DRAFT

Greater Melbourne Urban Water & System Strategy: Water for Life

Water for life | Greater Western Water | Melbourne Water | South East Water | Yarra Valley Water

Acknowledgement

We respectfully acknowledge the Traditional Owners of the Greater Melbourne region as the original custodians of this land and water upon which we rely and operate. We recognise their continuing connection to land, waters and culture.

In the spirit of reconciliation and recognition of First Nations water knowledge and values, we remain committed to genuinely partnering with the Bunurong, Dja Dja Wurrung, Gunaikurnai, Taungurung, Wadawurrung and Wurundjeri Woi Wurrung Traditional Owner groups. These partnerships will ensure ongoing contribution of Traditional Owners to the future of water management while maintaining cultural and spiritual connections.

Cover image: Dights Falls in Fairfield, Wurundjeri Woi Wurrung Country

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Foreword

Water is essential to making Greater Melbourne a vibrant, liveable and sustainable place both now and in the future. It underpins the health of people and the environment, enhances community wellbeing, and supports economic growth and jobs.

It is our pleasure to share this draft *Water for Life* strategy, which has been prepared collaboratively by Greater Western Water, Melbourne Water, South East Water and Yarra Valley Water to deliver on the requirement under the Water for Victoria planning framework that every 5 years Melbourne Water and retail water corporations produce the Melbourne System Strategy and urban water strategies, respectively.

The draft strategy builds on the work we are already delivering to provide our region with a secure and sustainable water supply for the next 50 years. As water corporations, we are continually forward planning and preparing for long-term changes in our operating environment. This future focus has allowed us to identify multiple possible future scenarios and challenges ahead of time.

Melbourne is consistently ranked as one of the world's most liveable cities and water makes a significant contribution to the prosperity of our people and places. We are one of Australia's most water efficient capital cities, ambitious to do even more to ensure we use water wisely. But that won't be enough.

We must start investing in readiness now to ensure our systems remain resilient to the challenges presented by our growing city and drying climate. Over time, we will need to add new sources of water to further supplement our water supplies.

Today, our water storage levels are high and, with significant annual contributions from our first desalination plant, the Victorian Desalination Project, our water supply system delivers safe and reliable services to more than five million people. However, over time, we will need to add new sources of water to further supplement our water supplies. Climate change is affecting the reliability of our traditional water sources due to lower rainfall – in some catchments we have seen water availability decline by 15 to 20 per cent. Climate change is also affecting our environment and landscape, with hotter and drier conditions threatening biodiversity and liveability.

This is exacerbated by our rapidly growing population. Historically, Victoria has seen significant annual population growth, and though the COVID-19 pandemic has slowed this increase for now, long-term projections show our population is still expected to double by 2070 – further increasing demand for water. Urbanisation is also increasing the amount of sewage and stormwater our systems need to manage.

While higher rainfall in recent years has helped our storages reach relatively full levels now, the expected long-term trend of a drying climate means in future, on average, less water will flow in our rivers and be captured in our storages. Our water storage levels can change quickly and we need to be prepared for conditions more severe than the Millennium Drought experienced between 1996 and 2010, during which levels dropped 50 per cent in four years.

Because of past gains in water efficiency and shifts in water use from outdoor to indoor uses, water restrictions won't save enough water to meet our needs during a severe drought. The best time to act is the present, while storages are high and we have the benefit of time. By progressing readiness activities on new water supplies now, we will be prepared for the future. This allows us to consider multiple options and make the best, informed decisions

Building system resilience will be key to managing future climate variability. To provide a secure water future, a supply system augmentation (enhancing and expanding our existing system) will be required within the next 10 years, and potentially several additional augmentations are needed over the next 50 years.

for the community. Investing at the right time lowers the overall cost of water supplies in the long term.

This draft aims to balance the water needs in our region by finding more efficient ways to use the water we already have, increasing our use of diverse water sources and using more climate resilient, manufactured water (such as desalinated water or fit-for-purpose recycled water) and stormwater solutions. To meet our near term water needs, we'll continue adding significant volumes of manufactured water to the system. In particular, desalinated water remains a viable short-term option because it can be fed directly into the drinking water supply system at the volumes required.

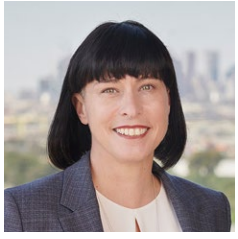
Melbourne is one of Australia's fastest growing capital cities with increasing urbanisation – which means we have a lot of people in a concentrated area – that is quickly spreading to regional areas. With more people comes more sewage to manage, and built-up areas divert more stormwater to our drains. This presents a great opportunity to put these water sources to better use. Stormwater, rainwater, and fit-for-purpose recycled water are important solutions in the portfolio of water management options, providing non-drinking water that can be used for irrigation, agriculture, industrial uses, toilet flushing and laundry use. These sources not only reduce pressure on drinking water supplies, they contribute to improving urban amenity and waterway health. Alternative water sources help combat the effects of a drying climate, providing water for open space, trees and gardens – supporting greener and cooler suburbs.

The strategy also seeks to mature our relationships with Traditional Owners beyond collaboration, by honouring and respecting Traditional Owners' status as our partners in water resource management. Our service region includes parts of the Traditional Country of the Bunurong, Dja Dja Wurrung, Gunaikurnai, Taungurung, Wadawurrung and Wurundjeri Woi Wurrung Traditional Owner groups (see Figure 3). Together, we collaborated on the development of this strategy to ensure Traditional Owner priorities and cultural values are embedded in water management decision making and planning. We co-developed a set of partnership principles and invited representatives from each group to make a genuine contribution to the strategy by developing a set of options evaluation criteria and strategy actions.

To strengthen the voice of the broader community, the *Water for Life* Community Panel was independently recruited to develop the strategy vision and a set of community criteria against which we tested our options for the future. Collaboration between the metropolitan and regional water corporations, our Traditional Owner partners, our customers and our communities has been essential to the development of this strategy.

We are grateful for the collective input to date, which is reflected throughout this draft strategy. These collaborations will continue to drive successful finalisation and implementation of the strategy.

We look forward to the next five years (and beyond) as we deliver the actions and aspirations set out in the draft strategy and secure our water future together. We would love to hear your views and ideas on how we plan, manage and use our water to support a thriving, sustainable and resilient Greater Melbourne.



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Our strategy on a page

Our challenge

Melbourne is growing and our climate is changing. Given this uncertain future, we need to plan now to find long-term water solutions for our customers and communities.

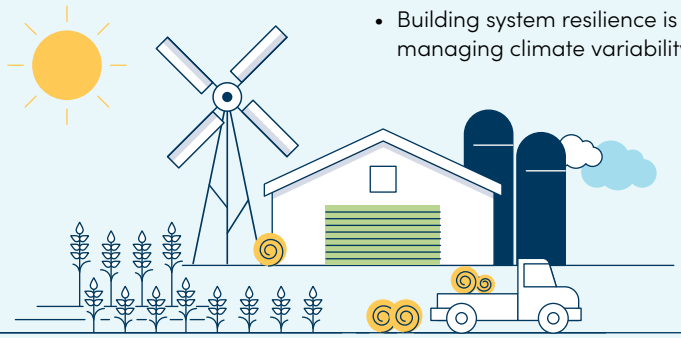
How do we confidently meet our diverse water needs for the next 50 years?

Key water challenges over the next 50 years

Our climate is changing

Victoria will be warmer and drier

- There will be less water in our rivers and streams, and less water flowing into our supply system
- Building system resilience is key to managing climate variability



Community vision

Our Melbourne.
Our Water.
Our Responsibility.

A future with:

1. innovation driving equitable access to water
2. pristine, precious, secure and sustainable water
3. meaningful partnerships with Traditional Owners
4. meaningful engagement with consumers.

Ensuring a secure and sustainable water supply

Our objectives

We need to be prepared for a future where Greater Melbourne's population is growing and the impacts of climate change and variability are uncertain. To do this, we will develop an Adaptive Plan that positions our water supply system to:

- make maximum use of the diverse range of available water sources
- use the water we already have efficiently
- transition to a more climate resilient supply of manufactured water.

What we will do in the next five years

Invest in readiness activities to prepare for the next supply system augmentations

Investigate additional climate independent manufactured water sources

Continue working with Government (via the CGRSWS) on the process for future augmentation decisions

Support Government commitments (via the CGRSWS) to return water to Traditional Owners and the environment

Figure 1: Our strategy on a page

Our population is growing

The amount of people in Victoria could double by 2070

- More people and urbanisation means there will be greater demand for our services
- By 2070, we could need up to 600 gigalitres (GL) of extra water each year

Our region is changing

We must balance environmental, economic and cultural water needs

- We need more water for the environment to keep our rivers healthy and support liveable communities
- We also need to support Traditional Owner access to water
- Significant investment will be required over the next 50 years – timely and appropriate investment will keep prices affordable for our customers

Equitably and affordably meeting diverse water needs

In planning to provide water to a growing population, we need to ensure our essential services remain affordable to customers, while also supporting Traditional Owner access to water and equitable access for future generations.

Ensuring healthy people, healthy environment

We will deliver integrated water management (IWM) initiatives to support community liveability, wellbeing and urban amenity across the Greater Melbourne region. This can be achieved by making better, more productive use of rainwater and stormwater runoff. To support community and Traditional Owner values, we will work together to protect waterway health and cultural values of our landscapes , as well as protecting our landscapes from extreme events and emergencies where possible.

Meaningful partnerships, engagement and education

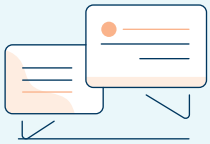
To best address our future water challenges, we will develop a shared plan with community and Traditional Owners. In order to share the true value of water with communities, we need to deliver meaningful engagement and transparent decision making about the future and commit to listening and responding to community views and concerns. We also need to establish genuine partnerships with Traditional Owners by working together in water management and planning to deliver benefits to the whole community.

Invest more in water efficiency initiatives

Invest more in IWM projects

Lead the transition towards greater use of fit-for-purpose recycled water

Increase community involvement in future water supply planning



Empower community to take a more active role in water efficiency

Establish partnerships with Traditional Owner groups

Executive Summary

Water. Everything we hold dear – our health and wellbeing, the ecosystems that support us, the economies we work to build, the ambitions of our communities and societies – depends on it.

At a glance

The draft *Water for Life* strategy explores two key challenges impacting Greater Melbourne's water resources, as identified in *Water for Victoria*: **(1) our growing region and changing needs and (2) our changing and uncertain climate.**

Across Greater Melbourne, our drying climate means less water is flowing in our rivers and captured in our storages. Demand has also increased due to population growth and increased urbanisation. On average, our annual water usage is already exceeding the amount of water that can be reliably supplied from our catchment areas alone, particularly in drier years.

Over the next 50 years, we may need to double our water supply, adding an average of 12 gigalitres (GL) of water each year to the Melbourne supply system.

Our system must adapt to these changing conditions. Although the Melbourne water supply system is resilient and our water storages are currently high, we know that conditions can change rapidly and our system is vulnerable to future volatility such as extreme drought depleting our water storages, or extreme rainfall resulting in floods and harm to our waterways.

To continue delivering on our customer's needs, we are consistently focused on long-term planning and preparing for the future. We know that to maintain the current strength of our supply system and to safeguard our precious water supplies, we need to start investing in readiness activities now. This will ensure our system remains resilient in the face of the future challenges and multiple possible scenarios identified throughout the draft strategy.

While our extensive network of dams currently supplies water to Greater Melbourne, their reliance on rainfall cannot meet the growing demand for water. We also need to consider the broader impacts of dams on communities, waterway health and the environment. **We cannot rely solely on dams and the Victorian Desalination Project to meet all our future water needs.**

The draft strategy explores these water challenges in detail and outlines an adaptive approach to delivering solutions. A key focus of these solutions is continuing our transition to a future with more climate resilient, manufactured water (such as desalinated water or fit-for-purpose recycled water) and stormwater solutions.

Our approach

The Victorian Government's water planning framework considers all aspects of the urban water cycle across a 50-year period. Under this framework, every five years retail water corporations are required to produce an Urban Water Strategy, and Melbourne Water a System Strategy.

This draft *Water for life* strategy (also referred to as the Greater Melbourne Urban Water and System Strategy (GMUWSS)) delivers on these requirements for Greater Melbourne's water corporations – Greater Western Water, Melbourne Water, South East Water and Yarra Valley Water.

The draft strategy provides a detailed view of how water corporations will deliver on the policy directive outlined in the Victorian Government's discussion draft Central and Gippsland Region Sustainable Water Strategy (CGRSWS), which addresses the broader impacts of these challenges on water security for cities, towns, agriculture and Traditional Owners, and the health of our rivers and waterways across the entire Central and Gippsland Region.

There is no single solution to the complex challenges we face. We need to ensure we have secure and sustainable future water supplies, without compromising our surrounding ecosystems.

In developing the draft strategy we have taken a thorough and robust approach to evaluating all potential water resource management options. We also sought to understand the many ways people use and rely on water today, while achieving balanced access to our precious water supplies.

We have worked together with our customers, community, Traditional Owner groups and the Victorian Government to address the shared challenge of planning for our water future.

The intent of this draft strategy is to answer a critical question:

> How do we best work together to develop a clear plan for a secure and sustainable supply of water now, and for generations to come?

Our *Water for Life* strategy vision:

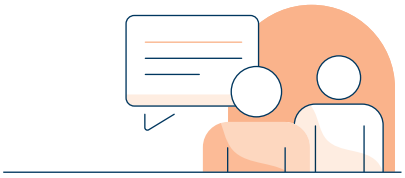
Our Melbourne. Our Water. Our Responsibility.

A future with:

- innovation driving equitable and affordable access to water
- pristine, precious, secure and sustainable water
- meaningful partnerships with Traditional Owners
- meaningful engagement with consumers.

The draft strategy has been shaped by what Traditional Owners and community members in our service regions told us is important to them. The Greater Melbourne water corporations are committed to achieving this vision through our **four key focus areas**:

1. Ensuring a secure and sustainable water supply.
2. Equitably and affordably meeting diverse water needs.
3. Ensuring healthy people and a healthy environment.
4. Delivering meaningful partnerships, engagement and education.



Our community's voice

We have worked with our customers and the broader Greater Melbourne community to develop this draft strategy.

In planning for the future, the strategy vision was independently developed by the *Water for Life* Community Panel with a set of criteria to assess future options for water security through a deliberative process, overseen by external facilitators.

Learning from the Traditional Owners of Country

In recognition of Traditional Owners' status as partners in water management and respect for their self-determination, we sought to continue to strengthen collaborative relationships with each of the Traditional Owner groups with Registered Aboriginal Parties (RAP) status across our service region - the Bunurong, Dja Dja Wurrung, Gunaikurnai, Taungurung, Wadawurrung and Wurundjeri Woi Wurrung Traditional Owner groups.We worked together to set the direction for the draft strategy and assess future options for water security.

The key success factors identified for Traditional Owners have informed the direction and focus for the strategy and also its outcomes. Together we co-developed key aspirations that support our common objectives and specific on-Country objectives for Traditional Owners. These aspirations have been embedded as actions within the strategy.

What this draft *Water for Life* strategy will deliver for Greater Melbourne

Water management strategies such as this ensure our systems can respond to growth, while also being resilient to drought conditions that could become more frequent and more severe than those we have experienced in the past.

To maintain and strengthen the resilience of our current system, we have developed a comprehensive set of options for how we respond. These options are grouped into three key themes:

- **Supply system augmentations** Enhancing and expanding our existing system through climate resilient, manufactured water (such as desalinated water or fit-for-purpose recycled water) and stormwater solutions.
- **Water efficiency solutions** Reducing demand on the system by continuing our investment in water conservation and efficiency programs.
- **Integrated water management (IWM) solutions** Reducing demand on the system by increasing our use of diverse water sources, such as stormwater, rainwater, and fit-for-purpose recycled water.

Under these themes, we have identified pathways that focus on reducing demand on drinking water supply or adding new sources to the supply system. We know that we'll need to provide more water for our growing population and rely less on river water as conditions become drier. We know that increased urbanisation will generate more stormwater, which impacts our environment. However, planning for Melbourne's water needs over the next 50 years must allow for significant uncertainties – including how quickly our population grows, how climate variability will impact water availability and how people will choose to use water.

To manage this uncertainty and future volatility, this draft strategy is focused on finding more efficient ways to use the water we already have, increasing our use of diverse water sources and transitioning to using more climate resilient, manufactured water (such as desalinated water or fit-for-purpose recycled water) and stormwater solutions. The draft strategy also considers all water as a potential resource and outlines opportunities to recycle more sewage and harvest more stormwater, which will contribute to and reduce the demand on our drinking supplies.

The draft strategy takes a best practice adaptive planning approach, which recognises there are multiple ways to respond to uncertainty and aims to keep as many options open as possible. This helps us to make an informed decision at the right time.

This adaptive planning process has confirmed the following:

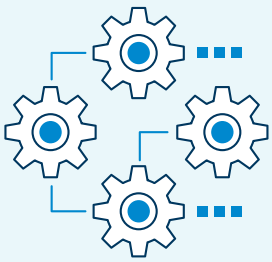
1 We need a lot of water

To provide the volume of water required, particularly in times of drought, **we need to increase our supply of climate resilient, manufactured water**.

To support population growth and address the impacts of climate change and increasing urbanisation, **Greater Melbourne may need 85GL of additional water by 2030 and 600GL by 2070**.

Under a 'worst case' future scenario, demand may start exceeding system yield as early as 2023.

Delivering resilience and liveability



2 There isn't one single solution

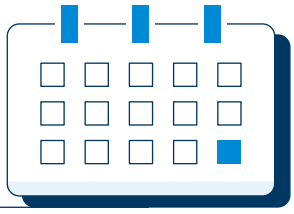
To ensure Greater Melbourne has enough water to meet future demands, we will need a diverse range of water sources.

Investment in IWM and water efficiency solutions plays a critical role in making the most and best use of our existing drinking water supplies and deferring progressive large-scale infrastructure investment over the long term.

3 We need to start now

Today, while water storages are high, we must take the opportunity to forward plan so that we have a range of fit-for-purpose options ready when needed. Many **water supply options take years of planning** and investment before they can deliver the water needed. Storage levels can drop quickly and if a severe drought (similar to conditions experienced in 2006/07) were to occur now, modelling indicates that storages could fall by around 40 per cent within four years.

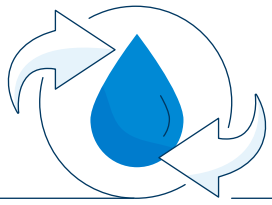
Being proactive and prepared allows water corporations to stagger required financial and resource spending over a longer period of time – ultimately lessening immediate cost impacts for our customers.



4 We have the opportunity to take a holistic, integrated approach

While we are committed to always providing water to meet the critical needs of our customers, we can also **plan more broadly to deliver meaningful integrated outcomes for the environment, Traditional Owners and liveable communities.**

The adaptive planning pathways show that higher investment in water efficiency and IWM solutions can provide additional benefits from having more diversity in our supply and offsetting our urban consumptive demand with alternative sources.



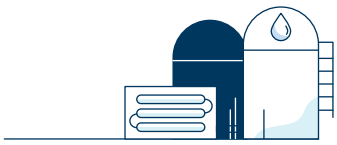
There is growing global recognition of the need for more flexible, adaptive water systems that are resilient to future uncertainty and the effects of climate change. While we often see the impacts of increasingly dry conditions - such as extreme droughts - climate variability can present in several extremes including floods, bushfires and storms, all of which have a significant impact on our water supplies. Increased urbanisation is also driving demand for open space in urban areas, and water will be essential to enhancing quality of life for communities.

Two key outcomes this draft strategy will deliver over the next five years are, increased system resilience and enhanced community liveability. The *Water for Life* Adaptive Plan is our roadmap for the future to manage future uncertainty and volatility by continuing to increase our investment in diverse water supplies which provide backup options in distribution and treatment networks, and by installing fire- and flood-resistant infrastructure. This will both build buffers in our water networks and provide water for essential for cool, green open spaces and healthy urban waterways.

In response, this strategy focuses on the following key deliverables for the next five years:

Ensuring a secure and sustainable water supply

Invest in readiness activities to prepare for the next supply system augmentations



We will **invest in 'readiness activities' for major augmentations** to ensure options are ready to be implemented within four years.

Continue working with Government (via the CGRSWS) to clarify the process for augmentation decisions

To enable investment at the right time, our Water Security Framework will identify key decision points through the use of an agreed Augmentation Decision Process.

Investigate additional climate independent manufactured water sources

We will transition to climate independent, manufactured water sources to provide future water security.

Equitably and affordably meeting diverse water needs

Invest more in water efficiency initiatives

We will continue to increase our focus and investment in water conservation and efficiency solutions to reduce demand on the system. This is an immediate and cost-effective response that will help use the water we already have efficiently and maintain affordability for our customers.

Support Government commitments (via the CGRSWS) to return water to Traditional Owners and the environment

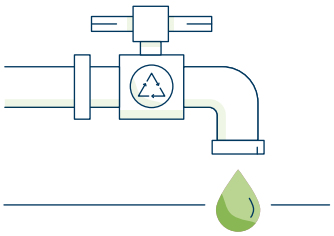
In planning for providing water for growing needs into the future, we will support Traditional Owner access to water for protection of waterway health.

Ensuring healthy people, healthy environment

Invest more in IWM projects

We will invest in and deliver innovative IWM solutions at the local and regional scale to support community liveability, wellbeing and deliver urban amenity (e.g. urban greening and cooling).

Lead the transition towards greater use of fit-for-purpose recycled water.



We will work together to protect waterway health and the cultural values in our landscapes by making better use of rainwater and stormwater runoff, and finding more productive uses for fit-for-purpose recycled water – which reduce the demand on our system while providing environmental, economic and liveability benefits.

Meaningful partnerships, engagement and education

Empower community to take a more active role in water efficiency

We will share with community the true value of water and empower community to take an active role in implementing this strategy through water conservation and behaviour change.

Increase community involvement in future water supply planning

We will develop a shared plan with our community and Traditional Owner groups. We are committed to empowering and actively involving customers and community in decision making through ongoing meaningful engagement.

Establish partnerships with Traditional Owner groups

We will establish meaningful partnerships with Traditional Owner groups, working together in water management and planning.

Implementation

Throughout the draft strategy, we have outlined strategic directions and actions we will commit to deliver on each element of our portfolio approach, while remaining prepared to respond to changing conditions.

Regular monitoring of the adaptive pathways as information, technology and conditions change will ensure Greater Melbourne remains prepared for an uncertain future. This approach will also allow us to keep multiple pathways, including various water management options and potential solutions, open for as long as possible.

The adaptive plan will be implemented consistent with the Water Supply Plan developed as part of the final CGRSWS. Together these will provide for carefully planned and sustained increases to available water supply.

Through ongoing implementation of an adaptive planning approach, we will continue to assess future scenarios and identify options that support delivering multiple benefits for the whole of the Greater Melbourne system.

It's important we continue on this path and work towards greater community water conservation and efficiency as a way of life. **Our precious water remains a limited resource** – one that we must conserve and protect for future generations.

Water for Life actions

There are several actions associated with the draft *Water for Life* strategy which are designed to provide tangible activities and milestones along our journey to a better water future. These are separated into seven action areas which reflect the chapters of this draft strategy.

Table 1: Action summary table

#	Action	Organisation	Timing
Our Challenge			
2.1	Enhance our understanding of water use to improve short, medium and long-term water use projections.	Joint Greater Melbourne water corporations (GWW, MW, SEW, YVW).	By March 2027.
2.2	Take a leadership role in climate change to build resilience and ensure preparedness.	Joint Greater Melbourne water corporations (GWW, MW, SEW, YVW) in collaboration with government.	Ongoing.
2.3	Demonstrate the value of Melbourne's sewage treatment plants as strategic resources for the city by leading a transition towards greater use of fit-for-purpose recycled water.	Joint Greater Melbourne water corporations (GWW, MW, SEW, YVW).	Ongoing.
2.4	Take a leadership role in the industry shift towards a circular economy and enable greater use of recycled water and a mix of centralised and decentralised solutions.	Joint Greater Melbourne water corporations (GWW, MW, SEW, YVW).	By March 2027 and ongoing.
Ensuring a Secure and Sustainable Water Supply			
4.1	Develop and deliver a joint Water Efficiency Plan increasing our focus on water conservation and efficiency to provide cost-effective water savings.	Melbourne retail water corporations (GWW, SEW, YVW) in collaboration with the wholesaler, Melbourne Water.	December 2022 and ongoing.
4.2	Support the development of IWM action plans to support delivery of the catchment scale IWM plans.	Joint Greater Melbourne water corporations (GWW, MW, SEW, YVW) in collaboration with government, Traditional Owners and other IWM forum partners.	By December 2022 and ongoing.
4.3	Engage with customers on the feasibility of using all approved source options across Melbourne to supplement drinking water supply and undertake studies and trials to demonstrate efficacy.	Melbourne Water, in collaboration with retail water corporations (GWW, SEW, YVW), government and research institutions.	By 2030.
4.4	Lead transition of the Melbourne system towards more manufactured water for our region.	Melbourne Water, in collaboration with retail water corporations (GWW, SEW, YVW) and government.	Ongoing.
4.5	Lead the planning and delivery of options for potential augmentations outlined in the Adaptive Plan pathways, including the commencement of readiness activities on near-term options.	Melbourne Water, in collaboration with retail water corporations (GWW, SEW, YVW) and government.	By 2023 and ongoing.
4.6	Plan and operate the existing water supply system to maximise water availability and be prepared to manage supply emergencies and droughts.	Melbourne Water, in collaboration with retail water corporations (GWW, SEW, YVW).	By December 2022 and ongoing.
4.7	Further develop the proposed augmentation decision making process within the *Water for Life* Water Security Framework.	Joint Greater Melbourne water corporations (GWW, MW, SEW, YVW) in collaboration with government.	By December 2023.
4.8	Continue to develop and utilise consistent project assessment and investment frameworks, aligned to the quadruple-bottom-line.	Joint Greater Melbourne water corporations (GWW, MW, SEW, YVW) in collaboration with government.	By December 2023.
Equitably and Affordably Meeting Diverse Water Needs			
5.1	Invest in and develop appropriate digital support for water efficiency programs.	Melbourne retail water corporations (GWW, SEW, YVW) in collaboration with the wholesaler, Melbourne Water.	Ongoing.
5.2	Partner with large water use customers to tailor and optimise water efficiency programs to meet their needs.	Melbourne retail water corporations (GWW, SEW, YVW) in collaboration with the wholesaler, Melbourne Water.	Ongoing.

#	Action	Organisation	Timing
5.3	Continue to deliver the Schools Water Efficiency Program to more schools in Greater Melbourne.	Melbourne retail water corporations (GWW, SEW, YVW) in collaboration with the wholesaler, Melbourne Water.	By 2030.
5.4	Deliver initiatives for effective management of non-revenue water and manage water losses.	Melbourne retail water corporations (GWW, SEW, YVW) in collaboration with the wholesaler, Melbourne Water.	Ongoing.
5.5	Support the discussion draft CGRSWS to return water to Traditional Owners and the environment.	Joint Greater Melbourne water corporations (GWW, MW, SEW, YVW) in partnership with government and Traditional Owner Groups.	Ongoing.
5.6	Explore opportunities to support Traditional Owner and environmental values via the annual operating planning processes for the Melbourne water supply system.	Joint Melbourne water corporations (GWW, MW, SEW, YVW) in partnership with government and relevant Traditional Owner groups.	Ongoing.
5.7	Work with Traditional Owner's to identify how future generations of Traditional Owners' access to water can be made resilient to drought.	Joint Greater Melbourne water corporations (GWW, MW, SEW, YVW) in partnership with Traditional Owner groups and government.	Ongoing.
5.8	Ensure fair access to water for vulnerable customers by continuing to deliver support programs and managing bill impacts.	Melbourne retail water corporations (GWW, SEW, YVW) in collaboration with the wholesaler, Melbourne Water.	Ongoing.
Healthy People, Healthy Environment			
6.1	Deliver environmental flow targets to ensure ongoing waterway resilience.	Melbourne Water in collaboration with the Victorian Environmental Water Holder (VEWH) and catchment management authorities (CMAs) and government.	Ongoing.
6.2	Lead system-scale stormwater management by planning for, investment in and management of large-scale stormwater projects.	Joint Greater Melbourne water corporations (GWW, MW, SEW, YVW) in collaboration with government.	By 2030.
6.3	Deliver collaborative place-based water management solutions with Traditional Owners and the community.	Joint Greater Melbourne water corporations (GWW, MW, SEW, YVW) in collaboration with government and partnership with Traditional Owner Groups.	Ongoing.
6.4	Optimise cultural, social and recreational uses and values of land and waterways to achieve multiple community and Traditional Owner benefits.	Melbourne Water in collaboration with retail water corporations (GWW, SEW, YVW), government and partnership with Traditional Owner Groups.	By 2030.
6.5	Investigate the whole of life cycle performance of rainwater and stormwater harvesting assets, and how to increase their effectiveness, affordability and compliance.	Joint Greater Melbourne water corporations (GWW, MW, SEW, YVW) in collaboration with government.	By March 2027.
6.6	Investigate stormwater and recycled water options for irrigation customers and unlock supplies to other users in growth areas and on the peri-urban fringe.	Joint Greater Melbourne water corporations (GWW, MW, SEW, YVW) in collaboration with Southern Rural Water.	By March 2027.
Meaningful Partnerships, Engagement and Education			
7.1	Establish partnership arrangements with Traditional Owners that support their participation in decision making and water management.	Joint Greater Melbourne water corporations (GWW, MW, SEW, YVW) in partnership with Traditional Owner Groups.	Ongoing.
7.2	Work with Traditional Owners to identify and deliver shared strategic water objectives, including those that may be documented in Traditional Owner Country Plans and other relevant strategic documents.	Joint Greater Melbourne water corporations (GWW, MW, SEW, YVW) in partnership with Traditional Owner Groups.	Ongoing.
7.3	Engage with the community on the 'true value of water' to empower our community in decision making and their participation in the Water Security Framework implementation, including drinking water conservation behaviour change.	Joint Greater Melbourne water corporations (GWW, MW, SEW, YVW).	Ongoing.

Have your say

The Greater Melbourne water corporations are inviting you and our broader community to have your say on this draft *Water for Life* strategy, including the directions and proposals it contains to meet our future water needs and values. Your responses to this consultation are central to the development of a final strategy.

Every Victorian urban retail water corporation must prepare an urban water strategy, while Melbourne Water prepares a system strategy. Each outlines a 50-year plan to manage demand for, and ensure sufficient supplies of, drinking water.

The urban water strategies are revisited every five years, which helps ensure we are constantly adapting to our ever-changing world.

Our draft *Water for Life* strategy will become the 2022 urban water strategies and system strategy prepared collaboratively on behalf of Greater Western Water, Melbourne Water, South East Water, and Yarra Valley Water.

The *Water for Life* website provides both educational background information, as well as options for you to view the draft strategy and provide your feedback. It can be found at: **waterforlifestrategy.com.au**

Your feedback on this draft strategy will help determine our actions for the next five years (and beyond) that will be set out in our final strategy, to be submitted to the Minister for Water in September 2022.

How to have your say

Submissions on this draft strategy are due by 13 July 2022.

To view the draft strategy and have your say, please go to: **waterforlifestrategy.com.au**

Following the community consultation period on this draft strategy, a final strategy will be released in 2022 with a consultation report that summarises how feedback has been addressed. The process for finalising this strategy is detailed in Chapter 8 of the complete draft.

1

Introduction

This draft strategy describes the challenges facing Greater Melbourne's water future and the actions we will take to meet the needs of our customers and the community over the next 50 years, to ensure a secure and sustainable water supply for Greater Melbourne.

1.1 About this draft strategy

Every five years Greater Melbourne water corporations – Greater Western Water, South East Water and Yarra Valley Water – are required to revise their urban water strategies. Melbourne Water, as wholesale service provider, is required to revise the supply system strategy for Melbourne. This ensures that our water plans are regularly reviewed to take into consideration changes in our operating environment, new knowledge and best practice.

The individual strategies were last reviewed in 2017 with a high level of collaboration. Ahead of the 2022 review process, we agreed to build on this collaborative approach by producing a single joint strategy – ***Water for Life*** – in partnership with neighbouring regional water corporations. The draft strategy builds on the strong foundation set by the 2017 strategies, combining their significant effort into a single, integrated and enhanced strategy covering the entire Greater Melbourne region.

The draft strategy will influence real change during the next five years and set a strong foundation for Greater Melbourne water corporations to confidently meet the diverse water needs of our communities for the next 50 years. We will continue to reduce per capita demand on Melbourne's drinking water supply, as well as add new sources of water to the supply system to meet the service needs of an uncertain future.

To find new solutions, we need to continue to innovate and share the challenge with our community. We have focused on achieving a more equitable balance across a diverse set of water needs, and **meaningfully engaged with and educated our community about water management** so they can contribute to key decisions on planning for the resilience and sustainability of the region's water and sewerage systems.

This strategy will also work to support improved water management and access outcomes for Traditional Owners. This will be achieved by **supporting the return of water to Traditional Owners** and the removal of barriers for Traditional Owners' water access, acknowledging the significant contribution water makes to cultural values.

Our strategic response will recognise that what has worked in the past will not necessarily work for the future. We are likely to need a broader range of complementary solutions that have the support of our customers and community to prepare for, and respond to, water challenges. During the development of this strategy, we have investigated a range of options with the community, including:

- **optimising the existing water supply system** to maximise water availability and be prepared to manage supply emergencies and droughts. This includes leveraging our existing water sources, supply system and the Victorian Desalination Project
- **continued investment in comprehensive water conservation and efficiency programs** such as embedding sustainable water use behaviours, and focusing on proactive measures with sustainable long-term impacts
- **making much greater use of stormwater and recycled water** to cool and green the city, benefit the agricultural sector and support recreational activities. This involves planning for, and investing in, catchment, sub-catchment, precinct, lot and development scale integrated water management (IWM) solutions
- **continued planning for new climate resilient, manufactured water supply options** such as desalinated water or fit-for-purpose recycled water and stormwater. Rainfall independent water sources can support growth and liveability and slow storage depletion rates, thus reducing the risk of extremely low dam levels during drought
- leading the planning and **readiness activities on near-term, potential augmentations** outlined in the Adaptive Plan, to ensure that we are prepared to augment the water supply system in the next 10 years and deliver the additional supplies we need, when we need them, and in the right locations across Greater Melbourne. This proactive 'readiness' approach will ensure we have enough water for customers, communities, the environment and Traditional Owners.

While our existing dam network serves us well and provides over 80 per cent of our water supply, **building new surface water storages is not the best option** to meet Greater Melbourne's future needs given the risk of climate change, as well as the broader negative impacts that building new dams would have on communities, waterway health and the environment. Instead, we need to optimise and increase our climate resilient, manufactured water supply to provide greater security for our system, particularly in times of drought.

Did you know?

The 2021 merger of City West Water and Western Water to create **Greater Western Water** allows for more integrated planning for supply from the Melbourne system to the city's western areas. This also means customers in some parts of the Greater Western Water region are supplied from separate sub-systems to that of the other. Considering how we best service customers and consumers across both systems is an important priority in planning for our future water supply.

Scope of this strategy

The draft strategy considers a holistic, integrated view of water resource management, taking into account the entire water cycle (see Figure 4) when planning and delivering services for our customers and communities. This includes the delivery of drinking water, sewage, recycled water, desalinated water and stormwater services in a way that is integrated with urban development, and broader land and resource management processes. By integrating water planning and development planning, Greater Melbourne's waterways, natural environment and biodiversity can also be protected, and our use of water can support recreation, cooling and greening initiatives, and urban amenity and liveability.

While the key focus of the draft strategy is how the Greater Melbourne water corporations will provide secure and sustainable water supply and sewerage services for the next 50 years, we have also listened to our community and worked with Traditional Owners to identify further benefits and opportunities that are complementary and integrated, such as providing environmental and cultural flows.

In that context, the focus of this draft strategy will include both the natural and built infrastructure that is used to treat and deliver water to our customers and the environment, as well as infrastructure used to remove sewage across the Greater Melbourne region, including:

- forested and open catchments used for water supply
- reservoirs and weirs used to harvest and store water from rivers and creeks
- the network of rivers, pipes and pumps used to transfer water across the region
- the Victorian Desalination Project – able to produce and deliver up to 150 GL per year of drinking water (approximately one-third of Melbourne's water demand)
- local infrastructure to harvest, store, treat and transfer rainwater, stormwater and recycled water to support fit-for-purpose uses
- Melbourne's sewerage system – the pipes, pumps and treatment plants that treat sewage, and either supplies recycled water or safely releases the treated water from these plants into the receiving ocean or waterway environment.

This draft strategy is aligned with a suite of others that consider parts of the water cycle, such as the *Melbourne Sewerage Strategy, Healthy Waterways Strategy* and *Flood Management Strategy.*

The strategic vision set by our community

In developing the draft *Water for Life* strategy, we committed to take a community-led approach, seeking to enhance industry collaboration with customers and community in order to better understand and meet their changing needs and expectations well into the future.

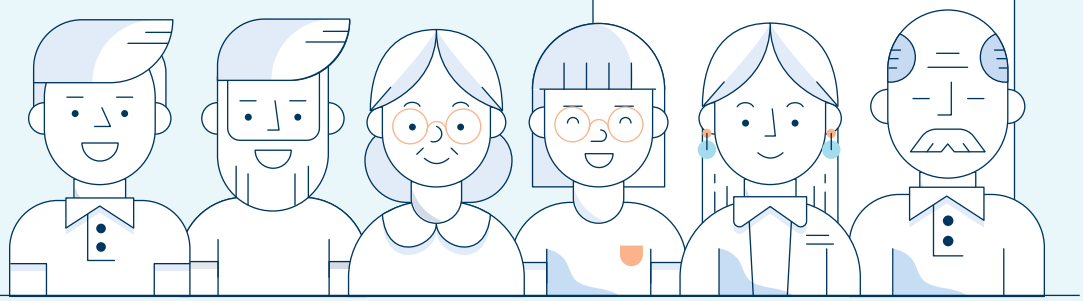
To strengthen the voice of community, the *Water for Life* Community Panel was independently recruited as the representative voice of our community. The following strategy vision was developed by the Community Panel and refined to reflect Traditional Owners' status as our partners in natural resource management:

Community Vision

Our Melbourne.
Our Water.
Our Responsibility.

A future with:

- innovation driving equitable access to water
- pristine, precious, secure and sustainable water
- meaningful partnerships with Traditional Owners
- meaningful engagement with consumers.



Strategic focus areas set by the Greater Melbourne water corporations

To deliver on the intent of an urban water strategy and the System Strategy, we have considered the challenges facing Greater Melbourne – our city is growing, and our climate is changing. Given this changing future, we have identified long-term water solutions for our customers and communities to confidently answer how we will meet our diverse water needs for the next 50 years.

Guided by our Community Vision, this draft strategy is underpinned by four key strategic focus areas that deliver on the needs and values of our community and Traditional Owners, and the needs of the environment, including:

1. A primary focus on: **Ensuring a secure and sustainable water supply**

These outcomes can be categorised by the following three complementary strategic focus areas:

2. **Equitably and affordably meeting diverse water needs.**
3. **Ensuring healthy people and healthy environment.**
4. **Meaningful partnerships, engagement and education.**

Providing for the future needs of the region sets a clear path to achieving greater outcomes for Traditional Owners, our customers, communities and the environment.

Albert Park Lake, Bunurong Country

1.2 Who we are

As Greater Melbourne water corporations, our role is to provide Greater Melbourne with safe and secure access to water supply and sewerage services. In addition, Melbourne Water is responsible for drainage and waterway management, while also delivering water to regional areas and the environment. These essential services support a healthy environment, strong economy and liveable communities in the face of key ongoing challenges such as climate change, population growth and urbanisation.

Producing a joint draft strategy provided the opportunity to build on our core service offerings and the many ways we, as Greater Melbourne water corporations, already collaborate. As an industry, referred to as the *water sector* throughout this draft strategy, we are working together to achieve the best outcomes for the people and places in our service regions and to support regional water needs in connected systems.

The Traditional Owners we work with

Prior to colonisation, Aboriginal and Torres Strait Islander groups lived with their own sets of laws, customs and cultures that were fundamentally linked to their traditional Country and water. A healthy Country and the responsibility to care for Country is central to Aboriginal identity, culture, and health and wellbeing. We can learn from this invaluable Aboriginal knowledge of how to care for Country and the water within it to better understand water and land management.

Colonisation of Australia saw historic dispossession of Traditional Country. Today, the Australian Government recognises the rights of Traditional Owners to traditional lands and water, seeking to redress historic dispossession through legislative mechanisms at state and federal levels. As Traditional Owners, these groups' interests in water are recognised under the *Native Title Act 1993* (Cth) and Victorian *Traditional Owner Settlement Act 2010*, with the latter recognising that access to water for Traditional Owners is a right. The *Water Act 1989* (Vic) reflects this right, requiring that Victoria's water resources and waterways are managed in a way that considers Aboriginal cultural values and uses. Under this legislation, Greater Melbourne water corporations are specifically required to:

- consider and provide for Aboriginal cultural values and uses of waterways in performing their functions conferred under the Act
- integrate both short and long-term Aboriginal cultural considerations under sustainable management principles.

Our service region includes parts of the traditional Country of the Bunurong, Dja Dja Wurrung, Gunaikurnai, Taungurung, Wadawurrung and Wurundjeri Woi Wurrung Traditional Owner groups (see Figure 2).

These groups are the original custodians of the lands and water in our service region as recognised as Registered Aboriginal Parties (RAP) status under the *Aboriginal Heritage Act 2006* (Vic). They have authority to speak on behalf of their representative group and are recognised as the primary custodians and knowledge holders of Aboriginal cultural heritage within the service area of the draft strategy.

As Greater Melbourne water corporations we recognise the importance of supporting restoration of water rights to Traditional Owners and meeting our obligations conferred under the *Water Act 1989* (Vic). Further, we recognise the key role we play in supporting the Victorian Government redress initiatives and policy outlined in the discussion draft Central and Gippsland Region Sustainable Water Strategy (CGRSWS). Through the draft strategy, we are working to establish trusted and sustained partnerships with each of the Traditional Owner groups with RAP status to support delivery of shared benefits in water planning and management, and to support Traditional Owner access to water. In line with the Victorian Aboriginal Affairs Framework 2018–2023 and the Department of Environment, Land, Water and Planning's (DELWP) commitment to Pupangarli Marnmarnepu, 'Owning Our Future', the strategy will support the self-determination of Traditional Owners by recognising and implementing their decisions on the sustainable management of water resources on their Country.

Melbourne's water wholesaler

Melbourne Water supplies wholesale drinking water, provides sewerage services, recycled water services, integrates drainage systems, builds resilience to flooding, and protects and enhances waterways and land on behalf of the Greater Melbourne community. Melbourne Water also supplies wholesale drinking water to regional water corporations, as well as managing water held by Southern Rural Water for irrigation and the VEWH for environmental releases.

Melbourne's retail water corporations

The retail water corporations deliver drinking water, sewerage services, recycled water and trade waste services to the community.

While more than 90 per cent of our customers are residential, we also deliver water to hospitals, schools, commercial and industrial businesses, as well as water for agricultural use such as on farms.

Greater Western Water

Our newest water service provider, formed in July 2021, bringing together Western Water and City West Water.

1.3 million
combined residential and business customers.

Service area stretches over
3,700
square kilometres, from Melbourne's city centre all the way to Lancefield.

Responsible for:

- **7,421** kilometres of water mains
- **6,251** kilometres of sewer mains
- **765** kilometres of recycled water mains
- **57** water pumping stations
- **135** sewage pumping stations
- **7** water treatment plants
- **8** sewage treatment plants
- **15** stormwater harvesting systems
- **1** recycled water plant.

South East Water

1.9 million
residential customers.

60,000
business customers.

Service area stretches over a
3,640
square-kilometre area, from Port Melbourne to Portsea in the south, and from Parkdale to some 30 kilometres east of Pakenham.

Responsible for:

- **14,258** kilometres of water mains
- **11,230** kilometres of sewer mains
- **1,231** kilometres of recycled water mains
- **82** water pumping stations
- **277** sewage pumping stations
- **9** recycled water pumping stations
- **8** water recycling plants
- **1** stormwater treatment plant.

Yarra Valley Water

2 million
residential customers.

59,000
business customers.

Service area stretches over
4,000
square kilometres, from Wallan in the north to Warburton in the east.

Responsible for:

- **10,246** kilometres of water mains
- **10,054** kilometres of sewer mains
- **654** kilometres of recycled water mains
- **64** water pumping stations
- **104** sewage pumping stations
- **10** sewage treatment plants
- **3** recycled water plants.

1.3 How we manage water in Greater Melbourne

Our combined service region provides water to an area of more than 11,340 square kilometres, from the Macedon Ranges across to the Yarra Valley and down to the Mornington Peninsula.

The major reservoirs and large pipelines of the water supply system are managed by Melbourne Water, the wholesale service provider, which treats and supplies drinking and recycled water, removes and treats most of Melbourne's sewage and manages waterways and major drainage systems across the Port Phillip and Westernport region.

The retail water corporations – Greater Western Water, South East Water and Yarra Valley Water – manage all aspects of the urban water cycle, including delivering drinking water, recycled water and sewerage services to their customers and the community.

Beyond these essential services, we also have a core focus on enhancing our customer's quality of life by improving community liveability across Greater Melbourne.

We do this by delivering IWM solutions where water contributes to creating more enjoyable and thriving public places like parks and sporting fields - encouraging people to spend time outdoors. We can also improve liveability by supporting green open spaces that provide cool, shaded areas for people and wildlife to seek shelter, while also reducing air pollution.

To deliver IWM solutions, such as those identified by Melbourne's catchment scale IWM forums (see Chapter 6), the retail water corporations work in collaboration and partnership with 38 local councils. Together we provide a range of services to drive innovation and create vibrant and sustainable communities.

Where does Greater Melbourne's drinking water come from?

Much of Melbourne's drinking water comes from forests high up in the Yarra Ranges and the upper Thomson River basin. We are also increasingly making use of climate resilient, manufactured water sources like the Victorian Desalination Project, which is a core part of our supply system. We are regularly drawing on close to its maximum capacity to supplement climate dependent water supplies (that is, rainfall) to Melbourne, Geelong and towns in Gippsland.

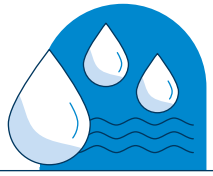
Water is supplied to customers via an extensive network of water supply reservoirs and distribution pipelines. Since Yan Yean Reservoir was completed in 1857, the system has continually evolved to deliver a safe, reliable and affordable supply of water and today includes Yan Yean, Silvan, Upper Yarra, Thomson, Cardinia, Greenvale, O'Shannassy, Maroondah, Sugarloaf and Tarago Reservoirs, operated by Melbourne Water. In the Greater Western Water area, Merrimu, Pykes Creek and Rosslyne Reservoirs are operated by Southern Rural Water and provide water for uses including urban consumptive. Many of these catchments in the Yarra and Thomson basins are largely closed to public access, including commercial and recreational activities, to minimise water quality risks at their source.

The Australian Drinking Water Guidelines recognise catchment management and source water protection as a key element of a multiple barrier approach to managing drinking water quality, and note that 'prevention of contamination provides greater surety than removal of contaminants by treatment, so the most effective barrier is protection of source waters to the maximum degree practicable'.

These reservoirs and associated catchments are still used today, supporting the ongoing supply of safe, affordable drinking water (see Figure 2). Greater Western Water manages a series of separate local regional water supply systems that have historically provided water to the communities of:

- Sunbury, Gisborne, Bulla, Diggers Rest, Macedon and Mount Macedon, and Riddells Creek
- Bacchus Marsh, Melton and Melton South, and Rockbank
- Lancefield
- Myrniong
- Romsey.

Over the past 20 years, these systems have also been progressively connected to the Melbourne system to ensure continued water supply security for communities where available local water resources have decreased. Appendix B includes a detailed description of the Melbourne and Greater Western Water supply system.



We supply water to more than 2.2 million properties and over 5 million customers across Greater Melbourne.

Water is supplied to Greater Melbourne by two supply sub-systems:

The Melbourne Water supply system provides water to the three metropolitan retail water corporations: Greater Western Water, South East Water and Yarra Valley Water. The supply system also provides part of the water requirements of the regional water corporations: Barwon Water, Gippsland Water, South Gippsland Water and Westernport Water. Water is also provided for irrigation and environmental requirements.

The Greater Western Water supply system: provides part of the water requirements for the regional urban areas of Greater Western Water, as well as water for irrigation and environmental requirements.

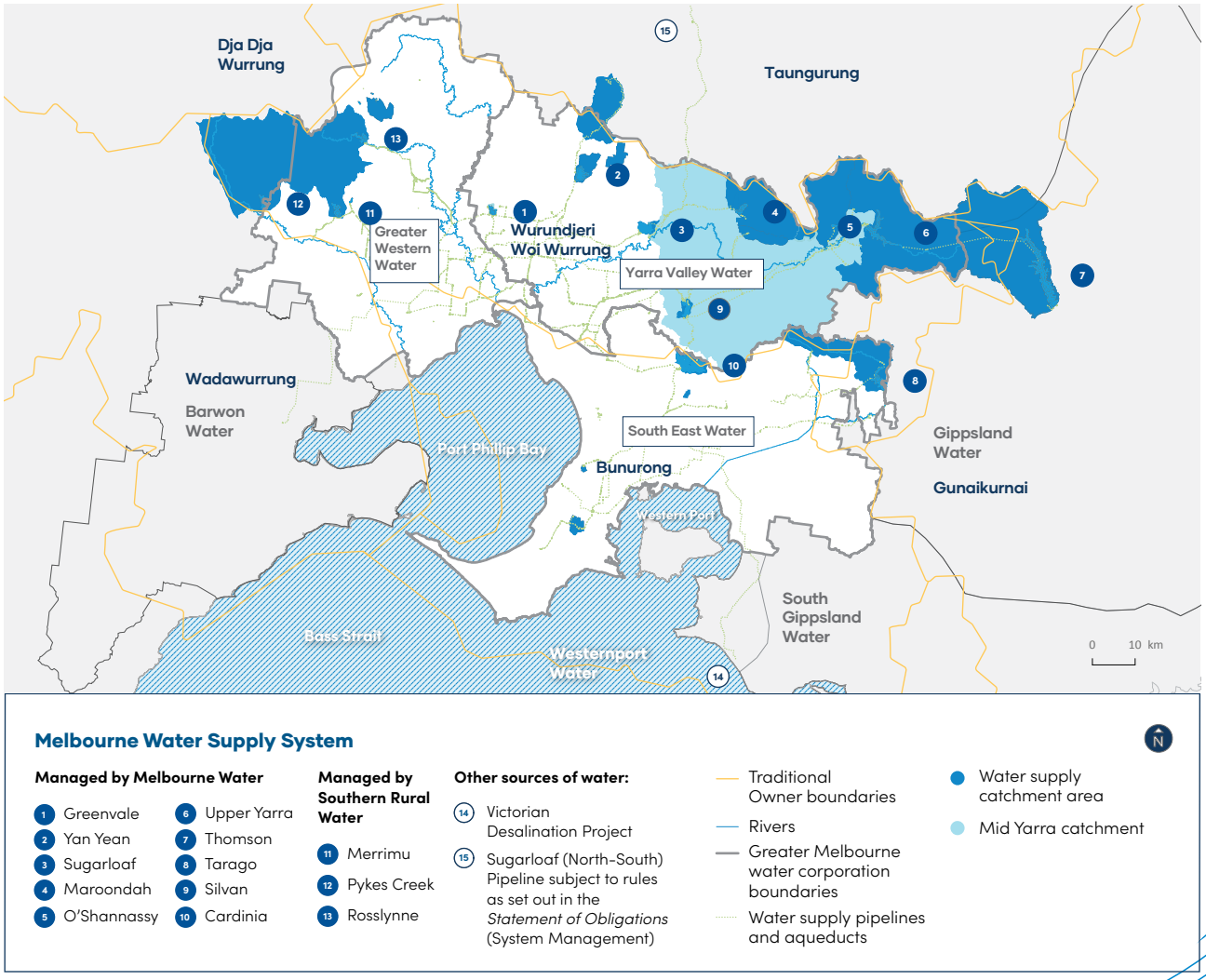


Figure 2: The combined Greater Melbourne water corporation service regions, waterways, reservoirs, catchment areas and Traditional Owner boundaries

Case Study: Supply System Augmentation

Did you know?

