 2021-22, 509,068 million litres of drinking water were used by residential customers, non-residential customers and in our system operations across Greater Sydney, Illawarra, and Blue Mountains. This is around 15,000 million litres less than was used in 2020-21. The extremely wet and relatively cool weather conditions have been major drivers of lower drinking water use.



Water conservation funding invested \$3.91 million this year in water efficiency programs and achieved 742 million litres in annual water savings but fell short of the projected target of 803 million litres. COVID-19 restrictions greatly affected the uptake by customers in these programs from July 2021 until mid-November 2021. Further, various marketing strategies were implemented to encourage both residential and non-residential customers to save water.

Leakage-management programs have ensured that Sydney Water manages drinking water supply efficiently, minimising water loss from our assets and potentially delaying investment in new large-scale supply infrastructure. We invested \$44 million in programs that contributed to the rolling 12-month leakage result of 121.5 ML/d. This result is within the range of the Economic Level of Leakage (ELL) band.

Sydney Water also invested \$32 million in operating our recycled water schemes to produce 37,700 million litres of recycled water, resulting in a reduction in drinking water demand of 12,700 million litres. Sydney Water continued to explore and develop opportunities to increase recycled water use. In 2021-22 we invested a further \$19 million in renewals, upgrades, and new infrastructure across our recycled water systems.

Sydney Water allocated \$2.85 million to the Research & Innovation team towards developing and testing new products and services that could be developed and implemented under the efficiency, leakage, and recycled water programs.

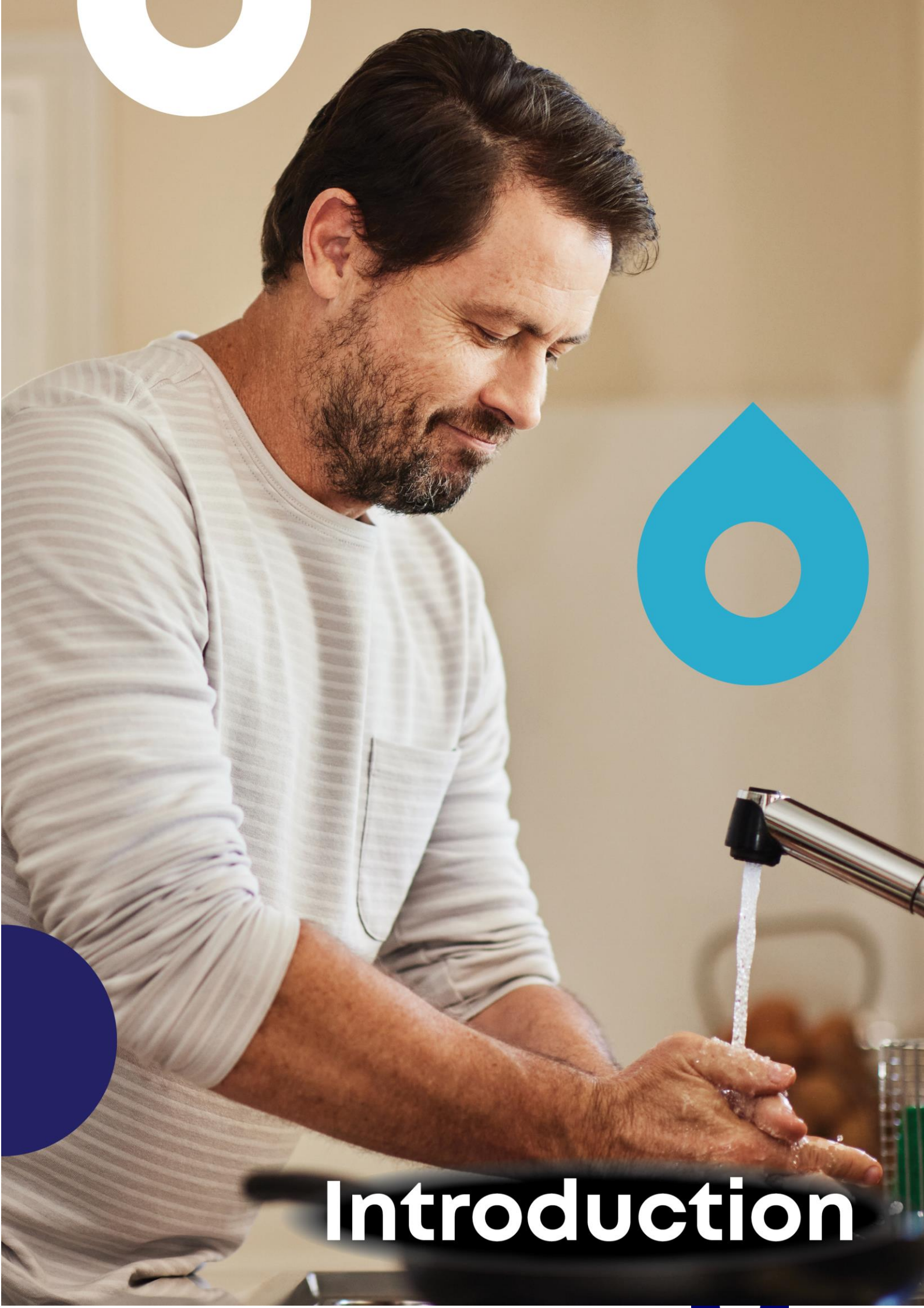
Ongoing water-wise behaviours from restrictions and campaigns, continued impacts from the COVID-19 pandemic and water-efficiency programs are estimated to have reduced the demand for drinking water in 2021-22 by around 6.6%.

Consumers' attitudes and behaviour towards water are connected to water literacy where a total of \$4.8 M was invested. Sydney Water's research highlights a relatively low level of water literacy, 4.9 out of 10. Education, combined with building awareness to improve water literacy, provide the bedrock for creating trust and engagement and a framework for activating behavioural change.

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 usage and the impact this can have.

Data and analytics have been leveraged extensively to support monitoring and decision-making for water conservation. This includes new approaches to existing data to assess the efficacy of programs, as well as investigating new opportunities to use data to predict events and improve performance. We are also using digital meters to explore customer behaviours around appliances that use water, such as dishwashers and washing machines. The use of data and analytics has delivered a marked improvement in our evidence base supporting water-saving practices.





Introduction

Introduction

Water conservation (including efficiency, leak reduction and recycling) reduces the demand for drinking water to help defer investment in new water sources. Under our Operating Licence, Sydney Water is required to deliver programs that meet the Economic Level of Water Conservation (ELWC) methodology approved by the Independent Pricing and Regulatory Tribunal (IPART) in December 2016.

Water security is critical to economic, social, and environmental sustainability. Population growth, climate change, climate variability and drought are ongoing challenges for the urban water sector in Australia. Recent severe climate variations across NSW have reinforced the importance of long-term supply-demand planning and investment across the full spectrum of options.

Water conservation is not restricted to drought response, and the planning and delivery of water conservation activities during non-drought, non-supply constrained periods is critical to maximise benefits of investment and improve our resilience in drought and at times of constrained supply.

In 2021-22 Sydney Water delivered the water conservation program under the Metropolitan Water Plan (MWP). Whilst there are no specific targets for Sydney Water under the MWP, we contributed towards overall targets for water efficiency along with other agencies. The Metropolitan Water Plan was replaced in August 2022 by the Greater Sydney Water Strategy (GSWS).

Sydney Water is developing 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 without compromising the value provided to customers and the community.

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



Figure 1 Water Conservation outcomes

Each year, Sydney Water reports on how we perform in conserving water and what plans we have for future water conservation, in accordance with Section 3 of our Operating Licence 2019–2023¹. The

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



Water Conservation Report 2021-22 outlines:

Chapter 1: Introduction to the program

Chapter 2: Overview of the program

Chapter 3: Performance for 2021-22

Chapter 4: Five-year forward plan

Chapter 5: Water conservation program activities undertaken in 2021-22

Appendices: Further analysis, methodology details and reporting requirements

In 2021-22, the Water Conservation Program was made up of six focus areas:



Figure 2 Water Conservation Program focus areas

Pilots, research, and innovation: Investigate innovation, emerging technologies and pilot customer offerings that could broaden the Water Conservation Program and increase its effectiveness.

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

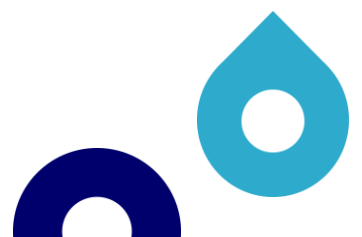
Water leakage: Develop and deliver water-leakage management and maintenance programs that reduce water loss in the Sydney Water network, including leak repairs and proactive leak detection programs.

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

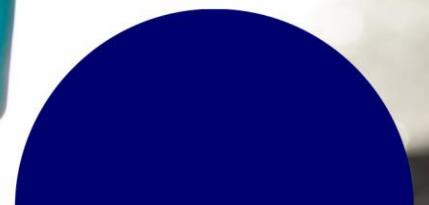
Community awareness: Increase awareness through behavioural change campaigns, customer engagement and student education.



Data and analytics: Develop and improve data analytic 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

Sydney Water’s Corporate Strategy is a 10-year plan to achieve our vision: *Creating a better life with world-class water services*. The Strategy includes four strategic outcomes to be achieved over the next 10 years. (Figure 3). Water conservation is key to the delivery of one of Sydney Water’s strategic outcomes, ‘Thriving, liveable and sustainable cities’. In addition, water conservation connects our blueprints for achieving our strategic outcomes: *Resilient and Reliable Water Supply, Sustainable and Smart Communities, Circular Economy and Resource Recovery and Healthy Waterways*.



Figure 3: Sydney Water’s vision and strategic outcomes

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 contribute to the sustainability of long-term supplies as populations increase and build community and water-supply resilience to drought.

A key action, to be delivered by Department of Planning and Environment (DPE), is the implementation of a state-wide water-efficiency framework and an adaptive program to support efficiency across all sectors focused on collaboration, capacity building, policy and a whole of water-cycle focus. This has shaped the directions for water conservation in the Greater Sydney Water Strategy (GSWS).



DPE has developed a best-practice framework to support water utilities to plan and implement water-efficiency programs. Sydney Water has contributed to the development of this framework and will use this framework in the future to guide our planning process.

Greater Sydney Water Strategy

Sydney Water is collaborating with DPE and WaterNSW in delivering the GSWS. The GSWS, when approved by the Government, establishes the key directions for urban water management for a sustainable, productive, and liveable Greater Sydney region. The Strategy, along with the supporting implementation plans, replace the Metropolitan Water Plan. The GSWS has identified water conservation and efficiency as a key element of the longer-term, demand-supply balance for Greater Sydney. Ongoing effort and investment in water conservation will build community-wide water capability which will improve day-to-day water management and community resilience to future challenges. To support the implementation of the GSWS, Sydney Water is working in partnership with DPE to develop a strategic plan for water conservation in Greater Sydney to 2030.

Economic analysis for the GSWS shows that water conservation is a cost-effective option for residents and businesses in Sydney and will be a complementary option alongside supply-side options, such as water recycling and desalination. Delivering positive water conservation outcomes through community engagement and other programs will further enhance Sydney Water's corporate reputation and allow us to deliver a world-class customer experience.

2.2 Program Governance

The Water Conservation program has continued to mature in 2021-22, with significant improvements to program governance, cost management and monitoring and control through reporting.

The IPART Audit found the Water Conservation Program to be fully compliant in 2020-21, which was a significant improvement on the previous year. One recommendation was held over from 2019-20 requiring Sydney Water to demonstrate how benefits are assessed, including Economic Level of Water Conservation (ELWC) during the transition of programs from the research and innovation phase onto early lifecycle and established programs. Chapter 0 Program Lifecycle explains how we transition projects in the lifecycle.

Sydney Water has recognised the need for greater visibility over tracking of projects delivered from the Water Conservation Fund. A centrally managed budget and Enterprise Portfolio and Program Management structure has been implemented to allow individual project managers to control and monitor project costs while providing visibility on the Water Conservation Program budget and expenditure.

Sydney Water improved project reporting in 2021-22 by expanding the role of the Water Conservation Program Control Board (WCPCB). The WCPCB now reviews escalated risks and issues along with cost tracking in its monthly meetings, developing actions to address as necessary.

The WCPCB is chaired by the Water Conservation Program Manager and includes heads of business, managers and program leads representing strategy and enterprise planning, research and innovation,



data and analytics, behaviour change, water efficiency, water leakage and recycled water. The WCPCB reports directly to the General Manager of Governance and Assurance who is the Executive Sponsor for the program and sits at an executive level under the Managing Director.

Workstream reporting is demonstrated in the figure below:

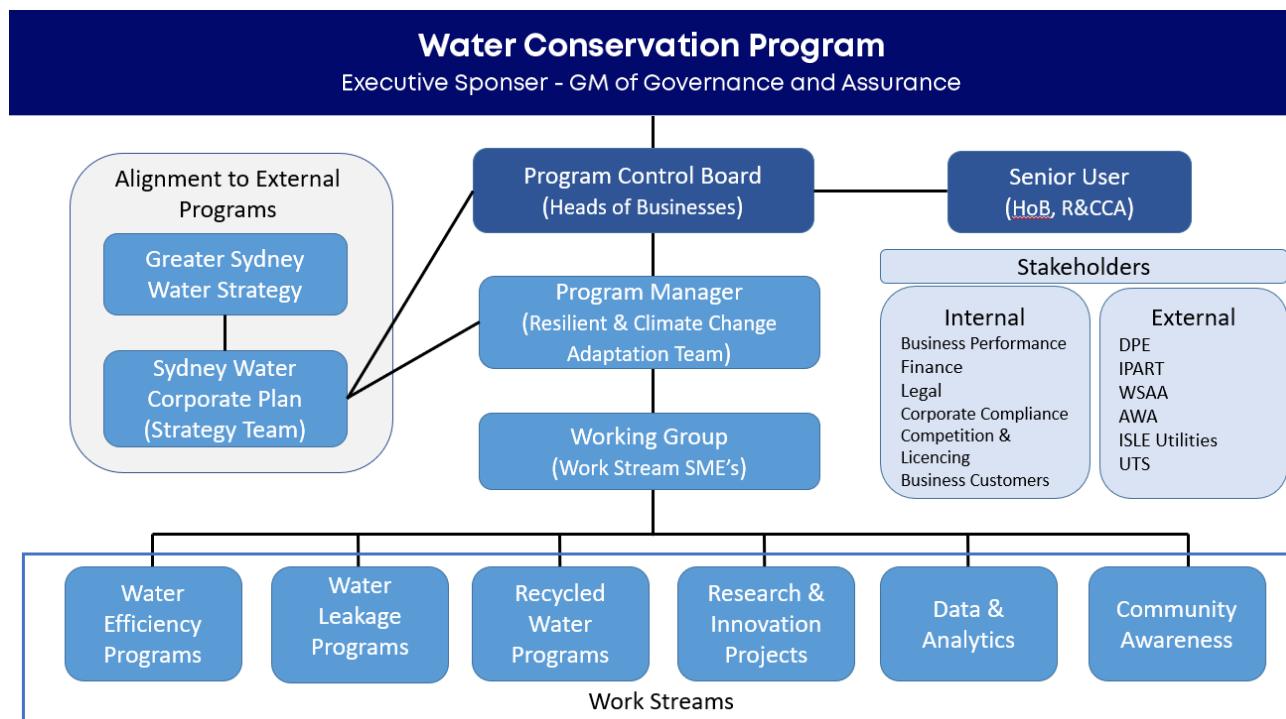


Figure 4 Water Conservation Program governance structure

2.3 Operationalising Projects

2.3.1 Program Lifecycle

Each project progresses through various stages to one of three outcomes. A project:

- advances to the next stage of the program lifecycle
- is included in existing drought-activated initiatives
- is closed because it has not demonstrated benefit or value for our customers and their communities.



