WATER CONSERVATION REPORT

SEPTEMBER 2022

Acknowledgement of Country

Hunter Water acknowledges the Traditional Countries of the Awabakal, Geawegal, Darkinjung, Wonnarua and Worimi peoples on which we operate and the Countries beyond where our water flows.

We recognise and respect the cultural heritage, beliefs and continuing connection to the lands and waters of our Traditional Custodians and pay respect to their Elders past, present and emerging.

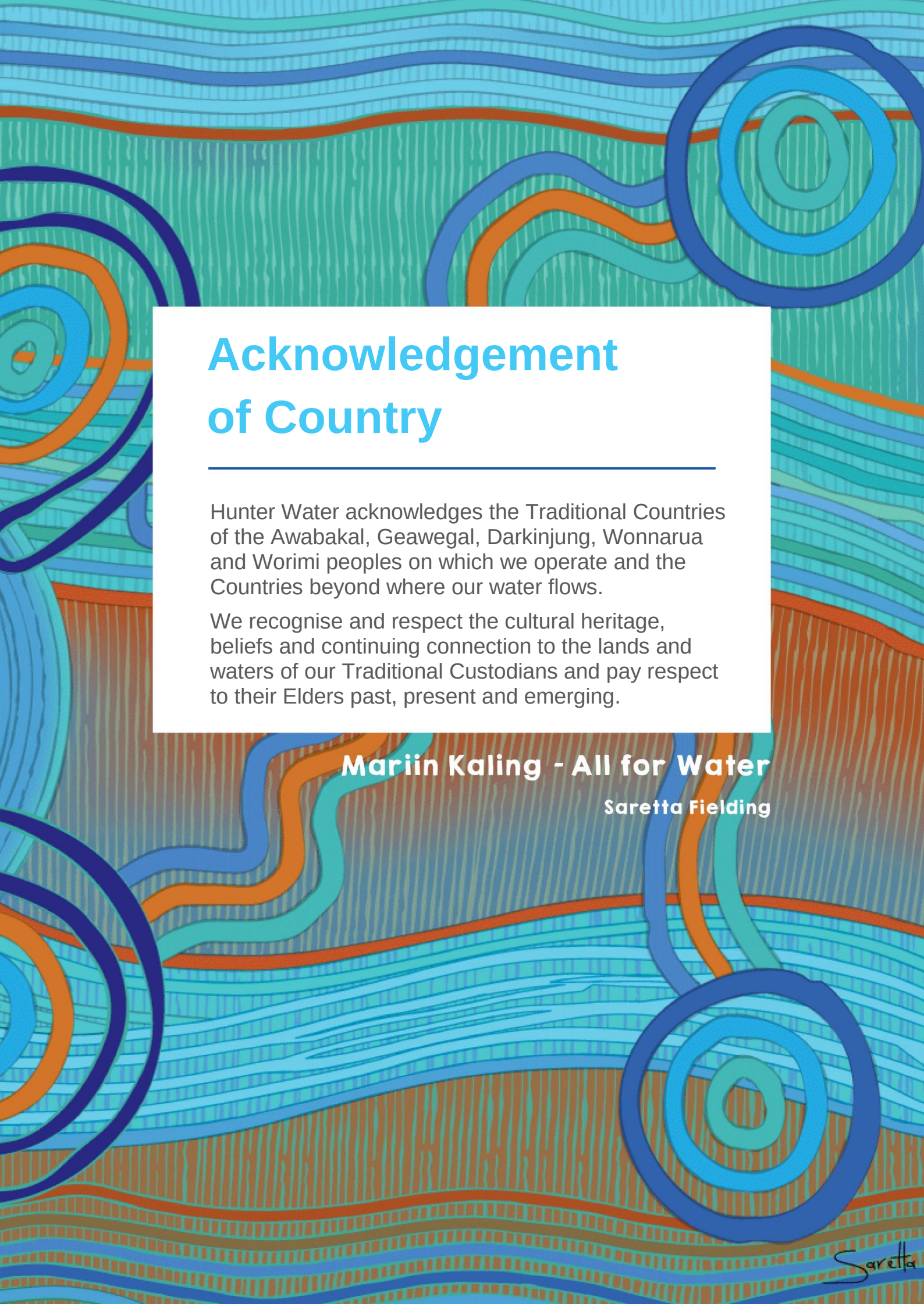


TABLE OF CONTENTS

EXECUTIVE SUMMARY

Hunter Water is a state-owned corporation that strives to be a valued partner in delivering the aspirations of our region. We provide safe, reliable and efficient water and wastewater services to over half a million people in the Lower Hunter region. Our Operating Licence is the key regulatory instrument that enables and requires us to provide our services.

This Water Conservation Report provides detailed information, in accordance with the requirements in our Operating Licence Reporting Manual, on the costs and water savings from the water conservation projects and activities Hunter Water carried out in 2021-22, as well as our water conservation plans for the next five years.

Our water conservation activities support the delivery of the recently-released Lower Hunter Water Security Plan (LHWSP). Water conservation is a key element to managing the supply and demand balance for the Lower Hunter region.

The Love Water campaign, launched early 2018, provided a brand position for Hunter Water as a leader in water conservation focus and action, and helped in significantly raising water literacy and awareness, leading to substantial behaviour change in how our community use water. The Love Water brand has since been adopted by several other utilities, nationally and internationally.

In 2021-22, customer focussed leakage and water efficiency programs saved 763 megalitres. Active leak detection, pressure management and Hunter Water asset replacement programs also continued during the year, however the Infrastructure Leakage Index (ILI) increased from 0.93 to 0.99 and real losses from 64 to 67 litres per service connection per day. The increase was primarily due to two large leaks that were difficult to locate and highlights the sensitivity of these measures to large events.

The cool wet weather has contributed to household annual water consumption in 2021-22 remaining steady at 151 kilolitres, similar to the previous year. Our community has also maintained the behaviours related to the Smart Water Choices permanent water conservation measures and the ongoing Love Water messaging. This has contributed to annual customer demand being 5.8% lower than expected when compared to pre-drought consumption trends.

Water conservation at Hunter Water targets water loss and water efficiency while seeking opportunities to introduce alternative, fit for purpose, water sources and support a more integrated approach to water planning. Water conservation initiatives are designed to focus on residential and non-residential customers and Hunter Water operational water consumption.

Hunter Water's approach to water conservation was assessed during the year against the draft NSW Water Efficiency Framework. The final version of the framework is due for release in September 2022.

INTRODUCTION

Hunter Water is a state-owned corporation that provides safe, reliable and efficient water and wastewater services to around 600,000 people in the Lower Hunter region. We also manage the trunk stormwater channels in the Newcastle, Lake Macquarie and Cessnock local government areas. We are governed by the State Owned Corporations Act 1989 and the Hunter Water Act 1991. The NSW Government regulates Hunter Water's operations through a number of regulatory bodies and instruments.

Our Operating Licence is the key regulatory instrument that enables and requires us to provide services. The Operating Licence sets the terms and conditions that specify how services are provided. It contains quality and performance standards that must be achieved. The Operating Licence makes us accountable to the NSW government for our performance, which is monitored by the Independent Pricing and Regulatory Tribunal (IPART).

This Water Conservation Report provides detailed information on our performance against Clauses 2.1.4 and 2.2.4 of the 2017-22 Operating Licence and has been prepared in accordance with the relevant sections of the associated Operating Licence Reporting Manual.

Section 1 of the report provides information on Hunter Water's overarching approach to water conservation, including how it is related to the LHWSP.

Section 2 describes and explains the water conservation activities Hunter Water carried out during 2021-22 and provides information on the volumes of water drawn from all sources, level of leakage and consumption per person.

Section 3 sets out our five-year plan for water conservation activities.

Further details of the methods used to assess water conservation options are provided in Appendix A.

Regulatory reporting requirements are provided in Appendix B along with cross-references to the location in this report that addresses each requirement.

1 WATER CONSERVATION APPROACH

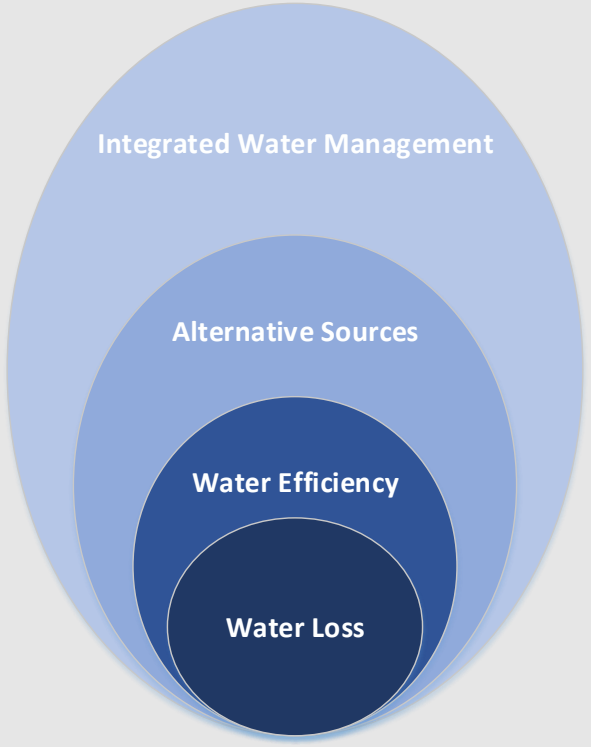
1.1 Why do we need to conserve water?

This is an important time in our water planning. The population in our region is expected to increase by around 175,000 over the next 20 years and we are seeing our climate changing. When planning for the future we need to balance the demand for water with the available supply. Decreasing our water consumption can help reduce the amount the region needs to invest in new drinking water sources and preserves this precious resource.

While the Lower Hunter's existing water supply system performs well in typical climate conditions, it is vulnerable to drought, and water storage levels can fall quickly in prolonged periods of hot dry weather. The introduction of water restrictions is a key component of Hunter Water's drought response along with a Water Conservation program that includes activities that can be easily ramped up or expanded as required during drought.

1.2 Where do we need to conserve water?

Hunter Water's approach to water conservation aims to sustainably and effectively manage water demand in a manner that responds to the expectations of our community. Our approach has four focus areas:



Integrated Water Management – ensuring that sustainable water extraction, use and treatment is fully considered when planning for, designing and building towns, cities, businesses and homes.

Alternative Sources – replacing potable water with water from alternative sources by matching end use with fit for purpose water quality.

Water Efficiency – installing more efficient fittings, appliances and equipment and changing water use behaviours to carry out the same activities but with less water consumed.

Water Loss – identifying and repairing leaking fittings and pipes and reducing evaporation and leakage from water storages.

1.3 How are we conserving water?

Water demand is generally divided into three areas:

- *Residential* – this is the water consumed by our customers in their homes and apartments and includes both indoor and outdoor use. Around 60% of the potable water produced each year is used for this purpose.

- *Non-residential* – industrial, commercial and municipal and government customers (for example local councils, schools and hospitals) consume around one quarter of the potable water produced.