Since 2017, the Victorian Desalination Project has contributed over 400 billion litres of water to our supplies.

As a result of population growth and our variable and changing climate, desalinated water has become a more critical component of our water supply. The Victorian Desalination Project helps us keep adequate water in storage to maintain ongoing supply and maintain a buffer of water in storage for future droughts and extreme weather events.

Our water storage levels can change quickly, and we need to be prepared for conditions more severe than the Millennium Drought experienced between 1996 and 2010, during which levels dropped 50 per cent in four years. Having sufficient water in storage at the beginning of droughts is critical to ensuring we have enough water to last through to the end of droughts. This is because the Victorian Desalination Project, able to provide up to 150 GL/year, can only supply up to around one third of the current demand for water from the Melbourne system, meaning that the remaining two thirds need to be sourced from our storages.

Without additional water from the Victorian Desalination Project the total volume of water in storage today would be more than 25 per cent lower (see Figure 3), bringing us closer to possible water restrictions.

To supplement climate dependent water supplies (rainfall) to Greater Melbourne, we are regularly drawing close to the maximum capacity of the Victorian Desalination Project. In each of the past three years, the Victorian Desalination Project has delivered 125 billion litres of water to the Melbourne supply system.

To meet our water needs over the next 10 years, we'll continue adding significant volumes of manufactured water to the system. In particular, desalinated water remains a viable short-term option because it can be fed directly into the drinking water supply system at the volumes required.

To meet future demand, it is likely we will need to build the next supply augmentation (enhancing and expanding our existing system) within the next 10 years. Over the next 50 years, we may also need augmentations totalling up to 600 GL - up to four times the existing Victorian Desalination Project capacity.

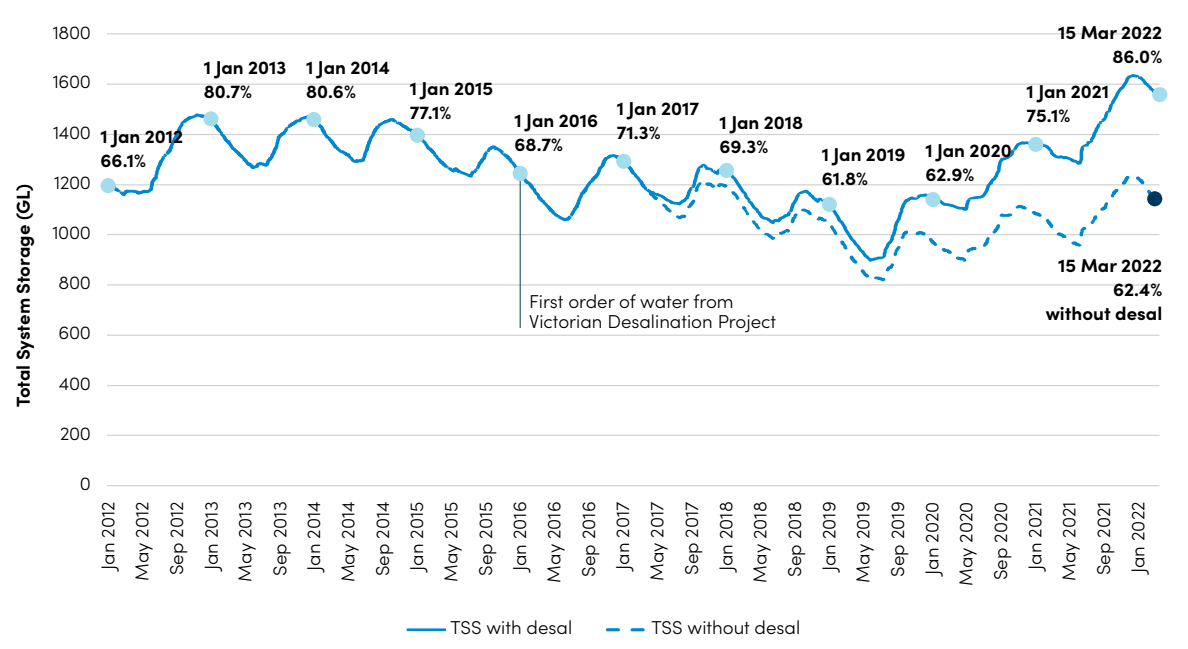


Figure 3: Comparison of Melbourne's total system storage levels over the last five years with and without annual desalinated water contributions.

Maribyrnong River at Footscray, Bunurong Country

Interactions with surrounding regions

Over the past decade, the Melbourne water supply system has become increasingly connected with neighbouring systems. The interconnection of these systems is collectively referred to as 'the water grid' and it enables the Greater Melbourne system to underpin water security in both Melbourne and the surrounding region.

Through the water grid we also support the supply of water to the separate but connected regional systems surrounding Melbourne that are managed by Barwon Water (supply connection from the Melbourne system to Geelong), South Gippsland Water (supply connection to the Lance Creek system from Cardinia Reservoir or the Victorian Desalination Project via its pipeline), Westernport Water (supply connection to San Remo, Phillip Island and the surrounding area from Cardinia Reservoir or the Victorian Desalination Project via its pipeline) and Gippsland Water (supply connection from Tarago Reservoir to Warragul and Drouin).

These regional retail water corporations have access to their own water resources from local weirs, reservoirs, groundwater bores and other sources, including stormwater harvesting schemes and recycled water plants. As a result, their demand on the Greater Melbourne water supply system varies from year to year, depending on availability from their own water systems. Compared to the metropolitan retail water corporations, the regional retail water corporations currently take a relatively small, but growing, volume of water from the water supply system. Southern Rural Water is responsible for supplying water for irrigation to agricultural customers, but also operates some of the regional reservoirs that provides water for consumptive use to regional urban communities.

What happens to our water after we use it?

Most uses of water within the metropolitan area generate sewage that needs to be managed. The sewerage system captures this sewage and transfers it to treatment plants, where contaminants are removed so that the treated water can either be used as recycled water or safely discharged into waterways, the bay or Bass Strait. This system has been the foundation of Melbourne's treasured liveability since the late 1890s by safeguarding our health and wellbeing, as well as that of our natural urban environments.

Today our sewerage system consists of over 25,000 kilometres of pipes and pumps that transfer sewage from homes, industry and businesses to one of 28 treatment plants across Melbourne. The system has also evolved to provide a range of co-benefits, such as improving our resilience to drought by diversifying water supplies. Recycled water is now a reliable source of supply such as providing treated water for irrigation, which reduces pressure on drinking water supplies and the need to draw on water resources from local waterways. Using recycled water more often also helps to delay costly future upgrades to sewage management infrastructure, required to manage growth across our cities.

Melbourne Water is able to produce the largest amount of Class A, or high-quality, recycled water in Australia, which can be used for fit-for-purpose uses. More than 90 per cent of Melbourne's sewage is treated at the Western Treatment Plant in Werribee and the Eastern Treatment Plant in Bangholme. Remaining sewage is treated at local treatment plants managed by Metropolitan Water Corporations.

How we manage waterways and drainage

The way we capture, manage, treat and release water back into the environment has a significant impact on the health of our waterways, the health of waterborne species and the natural movement of water.

The waterways in our region form a complex network of interconnected and interdependent rivers, wetlands and estuaries, which collectively gather rainwater, stormwater and groundwater from the landscape and carry this water to the bays and ocean.

Over the years, our water management practices have interrupted the natural flow of water – both in waterways and on the land.

In natural catchments, most rainfall soaks into the ground or gradually evaporates, with only a small portion running off the land into local waterways.

In an urban water cycle, roofs and paved impervious surfaces in developed areas prevent these processes from occurring, causing rainwater to run off through stormwater drains. This water (now stormwater) then collects in another separate set of drainage pipes, channels, wetlands and retarding basins before being discharged into waterways. When polluted, stormwater can be a risk to human health and the environment. Stormwater is also an issue due to its flashiness (causing quick rise and fall in stream flows) and, particularly after storm events, can cause erosion and other negative environmental impacts.

Beyond urbanisation, our waterways face additional, interconnected challenges such as climate change, pollution and rapid population growth. Melbourne Water works with a range of partners to manage waterways and major drainage systems in the Port Phillip and Westernport region, as well as providing integrated drainage and flood management services to create outstanding natural community spaces and healthy waterways for the future.

The Victorian Government also established the environmental water reserve, which is used to ensure the health of our waterways are protected. 'Environmental flows' dictate the certain volumes of water waterways require to improve seasonal flows and maintain the quality not only of water but surrounding habitats – all of which are vital for the health of flora and fauna. Read more about the work being done to protect the values of waterways in Chapter 6.

What is environmental water?

Environmental water is used to ensure waterways get enough water to protect environmental values. Environmental values are the uses, attributes and functions of the environment that Victorians value. By ensuring healthy waterways we can also provide added liveability benefits to our communities.

The Victorian Government established the environmental water reserve to ensure that the environmental values and health of waterways are protected, even when water is being diverted from a waterway to support urban centres and agricultural activities. This includes protection of waterway health during droughts.

The environmental water reserve is comprised of three key elements:

1. Minimum passing flows specified at key points along a waterway that must be delivered before any water is diverted for other purposes.
2. Statutory entitlements to water which can be used flexibly by the VEWH to deliver specific environmental needs.
3. Water available over and above the volume of water allocated to urban centres and agriculture.

How is water delivered for the environment?

The Victorian environmental watering program relies on relationships between local communities, waterway managers (CMAs and Melbourne Water), water storage managers, environmental water holders, land managers and scientists. Water available under environmental entitlements is collaboratively managed and used to improve the health of rivers and wetlands and the native plants and animals that depend on them. The seasonal watering plan previews which rivers and wetlands will potentially receive water for the environment under the program in the coming year.

Our supply system

Rain

Rain is a climate dependent source of water that can be captured to fill our dams, reservoirs and storages. Unfortunately, rainfall cannot meet our growing demand for water and we cannot rely solely on rainfall dependent supply sources to meet all our future water needs.

Diverse uses of water

We use water for a range of residential, commercial, institutional, agricultural and industrial purposes. Restoring Traditional Owner access to water for the purposes of caring for Country and for economic development is critical for the cultural, physical, spiritual and economic health and wellbeing of Aboriginal people. We are committed to ensuring fair and equitable water access for all water users, including to satisfy cultural, liveability and environmental values for all areas across the Greater Melbourne system.

Drainage system

When it rains on urban areas, the drainage system (managed by Melbourne Water and local councils) captures stormwater and channels it into waterways and bays. While this helps to prevent and manage the impacts of urban flooding, it has negative consequences for the environment. Our 50-year Adaptive Plan provides the opportunity to make greater use of stormwater harvesting as a valuable source of supply to contribute to our water needs.

Sewerage system

Most water uses generate sewage that needs to be managed. The sewerage system captures sewage and transfers it to sewage treatment plants, where contaminants are removed so treated sewage can either be used as recycled water, or safely discharged into waterways, the bays or Bass Strait.

In 2020/21, Melbourne Water treated 386 GL of sewage, of which approximately 8 per cent (or 32 GL) was supplied to customers as recycled water. With significant quantities of water available close to Melbourne, the sewerage system is an essential part of resolving the growing deficit in our water supply.

Integrated water management

In our current system, rainwater, stormwater and recycled sewage from the sewerage system are harvested for fit-for-purpose uses. The draft *Water for Life* strategy considers these critical water resources as part of an IWM approach which recognises stormwater and recycled water can provide more reliable sources of water and build resilience into our future water supply. This reduces the volume of water needed from the water supply system, and reduces the volume of stormwater and treated sewage discharged into waterways and bays.

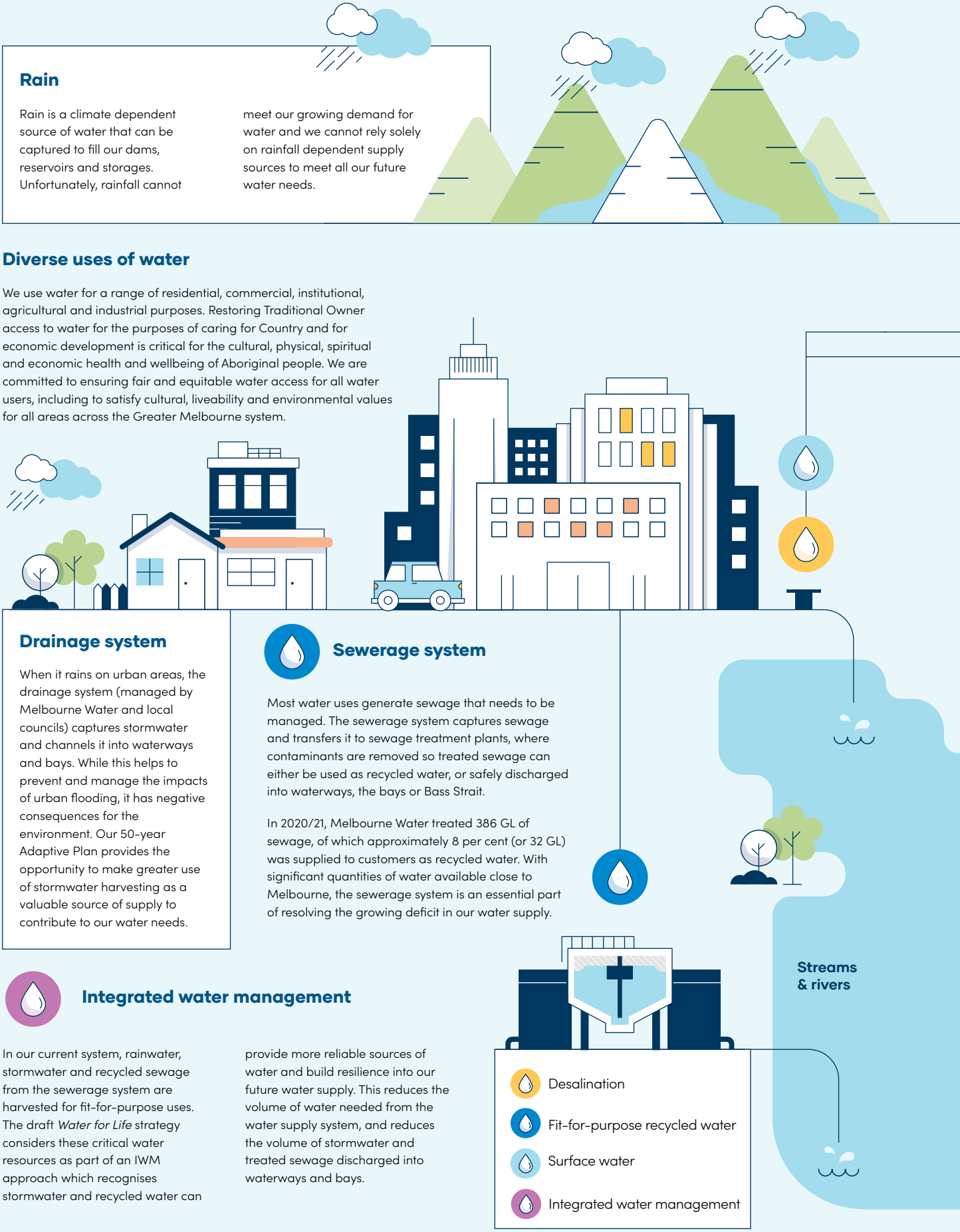
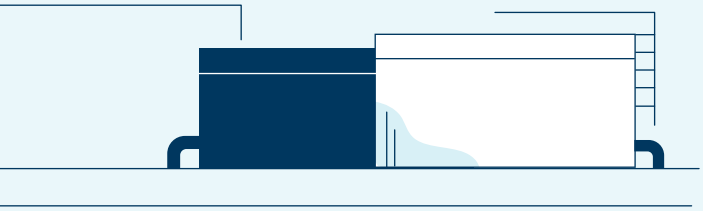


Figure 4: The water supply cycle and our diverse water sources

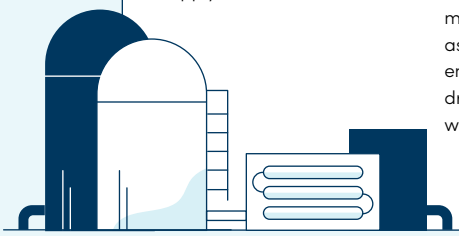
Water supply system

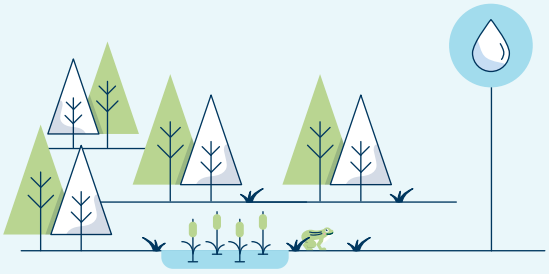
The water supply system includes protected and open water supply catchments, reservoirs and weirs used to harvest and store water, the Victorian Desalination Project, and the tunnels, pipelines, pump stations and tanks used to transfer water across the region to our customers. The water grid connects Melbourne with neighbouring water supply systems.



Desalination

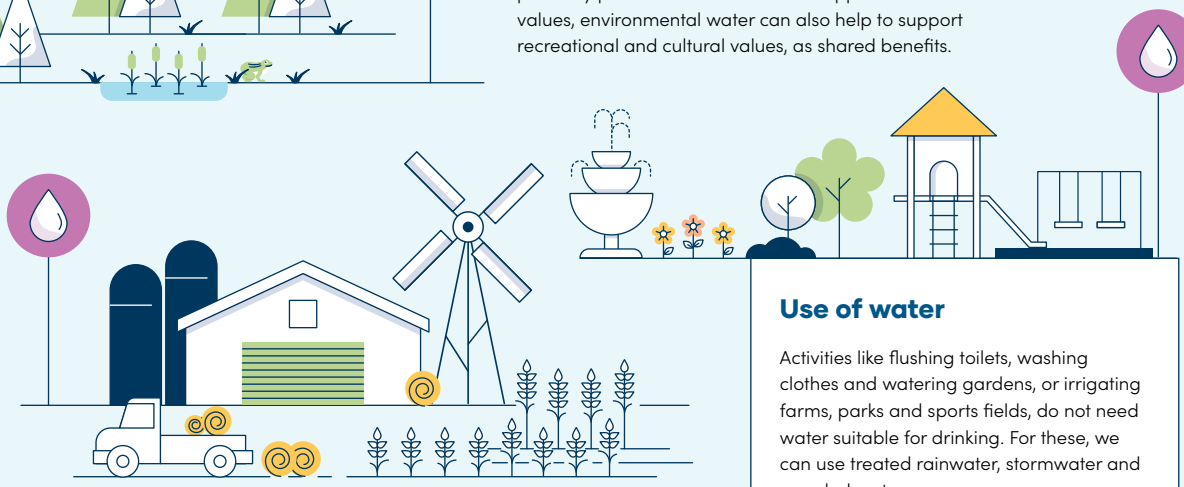
Desalination is the removal of salt from seawater. The Victorian Desalination Project provides rainfall independent, climate resilient manufactured water for Melbourne's drinking supply. It can deliver 150 GL per year, which is about one-third of our current demand. We operate the water supply system, including the Victorian Desalination Project, to keep adequate water in storage, subject to cost, for maintaining ongoing supply as well as ensuring we have enough water during future droughts and extreme weather events.





Environmental water

Environmental water is released from our water supply systems into waterways to support environmental values and contribute to maintaining a healthy environment. Although it is primarily planned and delivered to support environmental values, environmental water can also help to support recreational and cultural values, as shared benefits.



Use of water

Activities like flushing toilets, washing clothes and watering gardens, or irrigating farms, parks and sports fields, do not need water suitable for drinking. For these, we can use treated rainwater, stormwater and recycled water.

Using diverse sources of water such as rainwater, stormwater and recycled water for these purposes helps us reduce demand on drinking water and also better care for our open spaces such as parks and sporting grounds. Keeping these areas green, shaded and cool provides more enjoyable places for people to avoid the heat, exercise and spend time outdoors with their community. These spaces can also provide increased food, habitat and other resources for fauna, helping to keep our wildlife healthy. We currently use approximately 45 GL per year of stormwater, rainwater and recycled water for fit-for-purpose uses.

Waterways and bays

The waterways in our region form a complex network of interconnected and interdependent rivers, wetlands and estuaries, which collectively gather rainwater, stormwater and groundwater flows from the landscape (the catchments), ultimately carrying this water to the bays and ocean.

Waterways and bays across Port Phillip and Western Port support a range of economic, environmental and social values. The volume and quality of water in our waterways and bays have changed as a consequence of urban development – we need to work to manage the impacts of these changes on the values our waterways and bays support.

Bays & ocean

1.4 Water management context for Greater Melbourne

In Victoria, water is managed through a 50-year planning framework (see Figure 5). By planning and managing all elements of the urban water cycle in an integrated and innovative way, we can ensure that we support a healthy environment, a prosperous economy and thriving communities.

Water for Victoria, is the state's high-level policy and strategic plan for water management, which sets the long-term policy direction for managing Victoria's precious water resources. Since the plan was launched in 2016, significant progress has been made in meeting the challenges of climate change and population growth, and taking action to ensure our water systems are modern and efficient, future-focused and affordable.

Sustainable water strategies are developed by the DELWP on behalf of the Minister for Water and set out long-term plans that proactively develop actions to meet broader policy objectives, which secure future water resources at the broader regional scale. They identify threats to the reliability of supply and quality of water in each region and present policies and actions to help water users, retail water corporations and CMAs respond to those threats over a 50-year planning horizon. In addition to urban users, they consider water for Traditional Owners, agriculture, the environment and recreational values.

The draft *Water for Life* strategy delivers on the requirement under the *Water for Victoria* planning framework that Melbourne Water and retail water corporations produce the Melbourne System Strategy and urban water strategies respectively.

- The **Melbourne Water System Strategy** presents a system view of water resource management across metropolitan Melbourne and the surrounding regions for the next 50 years.
- **Urban water strategies** include plans for securing water supplies for the next 50 years given uncertainty with population, climate change and climate variability. They also include drought preparedness plans which detail how acute future water shortages will be managed. The aim of urban water strategies is to support the development of resilient and liveable communities while balancing social, environmental and economic costs and benefits across the water cycle.

Integrated water management forums have been established for catchments across the Greater Melbourne region to identify, prioritise and oversee the implementation of collaborative water management opportunities. They bring together all organisations with an interest in the water cycle, recognising that each has an important role to play in the management of our vital resource.

Price submissions are typically developed in parallel with the development of urban water strategies. Each retail water corporation develops a pricing proposal for submission to the Essential Services Commission, the independent economic regulator for Victoria's water sector. Developed on a five-year cycle, price submissions are guided by extensive customer engagement to to ensure the water and sewerage water, sewerage, waterway and drainage services provided deliver value to customers. They set out key strategies, projects, initiatives and operational requirements that impact future pricing. The final strategy must integrate with and inform price submissions.

Integrated water management (IWM) is a collaborative approach to the way we plan for and manage all elements of the water cycle. This includes managing and protecting the health of our waterways and bays, sewage management, using all sources of water to supply fit-for-purpose water, stormwater management and water treatment. This collaborative process allows organisations to identify and deliver greater value water cycle initiatives to improve the resilience and liveability of Victoria's cities and towns. Examples of IWM projects are highlighted in case studies throughout the draft strategy.

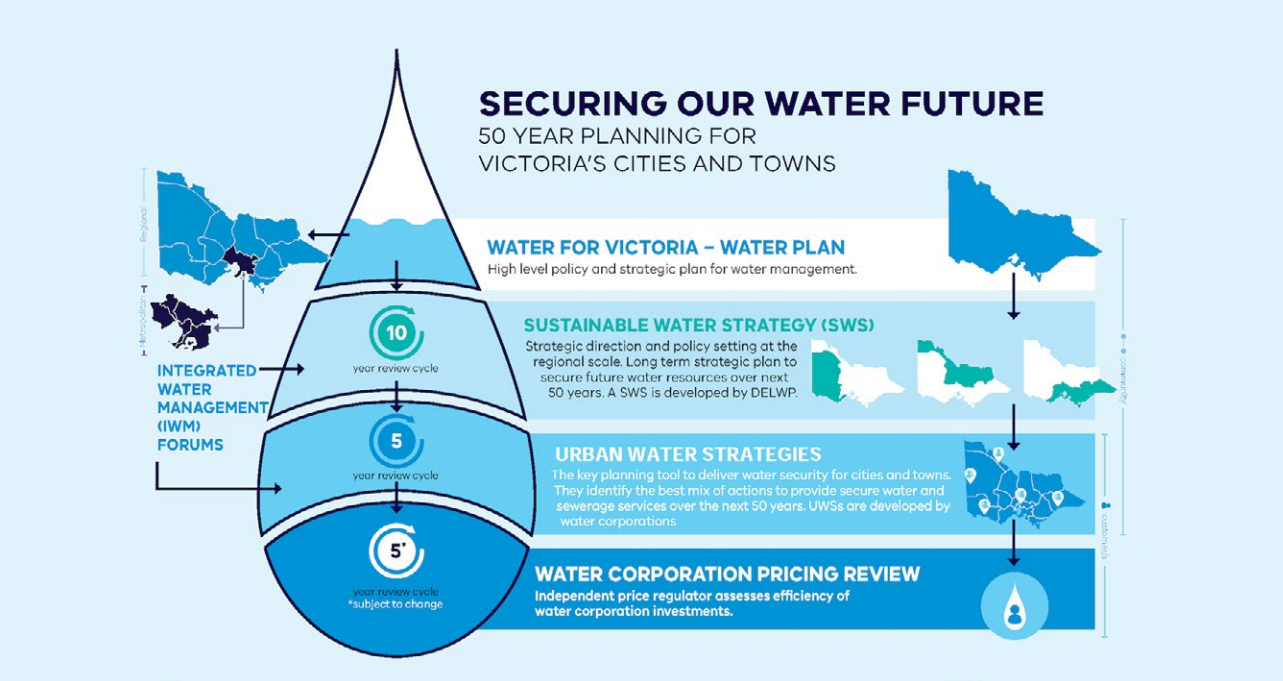


Figure 5: How our strategies work together [Source: DELWP]

Our Legal Obligations to develop urban water strategies

***Statement of Obligations* (General)**

Out Statement of Obligations is issued by the Minister and sets out a broad range of obligations and guiding principles applicable to all retail water corporations in relation to the performance of functions and exercise of powers. As retail water corporations, we have a legal obligation to comply with relevant industry legislation, primarily the *Water Act 1989* and the *Water Industry Act 1994*.

As part of these obligations, retail water corporations are responsible for developing urban water strategies and Melbourne Water is responsible for the Melbourne System Strategy.

By 31 March 2017, and thereafter as directed by the Minister, retail water corporations must develop, in accordance with any written guidelines issued by the Minister, an urban water strategy for its supply districts that must include:

- proposed levels of service
- measures to deliver sub-regional planning outcomes, and integrate water cycle management with relevant planning schemes
- options to facilitate efficient investments in projects across the urban water cycle that optimise shared benefits and avoidable costs
- measures to adapt to climate change
- measures to maintain a balance between the customer's demand for water and the supply of water in cities and towns
- options for the management of extreme event supply contingencies
- options and trigger points for major augmentations.

The strategy should consider all aspects of the urban water cycle across a 50-year planning horizon and be consistent with the guiding principles of this Statement and any relevant sustainable water strategy.

In developing an urban water strategy, the corporation must consult with the community and key stakeholders, and participate in the development of relevant local and regional plans.

Aligning with the Central and Gippsland Region Sustainable Water Strategy

The discussion draft Central and Gippsland Region Sustainable Water Strategy (CGRSWS) recognises that managing water in a holistic manner, where Traditional Owners are able to care for Country (including its waterways and water bodies), delivers benefits to all who live in the region. The quadruple-bottom-line method referenced in the discussion draft CGRSWS "takes into account not only economic and financial costs and benefits, but also social, environmental and cultural factors and outcomes." (DELWP, 2021.)

This draft strategy recognises that taking a quadruple-bottom-line approach (see Figure 6) to achieve more holistic water management can deliver benefits to everyone in Greater Melbourne. It therefore underpins the focus and decision making of this draft strategy and its implementation.

Once finalised, the discussion draft CGRSWS will have helped to inform the framework of this draft strategy. The discussion draft CGRSWS outlines the broader direction and policy settings for the whole region that will then support and enable the more specific programs of action included in this draft strategy which in turn will also inform the final CGRSWS by identifying likely future demands and local options to meet water demands as a result of customer values and preferences. The two strategies work together to secure water for our community's future needs.

The quadruple-bottom-line method is a way of evaluating performance against four criteria: cultural, economic, environmental and social. It is an extension of triple-bottom-line accounting (people, planet and profit) to include cultural needs.

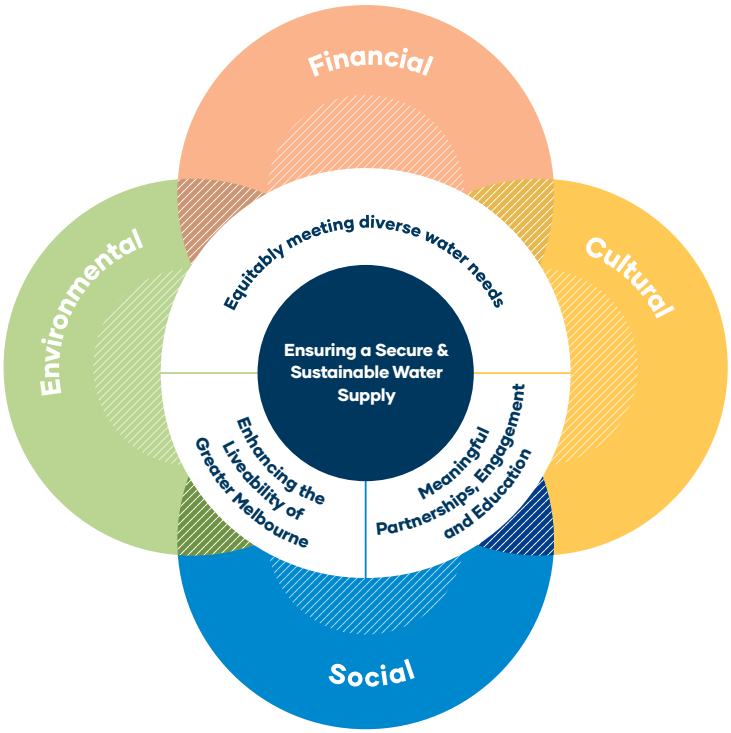


Figure 6: How this draft strategy aligns with the quadruple-bottom-line (cultural, financial, social and environmental) principles in the CGRSWS

1.5 Supporting sustainability

The United Nations Sustainable Development Goals (SDGs) are the blueprint to achieve a better and more sustainable future for all and are the guiding framework by which we can make sound strategic planning decisions. Adopted by 193 countries, they address the global challenges we face, including poverty, inequality, climate change, environmental degradation, peace and justice. The SDGs are a universal call to action to end poverty, protect the planet and improve the lives and prospects of everyone, everywhere.

Water plays a vital role in liveability, sustainability, wellbeing and equality. As Greater Melbourne water corporations, we are in a key position to contribute to the objectives of the SDGs, and Melbourne embodies many of the goals in its position as one of the world's most liveable cities. The SDGs provide a common framework or lens with which we can evaluate how to best deliver an improved, healthier and more equitable world. The activities in this draft strategy have been considered in line with the SDGs (see Figure 7), reflected by a demonstrated link between each relevant SDG and the planned activity for strategy delivery.

Figure 7: United Nations Sustainable Development Goals

Aerial view of Fishermans Bend, Bunurong Country

2

Our Challenge

The challenges we face in Victoria are impacted by global events and changing needs of the population. This section discusses the global challenges to water use, the changing needs of society and the impact of climate change.

Key strategy actions	Secure and sustainable water supply	Equitably and affordably meeting diverse water needs	Ensuring healthy people and healthy environment	Meaningful partnerships, engagement and education
2.1 Enhance our understanding of water use to improve short, medium and long-term water use projections.	✓		✓	
2.2 Take a leadership role in climate change to build resilience and ensure preparedness.	✓	✓	✓	✓
2.3 Demonstrate the value of Melbourne's sewage treatment plants as strategic resources for the city by leading a transition towards greater use of fit-for-purpose recycled water.	✓		✓	✓
2.4 Take a leadership role in the industry shift towards a circular economy and enable greater use of recycled water and a mix of centralised and decentralised solutions.	✓		✓	✓

2.1 Global challenges

The global environment is rapidly changing. Working to stay ahead of population growth, urbanisation, technological advancement and climate change will require new, bolder approaches.

Over the last few years, several unprecedented events have unfolded across the world. Australia, along with many other countries, has experienced the devastation of extraordinary natural disasters such as extreme bushfires and storms. We have all felt the global impacts of COVID-19, the lasting consequences of which are yet to be fully realised.

Recent customer perceptions research conducted by the Water Services Association of Australia (WSAA), showed 20 per cent of water customers are struggling to pay their bills.

According to the ABS Household Impacts of COVID-19 Survey conducted in June 2021, in Victoria:

- people were more likely to report it would take over a year for life to return to normal (34 per cent compared with 23 per cent of people in the rest of Australia)
- more people (27 per cent) experienced high or very high levels of psychological distress compared with the rest of Australia (18 per cent).

These events provide some insight into the future, which is also likely to be characterised by unforeseen events that are difficult to predict.

The World Economic Forum's *2022 Global Risk Report* presents an analysis of key risks emanating from current economic, societal, environmental and technological tensions (WEF, 2022). The report states:

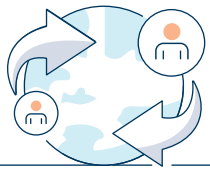
> "For the next five years, respondents again signal societal and environmental risks as the most concerning. However, over a 10-year horizon, the health of the planet dominates concerns: environmental risks are perceived to be the five most critical long-term threats to the world as well as the most potentially damaging to people and planet, with "climate action failure", "extreme weather", and "biodiversity loss" ranking as the top three most severe risks".

The breadth of global risks is relevant to all businesses and industries and describe patterns and issues that impact all parts of our socio-economic systems. The challenges we face in Victoria are impacted by global events as well, and the changing needs of our population. This chapter explores key impacts to water resource management – particularly, the changing needs of our growing population and the impact of climate change.

Disorderly climate transition and climate (in-)action

Climate change is already manifesting rapidly in the form of droughts, fires, floods, resource scarcity and species loss, among other impacts. Yet a disorderly climate transition characterised by divergent trajectories worldwide and across sectors will further drive apart countries and divide societies, creating barriers to cooperation.

Figure 8: World Economic Forum's *Global Risk Report's* Horizon for 2022

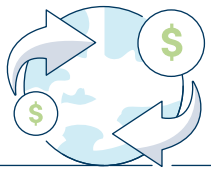


Barriers to migration

Climate change, conflict and political instability will force millions to leave their homes. In 2020, there were over 34 million people displaced abroad globally from conflict alone—a historical high. However, in many countries, the lingering effects of the pandemic, increased economic protectionism and new labour market dynamics are resulting in higher barriers to entry for migrants who might seek opportunity or refuge.

Digital dependencies and cyber vulnerabilities

Over the last 18 months, industries have undergone rapid digitalisation, workers have shifted to remote working where possible, and platforms and devices facilitating this change have proliferated. At the same time, cybersecurity threats are growing—in 2020, malware and ransomware attacks increased by 358 per cent and 435 per cent respectively—and are outpacing societies' ability to effectively prevent or respond to them.



Refreshing resilience

Better national preparedness creates a better environment to invest. At an organisational level, strategies such as grounding resilience analyses in key delivery requirements, appreciating systemic vulnerabilities and embracing a diversity of approaches can help leaders build better resilience.

2.2 Our growing region and changing needs

Growing population

Greater Melbourne is a vibrant, growing city with a population of over five million people, expected to double by 2070 which will increase demand for water.

The latest population projections by the Victorian Government indicate that Greater Melbourne could grow a population of almost 11 million people by 2070 (DELWP, 2019).

Greater Melbourne's outer regions are expected to continue to see rapid growth, expanding the footprint of the city. At the same time, it is also expected that the inner suburbs of the city will see strong growth through densification.

Outside of Greater Melbourne, population projections indicate that neighbouring regional areas are also expected to experience strong growth. A number of these regional areas already rely on the Greater Melbourne supply system for part of their water needs.

Although the COVID-19 pandemic has temporarily slowed Victoria's population growth, there remains a long-term trend of significant annual growth. Projections show our population is still expected to double by 2070 – further increasing demand for water. A larger, denser city brings the challenge of providing services such as public transport, education, health, and utility services, including the supply of water and safe management of sewage. A safe and reliable supply of water is not only critical to the health and wellbeing of our communities but also for industry and the functioning of the economy. Read more in chapter 6.

The Greater Melbourne water corporations have also factored in the possible impact of COVID-19 on the long-term growth projections for Melbourne. Using this information and recognising these are challenges faced by each organisation, the Greater Melbourne water corporations have projected the possible increase in demand for water over the next 50 years and produced three water demand scenarios (see Figure 9):

1. High demand growth.
2. Medium demand growth.
3. Low demand growth.

The medium demand growth scenario is aligned to *Victoria in Future* population forecasts, while the high and low scenarios take into account uncertainty and sensitivity analysis around population growth, per capita consumption and climate change.

These projections indicate that the growth of Greater Melbourne and its neighbouring regions is expected to drive a significant increase in the demand for water and sewerage services, with demand for water potentially doubling to 900 GL/year over the next 50 years under a high demand growth scenario.

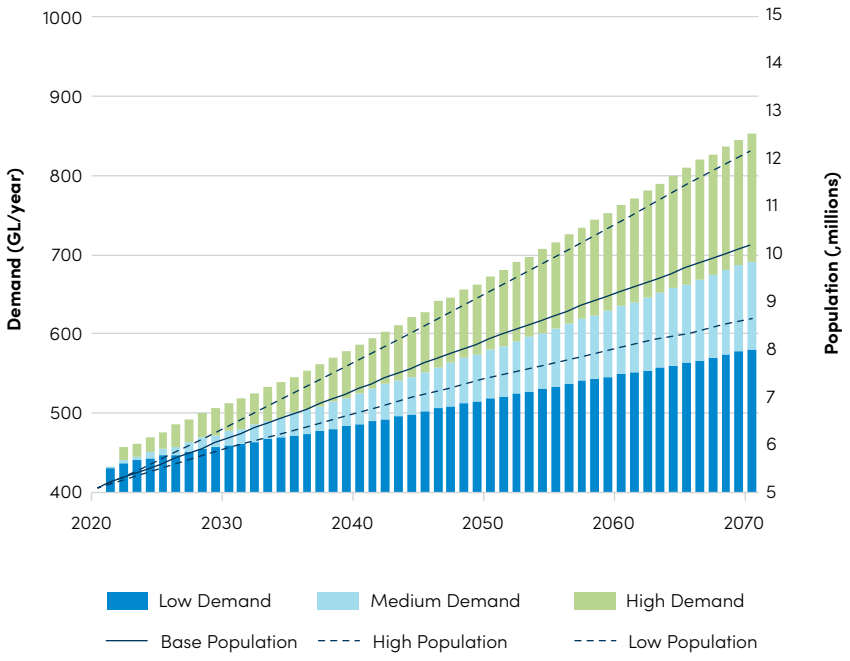


Figure 9: High, medium and low demand growth scenarios

Key impacts of population on the sewerage system

Population growth is placing increasing pressure on our sewerage system. As the number of households and businesses in our region grows, so too does the volume of sewage we will need to manage. Treating sewage requires major infrastructure, considerable energy and generates greenhouse gas emissions.

Key challenges facing the system include:

Environmental discharge limits

Long term, with our population expected to double and with increasing growth in sewage flows and loads received for treatment, our current approach to managing environmental limits is likely to be unsustainable. There is an opportunity to intercept and recycle more of Melbourne's sewage. Currently, approximately 82 per cent of Melbourne's sewage is used once, treated and discharged to the ocean. There are opportunities to use water more than once on a broader scale and continue to protect our precious waterways and beaches for the future.

Ageing infrastructure

Many of Melbourne's large sewerage assets were built before the 1970s and are reaching the end of their expected design life. These assets can continue to reliably serve their function by understanding their condition and applying a number of interventions such as increased maintenance or targeted rehabilitation works. As most of our sewers sit in and around highly built up areas, replacing or renewing these assets will require careful planning. Water corporations will work together to minimise the impact on our communities.

Emerging contaminants

There are many emerging contaminants that are either appearing in our sewage for the first time, or that we are now realising have negative impacts on our environment and public health. These include microplastics, pharmaceuticals and a range of other chemicals used for household or industrial applications. Some of these are removed at some or all of our treatment plants, but some are not.

Action 2.1

What: Enhance our understanding of how water is used to improve short, medium and long-term water use projections through ongoing engagement, studies and insights from new technology.

Detail: Support our capability to appropriately understand how water is used by the community, and the needs of Traditional Owners and the environment.

Further integrate the capability with sewerage system flow and load projections to holistically articulate the challenges we face in delivering an ongoing reliable water supply.

Identify and inform opportunities to use water more efficiently.

Who: Joint Greater Melbourne water corporations (GWW, MW, SEW, YVW).

When: By March 2027.

Delivers on SDGs

Regions in Focus

Our shared challenges

As Greater Melbourne water corporations, we are continuously working to address the ever-present challenges of a growing and diversifying population; urbanisation spreading into regional areas, and an increasingly changing and variable climate. We need to address these challenges and balance these diverse water needs of our communities, while also maintaining affordable and accessible services for all.

Our shared opportunities

Beyond every day consumptive uses such as drinking and washing, water also plays a critical role in community health and wellbeing and contributes to providing cool, green open spaces such as public parks and sporting grounds. Given our many shared challenges, we have the opportunity to work together in finding shared solutions. Co-developing this draft strategy is just one of the many ways water corporations are working hard to build a more resilient and water-sensitive Greater Melbourne - with a smart and sustainable water supply.

Melbourne Water has oversight of the entire water supply system with a focus on ensuring overall bulk water supply and long-term security is maintained for Greater Melbourne. This involves working with the metropolitan retail water corporations to plan for future expansion or changes to the system.

In addition, the metropolitan retail water corporations, Greater Western Water, South East Water and Yarra Valley Water also focus on the individual needs of the customers, communities and environment within their service regions. They work to progress opportunities that deliver regional scale solutions, work with communities to improve water conservation and efficiency programs and invest in IWM solutions which increase our use of diverse water sources, such as stormwater, rainwater and fit-for-purpose recycled water.

Our future focus

Some of the key opportunities the retail water corporations are committed to progressing across Greater Melbourne include:

- **Increasing our use of fit-for-purpose recycled water and stormwater**
  - pursuing opportunities to expand fit-for-purpose recycled water production for use in homes and public spaces, including our green corridors for greening and cooling
  - supporting increased agriculture and horticulture productivity, and supporting the creation of new and existing irrigation areas through the supply of fit-for-purpose recycled water.
- **Continued investment in comprehensive water conservation and efficiency programs**
  - working with customers and the broader community to deliver water knowledge campaigns and drive water conservation as a way of life.
  - using the latest technology to manage stormwater and optimise rainwater availability for non-drinking supplies
- **Maturing our partnerships with Traditional Owners**
  - maturing our relationships with Traditional Owners and working together on water management, protecting biodiversity and cultural values
  - improving our understanding of sustainable land and water management from Traditional Owners
- **Enhancing our circular economy approach**
  - implementing circular economy initiatives with large water, commercial and trade waste customers to minimise waste, promote resource recovery and improve resilience and performance of customer service obligations
  - progressing renewable energy (such as waste to energy) technology projects and per our Emissions Reductions Pledges, reduce our emissions by up to 50 per cent by 2025, with the aim of further reductions by 2030.

The Water Security Framework outlined in Chapter 4, provides a robust basis for addressing these challenges at a system-wide level and establishes a secure base to progress local opportunities. The draft strategy enables us to deliver regional and local scale opportunities which enhance water management and support the broader cultural values, lifestyle and amenity needs of local communities across the entire region. The different challenges and opportunities for each service region must be understood and taken into account in order to be incorporated in the overall draft strategy, and to fully complement the system-wide focus.

IWM committed projects (base case)

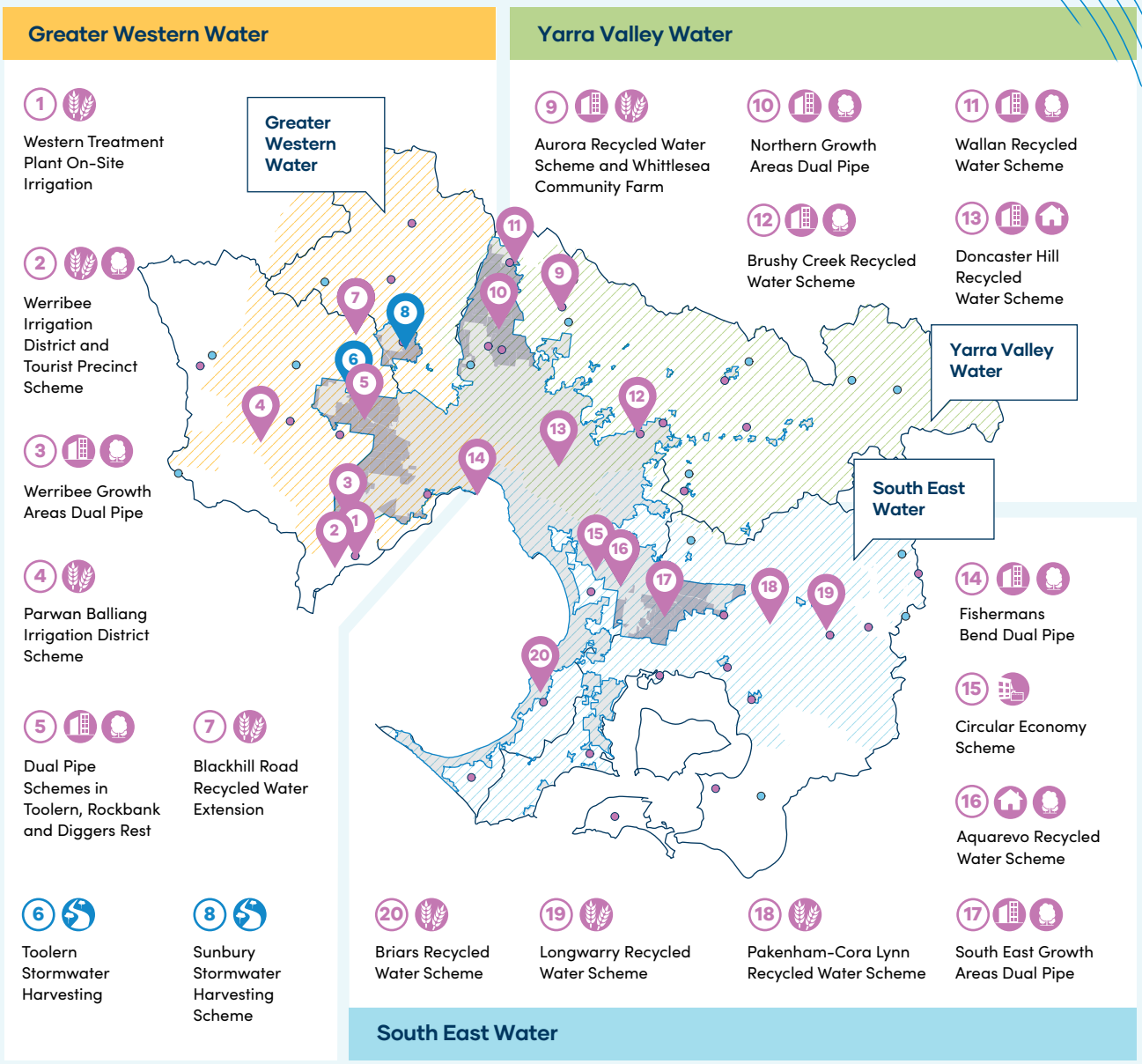


Figure 10: Committed IWM opportunities identified by the retail water corporations in collaboration with DELWP

Balancing urban and environmental needs

Due to urban growth and changing demographics, the complexity of balancing competing values and demands from urban users, agriculture, industry, recreation, Traditional Owners and the environment will be an increasing challenge.

Not enough water for the environment

The Long-Term Water Resources Assessment conducted by the Victorian Government in 2020 found that, across many rivers and basins in Victoria, the availability of water has decreased from when last assessed between 2006 and 2011. Some of the largest decreases are in the catchments surrounding and supplying water to Greater Melbourne, including the Moorabool, Werribee, Maribyrnong and Yarra catchments, where **water availability declined by 15 to 20 per cent**. Water availability decreased for both urban consumptive and environmental use (DELWP, 2020).

The assessment also found that in numerous catchments in or near Melbourne, **the decline in water available for the environment was proportionally greater than that for consumptive uses**. As such, significant existing deficits in water availability to support environmental values have worsened disproportionately over the last 10 years (see Figure 11).

The combination of a drying climate, increased urbanisation and continued extraction for consumptive purposes means that declining environmental health could continue, causing negative impacts on cultural heritage, water quality, amenity, flora and fauna, recreation and liveability. To ensure the health of our environment, and to address this disproportionate reduction in water availability, **a part of future water sources will need to provide additional water for the environment.**

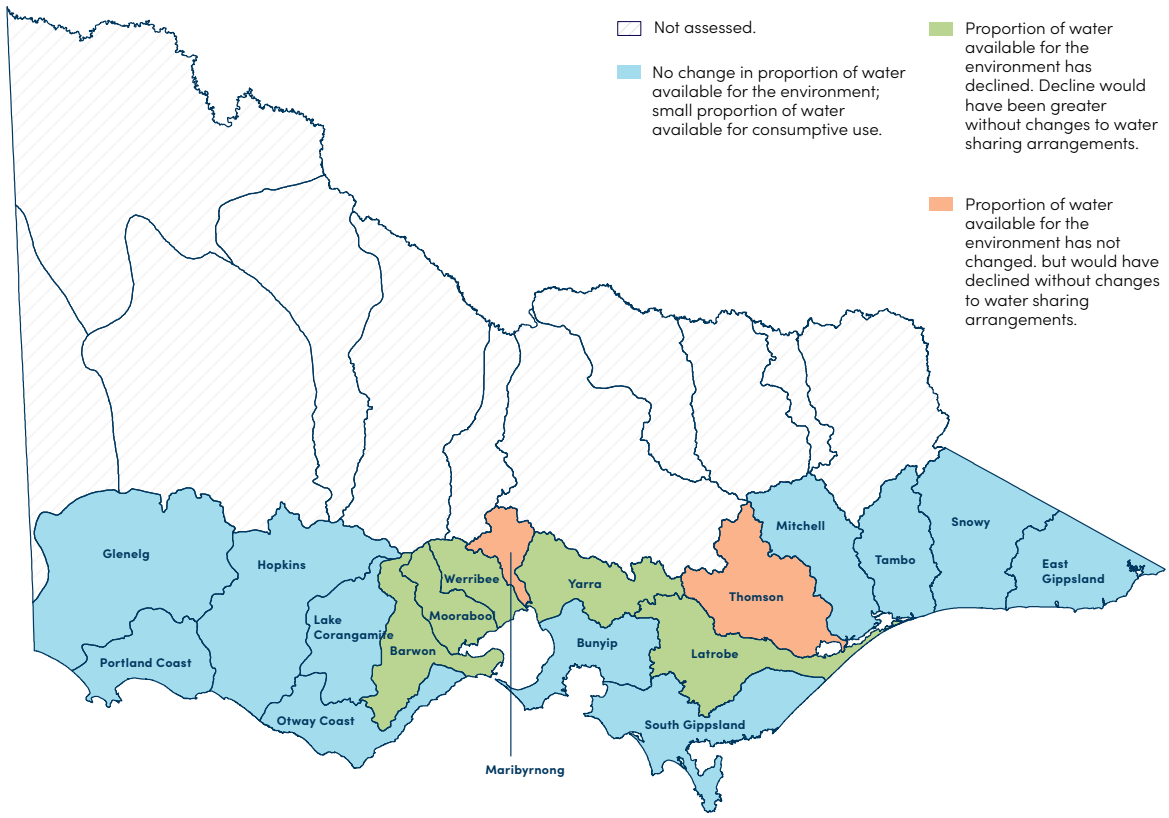


Figure 11: Changes in proportions of water available for the environment and for consumptive uses, by basin (DELWP, 2020)

Too much stormwater from our impervious cities

Urban areas are not just major users of water, they are also major producers of water resources. In a largely urban environment like the Greater Melbourne region, the water cycle has changed fundamentally.