Governance throughout the program lifecycle ensures that Sydney Water only invests in projects and programs that provide value to 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, and programs through periodical reviews, and are closed if they are not providing value.

Ideation

Ideas that align with the Water Conservation project mandate are accepted. These ideas form the pipeline for research and innovation projects and pilots.

Research and innovation, and pilot

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 need to be:

- Desirable with an acceptable balance of costs, benefits, and risks.
- Viable to confirm the project can be delivered.
- Achievable by demonstrating that 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 can be scaled to be 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 subject to funding availability.

If the project was not successful, it will either be closed or put on hold for consideration under drought conditions.

Early lifecycle

Projects and pilots with complexity and uncertainty in design, development or delivery, benefit from an early lifecycle stage where they can verify the market appetite and understand savings, costs, benefits, and assumptions at scale (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 with benefits and findings informing business cases to fund established programs. Key performance indicators and benefits such as water savings, reduced leakage (economic level of leakage) and ELWC are tracked throughout early lifecycle projects, with projects ceasing if they do not



meet targets. 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 capability and water saving outcomes.

Drought activated initiatives

Programs assessed to be not economic against ELWC in the current climate may be selected as drought activated initiatives. They are put on hold until environmental conditions deem delivery to be economical. We seek to have them plan ready to reduce lead time during drought.

2.3.2 Project Lifecycle

Below is the high-level project lifecycle that reflects the standard process for new projects.

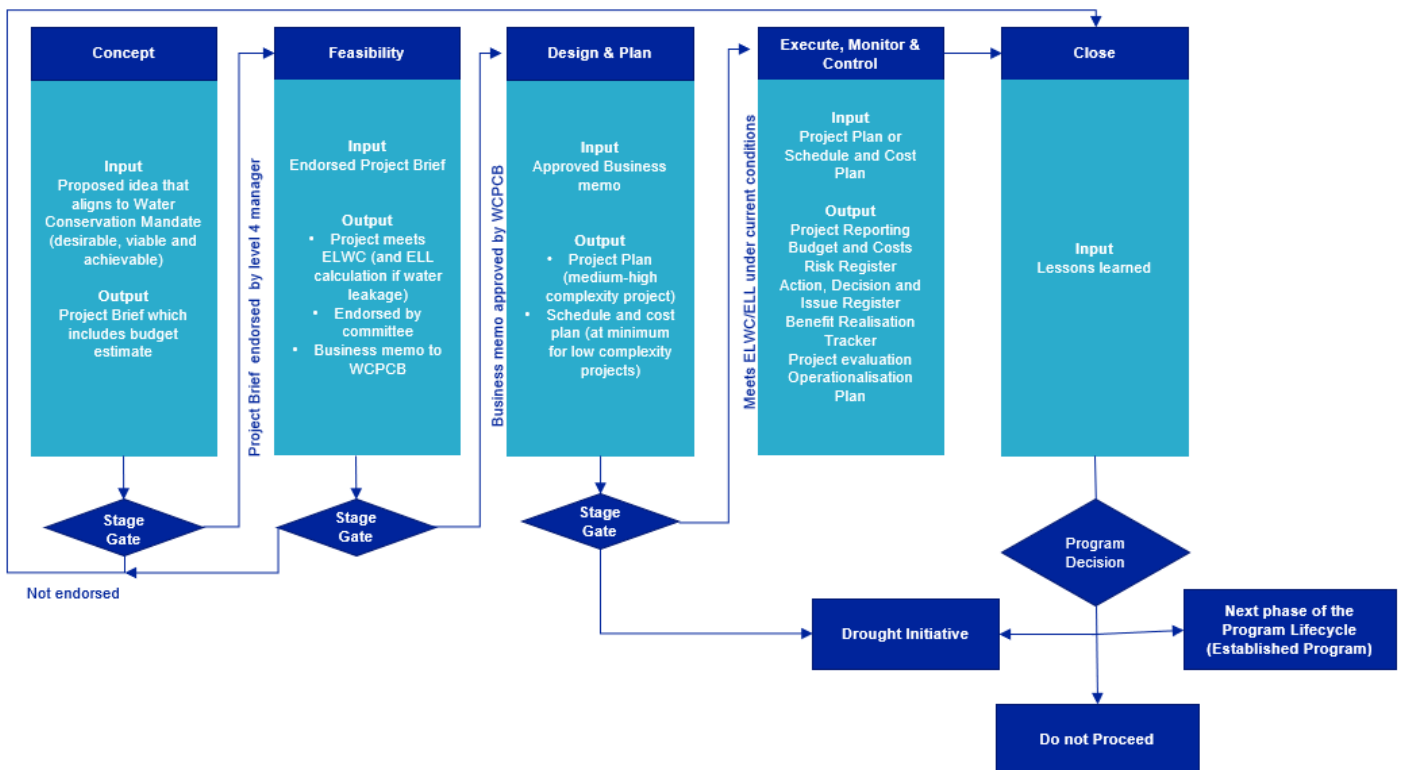
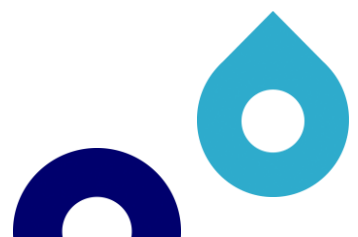


Figure 6 Project lifecycle





**2021 - 22
Performance**

3. 2021-22 Performance

3.1 Water use in 2021-22

In 2021-22, 509,068 million litres of drinking water were used by residential customers, non-residential customers and in system operations across Greater Sydney, Illawarra, and Blue Mountains. This is around 15,000 million litres less than was used in 2020-21. The extremely wet and cooler weather conditions have been a major driver of this lower drinking water use. Table 1 summarises the key water use statistics for 2021-22 and 2020-21.

Table 1 Breakdown of water use in 2021-22

	2021-22	2020-21
Total water use ²	509,068 million litres	524,168 million litres
Metered residential	69%	67%
Metered Non-residential	20% ³	21%
Leakage: economic level of leakage 108 ± 16 ML/d	8% (121.5 ML/d) ⁴	8% (112.5 ML/d)
Non-metered water (excluding leaks) ⁵	3% ⁶	3%
Observed average water use per person	265 litres per day (99 thousand litres a year)	272 litres per day (99 thousand litres a year)
Weather corrected average per person	275 litres per day (100 thousand litres a year)	275 ⁷ litres per day (100 thousand litres a year)
Observed average residential water use per person	180 litres per day (66 thousand litres a year)	184 litres per day (67 thousand litres a year)
Volume of drinking water saved by using Recycled Water	12,700 million litres	12,800 million litres

Ongoing water-wise behaviours and the impact of the COVID-19 pandemic on growth and water use patterns has meant that the demand for drinking water has continued to remain lower than it was prior to the introduction of water restrictions in June 2019. Figure 7 and Figure 8 illustrate the long-term trends in water use across Sydney Water’s area of operations.

² Includes drinking water and unfiltered.

³ Same as footnote 2.

⁴ 12 month rolling average leak result to end of June 2022. Percentage leakage compared to water supplied in baseline year 2005-06.

⁵ Includes billed unmetered consumption, unbilled unmetered consumption, unauthorised consumption and customer meter under registration.

⁶ Same as footnote 2

⁷ The 2020-21 data has been updated to incorporate changes in the BOM data.



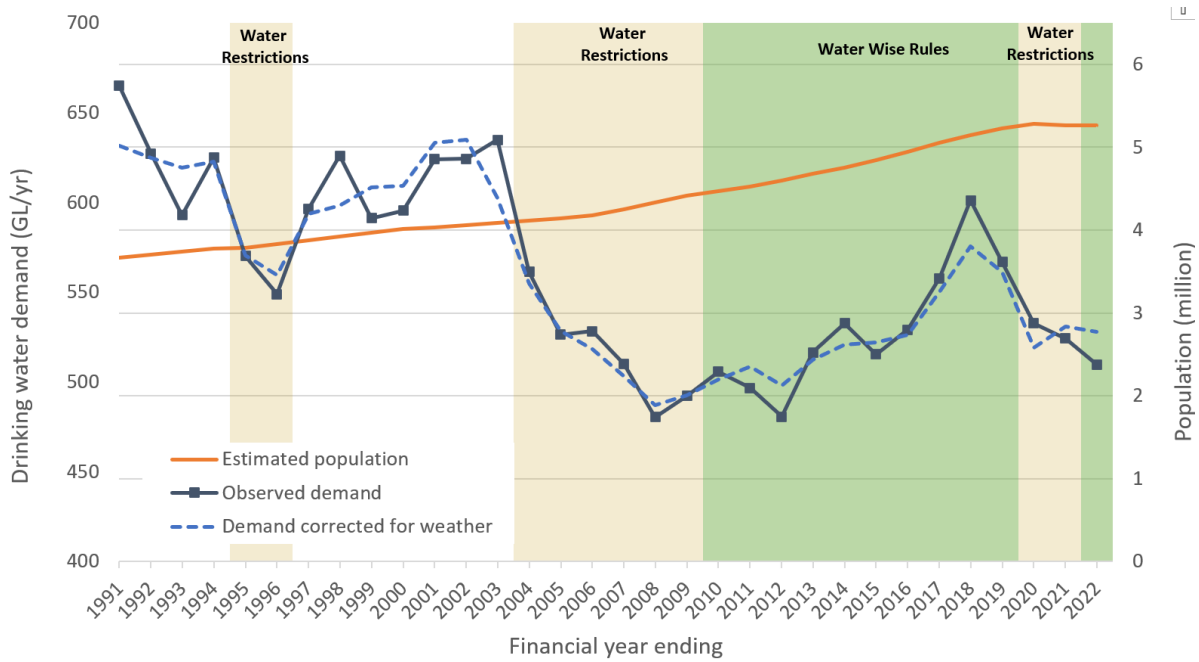


Figure 7 Demand for drinking water (observed and weather corrected in gigalitres) and population growth over time

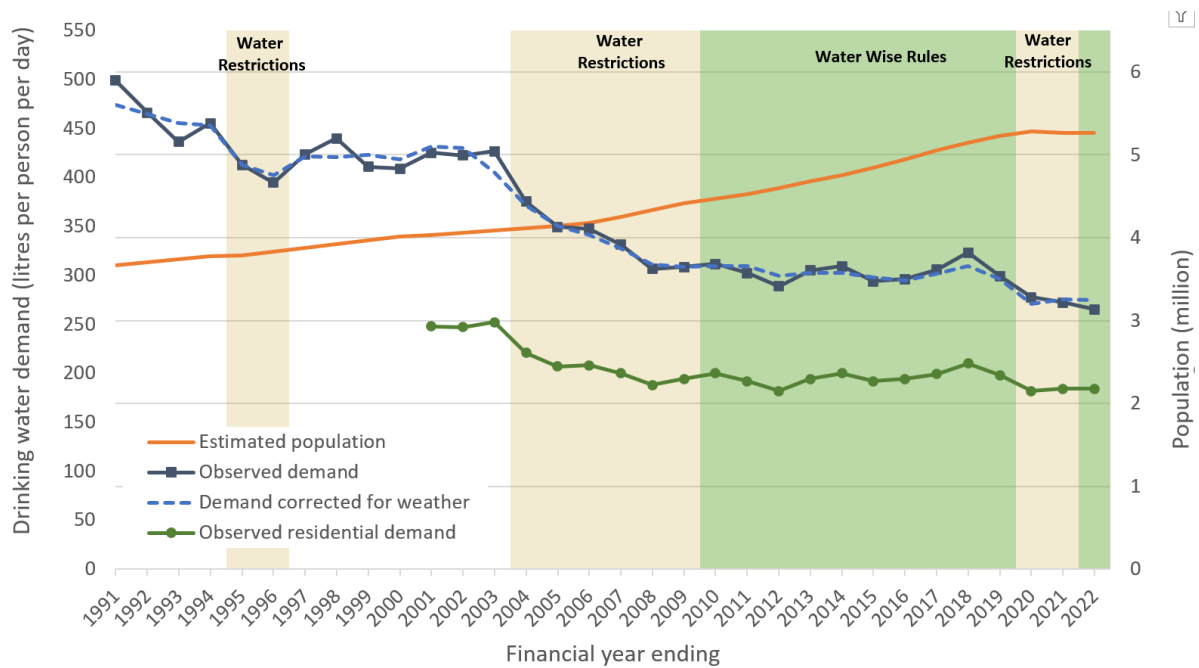


Figure 8 Demand for drinking water (observed and weather corrected in litres per person per day) and population growth over time



3.2 Water Savings in 2021-22

Table 2 Water conservation activities in 2021-22

Project Details		Target 2021-22		Actuals 2021-22	
Name	Status	Average annual savings (ML)	Calculated average annual savings ⁸ (ML)	Investment (\$M)	Participants
WaterFix® Residential ⁹	Established	186	106 ¹⁰	\$2.1M	5,302 ¹¹
WaterFix® Strata ¹²	Established	261	157	\$0.65M	1,682
PlumbAssist®	Established	63	79 ¹³	\$0.38M	382
WaterFix® Concealed Leaks	Established	136	256	\$0.07M	77
Online monitoring	Pilot		63	\$0.23M	52 ¹⁴
Water Savings Partnership	Pilot		19	0.11M	127
WaterFix® Commercial	Pilot	157	49	0.14M	8
WaterFix® Small Business	Pilot		13	\$0.23M	96
Total Water efficiency	-	803	742	\$3.91M	7,626
Active leak Detection Inspections & Repairs	Established	n/a	Contributes to leakage level	\$3.4M ¹⁵	n/a
Reactive leaks & breaks	Established	n/a	Contributes to leakage level	\$36.7M	n/a
Research & Innovation Leaks & Breaks	Pilot	n/a	n/a	\$0.1M	n/a
Behavioural change campaign	Established	n/a	n/a	\$4.8M	n/a
Recycled Water	Established	-	12,700	\$32M ¹⁶	n/a
Recycled water pilots & tools	Early lifecycle	n/a	n/a	\$1.0 M	n/a

⁸ Accumulated water savings by program's intervention for a period of 12 months.