- *Non Revenue Water (NRW)* – the remainder is the water used in areas such as Hunter Water operations and firefighting, or is lost due to leakage from the distribution system or theft. Non Revenue Water also occurs when metering inaccuracies mean that volume of water supplied to customers is not fully accounted for.

Hunter Water has a variety of water conservation activities and projects targeting these three areas. Each initiative aims to address one or more of the water conservation focus areas (water loss, water efficiency, alternative source or integrated water management).

Hunter Water has applied the Economic Level of Water Conservation (ELWC) methodology to determine whether initiatives are economically efficient. The methodology considers social and environmental costs and benefits in addition to the cost of the water conservation activity or project and the volume of water saved. Further details of this methodology can be found in Appendix A.2

Water conservation objectives are also an inherent part of Hunter Water's Strategic Asset Management Plan. This plan sets out the priorities, framework and process for decision making within Hunter Water – including options for water conservation and service efficiency improvements.

1.4 Who are we working with?

To be effective, water conservation programs need to achieve long-term, large-scale behaviour change with the adoption of new technologies and attitudes towards how water is used. This means that collaboration with customers, industry and government is key. Hunter Water has therefore carried out a broad range of engagement activities such as consultative forums, surveys and focus groups to help ascertain the expectations of our customers and the broader community in relation to water conservation, and to identify the potential barriers to behaviour change.

All of the customer, community and stakeholder related programs are carried out in accordance with our broader engagement approach. This approach involves listening and learning with customers to understand and appreciate their values, preferences and priorities, building strong and trusted relationships and seeking advocates and allies to help promote water conservation.

Hunter Water also recognises we have a critical role in driving water conservation outcomes by making sure water loss from the distribution system is minimised and that we are using water as efficiently as possible in our operations.

1.5 Monitoring and review

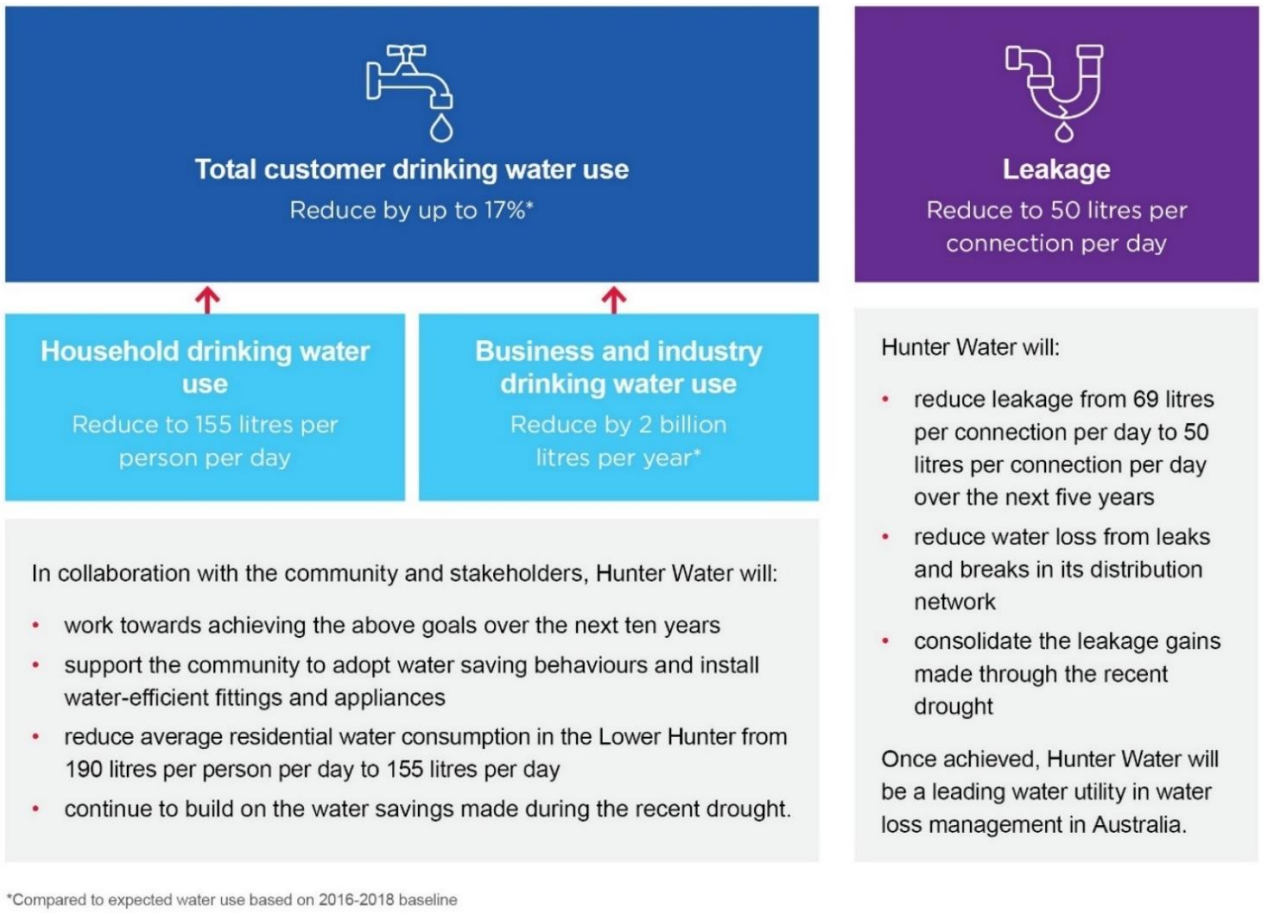
Consumption patterns at a site or population level are monitored to assess the effectiveness of each of the water conservation initiatives and the overall program. The scope and design of the program and associated activities and projects are then adjusted in response to this monitoring and, where necessary, to respond to drought.

1.6 Lower Hunter Water Security Plan

The Lower Hunter Water Security Plan (LHWSP) is a whole-of-government approach to ensure we have a sustainable and resilient water supply for our region, now and for future generations. The first plan was released in 2014 and included actions to supply, save and substitute water; as well as additional measures to respond to droughts when they occur.

A review was carried out to ensure the LHWSP reflects our changing community values and priorities, while being both robust and adaptable in the long term. Hunter Water investigated new sources of water and new ways to conserve water, so we can effectively balance water supply and demand in our region. The updated LHWSP was released by the NSW Government in April 2022.

The LHWSP has set ambitious water conservation goals in relation to customer drinking water use and leakage. The conservation program described in this report is aligned with the goals set in the LHWSP.



2 OUR PERFORMANCE IN 2021-22

2.1 Volumes of water sourced and supplied

In 2021-22, Hunter Water supplied 66,925 million litres (or 66.9 gigalitres) of water. The sources of extracted water are listed in Table 2.1. Of this, 3.1 gigalitres of recycled water was supplied for non-potable end uses. Water usage statistics are shown in Table 2.2.

Table 2.1 Sources of water supplied by Hunter Water in 2021-22 (megalitres)

Source of water	Volume sourced in 2021-22	Proportion in 2021-22
• Surface water[1]	60,260	89%
• Groundwater[1]	3,708	5%
• Received from other service providers or operational areas within the urban water system (ML)[1]	799	1%
• Recycled water [1,2]	3,132	5%
Total water sourced	67,899	100%
• Water returned to surface water and groundwater from the urban water supply system[3]	974	
Total water supplied[1]	66,925	

Notes: Figures may not add exactly due to rounding.

1. National Performance Report indicators W1, W2, W5, W7, W26
2. An additional 3,644 ML was supplied to Water Utilities Australia (another service provider). NPR Indicator W15
3. Losses at water treatment plants. NPR Indicator W31

Table 2.2 Usage of water supplied by Hunter Water in 2021-22(megalitres)

Water Usage	Volume Supplied in 2021-22	Proportion in 2021-22
Potable Water		
• Residential sector[1]	37,753	58%
• Non-residential sector[1]	15,211	23%
• Other service providers[1]	2,792	4%
• Non-revenue water[1]	8,987	14%
Total potable water supplied	*64,748*	*100%*
Observed average potable water use per person[3]	283 Litres a day (or 103 kL a year)	
Weather corrected average per person potable water demand[4]	310 Litres a day (or 113 kL a year)	
Recycled Water		
• Residential sector[1]	86	3%
• Non-residential sector[1,2]	3,046	97%
Total recycled water supplied	*3,132*	*100%*

Notes: Figures may not add exactly due to rounding.

1. National Performance Report indicators W8.3, W9.3 (with non-revenue water removed to prevent double counting), W14.3, W10.1, W20 and W21 which are all based on the April to April water year.
2. This doesn't include the 3,644 ML of recycled water supplied via Water Utilities Australia
3. Financial year consumption corrected for transfers to and from other service providers, includes residential, non-residential and non-revenue water
4. This figure is calculated on a comparable basis to the weather corrected average per person water demand reported by Sydney Water

Residential customers used on average 170 litres per person per day in 2021-22 in their homes, a slight increase on the 168 litres per person per day recorded in 2020-21. When all of the potable water supplied by Hunter Water is considered (residential, non-residential and NRW), the equivalent of 283 litres per person per day was used during the year, up from the 2020-21 figure of 281 litres per person per day.

Climatic conditions have a strong influence on the levels of customer water use, mainly because they affect outdoor and cooling tower use. Water use by residential customers is seasonal, with higher use over summer months. Changes in weather can vary annual water consumption by up to 7% compared to consumption under average weather conditions.

The purpose of weather (or climate) correction is to remove, as much as we can, the impact of climatic variations as an influencer on water usage. This helps us determine how much water would have been used under 'average weather conditions'. This is important, as year-to-year total demand figures may show significant variation. Weather correction is necessary to monitor and identify underlying demand trends.

Figure 2.1 shows the long-term trend in observed and weather-corrected water demand. Although population increased by 28% between 1991 and 2012, demand for water actually decreased over that time. Weather-corrected water demand remained relatively constant between 2012 and 2019 while a 9% population increase was observed.

Weather-corrected water demand increased during 2021-22 due to the ongoing softening of residential customer behaviour but did not return to previous levels due to the impacts of Covid 19 and water saving behaviours retained post restrictions. It is estimated that wetter weather in 2021-22 resulted in a 2.7 GL decrease in demand compared to what would be expected in a year with average weather conditions.