Stormwater is the single biggest threat to the environmental health of our urban waterways. It results in poorer water quality, increased sediment and nutrient loads, reduced dissolved oxygen, rapid alteration of habitats, and affects community liveability and access. Excess stormwater can also lead to localised flooding impacts.

As Melbourne's urban footprint expands, the volume of environmentally damaging stormwater will increase. We now know that significant damage to our waterways can occur even at very low levels of urbanisation, with the loss of our most sensitive species observed when the catchment's imperviousness exceeds two per cent. These impacts can be seen locally and also further downstream into Port Philip Bay and Westernport.

As stormwater has consequential impacts to the environment, **we have an opportunity to capture stormwater, treat it, and put it to beneficial use instead**. At present, the water balance (see Figure 16) for Greater Melbourne estimates that 400 GL of stormwater is generated. The vast majority of this was directed to waterways, with only 5 GL captured by stormwater harvesting. With over 39,000 dwellings added to the Port Phillip and Westernport region each year, it is essential that stormwater is valued as a significant resource and managed to protect waterways from the impacts of development.

The full range of issues related to future growth of stormwater are considered in the *Healthy Waterways Strategy:* however, this draft strategy sets the direction for ensuring **stormwater is valued as an important water resource.**

Supporting restorative water justice for Traditional Owners

Traditional Owners have never ceded rights to water across Victoria, yet Aboriginal people currently hold less than 0.1 per cent of water rights in this state (DELWP, 2021). The Traditional Owners across our service region hold minimal to no water entitlements.

As stated in the discussion draft CGRSWS, restoring Traditional Owner access to water so that they may care for Country is critical to its health and the health and wellbeing of Aboriginal people. It is also an important element in economic development. Access to water can play a fundamental role in supporting economic participation through Aboriginal enterprise and therefore Aboriginal employment.

The United Nations Declaration on the Rights of Indigenous Peoples describes self-determination as the ability for Indigenous people to freely determine their political status and pursue their economic, social and cultural equity, based on their own values and way of life. That means Traditional Owners have the right to make choices that best reflect them on their journey to self-determination and self-governance.

The discussion draft CGRSWS is setting a significant pathway to water access through a shift to more climate resilient, manufactured water to meet a growing proportion of consumptive water demands, so that surface water entitlements can be returned to Traditional Owners.

The draft *Water for Life* strategy has a role to play in supporting the discussion draft CGRSWS and the return of water to Traditional Owners. The Greater Melbourne water corporations will continue working with Traditional Owners and DELWP on new and existing opportunities for providing additional water to Traditional Owners.

Chapter 5 sets out how this draft strategy will support Traditional Owner access to water.

2.3 Our changing and uncertain climate conditions

The 2021 Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report has highlighted that global warming of between 1.5°C and 2°C will be exceeded during the 21st century unless deep reductions in carbon dioxide (CO_2) and other greenhouse gas emissions occur in the coming decades (IPCC, 2021).

How will climate change impact Victoria?

Greater Melbourne's weather and climate has always been variable. There have been periods of high rainfall causing floods, and periods of low rainfall resulting in droughts.

Historically, Melbourne has relied mainly on rainfall dependent water sources from rivers for our water supplies. Our water supply system has been designed, developed and expanded over time to provide a secure supply of water with variable climate and weather; both throughout the year and across wet and dry years (see Figure 13).

However, **Victoria's climate is changing**. Since 1910, Victoria has already warmed by 1.2°C and experienced a decrease in average rainfall, an increase in the frequency of extreme heat events and an increase in dangerous bushfire weather.

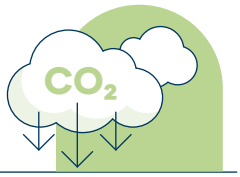
Due to wetter-than-average conditions in 2021, annual desalination orders, and ongoing water efficiency measures, our storages are at the strongest position they have been at this time of year since 1997. But the overall trend of warmer and drier conditions is expected to continue.

For Greater Melbourne, we have already seen some climate change impacts on our dam inflows from 1997 to the present (see Figure 12). The average inflows into the four major harvesting reservoirs of the Melbourne system since 1997 has declined by 31 per cent compared to the long-term average before 1997.

Climate projections suggest future changes could include:

- significant reductions in runoff across Melbourne's catchments
- droughts becoming more intense and more than twice as likely
- higher average and extreme temperatures more frequently, with the highest temperature increases in our bushfire-prone catchments
- increased severity and frequency of storms, bushfires and heatwaves
- sea level rise of 1 metre by 2100, continuing well into the next century.

Across Victoria, the water industry emits significant greenhouse gases – which is why the Greater Melbourne water corporations are committed to reducing emissions. Through our Emissions Reductions Pledges, we have pledged to approximately halve our emissions by 2025 and to aim for further reductions by 2030.



In line with the Victorian Government's commitment of net zero greenhouse gas emissions by 2050, new water supplies will need to use renewable energy or offset any non-renewable energy used.

Victorian climate and streamflow

Victoria's climate will continue to be variable with wet years and dry years, against a background drying trend. With a hotter future and projections of declining water availability, we can expect more frequent and severe droughts.

Even if there is an increase in summer rainfall, it is unlikely to offset the streamflow impact from rainfall reductions in winter because most of the runoff in Victorian catchments occurs over winter and spring. In the warmer months, catchments are drier and more rainfall soaks into the ground, and is used by vegetation or evaporates.

The Victorian Government with participation from Melbourne Water, is investing in further research to better understand how Victoria's climate is changing and the water resource implications, through the Victorian Water and Climate Initiative.

By reducing our emissions, and offsetting where necessary, we play our part in minimising the costs of adaptation for our customers.

Future climate risks and extreme events mean we cannot meet our water needs by only using traditional water supplies.

Extreme weather events such as droughts and floods can also damage our infrastructure, waterways and the environment.

We will continue to work to understand the risks and to adapt to climate change by developing and implementing climate adaptation plans using the best and most up-to-date science.

Action 2.2

What: Take an ongoing leadership role in climate change to build our understanding of how climate change and variability can affect all our business activities in the future, to operationalise outcomes to build resilience and ensure we are prepared for climate change.

Detail:

This will include:

- implementing emissions reduction strategies and actions to contribute to statewide initiatives that reduce climate change impacts
- improving the understanding and application of the most up-to-date climate science for assessing the impact of climate change on water businesses in collaboration with state-led initiatives
- Implementing climate change adaptation strategies, in alignment with the Victorian Government Water Cycle Adaptation Action Plan, and ensure the draft *Water for Life* strategy appropriately accounts for managing the impacts of potential climate change.

Who: Joint Greater Melbourne water corporations (GWW, MW, SEW, YVW) in collaboration with Government.

When: Ongoing

Delivers on SDGs

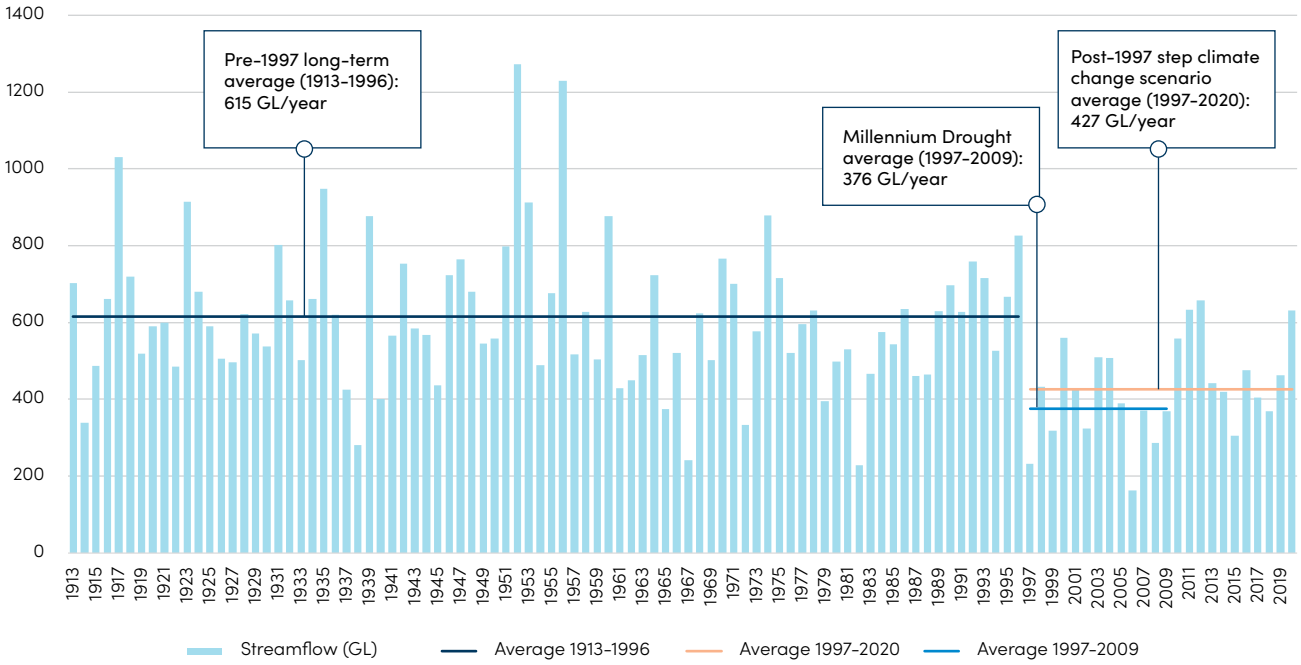


Figure 12: Reduction in streamflows into Melbourne's four major harvesting reservoirs, from 1913 to 2020

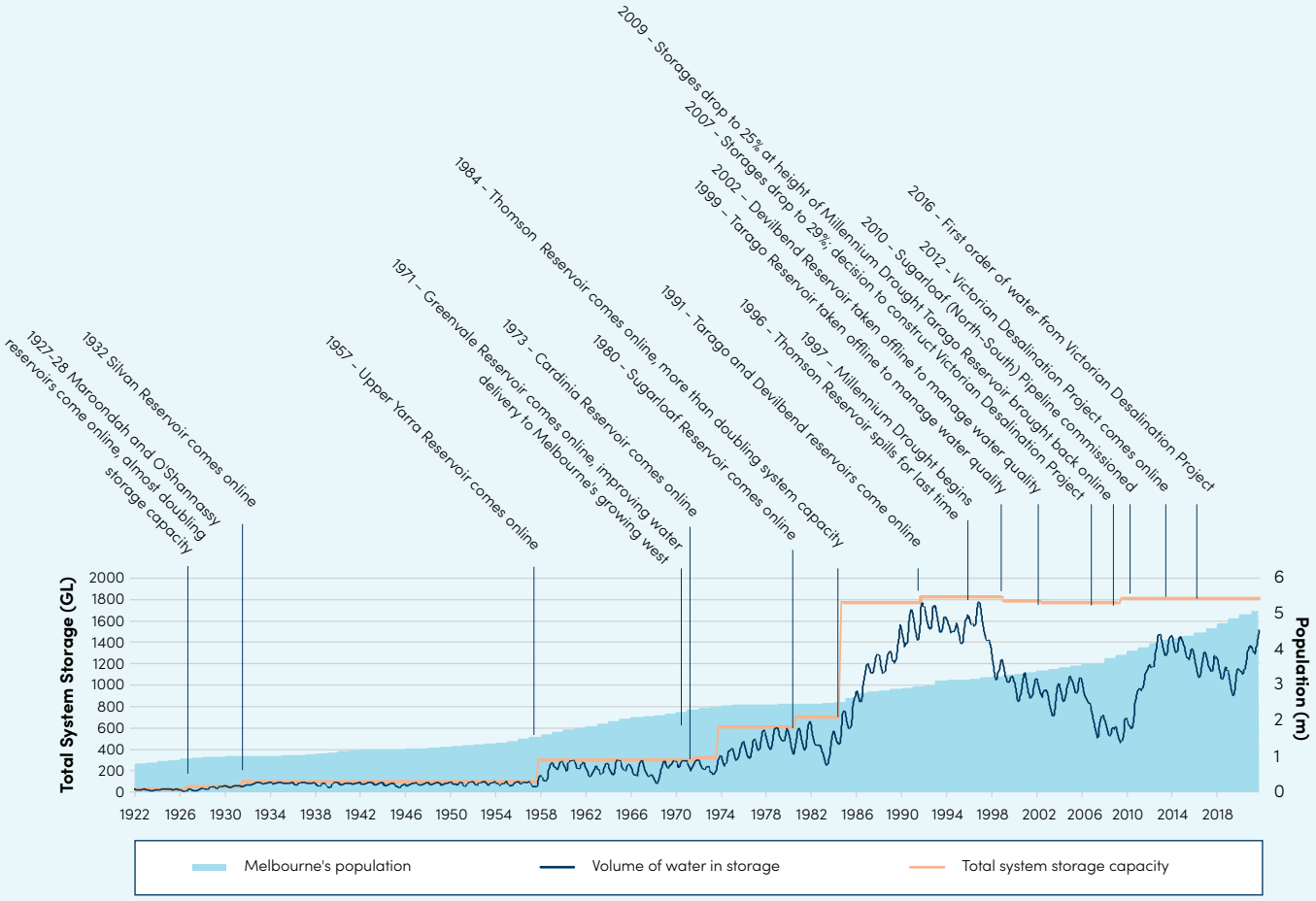


Figure 13: How our water supply system has evolved over time

Supply system augmentation

How our water supply system has been augmented over time and how it needs to evolve for a changing climate and growing population

Over more than 150 years, the Melbourne water supply system has been incrementally developed. Yan Yean Reservoir, which was completed in 1857, is still part of the system we use today.

In the 1980s, construction of the Thomson Reservoir more than doubled total storage capacity of the water supply system, enabling water to be banked during wetter periods for use in drought periods.

Then, the 1997-2009 Millennium Drought led to three key augmentations:

1. 2009: a new water treatment plant enabled Tarago Reservoir to be reconnected to the Melbourne system.

2. 2010: Sugarloaf Pipeline linked Sugarloaf Reservoir with the Goulburn River downstream of Lake Eildon.

3. 2012: the Victorian Desalination Project was commissioned with capacity to supply up to 150 GL/year into Cardinia Reservoir.

Although fast-tracked in response to the Millennium Drought, these augmentations were designed with a longer-term role in underpinning the supply of safe, reliable and affordable water across Greater Melbourne and the surrounding region in preparation for future population growth and climate change.

However, there are components of the system that are ageing and, to remain fully functional and reliable, will require increased maintenance, refurbishment or upgrading into the future. There will be a growing challenge to balance affordability with the need to maintain the existing system and augment supplies to provide a reliable supply for growing water demand.

Case Study: Building system resilience

Bushfire preparedness and response

We face an increasingly volatile environment with more extreme events. Bushfires are a risk that we expect to worsen under a warmer climate, and we continue to explore how climate change might alter the frequency and impact of this type of event. This enables us to build resilience into our system.

Our forested catchments act as natural filters, meaning we can minimise costly water treatment processes and still deliver a world-class product to our customers. However, the attributes of our forested catchments that make them so valuable – their well-established vegetation, restricted access, remote location and often steep terrain – means that they are also susceptible to bushfire.

With climate change projections for Melbourne's catchments signalling a drier future with more frequent and more severe storms, bushfires and heatwaves, it is more important than ever that we are prepared to protect our precious water supplies from the threat of bushfire.

In comparison, the potential impacts from the 2019-20 bushfire have been relatively small and have occurred over a finite period of impact. While some impacts on catchment yield may occur, it may be difficult to detect these given the natural variability in rainfall and runoff over time.

Figure 14: Impacts of bushfire on Melbourne's water supply catchments

Bushfires present key risks to our water supply:

- Bushfires can result in significant risks to drinking water storages, including water quality risks associated with debris flow.
- When Mountain Ash forests regrow after a bushfire, the young trees can soak up significant moisture from the soil so that less water runs off into reservoirs.
- As the forest matures, it can take up to 100 years before the quantity of water produced by a catchment stabilises following a bushfire. For example, recent analysis suggests the 2009 Black Saturday bushfires could reduce water availability from the Melbourne system by 2-5 per cent over the next 50 years.
- Additionally, Mountain Ash trees need to be more than 20 years old to make seed, so two or more fires within a 20-year interval means the forest may not regenerate.

After more than a decade of investment by Melbourne Water in post-fire erosion research, a detailed model has been developed to assess the post-fire contamination risk for the Upper Yarra and Thomson catchments. Based on the outcomes of this research, Melbourne Water plans to invest in a range of debris flow mitigation measures over the next few years including coir log erosion control on upper slopes, debris barriers installed in gully lines and debris racks, drainage risers and enhanced road embankments in lower parts of high-risk catchments (see Figure 14).

2.4 What do these challenges mean for future water supply?

A hotter drier climate means our reservoirs are already receiving much less water from rainfall in our catchments. Greater Melbourne is vulnerable to significant climate volatility ranging from droughts to floods, bushfire and intense storms. To ensure resilience to future extreme events we need more rainfall independent, manufactured water.

Victoria's *Infrastructure Strategy 2021 – 2051* has a focus on climate change and its impacts. The report states:

> "A warmer, drier climate means less rainfall flowing into Victoria's rivers and dams, putting more pressure on urban water supplies. Water infrastructure will also be affected by more frequent extreme rainfall events, movement and changes in groundwater, and higher average temperatures with lower average rainfall."
>
> **(Infrastructure Victoria, 2021)**

The diminishing yield from our catchments – because of a hotter, drier and more unpredictable climate with greater variability – means we need to think differently about how we source and distribute water in our region.

Using climate guidelines published by the Victorian Government in 2020 (DELWP, 2020), the Greater Melbourne water corporations have assessed how climate change could impact on the availability of water from the current supply system over the next 50 years. The guidelines were based on the IPCC's Fifth Assessment Report (IPCC, 2014). Three climate scenarios were used:

1. High climate change.
2. Medium climate change.
3. Low climate change.

As per the recommendations in the guidelines, all three climate change scenarios use the Representative Concentration Pathway 8.5 (RCP8.5) emissions scenario, but take into account varying outcomes from the suite of Global Climate Models used in the IPCC Fifth Assessment Report. It should be noted that none of these scenarios is seen as more likely than others. They are all considered as plausible futures that should be used as a basis for planning future water supplies.

As per the Victorian Government guideline, using RCP8.5 provides a suitably precautionary approach for planning for future water supplies. The lower emissions RCP4.5 scenario is not materially different from the RCP8.5 scenario up to 2040, while in the second half of the 21st century, the projected changes in rainfall in Victoria under the RCP4.5 scenario are within the range of the RCP8.5 scenario.

These three climate projection scenarios therefore provide a robust range of potential future water resource supply capacities for assessment of supply system performance over the strategy's 50-year planning horizon.

Our supply-demand balance under a range of climate and demand scenarios

The three climate projection scenarios have been combined with the three demand growth projection scenarios (Section 2.2) as the basis for projecting the potential range of emerging water supply-demand deficits that this draft strategy needs to address:

1. High climate change impact and high demand growth.
2. Medium climate change impact and medium demand growth.
3. Low climate change impact and low demand growth.

Figure 15 shows these projections in our modelling. We have also assessed the impact of climate variability, and this has shown a possible range of available supply. However, we have selected and shown the median water availability for each of the three supply scenarios modelled.

The supply and demand modelling indicates that under the range of scenarios explored, demand is expected to grow and climate change will decrease the availability of water from our existing supplies, requiring us to augment the supply system over time.

Modelling indicates that by 2030, under high demand and high climate change impact, additional annual water requirements could reach 85 GL. By 2070, this additional requirement could reach 600 GL.

While this does not create an immediate risk for Greater Melbourne, because dams are near-full and we have time to plan and act, we could be exposed to increased risk should we experience another severe drought before our water supplies are augmented. We must be aware that major augmentations can take approximately 8 to 10 years to plan and deliver, and that current modelling indicates that into the future severe droughts could reduce our water storages by 40 per cent over four years.

For reference, the current Victorian Desalination Project has a capacity of 150 GL/year, and in our modelling we consider it to be used at full capacity.

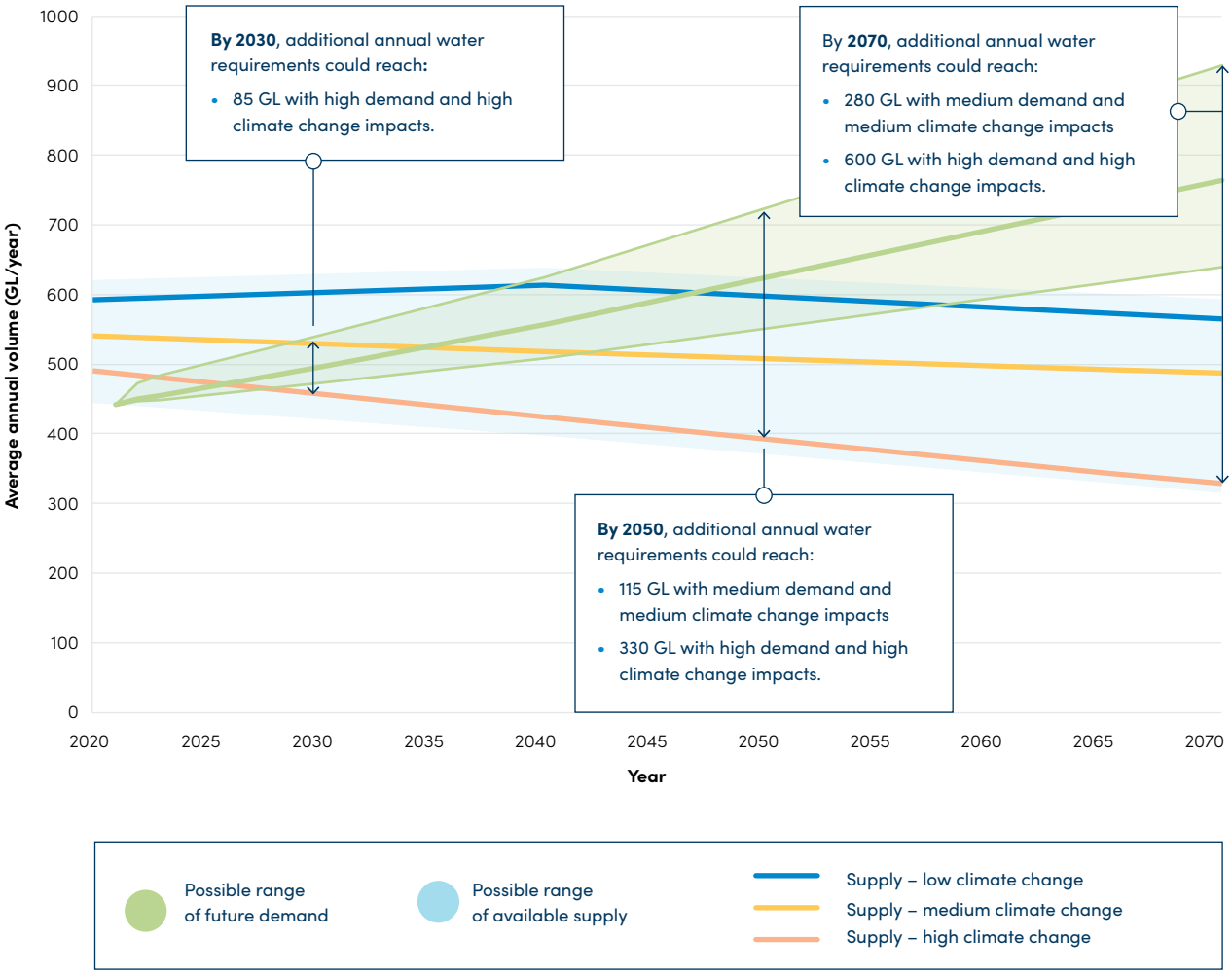
In producing the range of scenarios, we considered the uncertainty of when droughts could occur in future and what the average supply capacity of the system would need to be to provide an ongoing, secure supply of water. One assumption that can be made is the supply system must be able to reliably meet demand even during the worst drought imaginable. This, however, would be an inefficient use of infrastructure and be prohibitively expensive for customers. In reality, we chose to manage some severe droughts through restrictions and increased water conservation programs – this is fundamental to our **levels of service**, and is discussed further in Chapter 4.

Mt Martha Water Recycling Plant, Bunurong Country

The challenge of future uncertainty

The three supply-demand scenarios analysed illustrate the scale of the challenges we are facing. **It is likely that we will need to build the next supply augmentation within the next 10 years, and may need augmentations totalling up to 600 GL over the next 50 years.** This would be up to four times the existing capacity of the Victorian Desalination Project.

However, these three scenarios also highlight the uncertainty we face in planning for the future provision of water supplies. This underlines the need to **invest in readiness** now so that our future planning can be agile and adaptive, with a well-planned program of future response options that cover a full range of potential outcomes. This should be underpinned by ongoing monitoring and review of the water supply system performance and the status of the supply-demand balance so that we can bring forward or defer investment in new infrastructure in response to future conditions as they unfold.



These projections do not include additional water for Traditional Owners and the environment, the need for which has been identified through engagement with Traditional Owners and the Victorian Government's discussion draft CGRSWS. We are working with Traditional Owners and the Victorian Government on how we can provide for additional water from the existing system and future augmentations of the system.

Figure 15: High, medium and low demand growth and climate change scenarios for 2020–2070

The Victorian Government's discussion draft CGRSWS has identified environmental water deficits for river basins in the Central Region, over the next 5, 10 and 50-years. Table 2 shows the 5 and 10-year environmental water recovery targets for the rivers basins in the Greater Melbourne and Barwon Water supply areas, as well as the possible 50-year deficits to be addressed. Future expansion of the region's supply systems will need to provide for future urban consumptive use and these additional water volumes to ensure the health of the environment.

Once the above volumes are confirmed in the final CGRSWS, we will:

- work with stakeholders and our partners to identify the most optimal combination of solutions to provide for these additional requirements
- review our supply modelling to incorporate these requirements.

See Chapter 6 for further information on our commitment to protecting the values of waterways.

Table 2: Additional environmental water targets and possible deficits in the Central Region.

Basin	5 year recovery target	10 year recovery target	Possible 50 year deficits
	GL/year		
Thomson	8	15	31
Yarra	–	11	34
Maribyrnong	3	7	7
Werribee	–	11.9	12.2
Barwon/Leigh	2.3	5	28.7
Moorabool	3	6.5	17.1

Supply system augmentation

What is an augmentation?

An augmentation refers to adding to or expanding the capacity of the existing water supply system. The Melbourne water supply system was first augmented in 1926-27 when the Maroondah and O'Shannassy reservoirs came online, almost doubling our storage capacity.

In 2012, the Victorian Desalination Project was commissioned with capacity to supply up to 150 GL/year and has become critical to our water supply, being used at near full supply capacity in recent years and contributing almost a third of our water supply. Figure 13 (Chapter 2) provides a detailed timeline of how our system has evolved over the years.

Werribee River, border of Bunurong Country and Wadawurrung Country

All water is a potential resource

The Melbourne region's overall water balance for 2020/21 is shown in Figure 16.

Sewage and stormwater are no longer considered waste products. In the face of climate change and enabled by new technology, Greater Melbourne water corporations can use sewage or stormwater to generate valuable resources such as fit-for-purpose recycled water, harvested stormwater, biosolids or biogas (to generate renewable energy). This is part of the IWM approach which considers all water as a potential resource. *Water for Victoria* highlights IWM as an efficient way of maximising economic, social and ecological benefits to the community.

With significant quantities of water available close to Melbourne, the sewerage system is an essential part of resolving the growing deficit in Melbourne's water supply. Further, with increased demand on our water supply, there is increased pressure on our sewerage system, which means there are growing quantities of water that would be discharged to the environment from sewage treatment plants. There is an opportunity to move from the historical paradigm of treating sewage for discharge to the environment, to a future focused on producing high-quality, fit-for-purpose recycled water that can be used to offset Greater Melbourne's demand for water.

Melbourne's continued population growth also creates more urban stormwater runoff. This, coupled with increased frequency and intensity of extreme weather events due to climate change, will mean that managing Greater Melbourne's stormwater runoff will become a significant challenge. Thus, harvesting stormwater for beneficial use is an opportunistic outcome from urbanisation, offering a solution to reduce flood risk downstream and manage water quality impacts on Port Phillip Bay and waterways, whilst providing a future resource.

As can be seen in the water balance in Figure 16, in 2020/21 Melbourne Water treated 395 GL of sewage and of that only approximately 8 per cent (or approximately 32 GL) was supplied to customers as recycled water. Similarly, we estimate that 400 GL of stormwater is generated annually in Greater Melbourne, but the vast majority of this in 2020/21 was directed to waterways, with only 5 GL captured by stormwater harvesting.

By increasing use of these diverse water sources for fit-for-purpose uses we can reduce the demand on our drinking water supply system, while also delivering more water for irrigation of parks and trees, thus providing urban greening and cooling, health and liveability benefits for our communities. Read more about the work being done to utilise these fit-for-purpose resources in Chapter 6.

Action 2.3

What: Demonstrate the value of Melbourne's sewage treatment plants as strategic resources for the city by leading a transition towards greater use of fit-for-purpose recycled water.

Detail:

We will:

- optimise use of recycled water by finding uses for it that are independent of seasonal demand and appropriate to its quality, ensuring the significant quantities of water available close to Melbourne as part of the sewerage system are used as an essential part of resolving the growing deficit in Melbourne's water supply
- identify current and future demands for recycled water to ensure that the allocation of the resource is optimised
- increase the amount of water that is beneficially re-used by establishing partnerships with local government to identify priority public open space areas and opportunities for new connections to the recycled water network
- alleviate demand on the wholesale supply of potable water through greater use of recycled water
- increase community water knowledge and engage directly on the range of possible uses for recycled water.

Who: Joint Greater Melbourne water corporations (GWW, MW, SEW, YVW).

When: Ongoing.

Delivers on SDGs

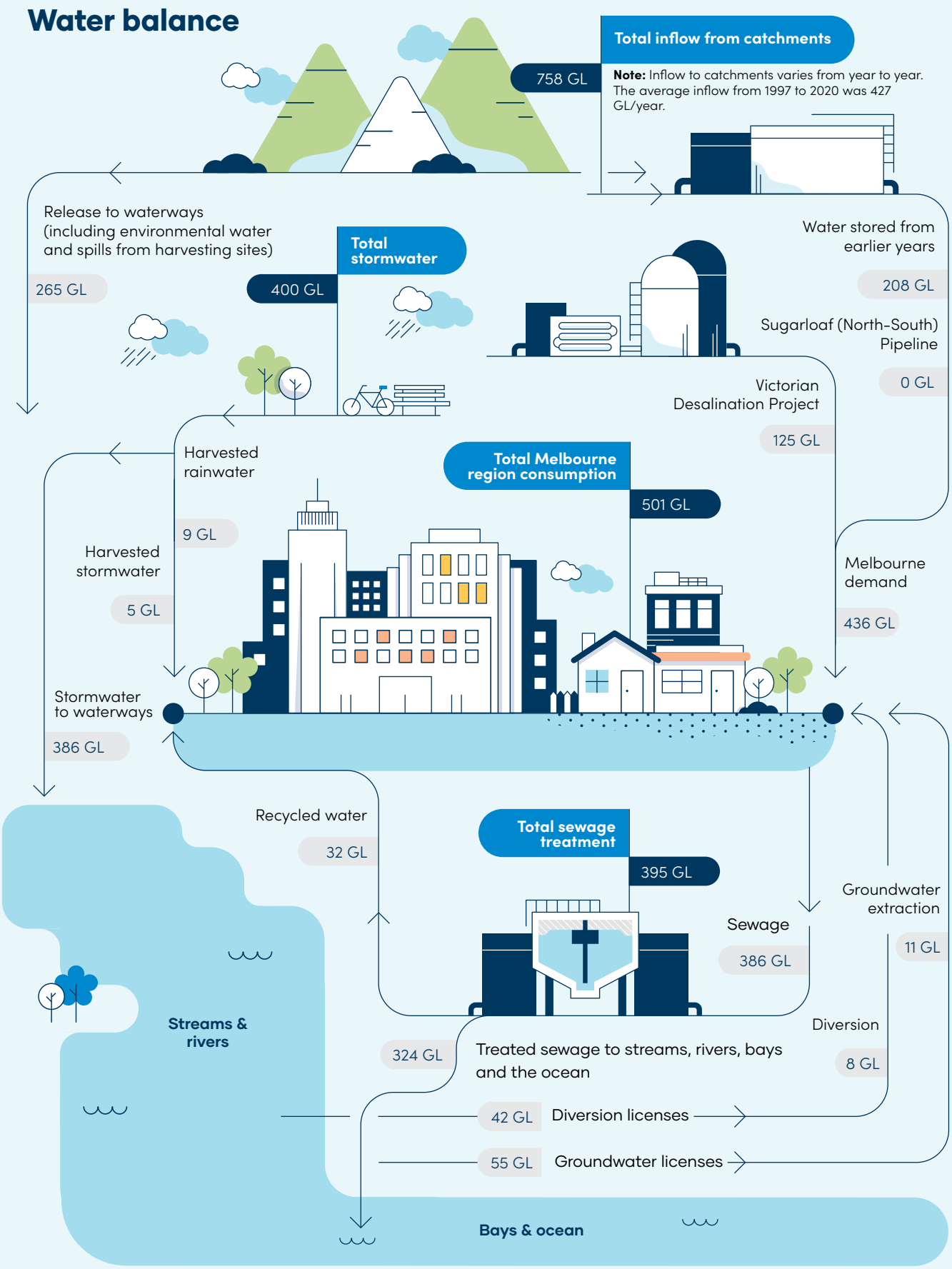


Figure 16: Water balance for Greater Melbourne in 2020/2021

Case Study: Integrated Water Management Solutions

Fishermans Bend

Fishermans Bend is Australia's largest urban renewal project covering approximately 485 hectares in the heart of Melbourne. The redevelopment will consist of five precincts across two municipalities and connect Melbourne's CBD to Port Phillip Bay. By 2050, Fishermans Bend is expected to be home to approximately 80,000 residents and provide employment for up to 80,000 people.

South East Water is helping to create a water sensitive community that secures Melbourne's liveability and sets a new benchmark in sustainable urban design - a great showcase of Victoria's innovation and leadership in water.

South East Water will design, construct and operate a robust integrated water system to deliver a reliable recycled water supply. The system will maximise the capture of rainwater for re-use in buildings, while providing enhanced flood mitigation to the area.

In the future, a precinct scale treatment plant will mine the city's sewage and treat it to class A recycled water standard at a significantly lower cost than smaller building-scale systems. Reticulated recycled water will be supplied through the precincts to create drought-resilient green spaces which enhance liveability.

Action 2.4

What: Take a leadership role in the industry shift towards a circular economy and enable greater use of recycled water and a mix of centralised and decentralised solutions.

Details:

This will include:

- identifying opportunities for increased resource recovery to deliver multiple benefits, including protection of the environment and human health, and enhanced economic resilience
- understanding and limiting contaminants that restrict beneficial re-use of treated sewage.

Who: Joint Greater Melbourne water corporations (GWW, MW, SEW, YVW).

When: By March 2027 and ongoing.

Delivers on SDGs

Why we need a circular economy approach

A circular economy exchanges the typical cycle of make, use, dispose for as much re-use and recycling as possible. As our population grows, so does the volume of waste we produce. This presents an opportunity to make better use of recycled water and reduce the amount of water discharged into the environment while also alleviating demand on the wholesale supply of drinking water. **This requires a future where recycled water is treated as a primary water source, not just a by-product of the sewage treatment process**.

A case study in practice

Both powered by and producing renewable energy, Yarra Valley Water's Aurora sewage treatment plant site exemplifies the transition to a circular economy.

Recycled water is produced onsite for urban and agricultural use. A waste-to-energy plant also converts food waste into green energy to power the plant - excess energy is exported to the grid.

Partnering with social enterprise Whittlesea Community Connections, Melbourne Polytechnic, and the Victorian Government, an onsite community farm helps feed families in need - aiming to provide one million native seedlings for local planting.

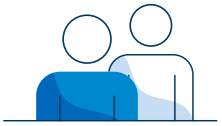
A cultural heritage management plan process with the Wurundjeri Woi Wurrung Heritage Aboriginal Corporation and ecosystem regeneration with the City of Whittlesea is enhancing cultural and biodiversity values.

The project demonstrates how traditional treatment plant, waste and water services can be reimagined to create significant new value for Victoria.

Boneo Water Recycling Plant, Bunurong Country

2.5 Meeting the Challenges

Key challenges for providing water over the next 50 years include:



population growth driving **increase in demand**

the impact of **climate change** on our water supplies

balancing water services **affordability** for our customers with the need to maintain and augment water supplies

balancing urban water consumption, water for the environment and water for Traditional Owners.

We are planning for a growing population and changing climate

Melbourne's growing population and changing climate mean that, without action, we are certain to face a future gap between our demand for drinking water and the available supply. Projections indicate that the next water supply augmentation will likely be needed within the next 10 years.

Historically, acute water shortages such as severe drought have been infrequent and generally short term. Major water supply system augmentations, including the Victorian Desalination Project, have been implemented following a 'once in a generation' event. These regional-scale augmentations were once sufficient for managing supply reliability over a relatively long planning horizon, making it less important to have further options ready to meet future supply increases.

Today, we are increasingly reliant on the Victorian Desalination Project, which is a climate independent source of supply. This means the volume is not impacted by climate conditions and ensures we will receive the volume of water ordered in any given year. The Victorian Desalination Project is an essential component of our supply system, and does not just function as a backup or 'insurance policy' for drought periods. We are regularly drawing on close to its maximum capacity to supplement climate dependent water supplies (that is, rainfall) to Melbourne, Geelong and towns in Gippsland.

Options for large-scale supplies from rivers and dams have been exhausted and the reliability of previous solutions is steadily decreasing. Additionally, taking water from these sources has resulted in legacy impacts and historical injustices to Traditional Owners. Our growing understanding of the amount of water needed for the environment means we cannot draw as much water from these sources as we have in the past and we also need to return water back to rivers.

We need an integrated, adaptive approach to a resilient future

Greater Melbourne is facing a water supply deficit of up to 600GL by 2070 under our worst-case scenario and, over the next 50 years, we may need to double our water supplies – adding an average of 12 GL of water each year to the Melbourne water supply system.

We are now at a point for our rainfall dependent water supply system where our projected long-term yield for water is less than the annual demand (see Figure 15). We need to invest in new options for delivering water: including manufactured water, harnessing stormwater runoff and sewerage volumes, and optimising the existing system.

Increasing our proportion of climate resilient, manufactured water supplies allows us to slow down depletion rates in times of drought, helps to keep our dams as full as possible (providing long-term security) and enhances our ability to respond to other shocks in the system, such as water quality incidents. As preparations, or 'readiness activities', for a water supply augmentation can require a long lead time (up to 10 years), we need to act now to be ready.

An integrated, adaptive planning approach is necessary to address the challenges of delivering water for varied needs. An adaptive approach allows us to develop ready options to meet short-term needs while also continuing to consider game-changing opportunities that will enable us to face future challenges. Understanding the trigger points that result in new water supply options is critical to our planning.

A sustainable approach will seek to balance all the needs for water in our region by finding more efficient ways to use the water we already have, use a broader diversity of water sources and transition from climate dependent to climate resilient, manufactured sources of water.

A more diverse, climate resilient, manufactured water supply can also support broader liveability and waterway health benefits to the city. As Melbourne continues to become larger and more dense, Greater Melbourne water corporations will need to manage greater volumes of sewage and stormwater. Further, greater climate volatility resulting in more extreme rainfall events means that we will need to ensure existing and future flood risks are managed, and there is an opportunity to maximise outcomes for the community by exploring IWM solutions. If we take an integrated approach to water management, these increased volumes can be viewed as additional fit-for-purpose supply such as harvesting stormwater for open space irrigation and expanding recycled water supplies to agricultural areas. By using more stormwater, rainwater and fit-for-purpose recycled water, we can reduce the demand on our system, improve water quality and support the health of our waterways. A more diverse water resource portfolio can provide for many of our water needs that would traditionally rely on river water resources. This can help reduce stormwater flows into our rivers and creeks, which helps to prevent erosion, pollution and other environmental impacts. Drawing less water from our rivers for urban consumptive use can then support the provision of environmental flows in key waterways which support ecological, community and cultural needs.

A critical aspect is community education about the need, safety and value of using all sources of water to ensure future water security.

Laverton Creek at Hobsons Bay, Bunurong Country

3

Our Collaborative Approach

The challenges presented in Chapter 2 are complex; there is no single solution that can meet all of the needs of Greater Melbourne's customers and community. In this section we outline the collaborative, integrated and adaptive approach we have taken to ensure a secure and sustainable water future that is shared with our partners, community and stakeholders.

3.1 Managing our system for the future

The combined pressures of ongoing population growth and climate change affect the entire water cycle. To develop this draft strategy we have collaborated with the community, Traditional Owners and industry experts to ensure integrated decision making, smart investments and future-focused solutions that deliver the best long-term value for all our diverse water needs.

Reflection on what we have learnt

The 2017 urban water strategies and Melbourne Water System Strategy set a strong foundation for this draft strategy by detailing a path forward for water security.

Since then, we have built on the insights and experience gained by managing our systems through extreme dry and very wet conditions, storm events and challenges for our customers, communities and businesses arising from COVID-19. We have improved our demand modelling, gained further insights into customers preferences and behaviours, benefited from in-depth research and analysis into the impacts of climate change, and furthered our understanding of IWM.

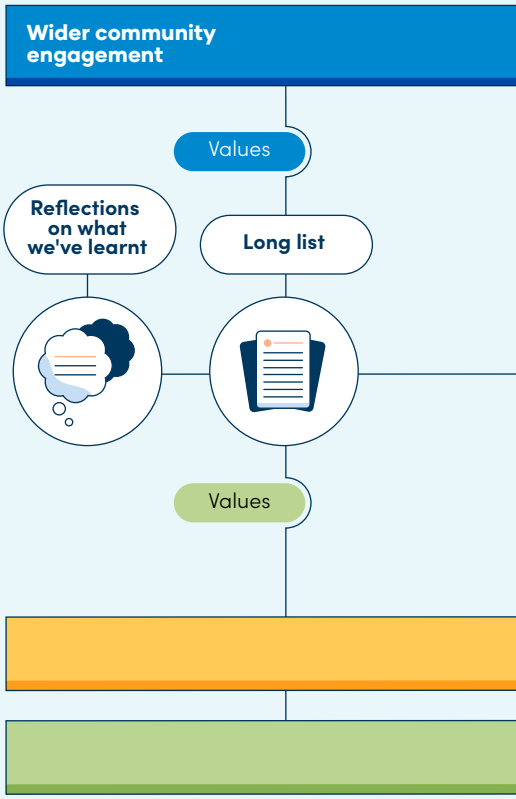
We now have an opportunity to use our improved understanding and build on the work from 2017 to outline the right balance of options to grow our water supply capability and reduce our demand for water.

In developing this draft strategy we have sought to build on and enhance work undertaken in previous strategies, including:

- **Community:** bringing stronger and more purposeful community input to the heart of decision making.
- **Traditional Owners:** working to embed and deliver on *Water for Victoria* by collaborating with Traditional Owners and supporting access to water for Traditional Owners which integrates cultural water needs in water management.
- **Environment:** ensuring the health of our environment and addressing a clear reduction in water availability for the environment (Long-Term Water Resources Assessment, DELWP 2020) by committing to allocating a proportion of future water sources for the environment.
- **Values:** continuing to develop and improve our understanding of social, environmental and cultural values. We will work to embed the values of our diverse water users in how we plan for the future and deliver a water supply system that benefits all.
- **Climate adaptation:** working to mitigate our carbon impacts in line with the Victorian Government commitment to move towards net zero greenhouse gas emissions. We are now more knowledgeable as to the likely changes in climate and we will continue to invest in climate independent sources.

Engagement outcomes

Our approach



What we heard

Engagement with broader community

345 people engaged

10 different forums including online survey and 28 hours of face-to-face

Held over April & May 2021

Outcomes

Key insights:

- Concern: water security
- Priority: water for the environment
- Opportunities:
  a. community education and engagement
  b. drinking purified recycled water

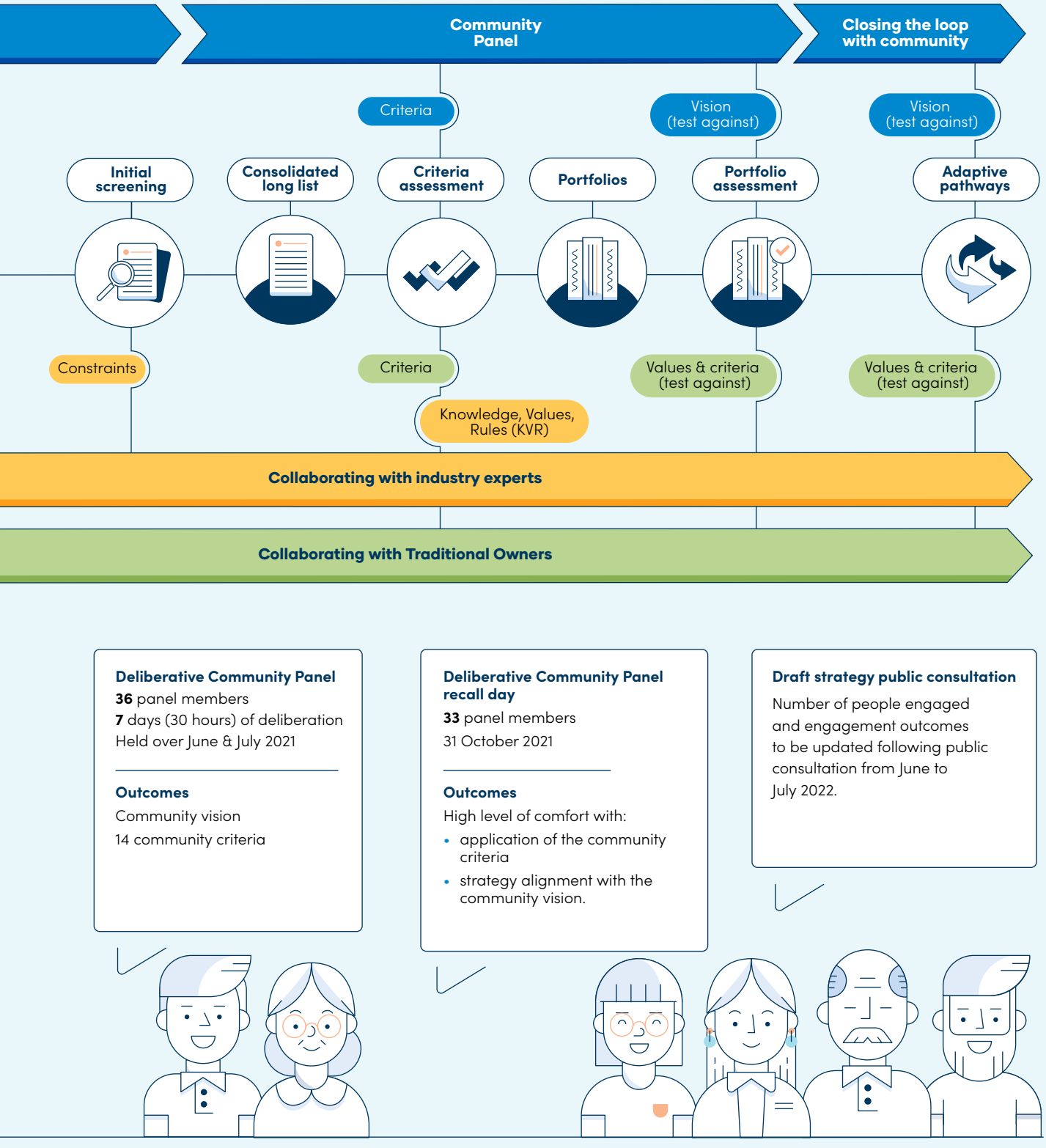


Figure 17: Our collaborative approach to decision making with the community, Traditional Owners, and industry experts

3.2 Customer and community-led service

Our customers and communities are at the heart of our service provision and it is equally important that they are involved and included in our decision making now and into the future.

Community engagement process

Throughout the process, the purpose of our engagement was to understand current community values in relation to water, and to bring community to the centre of decision making through three distinct phases of engagement:

1. Wider engagement.
2. Deeper engagement.
3. Closing the loop.

These engagement phases are summarised throughout this chapter and detailed on our website: **waterforlifestrategy.com.au**

Figure 18: Community and stakeholder engagement program for this draft strategy

Wider engagement

We reached out to people across our combined service region via an online survey, community workshops and targeted discussions with key industry representatives. During this time, we also engaged and continued to strengthen collaborative relationships with Traditional Owners.

Our objectives in working with community and stakeholders to build trust and a strong community mandate were that:

- water is recognised as essential to lives and livelihoods
- fair access to water underpins this strategy
- community knowledge around water issues is developed
- we work with Traditional Owners across the project's life cycle
- community members provide leadership and partner on areas of the strategy
- participants provide informed feedback and use evidence to help build shared decisions
- community needs and preferences are clear which enables the water sector to speak with more knowledge
- everyone knows what to expect in the process - there are no surprises
- all current policy constraints are transparent and shared with the community
- engagement questions and scope are clear and defined when engaging with customers and the community.

Through this approach, we have built a genuine and shared understanding of:

- current and future water challenges we need to address
- a clear vision
- options for how we can respond to our challenges and deliver the vision
- criteria against which we will assess these options.

Deeper engagement

To further support our community-led approach, we undertook a deeper phase of deliberative engagement, which involved recruiting an independent Community Panel. The *Water for Life* Community Panel has played an important role in considering all the feedback collected through our wider engagement.

Community panels are powerful examples of deliberative democratic engagement where members of the public are put at the centre of decision making with government.

The *Water for Life* Community Panel was built around several engagement principles including:

- a random sample of people affected by the decision are selected to participate
- participants are provided with detailed, in-depth information from a range of sources that helps them to understand the issues and options related to the decision
- participants are given the time and support they need to consider and discuss information and ideas, weigh up issues and options and agree on recommendations
- participants write their own report which is presented directly to decision makers. Their recommendations have a high level of influence over outcomes or decisions.

To ensure our Community Panel was independently recruited, we commissioned specialist engagement consultants to select the panel members and oversee the recruitment process. More than 10,000 hard copy invitations were mailed to households across our service region, and we also applied specific weighting criteria to applications to ensure a balanced representation of our customers (see Figure 19).

The highest level of involvement for the *Water for Life* Community Panel, according to the International Association for Public Participation (IAP2)'s Public Participation Spectrum was *Collaborate*. The panel was given responsibility for:

- developing a vision for this draft strategy
- recommending a set of community criteria to inform the assessment of options for the future.

To help guide its discussions, the panel considered a wide range of information about the impacts of our key challenges and heard from, and asked questions of, more than 15 independent experts including Traditional Owners and specialists in the fields of climate science, national and international water policy, city planning, affordability, water research and innovation, economics and environmental science.

It has been the panel's responsibility to understand the views of the broader community reflected through our wider engagement and to represent those views in its deliberations. Ultimately, decisions about future water options were informed by the panel's vision and criteria to the maximum extent possible (see Chapter 4 for the full suite of options evaluation criteria).

Closing the loop

The excellent work undertaken by the *Water for Life* Community Panel will have a lasting benefit and help guide our strategic direction for years to come.

To deliver on our commitment to the Community Panel, in October 2021 we recalled the Panel to test how the selected options and adaptive framework aligned with their strategy vision.