⁹ Program was on hold for four and a half months during COVID-19 lockdown.

¹⁰ Calculated based on approximately 20 kLs of water savings per property per year.

¹¹ New participants in the 2021-22 financial year.

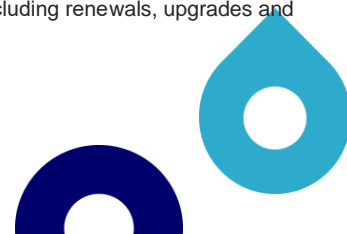
¹² Program was on hold for four and a half months during COVID-19 lockdown.

¹³ Based on retrofits and leaks repaired. Water savings from repairing leaks were based on plumber visual estimates.

¹⁴ Number of data loggers installed.

¹⁵ Active leak detection costs include Specialist Field Survey Contractor (\$2.4M) and repairs (\$1M)

¹⁶ Note that this is estimated operating cost. We've also invested a further \$19m in delivering capital work including renewals, upgrades and new infrastructure that can further increase the use of recycled water in Sydney



Research & Innovation ¹⁷	Piloting & Development	~49	n/a	\$2.85M	n/a
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n/a means not available

Leakage management is a form of water conservation that ensures Sydney Water manage drinking water supply efficiently, minimising water loss from our assets and potentially delaying investment in new large-scale supply infrastructure.

Water leakage in 2021-22 is estimated as 121.5 ML/d, an increase compared with 2020-21 of 112.5 ML/d despite a continued focus on our leakage program. This result is within the economic level of leakage upper band. Our analysis to date indicates that the increase may be due to the ongoing wet weather during 2021-22, resulting in:

- Soil saturation causing increased pipe movement and potential cracks / breaks
- Reduced visibility of leaks meaning less leaks are reported by customers
- Reduced ability to detect hidden leaks
- Impact on detection and repair work to ensure the safety of our people during adverse weather events.

In 2021-22 we invested \$44M in leakage management programs including increased length of mains inspected (15,455 kms compared to 12,000 kms in 2020-21) under the active leak detection program. We will continue to maintain this level of investment going forward and are working on identifying target areas to improve the effectiveness of the program.

¹⁷ Research and Innovation projects are intended to build knowledge and understanding of water saving potentials by exploring new water conservation opportunities. Savings from these projects are not intended to be realised until post-pilot assessments are completed.



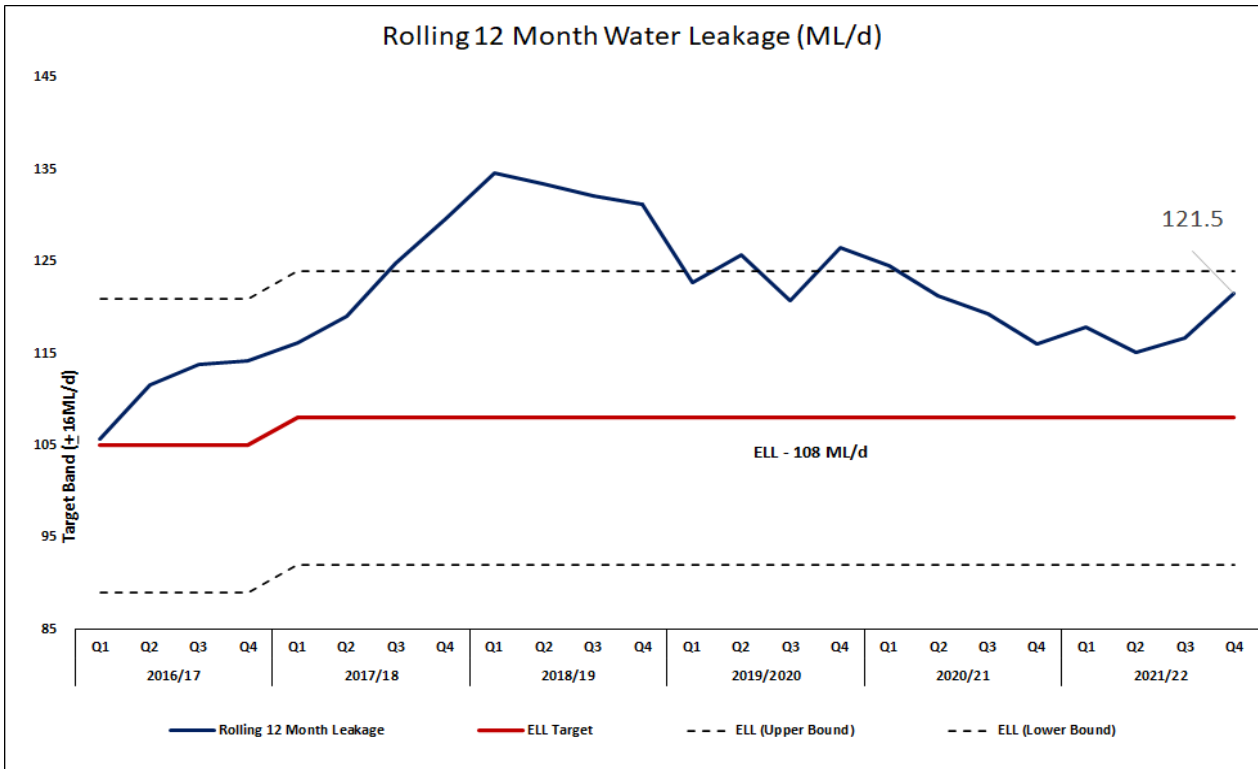


Figure 9 Actual leakage compared to the Economic Level of Leakage (ELL) in our system



Sydney Water invested \$32 million operating our recycled water schemes to produce 37,700 ML of recycled water (a reduction in drinking water demand of 12,700 ML). Sydney Water also continued to explore and develop opportunities to increase recycled water use. During 2021-22 we have invested a further \$19 million in renewals, upgrades, and new infrastructure to continue to build Sydney's use of recycled water.

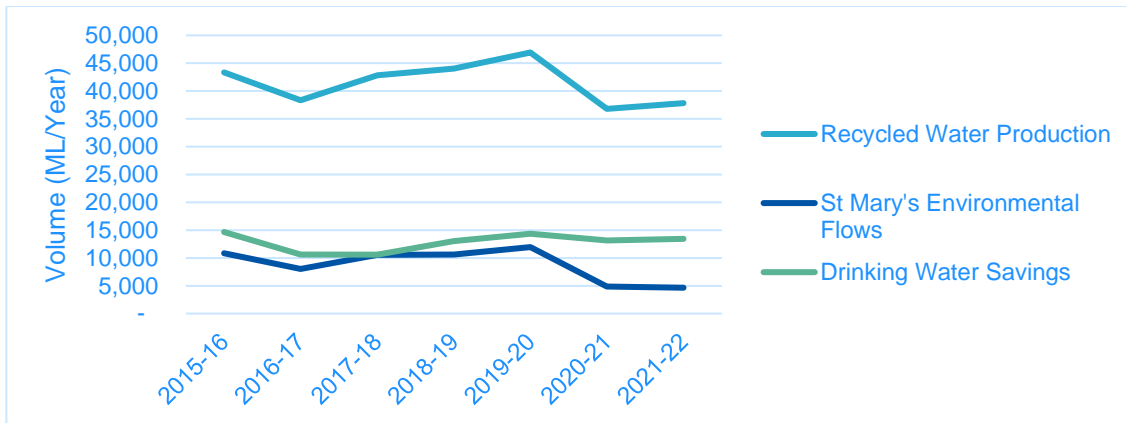


Figure 10 Annual Recycled Water production from 2015-16 to 2021-22¹⁸

Ongoing water wise behaviours from restrictions and campaigns, continued impacts from the COVID-19 pandemic and water efficiency programs are estimated to have reduced the demand for drinking water in 2021-22 by around 6.6%¹⁹.

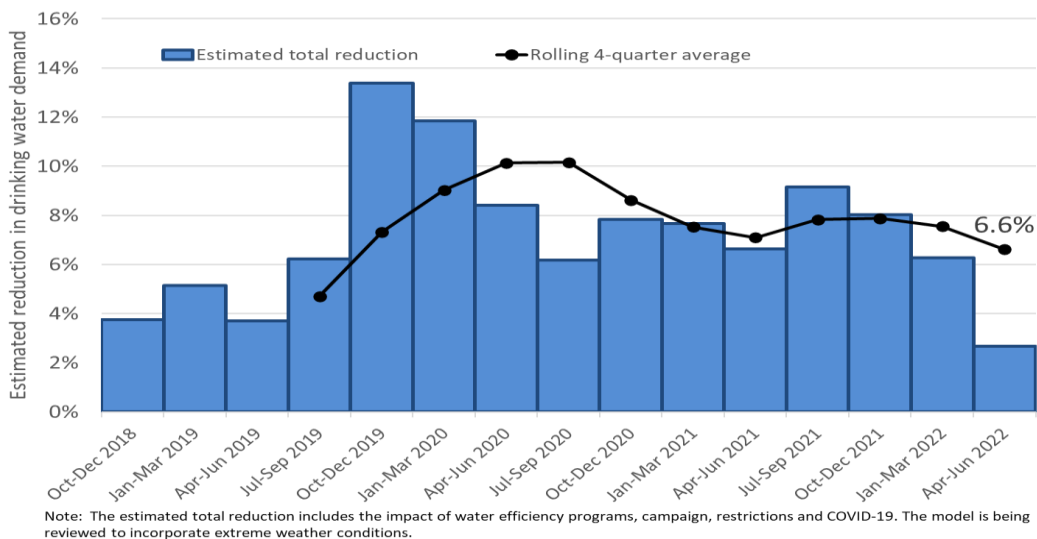


Figure 11 Reduction in drinking water demand resulting from restrictions, campaigns, efficiency programs and COVID-19.

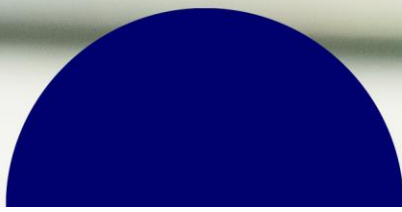
¹⁸ Drinking Water Savings between 2015-16 and 2020-21 have been reviewed and recalculated under new methods to better represent drinking water savings. Rouse Hill and Sydney Water On-Site Reuse have been calculated using the 2020-21 Drinking Water Savings method and will be reviewed.

¹⁹ Compared to expected demands under average weather conditions.





Forward Plan



4. Forward Plan

4.1 Water conservation for 2022-23

Table 3 Water Efficiency established projects for 2022-23

Project	Total Sydney Water Investment (\$M)	Water Conservation Fund Investment (\$M)	No. of interventions	Estimated annual water savings (ML/year)
WaterFix® Residential	\$2.0	\$2.00	9,000	180
WaterFix® Strata	\$1.6	\$0.14	2,500	250
PlumbAssist®	\$0.25	\$0.25	250	33
WaterFix® Concealed Leaks	\$0.14	\$0.00	150	216
WaterFix® Commercial	\$0.70	\$0.14	10	120
Total	\$4.69	\$2.53	11,910	799

The following leakage reduction programs contribute to maintaining performance in keeping with the economic level of leakage approach (108ML/D ± 16ML/D). This ensures that we're delivering value for our customers. Each program includes specific targets, derived from the overall goal but tailored to the individual program.

Table 4 Water Leakage established projects for 2022-23

Program	Total Investment (\$M)	Water Conservation Fund Investment (\$M)	Target
Active Leak Detection	\$1.8	\$1.05	21,000 km inspection
Asset management	Renewals funding*	\$0.00	Asset condition-based renewals process includes leakage benefits
Speed and quality of repairs (Customer Reported Leaks)	As required**	\$0.00	Response times (target will vary depending on priority of the job)
Pressure Management	\$0.3	\$0.00	Scheme planning anticipated during 2022/23
Supporting & enabling programs	\$0.5	\$0.00	District metering – candidates for flow meters

Notes:

* Sydney Water's Asset Management programs include renewals driven by asset condition and risk of failure (including customer impact). Historically an estimated 5-10kms of critical water mains plus 25-30kms of reticulation mains could be renewed annually. Reservoir renewals (roof replacement, relining etc) and major pump upgrades are also delivered

** Customer reported leaks and breaks are responded to by our reactive maintenance teams that also respond to other incidents within Sydney Water's systems.