Figure 2.1 Observed and Weather-Corrected Total Demand

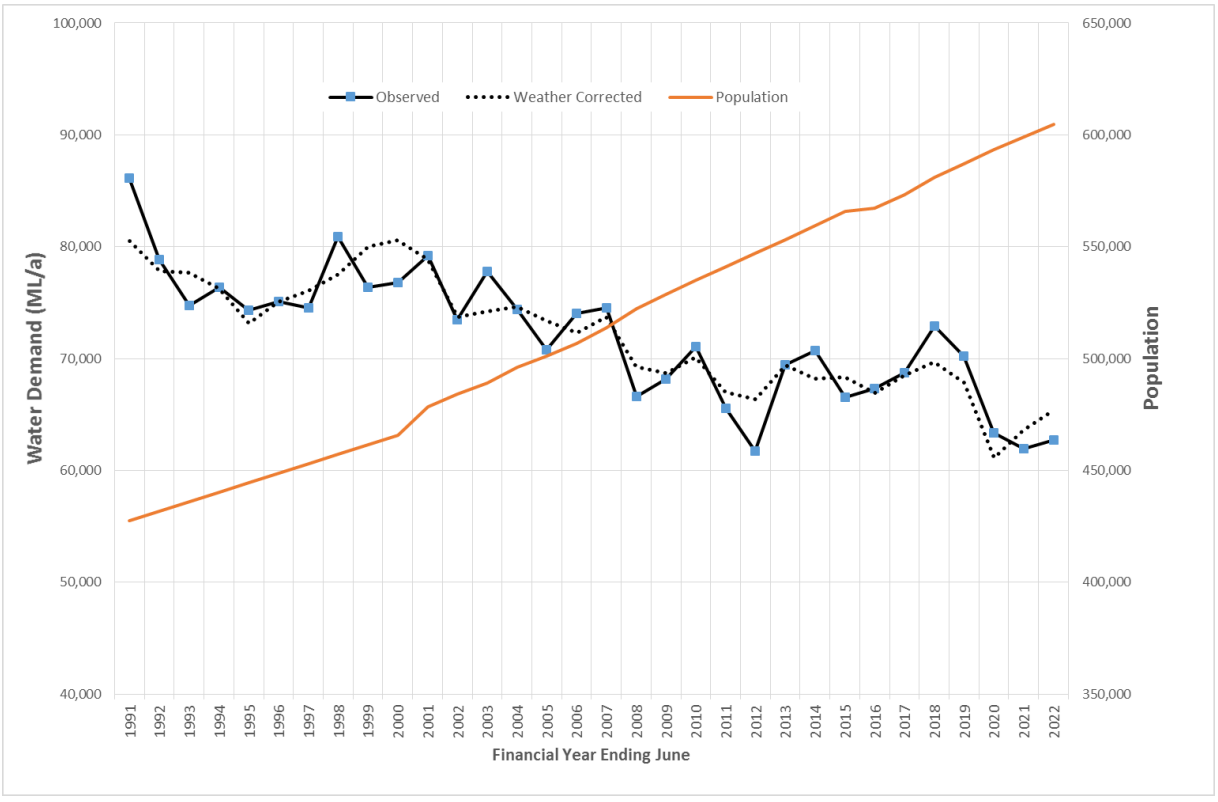


Figure 2.2 shows the long-term trend in both observed and weather-corrected per capita demand.

Figure 2.2 Observed and Weather-Corrected Per Capita Demand

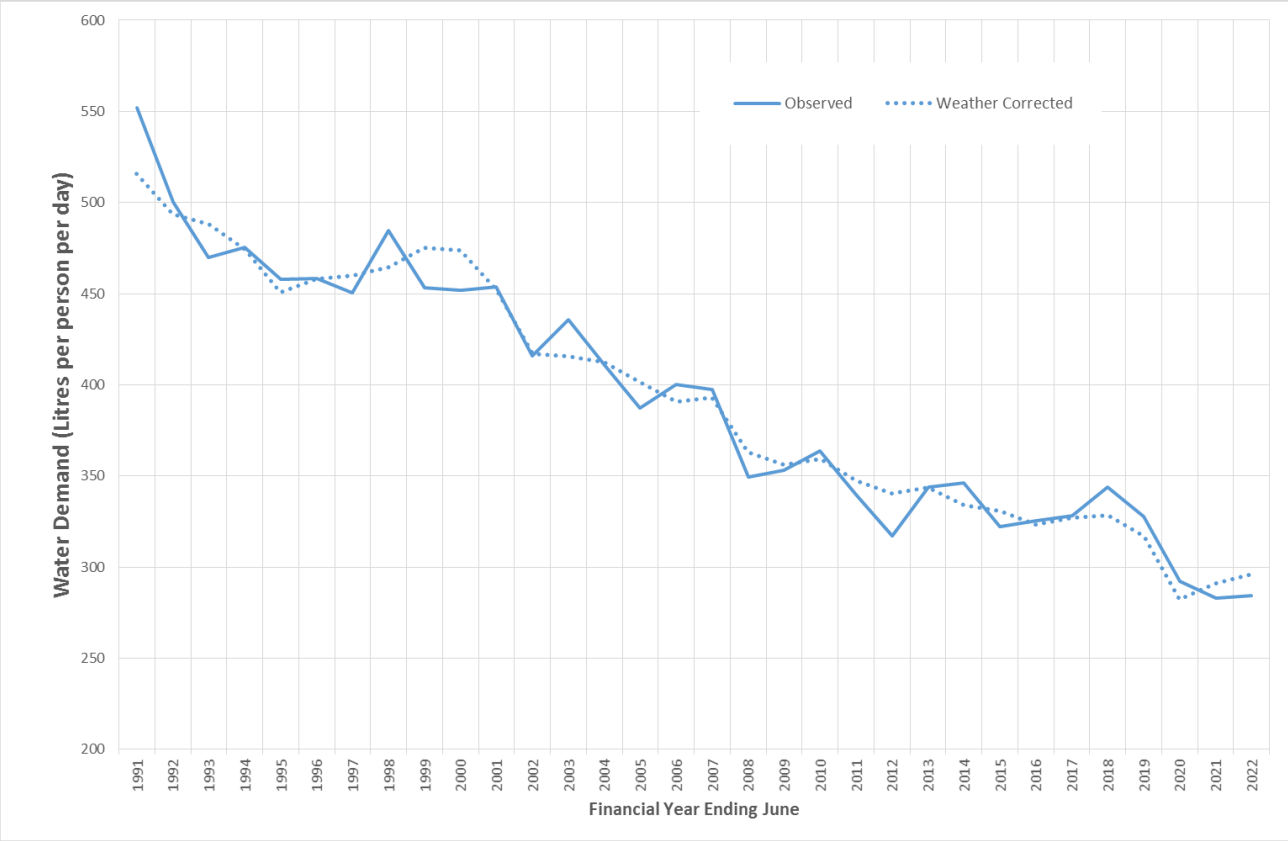


Figure 2.2 suggests that weather-corrected per capita demand has been relatively stable between 2015 and 2019. There was a significant reduction in weather-corrected per capita demand in 2019-20 due to the influence of water restrictions. That result has rebounded slightly during the last two financial years however remains well below pre-restriction levels. The wetter-cooler weather in 2021-22 caused around 12 litres per person per day less water to be used than would be expected in an average climatic year.

In 2021-22, the Infrastructure Leakage Index (ILI) increased from 0.93 to 0.99 and real losses from 5.6 gigalitres in 2020-21 to 6.0 gigalitres in 2021-22. All of the leakage projects and programs carried out in 2021-22 were assessed using the Economic Level of Water Conservation (ELWC) methodology.

2.2 Water conservation upstream of water treatment plants

Hunter Water extracts water from the Williams, Paterson and Allyn Rivers as well as groundwater sources under conditions specified in our Water Licence and approvals package issued under the *Water Management Act 2000.* Figure 2.3 provides an overview of Hunter Water's raw water storage, treatment and transmission assets.

Figure 2.3 Hunter Water storage, treatment and transmission network

2.2.1 Source Operating Strategy and Bulk Supply Procedure

Hunter Water's Source Operating Strategy ensures that our bulk water sources are operated in a manner that maximises water storage levels, while also considering source water quality and ensuring compliance with regulatory requirements that govern the operation of the bulk water assets. The Strategy comprises procedures that guide operational decisions in areas where Hunter Water has discretion. These decisions relate to how much water should be supplied from particular sources, and how much water to transfer from the Williams River into Grahamstown Dam.

The key mechanism related to water conservation within the Source Operating Strategy is the Bulk Supply Procedure.

The Bulk Supply Procedure specifies the target rates of supply from the major bulk surface and ground water sources that are used by Hunter Water. This procedure, which was reviewed in 2019, reflects source operating rules developed as part of the 2014 Lower Hunter Water Plan and the 2014 Tomaree Peninsula Drought Strategy. These operating rules are designed to minimise the risk of the bulk water sources running out of water. Some sources have explicit rules governing their use, including Chichester Dam, Tomago Sandbeds and the flowrate in the Tomago to Tomaree pipeline.

Decisions relating to which raw water source to use at Gresford (which can be supplied by either the Allyn River or Paterson River) are specified in the relevant Water Supply Work and Water Use Approvals.

2.2.2 Evaporation reduction

In 2020 a review was carried out of the various methods available for covering the surface area of dams to reduce evaporation. The review identified four that warranted further investigation. A controlled trial of the technologies is planned to collect data on effectiveness and potential water quality and environment impacts.

Extraction from various ground and surface water sources is managed to minimise the overall risk of depletion, this includes losses due to evaporation.

2.2.3 Leakage in storage and transmission infrastructure

Leakage is a consideration of the Asset Management Plans for raw water assets. A summary of existing programs to manage leakage is summarised below:

- Condition assessments are periodically carried out on the dams and downstream raw water mains. These assessments monitor the overall condition of the assets and inform the program of management initiatives included in Asset Management Plans.
- Routine inspections are carried out on the above ground sections of the Chichester Trunk Gravity Main (CTGM) upstream of Dungog Water Treatment Plant. These inspections focus on leakage, general condition of the main and access.
- Daily inspections are undertaken at the Chichester and Grahamstown Dams with results reported monthly to the Dams Committee.
- Leakage from borefields raw water infrastructure is managed through the preventative maintenance assessment plan.

2.3 Water conservation within & downstream of water treatment plants

After water storage levels reached a 40 year low in February 2020, rain events between March and August contributed to storages slowly climbing back towards normal operating levels. Water restrictions which had been implemented over the previous 12 months were therefore replaced on 1 October 2020 with Smart Water Choices. These permanent water conservation measures have accompanied a range of activities within and downstream of water treatment plants. An overview of these activities is provided below.

2.3.1 Residential

All of Hunter Water's water conservation activities are positioned under the Love Water brand to ensure alignment with the clear, consistent message of the value of water. This message was balanced with also providing the 'how' customers could save water in their homes and gardens.

Almost 100 customers were contacted about potential leaks on their property. These were leaks that had been identified by Hunter Water during acoustic surveys of the water distribution network. It is estimated that the proactive notification potentially saved around 54 megalitres of water from being lost through concealed leaks underground and in toilets, taps and pipes in homes around the Lower Hunter.

A partnership between NSW Land and Housing Corporation (LAHC) and Hunter Water delivered water efficiency upgrades and water leak repairs to more than 1,300 social housing properties. Tenants in these properties had more efficient toilets, taps and shower heads installed, helping them to reduce their water and electricity costs.