From here, this draft strategy will be shared for public consultation with the broader community to test levels of comfort on key topics such as how we intend to meet our supply and demand challenge with the Adaptive Plan (outlined in more detail in Chapter 4). Community responses received during this process will be central to the finalisation of this draft strategy.

Once the final strategy is submitted, we will enter a phase of implementation where we will deliver on the strategy actions and commitments, while also continuing to strengthen collaborative relationships with Traditional Owners.

Have your say

The next steps of 'closing the loop' involve what we're doing now - openly consulting the public on this draft strategy to test community level of comfort on key topics such as how we intend to meet our supply and demand challenge with the Adaptive Plan (outlined in more detail in Chapter 4).

During this time the Greater Melbourne water corporations are inviting you and our broader community to have your say on this draft strategy and the directions and proposals it contains to meet our future water needs and values. Your responses to this consultation are central to the development of a final strategy.

Feedback on this draft strategy will help determine our actions for the next five years (and beyond) that will be set out in the final strategy, to be submitted to the Minister for Water in September 2022. Following the current phase of 'closing the loop', the draft strategy will be revised to incorporate community feedback, and a final strategy will be released in 2022 with a consultation report that summarises how feedback has been addressed.

About our Community Panel participants

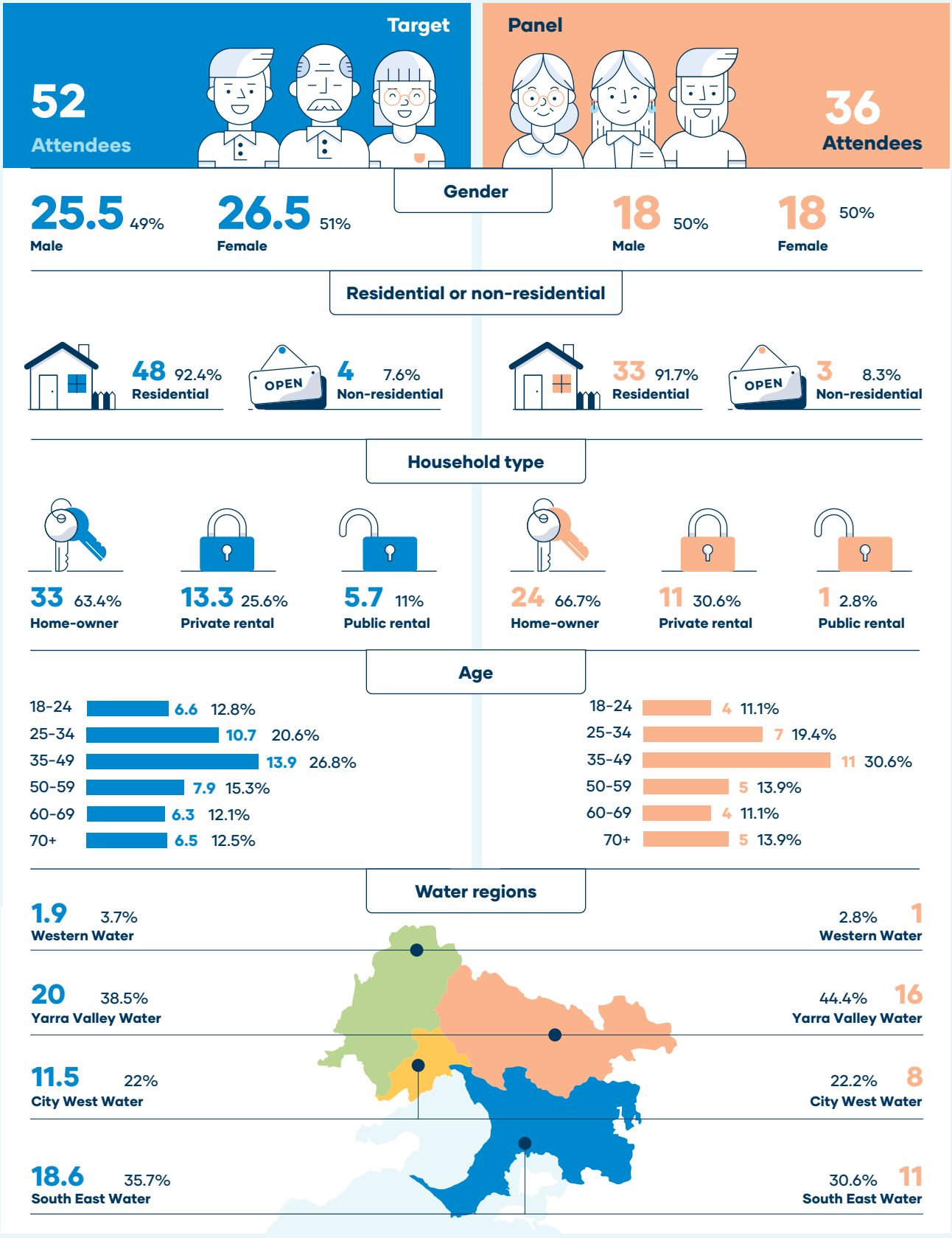


Figure 19: *Water for Life* Community Panel members

How community outcomes shaped the draft strategy

What the community vision means for this draft strategy

> **Our Melbourne.**
> **Our Water.**
> **Our Responsibility.**

The vision for this draft strategy reflects that water is fundamental to life, supporting the health and wellbeing of all in the Greater Melbourne region. Water is also the lifeblood of environmental health and essential to the cultural, spiritual and economic wellbeing of the Greater Melbourne community. While there are diverse community uses and needs for water, the common thread of value and importance provides shared interest and ownership in how water planning defines the future prosperity of Greater Melbourne.

A future with innovation driving equitable and affordable access to water

Access to safe drinking water is a basic human right. As we strive to address challenges and confidently meet our diverse water needs for the next 50 years, we will need to innovate, do things differently and be prepared for a range of outcomes. Maintaining the affordability of our services will be critical for accessibility and intergenerational equity.

A future with pristine, precious, secure and sustainable water

For the community, a vision of pristine water related to both the quality of water supplied to consumers and, importantly, the health of our waterways. Our precious closed water supply catchments have served Greater Melbourne well, but they are a limited resource and moving forward we will need to reduce the pressure and reliance we place on water sourced from catchments. Through this draft strategy, we focus on maintaining a safe, secure and sustainable water supply in a way that better supports protection and enhancement of the natural environment, our waterways and our urban environment, while also providing greater resilience against future supply challenges.

A future with meaningful partnerships with Traditional Owners

Traditional Owners have a shared interest in how water supply is planned for and managed, and have partner status in natural resource management. The draft strategy seeks to strengthen our relationship with Traditional Owners and grow our cultural competency. Trusted and sustained partnerships with Traditional Owners are fundamental to supporting their access to water and fostering a shared role in water management.

A future with meaningful engagement with consumers

Shared interest in our water future with the Greater Melbourne community, including consumers, reflects the need to expand our knowledge sharing around the value of water as a precious resource, the importance of using water wisely and ensuring water security for everyone. This shared ownership can be brought to life by empowering our community to fully appreciate our shared water challenge and to be more actively involved in planning our water future.

What the community criteria means for this draft strategy

The options evaluation criteria developed by the Community Panel were applied to a long list of options considered in the development of tthis draft strategy. Further detail on this approach and its outcomes is provided in Chapter 4.

The Community Panel's vision and criteria have shaped the *Water for Life* Strategic Framework (see Figure 20) and key focus areas.

Achieving the draft strategy vision is supported by a primary focus on **ensuring a secure and sustainable water supply** for everyone's benefit. This is underpinned by three complementary strategic focus areas.

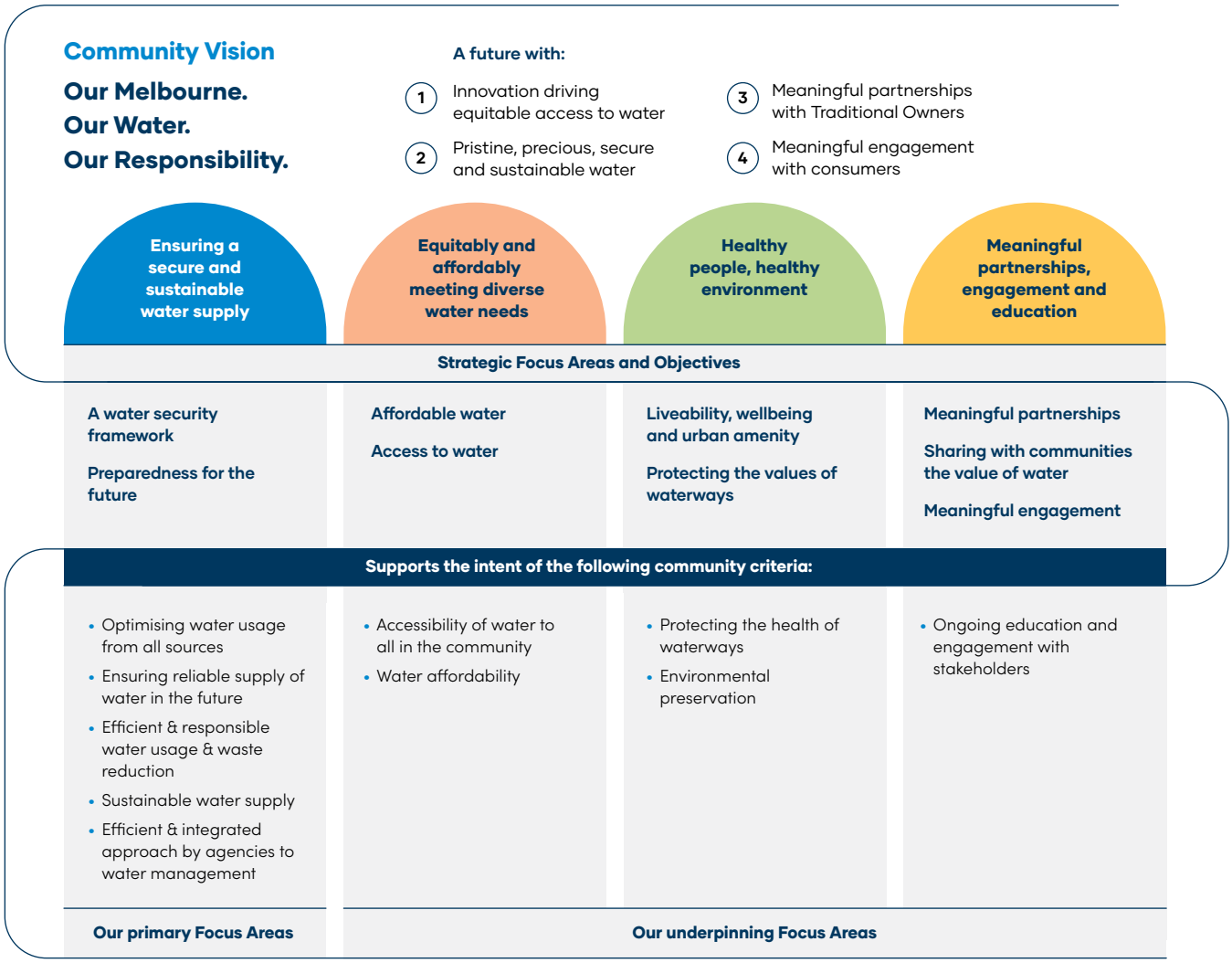


Figure 20: How the *Water for Life* Strategic Framework has been shaped by community priorities

3.3 Collaborating with Traditional Owners

In recognition of Traditional Owners' status as partners in water management, and respect for their self-determination, we have worked to continue to strengthen collaborative relationships with Traditional Owners groups with RAP status across our service region. Together we set the direction for the draft *Water for Life* strategy and assessed future options for water security.

Traditional Owner priorities

The **key success factors** identified **by Traditional Owners** in the draft *Water for Life* strategy broadly relate to the following three key themes:

1. Working together in water management and planning to deliver better outcomes

Genuine, trusted and sustained partnerships will deliver better outcomes for Traditional Owners, the broader community and the environment. Decisions use a quadruple-bottom-line approach, contribute to Healthy Country, Healthy Mob and recognise that increased Traditional Owner access to and management of water delivers benefits to all.

2. Supporting return of and access to water for Traditional Owners

This will improve Traditional Owners' ability to heal and care for Country, and ensure their physical and spiritual health. Water access also has a fundamental role in supporting economic development and participation through Aboriginal enterprise and therefore Aboriginal employment.

3. Preserving and enhancing natural water systems

Keeping water systems as near to their natural state as possible supports Healthy Country, Healthy Mob and, where possible, protects ecological and cultural values by:

- allowing rainwater to move slowly across land and into streams as would occur naturally
- keeping surface water in streams as much as possible
- keeping surface and groundwater on Country where it would naturally remain.

We have collaborated with representatives from the Bunurong, Dja Dja Wurrung, Gunaikurnai, Wadawurrung and Wurundjeri Woi Wurrung Traditional Owner groups to understand success factors for Traditional Owners in this draft strategy and barriers to their realisation. This insight informed the direction and focus for the draft strategy (see Figure 21), and together we co-developed key aspirations that support our common objectives and specific on-Country objectives. These aspirations have been embedded as actions in the draft strategy.

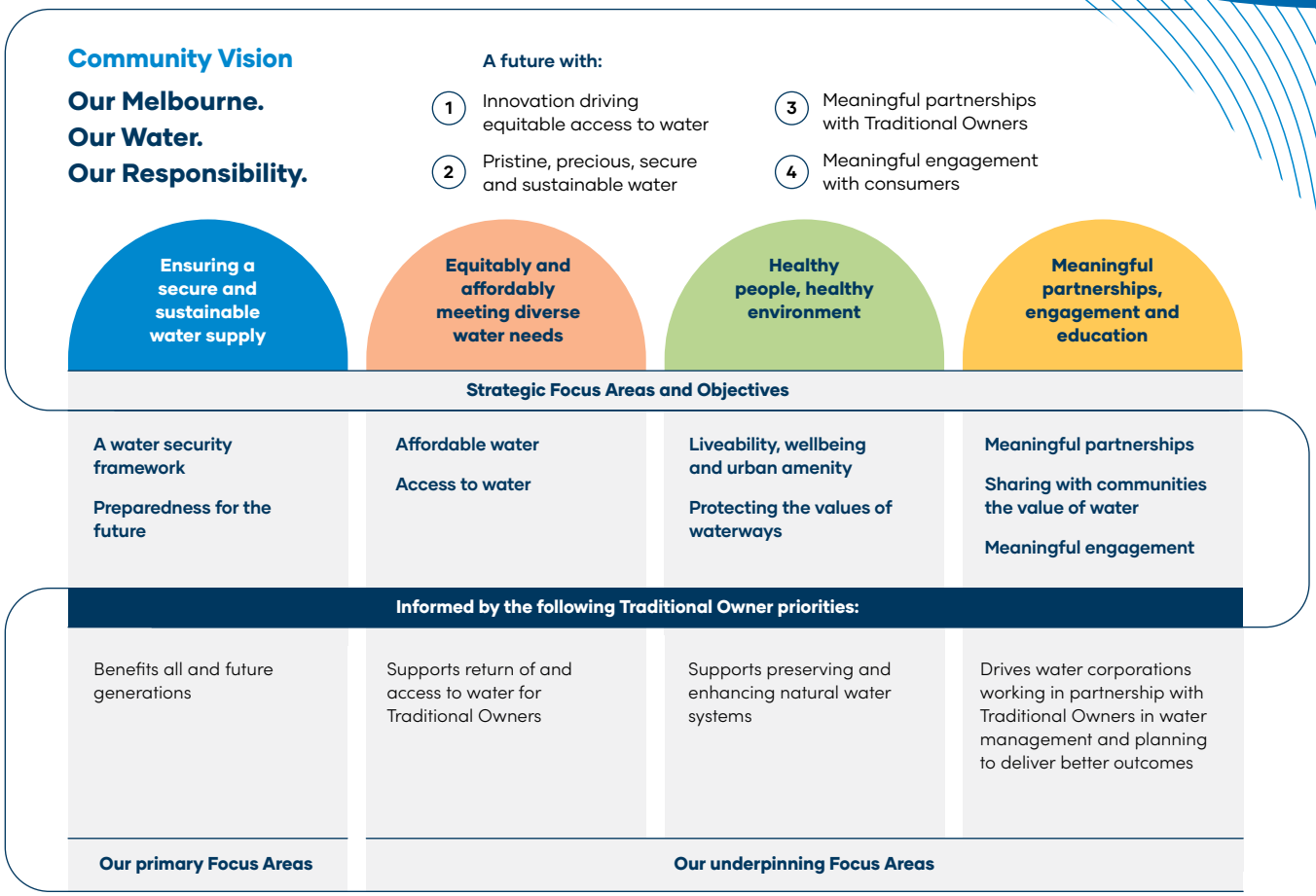


Figure 21: How the *Water for Life* Strategic Framework has been shaped by Traditional Owner priorities

Traditional Owner values in decision making

During the development of this draft strategy we collaborated with Traditional Owners on key water management decision making and planning to ensure their priorities and cultural values are embedded in everything we do. Traditional Owner group representatives were invited to:

- develop a set of options evaluation criteria
- develop a set of strategy actions.

When it comes to managing water on Country, we respect that each mob has a unique perspective and needs to determine its own pathway for the future.

Our collaboration resulted in a set of Traditional Owner options evaluation criteria being applied in our options evaluation process. These criteria supported Healthy Country and the health and wellbeing of Aboriginal Victorians by:

- supporting the return of water to Traditional Owners for self-determination purposes
- protecting and enhancing waterway health.

The *Water for Life* project team applied both the community and Traditional Owner criteria to the options identified and developed for adaptive management of our water security. See Chapter 4 for the options evaluation criteria, including those developed with Traditional Owners, and how they have been used to assess the options being progressed in this draft strategy.

3.4 Collaborating with stakeholders and experts

Bringing in our stakeholders and industry experts

Our stakeholders and industry experts were tasked with evaluating a long list of potential options within their areas of expertise which could help reduce demand on, or add supply to, the water supply system.

Application of the learnings from the previous experiences of our stakeholder and industry experts, along with previous planning work undertaken from 2007 to 2020, formed the basis of the long list options assessment for this draft strategy. Multiple working groups identified any gaps, risks and options that may not have been previously considered.

We used an **'Industry Challenge Team'** to bring together a wide range of technical, operational and strategic experts across the sector. By engaging this team, we were able to effectively:

- identify the issues, uncertainties, and preparedness activities for our strategic options
- incorporate key areas of expertise into the decision making and adaptive planning frameworks we use and options we put forward
- deepen our understanding of the practicality of, and key concerns for, all options put forward
- have a comprehensive diversity of input incorporating operational, strategic and technical knowledge
- support the development and application of technical criteria
- transfer and capture knowledge.

Three industry challenge team workshops were held at key milestones throughout the development of the draft strategy. An outcome from these workshops is a suite of options as described in Chapter 4, that provides an integrated portfolio approach to managing water security in both the near and long term to underpin delivery of the strategy's objectives.

Moving forward during strategy implementation, our industry partners including a range of technical, operational and strategic experts from both the public and private sector, will be pivotal to the success of implementing the strategy objectives.

Melbourne CBD across the Yarra River, Wurundjeri Woi Wurrung Country

4 Ensuring a Secure and Sustainable Water Supply

Chapter overview

Over the next 50 years, Greater Melbourne's population will continue to grow, with a resulting increase in the demand for water. Across Victoria, climate change will see a shift to a warmer and drier climate, with an expected decrease in rainfall, runoff and harvest from our water supply catchments. In addition, the frequency and severity of extreme weather events is also expected to rise.

Supply and demand projections show that we will likely need to augment the water supply system within the next 10 years. Depending on the severity of climate change impacts we will experience, we may need up to 600 GL of additional water by 2070.

As water corporations we are committed to:

- ensuring an integrated approach to water management that utilises multiple complementary options to maintain ongoing affordability for all water users
- ensuring fair and equitable access of water, including to satisfy cultural, liveability and environmental values across Greater Melbourne
- using a strong investment and evaluation approach to drive IWM planning and execution.

We will address these water supply challenges through a Water Security Framework, which will focus on:

- optimal operation of the existing system
- being prepared to manage severe dry conditions and water supply emergencies
- providing for future demand growth through an adaptive plan
- increased readiness to implement the adaptive plan
- clear governance and responsibilities for future water provision.

Key strategy actions	Secure and sustainable water supply	Equitably and affordably meeting diverse water needs	Ensuring healthy people and healthy environment	Meaningful partnerships, engagement and education
4.1 Develop and deliver a joint Water Efficiency Plan increasing our focus on water conservation and efficiency to provide cost-effective water savings.	✓	✓		✓
4.2 Support the development of IWM action plans to support delivery of the catchment scale IWM plans.	✓		✓	
4.3 Engage with customers on the feasibility of using all approved source options across Melbourne to supplement drinking water supply and undertake studies and trials to demonstrate efficacy.	✓		✓	✓
4.4 Lead transition of the Melbourne system towards more manufactured water for our region.	✓	✓	✓	✓
4.5 Lead the planning and delivery of options for potential augmentations outlined in the Adaptive Plan pathways, including the commencement of readiness activities on near-term options.	✓			✓
4.6 Plan and operate the existing water supply system to maximise water availability and be prepared to manage supply emergencies and droughts.	✓	✓		
4.7 Further develop the proposed augmentation decision-making process within the *Water for Life* Water Security Framework.	✓	✓		
4.8 Continue to develop and utilise consistent project assessment and investment frameworks, aligned to the quadruple-bottom-line.	✓	✓	✓	✓

4.1 Our commitment to providing water services to our customers

We commit to providing clear and timely information on Melbourne's water supply position and what that means for our customers.

Levels of service

Our commitment to how we deliver water services to our customers is set out in our levels of service, which is made up of two parts:

Agreed level of service: this is our commitment to the community to deliver water services under normal circumstances.

Minimum level of service: this is how we deliver water services in times of extreme dry conditions or emergencies.

Melbourne's levels of service

Our commitment to how we deliver water services to our customers:

Agreed level of service

- We aim to maintain water storage levels to provide resilience against drought.
- We will manage the water supply system to meet the demands for water while balancing cost to customers.

Minimum level of service

- We will always provide water to meet critical human needs.
- If we need to reduce demand, we will work with the community to prioritise voluntary demand reductions. We will implement mandatory Stage 3 or Stage 4 water restrictions only in the event of extreme dry conditions or emergency.

How we will deliver on our commitment

Our levels of service are managed using our water outlook zones, which are used to assess Greater Melbourne's water supply risk position. The water outlook zones are aligned to the amount of water held in storage in the reservoirs of the Greater Melbourne water supply system at 30 November of any given year, and are as follows:

- **Be Responsible zone:** 75 per cent and above of total system storage (TSS).
- **Be Proactive zone**: 60 per cent to below 75 per cent of TSS.
- **Act Now zone:** 45 per cent to below 60 per cent of TSS.
- **Critical Water Use Only zone:** minimum operating level to below 45 per cent of TSS.

Thomson Reservoir dam wall

The zones provide a clear signal to our community as to what we need to do to best manage our water. The water outlook zones are described in more detail on pages 98 and 99.

To deliver on our levels of service, we will plan and manage the system to maintain a greater than 99 per cent chance of storages being above the Critical Water Use Only zone. Should we experience a more extreme drought, we will always provide water for critical human needs through voluntary demand reductions or restrictions including, if necessary, Stage 3 or 4 restrictions.

Our agreed levels of service are managed through our desalination order principles where we balance our water supply risks and costs, guided by community preferences, to maintain storages appropriately within the Be Responsible, Be Proactive and Act Now zones. Annual advice is provided to the Victorian Government as to the appropriate order volumes. See Section 4.4 for further details.

To provide resilience to drought, if storage levels descend into the Be Proactive, Act Now and Critical Water Use Only zones, we would work with our customers, stakeholders and the community to recover storages back into the Be Responsible zone through the actions outlined in Section 4.4 and Figure 32, or by implementing actions to augment the system.

This is part of why we are prioritising readiness activities for our next augmentations – to have these options 'ready' and thus reduce the time needed to act if we need to augment the system.

Over the next five years, we will review the principles and hydrological modelling we use to manage and plan the water supply system to ensure these continue to align to best practice. This will also give us the opportunity to engage with our customers on how we communicate our water security position in a clearer way. We have committed to this in Action 4.6: engage with the community on clear communication of our water security position.

Engaging with the community on service levels and water supply preferences

During our wider community engagement, we reached out to our customers and communities across our combined service region through an online survey, in which we sought to understand preferences on how we should deliver our water services.

These community preferences will be key considerations in the actions we implement to ensure we meet our levels of service commitment to our customers. It will also inform how we invest in augmenting the supply system and building future infrastructure, which will ensure we can continue to meet our level of service commitment to customers into the future.

On the following topics, our customers indicated the following preferences:

- **Reliability of Melbourne's water supply:** customers expect to have water restrictions sometimes, such as during a severe drought.
- **Water quality:** customers value consistent appearance, taste and smell in their water nearly all the time.
- **Community green spaces:** To support the health and wellbeing of our community, customers value ensuring our public parks and sports grounds are always green, even during dry periods and drought.
- **Private gardens and lawns:** customers value more affordable water services, knowing that their garden and lawn may struggle during dry periods and drought.
- **Our natural environment:** customers value better protection of the natural environment they live in, for the future.
- **Expectations on ensuring a secure water supply:** customers expect to have water restrictions sometimes, such as during a severe drought.

From these, we understand that customers want a high quality, reliable water supply. They expect that during severe droughts, water restrictions may sometimes be needed, and that during these times private lawns and gardens may struggle. However, during droughts they would prefer the community green spaces are protected. Into the future, customers indicated a preference for ensuring we protect the natural environment.

4.2 Our water security framework

How we are delivering levels of service in an uncertain future

Our Water Security Framework will focus on ensuring that we can meet our commitment to providing water services to our customers over the short to long term.

Figure 22: Water Security Framework for Greater Melbourne

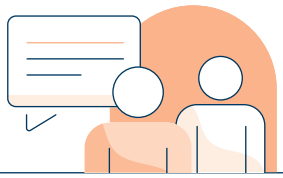
Through the Water Security Framework, water security management will focus on meeting our levels of service in the short and long term as follows:

1. How we deal with long-term uncertainty (50-year time horizon)

Adaptive planning: Long-term, strategic planning and preparedness

Our long-term planning is based on the *Water for Life* 50-year Adaptive Plan, considering future uncertainty such as climate change and population growth.

The Adaptive Plan aims to take a longer-term approach to informing shorter-term decisions by looking forward into possible futures and hypothesising how the water system may respond to those futures if they were to arise. This allows for consideration of readiness activities for the implementation of a diverse portfolio of options including water efficiency, IWM and large-scale manufactured water supply.



Community voice: Ensuring a reliable supply of water in the future was a key criterion set by the independent *Water for Life* Community Panel.

2. How we deal with short-term uncertainty (1 to 5-year time horizon)

Optimising the existing supply system: Our short-term planning focuses on optimising the existing system including catchments and water from the Victorian Desalination Project, considering uncertainty such as severe droughts and other emergency events. This will ensure our approach is focused on maintaining optimal operation of the existing supply system to deliver on our levels of service outlined throughout this chapter.

Drought response: Our drought response draws together actions to be implemented in the event of a severe drought or other emergency event. Ongoing review and preparedness will ensure we are ready to take necessary actions, should they be required.

3. How we decide (5 to 10-year horizon)

Decision making: Our augmentation decision process is a key component of the Water Security Framework to inform decisions on system augmentations. The Adaptive Plan needs to include decisions at discrete points to inform required planning and implementation of large-scale water supply augmentations. This will complement ongoing investment in the broader portfolio of water supply options.

These four components of the Water Security Framework are outlined in more detail in this chapter.

The various future scenarios explored indicates a wide range of potential supply shortfalls by 2070, as well as required timing for the next augmentations of the supply system. This wide range indicates the uncertainty in demand growth and the future impacts of climate change, as well as the uncertainty of the future occurrence of droughts. An overarching objective of this draft strategy is to ensure secure, resilient, reliable future water supplies aligned with our levels of service. The long and short-term planning required to achieve this objective has been integrated into a Water Security Framework, shown in Figure 22.

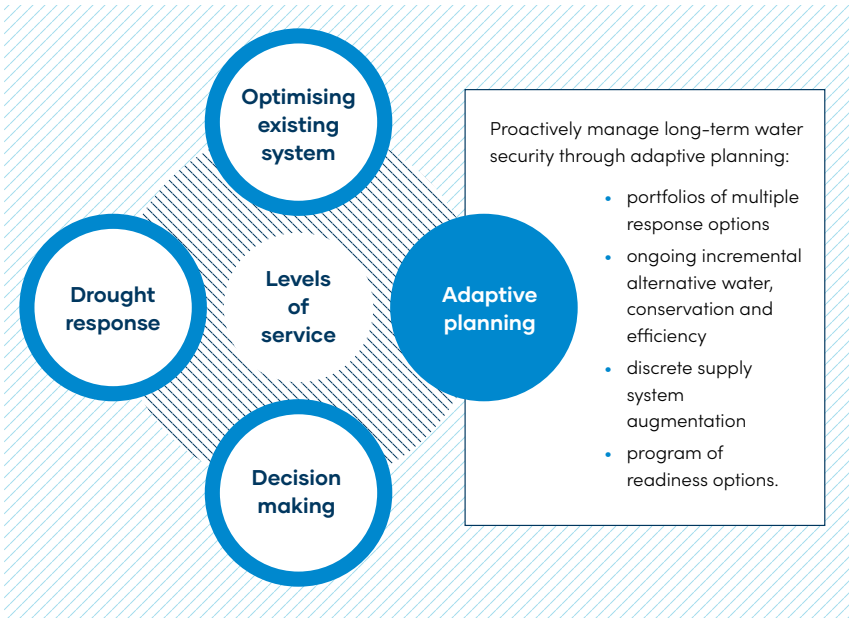
This framework will guide planning, decision making and implementation work required for our Adaptive Plan with clear trigger points and governance arrangements. We will have detailed options ready to progress in the near term which optimise the existing water supply system and progress readiness activities for system augmentations identified in our Adaptive Plan to ensure that we can bring these projects online when they are required.

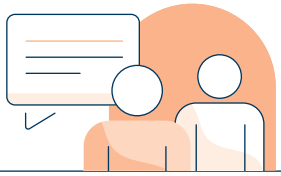
As discussed in section 4.1, levels of service are our commitment to customers and are fundamental to guiding the operation of the existing system and manage droughts, as well as for supply projections as part of long-term system planning and to determine when augmentations are needed. They are, therefore, a key element of the Water Security Framework.

4.3 How we are dealing with long-term uncertainty

Long-term strategic planning: preparedness for the future and our Adaptive Plan

At a glance: adaptive planning





Community voice:
Ensuring community understands the importance of water security and is engaged in decision making was a key criterion set by the independent *Water for Life* Community Panel.

Figure 23: How we are dealing with long-term uncertainty

The importance of being prepared

Planning for Melbourne's water needs over the next 50 years involves planning for significant uncertainties such as how quickly Melbourne continues to grow, how climate variability will impact water availability and how the community will choose to use water in the future. Climate change will increase uncertainty and variability of surface water resources and test the water system's ability to reliably meet demand over time: we have to be prepared for rapid change.

To meet the ongoing needs of Greater Melbourne, surrounding regions, Traditional Owners and the environment, we will need to invest in new water sources. Delaying investment helps to keep water costs down for customers but increases the risk of severe restrictions being implemented, with significant impacts to the community, the economy and the environment. To prevent bringing forward a major augmentation too early with the risk of it then being at a higher cost we need to continue to order desalinated water allocations from the Victorian Desalination Project. We must also make appropriate ongoing investment, so we are prepared with a range of solutions that can be implemented to address future uncertainty.

What is adaptive planning

The only thing certain about the future is that we cannot predict exactly what will unfold. When planning for future water needs, we must be ready for a range of possible scenarios.

To build this readiness, it's essential that we plan ahead so that we are able to act quickly and effectively in response to changing conditions, improved knowledge, changes in community values or new information. We need flexible options - we need an Adaptive Plan.

Adaptive planning is a globally-adopted approach to managing uncertainty. Decision making is enabled through the consideration of different scenarios that describe how our future might look.

Adaptive planning recognises there are multiple ways to respond to uncertainty. By considering multiple different future scenarios, we can analyse and explore the range and flexibility of options that could meet our future water needs.

An adaptive planning process explores the types and sequencing of options to respond to possible futures in what is terms a 'pathway'. For each pathway understanding time is critical to helping us identify the best actions and preparatory work to have options in a state of readiness to deliver water for Greater Melbourne under different possible futures.

An Adaptive Plan for Greater Melbourne

There is no single solution that can meet all of the needs of the community, Traditional Owners and the environment. We need to plan to adapt to changing future conditions. We need to be able to respond, when necessary, to changes in conditions, improvements in knowledge and new information. We need flexible options.

The *Water for Life* 50-year Adaptive Plan will enable informed decisions by engaging in the readiness activities for a suite of options now. Greater Melbourne water corporations can respond in a proactive and dynamic way to emerging challenges including population growth, a decline in the reliability of rainfall dependant supplies, and other shocks and stressors such as severe bushfires or drought.

The Adaptive Plan will support the proposed new Water Supply Plan in the discussion draft CGRSWS. Together they will provide for carefully planned and sustained increases to our water supply.

Global examples of adaptive planning

Thames Water has developed *London 2100, a case for change* (Thames Water, 2017) which applies an adaptive pathways approach to map an array of interventions to its key challenges of sea level rise, ageing infrastructure and limited land available for expanded infrastructure. In Australia, the Western Sydney Regional Master Plan, *Re-imagining water in Western Sydney* (Sydney Water, 2020) is a recent example of how adaptive pathways can be considered.

These adaptive plans are characterised by:

- scenario planning to understand the range of possible futures
- identifying the activities required to keep multiple options open until a decision is required
- identifying the triggers for actions
- identifying sequencing and staging over time that deliver in accordance with the current values.

How we developed an Adaptive Plan with a diverse portfolio of options

Why we need to consider all options

Considering all options is a prudent and necessary strategy for Greater Melbourne's future, as a diverse portfolio of water supply options will build resilience to climate change, provide for our growing population and make good use of resources that would otherwise be wasted and cause harm to our environment.

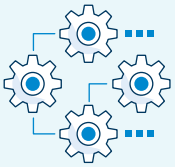
Our Adaptive Plan has been developed through a collaborative approach to decision making with the community, Traditional Owners, and industry experts (see Figure 17). We have reviewed a wide range of options to ensure our future water security, including those that add to supply, and those that reduce demand on the system. The different types of options available to us can be grouped under three key themes as shown in Figure 24.

Our Adaptive Plan will seek to keep options open so our community can continue to have the water future they choose.

The Australian Infrastructure 2019 Audit found:

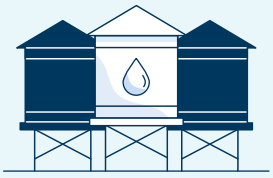
> "Ensuring all options are on the table, and can be deployed when required, is likely to be essential for governments and operators to effectively and efficiently ensure secure supply over the long term."
>
> **(Infrastructure Australia, 2019)**

Enhancing and expanding our existing system



- Manufactured water options (including desalination or fit-for-purpose recycled water)
- Surface water - river dependent sources (new dams, more water out of existing rivers, diversions from existing rivers)
- Groundwater
- Optimising the existing system - i.e. transfer network optimisation.

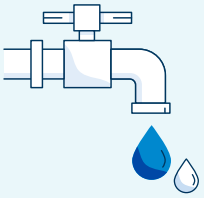
Integrated water management solutions



Increasing the use of diverse sources by:

- stormwater harvesting
- rainwater tanks
- fit-for-purpose recycled water (large and smaller scale)
- greywater (industry and household scale).

Water efficiency solutions



Increasing water conservation and efficiency by:

- digital meters
- behaviour change programs - e.g. community engagement or education campaigns
- household scale - efficient appliances, fixtures and fittings such as showerheads, toilets, leaks, washing machines
- industry-scale efficiency.

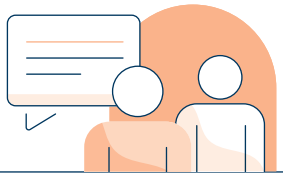
Figure 24: Future options grouped by key themes

Our 'long list' of options

To begin the adaptive planning process, a long list of options was developed to capture all the possible options at a point in time and provide a future reference point for review when implementing the Adaptive Plan. These options are detailed in Appendix A.

To meet the emerging deficit in our supply and demand (see Figure 15), most of our additional future water is likely to come from manufactured sources in 'supply system augmentations'. These manufactured sources simply require a certain level of treatment to be suitable for addition into our water supply system. We are transitioning to a manufactured water supply due to the natural resource constraints on availability from our existing surface water supplies, and the expected continued reduction in observed surface water availability associated with climate change (that is, reduction in rainfall).

However, manufactured water alone will not meet the broader needs of our system. To effectively use all sources of water, we need a range of actions at varying scales, including both centralised and decentralised, and structural and non-structural.



Community voice:
Some community panel members expressed an interest in drinking purified recycled water as an opportunity to secure our future water supply.

Thus a list of preferred options was identified by applying the evaluation criteria, Knowledge, Values, Rules Framework (see Figure 26) and supply-demand deficit (see Figure 15). With a comprehensive portfolio of preferred options the adaptive plan describes how we can 'combine' individual options. These combinations are then assessed under a range of possible future scenarios.

There are three key components to the options (see Figure 24):

Water efficiency solutions

Reducing demand on the system by continuing our investment in water conservation and efficiency programs

Integrated water management solutions

Reducing demand on the system by increasing our use of diverse water sources, such as stormwater, rainwater, and fit-for-purpose recycled water

Supply system augmentations

Enhancing and expanding our existing system through climate resilient, manufactured water (such as desalinated water or fit-for-purpose recycled water) and stormwater solutions.

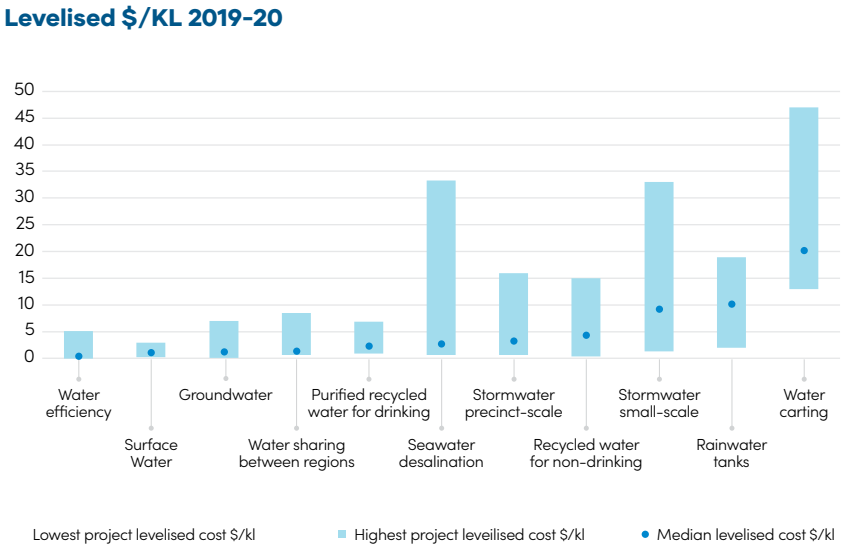


Figure 25: Costs of water supply options included in *All options on the table – Urban Water Supply Options for Australia* (WSAA, 2019). *Levelised cost approach contained in referenced WSAA All Options on the Table report (WSAA, 2019).

Global examples of water re-use

Globally, water security is a growing issue with 17 countries now drawing on more than 80 per cent of their available water supply each year, according to new data from the World Resources Institute. Forty-four countries, home to one-third of the world's population face 'high' levels of stress where, on average, more than 40 per cent of available supply is withdrawn every year. At the same time, however, global leaders in treatment and re-use are emerging:

- Oman, ranked number 16 of water-stressed countries, treats 100 per cent of its collected wastewater and re-uses 78 per cent.
- Namibia, one of the world's most arid countries, has been turning sewage water into drinking water for the past 50 years.

According to WSAA, there are 35 cities around the world (with recycled water schemes) with more coming on line, including Thames Water in London. Australia currently has three schemes built to treat sewage to drinking standards including:

- supplementation of Perth's potable water supply with purified recycled water
- South East Queensland's Western Corridor Recycling Scheme
- transfer of urban stormwater runoff from the NSW town of Orange to the main water supply.

(Melbourne Water Operating Environment Scan, 2019)

Learning from others

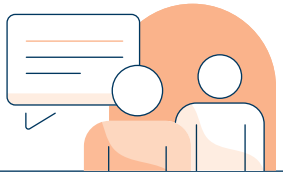
We can learn from others in Australia and worldwide about different supply options and the ways in which these can be best delivered. For example, the WSAA commissioned a study of supply options across Australia in 2020 (WSAA, 2019) which considered the costs of a range of water supply options, with results shown in Figure 25. While not every option is viable in every circumstance, or to the full extent required to meet a supply-demand shortfall, a combination can deliver the best outcome for all water users.

Water efficiency solutions

Using water efficiently and conserving water is the most cost-effective way of reducing the pressure on our water supplies. It helps to delay investment in infrastructure for new supply system augmentations reducing the costs to customers.

Melburnians have become much better at saving water since the Millennium Drought. Voluntary water efficiency programs and water restrictions resulted in a significant decrease in demand for water between 1997 and 2009, despite Melbourne's population growing by 500,000 people. Water consumption and peak day demands have both declined, with total water use decreasing from around 480 litres per person per day in the mid-1990s, to 236 litres per person per day in 2021.

We also work with customers to reduce household water use through initiatives such as the Make Every Drop Count campaign and Target 155 program (T155), a water efficiency initiative that encourages each household to limit water consumption to 155 litres per person each day. In 2018/19, residential water use across Melbourne was 162 litres per person per day, just one



Community voice: Using water efficiently was a key criterion set by the independent *Water for Life* Community Panel.

litre more than the previous 2017/18 and 2016/17 average, despite drier conditions for much of the year. We're well on track to achieving T155 with average daily water use currently at around 157 litres.

With continued population growth, the challenge of climate change and inevitable future drought, the demand on the water supply system will increase. Using water efficiently and conserving water alone cannot provide for our future water needs; it plays an important role in reducing demand and it is vital that the city continues to use water efficiently. Examples of water efficiency initiatives are highlighted throughout this draft strategy.

For more detail on water conservation and efficiency, see Chapter 5.

Action 4.1

What: Develop and deliver a joint Water Efficiency Plan increasing our focus on water conservation and efficiency to provide cost-effective water savings.

Detail:

As a key component of the Adaptive Plan, seek to achieve residential and total water use of 150 and 225 litres per person per day respectively by 2030, where business cases demonstrate value to our community, with an aspiration of achieving a residential demand of 100 litres per person per day by 2070.

This will:

- ensure Melbourne is water efficient
- achieve the right balance between proactive investment and any reactive investment needed in the event of drought or other emergency event
- deliver complementary benefits such as reduced hot water use (and associated greenhouse gas benefits and reductions in bills) and reduced water to sewerage requiring treatment and discharge.

Who: Retail water corporations (GWW, SEW, YVW) in collaboration with the wholesaler, Melbourne Water.

When: By December 2022 and ongoing.

Delivers on SDGs

Werribee River, border of Bunurong Country and Wadawurrung Country

Integrated Water Management solutions

There is a significant surplus of recycled water, stormwater and rainwater on properties across Greater Melbourne, and this surplus is growing.

IWM solutions are solutions that reduce demand on the system by increasing our use of diverse water sources such as stormwater, rainwater and fit-for purpose recycled water.We have identified a suite of IWM opportunities which will be further investigated, prioritised and progressed over the next five years. These opportunities indicate that our agreed IWM forum targets (see Chapter 6) for 2030 can be achieved and will reduce the demand for water on our system.

There is further work to be done to progress our 2050 targets but this suite of options can contribute significant long-term benefits to water security for the region.

Water authorities only have a limited role in delivering rainwater and stormwater services. To deliver the greatest benefit from IWM this will require us to work with state and local government to overcome challenges in investment and delivery of IWM. This includes how projects are funded and delivered to align investment and benefits.

The benefits of these IWM opportunities for liveability, health and wellbeing, environment and waterway health are outlined in more detail in Chapter 6.

Recycled water

In 2020/21, the Greater Melbourne water corporations treated 386 GL of sewage of which around 8 per cent (or 28 GL) was supplied to customers as recycled water.

With significant quantities of water available close to Melbourne, the sewerage system is an essential part of resolving the growing deficit in Greater Melbourne's water supply and provides an opportunity for resource recovery.

Action 4.2

What: Support the development of IWM action plans with clear accountabilities for each water business to support delivery of the catchment scale IWM plans and their embedded targets for the five catchments in Metropolitan Melbourne.

Detail: As a key component of the Adaptive Plan, increasing our focus on IWM and greater use of rainwater, stormwater and recycled water can reduce demand on our water supply system, to support the deferral of major system augmentations, and provide multiple benefits to our communities in the form of greening and cooling, or supporting recreation activities.

This will also:

- deliver 150 GL/year from diverse sources of water by 2050 where business cases demonstrate value to our community, ensuring the action plans and projects are working to achieve catchment scale IWM plan targets
- work with IWM forum partners to develop action plans and projects that progress towards other relevant catchment scale IWM plan targets, with a focus on delivering the 2030 targets
- work with the Victorian Planning Authority and DELWP to embed IWM through different planning instruments and processes
- work with IWM forum partners to ensure catchment scale IWM performance targets are included within organisational plans and strategies
- work with DELWP, the Essential Services Commission and Department of Treasury and Finance to resolve challenges in investing in and financing IWM projects, and establish accountabilities with respect to the benefits provided by IWM.

Who: Greater Melbourne water corporations (GWW, MW, SEW, YVW) in collaboration with government, Traditional Owners and other IWM forum partners.

When: By December 2022 and ongoing.

Delivers on SDGs

Case Study: IWM Solutions

Supporting communities with recycled water

Recycled water is an important alternative water supply and can be used sustainably over the long term.

Yarra Valley Water supplies Class A recycled water to new homes throughout Melbourne's booming northern growth corridor, which includes Wallan, Beveridge, Mickleham, Kalkallo and Donnybrook.

Residents in these new estates can use Class A recycled water to wash clothes, flush toilets, water gardens and clean cars. They typically use about a third less drinking water than households in other suburbs. In addition, recycled water can be used for watering public gardens and reserves so new communities can enjoy green open spaces.

Yarra Valley Water's recycled water network services more than 37,000 homes and businesses, mostly in the northern growth corridor, and continues to expand. Planning is underway to increase capacity at the Aurora recycled water treatment plant at Wollert. This will provide a significant increase in recycled water production capacity for this important growth area.

In addition, a new recycled water treatment facility will be delivered by 2030 just south of Donnybrook. Our IWM servicing strategy for the corridor will see us deliver critical recycled water infrastructure to enable us supply up to 10 billion litres of recycled water per year to more than 100,000 residential and commercial customers.

Yarra Valley Water's commitment to building and improving recycled water assets will ensure current and future generations have access to a reliable supply of drought resilient recycled water.

Action 4.3

What: Engage with customers on the feasibility of using all approved source options across Melbourne to supplement drinking water supply and undertake studies and trials to demonstrate efficacy.

Detail: By engaging with customers and conducting long-term trials to demonstrate the feasibility of manufacturing water from all approved source options across Melbourne to supplement drinking water, we can highlight the efficacy of proven technology. This can also highlight the range of beneficial uses for fit-for-purpose recycled water and stormwater, including for greening and cooling across our city and enhancing the health of our rivers.

Who: Melbourne Water, in collaboration with retail water corporations (GWW, SEW, YVW), government and research institutions.

When: By 2030.

Delivers on SDGs

Supply system augmentations

To meet the water supply challenges of the future, we need to continue to invest in new sources through large-scale supply system augmentations to complement our efforts to use water more efficiently.

Climate risks such as bushfires, and climate variability resulting in periods of drought, mean we need to diversify our traditional water supply approaches, leading a transition away from surface water options which may include new dams or dam augmentations, towards new climate resilient, manufactured water options.

Manufactured water options provide many important benefits including returning more water to waterways by not drawing on already stressed river systems or preventing Traditional Owner access to water. We know that surface water options are dependent on rainfall so their contribution may be less reliable into the future, particularly in times of drought. Manufactured water contributes to both climate resilience and ensuring the greatest efficiency and flexibility in options to deliver long-term water security for the broader community across our region including for Traditional Owners and also for waterway health.

Planning and 'readiness activities' must progress for new water supply system augmentation projects so that we are prepared for action in a timely and agile manner. When multiple options are investigated and planned for, we are better placed to select the best option at the right time.

Investment in research and readiness activities in the near-term may save the public money in the long term by preventing the need for reactive action and allowing time for consideration of location, design, approvals, funding, cost–benefit analysis, operation and governance.

Traditional Owner perspective: New sources of climate resilient, manufactured water (such as desalinated water and fit-for-purpose recycled water) and water conservation can support the return of water to Traditional Owners.

Action 4.4

What: Lead transition of the Melbourne system, and the sector, towards more climate resilient, manufactured water for our region.

Detail:

We will:

- develop an integrated and system view across all sources for long-term system planning
- Ensure the greatest efficiency and flexibility in options to deliver long-term water security for the broader community across our region
- lead the sector transition to plan for and deliver water to meet environmental and Traditional Owner outcomes
- build enhanced resilience to climate and system shocks across the Melbourne system (into our planning, asset management, maintenance and investments)
- optimise water quality improvement actions and their timing relative to source and system augmentations to provide system resilience for water quality and quantity from the Melbourne system
- invest in research and new technology for future innovation in climate resilient, manufactured water, supported by strong partnerships with universities, WSAA, VicWater and others
- Support DELWP and other water authorities in considering potential reform to urban bulk water entitlements
- optimise operation of manufactured water sources alongside more conventional (catchment) sources and rainwater, stormwater and recycled water
- balance use of manufactured water with our commitments towards net zero carbon by 2030.

Who: Melbourne Water, in collaboration with retail water corporations (GWW, SEW, YWW) and government.

When: Ongoing.

Delivers on SDGs

Assessing the options against our options evaluation criteria

The long list of options has been evaluated using a robust set of options assessment criteria which comprises of three key inputs (see Figure 27):

1. Technical and non-negotiable.
2. Community criteria.
3. Traditional Owner criteria.

These criteria have been considered using a quadruple-bottom-line method, incorporating economic, environmental, social and cultural criteria. This approach is aligned with the discussion draft CGRSWS and recognises that managing water in a holistic manner, where Traditional Owners are able to care for Country, delivers benefits to all who live in the region.

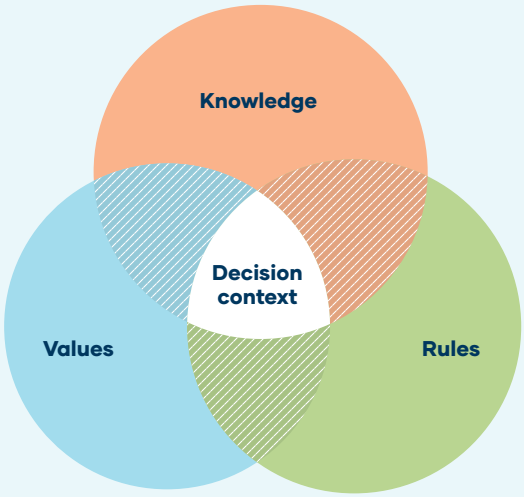
> The quadruple-bottom-line approach takes into account not only economic or financial results or benefits, but also social, environmental and cultural factors and outcomes. Consideration of all four elements should bring community wellbeing, prosperity and jobs.
>
> **(Discussion draft CGRSWS DELWP 2021)**

The objectives of the evaluation are to incorporate community and Traditional Owner values into the options assessment and to understand how these values inform the option preferencing.

Options have been categorised as those which are available to us now and those which may be available in the long term using a framework called 'Knowledge Values Rules' (see Figure 26). This framework is used for analysing decision making, incorporating societal factors that influence decision-making processes and the resulting options and choices. Using this model we are able to assess constraints in the decision processes supporting the development of adaptive responses.