Table 5 Recycled Water, community awareness and research and innovation activities for 2022-23

Program	Total Investment (\$M)	Water Conservation Fund Investment (\$M)	Target
Recycled water	\$32m ²⁰	\$0	12,700 million litres water savings 39,900 million litres recycled water production
Behavioural change campaign	\$5	\$0	Maintain 2.5% reduction in potable water use compared to pre-drought/pre-COVID (equivalent to ~10GL/yr). ²¹
Pilots, research, and innovation	\$2.5	\$2.5	-

4.2 Plan for 2022-23 to 2026-27

Table 6 Water efficiency plan for 2022-23 to 2026-27 based on the current value of water

Project	Meets ELWC	New Water Savings (ML/year)					Total Demand reduction (ML/yr) ²²
		2022-23	2023-24	2024-25	2025-26	2026-27	
WaterFix® Residential	Yes	180	160	140	140	140	760
WaterFix® Strata	Yes	250	250	250	250	250	1,250
PlumbAssist®	Yes	33	46	46	46	46	215
WaterFix® Concealed Leaks	Yes	216	216	216	216	216	1,080
WaterFix® Commercial	Yes	120	150	180	180	180	810
Online Monitoring (pilot)	Yes	91					91
Pool cover (pilot)	Yes	13	-	-	-	-	13
WaterFix Schools (pilot)	Yes	37	-	-	-	-	37
Total	-	940	822	832	832	832	4,256

²⁰ Note that this is estimated operating cost. We've also invested a further \$19m in delivering capital work including renewals, upgrades and new infrastructure that can further increase the use of recycled water in Sydney

²¹ Behavioural change savings will be delivered through water literacy programs, campaigns and as part of other water efficiency program delivery.

²² Expected reduction in demand in 2026-27 due to the implementation of the plan.



Table 7 Water leakage plan for 2022-23 to 2026-27 and projected impact on leakage

		Meets ELWC	Program Expenditure and targets				
			2022-23	2023-24	2024-25	2025-26	2026-27
ELL Target			108 ML/d	108 ML/d	108 ML/d	108 ML/d	108ML/D
Programs	Pressure Management	No	\$0.3M*	\$1.0M*	\$3.5M*	\$2.0M*	\$2.0M*
	Asset Management		\$50M**	TBA**	TBA**	TBA**	TBA**
	Active leak detection	Yes	21,000 km \$2.6M	21,000 km \$2.45M	21,000 km \$2.4M	21,000 km \$2.4M	
	Speed and quality of repairs - leak repairs		TBA***	TBA***	TBA***	TBA***	TBA***

* To be investigated to understand if economic to deliver and costs to be developed in detail during planning anticipated in 2022/23

** Sydney Water has several different asset renewals programs (eg reservoirs, pumping stations, critical and reticulation water mains) with primary targets relating to maintaining asset condition and system performance ie supply to customers but with secondary benefits including water savings through reduced leakages with improved condition.

*** this will vary depending on the amount of work required. The reactive response team also attend other types of incidents eg wet weather wastewater incidents etc

Table 8 Recycled Water plan for 2022-23 to 2026-27

Project	Recycled Water Production (ML/year)				
	2022-23	2023-24	2024-25	2025-26	2026-27
Existing & proposed schemes (recycled water production) ¹	39,000	43,000	43,000	46,000	46,000
Existing schemes (drinking water saving) ²	12,700	15,000	15,000	16,000	16,000

Note:

1: Proposed schemes for non-drinking recycled water use are as identified in planning, design and delivery.

The "most likely" forecast is included based on average weather conditions. Note that there are major projects (including upgrades and renewals) that may impact production. Information currently available has been used in providing this forecast.

2: In 2021-22 drinking water savings were 35% of all recycled water produced. This has been used to estimate future savings.



Water conservation program



5. Water conservation program

5.1 Water Efficiency

Water conservation funding invested \$3.91 million to achieve 742 million litres in annual savings from water-efficiency programs. Customer uptake was affected by COVID-19 restrictions from July 2021 until mid-November 2021. Once restrictions eased, various marketing strategies were utilised to invite residential and non-residential customers to save water. These include one-to-one interactions, direct mailouts, social media, radio advertisements and out-of-home advertisements, such as billboards and bus signage.

Key highlights from 2021-22 are outlined below:

- Over 1,500 meter replacements for properties recording zero water consumption and over 1,000 new meter fits on unmetered properties were organised by the Water Conservation Field Team.
- Over 5,300 new residential customers participated in the WaterFix® Residential program.
- Over 300 PlumbAssist appointments provided support to customers with emergency and essential plumbing works.
- 52 dataloggers were installed across 45 business and industrial sites by the Online Monitoring Pilot Program.
- 96 small businesses took up the WaterFix® Small Business pilot offer, saving of 3.5 million litres of water.
- Over 100 on-site assessments were completed through the Water Savings Partnership and helped many sites with funding for implementation of fixes. The collation of findings from over 270 childcare centre site assessments to develop a water-efficiency segment guide.
- Launch of the 2022 Water Efficiency Grants and Pool Cover Rebate Pilot Program in April 2022.
- Waterfix® Strata successfully upgraded water fixtures in to 1,682 units including 1625 units belonging to Land and Housing Commission social housing resulting in a 157 million litres annual water savings. This followed a successful pilot program last year.
- A Waterfix® Commercial pilot program for shopping centres, hotels, motels, and clubs identified and saved 49 million litres of water and identified another potential 99 million litres to be implemented.
- A Waterfix® Schools pilot program successfully developed an accurate report of all public schools' water consumption for the Department of Education which is now sent quarterly.
- Waterfix® Concealed Leaks saved 256 million litres of water.



5.1.1 Water Efficiency Programs

Water Conservation Field Team

The Water Conservation Field Team (WCFT) are skilled in frontline customer service, customer education, plumber engagement and water theft investigations. They are a field-based team who have knowledge and experience to work safely in the field and on construction sites.

They undertake the following activities:

- Identification of unmetered properties.
- Investigation of water theft.
- Investigation of zero consumption sites to identify and action possible metering issues
- Supporting the implementation of Water Wise Guidelines
- Supporting residential and business water-efficiency programs.

They also support opportunities across the Water Conservation Program as they arise.

2021-22 achievements

The WCFT has worked to increase and assure metered consumption across Sydney Water's area of operations via the following achievements:

- Identified and replaced 1,527 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 207L per day was calculated based on the meter readings from 149 properties pre- and post- the Field team's intervention. This equates to close to one person's daily usage.
- 1,060 new meters were fitted to unmetered properties; again, ensuring that a usage signal is sent to customers to help drive good water usage practices.
- Identified incorrectly classified and charged properties (for example commercial nurseries being charged as residential dwellings) to improve water balance outcomes via allocation of consumption to correct categories.

Program support

- 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 via education and engagement directly with customers.





WaterFix® Residential

Waterfix® Residential is a subsidised water-efficiency plumbing service that helps homeowners save water by fixing leaks and installing water-efficient devices. WaterFix® Residential has been helping customers for more than 20 years, saving over 300 million litres of water and reducing water bills for our customers.

Costs to customers vary, depending on the type of service selected. In 2021–22, the WaterFix® Residential service offered:

- tap and toilet leak repairs.
- installation of WELS 4-star dual flush toilets
- installation of WELS 4-star rated basin tap aerators
- installation of WELS 4-star rated showerheads

Adapting the program

The program was placed on hold from the 28 June 2021 until 14 November 2021 due to COVID-19 restrictions. From mid-November 2021, marketing was restarted through various channels including social media, digital campaigns, radio advertisements, outdoor advertising, and targeted mail-outs to high water users in local government areas (LGAs).

2021-22 achievements

- 5,302 new residential customers participated in the program even though it was on hold for four and a half months.



- We delivered an estimated 106 million litres of water savings annually (approximately 20 kLs of water savings per property per year).
- Results from the online customer surveys showed an 84% satisfaction rate and 85% advocacy towards the WaterFix® Residential Program.

Waterfix® Concealed Leaks

WaterFix® Concealed Leaks is a specialised concealed leak detection and repair service which covers leaks on properties for residential and strata customers.

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

2021-22 achievements

- 151 investigations and 82 customer leaks repaired.
- Delivered 256 million litres of water savings.

WaterFix® Strata

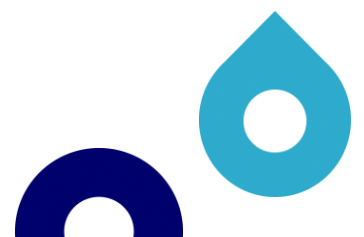
The Waterfix® Strata is a specialised water efficiency service that provides strata titled and multi-unit dwellings with a turnkey solution which can save residents thousands of litres of water each year. This service also provides customers the ability to use the savings to pay back the water conservation works. The service aims to make each residential unit and common area within the building water efficient. This promotes sustainable and efficient management of water.

The service includes:

- a desktop assessment, detailed water efficiency assessment against benchmarks and a quotation for consideration by high water users.
- all project management, appointment coordination and logistics.
- all plumbing works which includes minor leak repairs, concealed leak detection and repairs, and the installation of water efficient taps, toilets, and showerheads.
- various payment options are available and include a performance agreement. WaterFix® Strata on average achieves a 30% reduction in water use.

Adapting the program

Inspections of properties were not able to be completed for six months in the second half of 2021 due to COVID-19 restrictions. This hampered Sydney Water's ability to determine eligibility of new customers. COVID-19 restrictions also prevented contractors gaining access to sites to complete necessary plumbing works.



2021-22 achievements

- Waterfix® Strata successfully serviced 480 units for Land and Housing Commission social housing in a pilot program in the previous financial year. Following this success, Waterfix Strata delivered a further 1,625 social housing units plus 57 strata units (total 1,682 units) this financial year, resulting in 157 million litres of annual water savings.
- Residents and building owners were pleased with the results of the program which led to further work and a significant improvement in customer perception of our brand.

WaterFix® Commercial

Waterfix® Commercial is an expansion of the successful Waterfix® Strata program. It offers a specialised water efficiency service that delivers large scale, cost-effective water savings to 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.
- all project management, appointment coordination and logistics.
- datalogger installation and monitoring services.
- all plumbing works which include minor leak repairs, concealed leak detection and repairs, and the installation of water efficient taps, toilets, and showerheads.

Various payment options are available and include a performance agreement.

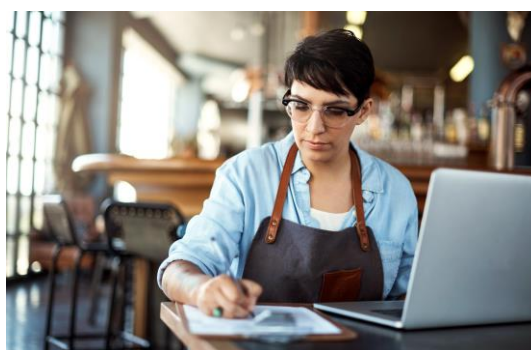
2021-22 achievements

Waterfix® Commercial this year saved shopping centres over 49 million litres in concealed leak repairs and identified another 99 million litres of water savings for 7 other commercial customers.

WaterFix® Small Business

There is a need in the market for affordable service offerings that can help small businesses improve their water efficiency. WaterFix® Small Business is a pilot program offering a subsidised water efficiency focused plumbing service for small business customers. This subsidy includes a call out and water efficiency assessment, as well as works completed by a WaterFix® plumber. This service can result in water savings in a range of ways, such as:

- leak repairs
- installation of WELS star rated aeration devices
- WELS 4-star rated showerhead replacements
- installation of water efficient pre-rinse spray valves
- toilet repairs and replacements



Adapting the program

The program was put on hold from 28 June 2021 until 14 November 2021 due to COVID-19 restrictions. The program restarted in mid-November 2021.

Unfortunately, the service offering was not highly attractive to small business customers for the pilot period due to several challenges identified:

- Relationship between owner and tenant was not always seamless
- Water affordability for small business customers
- Competitive neutrality limitations with marketing
- Limited target market during the initial phase of the pilot

The pilot finished on 30 June 2022 and will be evaluated in July and August 2022 to determine the feasibility of an established program with similar services to small business customers.

2021-22 achievements

- Completed 96 appointments and received 100% satisfaction from customer surveys.
- Variety of small business customers participated in the program including offices, warehouses, hairdressers, dental clinics, medical centres, cafés, hotels, boarding houses, preschools and childcare centres.
- Estimated to have delivered 13 million litres of water savings annually.

Waterfix® Schools' Water Efficiency

Schools, both public and private, are collectively among Sydney Water's biggest consumers of water, using over 5,500 million litres annually.



The pilot for Waterfix Schools® has been developed with three stages:

Stage 1. Identification of school water usage and analysis

Stage 2. Stakeholder engagement and tool development

Stage 3. Implementation of water-saving activities

Sydney Water has developed an accurate water consumption report that shows the Department of Education the level of water used across individual

schools. The report is shared quarterly with education agencies and the Department of Education to identify schools with high water usage.

Sydney Water is developing a holistic approach and collaborating with National Australian Built Environment Rating System to develop a water-usage rating scheme and aiming to gain commitment from the Department of Education to implement water conservation measures across the portfolio of schools.



It is expected that the top 10 schools with the highest water usage could save a total 37 million litres annually.

One Stop One Story Pilot

Financially vulnerable customers are less likely to be able to afford the cost of a plumber and potentially more likely to leave leaks unrepaired, leading to water waste and high bills that these customers cannot afford to pay.

The One Stop One Story (OSOS) Hub is an Australian-first digital platform providing a pathway for customers to receive extensive support across a range of sectors, overcoming the need to repeat their story to multiple organisations. Sydney Water's Customer Care team has trialled using the OSOS Hub as an additional referral point for vulnerable customers who may require the support of our PlumbAssist program to stop leaks, and hence save water and money. The trial initially focused on customers impacted by family and domestic violence; and will be extended in 2022-23 to capture a broader range of vulnerability drivers which lead to customers seeking support. If successful, it will scale to support PlumbAssist.

Benefits

Easy support to access water-saving and financial assistance in tough times, without having to call multiple service providers to repeat.

Achievements to date

30 referrals were received by Sydney Water through the Hub in 21-22, with each customer engaged in a conversation about water use at their property. None of this initial cohort required the assistance of PlumbAssist.

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.

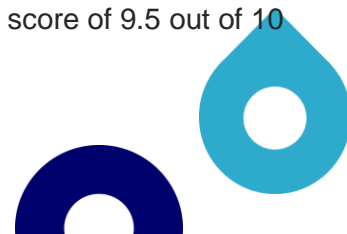
Customers who participate also receive support and case management from the Customer Care team.

Adapting the program

PlumbAssist® continued to be offered during the COVID-19 restrictions in the second half of 2021, with plumbers providing COVID-19 safety measures.