Hunter Water also collaborated with NSW Department of Planning and Environment on a trial which provided social housing tenants the opportunity of purchasing a new highly efficient washing machine at a heavily discounted price. Participants in the trial were able to replace inefficient top loaders with energy and water efficient front loaders helping them save money on water, electricity and detergent. More than 200 households benefited from this offer in 2021-22 and it is expected more than 400 will have participated by the end of the trial.

Community Water Officers monitored compliance with permanent water conservation measures. Over the year there were 24 reported breaches, and 96 conditional exemptions or permits were issued to customers seeking to fill pools or carry out other water related activities generally not permitted under restrictions. Covid 19 impacted on the number of face to face interactions and attendance at community events however phone calls, emails and letterbox drops were used extensively.

Community engagement and the promotion of water conservation behaviours were key in encouraging customers to not only comply with Smart Water Choices but to also reduce their consumption in other ways. The community responded positively to the campaigns with total demand in 2021-22, 3,210 ML or 5.8% lower than what would normally be expected under the weather conditions experienced during the year. An overview of the engagement and communications initiatives is provided in Table 2.3.

Table 2.3 Water conservation community engagement programs & partnerships in 2021-22

Description	Actions in 2021-22
Love Water Campaign	We introduced a new phase of the Love Water campaign to build on previous water conservation messaging including Smart Water Choices. A three-part video ad for TV and digital has focused on 'the value of water'. The campaign strategy increased presence in the market during the spring and summer periods. Both awareness and behaviour change across the community was strong during this time. With heavy rain and flooding during autumn and winter, our campaign activity was significantly reduced in the market.
Education Program	As part of Hunter Water's ongoing early childhood program, we offer an interactive and entertaining show called 'Let's Love Water'. This show is free of charge to Lower Hunter schools as part of Hunter Water's ongoing commitment to water saving education in its many forms. More than 4,000 primary and pre-school students learnt about water from attending the show this year. 'Waterworld' was launched with High Schools in November to encourage 4 minute showers among a segment in the community that typically spends more than 10 minutes in the shower each day. Waterworld is a web-based app where students compete against their classmates to take 4 minute showers for 28 days, while learning about water scarcity issues here in the Hunter, nationally and globally. Engagement with schools continued to be impacted by Covid-19 in the 2021-22 financial year. In response we continued to develop and promote our digital resources and engage with schools virtually and in person when possible. We continue to partner with Local Land Services and organisations such as Hunter Young Business Minds Awards to integrate water conservation messaging and education in broader sustainability programs.
Hunter Water Website	Our website includes a dedicated 'How to Save Water' section under 'Home and business' that provides information on how to be water efficient in the home and garden, and in business. The tips and information provided complement the Love Water objectives. The carousel on the website homepage has consistently included promotion of water conservation habits and benefits seeking to connect with customers at an emotional level. Our online water usage calculator has also continued to be popular attracting more than 533,000 views, indicating our community is thirsty for more when it comes to understanding their water use behaviours.
Community Events	Once again, COVID-19 limited our ability to execute our planned community events program. Even so, we did support community events including the Newcastle Show, Maitland Show, Surfest and the Girls Day Out Women in Sport. These opportunities allowed for us to engage our community and ensure we had a presence to communicate the value of saving water. At both the Maitland and Newcastle Shows, our 'Let's Love Water' show provided an educational water conservation presence for school-aged audiences. During National Water Week in October, we focussed attention on the second annual Love Water Day on the Saturday as an online event. We called on our community and encouraged advocates to share on social media channels how they value and conserve our most precious resource. Considering the ongoing impact of COVID-19 on face-to-face events, we continue to explore interactive tools to engage with our community, gather feedback and promote water conservation.
Media – Awareness Raising	In our media messaging during 2021-22 we emphasised the need for households to be water efficient, led by messaging from our Love Water campaign, with reinforcement from reiterating the actions under Smart Water Choices. Our awareness campaign included television commercials, radio, print and digital advertising as well as regular editorially gained content in mainstream media and feature segments in locally produced TV shows. This was supported by an active and growing social media presence.

Description	Actions in 2021-22
Community Funding Program	In 2021-22, in the strongest field of applications ever received through the Love Water Grants program, we supported 14 organisations, each with a share of $100,000. Each successful project contributed to both water conservation through infrastructure support, as well as community education and advocacy, where we will see continued benefits in years to come.
Support of WELS	We continued to support the Water Efficiency Labelling & Standards (WELS) scheme for household appliances by including information on WELS under the 'How to save water' section of the Hunter Water website and through our customer communications. In addition, Hunter Water attended several community events to promote and encourage householder uptake of water efficient products.
Smart Water Advice	Ongoing collaboration with the Water Conservancy (formerly Smart Approved WaterMark) has meant that we have been able to adopt, embed and link to the latest best practice water efficiency advice on our website.

2.3.2 Non-Residential

During 2021-22 there were 60 temporary data loggers deployed to help identify leaks at Hunter Water sites and on customer assets including hospitals, schools, council and business sites. This was in addition to the 281 permanent data loggers rolled out across major and large industrial and commercial customers and the 19 government schools, 40 Catholic schools and 2 independent schools (61 total) that have permanently installed data loggers to assist with the early detection of leaks and irregular usage. Water savings of 594 megalitres were achieved during the year through the repair of leaks and faulty valves and operational improvements identified as a result of this Find & Fix initiative.

Hunter Water has continued to work with 180 large and major non-residential customers to assist them prepare and implement Water Efficiency Management Plans (WEMPs). This has included detailed water audits of their businesses to help identify water savings that can be achieved through improved operational processes, leak repairs, fittings upgrades, cooling tower and irrigation system improvements and the use of alternative water sources. In 2021-22 customers have gone on to implement a number of these activities, saving 169 megalitres of water.

Collaboration with the six local councils in our area of operations has also continued post drought. This has included the preparation of a best practice guide for turf management to assist councils reduce water use without compromising the aesthetics and functionality of parks and sports fields. In addition, consultative groups have been formed with Councils across three key sectors: Strategy and Planning, Operations and Facilities and Communication and Engagement. These groups provide the opportunity to bring together conservation initiatives between and in conjunction with Lower Hunter Councils and provides consistency in water conservation messaging across the region.

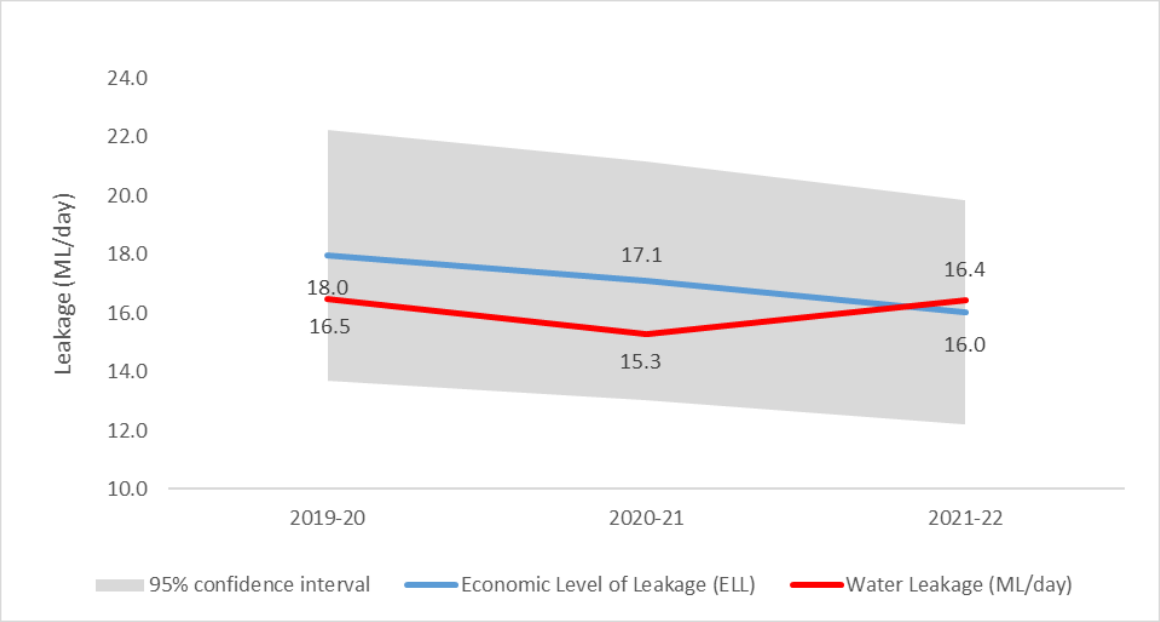
2.3.3 Reducing Hunter Water Leakage & Consumption

Hunter Water implements programs to reduce the frequency and size of leaks. These programs include:

- Active leakage control
- Pressure management
- District metered areas
- Repair of point sources

Leakage programs are justified based on achieving an Economic Level of Leakage (ELL) which 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 with the aim of reducing leakage to the ELL within 95% confidence interval. Hunter Water's ELL for 2021-22 has been calculated in accordance with the ELWC methodology approved by IPART in August 2019. Leakage performance is shown against the ELL in Figure 2.4, .

Figure 2.4 Actual leakage vs the Economic Level of Leakage (ELL) in our system



Non revenue water, including leakage, increased in 2021-22 by approximately 730 ML compared to the previous year. This was in part due to a large, water main break that was not identified for a number of weeks due to the location and wet conditions at the time.

Water loss activities during 2021-22 included:

- The survey of more than 5,700 km of water mains was completed using active leak detection technology to identify over 1,400 leaks, many of which were hidden from sight.
- Pressure management (permanent) – a program to implement pressure management zones specifically to address leakage and existing high pressure areas across the distribution network. Detailed design of new areas continued during 2021-22 however some delays have been experienced and further delays are also anticipated in delivery of these projects due to global supply issues.
- Pressure management (seasonal) – system pressures are being reduced across two water supply zones during lower demand periods (cooler months) to reduce leaks and main breaks in these zones. Seasonal pressure management is implemented through operational changes to reservoir levels.
- District Metered Areas – a program to implement DMA monitoring across 100% of the water distribution network through the installation of new flowmeters was approved for the 2020-24 Price Path period. DMAs are now in place across 45% of the network.

- Point Sources – a large leaking trunk main in Louth Park has been identified for replacement.
- Opportunities to replace potable water supplies and implement water efficiency improvement works were identified at Shortland and Edgeworth Wastewater Treatment Works. Work on this will commence in 2023.

There are a number of other works that support water loss management but are justified through other drivers and include:

- Water main replacement program – the ongoing replacement of reticulation mains with a history of multiple breaks or leaks recorded. The replacement of water mains is primarily driven by asset lifecycle costs, however the value of the water lost through leaks and breaks is also taken into consideration.
- Water service replacement program –the ongoing replacement of service mains (pipe located between the reticulation main and customer meters) that have previously failed. The replacement of water services is primarily driven by asset lifecycle costs, however the value of the water lost through leaks and breaks is also taken into consideration.
- When water mains do break, we can influence the quantity of water lost by promptly responding to and rectifying the break.