This framework also identified the actions required to change or evolve the decision-making context to enable a future decision, and when an option may become available. It complemented the community and Traditional Owner criteria by identifying the work required to enable options that align with community and Traditional Owner priorities and values as expressed in these criteria.

See **Appendix A** for details about how our Options Selection process was completed.

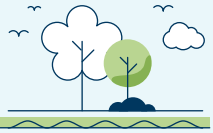


Knowledge: technical understanding of limits and issues, interactions and options. These may be engineering, technical limitations, or social, customer and community orientated, quantitative or qualitative.

Values: these describe what is important under a range of different contexts, now and in the future, for the community, our customers, the environment and Traditional Owners. Values include factors such as the water corporations' social licence to operate and community sentiment on issues.

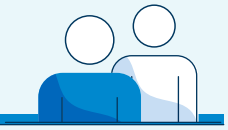
Rules: the governance and regulatory context for the water supply and sewerage management systems, including the water cycle, waste, and resources.

Figure 26: Knowledge, Values, Rules Framework to guide options analysis



Environmental

Protecting the health of waterways	Extent to which the option results in safe water quality for living organisms, ensuring healthy living and sustainable environment in waterways and land ecosystems
Self-sustaining water supply that recovers, re-uses and makes use of all resources	Extent to which the option has mechanisms that recover, re-use and make use of all surface water from rivers, groundwater, stormwater and water recycled from sewage
Ensuring reliable supply of water into the future that takes into consideration changing climate and emerging societal threats	Extent to which the option is resilient to shocks
Protect, restore, enhance our environment	Extent to which the option provides environmental benefits such as biodiversity health and habitat protection, tree canopy, healthy ecosystems and marine health
Scalability of option resulting in ability for new technology to be adopted	Extent to which the option is scalable and technology advances can be realised
Emissions	Extent of greenhouse gas emissions



Social

Optimising water usage from all sources	Extent to which the option improves use of all available water sources
Accessibility of water to all people, including vulnerable people, future generations and those living in rural areas	Extent to which the option provides equitable access to water now and into the future
Ensuring a reliable supply of water into the future that takes into account climate resilience	Extent to which the option is independent of rainfall
Land use	Extent to which infrastructure has an impact on private and community land assets and their social, cultural, commercial and environmental values

Figure 27: Options evaluation criteria

Financial

Reduction of water wastage	Extent to which the option reduces water wastage through leakage	
Responsible water usage by consumers and suppliers	Extent to which the option encourages water to be used efficiently	
Prevention of disruption to supply through network redundancy	Extent to which the option increases reliability through redundancy	
Ensure water is affordable and is of the highest appropriate quality - water quality	Extent to which the option improves water quality	
Ensure water is affordable and is of the highest appropriate quality - affordability	Levelised cost ($/kL), kilolitre of water supplied	
Volume of yield	Volume of water delivered by the option	

Cultural

Water for Traditional Owners	Extent to which the option can return water to Traditional Owners	
Healthy Country	Extent to which the option returns water to the environment supporting the return to a more natural waterway regime	

Technical criteria Community criteria Traditional Owner criteria

Pathways and possible futures

This draft strategy has applied an adaptive planning approach to dealing with the future uncertainty we face. We have explored the types and sequencing of options to respond to a possible future in each of the five 'pathways'.

Understanding what potential long-term options we want to keep open for the future allows for consideration of the 'readiness activities' that need to be started now. The Adaptive Plan has identified the options we want to keep open for the future and the actions needed in order to do this. This step in the Water Security Framework is required to allow us to identify decisions that need to be made.

The Adaptive Plan needs to include decisions at discrete points to inform the planning and implementation of large-scale water supply augmentations. The augmentation decision process will inform decision making as to when a project should proceed to readiness, selection or implementation. This step within the Water Security Framework will play a key role in informing the adaptive 'pathway' we are on or are transitioning between.

Through the adaptive planning approach and extensive analysis, we have identified five plausible future pathways that can respond to changing conditions (as shown in Figure 28). **All of the five future adaptive pathways are effective in securing our system against a warming and drying climate, growing population, and diverse and changing water uses, values and needs.**

Each pathway shows a different combination of water efficiency solutions and IWM solutions investment to reduce demand on the system. With a reduction in demand, these pathways then assess the point in time at which a supply-demand shortfall could be present and when a supply system augmentation is required.

The variation in five different pathways demonstrates the considerations of costs, benefits and trade-offs for the different combination of options.

Different future scenarios have been assessed to examine the resilience of our system to climate change, population growth, and extreme events such as bushfires and drought. By using the high climate change and high demand future conditions, we can demonstrate the earliest time a supply system augmentation is needed to address the supply/demand shortfall. This allows us to identify the planning required to address a potential 'worst case' scenario.

Which pathway?

It is human nature to want to 'choose a pathway' and have certainty for which path we are on. Adaptive planning is a process driven approach rather than solution driven approach. Whilst we can make an informed decision today, this doesn't take into account changes in the future, changes to our operating environment and our communities values, changes we need to be ready to adapt to. Our adaptive planning approach provides the process that allows us to shift as our operating environment changes.

The *Water for Life* adaptive plan is not dictated by an exact timeline and does not follow one particular pathway, rather it provides us with clarity on time. Understanding time is critical to helping us identify the best actions and preparatory work to have options in a state of readiness to deliver water for Greater Melbourne under different possible futures.

The augmentation decision process will inform decisions on supply system augmentations A large system augmentation is a major infrastructure project. This can take a decade or more to deliver, with many years of planning required. This process will inform decision making and when a project should proceed to readiness, selection or implementation. As decisions on large system augmentations are made these will inform the adaptive plan and the 'pathway' we are on or transition between.

Regular monitoring of the adaptive pathways as information, technology and conditions change will ensure Greater Melbourne remains prepared for an uncertain future. This approach is embedded within the Water Security Framework and will provide carefully planned and sustained increases to water, support decision making at the right time and allow our communities to influence the water future they want.

This adaptive planning process has highlighted the following outcomes:

1. We need a lot of water

To provide the volume of water required, particularly in times of drought, **we need to increase our supply of climate resilient, manufactured water**. To support population growth and address the impacts of climate change and increasing urbanisation, **Greater Melbourne may need 85GL of additional water by 2030 and 600GL by 2070**. Under a 'worst case' future scenario, demand may start exceeding system yield as early as 2023.

2. There isn't one single solution

To ensure Greater Melbourne has enough water in the future to meet demands, we will need a diverse range of water sources.

Investment in IWM and water efficiency solutions plays a critical role in making the most and best use of our existing drinking water supplies and deferring progressive large-scale infrastructure investment over the long term.

3. We need to start now

Today, water storages are high. This is thanks in great part to Melburnians who have continually improved their household water efficiency, significantly reducing per person usage over the last 20 years.

While dam levels are high, we must take the opportunity to forward plan so that we have a range of fit-for purpose options ready when needed. Many **water supply options take years of planning** and investment before they can deliver the water needed. Storage levels can drop quickly and if a severe drought (similar to conditions experienced in 2006/07) were to occur now, modelling indicates storages could fall by around 40 per cent within four years.

Being proactive and prepared allows water corporations to stagger required financial and resource spending over a longer period of time – ultimately lessening immediate cost impacts for our customers.

4. We have the opportunity to take a holistic, integrated approach

While we are committed to always providing water to meet the critical needs of our customers, we can also plan more broadly to deliver meaningful integrated outcomes for the environment, Traditional Owners and liveable communities.

The adaptive planning pathways show that higher investment in water efficiency and IWM solutions can provide additional benefits from having more diversity in our supply and offsetting our urban consumptive demand with alternative sources.

Through ongoing implementation of an adaptive planning approach, we will continue to assess future scenarios and identify options that support delivering multiple benefits for the whole of the Greater Melbourne system.

It's important we continue on this path and work towards greater community water conservation and efficiency as a way of life. **Our precious water remains a limited resource** – one that we must conserve and protect for future generations.

Through the adaptive planning approach and extensive analysis, we have identified five plausible future pathways that can respond to changing conditions. **All of the five future adaptive pathways are effective in securing our system against a warming and drying climate, growing population, and diverse and changing water uses, values and needs.**

Key takeaways from the adaptive plan:

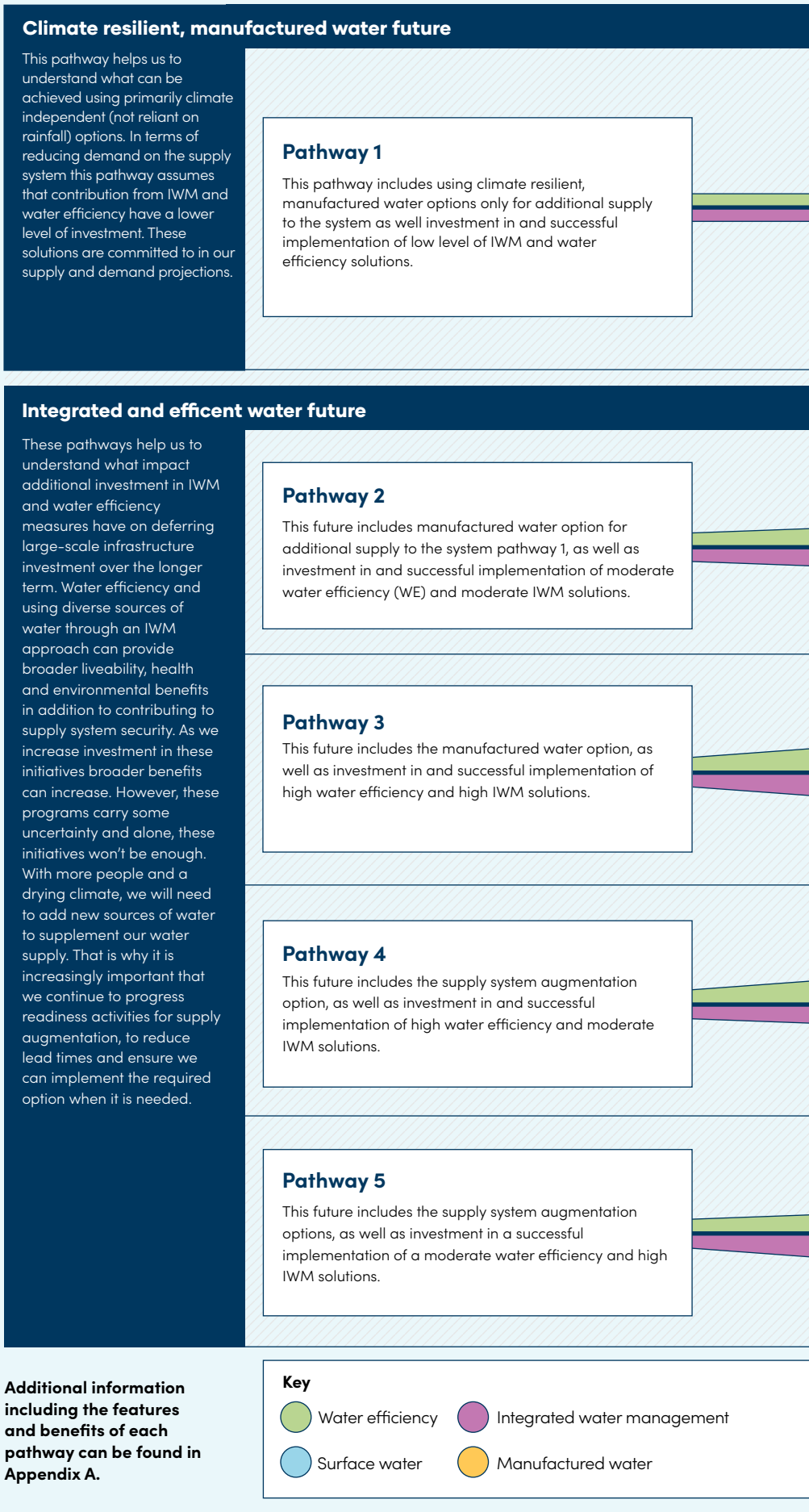
1. To provide a secure water future, we will need a diverse range of water sources.

2. Investment in IWM and water efficiency solutions will be critical to maintain affordability for our customers and protect waterway health and cultural values.

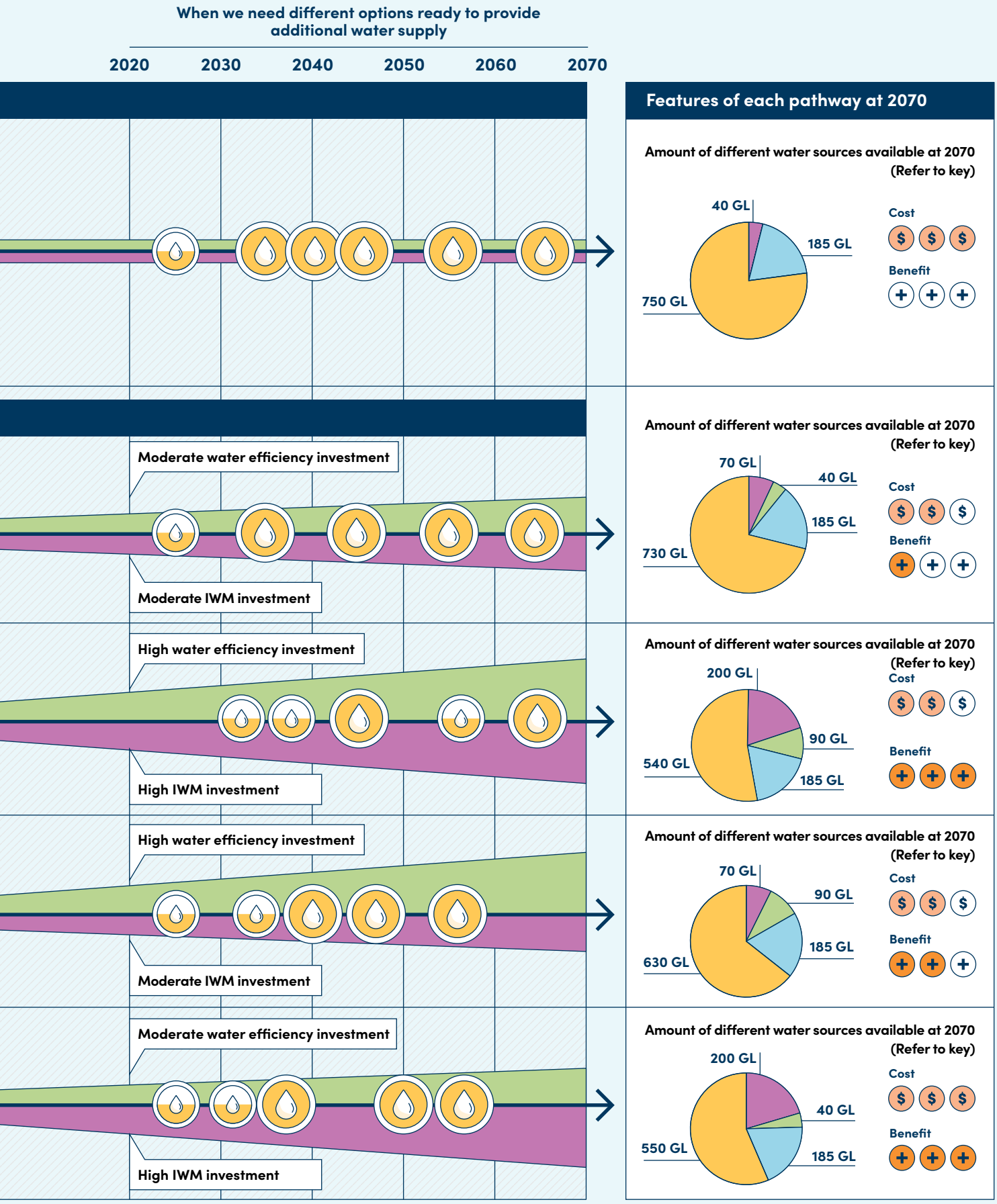
3. To address the volume of water required by 2070, particularly in times of drought, we also need to increase our supply of climate resilient, manufactured water.

4. A supply system augmentation (adding to or expanding our existing system) will be required within the next 10 years.

Figure 28: The *Water for Life* Adaptive Plan: an overview of possible futures demonstrating different interventions over time



Additional information including the features and benefits of each pathway can be found in Appendix A.



Manufactured water

- Less than 100 GL volume
- More than 100 GL volume

Cost

- Less than $3 per kilolitre
- Less than $4 per kilolitre
- Less than $5 per kilolitre

Benefit (social, environmental and Traditional Owner)

- Moderate
- Ambitious/Moderate
- Ambitious

Importance of implementing the Adaptive Plan

A key aspect of the Adaptive Plan is ongoing monitoring and evaluation of progress, providing us with the ability to assess and adapt as required.

Monitoring progress on the delivery of the IWM solutions and water efficiency solutions will be critical as they have the potential to reduce demand on the system, and thus the potential to impact the sequence of options and an augmentation. Poorly planned or unplanned delays to investments have the potential to create additional cost and impact on community. Ongoing evaluation of indicators ensures that our decision-making process leads to early, proactive decisions, rather than reactive decisions that are potentially made too late.

The short-term actions identified in this draft strategy are imperative to keep our adaptive pathways open and flexible for an uncertain future, and will also be critical to mitigate the potential future costs from delays in readiness activities. We know that **'investing in readiness'** by progressing the early planning works required on water supply options may reduce future risks of delay and provide a better opportunity to ensure more efficient costs.

We also review progress each year through the Annual Water Outlook prepared collaboratively by the Greater Melbourne water corporations, and through the annual desalinated water order.

Key to delivering the options portfolio and Adaptive Plan will be clear governance, decision making and monitoring as a key part of the action plan, as well as strong collaborative relationships with government and through the CGRSWS. Business collaboration and support, with ongoing resources for delivery (whether dedicated or through existing working groups), will be key to the success of governance and monitoring.

See Chapter 8 for details on implementation of this draft strategy.

Ti Tree Creek in Monbulk, Wurundjeri Country

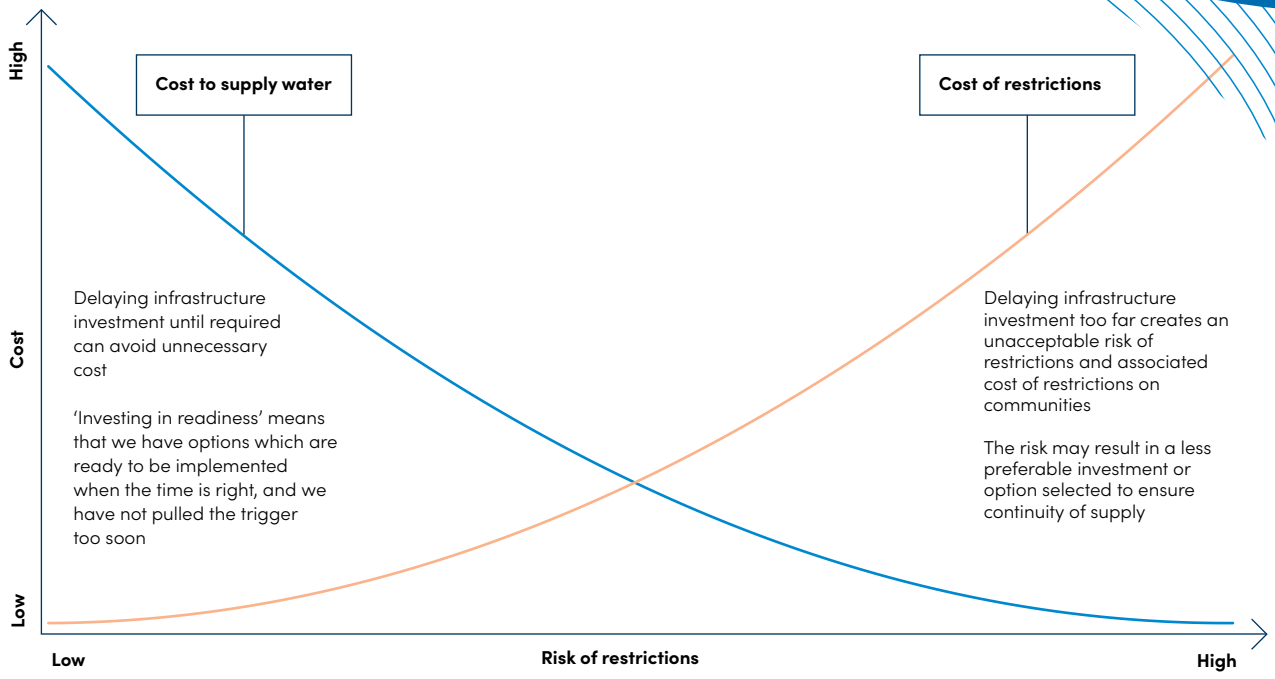


Figure 29: The cost of delay

Action 4.5

What: Lead the planning and delivery of options for potential augmentations outlined in the Adaptive Plan pathways, including the commencement of readiness activities on near-term options.

Detail:

1. As part of the short-term work program for the Adaptive Plan, deliver the early readiness activities required to ensure that the region's desalination capacity meets future needs. This will:

- ensure balanced investment across the investments needed in infrastructure, readiness, education and engagement to achieve outcomes expected by the community
- develop an accepted methodology for funding resilience planning, climate change and dealing with uncertainty.

2. As part of the longer-term, ongoing work program for the Adaptive Plan, lead the exploration and planning of options for potential augmentations by deepening our understanding of:

- water demand and supply options and whole of cycle water movement across our region at a system scale (including Traditional Owner and environmental water needs)
- system constraints and integration needs, in understanding how new supply sources are optimally brought into the system
- the holistic impact of supply options to ensure system resilience is considered for maintaining level of service commitments
- the process for ongoing evaluation of potential new options to be considered and incorporated into the adaptive pathways.

Who: Melbourne Water, in collaboration with retail water corporations (GWW, SEW, YVW) and government.

When: By 2023 and ongoing.

Delivers on SDGs

4.4 How we are dealing with short-term uncertainty

Managing our existing water supply system

Short-term planning for our water supply system focuses on optimising the existing system including catchments and water from the Victorian Desalination Project, and ensuring that we prepare for, and manage, water supplies in the event of dry conditions and droughts. Existing processes and tools used by Greater Melbourne water corporations include the annual desalination water order advice, annual water outlook, and drought and emergency preparedness actions.

Current modelling indicates that if we experienced a repeat of the Millennium Drought now, storages could fall by around 40 per cent within four years. However, as storage levels are currently high, and with the aim of maintaining high storage levels with support from the Victorian Desalination Project this places us in a much better position to manage dry conditions or a severe drought, giving us time to act.

The drought framework and water outlook zones will provide the basis for actions to manage short-term water security.

Greater Melbourne's water security position is assessed and managed through our water outlook zones, which align to water held in storage and, specifically, water held within that storage that is available for Melbourne to use. Since the zones were last reviewed in 2016, Greater Melbourne has grown, resulting in increased demand. The Melbourne water supply system's role to ensure supply across the grid has expanded. The supply system's operational constraints were also reviewed. These factors have been taken into account as part of the current formal requirement to review the zones every five years.

To align with community expectations and our emphasis on improved readiness, we have revised the water outlook zones and associated actions, to ensure water supply reliability is best balanced with optimised operation of the system. These actions will allow us to deliver our level of service commitments. We know that water in storage can fall quickly during drought so we have also reviewed our zone approach to system management and included an additional zone to recognise the need to escalate actions as storage levels decline. The revised zones and actions are shown in Figure 31.

At a glance: Optimising the existing system and drought response

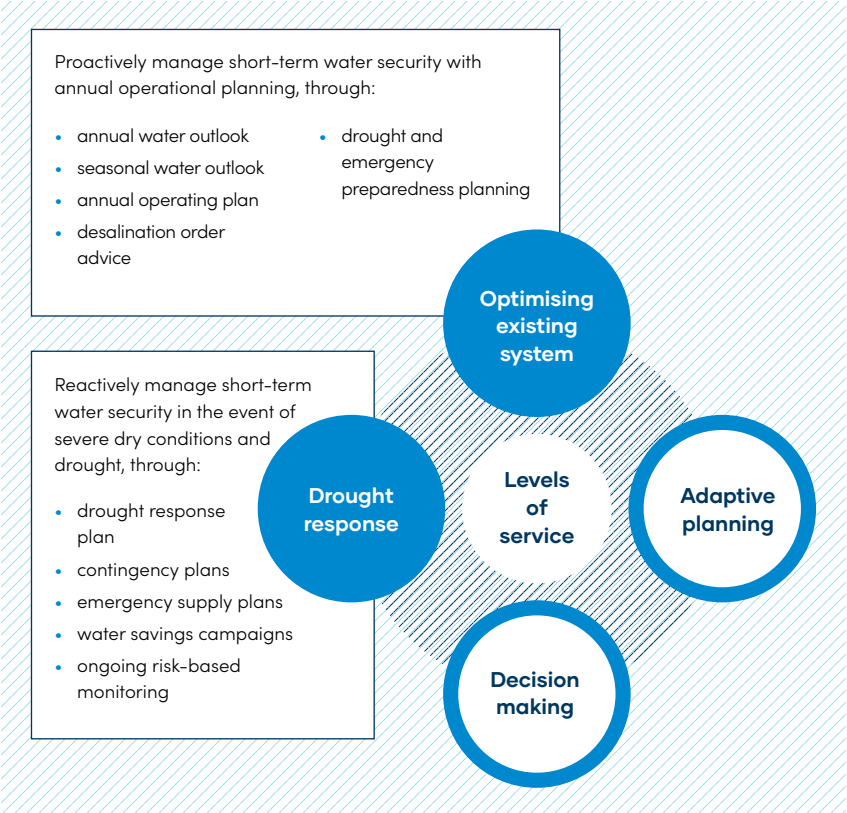


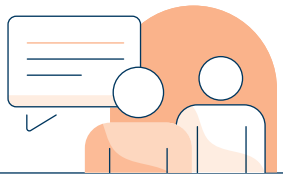
Figure 30: How we are dealing with short-term uncertainty

Community actions in this zone	Zones + Total Storage System (TSS)	Volume available for Greater Melbourne (GL)	Example water sector actions in this zone
Continue using water efficiently: make every drop count and continue using water efficiently.	**Be Responsible** **Equal to or greater than 75% TSS**	**Equal to or greater than 760 GL**	• Optimise existing water sources, including the use of existing desalination capacity • Continue implementing water knowledge campaigns • Develop plans to prepare for the 'Be Proactive' zone
Reduce your water usage: make every drop count to avoid restrictions.	**Be Proactive** **Equal to or greater than 60% and less than 75% TSS**	**Equal to or greater than 530 GL and less than 760 GL**	• Increased use of existing desalination capacity • Water knowledge campaigns for awareness and action • Implement a voluntary demand reduction plan • Develop plans for demand reduction in the 'Act Now' zone
Minimise your water usage: water restrictions are possible.	**Act Now** **Equal to or greater than 45% and less than 60% TSS**	**Equal to or greater than 300 GL and less than 530 GL**	• Maximise use of existing desalination capacity • Water knowledge campaigns for action required • Implement demand reduction plan, including restrictions if necessary • Develop plan for 'Emergency' zone
Extreme water shortage: water restrictions to be applied.	**Critical Water Use Only** **Equal to or greater than 25% and less than 45%**	**Equal to or greater than 0 GL and less than 300 GL**	• Maximise use of existing desalination capacity • Water knowledge campaigns for action required • Implement demand reduction plan, including restrictions • Implement emergency supply options to meet restricted demand on an ongoing basis • Use of Sugarloaf (North-South) Pipeline if storage at 30% or below on 1 November

Figure 31: Water outlook zones

Optimising available sources of water

As demand growth and climate change place additional pressure on our water resources, we need to deliver as much value for our customers as possible from the water resources we can already access through the existing water supply system. In this way we aim to continue deliver water services to our customers at the lowest possible cost.

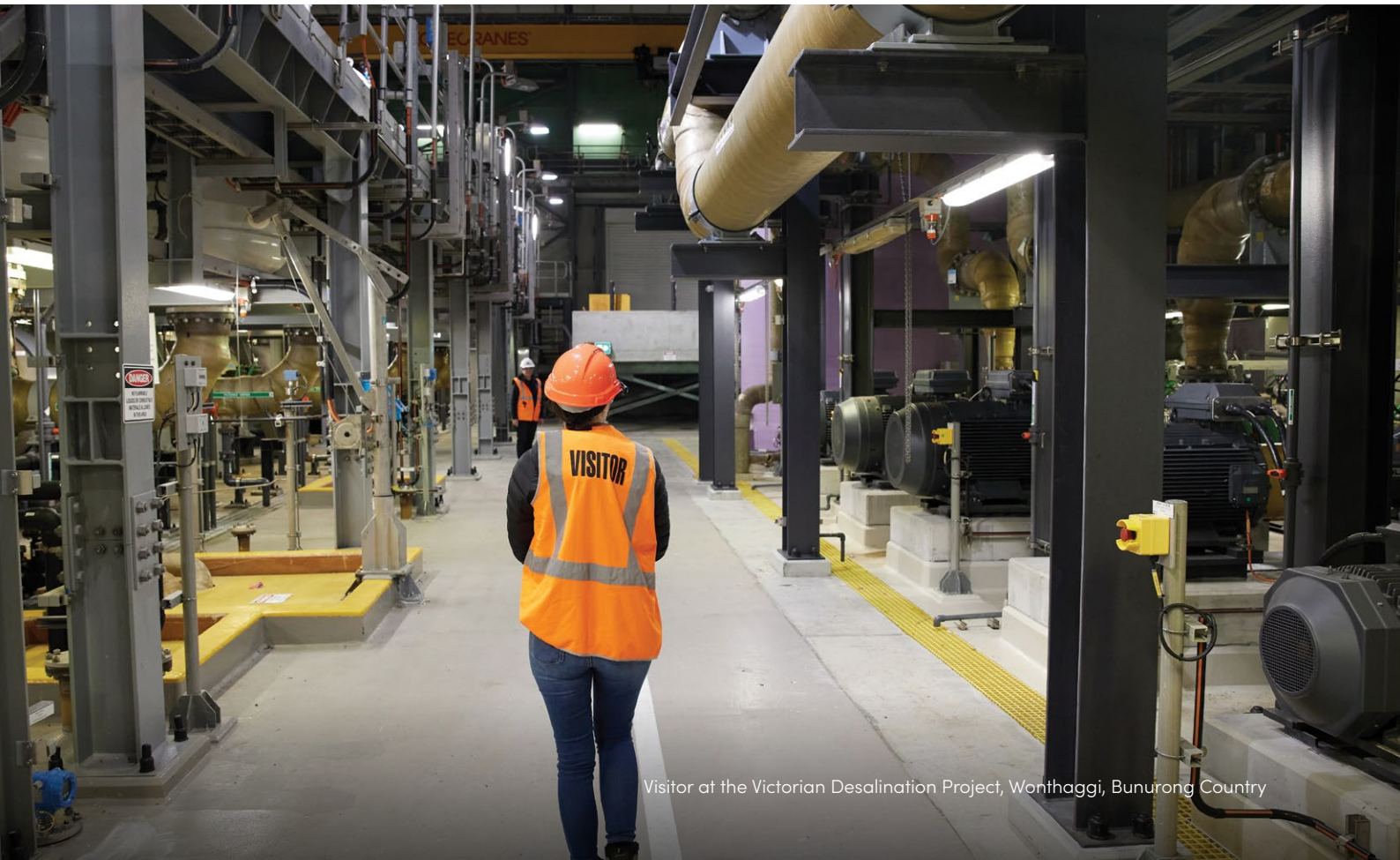


Community voice:
Optimising water usage from all sources was a key criterion set by the independent *Water for Life* Community Panel.

Value of water in storage

The water supply system is operated in a way that maintains a sufficient and cost-effective buffer of water in storage, to minimise the impacts of future severe droughts and avoid unnecessarily bringing forward an augmentation, as well as managing the impact of other extreme events, such as bushfires, on water sources. Diversifying available water sources also helps to manage this risk by using sources that are not reliant on rainfall, such as desalinated sea water.

Melbourne Water, Greater Western Water, South East Water, Yarra Valley Water and DELWP have partnered with the University of Melbourne to research innovative approaches to valuing the water held in storage. This has provided insights into how the economic value of water in the Greater Melbourne system changes as volumes in storage fall during droughts, informing the optimal use of all available water sources at any given point in time.



Visitor at the Victorian Desalination Project, Wonthaggi, Bunurong Country

Case Study: Supply system augmentation

Preparing the annual desalinated water order advice

Each year, Melbourne Water and the retail water corporations help to inform the Victorian Government's desalinated water order decision by providing technical and operational advice about the order volumes needed to maintain agreed levels of service to our customers.

In preparing the advice, we consider and balance the risks of storages falling to low levels with affordability, and the risk of our storages reaching capacity and spilling in wetter conditions.

As a result of population growth and our variable and changing climate, desalinated water has become a more critical component of our water supply, being used at near full supply in recent years.

Since 2017 up to May 2022, the Victorian Desalination Project has contributed around 450 GL to our water supplies. Our total storage volume would be around 25 per cent lower without this desalinated water production. This underlines the important role that desalination plays in keeping storages high. During 2021-22, the Victorian Desalination Project will deliver 125 GL of water.

Inside the Victorian Desalination Project, Wonthaggi, Bunurong Country

Action 4.6

What: Plan and operate the existing water supply system to maximise water availability and be prepared to manage supply emergencies and droughts.

Detail:

We will:

- manage the water supply system in accordance with the water outlook zone actions, to prepare for and be able to ensure an ongoing water supply during severe droughts and emergency events such as bushfires in our reservoir catchments
- determine a target level of storage that provides system resilience and optimises the value of higher volumes of water in storage
- invest in infrastructure replacements and upgrades which support optimising and maximising value from existing entitlements and water supply assets. This will take into account environmental, cultural, social (including recreation) and financial considerations. Initially, this will include reviewing options to fully utilise the existing Greater Yarra System Thomson River Pool entitlements by December 2022
- make optimal use of the Victorian Desalination Project to supply growing demand, as well as proactively provide a buffer to minimise the impact of the next drought. We will review the desalinated water order advice development process to make sure it is based on the latest available information, and delivers transparent advice that provides our customers, stakeholders and the community with certainty and confidence
- continue to reduce the risk of elevated turbidity to our water supply system caused by storms or bushfires in our forested catchments
- engage with the community to review delivery of clear and timely information about our water supply position
- ensure there is ongoing focus on development and review of the Water Security Framework to support future investment in diverse sources of water to align with Traditional Owner and community expectations.

Who: Melbourne Water, in collaboration with retail water corporations (GWW, SEW, YVW).

When: By December 2022 and ongoing.

Delivers on SDGs

Drought response

Having sufficient water in storage at the beginning of a drought is critical so there is enough water to provide adequate supply for the drought's duration.

Response actions to be implemented in the event of a severe drought are based on the drought framework and water outlook zones.

These emergency and contingency management response options will:

- ensure continued supply to minimise impacts of resource shortages caused by droughts and emergency events
- ensure the supply system meets critical demand needs at all times.

During droughts it is important to reduce water use. Even small reductions can benefit our water supply system, which relies on water in storage to maintain supply. Drought preparedness plans (Appendix C) allow us to take an adaptive management approach to water supply and guide the implementation of actions to reduce demand or increase supply as needed.

In Melbourne, the retail water corporations drought preparedness plans are consistent, and represent our collaborative approach to managing water security. These plans help us to continue to meet our level of service commitment to customers. This will be done though effective system operation, including use of the Victorian Desalination Project and providing information to the community about the water supply position and ways to reduce water use. The plans include the option of introducing mandatory water restrictions if and when other initiatives do not achieve desired water use reductions during drought periods.

Water restrictions

Severe water restrictions impact the liveability and economy of our city and region. If they are required, water restrictions are overseen by the Greater Melbourne and regional water corporations. Restrictions largely target outdoor water uses such as watering parks and gardens, refilling swimming pools, washing cars and other similar uses. Previous implementation of severe restrictions had an adverse effect on community sport and recreation, caused some industries to slow down or shut, and placed significant stress on the natural environment.

The anticipated impact of severe restrictions on the liveability of our city, and the potential broader associated economic impacts, are why we aim to avoid storages falling into the Critical Water Use Only zone. We do this through a range of planning and operational activities – these are detailed in the retail water corporations' drought preparedness plans (Appendix C).

Potential response to future droughts

Following the significant and sustained reductions in water use during the Millennium Drought, future water restrictions are not expected to deliver the same extent of water savings. During dry or extremely dry conditions our water storage levels can fall very quickly - faster than they did during the Millennium Drought. This is due to increased demand from a growing Melbourne population, as well as a number of efficiency measures being adopted by Melburnians. When water is already used efficiently, it becomes more difficult to find ways of using even less. Similarly, over the longer term, the ongoing urban densification of Greater Melbourne will lead to less external water use as gardens diminish in size, further reducing the effectiveness of water restrictions.

Early in the Millennium Drought it was estimated that severe water restrictions could potentially drive water consumption down by more than 25 per cent. Due to increased water use efficiency, current estimates suggest that:

- stage 1 or 2 water restrictions may drive water consumption down by 2 to 7 per cent
- stage 3 or 4 restrictions may drive water consumption down by 8 to 16 per cent.

Given the potentially limited reductions in water consumption, and the costs to and impacts on the community associated with restrictions, we will seek opportunities for the community to voluntarily reduce water use during times of drought prior to implementing restrictions.

The Victorian Desalination Project during droughts

Higher storages prior to the onset of a drought allow us to better maintain supplies during the drought. After a period of declining storages before 2018, higher desalination orders from 2018–2021 have contributed to their recovery from just above 60 per cent at the end of 2018 to around 90 per cent at the end of 2021.

Recent system performance modelling has shown that with current higher storage levels, the water supply system would be able to deliver sufficient water through a repeat of the Millennium Drought with support from the Victorian Desalination Project. However, storages would fall to lower levels, likely close to the Critical Water Use Only zone, requiring significant demand reduction measures, including the possibility of water restrictions. As demand grows into the future, even with the supply from the Victorian Desalination Project, the possibility of needing stage 3 or 4 restrictions will increase, especially if we experience a drought more severe than the Millennium Drought.

This further supports the outcomes of the supply-demand modelling, which suggests an additional manufactured water source will be needed in the short to medium term. This will enable us to minimise the impacts of a severe or extreme drought.

Dights Falls in Fairfield, Wurundjeri Woi Wurrung Country

4.5 How we decide

Augmentation decision process: investing at the right time

The Adaptive Plan (see Figure 28) needs to include decisions at discrete points to inform required planning and implementation of large-scale water supply system augmentations across Greater Melbourne. Experience over recent years has identified the need for a component in our broader Water Security Framework that can facilitate these decisions.

An augmentation decision process is a key component of the Water Security Framework, to inform decisions on system augmentations. A large system augmentation is a major infrastructure project. This can take a decade or more to deliver, with many years of planning required.

Given the uncertainty of the impact of climate change on system water yield, as well as the uncertainty of the impact of inter-annual climate variability on storages and supply, it is a challenge to determine when the planning and construction stages of an augmentation must commence. It is critical for new infrastructure to be built when required: too early and the costs would unnecessarily need to be carried by customers for longer than necessary; too late and customers may experience increased risk of water shortages, be exposed to severe water restrictions and end up paying more to fast-track an augmentation. The augmentation decision process needs to consider how Traditional Owner and environmental needs are met and delivers Greater Melbourne and connected regional water corporations a resilient system that is able to withstand shocks such as severe droughts, or events such as bushfires in our catchments, floods or storms that can impact on water quality and damage water supply infrastructure.

With all of the challenges that the water supply system faces we need to be preparing for augmentation. This means investing in readiness so that should an augmentation be required it can be delivered efficiently and in the shortest time possible.

Clear information and analysis that communicates the current water security risk will assist with the decisions and approvals required to invest in new supply infrastructure. Clear communication with stakeholders and customers would also assist water corporations with approvals and acceptance for new infrastructure investment.

We will develop an augmentation decision process (aligned to the Department of Treasury and Finance investment framework) to inform decision making through multiple stages of the implementation of an augmentation investment.

The decision process will be informed by a robust, risk-based approach that is underpinned by meeting levels of service for the community.

The process is informed by the key outcomes of adaptive planning and will follow these stages:

At a glance: augmentation decision making

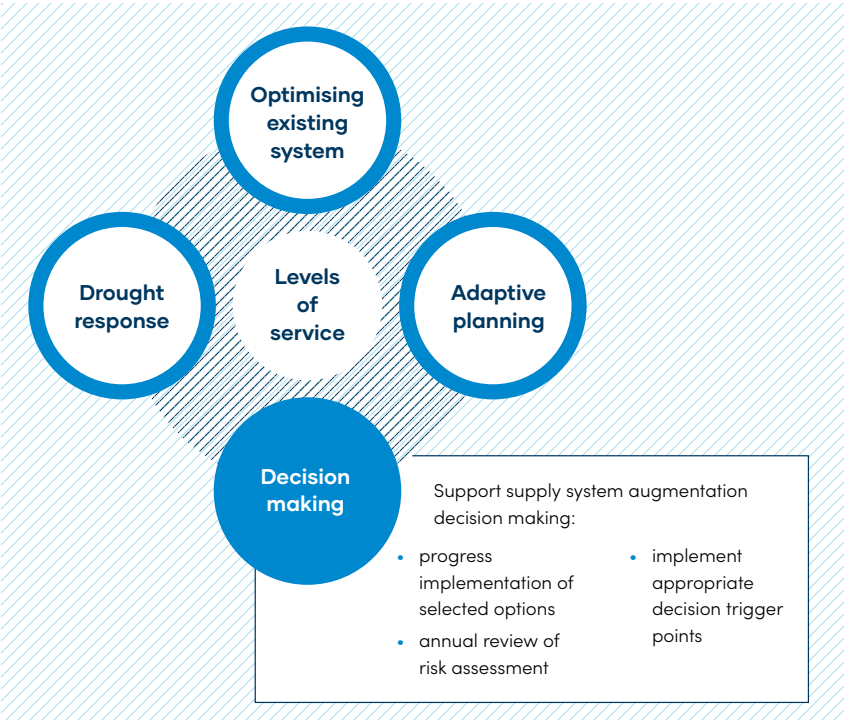


Figure 32: Augmentation decision process

- the 'readiness' stage: the initial planning work is done, which includes refining options, and conducting the concept and feasibility studies
- the 'selection' stage: preferred options available from the 'readiness' stage options are selected and then taken to detailed design
- the 'implementation' stage: the selected augmentation scheme is implemented.

In the future, all available options need to be considered so we can minimise costs and maximise the benefits of any new investment in water supplies. Ongoing and appropriate investment in IWM options and water efficiency measures needs to occur to manage our water supply needs and maintain affordability. The timing of a decision to invest in a new water supply will depend on the rate of growth in demand, impacts of climate change, costs and the time to implement an augmentation.

We work collaboratively with the Victorian Government to ensure that all major investment is aligned and meets the needs of all water corporations and their customers, as well as supporting the needs of Traditional Owners and the environment.

The Victorian Government is developing a Water Supply Plan for the CGRSWS to align statewide investment in water supplies. The augmentation decision process outlined in this draft strategy will help inform the Water Supply Plan in the CGRSWS.

Action 4.7

What: Further develop the proposed augmentation decision-making process within the *Water for Life* Water Security Framework.

Detail: To ensure there is ongoing focus on development and review of the Water Security Framework we will:

- continue to develop and review the Water Security Framework and supply system augmentation decision-making process
- monitor and review supply system augmentation needs and ensure alignment with level of service expectations and needs
- engage with the community on clear communication of our water security position.

Who: Greater Melbourne water corporations (GWW, MW, SEW, YVW)in collaboration with government.

When: By December 2023.

Delivers on SDGs

Traditional Owner perspective: An understanding of the true value of water needs to be developed and outcomes of quadruple-bottom-line taken forward in strategy implementation decision making.

Action 4.8

What: Continue to develop and utilise consistent project assessment and investment frameworks, aligned to the quadruple-bottom-line.

Detail: To support future investment in diverse sources of water to align with Traditional Owner, environmental and community expectations we will continue to build upon existing investment frameworks to enable best practice decision making. This will support water resource decision making that recognises and quantifies all benefits and impacts delivered by diverse sources of water and enables shared delivery and funding models.

Who: Greater Melbourne water corporations (GWW, MW, SEW, YVW) in collaboration with government.

When: By December 2023.

Delivers on SDGs

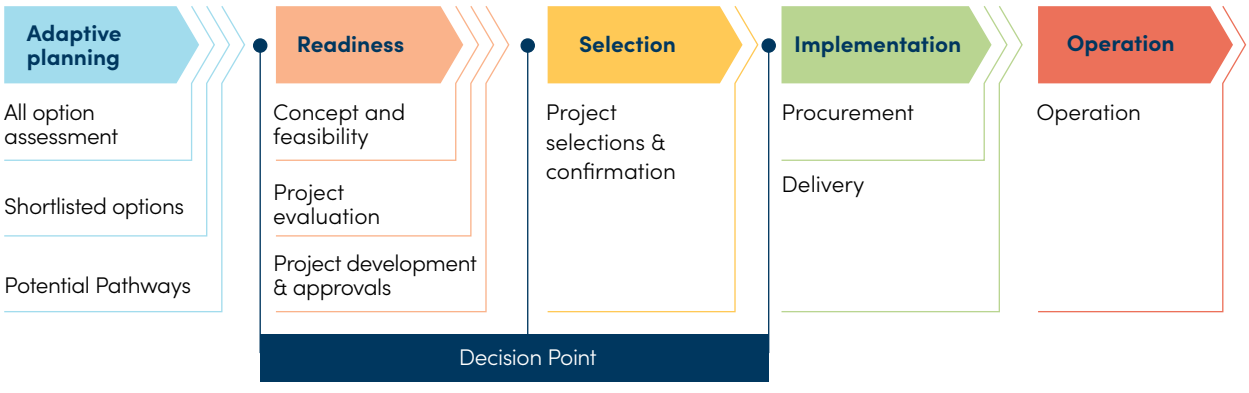


Figure 33: Augmentation decision framework

5 Equitably and Affordably Meeting Diverse Water Needs

Chapter overview

Water is critical to every single business and household in our economy, and we need to adapt the way we source and use our water to best manage the challenges we face. Together, the community and the Greater Melbourne water corporations have a key role in supporting the economy and a prosperous future for Victorians.

To ensure our water security, it is necessary to transition to more climate resilient, manufactured water within the next 10 years. This transition will require significant investment and strong stewardship to make the complex and long-term decisions required to implement what is a transformative change from where we are today.

The Melbourne system can supply water to more than 75 per cent of Victoria's population in Greater Melbourne and surrounding regions, including to urban, irrigation and environmental customers. We need to ensure balance across the different cultural, household, agricultural and environmental water needs of our customers and communities. This includes providing adequate water to the environment to maintain waterway health and for the preservation and protection of Traditional Owner values.

Ensuring a balance between water users is critical to keeping water affordable and accessible. As water corporations, we have a responsibility in maintaining a reliable, high-quality and affordable water supply for Greater Melbourne's many water demands and values.

Key strategy actions	Secure & sustainable water supply	Equitably & affordably meeting diverse water needs	Ensuring healthy people & healthy environment	Meaningful partnerships, engagement & education
5.1 Invest in and develop appropriate digital support for water efficiency programs.	✓	✓		✓
5.2 Partner with large water use customers to tailor and optimise water efficiency programs to meet their needs.	✓	✓		✓
5.3 Continue to deliver the Schools Water Efficiency Program to more schools across Greater Melbourne.	✓	✓		✓
5.4 Deliver initiatives for effective management of non-revenue water and manage water losses.	✓	✓		✓
5.5 Support the discussion draft CGRSWS to return water to Traditional Owners and the environment.	✓	✓	✓	✓
5.6 Explore opportunities to support Traditional Owner and environmental values via the annual operating planning processes for the Melbourne water supply system.	✓	✓	✓	✓
5.7 Work with Traditional Owners to identify how future generations of Traditional Owners' access to water can be made resilient to drought.	✓	✓	✓	✓
5.8 Ensure fair access to water for vulnerable customers by continuing to deliver support programs and managing bill impacts.		✓		✓

5.1 Greater Melbourne's diverse water needs

We recognise the importance of meeting the demand for water not only for Melbourne's growing urban need but also for cultural and spiritual values.

In addition to providing consumptive water to urban areas in Greater Melbourne and surrounding areas, water system management needs to consider:

- Traditional Owner cultural values provided by environmental flows and Traditional Owner self-determined use of water as essential components of healthy Country and the health and wellbeing of Aboriginal people
- environmental and ecological values provided by environmental flows, both in-stream and riparian
- agricultural values provided by a resilient water supply and subsequent value to businesses and communities
- recreational values provided by waterways and lakes
- other cultural, liveability and wellbeing values provided by water and waterways in our communities' local environments.

This draft strategy recognises the importance of meeting the needs and requirements of all water users. In addition to a key focus on maintaining overall water security for the future, the draft strategy also places significant importance on ensuring that the various needs of water users can be fairly and equitably met into the future.

Balancing all needs requires consideration of how we can support the Victorian Government to address current inequities such as inadequate Traditional Owner water access while also remedying deficits in environmental water within our existing supply availability. For example, the many demands on our water supplies can be reduced with increased use of stormwater, rainwater and recycled water sources as well as supporting the community to use water more efficiently, collectively freeing up water for non-consumptive uses such as irrigation. We also need to consider opportunities to restore an appropriate balance in allocation between users and uses as future supply augmentations are planned and implemented.

The draft strategy approach outlined in Chapter 4 and its supporting Adaptive Plan (Figure 28) provide a robust base for managing the overall supply-demand balance, on which the approach outlined in this chapter can be built to ensure fair and equitable access to water for all in the short, medium and longer term.

Urban water demand

How much water we use

Urban water use in Greater Melbourne has decreased significantly since the early 2000s. Despite Melbourne growing by more than one million people we are now using less water in total due to major reductions in the average person's water use, which is more than 35 per cent lower than it was in 2001 (see Figure 35).

What we use water for

Greater Melbourne's urban water demand comprises residential, non-residential and non-revenue water (water that enters the network but is not delivered to customers). Non-residential water use includes water used by industrial and commercial businesses, government and local councils. Home and garden use is the largest urban water demand, with 68 per cent of water being used by residential customers. Within the home most water is used in the shower, toilet or washing machine.

Our growing region

Population growth is a key driver of the future demand for water. To understand this we have used the population projections outlined in Victoria in Future 2019 and considered higher and lower population growth scenarios (DELWP, 2019). The Greater Melbourne water corporations have also considered the possible impact of COVID-19 on these projections. All planning and investment will consider updated projections as they become available.