2021 Achievements

- 382 PlumbAssist® appointments were completed, which exceeded the annual target of 262
- 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 9.5 out of 10



- 79 million litres estimated water savings

Water Savings Partnership

The Water Savings Partnership pilot, an initiative in its early lifecycle, has produced positive results despite navigating months of lockdown and a challenging post-COVID-19 operating environment.

The partnership is a collaboration between Sydney Water and five local councils that aims to engage, educate, and support non-residential customers in driving the adoption of behaviours, products and services that reduce their potable water demand. The program provides customers with a tailored service offering, site-specific recommendations as well as funding opportunities to support the implementation of water saving opportunities.

Sydney Water co-funds a water-efficiency officer at each council and provides training, support and resources to assist them in delivering the pilot program within their local government area. Councils who were involved in the pilot were City of Sydney, Northern Beaches, Campbelltown, Parramatta and Blacktown.

The program takes a segmental approach to outbound customer engagement and site assessments, to build knowledge of the non-residential customer landscape, and to gain insights that inform the development of pilot programs and services to support our customers in the future.

The program includes:

- Education delivered through webinars, workshops, and customer engagement.
- Proactive engagement with customers that have high water use or increasing water use to investigate the cause.
- Subsidised water-efficiency assessments, temporary datalogging and active online monitoring services, and a case management to support customers identify and implement opportunities to use water more effectively and efficiently.
- A report detailing site-specific findings, recommendations and supporting services that can improve the water efficiency and reduce environmental impact.
- Funding opportunities to assist customers in implementing work.

Adapting the program

The overall pilot period was affected by a total of 11 months of COVID-19 lockdowns, which impacted both business and council operations and revenue. This presented many challenges in delivering an ongoing program in the current operating environment with the current delivery model. These challenges make an expansion of the program to all councils in Sydney Water's area of operations under the delivery model unlikely to achieve the maximum possible water savings.

The delivery model has been reviewed; with a multi-tiered delivery model proposed to be trialled in a way which allows it to be offered to all councils across Greater Sydney, the Illawarra, and Blue Mountains. The intent of Phase 2 will be to provide an adaptive program and scalable support, tailored to each council's needs and aspirations to deliver water efficiency outcomes within their local government area.



2021-22 achievements

- Over 50 new water-efficiency assessments were completed, and 127 reports submitted.
- Interventions implemented are estimated to deliver 19 million litres of new water savings annually, with an accumulative saving of 138 million litres with previous years achievements (current estimates may be subject to the impact of COVID-19).
- Insights gathered from over 120 childcare centre assessments were used to inform the development of a pilot washing machine-replacement program for childcare centres.
- The collation of findings from over 270 site assessments is informing the development of water-efficiency segment guides with childcare centres to be delivered this financial year.
- Feedback from customers on the financial barriers to complete work has informed the development of a pilot water efficiency claims process which was trialled as a means of reimburse customers up to ELWC for the implementation of recommendations delivered through the private market.

Digital Metering Trial 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, system performance and to 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.

2021-22 achievements

- Completion of the initial digital-metering trial, including investigation of wireless communication technologies, business process changes, customer-facing benefits, and network management benefits.
- Around 8,500 digital meters were deployed in the Liverpool/Mount Pritchard supply zone and returned hourly water-usage data.

Digital Metering can now be expanded to a broader area, with the inclusion of large water users.

2022 Water Efficiency Grants

The Water Efficiency 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 Grant provides an economical way to put best practices in place to:



- understand the site's 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

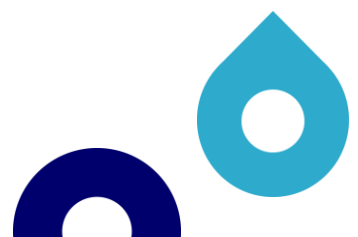
The grant, provided by Sydney Water, will partly fund the costs for a Water Efficiency Audit and potentially partially cover implementation of recommendations.

The pilot launched on 1 April 2022 and will run until 31 December 2022.



Pool Cover Rebate Pilot Program

The Pool Cover Rebate program will help Sydney Water understand how much water can be saved when pool covers are used. The pilot program commenced on the 21 April 2022 and will end on the 30 of September 2022. Under the program, rebates of \$200 will be available to pool owners who buy an approved pool cover. Over 40,000 litres of water per year evaporates from an average-sized, uncovered swimming pool in Sydney. Sydney Water will support the use of pool covers and run a survey to determine how much water pool owners saved in a typical swimming season. The results of the pilot will be used to plan future water-saving programs for the pool and spa industry.



5.1.2 Water Efficiency Research and Innovation

Smart Shower Timer Phase 2

A comprehensive Sydney Water end-use study revealed average showers last six minutes and account for 26% of residential water use in Sydney. One of the most effective mechanism Sydney Water can utilise during water restrictions is reduced shower use. However, current shower timers are not designed with the end-user in mind and do not work automatically. People must set them.

After successful prototype design, the 'Smart Shower Timer' is an alternative option to conventional and digital shower timers. The Smart Shower Timer Phase 2 is producing 25 prototypes for engineering testing and evaluation before we proceed to manufacturing.

Benefits

It provides Sydney Water customers with an easy-to-use, smart shower timer that supports behaviour changes and saves customers money and aims to reduce shower times to a nominal four minutes. This could potentially save 60 million litres per day during drought conditions, preparing in advance for the next drought.

Achievements to date

Successful prototype design with 25 prototypes produced for engineering testing and validation.

Childcare Washing Machines Upgrade



At least 87% of washing machines in council-owned childcare centres have been found to be top-loading, inefficient machines. These centres used their washing machines two to 15 times more often than households, where front load washing-machine upgrades save 25 kL per year.

This project tested the replacement of inefficient, top-loading washing machines with front-loaders in childcare centres in five local council areas to confirm significant water saving, energy and detergent cost savings.

Benefits

Estimated water savings for commercial childcare customers are 2.4 million litres a year over the 25-year design life of the machines. Actual data from analysis of the results will confirm this modelled estimate. Washing-machine choice will determine cost savings from detergent and energy, as well as water.

Achievements to date

The machines have been installed across four council areas so far. COVID-19 and payment delays have meant the final deliveries will be made to the last council area in 2022-23.

An assessment will be carried out during the pilot and a framework, which includes eligibility criteria, will be created for the potential delivery model.



Washing Machine Replacement Trial

Front-loading washing machines provide long term water savings estimated at 25 kL a year per household, in addition to energy and detergent savings. Higher water efficiency star rated machines are at a premium price and households with limited or no disposable income are unable to afford the more efficient appliances.

This first state-wide collaborative pilot program that aims to improve access to water efficient washing machines for low-income families. The program is predominantly offered to large families in multi-bedroom social housing dwellings. The pilot was co-funded and co-delivered by Sydney Water, Land and Housing Corporation, Department of Planning and Environment, Hunter Water, and the Aboriginal Housing Office. Sydney Water is also exploring how to provide a broader program that targets other customer segments.

Benefits

Approximately 70% of the lowest cost, inefficient washing machines are purchased by socially disadvantaged households. Replacing a top-loader to a front-loader washing machine can save the average household 25 kL a year. The pilot program expects to achieve water savings of approximately 47.5 million litres a year, as well as energy and detergent cost savings.

Achievements to date

The pilot has been oversubscribed with 1,900 washing machines replaced in the trial area. An 18-month assessment period will be used to determine the actual benefits and the ELWC value.

SOPA Smart Irrigation Trial

Drought conditions put pressure on valuable drinking water and often trigger restrictions on water availability for urban greening. The use of smart irrigation technologies can incorporate plant wilt factor, prevailing and forecast weather conditions and soil moisture levels supporting both remote and more efficient water use for urban greening. This project is a partnership between Sydney Water, Sydney Olympic Park Authority, Western Sydney University and University of Technology Sydney. It leverages a \$2 million NSW State Government Digital Restart Grant.

The SOPA Smart Irrigation Trial is using an array of Internet of Things-connected sensors collecting soil moisture, irrigation output and local temperatures, windspeed and relative humidity in Sydney's largest public parklands. It will combine short and long-term weather forecasts from the Bureau of Meteorology to create a highly dynamic irrigation system that responds to changing weather and soil conditions using machine learning. Smart irrigation represents one of the few ways Sydney can meet its Metropolitan Water Plan goals while also meeting the State Government's liveability targets for Western Sydney.

Benefits

This open-source model of smart irrigation meets the expected irrigation demands of all public and private irrigated landscapes in Western Sydney. As a result, it can be used by state and local government agencies as well as private sector companies and organisations to better manage their green infrastructure during heat waves and drought conditions.



Achievements to date

The grant has been awarded and the trial commenced. Sydney Water has executed its contract.

Better Life at Home Trial

Western Sydney faces challenges with urban heat. Water is recognised as a core requirement for passive cooling, especially during heat waves to mitigate heat stress. This project aims to enhance customer knowledge to influence behaviour change on how to use water more efficiently and effectively inside and outside the home. The objective is to maximise cooling benefits obtained through trees and other green infrastructure, as well as misting to reduce peak water and energy demand on critical infrastructure on hot days.

This project aims to educate residential customers on new ways to improve liveability within their home by providing evidence through a trial targeted specifically for Western Sydney's environmental conditions and engaging 100 people from Sydney Water. Our strategic objective of creating thriving, liveable and sustainable cities will be advanced through efficient and effective indoor and outdoor water use, as well as targeted messaging around irrigation, misting and actions to ensure effective water use during heat waves.

Benefits

The project has been designed to ensure efficient and effective water use to improve liveability, energy use and community resilience during heat waves and hot days. The outcomes are broader than saving water, although some water savings will be achieved as we provide advice on when and where to irrigate their lawn and garden prior to heatwaves.

Achievements to date

Sydney Water has 100 staff that have engaged in trial over the summer of 2021-22. However, due to the floods and relatively cool temperatures, we are extending the trial to the 2022-23 summer. Trial results will help Sydney Water enhance customer water efficiency and improve liveability for our customers.

Smart Devices Smart Homes Pilot

Many buildings across Sydney have old, leaky, and inefficient plumbing fittings which may be costing water and money, especially during times of water scarcity.

The project explores what smart homes of the future look like through a lens of smart integrated water management at precinct scale with different end-user groups. Sydney Water and UTS Institute for Sustainable Futures have partnered with bathroom manufacturer Caroma to install their state-of-the-art Smart Command technology in a commercial office building. The trial of Caroma Smart Command at a building in Rhodes is in hibernation until tenants occupy the building.

Benefits

The project will show what water efficiency benefits can be achieved for commercial and residential customers from Smart Command through flow rate control, water pressure adjustments, control of toilet flushing, detection of leaks and more. This will inform Sydney Water's future water conservation programs that harness smart appliances and new digital technologies.



Achievements to date

Installation of Smart Command system in commercial building

Water Smart Homes in Great Sydney: A field guide for the future is publicly available and has been promoted externally via LinkedIn.

Robots for Urban Greening Pilot

Councils, golf courses, commercial gardens and parklands need access to commercially viable and cost-effective smart technologies to be more water efficient and resilient to drought. Recent advances in agricultural field robotics and smart sensing may provide ways to reduce business cost and improve drought resilience.

The project aims to undertake a background market and technology review to identify emerging professional service robotics and artificial intelligence smart sensing that may be applicable for large commercial business users.

Benefits

The project will identify current and emerging technologies that could benefit large commercial businesses. This information will be used to inform potential trials.

Achievements to date

End-user workshop was held in November 2021

Final Report being prepared for delivery

Digital Metering Data Analytics to Support Non-Residential Water Conservation

Most of Sydney Water's large water users have limited access to granular insights around their usage data. This means that it is difficult for customers to ascertain how to improve water efficiency for enhanced drought resilience and sustainability (unless they have complex control automation software installed for other business processes).

As part of the pilot Sydney Water will develop internal data analytics capability to identify water savings opportunities for non-residential customers, harnessing digital meter readings and other data sets. These insights and water saving opportunities will be shared with customers.

Benefits

The pilot will provide non-residential high water using customers with granular data insights to identify ways to save water and improve efficiency.

Achievements to date

Positions were advertised in March 2022 and the first data analyst has been recruited to undertake data analysis.

End-Use Study Extension

The project extends the end-use digital meter study from 104 households to 300 households. It is run in partnership between Sydney Water and NSW Department of Planning and Environment leveraging NSW Digital Restart funding.



The project will inform water demand forecasts, inform BASIX findings, and to investigate whether behaviour patterns learned from 10 second meters can be extended to less granular hourly digital meter readings – with the potential of improving engagement with customers on water saving behaviours.

Benefit to customers This pilot project will provide residential customers with granular data insights to identify ways to save water and improve efficiency.

Achievements to date

The end-use study to date has been intrinsic to our understanding customer behaviours under normal and restriction conditions. It has also provided improved insight into water-use behaviours under COVID-19 lockdown conditions.

It has, therefore, informed educational and campaign activity to support water conservation while directly informing demand forecasts.

The extension program is progressing with new meters being installed and the recruitment of new participants is underway.

5.2 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.

Sydney Water runs a range of water leakage-management programs aimed at minimising the loss of water within our networks in keeping with the Economic Level of Leakage (ELL) target. The economic level of leakage approach is used to measure Sydney Water's performance and determine proactive leak-reduction activities which are cost effective.

There are four key areas within which this work is done:

- 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.

Key highlights over the past 12 months include:

- 90% of high priority leaks reported by customers were stopped within 24 hours
- \$1.8 million invested in active leak detection
 - Improved our data analytics tools to better target proactive leak detection.
 - Completed field inspection of over 15,455 kms of water mains through the active leak detection program, which identified 3,568 leaks.



- Further development of innovations such as the leak-detection dog program, use of the Iquarius tool and early lifecycle development of proven concepts, such as lift and shift sensors.
- Renewal of Active Leak Detection (ALD) contracts.
- Asset management renewals program delivered as planned, after disruptions caused by drought, the pandemic and contract changes, including updated processes and cost estimation.
- Pressure management candidate projects developed.