2.3.4 Alternative Sources

Recycled water forms an important part of our supply 'portfolio' by utilising these resources in applications where drinking-quality water is not required.

Hunter Water operates 19 wastewater treatment plants and two recycled water treatment plants across the Lower Hunter. Hunter Water has 16 recycled water schemes which provide water for irrigation, agriculture and industry. About 11 per cent of effluent is treated to a recycled water standard and supplied to recycled water users.

We consider recycled water to be a water conservation initiative when recycled water is provided instead of drinking water. A summary of our recycled water scheme performance in 2021-22 is provided in Table 2.4. As a result of recycled water operations, approximately 5,733 ML of drinking water was conserved. Our plant and supply locations are shown in Figure 2.5. We also used recycled water for internal purposes at our own wastewater treatment plants.

In 2021-22, Hunter Water began design work for a recycled water irrigation scheme that will provide water to playing fields in Edgeworth and Cameron Park. The project, in partnership with Lake Macquarie City Council, will ensure that community parks and sporting fields are kept green, even in future drought. Hunter Water has undertaken studies for recycled water supply for irrigation, industrial, residential and agricultural uses.

Hunter Water continues to engage with stakeholders, including council and the community, about how we value the social, environmental and resilience benefits that recycled water provides. Reflecting the true value that recycled water provides will ensure that beneficial recycled water opportunities are not overlooked.

Hunter Water commissioned on-site reuse at two of our wastewater treatment plants in 2021-22. This will result in less drinking water being used as process water at Hunter Water's wastewater treatment plants.

Figure 2.5 Hunter Water's water recycling operations

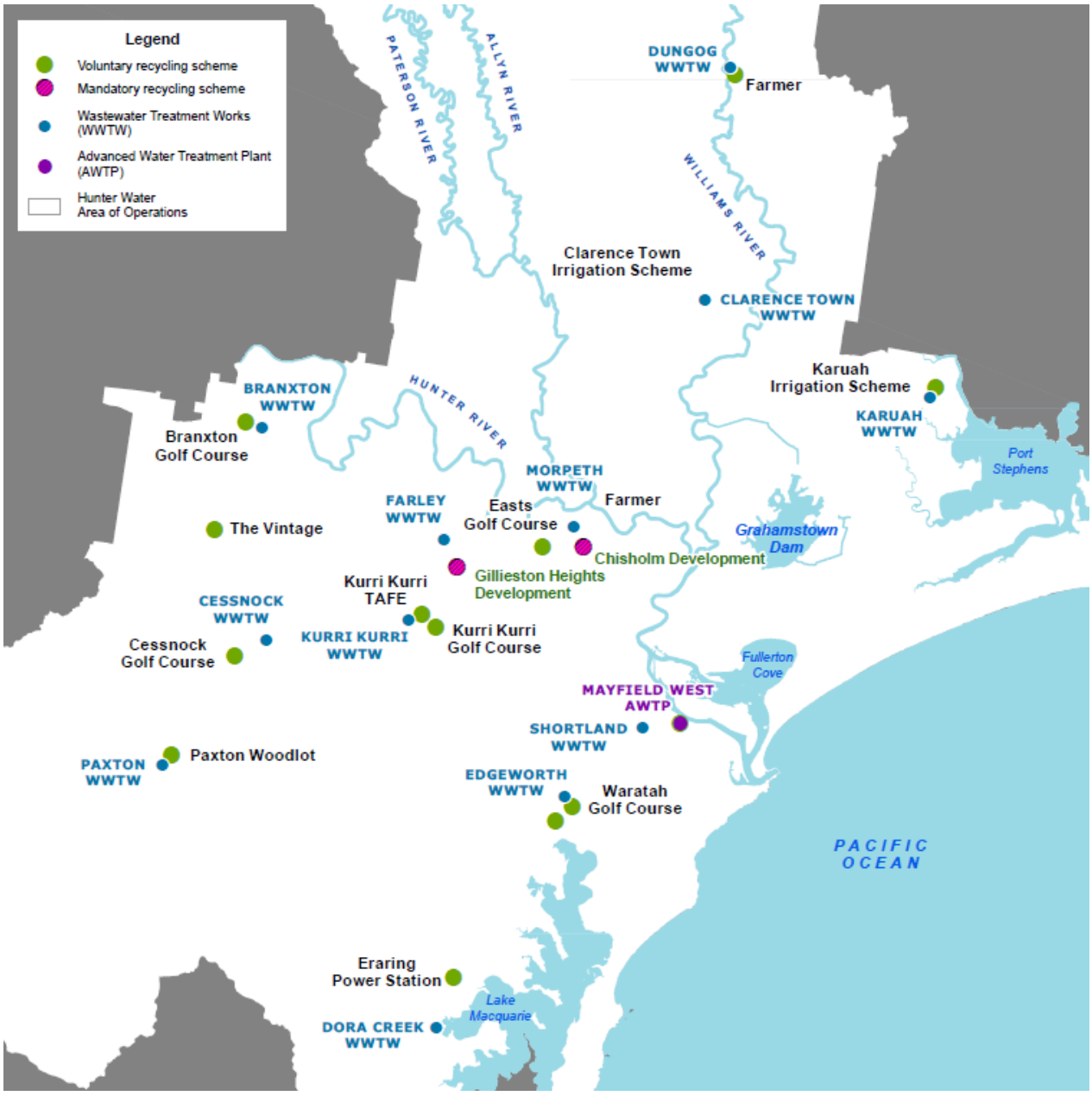


Table 2.4 Hunter Water's recycled water schemes

Recycled water source	Recycled water use	2021-22 reuse volumes (ML)	2021-22 drinking water replaced (ML)
Branxton WWTW	Branxton Golf Course & The Vintage Golf Course	109	109
Cessnock WWTW	Cessnock Golf Course	31	31
Clarence Town WWTW	Clarence Town Irrigation Scheme	42	-
Dora Creek WWTW	Eraring Power Station	845	845
Dungog WWTW	Local farmer	351	-
Edgeworth WWTW	Waratah Golf Course	65	65
Farley RWTP	Gillieston Heights dual reticulation	63	63
Karuah WWTW	Karuah Irrigation Scheme	85	-
Kurri Kurri WWTW	Kurri Kurri Golf Course and Kurri Kurri TAFE	15	15
Shortland WWTW	Water Utilities Australia	3,644	3,644
Morpeth WWTW	Easts Golf Course and local farmer	33	33
Morpeth RWTP	Chisholm dual reticulation	24	24
Paxton WWTW	Paxton Woodlots	16	-
Indirect agricultural reuse[1]	Downstream irrigation users	549	-
On-site reuse	Process water at Hunter Water WWTWs	904	904
Total		**6,776**	**5,733**

Notes:
1. Indirect agricultural reuse includes discharges from Cessnock WWTW and Farley WWTW to downstream watercourses that are beneficially used for agricultural irrigation. Estimates are determined based on weather conditions throughout the year and calculated irrigation rates for downstream users.

3 FIVE YEAR WATER CONSERVATION WORK PROGRAM

3.1 Program Overview

The following table provides an overview of the water conservation projects and activities that have been considered as part of Hunter Water's approach to water conservation. These include updates from reviews and feedback received during the development of options for the Lower Hunter Water Security Plan. Further details are provided in Section 3.2.

Table 3.1 Water Conservation Projects and Activities

Activity / Project	Levelised Cost[1]	Value of water saved[2]	Economically efficient[2]	Forecast extent (per year)	Water savings potential[3] (ML/yr)
Residential					
Essential Plumbing Assistance	$0.63/kL (HWC) $0.63/kL (societal)	Short-run	At all times	50 households	51
Leak Repair Assistance Rebate	$0.62/kL (HWC) $0.85/kL (societal)	Short-run	When storage level below 70%	500 households	473
DIY Rainwater Tank Tune-Up	$0.21/kL (HWC) $24.65/kL (societal)	Intermediate	When storage level below 30%	400 households	29
Rainwater Tank Repair Assistance Rebate	$3.55/kL (HWC) $7.05/kL (societal)	Intermediate	When storage level below 50%	4,000 households	531
Rainwater Tank Repair Assistance & Retrofit Rebate	$5.02/kL (HWC) $8.38kL (societal)	Intermediate	When storage level below 50%	4,400 households	663
Efficiency Upgrades – Minor Fittings Rebate	$0.48/kL (HWC) $2.71/kL (societal)	Intermediate	When storage level below 70%	3,300 households	1268
Efficiency Upgrades – Major Items Rebate	$3.81/kL (HWC) $7.01/kL (societal)	Intermediate	When storage level below 60%	3,400 households	354
Multi-Res Monitoring & Audits	$1.83/kL (HWC) $2.74/kL (societal)	Intermediate	When storage level below 70%	2 sites	11
Love Water	$1.29/kL (HWC) $1.29/kL (societal)	Short-run	When storage level below 70%	All customers	590
Community Water Officers	$1.60/kL (HWC) $1.60/kL (societal)	Short-run	When storage level below 70%	3,600 sites	72
Non-Residential					
Find & Fix	$0.36/kL (HWC) $0.44/kL (societal)	Short-run	At all times	20 sites	641
Large & Major WEMPs & Audits	$0.60/kL (HWC) $1.00/kL (societal)	Varies	At all times	10 sites	600

[1] In the ELWC method, the levelised cost from a societal perspective is compared with the value of water saved (societal levelised costs include those incurred by Hunter Water, program participants and the community). The levelised cost to Hunter Water has been included for transparency purposes.

[2] The life of the project is set by the total length of time that water conservation benefits are expected to be realised from the project investment. In the ELWC method, water conservation projects with a life of 6 to 14 years are compared with the 'intermediate' value of water saved. The intermediate value of water saved is a linear interpolation between the short-run value of water (which is based on the prevailing water storage level) and the long-run value of water saved ($2.52/kL in $2021-22). The short-run value of water when the storage level is greater than 79% is $0.66/kL ($2021-22), when at 70-79% water storage level it is $0.70/kL ($2021-22), when at 60-69% water storage level it is $3.71/kL ($2021-22) and when at 50-59% water storage level it is $8.63/kL

[3] Average annual savings for the Residential and Non Residential initiatives have been assessed over a 40 year period.

Activity / Project	Levelised Cost[1]	Value of water saved[2]	Economically efficient[2]	Forecast extent (per year)	Water savings potential[3] (ML/yr)
Medium, Large & Major WEMPs, Audits & Efficiency Grants	$0.57/kL (HWC) $0.82/kL (societal)	Varies	At all times	20 sites	1300
Local Council Water Resilience & Audits	$3.25/kL (HWC) $3.70/kL (societal)	Intermediate	When storage level below 70%	5 sites & 6 councils	27
School WEMPs	$1.43/kL (HWC) $2.17/kL (societal)	Intermediate	When storage level below 70%	25 schools	95
Targeted Business Support & Awards Program	$0.73/kL (HWC) $3.27/kL (societal)	Intermediate	When storage level below 70%	150 sites	118
Non Revenue Water					
Active leak detection survey – 22 month return frequency	< $0.62/kL	Short-run	Yes	Approximately 2,790 km/yr*	675
Active leak detection survey – 10 month return frequency	> $0.62/kL	Short-run	No	Approximately 3,633 km/yr*	975
Pressure management	≤ $2.46/kL	Long-run	Yes	25 sites	692
District metering	≤ $2.46/kL	Long-run	Yes	100% of network (by 2024)	1012
Point sources	≤ $2.46/kL	Long-run	Yes	Various	511
Research and Development					
Evaporation Management			Not measurable		
BASIX optimisation			Not measurable		
Behaviour change			Not measurable		

* A total of approximately 5700km of active leak detection was undertaken in 2021/22.