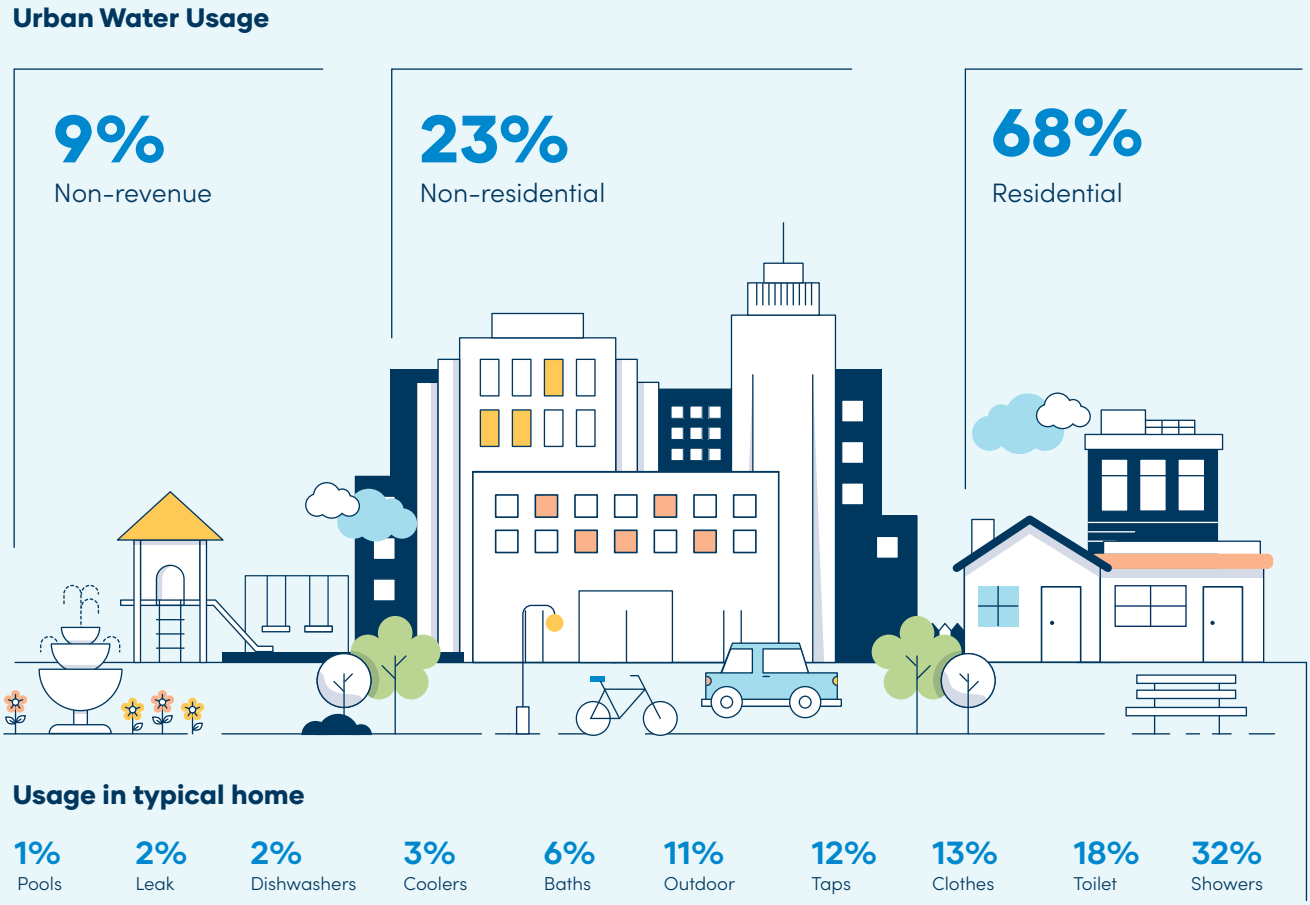


Figure 34: Greater Melbourne water usage breakdown (2019/20)

Upper Yarra Reservoir, Wurundjeri Woi Wurrung Country

Urban greenery

High-quality urban greenery, whether it be open space or trees, is an important part of Melbourne's liveability. It provides numerous benefits such as a cooler urban environment, enhanced biodiversity, areas for exercise or a place for people to connect with nature and each other.

Adequate water is essential for high-quality urban greenery. The amount of water vegetation needs to be healthy is often more than it can access through rainfall and groundwater, so irrigation is used to provide supplementary water. Requirements for irrigation in Greater Melbourne are likely to increase in the future with new open spaces as the city expands, and through efforts to increase green spaces in existing areas.

Climate change

Climate change will affect the demand for water from the Melbourne water system.

Just as Melbourne's surface water supplies are likely to diminish due to climate change, so will local water resources of other regions. They will require more water from the broader water grid, including the Melbourne water system.

Another factor is how we maintain high-quality urban greenery in a warmer and drier climate. While some of this can be managed through the selection of appropriate plant species, it is anticipated that in order to keep vegetation as healthy as it is today more irrigation will be needed.

Case Study: Water Efficiency

Metering goes digital

South East Water, Greater Western Water and Yarra Valley Water are working together to explore the benefits of upgrading existing water meters to digital meters. The program includes customer research and engagement in addition to rigorous testing of new technologies and ways of working. The meters take readings every 30 minutes, so customers can see their hourly, daily, weekly and monthly water use.

The early results are promising, revealing the following key benefits:

- greater customer awareness leading to improved water efficiency which will ultimately result in reduced bills
- household leak identification
- water system leak detection
- increased detail and data on asset condition and performance, helping inform our maintenance planning.

5.2 Key elements in equitably meeting our diverse water needs

Affordability

The cost of water services is paid for by water users, primarily through water bills. Keeping bills affordable and avoiding large increases in a single year is critical in meeting community expectations.

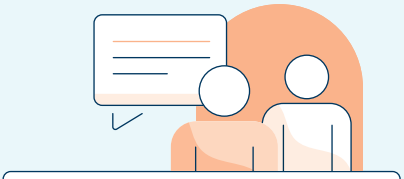
It will be necessary to balance affordability considerations with meeting levels of service and delivering other outcomes the community wants and needs from the water supply system.

As outlined in the *Water for Life* 50-year Adaptive Plan (see Figure 28), specifically the supply system augmentation portfolio, significant wholesale investment will be required in the next 10 years to ensure water is delivered at the lowest cost to the community where and when it is needed. We need to start the work early, as large-scale wholesale investments such as augmentations take time to plan and build.

Water bills in Greater Melbourne are, on average, lower than any other capital city in Australia.

Affordability is central to how we provide our customer services and plan for the provision of water into the future. As outlined in Chapter 1, each water corporation's prices are determined by a price submission proposal for the Essential Services Commission every five years. This ensures that water corporation investments are efficient and prudent.

So that water bills remain affordable, we need to ensure that our existing water resources are sourced and managed as effectively as possible, that we use water as efficiently as possible and that when new sources are required the right investment is made at the time they are needed.



Community voice: Keeping water affordable for all consumers was a key criterion set by the independent *Water for Life* Community Panel.

Water efficiency

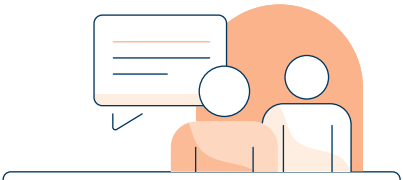
Using water efficiently means using less water while maintaining the liveability outcomes that customers and our community expect.

For a residential household, using water more efficiently could mean:

- fixing leaks or dripping taps
- planting drought tolerant grass and using mulch on gardens.
- installing a water-efficient showerhead
- buying an efficient appliance next time a washing machine or dishwasher is replaced
- shortening time spent in the shower by one minute.

Changes over the past 20 years have been supported by initiatives such as the Water Efficiency Labelling and Standards (WELS) scheme which requires certain products to be registered and labelled with their water efficiency and given a star rating. WELS also introduced minimum water efficiency standards for products such as toilets, with further products included through the National Construction Code. A learning from the Millennium Drought indicated the sense of having permanent water use rules in place at all times to ensure drinking water is used wisely.

With the continued uptake of water-efficient appliances, fixtures and fittings we expect that Greater Melbourne will continue to use water more efficiently over time. This increasing efficiency is a key component of our plan to adapt to a future with less water and has been considered in how we forecast demand. The historical and forecast changes in urban water usage is shown in Figure 35. Opportunities exist for water to be used more efficiently than is forecast and will form the basis of our joint Water Efficiency Plan.



Community voice: Using water efficiently was a key criterion set by the independent *Water for Life* Community Panel.

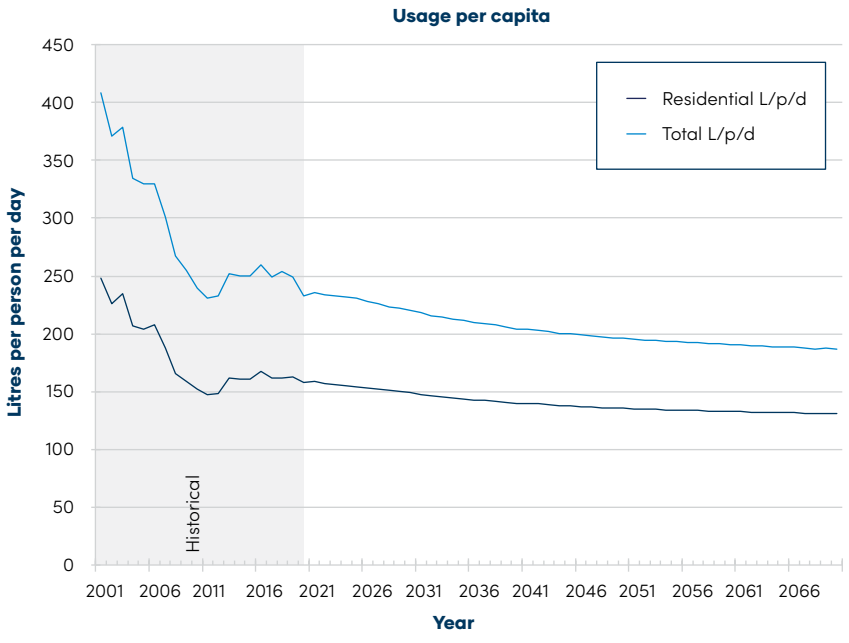


Figure 35: Historical and forecast usage per capita for metropolitan Melbourne

Permanent water use rules

Permanent water use rules are simple, common sense actions about the way we use water. They apply at all times and include actions such as:

- a residential or commercial garden or lawn can be watered with a hand-held hose with a trigger nozzle, a bucket or a watering can at any time
- watering systems can only be used between 6pm and 10am, and must be fitted with a rain or soil moisture sensor if used to water public gardens, lawns and playing spaces
- in general, water cannot be used to clean hard surfaces, including driveways, paths, concrete, tiles and timber decking
- water cannot be used in a fountain or water feature, unless it is recirculated.

Role of water efficiency in maintaining affordability

Using less water has many benefits including reducing the amount of water we need to take from rivers or desalinate, and reducing the amount of sewage that needs to be treated. This has flow on benefits to the sewerage system by deferring or avoiding network and treatment upgrades, and helps maintain the health of our waterways and bay by reducing the amount of treated sewage discharged to the environment (see Figure 16). These benefits can include deferring or avoiding sewerage network and treatment upgrades, and helping maintain the health of our waterways and bay by reducing the volumes we need to discharge.

Reducing our water usage can also significantly reduce the amount of energy that is used in households or businesses.

Energy is used to:

- desalinate or treat water
- pump it to homes and businesses
- heat water in homes and businesses
- pump and treat sewage.

Total emissions generated by Victorians through their hot water use is much higher than the emissions generated by the water sector to deliver and treat water (DELWP, 2021).

So, saving water can save households on electricity or gas bills as well as water and sewerage charges. While it will depend on personal circumstances, it is estimated that changing to a 4-star water-efficient showerhead can save a two-person household at least $160 annually on household energy and water bills (Watson, 2020).

Water efficiency can:

- reduce household and business energy use
- reduce the amount of water that needs to be sourced from the Victorian Desalination Project
- defer investing in an augmentation, such as another desalination plant
- reduce the volume of sewage that needs to be treated.

All of these result in lower costs to customers and will inform our considerations in investing in water efficiency.

Role of water efficiency in supporting our Adaptive Plan

Continuing to improve water efficiency is a key component of the *Water for Life* 50-year Adaptive Plan. Some of the most cost-effective ways this can be done is through national and state regulations and schemes such as WELS or the National Construction Code. These ensure that new buildings, renovations or new appliances meet minimum standards.

There are further opportunities for achieving water efficiency by replacing existing inefficient appliances or changing the water-use behaviours of residential customers, businesses, industry and government.

Our customers support using water wisely, and understand the need to save water for the future and minimise our impact on the environment. They expect water corporations to conduct educational and behaviour change campaigns before implementing any water restrictions or augmentations. They also expect that corporations should be saving water where possible.

With new technology, such as digital metering or automated alerts, there will be new ways for customers to understand and manage their water use. Water corporations are currently considering water efficiency improvements through a variety of measures. Our proposed joint business Water Efficiency Plan, as detailed in Action 4.1, will further develop the actions we are taking to enable uptake of water-efficient appliances, behaviour change programs and other ways to reduce water consumption. Key programs under consideration will include showerhead exchanges, in-home audits, rebates, digital metering and behaviour change engagement.

Industrial, commercial and government customers are large water users and, in some cases, present significant opportunities to achieve greater levels of water efficiency. Partnerships with these organisations will enable uptake of water efficiency and tailored interventions to meet their needs. These interventions could enable these organisations to use water more efficiently or, in some instances, to use fit-for-purpose water such as recycled water, rainwater or stormwater.

Action 5.1

What: Maintain an ongoing focus and commitment to investing in and developing appropriate digital and technological support for implementing water efficiency programs. Install digital meters where business cases demonstrate value to our communities.

Detail: We will continue trialling digital meters to help customers understand their water usage, and identify and fix leaks to save money and water.

Who: Retail water corporations (GWW, SEW, YVW) in collaboration with the wholesaler, Melbourne Water.

When: Ongoing.

Delivers on SDGs

Yarra Valley Water is trialling a project to give away 1,000 water-efficient showerheads to better understand consumer perceptions and behaviours around use of these products. The giveaway, distributed largely through a social media campaign, proved popular with customers. Feedback from recipients will inform the potential rollout of future programs.

Action 5.2

What: Investigate opportunities to partner with large water users to ensure water is used as efficiently as possible, and tailor efficiency programs to meet the needs of business and government customers.

Detail: Develop specific business and government programs, and enable best practice water use for industrial production, commercial use and open space watering where businesses cases demonstrate value to the broader community.

Who: Retail water corporations (GWW, SEW, YVW) in collaboration with the wholesaler, Melbourne Water.

When: Ongoing.

Delivers on SDGs

Case Study: Water Efficiency

Schools Water Efficiency Program

The Schools Water Efficiency Program (SWEP) allows facility managers, teachers and students access to up-to-date water consumption information through a user-friendly interactive platform. Complementing the platform, participating schools will receive access to a tailored curriculum program which incorporates the school's water data in mathematics and sciences as well as providing students with robust water-saving messages which they can apply at home.

Over 800 schools across Melbourne have now participated in the program helping them identify leaks, faulty appliances and inefficient practices. This has saved over 600 million litres of water and $2.66 million in 2020–21. Overall, SWEP schools have saved 9.9 billion litres since program inception in 2012 at a cost of $31.5 million.

SWEP is funded by the DELWP and the Department of Education and Training.

Action 5.3

What: Continue to deliver the Schools Water Efficiency Program to more schools in Greater Melbourne.

Detail: Enable more schools to use water wisely, to identify and address leaks to minimise bills and enhance community water knowledge through the school curriculum.

Who: Retail water corporations (GWW, SEW, YVW) in collaboration with the wholesaler, Melbourne Water.

When: Ongoing.

Delivers on SDGs

Minimising water losses

Approximately 10 per cent of the water that enters the network is not delivered to customers, with these losses categorised as non-revenue water. Some of this water provides value to society, such as when it is used for firefighting, but much of it is attributable to system leakage or losses from pipe bursts.

Water corporations have actively invested in programs to reduce water losses over many years, with the total volume of non-revenue water now consistently lower than it was in the early 2000s, despite the water network's significant expansion and age. We perform well against international standards but recognise the importance of doing more.

In addition to our programs to assist the community use water more efficiently, we will focus on ensuring our network delivers water safely and effectively to minimise any losses supported by:

- asset maintenance and renewals programs
- active leak detection
- increased real-time network monitoring, such as digital metering.

Action 5.4

What: Deliver initiatives for effective management of non-revenue water and manage water losses to an economic level taking into account the broader social and environmental costs and benefits.

Detail: Managing water losses as a key component of the overall water efficiency program. This includes ongoing delivery of leak detection programs, drainage monitoring and trialling intelligent network technologies.

Who: Retail water corporations (GWW, SEW, YVW) in collaboration with the wholesaler, Melbourne Water.

When: Ongoing.

Delivers on SDGs

5.3 Access to water

Supporting Traditional Owner water access

The rights to water across Australia were never ceded by Traditional Owners. Under existing legislation, Traditional Owners have a right to water. The discussion draft CGRSWS sets the pathway for how these rights will be reinstated. The Traditional Owners we work with have reinforced this as a priority.

Traditional Owner perspective: Traditional Owner access to water is essential. It allows Traditional Owners to care for Country, protect their physical and spiritual health and is also an important element of economic development.

There are a number of potential pathways to water access for Traditional Owners (see Figure 36) which have varying existing barriers to realisation:

- water can be returned to Traditional Owners under water substitution arrangements
- water can be returned to Traditional Owners via transfer or trade on a temporary or permanent basis.

Water corporations can play an important role in supporting some of these pathways for Traditional Owner access to water and can also support the removal of barriers for Traditional Owners to use existing rights.

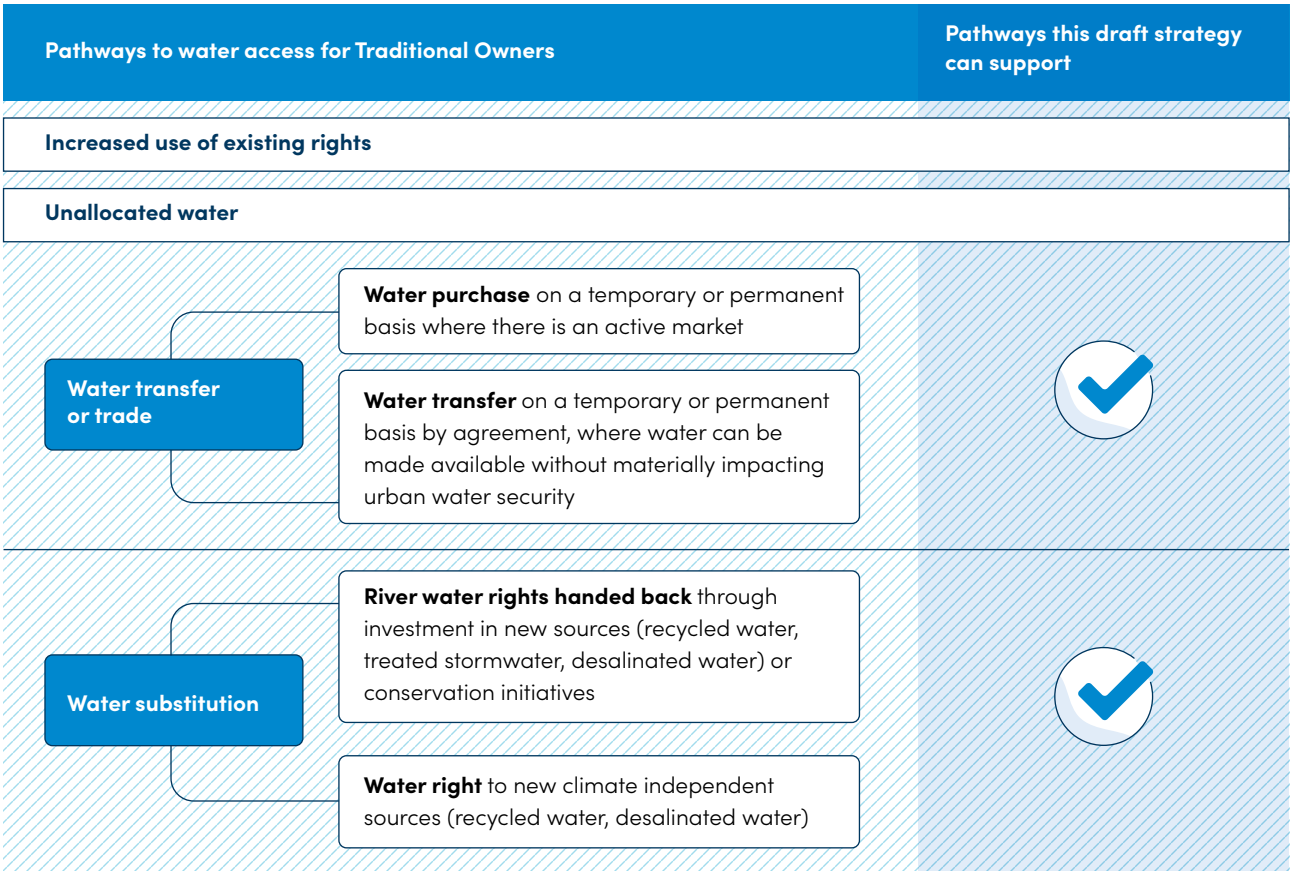


Figure 36: Pathways to water access for Traditional Owners (O'Donnell, 2021)

Water return through substitution

The discussion draft CGRSWS proposes to return water to Traditional Owners under water substitution arrangements. It states that:

- as new water sources are built (such as recycled water systems and desalination plants), Traditional Owners will have access to a share of these new supplies, directly or via substitution for river water
- water substitution arrangements that free up water in rivers for Traditional Owners should be pursued in water systems on the Country of each Traditional Owner.

This draft strategy is committed to supporting new sources. We aim to work in partnership with DELWP to support the realisation of this directive, recognising that while these activities are broader than the remit of the draft strategy, we play a pivotal and enabling role in supporting the delivery of these objectives.

Under these water substitution arrangements, investment in new major sources of water will be required to see significant broad-scale water return to Traditional Owners. Water corporations will also work to support the return of water to Traditional Owners in the near term via place-based initiatives such as IWM (see Chapter 6) and through water conservation initiatives. This draft strategy is committed to working in partnership with Traditional Owners to identify shared on-Country opportunities.

Supporting the removal of barriers to Traditional Owners' use of existing rights

The discussion draft CGRSWS seeks to remove barriers that currently constrain how Traditional Owners can hold and use water rights. The water laws in Victoria are consumptive-based and they disconnect water from Country. This presents challenges for Traditional Owners with using water even when they hold entitlements.

The section 51 license water right is one such example. A section 51 license provides the right for the holder to take water (from groundwater or a water body) within the bounds of the conditions of the license. These licenses are predicated on access to the land where the water will be used. Not all Traditional Owners have land, resulting in limited use of this licensing mechanism.

As water and asset managers, water corporations are also land managers. The draft *Water for Life* strategy can support the removal of barriers to Traditional Owners using water under the conditions of a section 51 license. We will do this by working in partnership with Traditional Owners to identify opportunities where a land access agreement could be entered into to support their use of water under a section 51 license.

Action 5.5

What: Support the discussion draft CGRSWS to return water to Traditional Owners and the environment.

Detail: We will:

- consider water return to Traditional Owners and the environment through planning processes, such as the Adaptive Plan, and their requirements when planning supply augmentations
- support DELWP's associated work to establish funding arrangements
- investigate opportunities for recycled water, stormwater and demand reduction initiatives to support water return to Traditional Owners and the environment, informing DELWP's work to establish appropriate funding arrangements
- support the business case for recycled water substitution project(s) in the Werribee and Bacchus Marsh irrigation districts so Traditional Owners receive a portion of water saved and inform DELWP's work to establish funding arrangements
- explore opportunities to support section 51 (of the *Water Act 1989*) license through land access agreements.

Who: Greater Melbourne water corporations (GWW, MW, SEW, YVW) in partnership with government and Traditional Owner Groups.

When: Ongoing.

Delivers on SDGs

Water return via transfer

Under water substitution arrangements outlined in the discussion draft CGRSWS, investment in new sources of water will be required to see significant broad-scale water return to Traditional Owners. For the Greater Melbourne water supply system, new water supply sources are not expected to be operating within the next five years. Given the importance of Traditional Owner access to water, near-term opportunities to support this will be explored through the implementation of this draft strategy.

The Greater Melbourne water supply system comprises largely of entitlements held in the Greater Yarra-Thomson system and the Victorian Desalination Project. There are also entitlements held in the northern system for the express purpose of use as a drought response measure.

The Greater Melbourne water corporations undertake annual water planning and review processes to ensure there is sufficient water through these entitlements to meet customer servicing needs for the forthcoming year and to maximise water in storage to maintain customer servicing needs in the event of dry conditions. Opportunities to provide water to Traditional Owners and the environment, while not impacting urban water security, could potentially be identified and realised opportunistically through these planning and review processes.

The feasibility of the potential opportunities, and associated access options, will need to be investigated in partnership with interested Traditional Owners, VEWH and DELWP, before they can be trialled. It should be noted that each time the water supply system nears the need for a new water supply source, these potential opportunities will diminish as available water is increasingly required to meet urban water security needs.

In Victoria, the process of returning water to Traditional Owners has begun with the discussion draft Central Region Gippsland Sustainable Water Strategy (CRGSWS). It sets out proposed directions to support the objectives of Traditional Owners in relation to water, including restoration of water rights. The role of this draft strategy is to support the delivery of these actions and to work with Traditional Owners in support of their relevant objectives.

Action 5.6

What: Explore opportunities to support Traditional Owner and environmental values via the annual operating planning processes for the Melbourne water supply system.

Detail: Support the discussion draft CGRSWS to return water to Traditional Owners and the environment.

Who: Greater Melbourne water corporations (GWW, MW, SEW, YVW) in partnership with government and relevant Traditional Owner groups.

When: Ongoing.

Delivers on SDGs

Equitable access

Managing investment impacts

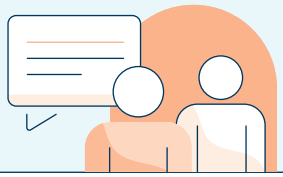
The number of water customers who are financially vulnerable or experiencing hardship is increasing. As essential service providers, water corporations have a range of programs and processes in place to support these customers.

To ensure securing water for our communities' needs does not drive greater financial hardship or vulnerability, it is imperative that we plan ahead to avoid reactive water system augmentation measures that may prevent us from providing the service the community expects, and can result in significant increases in bills for consumers. Investments in climate resilient, manufactured water need to balance water security with cost to customers. While water customer bills are expected to increase over the medium to long term, staged and carefully planned increases in water supplies will lead to efficient investment that should minimise bill increases.

Additionally, customers need to be supported to make further savings on water where possible. Some measures to achieve this include expanded water-efficiency programs and digital metering, which empowers customers to know how much water they are using and alerts them to potential leaks that can result in higher bills. However, we know that any increase in water bills will require an increase in support for vulnerable customers.

Future generations

We all have a role to play in ensuring that our region uses water efficiently and sustainably, to provide access to water for generations to come, including future generations of Traditional Owners. Future generations will only have equitable access to water if we put plans in place now for water security and the growth of our water supplies.



Community voice:
Water access and affordability was a key criterion set by the independent *Water for Life* Community Panel

Action 5.7

What: Work with Traditional Owners to identify how future generations of Traditional Owners' access to water can be made resilient to drought.

Detail: To support security of Traditional Owners' access to water in the future in the face of climatic uncertainty.

Who: Greater Melbourne water corporations (GWW, MW, SEW, YVW) in partnership with Traditional Owner groups and government.

When: Ongoing.

Delivers on SDGs

Action 5.8

What: Ensure fair access to water for vulnerable customers by continuing to deliver support programs and managing bill impacts.

Detail: Support customers who are financially vulnerable or experiencing hardship. Business cases for all options and programs to be implemented will include consideration for minimising bill impacts on customers and identifying options for managing bill impacts on vulnerable customers.

Who: Retail water corporations (GWW, SEW, YVW) in collaboration with the wholesaler, Melbourne Water.

When: Ongoing.

Delivers on SDGs

6 Healthy People, Healthy Environment

Chapter overview

With less water flowing into rivers, and less water captured in our water storages and dams, we need to make the best use of all water sources and align each source with the best fit-for-purpose use. As we seek to use a broader range of diverse water sources, including a transition to more manufactured water, an IWM approach is key to ensuring we can preserve the liveability of our cities, while also protecting the environment.

A liveable city provides for the critical social, environmental and economic needs of its people, while also addressing community values and preferences for liveabilty, wellbeing and a sense of place.

Water plays an important role in the health of our communities and our environment – it creates greener and cooler neighbourhoods; fosters recreation and connection with nature; supports industry, business and agricultural production; is vital for cultural values and traditions; and supports our ecosystems and wildlife.

Despite this, the true value of water and the many benefits it provides are often taken for granted until they are compromised, or we have to live without them. Consider the benefits of being able to easily visit a local park for a walk or shaded picnic, to kayak across a lake or to go wildlife watching at a nearby reserve.

Climate change and population growth will continue to increase pressure on future water availability for our environmental needs as well as the liveability, amenity and wellbeing of our communities.

By better utilising rainwater, stormwater runoff and recycled water, we can deliver a range of other outcomes across the water cycle that not only contribute to our secure water future, but also provide additional benefits for our communities.

IWM is the key to considering all aspects of the water cycle to support sustainable communities, protect waterways, reduce adverse effects of climate change and support cultural values for Traditional Owners.

Key strategy actions	Secure & sustainable water supply	Equitably & affordably meeting diverse water needs	Ensuring healthy people & healthy environment	Meaningful partnerships, engagement & education
6.1 Deliver environmental flow targets to ensure ongoing waterway resilience.	✓		✓	
6.2 Lead system scale stormwater management by planning for, investment in and management of large-scale stormwater projects.	✓	✓	✓	✓
6.3 Deliver collaborative place-based water management solutions with Traditional Owners and the community.	✓	✓	✓	✓
6.4 Optimise cultural, social and recreational uses and values of land and waterways to achieve multiple community and Traditional Owner benefits.	✓	✓	✓	✓
6.5 Investigate the whole of life cycle performance of rainwater and stormwater harvesting assets, and how to increase their effectiveness, affordability and compliance.	✓	✓	✓	✓
6.6 Investigate stormwater and recycled water options for irrigation customers and unlock supplies to other users in growth areas and on the peri-urban fringe.	✓	✓	✓	

6.1 The importance of taking an integrated water management approach

An IWM approach is a key component of our Water Security Framework (see Chapter 4). By expanding our portfolio of water resources to include rainwater tanks, stormwater harvesting, fit-for-purpose recycled water and exploring aquifer storage and recovery opportunities, we increase the resilience and security of our water supplies, providing fit-for-purpose water to support a thriving environment for all to enjoy.

By working with Traditional Owners, communities, businesses and local government, we can better understand local water needs and how a more diverse portfolio of water supplies could support current and emerging needs.

These **'new needs'** include:

- additional environmental water to support waterway health and regeneration of natural environments
- cultural water to support Traditional Owner needs and values
- enhancing or expanding agricultural areas
- irrigating more public open space, including 'passive' areas such as parks and gardens which have become increasingly important during COVID-19 lockdowns, and 'active' spaces such as sports grounds
- irrigating trees which provide valuable canopy in streets and public spaces to mitigate the effects of a warmer climate and support biodiversity.

An IWM approach provides opportunities to maintain and improve water regimes in rivers, estuaries and wetlands, and can support the protection of cultural heritage and regional economic values such as productive land for agriculture, recreation and tourism.

There are many opportunities to harness different types of water to achieve great outcomes for our region. The **types of IWM opportunities** vary with location and context, and include:

- installing rainwater tanks in new homes, particularly in established areas and major development areas without access to a recycled water supply
- expanding recycled water supplies to agricultural areas
- supporting irrigation of public open space and street trees with recycled water and stormwater
- expanding 'third pipe' recycled water networks to major greenfield growth areas, and key activity centres and redevelopment sites in the region.

Managing all sources of water for best use is a cornerstone objective of an IWM approach. By better utilising rainwater, stormwater runoff and recycled water, we can deliver a range of other outcomes across the water cycle that not only contributes to our secure water future but provides additional benefits.

Strengthening our agriculture sector with recycled water

Did you know Melbourne's local food bowl currently supplies 41 per cent of the region's food needs? Agriculture plays a vital role in the region's economy and conventionally has drawn on river water and groundwater supplies to support production. These supplies are limited and often decreasing with competing demands and a changing climate. There are many opportunities to reduce the demand on our resources by extending recycled water networks to agricultural users and expanding production while embedding resilience in the local agricultural sector.

Victoria's IWM forums, as shown in Figure 37, have worked together to detail the **benefits and outcomes of an IWM approach, and are detailed in Table 3.**

Progressing our understanding of priorities at a range of scales (local, regional or catchment wide) will help to provide focus and direction to the most strategic and impactful interventions. During the development of this draft strategy, a detailed review of opportunities showed that **targets set in the catchment scale IWM plans can be achieved** with options that have already been identified, and these can deliver significant long-term benefits to water security for the region.

Integrated Water Management Solutions

IWM in Victoria

The IWM framework for Victoria aims to help government, the water sector and the community work together to better plan, manage and deliver water in Victoria's towns and cities.

Victoria's IWM forums have been established to identify, prioritise and oversee the implementation of collaborative water opportunities. These forums bring together all organisations with an interest in the water cycle, recognising that each has an important role to play in the management of our most vital resource.

The Metropolitan Melbourne Integrated Water Management Forum boundaries are aligned with the five major waterway catchment boundaries within the Port Phillip and Westernport catchment. The forums have developed catchment scale IWM plans to guide future water management to deliver multiple benefits.

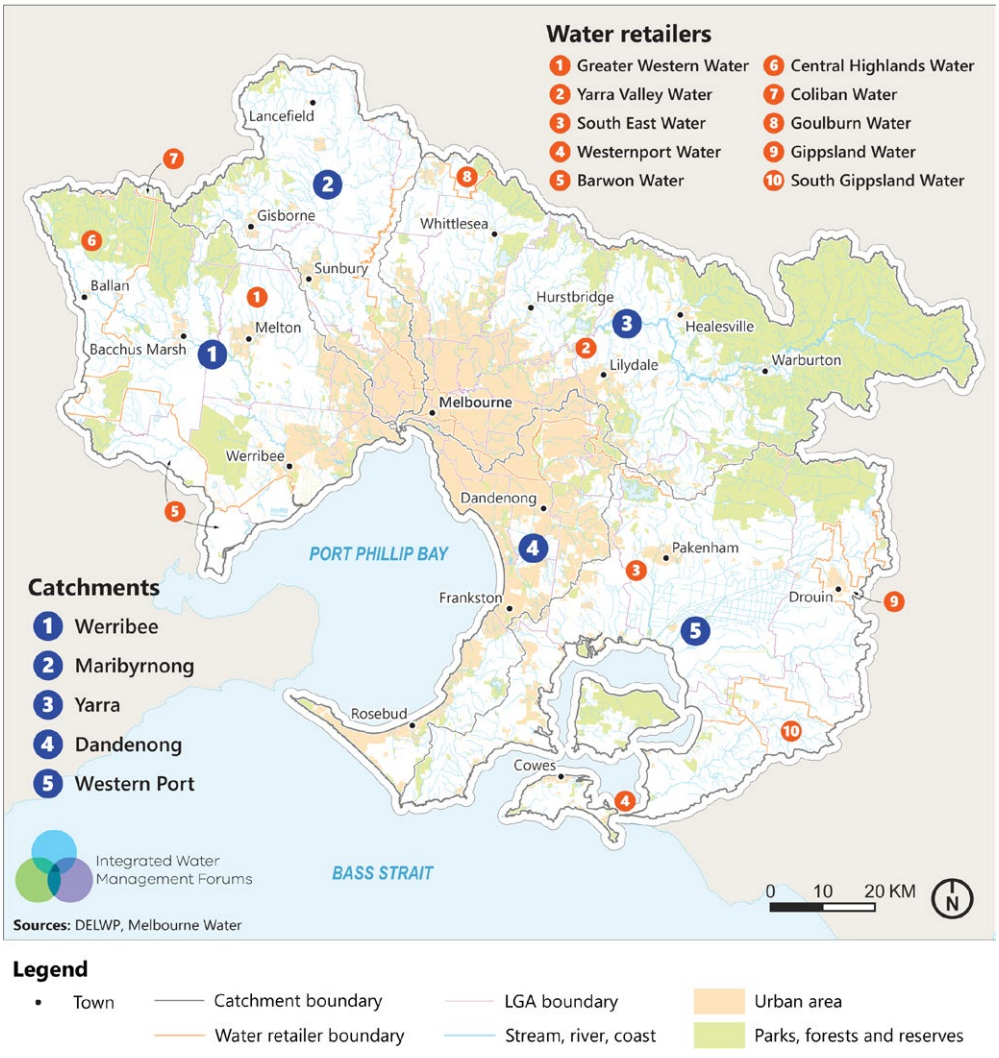


Figure 37: Catchment boundaries of the five metropolitan IWM forums

Merri Creek at Coburg, Wurundjeri Woi Wurrung Country

Case Study: Integrated Water Management Solutions

Upper Merri Creek Place-Based Planning

The IWM pilot plan is an innovative 50-year sub-catchment plan for the Upper Merri Creek. Located in Melbourne's Northern Growth Corridor, the plan will step-out the critical transition from the business-as-usual approach to water management to a regenerative scenario, focusing on liveability outcomes and climate readiness.

The community of the Upper Merri has said that *"Business as usual is not OK. Minimising the impact on the environment is important but the focus needs to be on regenerative practices."*

Partnerships are central to this project. The Wurundjeri Woi Wurrung Cultural Heritage Aboriginal Corporation, Hume City Council, City of Whittlesea, Mitchell Shire Council, Yarra Valley Water, Melbourne Water and the Victorian Planning Authority recognised that a collaborative approach to water management is essential to address urban growth challenges, and deliver positive outcomes for community and the environment. The place-based approach encourages all agencies operating in the sub-catchment to work together with Traditional Owners and communities to address complex issues and produce mutually beneficial outcomes.

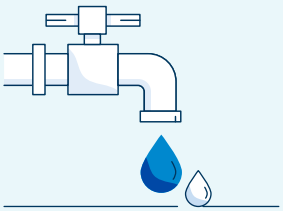
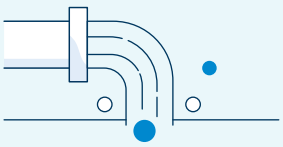
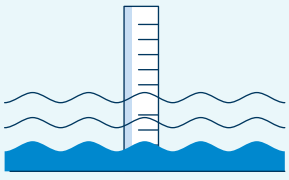
The Wurundjeri Woi Wurrung Water Unit led the Cultural Flows Assessment to identify and prioritise the economic, social, ecological and cultural values that are connected to the Upper Merri Creek sub-catchment. These inputs will provide the collaborating partners with an understanding of the expectations of the Wurundjeri Woi Wurrung people.

Diverse sources of water are not just a component of ensuring supply security, they underpin delivery of expected community and Wurundjeri Woi Wurrung outcomes.

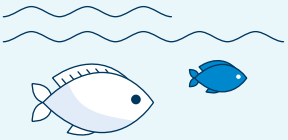
This pilot is an action-based learning and research project, a recipe for sub-catchment planning, which strives to:

- address environmental issues associated with rapid development along the catchment, none more critical than a stormwater increase of 21 GL
- promote and drive water use which is fit-for-purpose, to conserve drinking water and utilise increasing stormwater flows
- strengthen and embed key partnerships to leverage opportunities, and solve and manage issues collaboratively
- celebrate Wurundjeri Woi Wurrung culture, protect significant sites, and utilise traditional water management practice and knowledge, including species selection
- improve the sub-catchment's overall health, and create vibrant accessible and climate-ready natural places for communities to enjoy.

Table 3: How can IWM support key outcomes and benefits for the community?

Strategic outcomes for IWM	How can better use of all water resources support this outcome?	
 **Safe, secure and affordable water supplies in an uncertain future**	**Fit-for-purpose use of water resources:** Rainwater, stormwater runoff and recycled water can be treated to an appropriate quality for many uses in urban areas and also for agricultural and environmental needs. Greater use of these resources will help to reduce pressure on the highest-quality drinking water supplies sourced from our natural catchments and help to save energy and expenditure on unnecessary water treatment and distribution. **Increased resilience of water resources against population growth pressures:** Stormwater runoff and sewage are major water resources that are continually produced in urban areas, and could be intercepted and diverted to support many of our water needs. Both resources will increase as our population grows and our region becomes more urbanised. In a typical urbanised area, the combined total volume of these resources will significantly outweigh local demands for water and we therefore need to address this growing resource.	**Increased resilience of water resources to a changing climate:** Sewage is a reliable water by-product, used in homes and businesses, which is continually produced. Stormwater runoff from urban areas is rainfall dependant, but runoff yields after a rainfall event have the potential to generate large volumes if intercepted and stored for later use. **Increased resilience through water supply diversification:** By adding different sources of water to our supply portfolio, we are more resilient to shocks and disruptions that could impact existing supplies, such as bushfires and drought within water supply catchments.
 **Effective and affordable sewerage systems**	**Avoiding upgrades in sewerage and sewage treatment systems:** By using recycled water and its solid by-products locally, we can often avoid costly upgrades to sewerage infrastructure which would be required to manage higher volumes of sewage while limiting the impacts of releases to our environment.	**Supporting resource recovery and zero-waste outcomes:** By increasing our use of recycled water, we will harness a resource that would otherwise be wasted. Through a closed-loop approach to resource management, the Melbourne Sewerage Strategy aims to move towards a circular economy with increased resource recovery in the future, where the focus is on recovery of water resources and, where viable, energy and nutrients.
 **Existing and future flood risks are managed to maximise outcomes for the community**	**Capturing rainwater and stormwater runoff for use locally can reduce flood risk downstream:** Over time, our urban areas have intensified and become less permeable. As more stormwater runoff is created, this can mean the local drainage system in some areas is overwhelmed more easily than it once was, leading to flooding. Where local storage for rainwater and stormwater is installed to manage the flooding risk this water can be beneficially used to supply fit-for-purpose water.	

Strategic outcomes for IWM developed by the IWM forums

Strategic outcomes for IWM	How can better use of all water resources support this outcome?
 **Healthy and valued waterways and marine environments**	**Improving waterway health:** By increasing our use of rainwater, stormwater runoff and recycled water which would otherwise be released to the environment, we will improve water quality and support the health of our waterways, Port Phillip Bay and Western Port. **Providing environmental water and cultural flows in waterways:** By creating a more diverse water resource portfolio for a range of uses that would traditionally draw on river water resources, we can support the provision of additional flow allocations in key waterways including environmental water to support ecological and community needs, while delivery of cultural water will provide Traditional Owners with the opportunity to deliver their priority cultural, social and environmental benefits within their Country.
 **Healthy and valued urban and rural landscapes**	**Supporting our trees and green spaces:** By accessing different types of water, we can increase irrigation of the sports grounds, parks, gardens and trees that are so essential to the liveability and character of our neighbourhoods, and to the health and wellbeing of our community. As our climate becomes drier, increased irrigation will be a key strategy to support healthy landscapes. Stakeholders can work together to find fit-for-purpose sources of water for irrigation where it is most needed for community benefit. **Cooling our neighbourhoods:** By introducing more water to our landscapes, irrigating grass and trees, and creating water features, we will reduce local temperatures and provide cool refuges for the community during heat waves. **Supporting Traditional Owner values:** Through an IWM approach, we can find opportunities to provide water to Traditional Owners that they may utilise for self-determined use. For example, providing cultural flows that support aspirations in relation to spiritual, social, cultural, environmental and economic benefits to provide a healthy Country within the changing landscape.
 **Community values are reflected in place-based planning**	**Increasing community understanding and participation in water management:** By harnessing the water resources available locally, such as rainwater from roofs, communities can play an active role in water management. Providing the right water source for the right use also increases our awareness and understanding of water resources.
 **Jobs, economic benefits and innovation**	**Supporting local food and resource production:** Up to 41 per cent of Melbourne's food is produced locally in the region. We can support our local food bowl and enhance our agricultural production by harnessing a diverse range of resources. **Supporting local industry and business:** Some industrial processes and commercial activities rely heavily on water supply but do not require drinking quality water. By providing fit-for-purpose water resources, we can support local business, potentially attract key businesses to particular water supply locations and increase productivity. **Supporting Traditional Owner economic opportunities:** Through meaningful partnerships with Traditional Owners, we can support the realisation of employment and economic opportunities that lead to stronger communities.

Case Study: Integrated Water Management Solutions

Pakenham Cora Lynn Recycled Water Scheme

A localised water cycle management solution that achieves broad community and environmental benefits.

The challenge

Large growth forecast for Melbourne's outer reaches will place increasing pressure on our drinking water supplies and create higher volumes of sewage at our water recycling plants. This presents both a challenge and an opportunity for our communities and the environment.

The solution

In the Casey Cardinia growth corridor South East Water, Southern Rural Water, Cardinia Shire Council and DELWP have identified that in tackling the challenge of managing future sewage flows there is an opportunity to provide positive environmental outcomes and support the economic prosperity of the region by improving water security.

These shared beneficial outcomes are to be achieved by pursuing the key principles of retaining water in the catchment and supporting drinking water substitution with climate resilient supplies. The proposed scheme involves diverting sewage flows from urban areas that would otherwise flow west for treatment, and have no productive use, to Pakenham Recycled Water Plant for treatment. This treated water will be available for use locally to support urban uses and irrigators currently relying on groundwater and the Bunyip River.

Offering a reliable alternative water supply to traditional sources will build the resilience of primary industries, address concerns regarding sustainable use of groundwater supply and play a role in protecting and restoring degraded environmental condition of local waterways. The water will also supplement non-drinking urban water demands as growth occurs, reducing customer water bills, providing alternative water for greening and liveability and supporting the resilience of our city by diversifying water resources and delaying investment in future supplies. The productive use of recycled water also helps protect the environment from alternative sewage disposal options that would be needed to support the forecast growth in the south-eastern region of Melbourne.

The proposed scheme also presents an opportunity for expanded productivity in the region east and south of Pakenham with potential irrigation areas having good soils and other market conditions that are suitable for primary industry expansion across Cora Lynn, Catani and Lang Lang. Large-scale expansion of regional horticultural industry is currently limited by surface and groundwater availability and the security of this supply is increasingly threatened by climate change.

South East Water is currently committed to expanding recycled water supply to Pakenham South of up to 1 GL/year. The Australian Government has committed to supporting the further development of the scheme's business case through the National Water Grid Fund and project partners South East Water and Southern Rural Water are progressing investigations to optimise the scheme's potential.

The expanded scheme could be delivered in three stages, subject to funding, with progressive volumes of treated water available for productive use as the region grows:

- Stage 1: Pakenham-Cora Lynn up to 2.8 GL/ year
- Stage 2: Pakenham-Bayles up to 5 GL/ year (plus 2.2 GL/year)
- Stage 3: Pakenham- Lang Lang up to 12 GL/year.

Conclusion

This case study illustrates the opportunities that can be created by taking a shared benefits approach to water cycle management. While a key driver for water service planning in the south-east of Melbourne is supporting growth in a changing climate, by focusing on local catchment scale solutions, opportunities to efficiently support more than urban growth objectives were uncovered. Ultimately this approach leads to better community and environmental outcomes, and a more resilient and prosperous city.

6.2 Protecting the values of waterways

Water for the environment

Protecting the values of our waterways is critical, as highlighted by our Community Panel and in discussions with Traditional Owners in our region.

One of our most important actions is providing water back to the environment. We do this primarily through environmental water, which is released from our supply systems into waterways to ensure enough water supports environmental values. Environmental water can also help to support recreational, liveability and cultural values, as shared benefits.

The increasing amount of water we take away from the environment for consumption, and changes to the way we use land resulting in the loss of natural environment, have been detrimental to natural water systems. This is further challenged by climate change, as outlined in the Long-Term Water Resource Assessment (DELWP, 2020).

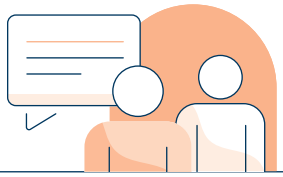
This has led to the current situation where there is insufficient water available to support the health of our environment or environmental values in our waterways.

If water is not recovered for the environment, risks include:

- loss of important native freshwater fish species
- further reductions in platypus populations
- reduced water quality
- reduced vegetation and habitat for macroinvertebrates and frogs.

Recovering environmental water is a priority to prevent further deterioration of waterway health, and was one of the priorities of Traditional Owners in our service region.

The delivery of cultural water will enable Traditional Owners to deliver cultural, social and their own priority environmental benefits within their Country. Environmental water can deliver cultural values, but differs from cultural water which may not always deliver environmental values.



Community voice:
Protecting the health of waterways was a key criterion set by the independent *Water for Life* Community Panel.

The discussion draft CGRSWS has proposed environmental water recovery targets over the next 5 to 10 years, for river basins in the region, shown in Table 2 (page 53). To ensure our waterways are resilient now and into the future, during strategy implementation we will ensure that environmental recovery targets are included in our supply-demand balance and that the impacts of climate change on environmental values is further investigated. This, combined with an Adaptive Plan and diverse portfolio of options, will enable us to effectively identify opportunities to free up or provide environmental water.

Traditional Owner perspective: Preserving and enhancing natural water systems is a key priority for Traditional Owners, whereby water is kept in stream and on Country to support ecological and cultural values.

How we manage environmental water

The VEWH is responsible for holding and managing Victoria's environmental water entitlements, which help to protect the environmental values of Victoria's rivers, wetlands and floodplains, including during droughts.

Melbourne Water is responsible for managing waterway, estuary and wetland health underpinning the region's liveability, biodiversity and economy. Its commitment to invest in and facilitate waterway health outcomes is outlined in the *Healthy Waterways Strategy*, a shared strategy across Melbourne Water, state and local government, water corporations, Traditional Owners and land management councils, non-government organisations and the community.

Melbourne Water works in conjunction with the VEWH to release water, known as environmental flows, that improves seasonal flow within key river systems across the Port Phillip and Westernport region.

Action 6.1

What: Ensure waterways are resilient now and into the future by refining and delivering environmental water requirements.

Detail:

We will:

- minimise the impacts of key challenges such as drought and climate change to ensure protection of environmental values, recognising the important role of water in supporting waterways, wetlands, flora and fauna
- refine environmental flow targets and incorporate these into our long-term supply and demand projections and adaptive planning
- deliver environmental water recovery targets as outlined in the discussion draft CGRSWS
- investigate stormwater and recycled water opportunities to provide water for environmental benefit.

All augmentation option planning and business cases will include consideration of opportunities to return surface water to the environment through freeing up existing uses.

Who: Melbourne Water in collaboration with the VEWH, CMAs and government.

When: Ongoing.

Delivers on SDGs

The need to improve stormwater management to protect our waterways

As outlined in Chapter 2, stormwater is the single biggest threat to the environmental health of our waterways. It results in poorer water quality, increased sediment and nutrient loads, reduced dissolved oxygen, rapid alteration of habitats, and reduced liveability and access for communities. Excess stormwater can also lead to localised flooding impacts. As Melbourne's urban footprint expands, the volume of environmentally damaging stormwater will increase. Melbourne Water, the retail water corporations and councils all play a key role in stormwater management and there are significant opportunities to use this water in more beneficial ways.

Melbourne Water works with its partners using IWM to design stormwater harvesting systems to protect waterways from excess stormwater and pollutants that can impact on water quality as well as help protect property from flooding and provide diverse sources of water that can contribute to the maintenance of cool, vegetated urban environments. The *Healthy Waterways Strategy* highlights the critical need for stormwater harvesting to prevent the decline in waterway health. It includes ambitious targets and identifies priority areas across the region for stormwater harvesting. These targets are now supported by the Environment Protection Authority's urban stormwater management guidance for new development. Failing to meet these targets is forecast to lead to significant and irreversible decline in waterway health across the region, and loss of species and habitat. This could include (but is not limited to) the presence of platypus in Melbourne's waterways, now listed as 'vulnerable' under the *Flora and Fauna Guarantee Act 1988* (Vic).

A key challenge with more effective stormwater capture, management and use is the unclear and overlapping responsibilities for stormwater management among Melbourne Water, the retail water corporations, local councils and DELWP. This leads to potential inefficiencies, delays in developing and investing in solutions that will have a sustainable, long-term impact on waterway health and flood management, and the loss of opportunity to beneficially re-use stormwater to decrease the demand on drinking water supply.

Melbourne Water is demonstrating leadership in stormwater management through its commitment to large-scale stormwater project management, recognising the value of diverse sources of water for wholesale supply, as well as the integration with drainage services. Its focus for the next 10 years is on strategic planning and oversight at the system level, investment optimisation, reduction of harm to our waterways and decreased demand on potable water.

Action 6.2

What: Lead system-scale stormwater management by planning for, investment in and management of large-scale stormwater projects.

Detail:

We will:

- optimise investment in stormwater management and planning to reduce harm to waterways and decrease demand on potable water
- invest in trials to engage directly with the community on the range of possible uses for harvested stormwater, including for environmental flows or potable use, on key projects such as:
  - Sunbury Stormwater Harvesting Scheme
  - Melton Stormwater Harvesting Scheme
  - Upper Merri Creek Stormwater Harvesting Scheme
- ensure long-term delivery of stormwater performance objectives in the *Healthy Waterways Strategy 2018*.

Who: Greater Melbourne water corporations (GWW, MW, SEW, YVW) in collaboration with government.

When: By 2030.