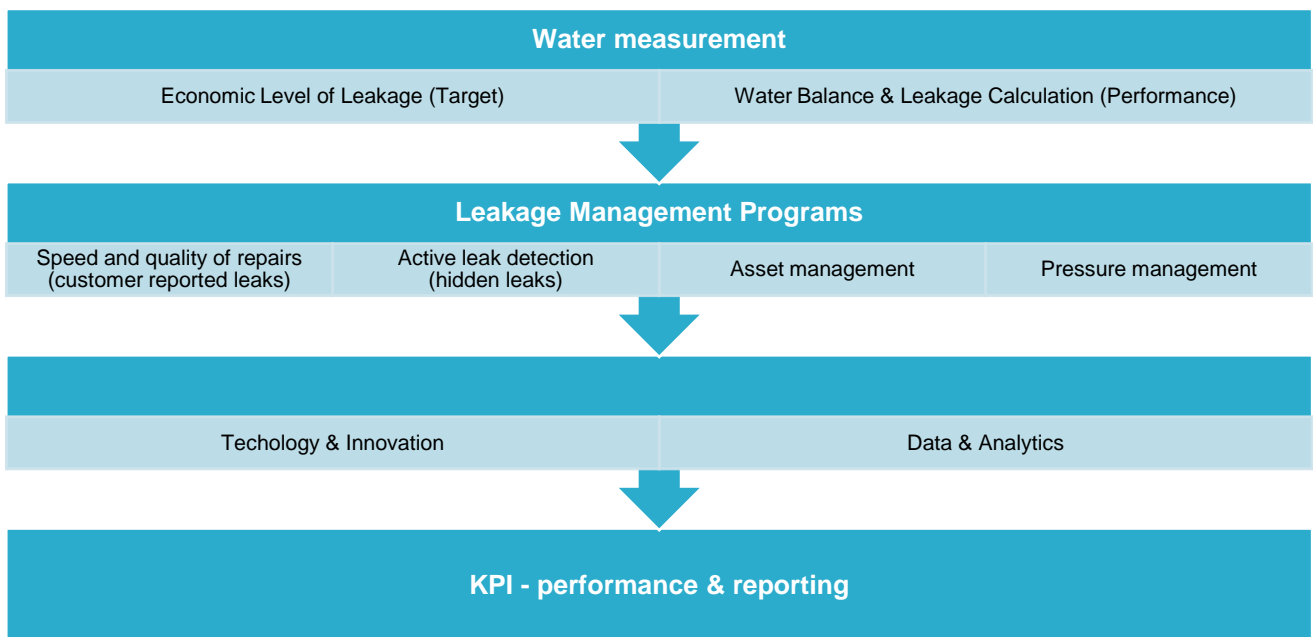


Figure 12 Water leakage programs summary



5.2.1 Water Leakage Programs

Speed and quality of repairs (customer reported leaks)

Data Analytics (Desktop)

Data analytics continues to significantly improve how we detect hidden leaks. There are several initiatives being worked on within this area in relation to water balance calculations, minimum night flows (as a means of targeting leak detection inspections) and predictive analytics.

The accuracy of minimum night flow calculations has significantly improved with focus on validation of equipment, processes, and results. This is used to guide the bulk of active leak detection work.

Additionally, approximately 25% or 5,000kms of our drinking water network is more closely monitored by flow meters via our online monitoring and control system (IICATS). We have deployed real time monitoring of system performance and use sophisticated data analytics to detect unusual flow patterns. Business rules are used to review this data and target field inspections to find hidden leaks.

We are replacing existing flow meters and installing new flow meters to improve data accuracy and the real time monitoring of our drinking water systems.

2021-22 achievements

- Ongoing use of IICATS (telemetry) based statistical analysis to identify leaks and breaks and minimise water loss and disruption to customers. For 2021-22, the statistical analysis techniques led to identification of 14 hidden leaks, equating to avoided leakage volume of 1,175 million litres and avoided cost of \$282,000
- Significant improvements in the accuracy of minimum night-flow calculations with extensive verification of data sources, key assumptions, and process
- Ongoing field trials of lift & shift sensors

Response to Leaks & Breaks

Sydney Water has improved the ways in which it responds to water loss and leaks.

Sydney Water encourages customers, plumbers, and members of the public to report water and wastewater leaks or breaks through our 24-hour emergency line. We have minimised water loss by improving our response time to visible leaks and by using innovative tools.

We have minimised water loss through leaks by deploying smaller geographic area-based teams to locations where higher levels of leaks occur, so response (travel) time is reduced. We've also minimised water loss from leaks by optimising resource scheduling so leaks with higher water loss are addressed as a priority. We monitor indicators, such as response time, to ensure we maintain good performance.

Sydney Water has introduced innovative tools to allow repair of water mains and installation of new valves under pressure. This can avoid the need for network shutdowns and conserves significant volumes of water by removing the requirement to empty, flush/clean and recharge the network.

2021-22 achievements

- 90% of high priority leaks and breaks repaired within 24 hours.



- Embedded smarter scheduling of work to minimise response times to leaks and breaks.
- Advances in tools and processes to minimise service disruption.

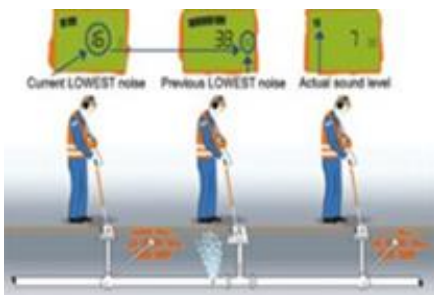
Active Leak Detection (hidden leaks)

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.

Leak-detection activities are targeted to areas with higher water loss, based on system minimum night-flow monitoring. This varies in terms of granularity from supply (reservoir) zone level down to more local areas depending on the location of flow meters. The deployment of digital water meters to customers will also improve our ability to target leak-detection activities.

Improvements include assessment of tools being used, including the interface with emerging data and analytics foundation work and the use of the statistical analysis capability in IICATS.

Active Leak Detection (Field Services) Contracts



The objective of the ALD is to find and repair hidden leaks (ie before they are reported by customers). This saves water, reduces the incidences of main breaks and improves service continuity.

Most of this work is undertaken by specialist field survey companies, who scan watermains using acoustic leak detection equipment and identify hidden leaks.

Leak detection activities are targeted based on minimum night flow monitoring using available flow meters. This varies in terms of granularity from supply (reservoir) zone level down to local demand, or pressure management zones, depending on the location of flow meters.

Improvements include assessment of tools being used, including the interface with emerging data and analytics foundation work and the use of the statistical analysis capability in IICATS.

2021-22 achievements

- Refined minimum night-flow calculations to improve the targeting of field inspections
- Surveyed 15,455kms of watermains to identify 3,568 hidden leaks
- Use of new mobile device technologies to improve the ALD efficiency

Leak Detection Dogs program

Joey is a working Springer Spaniel trained to detect drinking water leaks throughout Sydney Water's network. Joey's job involves scanning critical and reticulated water mains for leaks, supporting reactive leak detection where conventional methods have not been effective, and working to improve detection methods.

To date, Joey has successfully sniffed out leaks on mains, service valves, hydrants, water meters and private properties across Sydney. Additionally, Joey and his handler have been great ambassadors, spreading the word about the importance of water conservation with social media campaigns,



appearances in the Daily Telegraph and on Channel 9, industry forums and community events such as the North Sydney Council's Bark in the Park display.

As a light, agile, alternative to more traditional leak detection tools, Joey can provide quick leak detection in difficult conditions e.g. bushland or difficult terrain. A second leak detection dog, Hydro, is now in training.



2021-22 achievements

- Joey scanned 204kms and identified 114 confirmed leaks
- Ongoing work has revealed specialised strengths in terms of Joey's agility and light weight allowing him to be deployed successfully in rougher terrain (including parks) without significantly impacting the local environment. Joey has been trained to work safely around wildlife

The program has been expanded with the recruitment and training of a new puppy, Hydro and is moving from an early lifecycle innovation to an established program.



Pressure Management

Pressure Management Program

Pressure management can significantly reduce the risk or scale of leaks and breaks. With reduced average pressures, the volume of water lost can be reduced.

A pressure-management program previously delivered by Sydney Water yielded benefits in terms of water savings (reduced leakage) and reduced breaks. The second phase of this program incorporates learnings and is adopting a targeted approach to yield further leakage.

2021-22 achievements

- Incorporation of research findings on the relationship between pressure, other potential factors, and leakage into the pressure management program.

Pressure Calming

Where pressure management is related to reducing maximum pressures caused by pumping of water, pressure calming relates to reducing the range of pressures and cyclic loading on a pipe.

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

As part of this program, cyclic loading events are identified and reported so that work can be undertaken to address the causes.

2021-22 achievements

- Automated Water Hammer reporting using IICATS alarms which provide instant alerts for events which are investigated

Asset management

Watermain Renewals

The primary drivers for watermain renewals are reducing maintenance costs and customer disruption. However, they have a secondary benefit in reducing water leakage, with new pipes anticipated to improve performance in terms of leaks and breaks.

2021-22 achievements

- Development of a new cost-estimation approach and supporting tools, which include water savings as a financial benefit
- Recovery of renewals program following reprioritisation of work to support drought response

5.2.2 Water Leakage Research & Innovation

There are multiple emerging technologies that may be able to support Sydney Water in reducing water leakage, such as acoustic sensors, dark fibre, Interferometric Synthetic Aperture Radar (InSAR) and satellite imagery. Sydney Water is currently piloting several options to ascertain which of these technologies are the most appropriate for water leaks and therefore water conservation.



Lift & Shift Acoustic Sensors



Acoustic sensors can detect leaks as low as 0.01 litres per second and can be installed either temporarily or permanently placed into areas to monitor network performance. This combined with machine learning provides an opportunity to take a proactive approach to leak detection, rather than a reactive approach when a leak is either reported by the public or discovered when using listening sticks.

Lift and shift acoustic sensors can be installed temporarily or even permanently to monitor system performance. The lift and shift acoustic sensors can combine with machine learning to recognise the acoustic signature of a leak, picking up leaks as low as 0.01 litres per second. This provides an opportunity to move from a reactive approach (deploying field resources with listening sticks) to a proactive approach where leaks can be detected as they arise.



Sydney Water has used semi-permanent acoustic sensors in six high-density urban areas including Sydney CBD, and other prioritised zones.

2021-22 achievements

- Planning for the transition from proven pilot to an established component of the Active Leak Detection (ALD) program

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 has tendered for this work, is partnering with suppliers to use unused telecom cables (Dark Fibre) to assess the usefulness of the technology for detecting leaks.

2021-22 achievements

- Sydney Water has completed procurement of a contractor to complete this trial

Quantum Sensing



This project will test the use of a quantum sensor to assess gravity measurements to identify hidden leaks (ie where soil moisture impacts these measurements).

Sydney Water is collaborating with the Australian National University and industry partners to assess the usefulness of the technology to detect leak patches associated with subsurface leaks. The Australian National University and Nomad Atomics (start-up) has validated the possibility of detecting a subsurface created leak patch. Sydney Water is planning to assess the potential of using quantum sensing in critical water mains and distribution mains to detect real leak patches in Sydney Water's active buried pipe assets. Quantum sensing measures the change in gravity caused by a subsurface leak patch caused from a leaking pipe.



2021-22 achievements

- Sydney Water has completed procurement of a contractor to complete this trial

InSAR Leaks and Breaks Project

Studies have shown ground movement interactions with soil, under weather conditions within an urban environment, can cause pipe stress leading to leaks and breaks. However direct ground movement can be difficult to detect with buried assets on a large geographic scale.

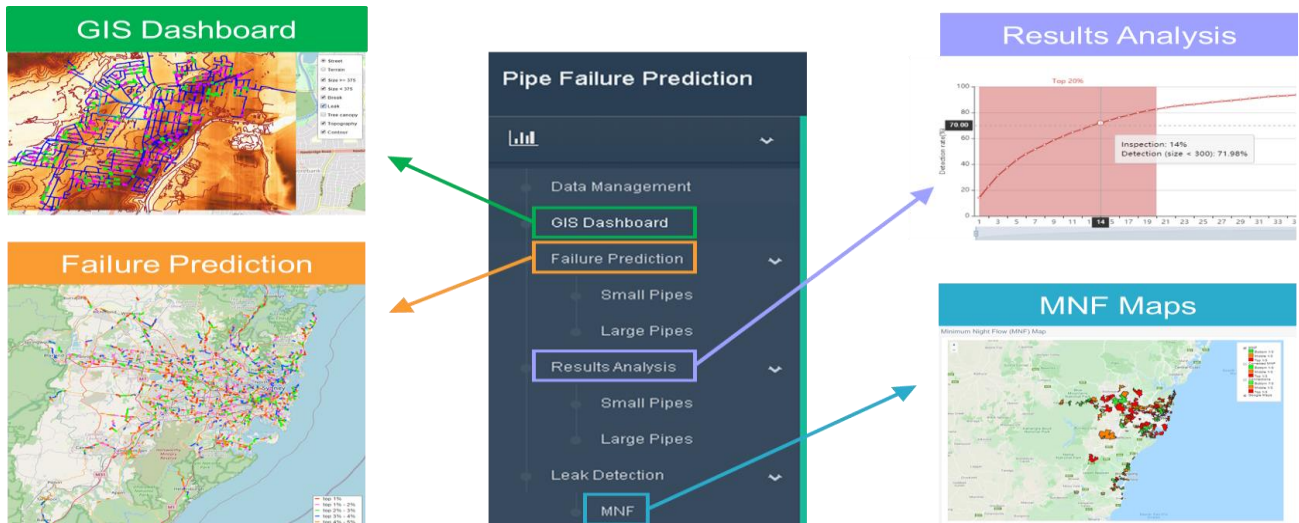
This project explores whether millimetric precise ground movement data from Interferometric Synthetic Aperture Radar (InSAR) measurement from satellite services could improve our predictions of leaks and breaks at a geographic level that covers large portions of our operations on a frequent basis. The project will attempt to use pattern recognition and predictive modelling (potentially machine learning techniques) to improve the accuracy of detecting of leaks and breaks with this additional data source.

2021-22 achievements

- Contract is in the process of being fully executed to undertake the pilot assessment.

Predictive Model

Sydney Water, in collaboration with the University of Technology Sydney, developed a data-driven predictive model to predict leaks and breaks and generates a prioritisation map. This can provide additional input for enhanced targeting of active leak detection field work. Sydney Water is currently looking at the way forward for integrating this with technology already in use.