Table 3.2 provides a summary of the water conservation initiatives that were assessed as being efficient at a water storage greater than 80% or that have other important community or customer benefits and have therefore been included in our current five year program. Should the water storage level fall below 80%, additional initiatives will be added to the program.

Our ELWC for the next five years is 13.2 ML/day. This means that investment to reduce demand beyond this volume is not considered to be economically beneficial (see Appendix A2 for further explanation). This increase in the ELWC, from the 12.8 ML/day assessed on 1 July 2021 for the 2021-22 Water Conservation Report, is due to a growing population and variety of additional initiatives being commenced to support the LHWSP goals. Investment in previous years has also provided foundational equipment and relationships to support greater levels of water efficiency and water loss reduction over the next five years.

The overall five year program has the potential to reduce demand by 15.9 ML/day, which is 2.7 ML/day above ELWC. The additional expenditure above ELWC relates to initiatives that support the goals and objectives of the LHWSP. These include reducing customer drinking water consumption by 17% over the next ten years, meeting community expectations and preferences for a strong focus on water conservation and creating a broad foundational program that allows us to quickly and effectively respond to drought.

Table 3.2 Water conservation program for 2022-23 to 2026-27 based on the current value of water

Activity / Project	Status[4]	Predicted Water Savings (ML/year) [5]					
		2022-23	2023-24	2024-25	2025-26	2026-27	TOTAL
Residential							
Essential Plumbing Assistance	Ongoing – efficient	27	36	45	46	46	200
Leak Repair Assistance	Proposed – other drivers	0	46	139	233	329	748
Fittings Upgrades	Proposed – other drivers	0	69	207	348	490	1113
Multi-Res Monitoring & Audits	Proposed – other drivers	0	1	3	4	5	13
Love Water	Ongoing – other drivers	480	487	494	502	509	2472
Community Water Officers	Ongoing – other drivers	72	72	72	72	72	360
Non-Residential							
Find & Fix	Ongoing - efficient	750	875	1000	875	750	4250
Large & Major WEMPs & Audits	Ongoing - efficient	650	646	643	674	752	3334
Local Council Water Resilience & Audits	Ongoing – other drivers	25	28	30	33	35	150
School WEMPs	Proposed – other drivers	0	12	24	36	48	120
Non Revenue Water							
Active leak detection	Ongoing - efficient	975	975	975	675	675	4275
Pressure management	Ongoing - efficient	369	554	738	923	923	3507
District metering	Ongoing - efficient	569	931	1349	1349	1349	5547
Point sources	Ongoing - efficient	341	511	681	681	681	2894
Research and Development							
Evaporation Management	Technology Review	Not applicable					
BASIX Optimisation	Feasibility Study	Not applicable					
Behaviour Change	Research Project	Not applicable					
Total possible ELWC water savings (ML)		3681	4528	5431	5223	5176	24007
Total potential water savings (ML)		4258	5243	6400	6451	6664	28983
						ELWC (ML/day)	**13.2**
						Total potential (ML/day)	**15.9**

[4] Total storage level was 100% as of 1 July 2022 so all activities included in the current 5 year program were assessed against the value of water for storage level >79%. Some activities were not assessed as efficient but were included based on other drivers.
[5] This includes the cumulative savings from previous years for initiatives and projects that provided Intermediate and Long Term water conservation benefits.

3.2 Proposed Water Conservation Initiatives

3.2.1 Residential

Essential Plumbing Assistance

This initiative helps customers facing financial hardship with the cost of essential plumbing repairs to their property. These repairs often relate to leaking or broken taps, toilets or pipes. Assisting customers with these repairs, not only reduces water loss but also limits water usage charges on the account and helps to minimise the customer's debt and maintain long-term payment of water bills.

The plumbing assistance is provided reactively in response to customers who are at risk of non-payment of bills and ongoing debt due to financial hardship. Upon assessing financial hardship and identifying the potential for leaks, Hunter Water engages a plumber to inspect the residence and carry out any minor plumbing repairs such as washer, tap and toilet cistern replacements. Larger repairs are assessed on a case by case basis.

Essential Plumbing Assistance has been assessed as economically efficient at all times, it also helps minimise customer debt and additional financial hardship.

Leak Repair Assistance

Small internal leaks are often overlooked as a source of water loss, however the volumes lost can become quite significant over time. As part of the drought response Hunter Water provided a rebate of up to $500 per property to assist with the plumbing costs associated with repairing or replacing leaking taps, showers, toilets, pipes and tanks. Customers known to have internal leaks were also proactively contacted and encouraged to have repairs carried out. This initiative was in addition to the ongoing Undetected Leak Rebate which provides eligible customers an allowance of up to 50% of the increase in water usage that occurs due to a hidden leak.

The Leak Repair Assistance drought response program ended on 30 June 2020. Learnings from this initiative will be used in the design of a similar scheme longer term with a smaller rebate being offered. When evaluated using the ELWC methodology and the average costs observed during the drought program, Leak Repair Assistance is only economically efficient when the water storage level is less than 70%, however it helps meet the LHWSP target in a relatively efficient manner and can be easily ramped up during drought. A more targeted and carefully designed ongoing assistance program may also prove to be more economically efficient than the rebate offered during the drought. It is therefore included in the current five year program.

Rainwater Tank Repairs & Retrofits

It is estimated that around 17 per cent of the households serviced by Hunter Water have rainwater tanks installed. Studies have found that the water supplied by rainwater tanks can reduce mains water needs by around 42 kL per year (20 to 25 per cent), but only 65 per cent of rainwater tanks are functional due to design and maintenance issues.[6]

Hunter Water carried out a Tank Tune-Up pilot in 2019, where customers in selected suburbs were offered plumbing audits of their rainwater tank systems. We found similar failure rates to those previously reported and identified particular trends in failure modes. Using this information along with the associated maintenance, repair and installation costs, three different rainwater tank initiatives were assessed using the ELWC methodology.

1. A *DIY Rainwater Tank Tune-Up* which involves Hunter Water preparing and regularly promoting a DIY tank inspection and maintenance regime with customers engaging a qualified plumber or electrician to diagnose or repair more complex issues. We already

[6] Retamal M, Mukheibir P, Schlunke A, & Prentice E., 2018 Work Package 4: Rainwater, Report prepared by The Institute for Sustainable Futures (University of Technology Sydney) for the Hunter Water Corporation.

provide guidance on our website (https://www.hunterwater.com.au/home-and-business/information-for-homes/how-to-love-water/rainwater-tanks) however once the full costs of repair are included it was found that additional investment in this initiative is only economically efficient when the water storage level is less than 30%.

2. *A Rainwater Tank Repair Assistance Rebate* where customers are able to claim a portion of the costs associated with engaging a suitably qualified tradesperson to carry out maintenance or repairs on their rainwater tank system was also assessed as being economically efficient when the water storage level is less than 50%.
3. An expanded *Rainwater Tank Repair Assistance & Retrofit Rebate* which provides financial assistance for repairs and the retrofitting of a rainwater tank system in established homes was found to be economically efficient only when the water storage level is less than 50%.

None of these initiatives have therefore been included in the current five year program, however further investigation into opportunities for improved tank design are being pursued as part of a proposed BASIX review and the potential for flood mitigation and water quality benefits in some catchments is being explored.

Efficiency Upgrades

Replacing older shower heads, taps, toilets and washing machines with more efficient fittings or appliances or installing a pool cover can reduce household consumption by around 40 kilolitres per year.[7] Two different levels of efficiency rebate schemes were assessed.

1. *Minor Fittings Efficiency Upgrades* would provide property owners with a rebate where it is demonstrated that older inefficient showers, taps and toilets have been upgraded or replaced by a qualified plumber. This rebate scheme was assessed as economically efficient when the water storage level is less than 70%.
2. *Major Items Efficiency Upgrades* would provide households with a rebate where it is demonstrated that an inefficient washing machine has been replaced by a machine with a 4.5 or higher WELS star rating or an older toilet has been replaced with a 4 star or higher model or a pool cover has been purchased and installed. This rebate scheme was assessed as economically efficient when the water storage level is less than 60%.

Our customer segmentation found that around 22% of the households to whom we provide services are renting privately, and 5% are in public housing (e.g. NSW Housing, Compass Housing, Aboriginal Housing Office or Defence Housing Australia).[8] Currently, tenants are indirect customers of Hunter Water because some landlords may pass on water usage charges for payment by the tenant.[9] However, as water users, residential tenants play an equally important role to other households in helping to balance water demand and supply.

We face two challenges in encouraging water conservation with household tenants:

- Hunter Water has limited ability to identify which customer properties are owner occupied and which are rental properties.
- Tenants can engage in water use behaviour change or purchase more efficient appliances, but they are not in a position to carry out leak repairs or install more water efficient fittings.

Implementing these initiatives would therefore include engagement with real estate agents and public housing providers, as a means of reaching both tenants and landlords, so that we can improve water efficiency together.

---

[7] Based on an increase from 3 to 4 star WELS rating and average usage patterns, pool sizes and evaporation rates.
[8] Further detail on our customer segmentation is provided in Technical Paper 1 of the 2019 Pricing Submission to IPART.
[9] According to the Residential Tenancies Act 2010 a landlord can only pass on water usage charges if the rental premises is individually metered and the rental premises meet required 'water efficiency' standards (all internal taps and showers have a maximum flowrate of 9 litres/minute and no leaking taps). The landlord must also provide the tenant with a copy of the water bill setting out the charges, or other evidence of the cost of water used by the tenant.

Minor Fittings Efficiency Upgrades are only economically efficient when the water storage level is less than 70%, however it helps meet the LHWSP target in a relatively efficient manner and can be easily ramped up during drought. It is therefore included in the current five year program.

Carefully targeted appliance upgrades like the DPE/LAHC washing machine pilot may provide greater demand reductions at a lower cost than the approach assessed against ELWC. Therefore while an appliance upgrade or pool cover rebate initiative has not been included in the current five year program opportunities to fund or collaborate on such initiatives will be assessed on their merits as they arise.

Multi-Residential Dwellings

Hunter Water has around 30,000 multi-residential customers (e.g. apartments, villa complexes and over 55's lifestyle villages) in our area of operations. These customers often only have a single water meter for the whole site. There is therefore little incentive for each apartment or dwelling to save water by taking actions like repairing plumbing faults because the usages charges are pooled and leaks in common areas are often overlooked.