Delivers on SDGs

Case Study: Integrated Water Management Solutions

Sunbury Integrated Water Management Plan

Strong population growth and climate change will have a significant impact on Sunbury's local water supplies, wastewater management and waterways into the future. The population of Sunbury is forecast to more than double over the next 20 years. With major water shortfalls expected in the regions supplied by Greater Western Water, this is predicted to lead to an increased reliance on the Melbourne system.

Under current stormwater management practices, a declining trajectory in waterway values is expected. For Sunbury's Jacksons and Emu creeks, this means a decline in populations of platypus, frogs, macroinvertebrates, vegetation and the level of community connection.

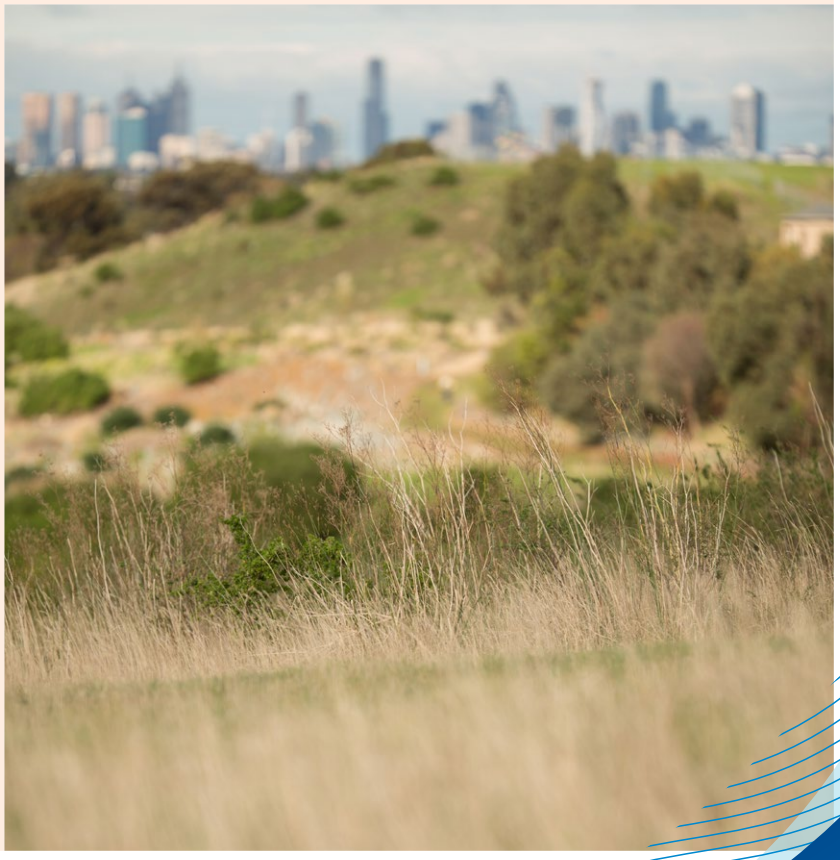
Greater Western Water, Melbourne Water, Hume City Council and DELWP are working closely together, and with the community, to progress IWM solutions for Sunbury that will be best for the community and environment.

In 2015, an initial Sunbury IWM Plan was developed collaboratively between Western Water (now Greater Western Water), Melbourne Water, Hume City Council and DELWP. The plan sought to identify and assess a broad range of water cycle servicing options, examined for their performance against agreed financial, social and environmental criteria. Key objectives were: protection and enhancement of local waterways; creation of diverse sources of water for local use; and supporting liveability outcomes for the area.

Of the range of options evaluated, a regional-scale stormwater harvesting system for treatment and addition to the drinking water supply was identified as the most strategically attractive solution, and the least costly way to achieve desired objectives. This included harvesting water from stormwater treatment wetlands (implemented through Melbourne Water's Development Services Scheme) and transfer to an existing water storage at Riddells Road. Following preliminary treatment at this site, water will be transferred via pipe to Rosslynne Reservoir where it would be mixed and receive further treatment as necessary.

A comprehensive community engagement process was undertaken and, in June 2019, the community panel delivered its nine recommendations. The panel's report is publicly available and is published on the Melbourne Water *YourSay* web page (**https://yoursay.melbournewater.com.au/Sunburys-Water-Future**).

The approach taken to date is considered to be a first for IWM in Victoria.



6.3 Supporting the needs of our communities

Urban amenity, liveability and wellbeing

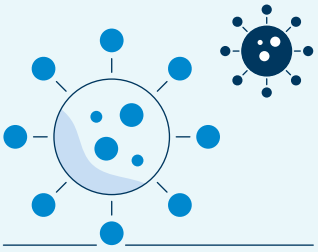
Water corporations play a significant role in ensuring Greater Melbourne remains resilient and liveable through well-established avenues of public health and safety, and equitable access to services. In response to our growing understanding of the challenges posed by rapid population growth and climate change, and of the community's expectations for water corporations to contribute to liveability and wellbeing outcomes, our role is expanding to further support liveability using a place-based approach.

Water plays an incredibly important role in the health of our environment and the liveability and wellbeing of our communities by:

- creating greener and cooler neighbourhoods
- enriching healthy gardens, sports fields, parks and trees
- supporting business, industry and agricultural production, ensuring we can produce food for the region and grow thriving local economies, including opportunities for Traditional Owners
- supporting cultural values, knowledge and traditions and underpinning connections to Country
- fostering play, relaxation, recreation and connection with nature through its presence in both our urban and rural landscapes
- supporting our ecosystems and wildlife, and the beautiful waterways and beaches that Victorians treasure.

To be long-lasting and resilient, a liveable city or region must consider the needs of future generations and use systems thinking to understand and respond to shocks and long-term change.

During the creation of new places to live and work, there are opportunities to improve water and urban design outcomes from the start. Taking **a place-based approach to planning** development areas allows us to understand both the local water cycle and the needs of the local community, and then design solutions that optimise outcomes for our communities such as urban cooling, recreation, active transport and creating a sense of place. The best solutions will depend on the local context from both a water management and a place-making perspective. Learning from Traditional Owners and taking a Care for Country approach to land and water management can help us to respond to the local environment and live in balance with natural resources.



The Coronavirus (COVID-19) Pandemic

Natural places allow 'escapism' during lockdown

During the COVID-19 restrictions in 2020, Melbourne Water recorded an increase in visitation to public parks, waterways and other accessible spaces. People visited these places for their emotional and mental health, including 'escapism'. Community satisfaction with local waterways was also the highest ever recorded in 2020, confirming the essential contribution water makes to Melbourne's liveability, and its role in shaping a sense of place and space in suburbia.

Did you know?

Why we need water for greening and cooling

Quality green spaces with large trees create many benefits for people, animals and plants. Unshaded areas have a 'feels like' temperature up to 15 degrees hotter than shaded areas (Ennos, 2015), reducing the risk of skin cancer, heat stress and mortality during heatwaves. Unirrigated grass is also 8 degrees hotter than irrigated grass (Broadbent, Coutts, Tapper, Demuzere, & Beringer, 2018).Creating more enjoyable places, such as public parks, walking tracks and sporting fields, encourages people to spend time outdoors for both exercise and passive recreation, improving community connection and mental health and reducing chronic disease. Quality green spaces also sequester carbon, manage stormwater, reduce air pollution, and improve biodiversity outcomes through increased food, habitat and other resources for fauna.

Carbon sequestration is the process of long-term removal, capture and storage of carbon (i.e. carbon dioxide, CO2) from the atmosphere in carbon sinks (such as forests, woody plants, mangroves or soils). This process can slow or reverse atmospheric CO2 pollution and mitigate or reverse climate change.

Sustainable land and water management practices are a key way to encourage carbon sequestration.

Urban Cooling, City of Hume, Wurundjeri Woi Wurrung Country

Case Study: Integrated Water Management Solutions

Lower Werribee Waterway Amenity Action Plan

The Lower Werribee Waterway Amenity Action Plan is a collaborative place-based plan that sets out a shared vision and prioritised action plan for improved liveability, cultural values, community access and activation along the Lower Werribee River.

The plan is being developed through a collaborative partnership between Traditional Owners, government and community organisations, resulting in efficiencies, alignment and collective impact of multiple land and waterway managers caring for this stretch of the Werribee River.

The co-designed plan identifies additional recreational infrastructure such as shared path links and multi-use platforms to enable on-water activity and connection with nature, as well as opportunities for urban greening and cooling. The plan to enhance the waterway corridor will enable the community to better enjoy the waterway including shared benefits that may be provided by IWM and environmental water.

Werribee River, border of Bunurong Country and Wadawurrung Country

Darebin Parklands, Wurundjeri Woi Wurrung Country

Integrating the way we deliver our services maximises benefits for our communities. We do this by:

- identifying opportunities within growth, infill and new employment clusters to build infrastructure to support the supply of suitable water sources for local needs, which could include installing rainwater tanks or recycled water supplies to homes to flush toilets and water gardens
- increasing urban cooling to alleviate the impacts of heat stress and create cool spaces for people. This includes tree planting and vegetation management, as well as using sources of water such as stormwater to irrigate open space and revitalise wetland environments
- collaborating to achieve multiple community benefits from water systems and land, such as: increasing recreation opportunities at retarding basins; supporting community and social enterprises on underutilised land; or developing active transport links on our pipeline track network and waterway corridors through safe, shared pathways to better connect communities.

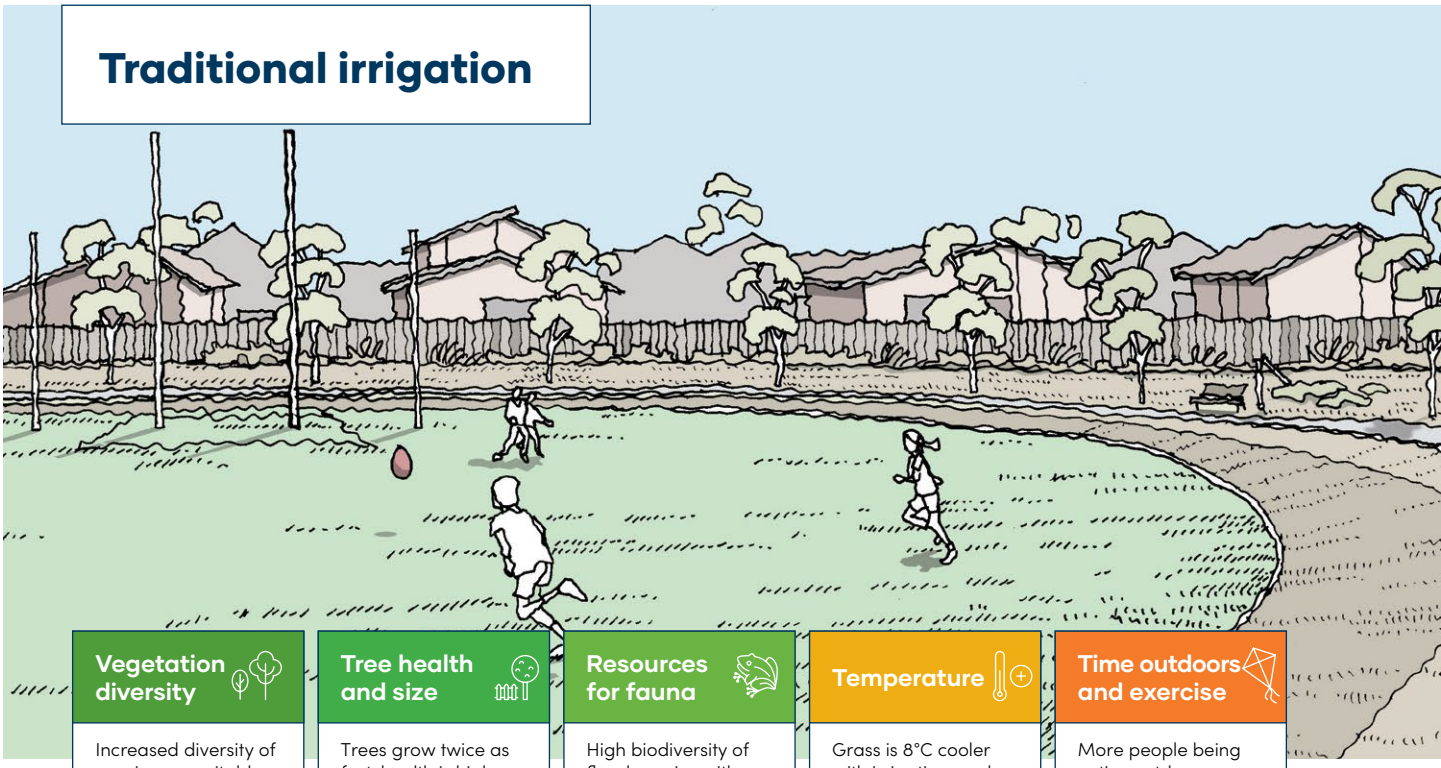
Developing an Innovative Social and Environmental Value Tool (SEVT)

As outlined in Chapter 5, it is essential that we make appropriate ongoing investments in each of our portfolios. Traditional investment principles designed to meet a single service objective at the least cost do not suit an IWM approach, which aims to deliver multiple outcomes to provide the greatest overall value. Social and environmental benefits can often be difficult to quantify and evaluate.

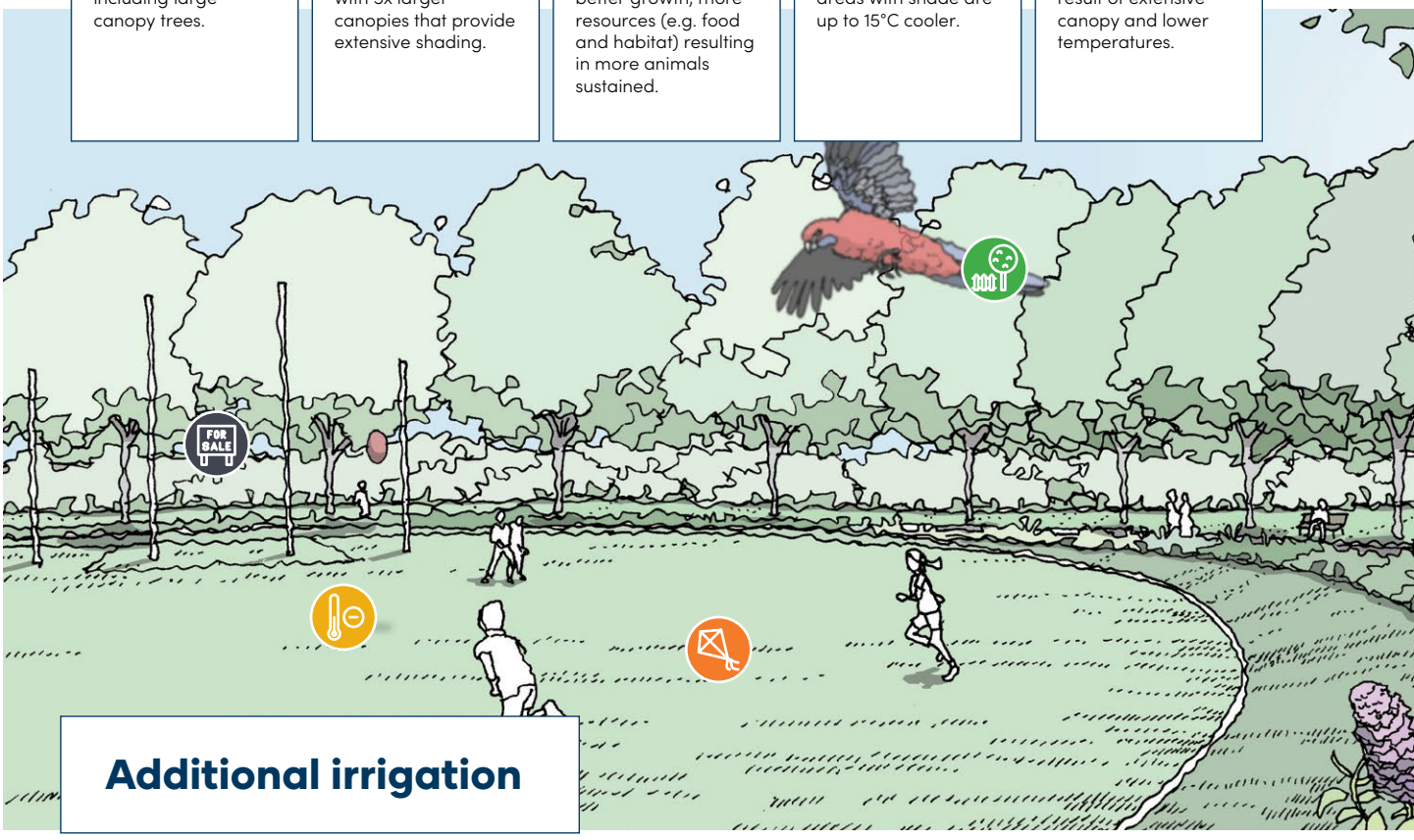
In the past five years, a significant body of work has expanded our knowledge of and our ability to quantify the broader benefits of IWM including economic quantification of benefits relating to wellbeing, liveability and ecological health using the SEVT database. It was developed by selecting values relevant to Greater Melbourne from the latest industry and national data including WSAA, the Cooperative Research Centre for Water Sensitive Cities and local studies.

We are well-equipped to make holistic investment decisions; however, there is more work to be done to understand priorities at different spatial scales and across the region.

Benefits of irrigating more at 2070
(under high climate change)



Vegetation diversity	Tree health and size	Resources for fauna	Temperature	Time outdoors and exercise
Increased diversity of species are suitable, including large canopy trees.	Trees grow twice as fast, health is higher, with 5x larger canopies that provide extensive shading.	High biodiversity of floral species with better growth, more resources (e.g. food and habitat) resulting in more animals sustained.	Grass is 8°C cooler with irrigation, and areas with shade are up to 15°C cooler.	More people being active outdoors as a result of extensive canopy and lower temperatures.



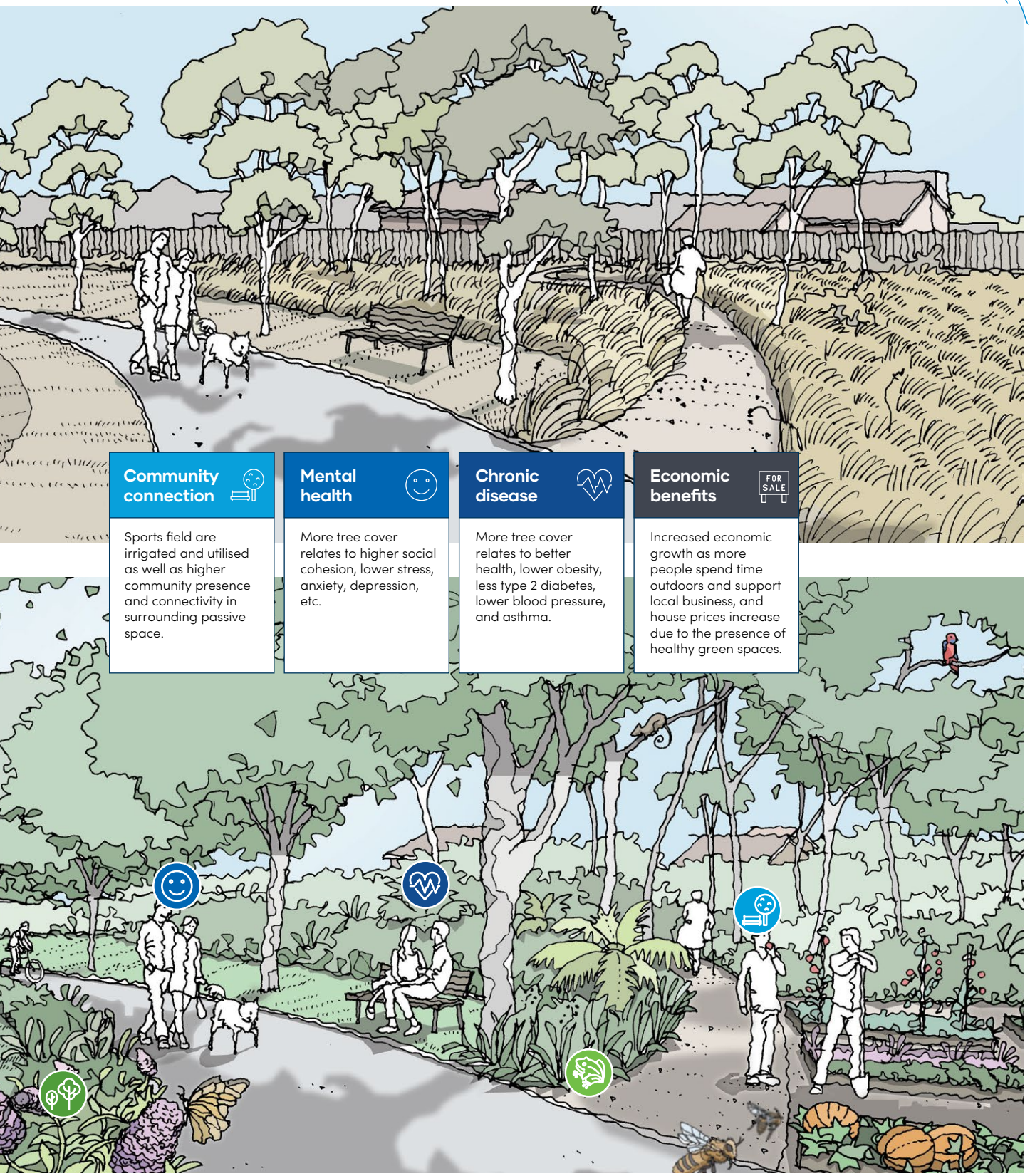


Figure 38: Melbourne Water's Water for Greening and Cooling program – GHD image

Case Study: Integrated Water Management Solutions

Greening the pipeline

Melbourne Water is working with numerous partners and collaborators, including Wyndham City Council, VicRoads and Greater Western Water, to transform the decommissioned Main Outfall Sewer reserve into a vibrant open space in the booming western suburbs. Inspired by the High Line Project in New York City, in which a disused train line was transformed into a revitalised linear park, the 27-kilometre linear corridor will provide walking and cycling paths and amenable spaces for people to meet, commute, play and relax.

As part of the transformation, project partners co-created a 100-metre section of the decommissioned reserve into an exemplar community park at Williams Landing, complete with exercise equipment, seats, space to play sports and games, and walking and cycling connections to the Federation Trail. Visitor numbers at the park have increased by 105 per cent since it opened in 2017, with hundreds of people enjoying the park each week. The focus is now on delivering a new park along a 3.7-kilometre section and master planning is underway to improve liveability outcomes along two other sections of the pipeline in Hoppers Crossing and the Brooklyn industrial precinct.

Pilot Park integrated stormwater system, Williams Landing, Bunurong Country

Action 6.3

What: Improve capacity and capability within organisations to expand collaborative place-based approaches to planning and delivering place-based planning solutions with Traditional Owners and the community, and embed learnings.

Detail: We will explore opportunities for projects that have a capacity and capability building component with Traditional Owners and our community to deliver improved place-based outcomes in the long term.

Who: Greater Melbourne water corporations (GWW, MW, SEW, YVW) in collaboration with government and partnership with Traditional Owner Groups.

When: Ongoing.

Delivers on SDGs

Opportunities to better protect our waterways and create liveability benefits

As outlined in the water balance (Figure 16), in 2021/22, an estimated 400 GL of stormwater was generated and only 5 GL harvested. Rainwater and stormwater runoff are valuable potential sources of water that can be intercepted, stored and used locally.

With Melbourne's growth, the volume of available stormwater will increase significantly. In 2021, the Environment Protection Authority also released urban stormwater management guidance, setting new targets to support stormwater harvesting and protect our waterways from the impact of development. To ensure future liveability, local harvesting of rainwater on property and from stormwater is an essential initiative to improve the health of our waterways while contributing to water security.

Including a rainwater tank to capture rainwater from the roof is a simple example, which many residents and businesses across the region have already installed. Based on resident surveys, it is estimated that around 30 per cent of homes in the region have a rainwater tank. However, they are not always proactively maintained and managed, with leaves blocking downpipes and pumps failing over time. Residents and building owners are often unaware of how effectively their tank is working and how much rainwater they are using. With improved technology, metering and monitoring, we can better understand rainwater supplies' contribution to the region's water needs and work to improve the effectiveness of rainwater tanks.

Other measures such as raingardens and water sensitive urban design assets can also be used to slow water from entering our rivers.

Throughout the region, local government authorities are continuing to actively install stormwater harvesting systems to provide local green space irrigation and to protect local waterways from the impacts of runoff. Often, these schemes are for single ovals or open space areas and are managed by councils. However, in some cases, there may be the potential to expand or create new networks that link various uses to a stormwater supply. As water supply service providers, water corporations would play a key role in enabling expanded network supply schemes.

These opportunities better protect our waterways from stormwater runoff and assist with water security, while providing liveability and health benefits to our green open spaces. Further work will be undertaken in this area.

Action 6.4

What: Deliver activities to optimise cultural, social and recreational uses and values of land and waterways to achieve multiple community and Traditional Owner benefits.

Detail:

We will:

- establish collaborative place-based planning for enhanced blue-green corridors (open space and waterway corridors) to achieve multiple community benefits
- in partnership, deliver actions identified in collaborative place-based plans to support the community to enjoy waterway corridors and the shared benefits of water
- consider the social and recreational uses and values of land and waterways in activating water system land and assets to achieve multiple community benefits, including greening and cooling, and recreation
- explore long-term legislative and policy reform to support better governance and funding models for delivering water system land and asset activation and shared benefits from water.

Who: Melbourne Water in collaboration with retail water corporations (GWW, SEW, YVW) and government, and partnership with Traditional Owner Groups.

When: By 2030.

Delivers on SDGs

Case Study: Integrated Water Management Solutions

Aquarevo – creating a blueprint for water sensitive communities

Aquarevo is a collaboration between South East Water and Villawood Properties to create a residential development in Lyndhurst, south-east of Melbourne, where homes feature a range of unprecedented water-saving features. This innovative initiative has helped provide a blueprint for water sensitive communities and tackled a range of traditional barriers to implementing IWM solutions to provide important lessons for future IWM planning.

The unique approach to water servicing at Aquarevo sees each home plumbed with three types of water: drinking, recycled and rainwater. Each property is fitted with a 2,400-litre rainwater tank and the rainwater is treated to a standard suitable for supply to hot water systems as well as other non-potable demands. Pressure sewer pods are provided for each property and waste will be stored and transferred to a proposed local water recycling plant where it will be treated and returned for use in gardens, toilets and washing machines. Each Aquarevo home is installed with OneBox® technology which remotely monitors and controls the rain to the hot water system and the pressure sewer, and records information about each home's water and energy use to enable the household to better understand and adjust their usage behaviours and detect problems such as leaks. South East Water's TankTalk® technology is also connected to each rain tank.

This receives weather forecast data and can release harvested water to the stormwater system before predicted heavy rainfall to help mitigate localised flooding by 25 per cent.

This innovative Aquarevo project has successfully demonstrated:

- that rainwater can be safely utilised as a supply for hot water
- the viability of a local integrated water recycling plant to provide high-quality recycled water to homes
- the effective operation of real-time monitoring systems.
- a new model of service delivery through public-private sector collaboration.

Maribyrnong River at Footscray, Bunurong Country

Action 6.5

What: Work with DELWP, councils and the community to better understand the whole of life cycle performance of rainwater and stormwater harvesting assets, and how to increase their effectiveness and affordability through efficient design, new technology, product quality, operational efficiency, site suitability and the locational outcomes to be achieved.

Detail: Support effective delivery and operation of rainwater tanks, and enable an environment for co-delivery of stormwater harvesting regulation, compliance and enforcement.

Who: Greater Melbourne water corporations (GWW, MW, SEW, YVW) in collaboration with government.

When: By March 2027.

Delivers on SDGs

Action 6.6

What: Engage with farmers and agricultural landholders to investigate the possibility of providing stormwater and recycled water to irrigation customers. Strategic planning should also explore how servicing agricultural areas could unlock supplies to other users in growth areas and on the peri-urban fringe.

Detail: Engage in priority areas identified with potential for expansion of diverse sources of water supplies which include Western Irrigation District, Bacchus Marsh Irrigation District, Parwan-Balliang Irrigation District, Romsey/Lancefield, Sunbury/Bulla/Keilor, West Wallan, Yan Yean, Boneo, Lang Lang, Pakenham, Tyabb/Somerville/Pearcedale, Mornington Peninsula Hinterland, and Phillip Island/Bass Coast.

Who: Greater Melbourne water corporations (GWW, MW, SEW, YVW) in collaboration with Southern Rural Water.

When: By March 2027.

Delivers on SDGs

7 Meaningful Partnerships, Engagement and Education

Chapter overview

Our commitment is for proactive, planned and sustained partnerships with Traditional Owners, and education and engagement with community throughout the implementation of this and future strategies. We will leverage this progress to support how we continue to work with Traditional Owners and community across all areas of our businesses.

The actions in this draft strategy will drive a step change for the water corporations in:

- community education and empowerment in decision making
- cultural competency and partnering with Traditional Owners.

The legacy of this strategy will be ongoing partnerships, with engagement and education arrangements embedded in the water corporations' operations and planning. They will be constantly monitored and reviewed to ensure we are agile in the face of evolving needs and future conditions. The ultimate benefit of this will be a pathway to a secure and sustainable water future that is wholly supported and shared by our partners and community.

Critical components for enabling successful implementation of this draft strategy will be:

- meaningful partnerships with Traditional Owners
- sharing with communities the value of water
- empowering and actively involving customers and community in decision making through ongoing meaningful engagement.

Key strategy actions	Secure & sustainable water supply	Equitably & affordably meeting diverse water needs	Ensuring healthy people & healthy environment	Meaningful partnerships, engagement & education
7.1 Establish partnership arrangements with Traditional Owners that support their participation in decision making and water management.	✓	✓	✓	✓
7.2 Work with Traditional Owners to identify and deliver shared strategic water objectives, including those that may be documented in Traditional Owner Country plans and other relevant strategic documents.	✓	✓	✓	✓
7.3 Engage with the community on the 'true value of water' to empower our community in decision making and their participation in the Water Security Framework implementation, including drinking water conservation behaviour change.	✓	✓	✓	✓

7.1 Meaningful partnerships with Traditional Owners

Traditional Owner perspective:
Traditional Owners want to work together in water management and planning to deliver better outcomes.

The Bunurong, Dja Dja Wurrung, Gunaikurnai, Taungurung, Wadawurrung and Wurundjeri Woi Wurrung Traditional Owner groups are recognised as partners in natural environment management. Their deep understanding of water should be honoured and respected in water management and decision making.

Despite Traditional Owners' strong spiritual connection to Country and cultural responsibility for managing the waterways in our region, over the years they have been consistently overlooked in water management and planning. This omission has created immeasurable social and economic inequalities for Traditional Owners today.

Throughout development of this draft strategy, we have sought to honour and respect Traditional Owners' status as our partners in water management. This is central to our desire to grow our cultural competency and evolve from collaborations to genuine partnerships with Traditional Owners. The draft *Water for Life* strategy is committed to the establishment of these partnerships, with the draft strategy setting a pathway for how we will work together to achieve this.

The establishment of these partnerships will support Traditional Owners' participation in water management, planning and decision making. They will also provide the basis from which we can work towards our shared objectives together, supporting economic growth, protection and enhancement of cultural values and also delivering shared benefits.

Principles for partnerships with Traditional Owners

To set the foundations for partnerships with each of the Traditional Owners moving forward, representatives from the Bunurong, Dja Dja Wurrung, Gunaikurnai, Wadawurrung and Wurundjeri Woi Wurrung Traditional Owner groups came together with the *Water for Life* project team to co-develop a set of principles that defines how we will work together.

Principles for partnerships between Traditional Owners and water corporations

The partnership between the Greater Melbourne water corporations and Traditional Owners is underpinned by mutual respect and trust in our roles as natural resource managers.

Our **agreed guiding principles** for how we will work together for better water-related outcomes for our communities are:

- commitment and recognition of Traditional Owners' self-determination
- commitment by water corporations to achieve cultural competency
- recognition of Traditional Owners as partners in natural resource management
- that the partnerships are live, collaborative and sustained professional working relationships that respect
  - the governance arrangements of all the participating organisations
  - the different needs of each Traditional Owner corporation.
- that the partnership arrangements will support:
  - collaboration with Traditional Owners in water management
  - the delivery of shared water objectives (for example, water objectives in Country plans and other relevant strategic plans)
  - collaborating in an ongoing and genuine way that supports early planning for all
  - Traditional Owner inclusion at collaborative forums at all levels.

Action 7.1

What: Establish partnership arrangements with Traditional Owners that support their participation in decision making and water management, growing access to water and recognition of the role that water plays in contributing towards a Healthy Country.

Detail:

Commitment to working in partnership with Traditional Owners in water management and planning, and supporting greater influence of Traditional Owners in water landscapes and access to water.

Documentation of each individual partnership arrangement reflects the following base principles:

- Develop relevant forums and processes of interest for Traditional Owners.
- Define agreed timing for participation.
- Provide necessary resources or fee-for-service arrangements.
- Establish the approach for how the partnership will work on shared trust and capacity/succession building.
- Identify shared water objectives (for example, from Country plans) and the approach to achieving these objectives.
- Determine how the success of the partnership will be measured, including the process by which Traditional Owners will have the opportunity to review and contribute to water corporation reporting, including 360-degree feedback on progress.

Who: Greater Melbourne water corporations (GWW, MW, SEW, YVW) in partnership with Traditional Owner groups.

When: Ongoing.

Delivers on SDGs

Action 7.2

What: Work with Traditional Owners to identify and deliver shared strategic water objectives, including those that may be documented in Traditional Owner Country plans and other relevant strategic documents.

Detail: Support Traditional Owner participation in water planning and decision making, and the protection and enhancement of cultural values.

Who: Greater Melbourne water corporations (GWW, MW, SEW, YVW) in partnership with Traditional Owner groups.

When: Ongoing.

Delivers on SDGs

7.2 Sharing the value of water with communities

As water corporations, customers and community are at the centre of everything we do.

The draft *Water for Life* strategy approach and associated Adaptive Plan outlined in Chapter 4 are critically important in providing the solid base upon which we deliver a secure and resilient water supply and robust sewerage service to communities. But importantly, we need the community to enable the delivery of each component:

- Water efficiency programs – need to be informed by customer and community insights and delivered through the water conservation behaviours of our customers to be successful.
- Using a diverse range of sources – engagement at the region-wide scale and within local communities as part of placed-based IWM planning to build understanding and inform planning and decision-making processes.
- Supply system augmentations – engagement, knowledge sharing and involvement to ensure planning decisions and strategy implementation remain aligned with customer and community needs and expectations.

Did you know?

The Thomson Dam, which supplies water to Greater Melbourne, sits on Gunaikurnai land.

Through community engagement undertaken when developing this draft strategy, we understand that people in Greater Melbourne:

- have a strong appreciation for water and the importance of having a reliable water supply in their daily life
- place high priority on water knowledge and would like more support to maintain the currency of their knowledge
- understand they have a role to play in ensuring water security for the future
- want more information to help them make appropriate decisions about how they use water.

Working together to make change

Understanding the true value of water

As water corporations and communities, we need to work together to create a more water efficient society. It is imperative that Victorian communities maintain a strong sense of shared responsibility for our water security.

Water plays an important role in many aspects of life and liveability, ranging from environmental to social, financial and cultural needs. Victorians also value the wide range of recreational activities offered by the waterways of our region.

We all need water to:

- maintain our health and wellbeing
- protect and enhance the health of our natural environment
- support the prosperity of our economy
- ensure water security for Greater Melbourne and our connected water regions.

Traditional Owners we have partnered with have shared that ensuring community understanding around the value of water is also vitally important to support water use decision making.

Victorians are placing increasing value on our environment and protection of our natural world and, during recent engagement, the Greater Melbourne community told us water for the environment and having enough water to reduce the impacts of climate change is a high priority for them. We also learned that people are seeking more information and ongoing guidance from their water corporations. Specifically, customers want to better understand where water comes from and the role it plays in both the health of our environment and wellbeing of our community.

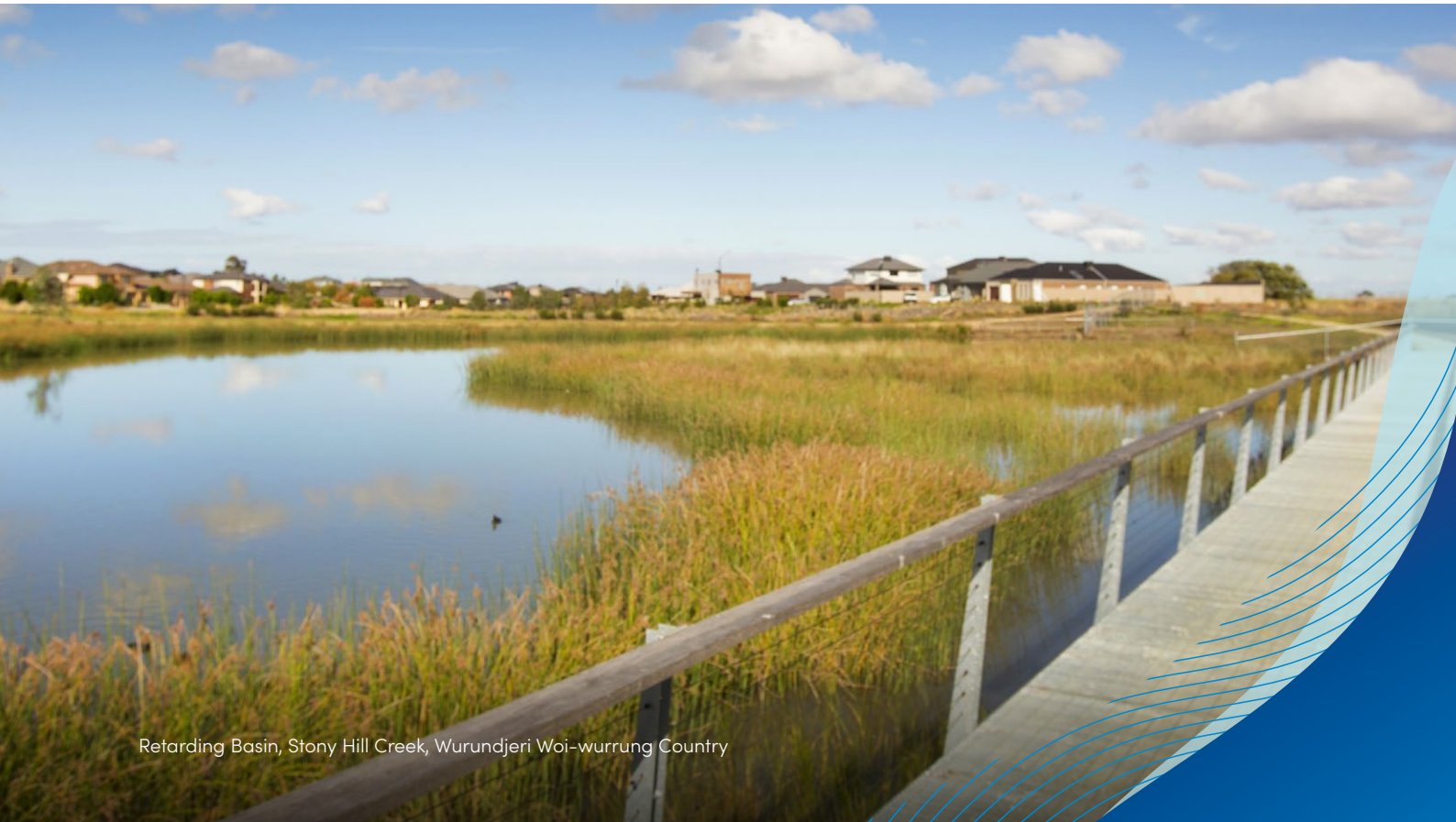
The need for knowledge sharing

By sharing our industry knowledge about how water affects the liveability of our regions, including the protection of environmental, waterway and human health, we will enhance community appreciation of water. Increased education about the cultural and social significance of water is also an essential step towards encouraging everyone to place greater value on water and use it as efficiently as possible. Our community wants to be educated about making use of all available water sources and incentivised to do their bit in homes and businesses.

While people value a reliable supply of water and want to do the right thing when it comes to responsible water use – as demonstrated through exceptional water saving action in the past – there is a need for water corporations to do more. We know younger generations of Victorians have not experienced significant water insecurity, such as water restrictions activated during the Millennium Drought. As the security of our water supply faces increasingly complex challenges, ongoing work is needed to ensure that generations to come hold an in-depth knowledge of the importance of water.

This can be achieved by expanding our current community programs and education campaigns (such as Make Every Drop Count and Target 155) to help people understand the impact of their everyday water use decisions.

The Greater Melbourne water corporations work collaboratively with government to promote efficient water use through initiatives such as the Make Every Drop Count campaign and Target 155 program, a water efficiency initiative that encourages each household to limit water consumption to 155 litres per person each day. These initiatives have contributed to our customers using much less water per person than they did 20 years ago.



Retarding Basin, Stony Hill Creek, Wurundjeri Woi-wurrung Country

Changing the way we use water

There is room to improve water saving efforts across our regions to prepare us for possible long-term drought and increase the security of our water supplies.

We need to work towards better understanding of the true value of water as a precious resource and greater community water conservation as a way of life.

According to a 2017 survey, most people in Greater Melbourne would prefer to use water more efficiently by making changes at home rather than paying more for their water. However, people are not taking advantage of water efficient technologies, as evidenced by the increase in sales of inefficient 3-star washing machines between 2014 and 2017 (Institute for Sustainable Future, 2018).

Water corporations need to respond by providing education and tools to empower customers. For example, applications connected to digital meters can provide them with immediate access to water usage data, helping to address spikes in use or remedy possible leaks that may have otherwise gone unnoticed. We can also help encourage responsible water use through incentives such as rainwater tank rebates and recycling of greywater and stormwater.

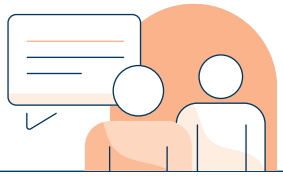
As outlined in Chapter 5, equitable access to water is a priority for our communities. Water should be accessible to all people, including the vulnerable, those living in rural areas and future generations. This requires an integrated and adaptive planning approach that keeps water affordable to allow for equitable distribution in the community today and supports intergenerational equity for our community of the future.

Implementing our 50-year plan

To successfully implement our *Water for Life* 50-year Adaptive Plan and shift to more climate resilient, manufactured water, it is crucial that communities understand, contribute to and support the decisions we need to make.

Educating the community about the need to address our water supply challenge, the true value of water and the opportunities presented by a more diverse water supply system (including climate resilient, manufactured water) is important to build confidence and trust in the services we deliver.

It is vital that all water users understand why we need to act, the role of community and our options to address current and future challenges. Water corporations need to empower the community to participate in decision making throughout the implementation of our Adaptive Plan.



Community voice:
Ongoing education and engagement with stakeholders was a key criterion set by the independent *Water for Life* Community Panel.

Water plays a vital role in almost all production processes and contributes to jobs, exports, international and domestic competitiveness, and vital sectors such as agriculture, manufacturing and tourism. Together, water customers, consumers and corporations have the power to shape a prosperous future for all Victorians by recognising how critical water is to every single person, place, home and business in our community.

Community at Yarra River, Wurundjeri Woi Wurrung Country

7.3 Meaningful engagement

Throughout the development of this draft strategy, the community has been actively involved in decision making. The draft strategy seeks to build on this foundation, with a commitment to empower community through education and engagement for a more prominent role in decision making throughout the implementation of our *Water for Life* 50-year Adaptive Plan.

Shared understanding of how decisions will be made

Water security affects everyone. In planning to protect our future water supply, customers and community should be consulted in an ongoing manner throughout each decision-making process. Empowering and actively involving customers and communities in decision making is a central objective of this draft strategy.

The implementation of the Adaptive Plan outlined in Chapter 4 includes the use of all water supply options, including climate resilient, manufactured water, fit-for-purpose recycled water and stormwater, and greater efforts in water efficiency. It is important that the community has an opportunity to decide on their willingness to pay for service levels we offer and understand the trade-offs we can make to best reflect their priorities.

Our aim is to engage the community about the value of our diverse water supply to encourage contribution to a shared plan for our water future. All end users of water need to be given access to current information regarding the nature of our water supply system, the current status of our water security and the relative merits of the options we have available to us. An informed and empowered public is more likely to value water and contribute to the implementation of a shared plan, whether that be through knowing how they can conserve this precious resource or actively participating in decision-making processes.

Action 7.3

What: Engage with the community on the 'true value of water' to empower our community in decision making and their participation in the Water Security Framework implementation, including drinking water conservation behaviour change.

Detail: This will support the implementation of the Water Security Framework, provide understanding of the water supply system (including the various options, key challenges, and decisions to be made) and build confidence and trust in the services we provide both now and into the future. This will involve:

- delivery of an ongoing cross-industry community knowledge building campaign that supports development of the 'Knowledge, Values and Rules' elements of the adaptive plan and includes driving a stronger appreciation of:
  - the true value of water to all in our community including Traditional Owners, recognising cultural, environmental, recreational and economic values
  - how we are planning to address an uncertain future
  - where our water comes from now and the full range of opportunities we have to address our needs in the medium and long-term.
- water corporations developing and delivering a flexible behaviour change campaign that is underpinned and connected to the community knowledge building campaign and the drought response framework. It is therefore responsive to any short-term water shortages, while driving long-term behaviour change around drinking water conservation and increased uptake of fit-for-purpose recycled water.
- an ongoing community engagement program that seeks to understand evolving community values, preferences and expectations that:
  - supports implementation of the Adaptive Plan through development of the 'Knowledge, Values and Rules' elements for each option
  - informs decision making in relation to specific augmentations
  - informs decision making as to action preferences needed to manage supply emergencies and droughts and understanding changing community preferences.

Who: Greater Melbourne water corporations (GWW, MW, SEW, YVW).

When: Ongoing.

Delivers on SDGs

A Water Security Framework underpinned by community knowledge building, behaviour change and empowerment, and engagement in decision making.

The short and long-term water security for Greater Melbourne is managed through our Water Security Framework. This framework guides planning, decision making and implementation work required for our Adaptive Plan with clear trigger points and governance arrangements.

For each element of the Water Security Framework, community knowledge building, behaviour change and engagement in decision making are critical components (see Figure 39). For example, embedding water conservation behaviours is integral to both our short and long-term planning. Flexibility in such campaigns to drive greater community focus on the actions they can take in the instance of a drought will be critical to the success of our response.

A shift in community appreciation that water is much more than a utility is also critical to support our short and long-term planning; that is, community's appreciation of how water underpins:

- the way we live our lives
- wellbeing for all in our community including Traditional Owner cultural and spiritual wellbeing
- the health of our environment.

This understanding, along with that of our short and long-term water availability status, empowers the community to participate in and support key decision making around the level of service provided and what our water future should look like. Working with the community to have an ongoing appreciation of evolving community values and preferences will be a critical element of the implementation of our Adaptive Plan.

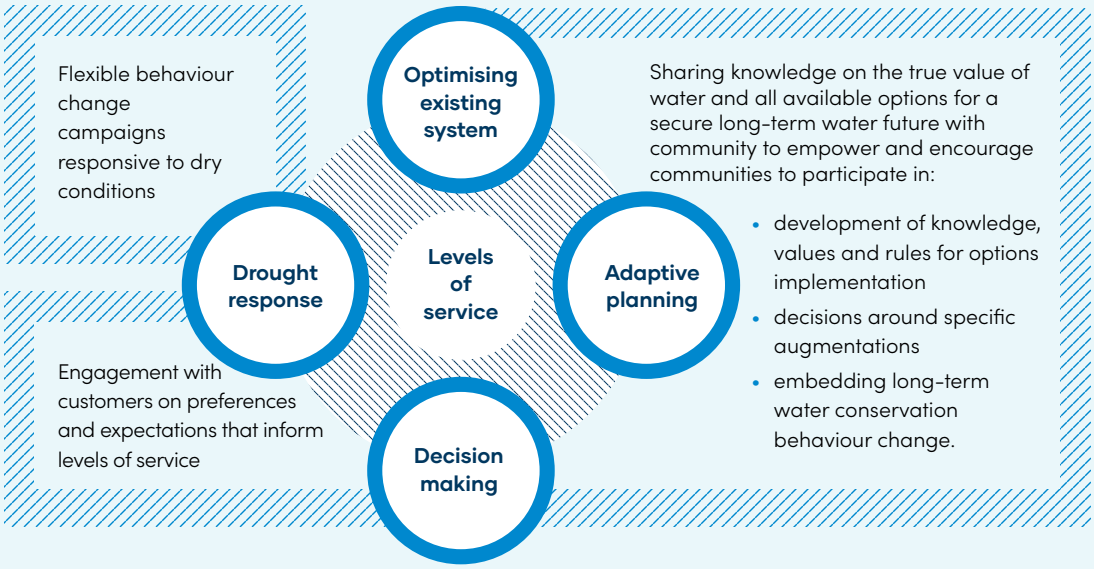


Figure 39: How working together with the community strengthens our Water Security Framework

8

Finalisation and Implementation of the draft *Water for Life* strategy

Chapter overview

This draft strategy sets out the Greater Melbourne water corporations' proposed plan to meet the region's short and long-term water needs over the next 50 years.

It includes an adaptive implementation plan that specifies how each action will be implemented and when further community or stakeholder engagement will occur to refine specific solutions over time.

8.1 Ongoing monitoring and adaptive implementation

Why we need adaptive management

The challenges of managing water systems are multifaceted and need a range of solutions to ensure they are adequately addressed. Given future uncertainty, it is vital that we take an adaptive approach to water management, developing plans and strategies that form part of a broader approach.

Critical to the success of such an adaptive approach is to monitor key changes in water demand, climate change, customer behaviour, innovation, social preferences, economic conditions and affordability, among others.

We also need to look back to see what has worked well, what we need to keep and what we need to change. This adaptive approach will ensure that the strategy remains relevant and that we are doing the right things to continue to improve water services into the future.

As outlined throughout this draft strategy, Victoria's water resources are managed through various processes and plans, including (see Figure 40):

- a CGRSWS every 10 years
- an urban water strategy with a 50-year planning outlook every five years
- IWM forums and plans, refreshed every five years
- a drought preparedness plan every five years or within 12 months of either the lifting of any period of water restrictions or the augmentation of any water supply system
- an Annual Water Outlook with a short (one-year) and medium-term (up to five-year) focus that includes action plans for managing the water portfolio for the following year and next three years.

In addition to these cycles of review, ongoing planning and evaluation occurs in relation to accounting and reporting, monitoring and analysis, system modelling, yield assessment, system optimisation, research, customer and stakeholder relationships, infrastructure studies and risk management plans.

Throughout all processes, water corporations regularly review their actions and approach to ensure they are appropriate to the current situation and reflective of available future projections.

Following the community consultation period on this draft strategy, a final strategy will be released in 2022 which outlines the agreed strategy outcomes and actions and includes an adaptive implementation plan that specifies how each action will be implemented and when further community or stakeholder engagement will occur to refine specific solutions over time.