2021-22 achievements

The predictive model has been used to target existing technologies used to improve water loss management.



Online Monitoring (behind the meter)

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 pilot 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.

Adapting the program

Marketing the program and installations were placed on hold from 28 June 2021 until 14 November 2021 due to COVID-19 restrictions. The program restarted in mid-November 2021. The pilot finished on the 30 June 2022 and will be evaluated in July to determine the feasibility of moving into an established program phase.

2021-22 achievements

- 52 data loggers installed across 45 business and industrial sites
- 27 litres per minute of abnormal water usage detected at a leisure centre was fixed within 3 days
- A baseflow at an office was detected at 4 litres per minute. This was rectified
- 7 litres per minute at a swimming centre was identified and fixed
- Another swimming centre identified a baseflow of 30 litres per minute that was caused by a malfunctioning urinal. This was fixed immediately
- Estimated to have delivered 63 million litres of water savings annually
- Satisfied customers who participated in the online monitoring program have returned to extend their subscription for a second year

SmartPipe (Smart Standpipes)

Standpipes are used to allow access hydrants when a normal metered connection is not available, the usage patterns are often unknown, and unmetered water is often counted as water leakage. Sydney Water trialled 36 smart standpipes to record usage for environmental clean-up purposes. The device recorded flow, volume, and GPS positioning of extraction to improve understanding of Sydney Water's operational water use and will be used to support the LEO Truck pilot to utilise recycled water in the place of drinking water for these clean ups. Project outcomes identified many applications for internal use such as improving water balance and economic levels of water loss calculations, improved information to customers about pressure loss, and exploring internal opportunities for harnessing recycled water. The pilot will be extended to an early life cycle trial to explore how it can be scaled more broadly across the business.



2021-22 achievements

- A proof of concept has been developed through a six-month trial and a project has been proposed to advance to operational / field trials to build on the benefits seen to date. The metered standpipes have recorded 1,000 million litres of water usage during the trial.
- Explored opportunities with Fire & Rescue NSW regarding adding loggers to improve their understanding of water use for their operations eg either within trucks or at dedicated fire hydrants, where the water data would be fed back into the SmartPipe system and support achieving water savings, as well as unaccounted water used for emergency services.
- Identified potential for pressure sensors for enhanced use and support managing pressure calming.



5.3 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.

Sydney Water seeks to maximise recycled water production to reduce unnecessary use of drinking water, ensuring public health and the environment are protected. We also ensure recycled-water schemes are financially viable, so we continue to deliver value for our customers.

Sydney Water continues to explore opportunities for recycled water to offset drinking water use both with existing industrial, agricultural or irrigation customers (to reduce their drinking water use), as well as broader precinct-scale, development-servicing opportunities (with examples below).

Around 55 recycled water opportunities have been identified and are being investigated by Sydney Water, with 10 new schemes in design or delivery. These opportunities are subject to detailed analysis (including financial, community, environment, financial and technical aspects) to ensure that the schemes represent value for the community. We also work closely with key regulators such as NSW Environmental Protection Authority and NSW Health, and stakeholders including DPE, as well as developers and customers to ensure that we have a more holistic sense of the value proposition of recycled water for its users.

5.3.1 Recycled Water Schemes

Existing recycled water schemes produced 37,700 million litres of recycled water and saved 12,700 million litres of drinking water in 2021-22. Growth within existing recycled water supply areas (eg Rouse Hill) has resulted in additional recycled water use. Sydney Water has also continued to use recycled water within our water resource recovery facilities and considered it as a preferred source of water for non-drinking purposes, where viable.

Table 9 Recycled Water use in 2021-22 and 2020-21

Supplied to	Run by	2021-22 annual production (ML)	2020-21 annual production (ML)
Residential, commercial, and industrial use	Sydney Water	10,600	10,530
Environmental flows	Sydney Water	5,500	4,870
Use at wastewater treatment plants	Sydney Water	17,100	15,800
Irrigation of parks, sports fields, and agriculture	Sydney Water	5,400	5,670
Total from Wastewater	Sydney Water	37,700	36,900
Total drinking water savings	Sydney Water	12,700	12,800



Sydney Water also facilitates the development of independent recycling schemes, such as sewer mining schemes, by providing information on wastewater quality and approval to discharge to our wastewater network.

The wetter climatic patterns which have prevailed across the greater Sydney region since 2020 have reduced the demand for recycled water. End users are utilising the regular rainfall in place of recycled water, not increasing their drinking water consumption. Sydney Water has also been delivering major upgrades at some of our larger Water Resource Recovery Facilities (WRRF), which has resulted in temporary outages and shutdowns. This has also impacted recycled water production, for example, Sydney Water temporarily reduced transfers to St Marys Advanced Water Treatment Plant as part of an upgrade to the Quakers Hill and St Marys WRRFs.

Sydney Water is also continuing to develop our reporting, planning and design processes to look at how we can maximise the value of recycled rainwater, stormwater and wastewater sources against various customer and environmental end uses. This directly supports meeting place-making objectives such as creating a cool, green, Western Sydney growth area and moving towards a more sustainable future.

Western Sydney Aerotropolis Growth Area Recycled Water Supply projects

With water playing a lead role in cooling and greening the city, Sydney Water is working, as part of the Parkland City Planning Partnership, to identify and create water servicing opportunities to help bring the Western Parkland City vision to life.

Water and wastewater are essential for growth and development, and they will also play a vital role in ensuring the Western Parkland City becomes a vibrant, liveable, sustainable urban centre. Taking an integrated (total water cycle) approach, we're exploring opportunities for greater circularity in the way we manage water resources to maximise value to customers. Maximising the value of water through recycling and reuse is central to this approach.

Sydney Water has been investigating the integration of recycled water and stormwater for non-drinking purposes to help achieve the Government's vision as well as our own: creating a better life with world class water services.

Seasonal water balance modelling was used to confirm that even with broadscale stormwater harvesting (required to meet waterway health targets), there remains an important role for recycled water to ensure the reliability of supply in hotter, drier months to maintain urban greening and cooling of the Western Parkland City. We continue to work with key stakeholders, delivery partners and customers to develop viable servicing arrangements.

2021-22 achievements

- Refined methodology to explore the relationship between rainwater and recycled water and sequential use of suitable water sources for specific end uses
- Detailed planning on the servicing concepts and networks that would deliver recycled water to Mamre Road.
- The NSW Government has appointed Sydney Water the stormwater trunk drainage manager for the Western Sydney Aerotropolis Growth Area.





5.3.2 Recycled Water Research and Innovation

Increasing population growth will put pressure on our valuable drinking water, particularly under drought conditions. It is essential that we utilise recycled water instead of drinking water especially for purposes such as urban greening.

Recycled Water and Soil Interaction Stage 2

This project is undertaking research to understand the role of recycled and stormwater for irrigated landscapes in Western Sydney.

The project investigates use of recycled water and stormwater on soil interactions in Western Sydney at two sites in Picton and Penrith Lakes. The project will explore how to improve the water holding capacity of soils, especially in degraded areas, to enhance the water retention of soils so irrigation water use can be reduced. The project will also review how stormwater can be better utilised to prevent runoff during storm events.

Benefits

- Provides information on how to improve soils and build drought resilience through use of alternative water sources such as stormwater and recycled water.
- Helps Sydney Water understand optimum recycled water quality to improve soil water storage capacity.
- Supports best practice irrigation guidelines.



Achievements to date

Soil samples from different sites have been cross compared based on soil quality against different types of water sources and analysed.

Arboretum and Recycled Water Project

Western Sydney has environmental challenges for water efficiency and liveability with its increasing population, extreme heat and water demand for urban greening and cooling.

NSW Government Premier Priorities aims to address these challenges by enhancing the urban canopy, introducing more trees.

Sydney Water, The Australian Botanical Gardens Mt Annan, Macquarie University and NSW Department of Planning and Environment are developing a 'living lab' through a geo-specific site trial to test and showcase how recycled water, smart irrigation, effective soil amendments and right tree selection can enhance the urban canopy.

Benefits

The project will provide local councils, government, commercial and residential customers with knowledge and training on recycled water use for urban greening, smart sensing technologies, right tree selection and soil improvements.

Achievements to date

- Trial site has been selected, with the smart irrigation system and trees ordered for planting in spring.
- Project secured a grant through NSW DPE for the installation of additional smart sensing technology to support evidence of urban cooling and greening.

Recycled water for construction

Sydney Water explored how recycled water could be used for construction eg. for dust suppression. As part of this review, Sydney Water assessed potential health impacts, potential drinking water savings, and discussed practicalities such as source points, transportation requirements and timeframes.

2021-22 achievements

- Sydney Water worked with delivery partners and third parties end users (eg local councils, major projects in Western Sydney) to find viable opportunities for use of recycled water in construction.
- Sydney Water developed a decision-making framework which assessed viability, including financial analysis.
- Sydney Water explored a fixed tankering point opportunity at one of our WRRFs. Sydney Water anticipate that the learnings from this, and assets designed to date, could be used during future droughts.

Hydraloop Trial

Harnessing recycled water at existing residential, commercial, and high-density properties is a challenge, as decentralised recycling water options are often not commercially viable.



Hydralooop is a domestic and light commercial greywater processing system. It represents a radical departure from traditional approaches to onsite wastewater treatment for the domestic and light commercial markets.

The Hydralooop trial will test 33 Hydralooop units to determine the costs and benefits of the technology in a wide variety of residential and commercial properties.

The Hydralooop unit accepts wastewater from showers, baths and optionally rinse cycles from washing machines and treats the water using a 6-stage aerobic treatment process that requires no chemicals or filters. The treated water meets water quality standards for recycled water use for toilet flushing, washing machine wash cycles and irrigation.

The trial will evaluate the product on four target markets, single dwelling renovation projects, newly constructed single dwellings, commercial installations and multi-residential dwelling renovation projects. Hydralooop will also be trialled at a TAFE plumber training facility.

Benefits

Modelled water savings range between 31% and 48% of average household water consumption. We expect that households able to take up the washing machine option will achieve savings closer to 48%, while those without will likely save less than 40%. This data will be verified during the trial. If the modelled water savings are achieved, Hydralooop may offer an alternative solution to rainwater tanks which are a requirement under the BASIX certificate for new homes.

Achievements to date

The trial has uncovered complex regulatory pathways that need to be met for compliant installations, so they don't void household insurance.

As part of the trial, Sydney Water are assisting Hydralooop in achieving certification in Australia so the technology can be adopted more widely than Sydney Water.

Leo Truck

Wet and dry weather overflows require up to 960,000 litres of drinking water to restore a site to its pre-overflow conditions. Minimising the use of drinking water for operations and preserving drinking water resources is a focus area.

The project has completed a detailed design of a mobile treatment method to mitigate the need for drinking water to be used for flushing by harnessing recycled water that is re-circulated through the LEO Truck to restore the site to its pre-overflow conditions. The results of this project phase will enable the LEO Truck to move into a manufacturing a pilot truck to test and evaluate.

Benefits

The project will provide Sydney Water with a decentralised mobile water recycling option to minimise drinking water consumption for operational water use applications.

Achievements to date

Detailed engineering design has explored how the recycling equipment can be installed into existing fleet vehicles, as well as smart standpipe data to analyse water consumption for a specific trial application.



5.4 Community awareness

5.4.1 Community Education

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

In 2021-22, 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.

Adapting the program

Face-to-face engagement resumed after the 2020-21 COVID-19 restrictions, including Sydney Water's investment in a Wonders of Water (WoW) Discovery van. The van is purpose-built for reaching out to communities and school groups. The WoW van has facilitated the reach of primary school students, diverse community groups, events and locations around Sydney Water's service area.

Wonders of water van

The education focus of the WoW van is sustainability, water conservation, future water supply and the circular economy. The WoW van commenced in May 2022 and has since attended four community locations/events. Nine events are currently in place for the second half of 2022 with more anticipated. The WoW van is an integral part of the Stage 2 – Aqua Allies school incursions being offered to primary schools.



Purified Recycled Water Demonstration Plant and Customer Experience Centre

Construction of our Purified Recycled Water (PRW) Demonstration Plant and Customer Experience Centre is underway, with completion expected early 2023.

The Plant will demonstrate the performance and reliability of the treatment technology and help to build community understanding and acceptance.

We'll also be demonstrating how we can produce water that complies with the Australian Guidelines for Water Recycling (Phase 2) and how this water could safely be added to our existing raw water supply (i.e. dams and rivers). From there it would be treated further as part of our drinking water supply.

Digital learning resources

Sydney Water's education webpage continued to attract more than 60,000 page views throughout 2021-22. The education pages that were accessed the most include those pertaining to wastewater treatment and recycling (1,103 views), water use and conservation (980 views) and the natural water cycle (476 views).

Primary school resource packs

In 2020-21, Sydney Water invested in Stage 1 water conservation resource packs. The resource packs included card games as well as lesson plans and activity worksheets for teachers, with a focus on building value for water and water saving behaviours.

Throughout February to April 2022, these packs were sent to 1,230 primary schools across Sydney Water's service area. These packs were distributed to all school sectors within NSW and are expected to reach 90,000 Year 1 and 2 students.

5.4.2 Behavioural change campaign

Consumers' attitudes and behaviour towards water i.e., 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'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 and 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 have the objective of increasing awareness regarding personal water use and the impact this increased awareness can have on this generation and those to come.

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

From January to March, there was a 14% decrease of consciousness towards saving water in homes in conjunction with an 8% decline in awareness of applicable water restrictions.



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

There has also been a deliberate emphasis on targeting culturally and linguistically diverse customers, representing 36% of Greater Sydney’s population.



The 'Turn it off Bob' campaign significantly increased awareness of day-to-day usage in and around the home.

Sydney Water’s Brand Tracker showed that 71% of people surveyed will reduce water usage outside the home, 50% intend to use less water in the bathroom, and 43% said they would use less water in the kitchen.

Turn it off Bob’s key strength remains its novelty and its ability to grab people’s attention, which is supportive of the campaign’s objectives.