We considered a similar program to that offered by Sydney Water, whereby strata buildings with high water use are offered plumber audit and repair services and the strata body pays no upfront costs, instead repaying costs with the savings achieved. That is, the water bill of the account is held static until the costs of the service are recovered.[10] On further investigation we found that the number and style of multi-residential sites in our region would not support this kind of scheme.

Instead, a simpler and more targeted program of leak monitoring and water efficiency audits for large multi-residential sites was assessed. It was found to be economically efficient only when the water storage level is less than 70%.

Ultimately, we encourage the installation of separate water meters on each individual dwelling, where this is a practical option.

Love Water

Love Water provided a strong foundation for water restrictions messaging and is a common thread for all our water conservation activities to galvanise a community effort to achieve water conservation goals together. A variety of investment options were considered with the aim of providing the most cost effective coverage both in terms of breadth and depth of engagement. This includes more traditional channels such as free-to-air television and radio as well as social and digital media, on-demand television, along with participation in community events.

It is difficult to estimate the direct and indirect contribution communications and engagement campaigns make towards changing customer water use behaviours because of the influence of broader social and environmental factors and the gap between self-reported and actual behaviours and intentions. The initiative has been included in the current five year program because there are already high levels of brand and message recognition among our customers. By maintaining Love Water we also provide foundational messaging for all water conservation initiatives and help to maintain the demand reduction momentum gained during the drought.

Community Water Officers

In 2021-22 post drought, the CWO (Community Water Officers) role was integrated into the Water Conservation and Compliance (WCC) role. The WCC continues to advise customers on Smart Water Choices, respond to breach notifications and exemption requests, conduct leakage investigations,

[10] Sydney Water, 2017-18 Water Conservation Report, p. 11.

address non-compliance issues, and offer support and technical advice for leak management both internally and externally. The WCC contributes to WEMPs by advising on submetering arrangements, metering compliance, and monitoring usage.

The size of the team has fluctuated in response to workload and the severity of the water restrictions in place. Like Love Water, it is difficult to estimate the extent to which this initiative directly or indirectly contributes to reductions in water demand, however a conservative assessment found that a small ongoing team is economically efficient when the water storage level is less than 70%. This initiative has been included in the current five-year program to ensure that Hunter Water has the capacity to respond to community queries and reports that arise while enforceable water restrictions or permanent water conservation measures (Smart Water Choices) are in place.

3.2.2 Non-Residential

Find & Fix

Water loss due to leaking pipes and fittings or malfunctioning valves can be quite significant, particularly on large or complex sites. The water loss may be hidden from sight or be unnoticed as it discharges to sewer or stormwater and because it can slowly build up over time it may have no sudden or obvious bill impact. Data loggers can be added to water meters to collect real time information on the volume of water flowing into a customer site. This information can then be used to identify unusual flow patterns that indicate potential water loss on the premises (e.g. night flows when site is closed or gradual upward trend). The loggers also provide daily flow patterns to assist the site users with understanding how they use water. Due to the increase in data received from over 400 data loggers Hunter Water is trialling an internal purpose-built automated data analytics tool (AQUO) to help monitor and set alarms for leakage and zero usage.

Under the Find & Fix initiative Hunter Water installs permanent data loggers on the water meters of large customer sites and assists with data monitoring and alarm set ups. Temporarily deployed loggers are also available to monitor and investigate smaller, complex sites where a leak is suspected but is not visible. In some cases, follow up technical advice is provided to assist the customer with pinpointing the exact location of a leak so that they can carry out repairs.

An assessment of Find & Fix, using data from existing installations and interventions, found that it is economically efficient under all water storage conditions. It has therefore been included in the five year water conservation program.

WEMPs & Audits

Under Smart Water Choices large non-residential customers (those with sites consuming more than 10 megalitres per year) are required to prepare and implement a Water Efficiency Management Plan (WEMP)

One of the initial actions required to complete a WEMP is a detailed water audit of the site. The audit identifies sub-metering opportunities and provides a breakdown of usage across the site, opportunities to reduce the use of drinking water through the implementation of efficiency measures or use of an alternative water supply.

In 2021-22, all large and major water customers continued to work with Hunter Water on the preparation or implementation of a WEMP. A number of customers also participated in a detailed water audit of their site. An assessment of an ongoing WEMP and Audit initiative, specifically targeting large and major customers, found that it is economically efficient at all water storage levels so it was included in the five-year water conservation program.

An expanded program that includes medium sized customers (greater than 2 megalitres per year) and provides additional technical assistance for WEMP implementation was also found to be economically efficient. However, further work is required on the design of this expanded initiative before it can be considered for implementation.

Local Council Water Resilience & Audits

There are six local councils in Hunter Water's area of operations. Collectively they consume around 1.2 gigalitres of water per year across more than 3,000 sites. These sites include public pools and parks, sports fields, holiday parks, waste management centres and works depots. The spread and wide variety of water use across these locations make it challenging to identify easily implemented water saving initiatives. Specialised water audits targeting specific types of sites or end uses can however assist councils with benchmarking and preparation of water efficiency investment programs. Best practice guides that promote water efficient design, construction, operation and maintenance of council assets will also be developed where appropriate.

The use of drinking water to irrigate public parks and sports fields is limited under Level 1 and Level 2 water restrictions and banned under Level 3 water restrictions. In other jurisdictions, this restriction on irrigation was found to have a significant and long-lasting impact on community liveability outcomes during drought. Assisting councils to improve the resilience of these facilities can both reduce the volume of drinking water currently used for irrigation and ensure that the social impact of a drought is reduced.

An initiative that includes council targeted irrigation and facilities audits along with support for business case development and external funding submissions for water conservation initiatives is proposed along with ongoing collaboration on the development of alternative water source opportunities (e.g. recycled water or stormwater). An assessment of the costs and benefits of council site audits found them to be economically efficient when the water storage level is less than 70%, however improving the water resilience of council facilities provides broader community benefits so it has been included in the current five-year water conservation program.

School WEMPs

The 250 schools located in Hunter Water's area of operations consume around 570 megalitres of water per year servicing a student population of more than 93,000. A previous initiative (Leakage in Schools Program) where Hunter Water assisted interested schools with the installation of data loggers on their water meters had mixed success with some schools embracing it as part of their asset management program while others only used the information for a limited period of time. Any future data logger installations at school sites will be carried out under Find & Fix.

Taking learnings from the broader Hunter Water education program an activity based learning initiative, which involves student participation in the preparation and ongoing implementation of a school Water Efficiency Management Plan, was considered. This would be resource intensive both for Hunter Water and the school but would also provide deeper and longer term water conservation behaviour change benefits. This initiative is only economically efficient when the water storage level is less than 70%, however it has the potential to lead to long term embedded behaviour change thereby contributing to the LHWSP target. It is therefore included in the current five year program.

Targeted Business Support & Awards Program

Hunter Water supplies drinking water to more than 12,000 small to medium non-residential customers (those consuming less than 10 megalitres per year). These customers range from hairdressers to cafes and from landscapers and car washes to office based businesses. The type of end uses vary greatly along with the scale of the potential water savings so designing practical and cost effective water conservation initiatives to support these customers is quite difficult.

Specialised audits and rebate schemes that target particular industries or end uses have been assessed as being economically efficient when the water storage level is less than 70% and have therefore not been included in the current five year program. Further customer segmentation, industry benchmarking and consultation and collaboration with key stakeholders are however being explored to support the potential future development of niche end use programs.

3.2.3 Reducing Hunter Water leakage

Active leak detection

Each year, our contractors physically walk and check all of our network. Reducing water lost to leaks is one of our highest maintenance priorities. We use 'listening equipment' to identify hidden leaks and water escaping into the ground, which otherwise may not be found - about 30 new leaks are found each week. A major benefit of the program is finding small leaks, before they get bigger. Large leaks can be inconvenient for our customers due to water supply interruptions and also the possible damage to their property. A leak detection survey covering approximately 2,800 kilometres per year has been assessed as economically efficient when the storage level is less than 80%.

During the 2019-20 drought the active leak detection survey was increased to cover around 6,200 kilometres per year. This higher rate of survey was maintained in 2020-21 and reduced back to 5,700 kilometres per year in 2021-22.

Our customers know how important it is for us to find and fix leaks and save precious water. About 150 customers contact us each week to report a leak they've found. We respond quickly to every single report and prioritise these repairs along with the leaks identified by our contractors.

Pressure management

High water pressure in our system contributes to water main leaks and breaks, and the excessive pressure reduces the life of our assets and equipment. Our Operating Licence states we need to provide customers with a minimum pressure of 20 metres, but some parts of our network have water main pressure greater than 100 metres. Pressure management involves the installation of automated pressure reducing valves to reduce the pressure in the water network and customer fittings, thereby reducing the internal stress and reducing either the quantity of leaks/breaks or the volume lost from leaks/breaks. In the current price period, we have an approved program of works to address unnecessarily high pressure in a further 25 areas of our network. Pressure management at these locations has been assessed as economically efficient against a long-run value of water of $2.37/kL.

Reducing water pressure extends the life of our water mains and equipment, reduces leaks and water main breaks which inconvenience customers.

District metering

District metering involves installing network flowmeters and zone valves to segment the network into smaller 'districts'. Water movement in each district is then monitored and analysed, and any increased water use may indicate a leak in that district. Dividing the network into segments means we can identify and repair leaks more quickly, which reduces costs and customer interruptions.

Hunter Water currently has 70 district metered areas with telemetered flow monitoring, which represents 45 per cent of the network. The district meter outputs are incorporated into a software program called Takadu, which undertakes hourly monitoring and analysis of system performance changes. In the current price path we have an approved program of works to increase the number of districted metered areas so that it covers 100 per cent of the network. This program was assessed as economically efficient against a long-run value of water of $2.37/kL.

Point sources

This important program fixes water lost, or likely to be lost in the near future, at our major assets, including reservoirs and trunk water mains. We have identified two key point sources of leakage that will be addressed over this price path.

3.2.4 Alternative sources

The Lower Hunter Water Security Plan identified a preferred portfolio of options for recycled water (for irrigation and industrial use) and stormwater harvesting. Up to 1,300ML/yr of additional alternative water supply could be delivered, offsetting drinking water demands for industrial and irrigation uses. We are working the community and recycled water (and stormwater harvesting) customers to ensure the most viable projects are implemented.

Other recycled water initiatives planned for the 2020-2025 period include:

- Continue to investigate the true value of recycled water including social and environment and resilience benefits, and monetising non-market values, to ensure cost effective recycling opportunities are not missed.
- Continue to engage with customers and the community on their values around recycled water and understand their willingness to pay for recycled water services.
- Continue to work with local councils to explore opportunities and build business cases for cost effective public open space irrigation schemes. These schemes may also service some private users such as golf courses and jockey clubs.
- Continue to work with local councils, government agencies and stakeholders to explore planning and institutional barriers to cost effective recycling.
- Continue to work with local councils, government agencies and stakeholders to explore planning frameworks and undertake economic analysis of dual reticulation options for greenfield residential areas.
- Continue to explore the economic viability of new or expanded industrial recycling schemes.
- Continue to monitor and investigate advances in recycled water treatment technologies and emerging contaminants.