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

5.5 Data and Analytics

Data and Analytics have been leveraged in water conservation since the drought of 2018-2020. In response to drought, Sydney Water used available data sources to:

1. Design water restrictions
2. Inform drought advertising and educational campaigns
3. Inform other water savings programs
4. Estimate and measure the water saved



During and ever since this drought we have been upgrading our approaches to data within the water conservation space, collecting additional data from digital meters to inform on customer behaviours and recording locations where we have applied water conservation programs to assess ongoing impacts.

It is in this latter space where we have been able to assess the efficacy of the WaterFix® Residential program. Metered consumption of 10,000 properties that went through WaterFix® in FY 2019-20 was considered for analysis in comparison to a control group when conducting the post consumption analysis. Our analysis demonstrated that WaterFix® interventions helps properties save a minimum of 10kL, which is on average, approximately 5% of household consumption.

This methodology has established an accepted method to track and report the performance of Water Conservation programs. A similar approach was applied to understand PlumbAssist program performance.

We are now using these findings to propose a model for offering WaterFix® to households that will achieve the most benefit, to maximise the return on investment.

Digital meters have also been used to understand household behaviours better. We now have measures of the water volumes and associated drivers of behaviours of individual water usages such as outdoor use, showers and washing machines. Using detailed weather information, we can associate behaviours with weather conditions to further inform campaigns, education, and water efficiency programs.

Finally, we have been able to refine the measure of network leakage to provide a more accurate and timely assessment of leakage across our operations.

Future Programs

A key driver of a successful data and analytics approach to water conservation is to encourage creative techniques to how we approach the available data, so we maximise return on investment.

The use of historical results from water conservation programs was mentioned above, in the context of targeting future offers to customers that would likely get the most benefit most from such offerings.

Other programs planned for the coming year are:

- **Satellite ground movement data** to be assessed as a predictive tool for locating leaks and breaks across our network. If proven effective, then modelling to identify high risk areas for leaks and breaks can inform more efficient allocation of resources to address.
- **Digital Meters** co-funded by the Department of Planning and Environment. We will assess whether detailed behavioural data can be extended into less frequent metered data to better engage with our customers on water savings practices. If proven to be feasible this will provide a platform for improved and timelier customer engagement on water usage.



6. Appendix

6.1 Appendix A Reporting Requirements

Table 10 Annual Water Conservation Report requirements

Summary of requirement	Location
Clause 2.1 Water Conservation Report	
<p>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):</p> <ul style="list-style-type: none"> Sydney Water’s strategies, programs and projects relating (at a minimum) to water leakage, recycled water and water efficiency (Water Conservation Measures); Whether the Water Conservation Measures are economic; How and when the Water Conservation Measures will be implemented; The targeted water users; The expected water savings; Cost of the measure per kilolitre of water saved; The method to assess the effectiveness of the Water Conservation Measures; and The extent to which these Water Conservation Measures accord with the with the economic level of water conservation (ELWC) and the Current Economic Method; 	<p>Section 3 Section 4 Section 5</p> <p>Section 4.2 - Table 6</p> <p>Section 3.2 - Table 2 Section 4.2 - Table 6</p> <p>Section 4 – forward plan</p> <p>Section 3 Section 4 Section 5</p> <p>Section 5</p> <p>Section 4.2 - Table 6</p> <p>Section 3 - Table 2</p> <p>Section 3.2 - Table 2 Section 5</p>
<p>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:</p> <ul style="list-style-type: none"> Are economic when assessed by the Current Economic Method; May become economically efficient at a later date; Sydney Water is required to implement under Licence clause 3.1.2; Sydney Water has implemented; Sydney Water is proposing to implement at a later date (or under specific circumstances); and Sydney Water is proposing not to implement and the reasons for not implementing; 	<p>Section 4 Section 5 Section 6.2 Section 6.3 Section 6.4</p> <p>Section 4.2 - Table 6 Section 3 - Table 2</p> <p>Section 2.3 Section 5 (pilot programs)</p> <p>Section 3.2 - Table 2 Section 4.2 - Table 6</p> <p>Section 3.2 -Table 2 Section 5</p> <p>Section 2.3 Section 5 (pilot programs)</p> <p>Not Applicable for 2021- 22</p>
<p>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</p>	<p>Section 3.2 Section 5</p>
<p>Describe and explain any changes to Sydney Water’s water conservation program relative to the previous annual Water Conservation Report (where applicable);</p>	<p>Section 5</p>
<p>Outline how Sydney Water’s water conservation program relates to the Metropolitan Water Plan and its progress against the Metropolitan Water Plan;</p>	<p>Introduction Section 2.1</p>



Include information on any Water Conservation Measures researched, piloted or developed for the previous financial year (including the funds spent on these activities);	Exec Summary Section 3.2
Include information on the water conservation performance indicators (in Appendix C) for the previous financial year; <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> Quantity of Drinking Water drawn by Sydney Water from all sources, expressed in gegalitres per year (aggregate); 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); and Volume of water sourced from Recycled Water (in megalitres). 	Section 3.1 – Table 1 Section 3.1 – Table 1 Section 5.3.1 – Table 9

IPART Audit recommendation (2020-21)	
Sydney Water must update the Water Conservation Report to include more information on the development, delivery and monitoring of the program. This should include more information on how projects are first identified from the wide range of potential options, assessment of project effectiveness and monitoring of benefits. The structure of this report and content to be included should be developed in quarter three and then populated for the next water conservation report for the 2020-21 year.	Section 2.2 Section 2.3

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.



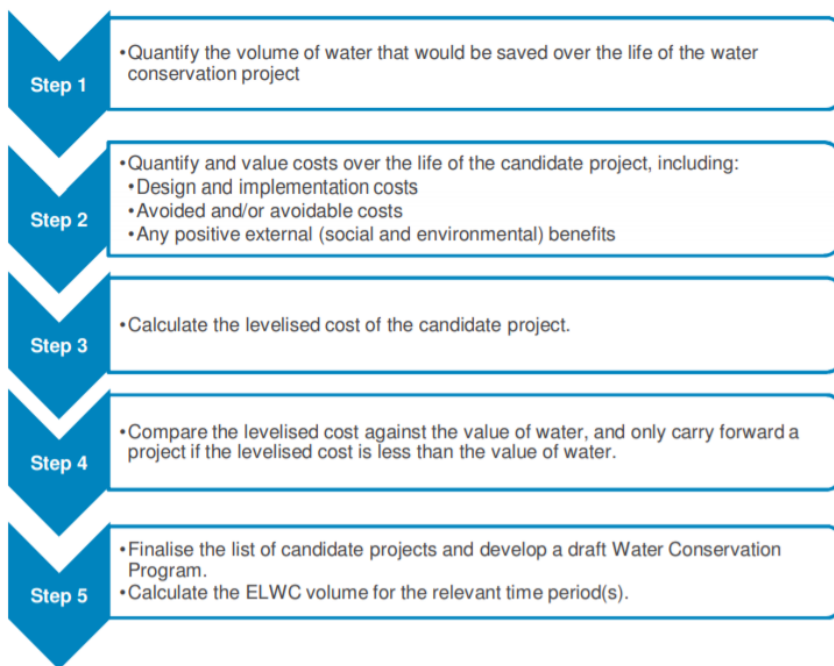


Figure 13 Economic Level of Water Conservation Process

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 less in non-drought related years.

Forecasting and monitoring water savings

The volume of water savings achieved from our water conservation programs are reviewed to support an adaptive planning approach for water conservation. It also provides evidence to inform the ELWC assessment process.

The table below summarises the status of these reviews.

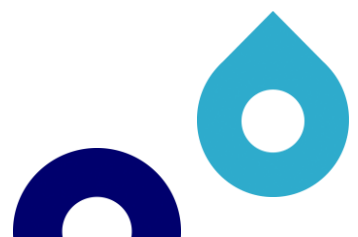


Table 11 Program reviews

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 100 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 1,200kL/property/yr on average. Savings to be reviewed in 2022-23.
WaterFix® Commercial	Assumes average savings of 15ML/site/yr based on estimate savings from early program participants. Savings to be reviewed at the end of the pilot in 2022-23
Online Monitoring (pilot)	Savings to be reviewed at the end of the pilot in 2022
WaterFix® Small Business (pilot)	Savings to be reviewed at the end of the pilot in 2022-23.
WaterFix® Schools (pilot)	Assumes average savings of 7.3 kL/site/yr based on estimated pilot results in 2019. Savings to be reviewed at the end of the pilot in 2022-23
Water Savings Partnership Phase 2 (pilot)	Water savings are estimated using site-specific findings, and a bottom-up estimation for the program impact and forward potential
Pool cover (pilot)	Assumes average savings of 33kL/cover/yr based on bottom-up estimation. Savings to be reviewed at the end of the pilot in 2022-23

6.3 Appendix C Recycled Water

Definitions and methods for calculating Drinking Water Savings have been reformed to better reflect the Drinking Water saved by Sydney Water. Recycled water schemes have been reassessed under this new method for the 2021-22 Water Conservation Report. This new method will help to reflect how much drinking water Sydney Water more accurately has saved through Recycled Water schemes.



Reclaimed Effluent and drinking water use at WRRFs will be reviewed for the 2022-23 Water Conservation Report.

Table displays Sydney Water's Recycled Water scheme's performance for the 2021-22 Financial Year.

Table 12 Drinking water savings 2021-22

Source	Recycled Scheme	Water	Recycled Water Use (ML/Year)	Drinking Water Savings (ML/Year)	Type of Use
St Mary's AWTP	Replacement Flows		4,482	0	Environmental
Water Resource Recovery Facilities	Operational reuse at water resource recovery facilities		17,415	1,851 ¹	Industrial
Wollongong	BlueScope Steel		6,477	6,477	Industrial
Rosehill	Rosehill Camelia Scheme		1,280	1,280	Industrial
Bombo	Kiama GC, Kiama		40	40	Irrigation
Castle Hill	Castle Hill Country Club		70	70	Irrigation
Gerringong	Aorangi Farm, Gerroa		63	0	Irrigation
Liverpool	Liverpool Golf Club		23	23	Irrigation
Liverpool	Warwick Farm Racecourse		117	117	Irrigation
Penrith	Penrith Council Playing Fields		0.1	0.1	Irrigation
Picton	Carlton Farm, Picton,		206	0	Irrigation
Quakers Hill	Stonecutters Ridge Gold Club, Colebee		55	55	Irrigation
Quakers Hill	Water sharing, ag release		365	0.0	Agricultural
Richmond	University of Western Sydney, Hawksbury Campus		128	128	Irrigation



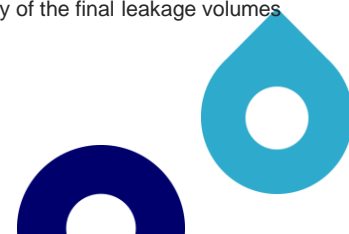
Richmond	Richmond Golf Club	29	29	Irrigation
St Mary's	Dunheved Golf Club	30	0	Irrigation
St Mary's	Water sharing, ag release	2,428	0	Agricultural
West Camden	Camden Council	1	1	Irrigation
West Camden	Elizabeth Macarthur Agricultural Institute	3	3	Irrigation
West Camden	Agricultural release	1,825	0	Agricultural
West Camden	A Smart Farmer	0	0	Agricultural
Wollongong	Wollongong Golf Course (Stage 2)	5	5	Agricultural
Wollongong	Wollongong Council (Stage 2)	1	1	Agricultural
Wollongong	Port Kembla Coal Terminal (Stage 2)	181	181	Industrial
Rouse Hill	Rouse Hill Recycled Water Scheme	2,464	2464	Residential
Combined Total		37,700	12,700	

6.4 Appendix D Leak Management

Table 13 Leakage management statistics

Key statistics	2019-20	2020-21	2021-22
Actual Leakage (refer Water balance)	124 ML/day	112.5 ML/day	121.5 ML/day
Economic Level of Leakage (ELL) Target ²³	108 ML/day	108 ML/day	108 ML/day
Number of water main breaks, bursts and leaks	6,797	4,872	4,042

²³ 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.



Number of water main breaks, bursts and leaks, per 100 km of water main	29	21	18
Average duration of an unplanned water interruption (minutes)	187	200	192
Length of mains inspected	18,001 km	12,000 km	15,455 km
Infrastructure Leakage Index (ILI)	1.50	1.31	1.37

ⓘ 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

Water Supplied						
509,068 ML						
Non-revenue Water				Revenue Water		
57,914				451,154		
Water Losses			Authorised consumption			
54,013			455,056			
Real Losses	Apparent Losses		Unbilled Authorised		Billed Authorised	
44,352	9,661		3,901		451,154	
Leakage on Mains	Meter Inaccuracy	Unauthorised consumption	Unbilled Unmetered	Unbilled Metered	Billed Unmetered	Billed Metered
44,352	9,152	509	3,706	195	2,697	448,457
(121.5 ML/day)						



7. Glossary and Acronyms

7.1 Glossary

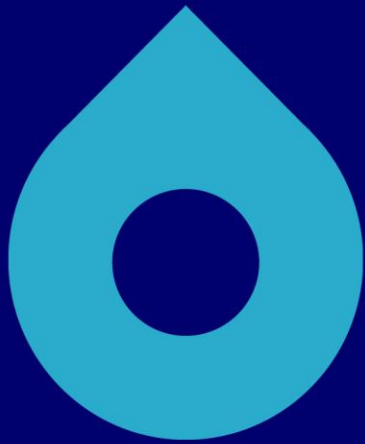
Building and Sustainability Index (BASIX)	State-wide planning policy that ensures new residential dwellings are designed to use less drinking water and produce fewer greenhouse gas emissions by setting energy and waste reduction targets. BASIX also applies to extensions and alternations of existing residential 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 will replace the existing Metropolitan Water Plan 2017 and provide 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	<p>The NSW Government 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 are now in place. They came into effect at 12:01AM on 1 December 2020.</p> <p>The rules focus on simple, common-sense behaviours such as watering lawns and garden 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</p>
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 overarching goal is to secure water for a liveable, growing, and resilient Greater Sydney. It establishes key strategies to be implemented over the life of the plan which includes, optimising the way we manage the water supply system, investing in water conservation, preparing for drought, delivering WaterSmart cities and improving river health



7.2 Acronyms

ALD	Active Leak Detection
AWA	Australian Water Association
BASICX	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
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
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





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