3.3 Research and Development

Projects or activities that aim to build knowledge or capacity are not assessed using the ELWC methodology. These initiatives may lead to future water savings however quantifying them is difficult at this point.

Evaporation management

We will be reviewing both existing and emerging technologies and methodologies to reduce evaporation from Hunter Water's dams and seek opportunities to work with other Australian water utilities to encourage further research, development and testing.

BASIX optimisation

Studies indicate that the fittings installed under BASIX are not always the most efficient available[11] and that there is potential for a more targeted rebate scheme to encourage the purchase of more efficient appliances and fittings.[12] We are engaging and collaborating with key planning and implementation stakeholders regarding the feasibility and possible scope of a BASIX review and the development of rebate or incentive programs to promote the purchase and installation of higher efficiency fittings and appliances.

Behaviour Change

We are currently partnering with the University of Newcastle to seek a deeper understanding of community and customer attitudes towards water conservation. The research includes identifying potential barriers and incentives for adopting more water efficient behaviours and how these might differ across generations and life stages. Initial findings from the collaboration were used to assist with the development of targeted water conservation messaging during 2019-20.

[11] Institute for Sustainable Futures (ISF), 2018, "Evaluation of the environmental and economic impacts of the WELS scheme", prepared for the Department of Agriculture and Water Resources.
[12] Urbis 2012, "Evaluation of the NSW home saver rebate program", prepared for the NSW Office of Environment and Heritage.

APPENDIX A – METHOD OVERVIEW

A.1 WATER CONSERVATION STRATEGY FOR 'CATCHMENT TO WATER TREATMENT PLANTS'

We identify new options for water conservation through Hunter Water's Strategic Asset Management Plan. The Plan is the delivery mechanism for Hunter Water's overarching Asset Management Strategy.

The Strategic Asset Management Plan (SAMP) is an overarching document describing how services are to be provided through continual planning, delivery and management of assets. The SAMP outlines how Hunter Water's strategic objectives are fed into asset management objectives, ensuring the assets' performance both delivers and adapts to the required level of service at an acceptable level of risk and cost.

The SAMP outlines the tasks required for identifying existing and future community service objectives, then planning and delivering those objectives through the asset management functions across the life cycle of the varied asset types. The SAMP articulates the processes and the documentation related to managing assets as governed in the Asset Management Policy.

The SAMP is revised every four years as part of the strategic asset management planning cycle.

In our planning and asset management activities Hunter Water recognises the importance of water conservation in:

- Water resource availability and supply augmentation
- Supply costs
- Infrastructure capacity requirements; and
- Maintenance activity levels and scheduling.

New water conservation options are compared using the ELWC methodology (described in A.2). Programs and projects are selected for funding and implementation in the same manner as other operating expenditure and capital expenditure proposal, that is through robust internal governance process and IPART price reviews.

A.2 ELWC METHODOLOGY FOR 'WATER TREATMENT PLANTS TO TAP'

The ELWC methodology is based on a cost-benefit analysis framework where the costs and benefits are assessed in marginal terms from a societal perspective.

A water conservation measure is considered to be economically viable if the benefits are at least equal to the costs.

- The benefits are assessed in terms of the value of water conserved
- The costs are assessed in terms of the levelised cost of implementing the water conservation measure, and
- The costs and benefits are expressed as present value of dollars per kilolitre of water.

That is, when the cost to society of a water conservation measure is less than the value of water it is expected to save, it is economically viable.

The value of water conserved is based on the marginal cost. Marginal cost is the cost incurred in the production of one extra unit of water supply.

- In the short-run, this cost is usually the operating cost associated with, for example, the additional pumping and chemical treatment of supplying an extra unit of water through the existing network.
- In the long-run all inputs are considered variable and therefore this cost is the cost associated with all actions required to bring supply and demand into balance, including capital expenditure on source augmentations (if necessary).

The value of water conserved depends on the timing and durability characteristics of the water conservation measures being assessed (i.e. short or long-term).

For conservation measures with short-term benefits, the short-run value of water reflects the short-run marginal cost including direct operating costs, the social costs of water restrictions, and the alternative drought measures and supply options.

For conservation measures with long term benefits, the long-run value of water reflects the long-run marginal cost plus an option value. *"Options value refers to the value of delaying an irreversible commitment to an investment, where it increases the likelihood of delaying or avoiding the need for the investment, or that the cost of the investment would reduce - eg, as a result of technological progress".*[13]

The ELWC is calculated by adding the volume of water conserved from all new water conservation measures that are assessed as being economically viable. That is, our investment in new water conservation activities could increase (depending on available projects and funding) until the marginal benefit of saving an extra unit of water is just equal to the marginal cost of supplying an extra unit of water. The economic level of investment is achieved when the marginal values are equal. This can be explained with the assistance of a diagram (see Figure A1.1).

[13] IPART, 2019, Review of pricing arrangements for recycled water and related services, page 37.

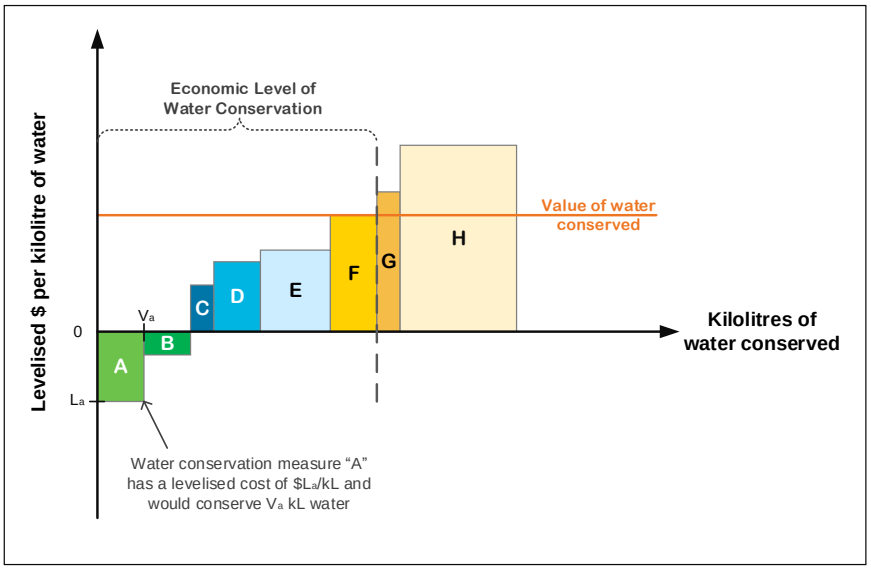


Figure A1.1 Conceptual diagram showing calculation of the Economic Level of Water Conservation

The horizontal axis represents the volume of water saved through implementing water conservation measures, while the vertical axis represents the cost per kilolitre. Each new water conservation measure (e.g. A to H) can be characterised by an estimated *volume of water conserved*, which is shown by the horizontal width of each rectangle, and a *levelised cost*, shown by the height of each rectangle. The levelised cost of a water conservation measure can be negative (measures A and B) or positive (measures C to H). A negative levelised cost means the water conversation measure results in a levelised benefit (even before considering the value of water conserved). For example, in the diagram water conservation measures A and B have negative levelised costs and are shown below the horizontal axis. Measure A could be a water efficient showerhead giveaway to customers that enables the customer to save more money on electricity costs for water heating than the financial cost to Hunter Water to buy the showerheads.

In this conceptual example, the projects are ordered by increasing levelised cost from left to right. That is, projects towards the left of the figure are more economically beneficial than those towards the right of the figure. Adopting this convention, the shape formed by the levelised costs of all measures assessed is similar to a marginal cost curve - the cost to save one kilolitre of water rises as we try to save more and more water.

The orange horizontal straight line - "value of water conserved" - reflects the marginal costs of supplying water. It is assumed to be constant at a given point in time, under specific assumptions about balancing supply and demand in the short and long terms.

Using the ELWC methodology, all water conservation measures with a levelised cost less than or equal to the value of water are considered to be economically viable. The volume of water that could be saved if Hunter Water implemented all of these measures is the Economic Level of Water Conservation. In Figure A1.1, measures A to F are economically viable. In other words, the vertical height of the rectangles for A to F are all no taller than the orange horizontal line representing the value of water conserved. Reducing water use any further (e.g. implementing measures G and H) would not be economically beneficial.

The ELWC is a forward-looking methodology. That is, only new potential water conservation projects are assessed using the ELWC methodology. We do not assess research, pilot trials or initiatives to drive behavioural change using our ELWC methodology as these types of projects aim to provide us with better information to use in the ELWC methodology, for example to calculate the project costs and water savings.

APPENDIX B – OPERATING LICENCE REPORTING MANUAL REQUIREMENTS

This section presents water conservation work program requirements in the Reporting Manual associated with Hunter Water's 2017-2022 Operating Licence (issue 2.0, June 2018, clauses 2.1.1 and 2.2.4) and provides a guide to where the relevant requirement is addressed in this report.

Item No.	Reporting Manual requirement	Reference
1.	Describe and explain Hunter Water's progress against implementation (or otherwise) of water conservation activities for the previous financial year	Sections 2.2 and 2.3
2.	Include, for water conservation activities upstream of Hunter Water's water treatment plants, for the next five financial years: • Hunter Water's strategies, programs and projects relating to Water Storage and Transmission • options identified for conserving water within system operating arrangements • comparison of these options, and • options selected for implementation	Section 3
3.	Include, for water conservation activities within and downstream of Hunter Water's water treatment plants, for the next five financial years: • Hunter Water's strategies, programs and projects relating to water leakage, recycled water and water efficiency • Hunter Water's water conservation objectives, targets and timetables, and • the extent to which these elements align with the Economic Level of Water Conservation Methodology	Section 3
4.	Describe and explain any changes to the water conservation activities, relative to the water conservation activities identified in the previous annual report	Sections 2.2 and 2.3
5.	Outline how Hunter Water's water conservation activities relate to the Lower Hunter Water Plan	Section 1.6
6.	Include information on the following measures for the previous financial year, as well as earlier financial years (where applicable) of the Licence term: • the level of water leakage from Hunter Water's Drinking Water supply system against the economic level of leakage for that financial year • the volume of water sourced from Recycled Water (in megalitres), and • The quantity of Drinking Water drawn by Hunter Water from all sources, expressed in gigalitres per year (aggregate), litres per person per day (weather corrected) and kilolitres per person per year (weather corrected).	Section 2.1 Tables 2.1 and 2.2

Hunter Water
ABN 46 228513 446
Customer enquiries 1300 657 657
enquiries@hunterwater.com.au
hunterwater.com.au

Version: 1.0

Date: September 2022