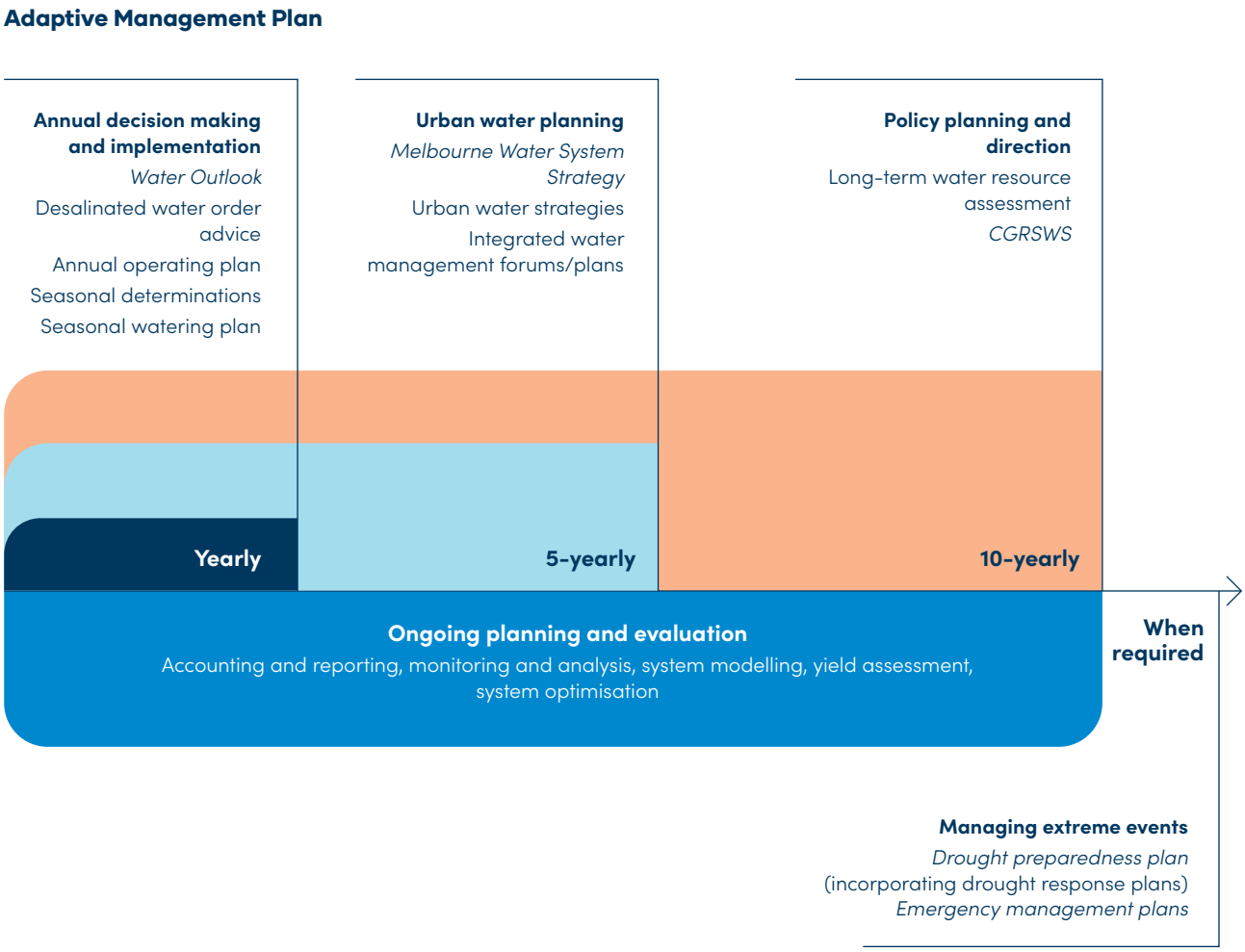


Figure 40: Victoria's existing water management planning processes

Ongoing monitoring and review

The events of the past few years (drought, bushfires, floods, COVID-19) have highlighted that we live in a complex, changing and unpredictable world.

Climate conditions and water availability are variable, but things can change quickly. We know from previous urban water strategies and system strategies that the implementation of actions can be influenced by environmental, technological, social, cultural and economic drivers, triggers and uncertainties. Intense, frequent and overlapping disruptive events caused by a changing climate, which are increasingly likely in the future, also generate uncertainty.

To develop this draft strategy we have considered:

- a wide range of future scenarios
- the role of water in delivering our Community Vision for Greater Melbourne
- the aspirations of communities
- the needs of Traditional Owners
- the options for infrastructure and water management solutions
- other policy responses needed to ensure that we have enough water to meet our water needs now and into the future.

However, there remains uncertainty around what our future will look like and the scale and types of water services that will best meet those needs. Even though we have a view of what needs to be done to deliver the outcomes for Greater Melbourne over the near term in the next 15 years, the draft strategy still needs to set out a pathway for adaptive decision making.

A detailed adaptive implementation plan for ongoing monitoring, evaluation and reporting will be developed after the release of the final strategy. In developing and implementing this plan, the Greater Melbourne water corporations will work with Traditional Owners, recognising the commitment of Traditional Owners to care for Country and their unique and sacred knowledge of Country derived from their connection.

The adaptive implementation plan will support the achievement of the agreed outcomes by articulating 'how to get there' and deliver on the outcomes as the future unfolds. It will be a tool to assist the water sector, Traditional Owners and our community to successfully deliver the final strategy. It will detail who is responsible for delivering each action, the timeframe for implementation and what additional consultation is required during its implementation.

The adaptive implementation plan will ensure that the outcomes in the final strategy are locked in, while at the same time allowing flexibility to allow for adaptation as circumstances change and knowledge improves. For example, the Adaptive Plan outlined in Chapter 4 will allow new water supply options to be brought forward, pushed back or amended to reflect new data and changed circumstances over time.

As the urban water strategies and system strategies are refreshed every five years, updates to the Adaptive Plan will be published so that any changes are transparent, with consultation on specific options built into future business cases and assessment processes.

8.2 A clear oversight model for implementation and decision making

Many organisations including government, water corporations, CMAs and Traditional Owners are involved in water management for Greater Melbourne and all will have a part to play in implementing the final strategy.

Supporting the restoration of Traditional Owners' cultural responsibility into the region's waterway management and planning will require strengthening agreement-making processes between the water sector and Traditional Owners. A cultural landscape approach will be important when implementing the final strategy, as will providing appropriate resourcing and funding.

To ensure we have enough water for all of our requirements, we need to ensure that:

- in the short term (5 to 10-year horizon) we are choosing the right options and making sound investment decisions
- in the long term (50-year horizon) we continue to:

  1. reduce demand on the system through water conservation and efficiency efforts, as well as increased application of IWM and alternate source projects
  2. progress readiness activities and be prepared to implement a supply system augmentation, as needed.

Over the next 50 years our future will face challenges that will require more water, and we have to be prepared with a plan for this uncertainty.

The proposed Water Security Framework enables us to manage the uncertainty from the pressures on our water system in both the short and long-term horizons. A key proposal to accompany the framework will be clear roles and responsibilities, and principles for business case implementation for future augmentations. Clarity on oversight and funding models once this draft strategy is finalised will ensure we can make good decisions in the future.

The existing oversight model used by water corporations is currently being reviewed and will be confirmed after the release of the final strategy in line with the adaptive implementation plan, after the wide range of organisations involved in water management decisions have worked through the best model.

Abbreviations

BE	Bulk Entitlements
CGRSWS	Central and Gippsland Region Sustainable Water Strategy
CMA	Catchment Management Authority
DELWP	Department of Environment, Land, Water and Planning
GL	gigalitre (one billion litres)
GMUWSS	Greater Melbourne Urban Water & System Strategy
GWW	Greater Western Water
IAP2	International Association for Public Participation
IWM	integrated water management
KVR	'knowledge, values, rules' framework
ML	megalitre (one million litres)
MW	Melbourne Water
RAP	Registered Aboriginal Party
SEW	South East Water
SRW	Southern Rural Water
SWEP	Schools Water Efficiency Program
VEWH	Victorian Environmental Water Holder
VPA	Victorian Planning Authority
Water Act	*Water Act 1989* (Vic)
WELS	Water Efficiency Labelling and Standards scheme
WSAA	Water Services Association of Australia
YVW	Yarra Valley Water

Glossary

Term	Definition
Aboriginal	'Aboriginal' and 'Torres Strait Islander' refer to different groups of peoples. Aboriginal refers to the original peoples of mainland Australia. Torres Strait Islander refers to the original peoples of the islands located in the Torres Strait. If describing people individually, 'Aboriginal people' or 'Torres Strait Islander people' is preferred (noting people would rather be called by their mob name). 'Indigenous people' can be used to describe Aboriginal and Torres Strait Islander people either individually or collectively.
allocation	Water that is available to water entitlement holders (excluding take and use licences) in a given water season under the terms of their entitlement.
aquifer	An underground layer of rock or unconsolidated material – gravel, sand or silt – that can store and yield very large volumes of usable water.
augmentation	Adding to or expanding the capacity of the existing water supply system
basin	Earthen water storage.
biosolids	Predominantly bacteria, biosolids are organic matter recycled from sewage. After treatment it is used as a fertiliser and soil conditioner.
bulk entitlement	A right to use and supply water in a waterway, water in storage works of a water corporation, and groundwater. The bulk entitlement sets out the amount of water that can be taken or stored under specific conditions or specifications, up to a maximum volume. Water corporations and other specified bodies defined in the *Water Act 1989* can hold bulk entitlements.
cap	An upper limit on water that can be diverted from a waterway, catchment, basin or aquifer.
carryover	An arrangement that allows a water entitlement holder to take unused water allocations from one season into the next season to use or trade. Carryover rules depend on the declared system in which allocations are held.
catchment	The region within which all rainfall flows, other than that removed by evaporation, into waterways and then to the sea or terminal lake.
(protected) catchment	Water in Melbourne often comes from catchments which are protected – that is, human activities and development in these areas are very limited or not allowed.
catchment management authority	A statutory body established under the *Catchment and Land Protection Act 1994* (Vic). CMAs have responsibilities under both that Act and the *Water Act* for river health, regional and catchment planning and coordination, and waterway, floodplain, salinity and water quality management.
commoditisation of water	Process of transferring water from a public good into a tradeable commodity.
consumptive uses	All extractive uses of water by individuals, households, agriculture, industry and commerce.
Country	Aboriginal culture revolves around relationships to the land and water. For Traditional Owners, Country is a part of who they are, just as they are a part of it. Country must be respected. Traditional Owners are authorised to speak for Country and its heritage.

Term	Definition
Country plan, Caring for Country plan, Whole-of-Country plan	Country plans are one way for Traditional Owners to articulate their priorities and aspirations for looking after Country. These can be strategic plans that encompass physical and spiritual concepts of Country, provide a strategic basis for partnerships, and identify management actions and economic opportunities.
disinfection of water	The removal, deactivation or killing of pathogenic microorganisms. This can be achieved in water by a number of different physical, chemical and biological processes.
diverse sources of water	A range of sources of water that includes stormwater, rainwater and fit-for-purpose recycled water that can reduce the demand on the water supply system and can provide additional benefits to the environment and our communities.
diversion	Removal of water from a waterway – e.g. via a pump.
ecosystem	A dynamic complex of plant, animal, fungal and microorganism communities and associated non-living environment interacting as an ecological unit.
environmental entitlement	A continuing legal right to take and use water allocated under Part 4, Division 1A of the *Water Act* to maintain the Environmental Water Reserve and to preserve or improve the environmental values and health of water ecosystems.
environmental water deficit (shortfall)	The shortfall volume of water required to sustain a waterway's ecological values under current and/or future climate scenarios, and the volume of water that is actually supplied to the waterway.
environmental water manager	A CMA or Melbourne Water which decides when and how to use environmental entitlements in partnership with the VEWH, and how to manage and protect the Environmental Water Reserve.
environmental values	The uses, attributes and functions of the environment that Victorians value
Essential Services Commission	Victoria's independent body responsible for regulating the price, quality and reliability of essential services.
excess stormwater	The additional runoff created by an urbanised environment, compared to that of a non-urbanised environment, particularly by impervious surfaces.
fit-for-purpose water use	Matching water of a certain quality to a use that is appropriate to that quality and reliability.
flow	Water moving in a waterway.
greywater	Sewage discharged from domestic washing basins, baths and showers.
greywater treatment system	Treatment system that only treats greywater. Generally occurs on a small onsite scale. Chemical, physical and biological treatment approaches can be applied to greywater treatment.
greywater diversion	Greywater that is diverted without treatment, generally on a small residential scale for irrigation purposes.
groundwater	Water held in an aquifer.
inflows	Water flowing into a storage or waterway.
industrial wastewater	Effluent derived from an industrial or commercial process. Interchangeable with industrial sewage or industrial waste.

Term	Definition
integrated water management (IWM)	Water management that considers the urban water cycle as a single integrated system. IWM is practised through a collaborative and jointly planned management of all water systems where all waters are resources, valued and put to use.
knowledge, values, rules framework	A framework used for analysing decision making, incorporating societal factors that influence decision-making processes and the resulting options and choices.
levelised cost	The overall project expenditure relative to the amount of water provided over the asset life. Allows different approaches to be compared in units of $/kL or $/ML.
liveability	Factors that improve the 'quality of life' or 'wellbeing' of the inhabitants of a city or place.
long term	The period of time beyond 15 years from when this strategy was developed.
manufactured water	Water that is produced at scale using advanced treatment processes to a high quality. This includes desalinated water and fit-for-purpose recycled water.
Melbourne Water System Strategy	A plan prepared by Melbourne Water in accordance with its *Statement of Obligations* (General) that provides an overview of the security of the metropolitan Melbourne water supply system.
Millennium Drought	The Victorian drought that began with low rainfalls in late 1996 and ended in 2009, resulting in the lowest inflows on record into many of Victoria's catchments.
Minister	The Victorian Government Minister responsible for administration of the *Water Act 1989* (Vic) and *Water Industry Act 1994* (Vic).
near term	The period of time from when this strategy was developed to 15 years.
non-revenue water	Water that enters the network but is not delivered to customers.
portfolio	A range of options in combination to deliver water security.
potable water	Water that is appropriate for human consumption, i.e. drinking.
price signals	Information conveyed to consumers and producers via the price charged for a product or a service.
purified recycled water	Taking treated sewage or stormwater and sending it through advanced treatment processes, to filter and purify it so that it is safe to drink and meets the required health and safety standards.
qualitative survey	Qualitative surveys are primarily exploratory research. They are used to gain an understanding of underlying reasons, opinions and motivations.
quantitative survey	Quantitative survey questions are defined as objective questions used to gain detailed insights from respondents about a specific area of enquiry.
quadruple-bottom-line method	A method of evaluating performance against four criteria: cultural, economic, environmental and social. It is an extension of triple-bottom-line accounting (people, planet and profit) to include cultural needs.
raingarden	A specifically designed garden that captures stormwater from hard surfaces such as driveways, patios and roofs and treats it before re-use or discharge to the environment.
rainwater	Water originating from roofs. Once mixed with water from other urban surfaces (roads, carparks, etc.) it becomes stormwater.
rebates	A portion of money that is returned to consumers. Returns may be tied to expenditure on certain items like water savings infrastructure.

Term	Definition
reclaimed/recycled water	Water that has been derived from sewerage systems or industrial processes and is treated to a standard that is safe and appropriate for its end use. The following classifications are utilised in Victoria and based on the presence or assumed presence of pathogens based on the level of treatment: Class A: Tertiary treated wastewater with a high level of disinfection. Can be utilised for non-potable purposes including irrigation of food crops and sporting fields, and clothes washing. Class B: Secondary treated wastewater with some disinfection. Can be used for animal grazing and industrial washdown. Class C: Secondary treated with some disinfection. Can be used for irrigation in controlled public space, industrial use with no risk of human exposure or agricultural use for food crops that will be cooked or processed. Class D: Secondary treated. Can be used for non-food crops, including instant turf, woodlots and flowers.
recreational users	People who fish, waterski, row, camp, walk, birdwatch or attend or participate in sports events, social gatherings and other activities on or near waterways.
Registered Aboriginal Party (RAP)	A Traditional Owner group legally recognised under Victoria's *Aboriginal Heritage Act 2006*, with responsibilities for managing and protecting Aboriginal cultural heritage on Country. They are the primary guardians, keepers and knowledge holders of Aboriginal cultural heritage.
resilience	The capacity of a community, business, or natural environment to prevent, withstand, respond to, and recover from disruption.
restorative justice approach to water	A return of rights that were never ceded but were enjoyed by settler communities and then enshrined in Western systems of law. It recognises that past practices have caused historical and continuing harm and inequities.
reverse osmosis (RO)	The process which uses a membrane under pressure to separate relatively pure water from a less pure solution. The approach is often applied to salt water or recycled water for drinking water purposes.
self-determination	The United Nations Declaration on the Rights of Indigenous Peoples describes self-determination as the ability for Indigenous people to freely determine their political status and pursue their economic, social and cultural equity, based on their own values and way of life. This means that Traditional Owners have the right to make choices that best reflect them on their journey to self-determination and self-governance.
septic tank/onsite treatment system	Sewage treatment system that retains water on its own site.
sewage	Water (wastewater) that households and businesses wash away through the sewerage system (excluding trade waste).
sewerage	The pipes and plants that collect, remove, treat and dispose of sewage.
shared benefits	Benefits achieved when water is managed primarily to meet the needs of the entitlement holder, but also provides secondary environmental, Traditional Owner or social benefits through decision making, without requiring additional water.
short-term or ready options	Options that can be implemented in the next five years.

Term	Definition
social licence	When a project or organisation has an ongoing approval with the community and other stakeholders.
Statement of Obligations	A ministerial directive issued under section 4I of the *Water Industry Act 1994* that imposes obligations on a water corporation in relation to the performance of its functions and exercise of its powers.
storage capacity	The lesser of 1,812,175 ML or the sum of the capacity of the following reservoirs at full supply level – Thomson, Cardinia, Upper Yarra, Sugarloaf, Silvan, Tarago, Yan Yean, Greenvale, Maroondah and O'Shannassy.
stormwater	Water that is generated predominantly from impervious surfaces (roofs, roads, footpaths and hard surfaces) as a result of rainfall events. Rainwater (water originating from roofs) is a component of stormwater.
stormwater harvesting	The collection, treatment, storage and use of stormwater.
stormwater management	Technological and institutional initiatives and interventions to mitigate the impacts on the natural environment of excess stormwater (quality and quantity) resulting from landscape development.
supply system augmentation	An additional volume of water being brought into the water supply system.
surface water	Water found on the surface of the land, in waterways (such as rivers, wetlands and estuaries) and in bodies of water (such as lakes, dams and reservoirs).
time of use pricing	Pricing is charged at different rates depending on the time of day or year.
trade waste	Describes both industrial or commercial wastewater/effluent. For organisations discharging large volumes of trade waste, charges are based on the volume and quality of discharged water.
Traditional Owners	People who, through membership of a descent group or clan, are responsible for caring for particular Country. A Traditional Owner is authorised to speak for Country and its heritage.
Traditional Owner Corporation	An incorporated group that represents the interests of Traditional Owners in a particular area. A TOC may hold rights under the *Native Title Act 1993 (*Cwlth), the *Aboriginal Heritage Act 2006* (Vic) or the *Traditional Owner Settlement Act 2010 (*Vic) on behalf of the Traditional Owners it represents and enter into other formal agreements.
Traditional Owner water access	Relate to holding of water entitlements on a temporary or permanent basis by Traditional Owners.
units of measurement	megalitre (ML): one million (1,000,000) litres. gigalitre (GL): one billion (1,000,000,000) litres.
urban heat island effect	The effect of a localised increase in heat (temperature) within urban areas relative to surrounding natural or rural environments. This is a result of greater paved and concrete areas, less vegetation and increased thermal impacts from vehicle and building emissions.
urban water strategy	All water corporations in Victoria are required to develop an urban water strategy, stating how water supplies and water demands will be balanced over the long term. These strategies are the next iteration of water supply-demand strategies first prepared in 2007. *Water for Life* is an urban water strategy.

Term	Definition
variable tariff	A variable tariff can change based on the determination of the seller or pricing regulator.
Victorian Environmental Water Holder (VEWH)	An independent statutory body responsible for holding and managing Victoria's environmental water entitlements.
wastewater	Water (sewage) that households and businesses wash away through the sewerage system.
water balance	A summary of the flow of water into and out of a system, such as a catchment or town.
water corporation	A state-owned organisation providing a range of water services to customers in its service area, including: water supply; sewage and trade waste disposal and treatment; water delivery for irrigation, domestic and stock purposes; drainage; and salinity mitigation. Some have regulatory functions for diverting water from waterways and extracting groundwater.
water entitlement	An authorisation to take and use water depending on resource availability, such as a water share, take-and-use licence, water allowance or supply by agreement.
water grid	Victoria's water grid connects sources of water through a network of natural and built infrastructure to meet demand for water by people, industries and the environment. It also incorporates arrangements by which water can be purchased and sold through water markets and allocated through the water entitlement framework.
water quality	The chemical, physical, biological and radiological characteristics of water. It is a measure of the condition of water relative to the requirements of one or more biotic species or to any human need or purpose.
water restrictions	Temporary short-term measures imposed in times of drought to reduce demand and conserve water supply for essential needs.
water sector	The broad range of entities with a stake or role in water management, for example water corporations, CMAs, local government and the VEWH.
water security	The capacity of a population to access adequate quantities of acceptable quality water to sustain life, socio-economic development and human wellbeing.
water sensitive urban design	An approach to the planning and design of urban environments focused on integrating the urban water cycle (including potable water, sewage and stormwater) with the built and natural landscape.
water storage	A hydrological feature that stores water. Surface water storages include natural and artificial ponds, lakes, reservoirs and lagoons, as well as weirs and dams.
water supply system	Any plant, equipment, inflows, hydrological dynamics, receptacle or other device involved in manufacturing, harvesting, treating and/or distributing potable water throughout the water corporations' collective districts.
waterway	A river, its associated estuaries and floodplains (including floodplain wetlands) and non-riverine wetlands.
wetland	An area, whether natural, modified or artificial, that is subject to permanent or temporary inundation and holds static or very slow-moving water and develops – or has the potential to develop – biota adapted to the aquatic environment. A wetland may be fresh or saline.
yield	The quantity of water produced by a storage or aquifer.

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Appendix A
Adaptive Planning

How we developed an Adaptive Plan made up of a diverse portfolio of options

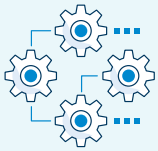
Considering all options is a prudent and necessary strategy for Greater Melbourne's water future. A diverse portfolio of water supply options will build resilience to climate change, provide for our growing population and make good use of resources that would otherwise be wasted and cause harm to our environment.

To develop this draft strategy we have collaborated with the community, Traditional Owners and industry experts to ensure integrated decision making, smart investments and future-focused solutions that deliver the best long-term value for all our diverse water needs. This process (as shown in Figure 2) has informed our Adaptive Plan, shown in Figure 3.

Why we need to consider all options

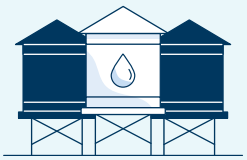
Good planning means considering all options, and exploring and understanding these in the local context. Exploring a range of options from a variety of different perspectives means we can make informed decisions to help address the challenges we are facing. The different types of options available to us can be grouped under three key themes, shown in Figure 1 (also shown in Chapter 4, Figure 25).

Enhancing and expanding our existing system



- Manufactured water options (including desalination or fit-for-purpose recycled water)
- Surface water - river dependent sources (new dams, more water out of existing rivers, diversions from existing rivers)
- Groundwater
- Optimising the existing system - i.e. transfer network optimisation.

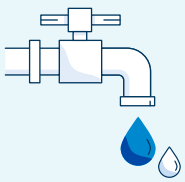
Integrated water management solutions



Increasing the use of diverse sources by:

- stormwater harvesting
- rainwater tanks
- fit-for-purpose recycled water (large and smaller scale)
- greywater (industry and household scale).

Water efficiency solutions



Increasing water conservation and efficiency by:

- digital meters
- behaviour change programs - e.g. community engagement or education campaigns
- household scale - efficient appliances, fixtures and fittings such as showerheads, toilets, leaks, washing machines
- industry-scale efficiency.

Figure 1: Future options grouped by key themes

What was considered in our 'long list of options'

Investing in a diverse portfolio of water supply options will balance water security with affordability and delivery of other benefits that a water supply system can provide. It will assist us to reduce our reliance on rivers and dams for water supply, and it could provide more opportunity to return water to Traditional Owners and the environment. Using multiple options of supply also gives us the flexibility to respond to changing circumstances, such as variations in climate and rainfall.

To effectively use all sources of water, we need a range of actions at varying scales, including both centralised and decentralised, and structural and non-structural. We have developed a comprehensive portfolio of options, so that the investigation and planning of these – including design, approvals, contracts and governance – can be actioned ahead of time. This means that preferred options are ready to proceed when required, with shorter lead times resulting in more efficient implementation of new approaches.

Thus, there are three key components of the options:

Water efficiency solutions

Reducing demand on the system by continuing our investment in water conservation and efficiency programs.

Integrated water management (IWM) solutions

Reducing demand on the system by increasing our use of diverse water sources, such as stormwater, rainwater, and fit-for-purpose recycled water.

Supply system augmentations

Enhancing and expanding our existing system to increase supply through climate resilient, manufactured water (such as desalinated water or fit-for-purpose recycled water) and stormwater solutions.

The following section describes how each of the components have been developed.

1. Using water efficiently and conserving water

Using water efficiently and conserving water is the most cost-effective way of reducing the pressure on our water supplies. It requires our communities to use water more conservatively to make the most of the supplies that we have. Using water more efficiently assists in delaying the need for investment in infrastructure for new supply system augmentation options, therefore reducing the costs to customers and allowing additional time for new technologies to be established.

Water efficiency programs, aimed at changing inefficient fixtures, appliances and behaviours, are run in Melbourne, across Australia and worldwide. Understanding these programs, combined with our knowledge of how the community uses water, allows us to tailor future programs to Greater Melbourne's needs. Taking these learnings we have sought to understand the potential role for:

- residential plumbing audits
- showerhead exchanges
- digital metering
- rebates
- behaviour change
- targeted programs with business and government customers.

To determine the total contribution the potential efficiency programs could make to offsetting demand on the water supply system, two combination projections were made:

- **'Moderate Portfolio':** A combination of audits, showerhead exchanges, rebates and behaviour change programs spread over time with a moderate take-up effectiveness to reflect a likely scenario.
- **'Higher Portfolio':** The total of all water efficiency activities identified with full take-up effectiveness and early take up, reflective of high early investment.

These projections provide a possible performance range for the volume of drinking water offset to the system delivered by water efficiency over time.

2. Using diverse sources of water through an IWM approach

A suite of IWM opportunities to utilise diverse sources of water has been identified by the water corporations and will be further investigated and prioritised in the next five years. This includes rainwater, stormwater and recycled water, and greywater opportunities.

These projects were identified through a process involving key stakeholders, which built from a series of recent studies and work to date through the IWM forums. The purpose of the investigation was to:

- identify the IWM opportunities at a regional precinct and local scale
- understand how they contribute to the catchment scale IWM targets (referenced in Chapter 6.1 on page 122) which have been developed through the IWM forums
- establish the volume of water these schemes could produce that may reduce demand on the water supply system.

Three IWM portfolios made up of IWM solutions were created to reflect different delivery contexts as shown in Table 1.

Table 1: IWM project portfolios

Portfolio	Overview
Base case	Includes third pipe recycled water to majority of growth areas. The base case of committed projects is included in our supply demand curve.
1 Growth areas + peri-urban fringe 	This portfolio considers the opportunity to introduce IWM opportunties such as rainwater on properties, stormwater harvesting and recycled water supplies in 'greenfield' areas on the urban-rural fringe of Melbourne. These projects include 'new' infrastructure and networks that could be rolled out with development in greenfield growth areas or could provide new water supplies for agricultural and environmental uses outside of built-up areas. Due to their greenfield nature, these projects are typically more straightforward from a physical design and delivery perspective. This portfolio will reduce the demand on our system.
2 Established areas 	This portfolio considers IWM opportunties such as rainwater on properties, stormwater harvesting and recycled water supplies that could service existing and future demands in established areas, through retrofitting infrastructure or infill or 'brownfield' development in established areas of Melbourne. This could include incremental change and the gradual expansion of supply networks in tandem with other urban regeneration and infrastructure upgrades. This porfolio of opportunities will reduce demand on our system.
3 Supplementary drinking supplies 	While portfolios 1 and 2 provide IWM opportunties such as rainwater on properties, stormwater harvesting and recycled water to existing and future demands, the third portfolio considers the potential for diverse sources of water to supplement regional drinking water supply networks, by contributing to reservoirs or aquifers or by manufacturing stormwater for potable supply.

To determine the total possible contribution the portfolios could make to offsetting demand on the water supply system, two combination projections were made:

- **'Moderate Portfolio':** A grouping of projects that are considered likely and deliverable under current policy conditions and with existing organisational responsibilities.
- **'Higher Portfolio':** The total of all projects identified, including projects which would require changes in delivery conditions and policy.

The supply and demand projections in this draft strategy do include a low 'portfolio' of committed IWM solutions which is called the 'base case' and these solutions reduce the demand on the supply system.

3. Adding new sources: supply system augmentations

To meet the water supply challenges of the future, we need to continue to invest in new sources through large-scale system augmentations to complement our efforts in using diverse sources of water and using water more efficiently.

Climate risks (such as reduced streamflow due to climate change) and climate variability (resulting in periods of drought) require us to shift away from reliance on traditional water supply approaches, such as new dams or dam augmentations. Climate resilient, manufactured water will play a large role in providing new sources of water.

A long list of options was developed to capture a summary of all of the possible options at a point in time and provide a future reference point for review when implementing the Adaptive Plan. These options are outlined in Table 2.

Table 2: The 'long list' of water supply system augmentation options

Categorisation
Manufactured water
Desalination centralised – east and west
Desalination – decentralised
Surface water - river dependent sources
River dependent sources – east, north and west
Optimising the system – transfer network upgrades and local system diversions
Groundwater
Stormwater – included in the IWM project portfolios
Other
Tasmanian pipeline
Cloud seeding
Evaporation reduction
Ice harvesting

Assessing the options against our options evaluation criteria

The long list of options has been evaluated using a robust set of options assessment criteria which comprises three key inputs: technical and non-negotiable; community; and Traditional Owner (**see Chapter 4,** Figure 27 **for the options evaluation criteria**). These criteria have been considered through a quadruple-bottom-line framework, incorporating economic, environmental, social and cultural criteria.

The objectives of the evaluation are to incorporate community and Traditional Owner values into the options assessment and to understand how these values inform option preferences.

Assessing the options against our Knowledge Values Rules framework

Options have also been categorised between those which are available to us now, and those which may be available in the long term using a framework called 'Knowledge, Values Rules' (**see Chapter 4,** Figure 28 **for the KVR framework**).

The KVR framework identified the actions required to change or evolve the decision-making context to enable a future decision, and hence the timeframe in which an option may become available. The framework complemented the community and Traditional Owner criteria by identifying the work needed to enable options that align with community and Traditional Owner priorities and values, as expressed in these criteria.

By using this model, we are able to assess constraints in the decision-making processes supporting the development of adaptive responses.

Portfolios of preferred options

We have investigated a range of options that include climate resilient, manufactured water (such as desalination and fit-for-purpose recycled water), optimising the existing surface water system, recycled water, stormwater harvesting, rainwater, water efficiency and conservation. No single solution can meet the challenges of a warming, drier climate and a growing population and meet the needs of our community, Traditional Owners and environment.

Figure 2 outlines the full options analysis process we have undertaken to develop the Adaptive Plan (**see Chapter 4,** Figure 29 for full detail). This list was identified by applying the evaluation criteria, Knowledge Values Rules framework and the supply demand deficit.

The portfolios of preferred options can be used to describe how we can combine these individual options. The adaptive pathways then enable comparison of the different 'combinations' of the portfolios and assessment of these different combinations under a range of possible future scenarios, which include climate change and population growth.

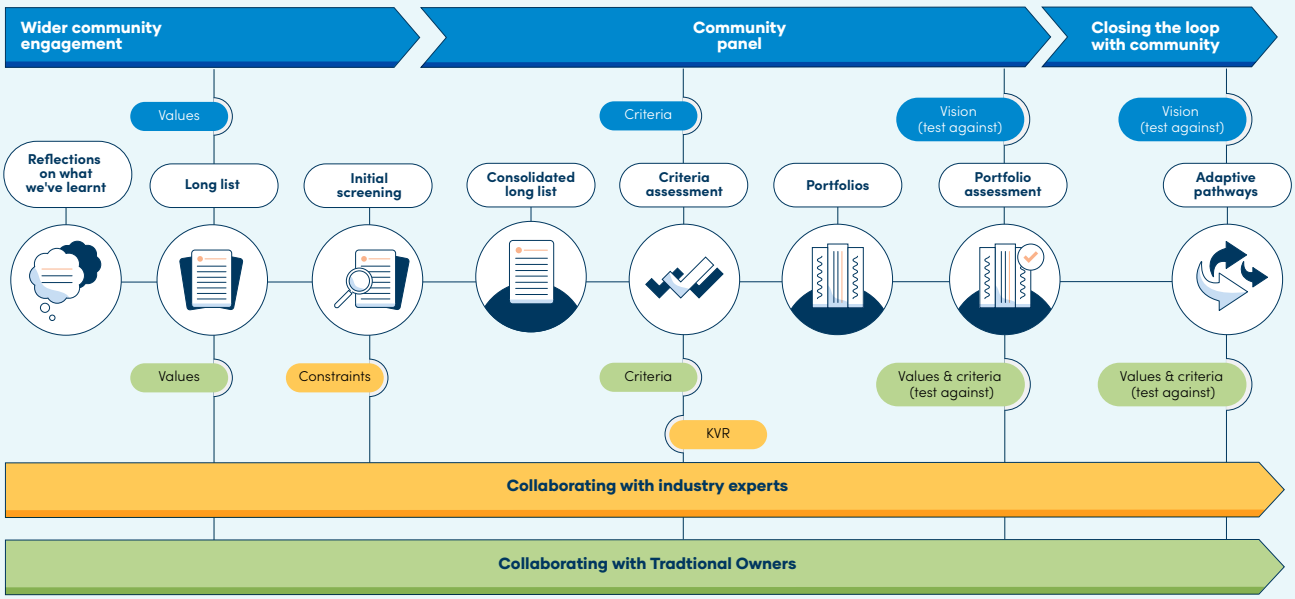


Figure 2: The options analysis process for the Adaptive Plan

Pathways and possible futures

Strategic objectives of the pathways

An adaptive plan requires clear strategic and tactical objectives. Strategic objectives describe the high-level aspiration or purpose and direction for what this draft strategy is trying to achieve. Tactical objectives communicate a more detailed approach to meeting the strategic objectives, often bound by a timeframe and including a metric.

The strategic objectives for the adaptive pathways have been guided by the strategic framework of this draft strategy. Storage, consumptive water, environmental water, cultural water and social water were central themes. Workshopping and refinement of these objectives with key stakeholders led to the strategic objectives detailed in Table 3. These objectives have guided how the options have been developed into portfolios to inform possible futures for the Adaptive Plan.

The key drivers for meeting the strategic objectives have been determined as: ensuring there is no prolonged system deficit (projected supply meets projected demand over time); ensuring adequate supply, with enough water within the system to meet existing environmental and drinking supply obligations (water is of adequate volume and quality and is fit for purpose); and increasing the Greater Melbourne water system resilience to respond to shocks and stresses such as drought or severe bushfires.

Table 3: Adaptive plan strategic objectives

	Strategic Objectives
Short term (first 5 years)	For the next five years the water supply system is capable of meeting existing levels of service
Medium to longer term (up to 2070)	The water supply system is capable of satisfying all demands over the 50-year outlook period, while meeting agreed levels of service – considering potential growth, climate change, shocks and stressors, and drought outlooks
	IWM solutions (stormwater, rainwater and recycled water) are significant contributors to water resource management including for the water supply system
	A baseline water supply system augmentation pathway is developed for the high climate change and high growth scenario, accounting for drought and without reliance on IWM solutions
	Water conservation and efficiency measures will provide an ongoing, incremental base contribution to meeting the supply-demand deficit over the 50-year planning horizon
Other **(from separate processes which may amend or add to the above)**	Restore the environmental share of water to the level set in the last Sustainable Water Strategy
	Traditional Owner water rights are restored
	The water supply system is carbon neutral by 2030

Through the adaptive planning approach and extensive analysis, we have identified five plausible future pathways that can respond to changing conditions. **All of the five future adaptive pathways are effective in securing our system against a warming and drying climate, growing population, and diverse and changing water uses, values and needs.**

Key takeaways from the Adaptive Plan:

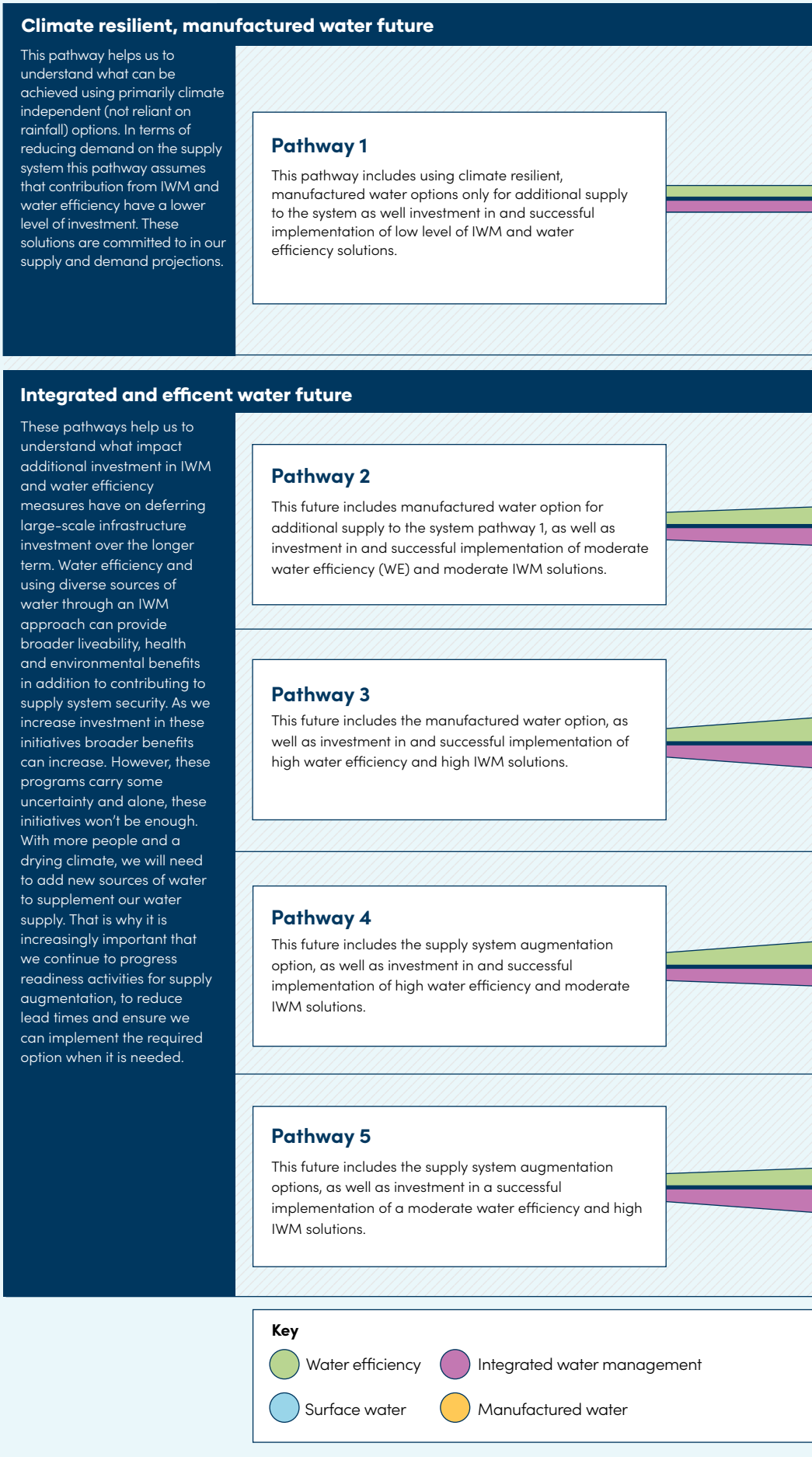
1. To provide a secure water future, we will need a diverse range of water sources.

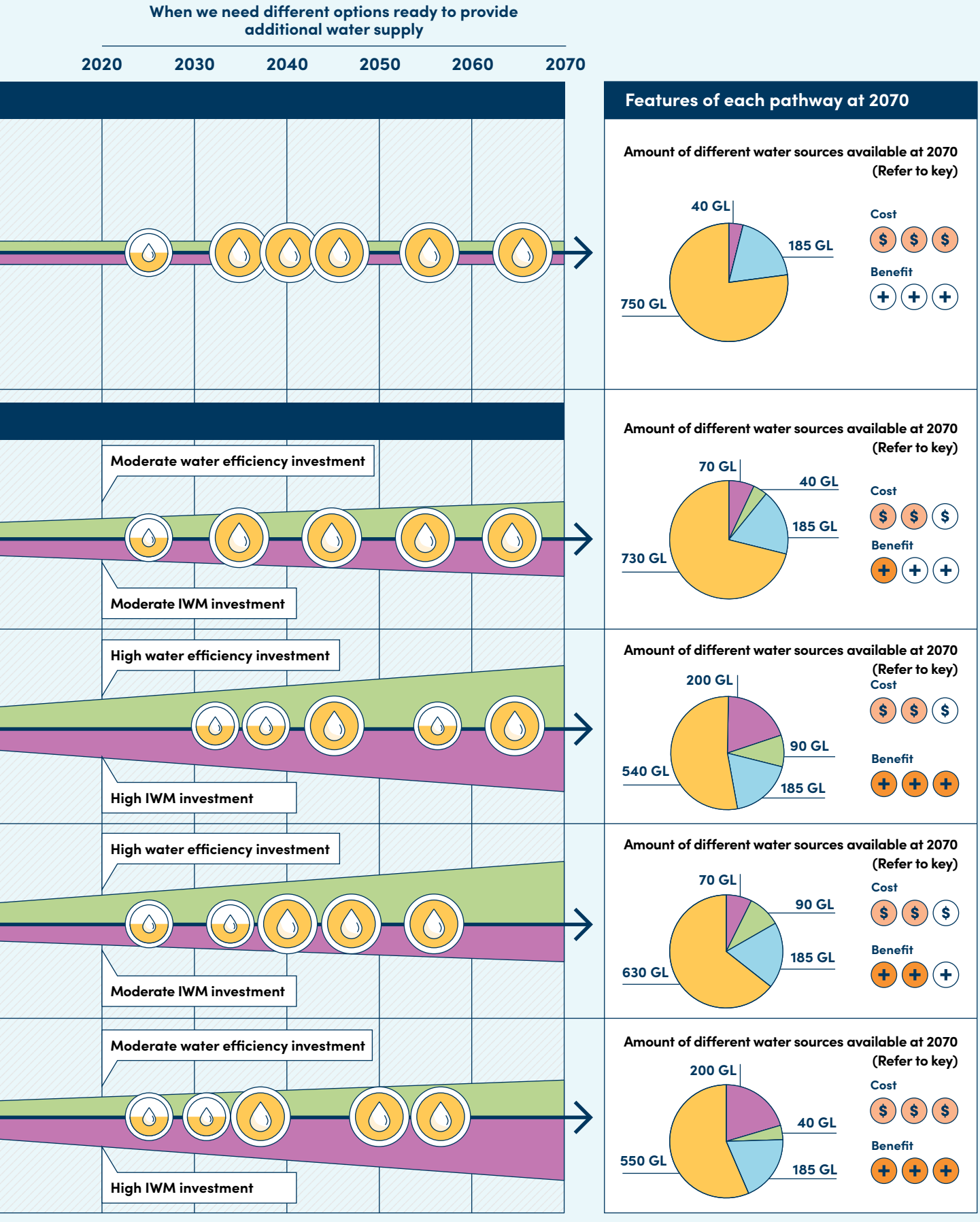
2. Investment in IWM and water efficiency initiatives will be critical to maintain affordability for our customers and protect waterway health and cultural values.

3. To address the volume of water required by 2070, particularly in times of drought, we also need to increase our supply of climate resilient, manufactured water.

4. A supply system augmentation (adding to or expanding our existing system) will be required within the next 10 years.

Figure 3: *Water for Life*'s Adaptive Plan




When we need different options ready to provide additional water supply
2020
2030
2040
2050
2060
2070
Features of each pathway at 2070
Amount of different water sources available at 2070 (Refer to key)
40 GL
185 GL
750 GL
Cost
Benefit
Moderate water efficiency investment
Moderate IWM investment
70 GL
40 GL
185 GL
730 GL
High water efficiency investment
High IWM investment
200 GL
90 GL
185 GL
540 GL
High water efficiency investment
Moderate IWM investment
70 GL
90 GL
185 GL
630 GL
Moderate water efficiency investment
High IWM investment
200 GL
40 GL
185 GL
550 GL
Manufactured water
Less than 100 GL volume
More than 100 GL volume
Cost
Less than $3 per kilolitre
Less than $4 per kilolitre
Less than $5 per kilolitre
Benefit (social, environmental and Traditional Owner)
Moderate
Ambitious/Moderate
Ambitious

The adaptive pathways are:

1. A Climate Resilient, Manufactured Water Future

The intent of this future is to understand what interventions can be made that are climate independent, or do not rely on rainfall. This future assumes that the contributions from water efficiency measures and IWM are limited to those committed to and included in the base case of our supply and demand projections.

- **Pathway 1:** This future includes using climate resilient, manufactured water options to test what a future looks like under a technology aligned to existing knowledge/values/rules.

Table 4 (below), describes the key features and benefits for the pathways under a high climate high demand scenario. This scenario ensures we are ready to act by providing us with a 'worst case' to plan for when we will need options available. The medium climate medium demand scenario has been tested and is described in the benefits section.

Table 4: Features and Benefits of the ***Climate Resilient, Manufactured Water Future*** Pathway

Pathway	Features	Benefits and trade offs
Pathway 1	Driven by implementing an option before deficit emerges, aiming to meet long-term demand Within current policy framework Greater Melbourne network upgrades required Does not meet strategic or tactical (targets) objectives for IWM and water efficiency Under a high climate-high demand scenario system, vulnerable to severe and prolonged drought over the next 10-20 years Relies on eastern supplies to distribute across the whole system Higher greenhouse gas impact and cost to offset pathway	System meets demand at a higher degree of certainty between 2030 to 2070 The system becomes less reliant on rainfall dependent water supply over time Water is available for greening and cooling initiatives Provides significant bushfire resilience benefits Under a medium-medium scenario, a smaller deficit emerges which relates to a reduction in the number of supply system augmentation decisions needed in that timeframe

2. An Integrated and Efficient Water Future (IEW)

The intent of this future is to understand what impact additional water efficiency measures and IWM options have on the timing of supply system augmentation options over time. Four possible pathways under the IEW future have been considered:

- **Pathway 2:** This future includes supply system augmentation options, as well as a successful implementation of moderate water efficiency program, and moderate IWM solutions
- **Pathway 3:** This future includes a successful implementation of a higher water efficiency program, and higher IWM solutions
- **Pathway 4:** This future includes a successful implementation of higher efficiency program, and moderate IWM solutions
- **Pathway 5:** This future includes successful implementation of a moderate efficiency program, and higher IWM solutions.

For all the pathways, up to two supply system augmentations may be needed in the near term (next 15 years). However, over time the deficit can be addressed through water efficiency and IWM programs, which may defer the need for the longer-term augmentations in some of the pathways.

Table 5: Features and Benefits of the ***Integrated and Efficient Water Future*** Pathway

Pathway	Features	Benefits and trade offs
Pathway 2	IWM options are implemented to reduce supply/demand deficit of up to 28 GL/yr by 2070 Water efficiency measures are successful in reducing demand, saving 10-40GL/yr by 2050 and ongoing Desalination to be implemented at earliest possible stage Greater Melbourne network upgrades required Ability to meet demand is subject to the success of IWM options and water efficiency program System is vulnerable to severe and prolonged drought over the next 25 years Moderate to significant bushfire resilience benefits in the long term (2070)	Between 2030 to 2070, system meets demand at a medium degree of certainty when compared to Pathway 1 Defers the need for mid and longer-term investments (beyond 2030) The system becomes less reliant on rainfall dependent water supply over time Water is available for greening and cooling initiatives Contributes towards partially meeting strategic objectives (targets) for alternative water and water efficiency Greenhouse gas impact and cost to offset - slightly lower than Pathway 1 Under a medium–medium scenario, a smaller deficit emerges which relates to a reduction in the number of supply system augmentation decisions needed in that timeframe

Pathway	Features	Benefits and trade offs
Pathway 3	Under a high climate and high demand scenario IWM options are implemented reduce supply/ demand deficit of up to 155 GL/yr by 2070 Water efficiency measures are successful in reducing demand, saving up to 92 GL/yr by 2070 Desalination to be implemented at earliest possible stage Greater Melbourne network upgrades required Ability to meet demand is heavily reliant on the success of IWM solutionsand water efficiency solutions System is vulnerable to severe and prolonged drought over the next 50 years Minor bushfire resilience benefits in long term (2070)	Between now and 2070, system meets demand at a lower degree of certainty than Pathway 1 Significantly defers the need for mid and longer-term investments (beyond 2030) Water is available for greening and cooling initiatives and provides additional water to irrigators, industrial users and urban users Meets strategic objectives (and tactical objectives/targets) for alternative water and water efficiency Greenhouse gas impact and cost to offset - moderately lower than Pathway 1 Under a medium–medium scenario, a smaller deficit emerges which relates to a reduction in the number of augmentation decisions needed in that timeframe
Pathway 4	Under a high climate and high demand scenario IWM options are implemented to reduce supply/demand deficit of up to 28 GL/yr by 2070 Water efficiency measures are successful in reducing demand, saving up to 92 GL/yr by 2070 Desalination to be implemented at earliest possible stage Greater Melbourne network upgrades required Ability to meet demand is heavily reliant on the success of IWM options and water efficiency program System is vulnerable to severe and prolonged drought over the next 50 years Minor bushfire resilience benefits in long term (2070)	Between now and late 2060s, system meets demand at a lower degree of certainty than Pathway 1 Significantly defers the need for mid and longer-term investments (beyond 2030) Water is available for greening and cooling initiatives Meets strategic objectives (and tactical objectives/targets) for water efficiency and partially for IWM Greenhouse gas impact and cost to offset - moderately lower than Pathway 1 Under a medium–medium scenario, a smaller deficit emerges which relates to a reduction in the number of augmentation decisions needed to in that timeframe

Pathway	Features	Benefits and trade offs
Pathway 5	IWM options are implemented to reduce supply/demand deficit of up to 155 GL/yr by 2070 Water efficiency measures are successful in reducing demand, saving saving 10-40 GL/yr by 2050 and ongoing Desalination to be implemented at earliest possible stage Greater Melbourne network upgrades required Ability to meet demand is heavily reliant on the success of IWM options and water efficiency program System is vulnerable to severe and prolonged drought over the next 50 years Minor bushfire resilience benefits in long term (2070)	Between now and late 2060s, system meets demand at a lower degree of certainty than Pathway 1 Significantly defers the need for mid and longer-term investments (beyond 2030) Water is available for greening and cooling initiatives and provides additional water to irrigators, industrial users and urban users Meets strategic objectives (and tactical objectives/targets) for IWM and partially for water efficiency Greenhouse gas impact and cost to offset - moderately lower than Pathway 1 Under a medium–medium scenario, a smaller deficit emerges which relates to a reduction in the number of augmentation decisions needed to in that timeframe

Simons Creek in Mernda, Wurundjeri Country

Resilience testing

Responding to drought

Although considered a low likelihood, the high impact consequence of an extreme drought remains a critical risk for the Greater Melbourne region. The retail water corporations have developed their drought preparedness plans (**see Appendix C**), including the drought response plan, which details what will be implemented in the event of water shortfall. This will seek to reduce the rate of water supply depletion under drought conditions.

An additional practical way to reduce the rate of depletion is to progressively add enough rainfall independent supply to the system, so that this will consistently provide water even under drought conditions. The volume of rainfall independent supply needed to be operational within the system before a drought emerges is called the 'initial rainfall independent supply.' Rainfall independent supply comes from manufactured water sources that are climate resilient.

Analysis was undertaken to see how much initial rainfall independent supply would be needed in the Greater Melbourne water system to adequately respond to a prolonged and severe drought. This analysis informed the direction to form portfolios of options and consideration of the adaptive pathways.

Responding to bushfires

Melbourne's water supply is particularly vulnerable to disruptions such as bushfires affecting the quality of water supplied from the Upper Yarra Reservoir. Melbourne Water recently commissioned a study to understand what the key impacts of a severe bushfire could have on the Melbourne supply system.

The consideration of enhanced bushfire resilience by diversifying the supply options and relying less on supply from the Upper Yarra catchment was considered in the features and benefits of each pathway.

Benefits

Meeting Greater Melbourne's water needs though different options provides opportunities to deliver complementary benefits. Figure 4 shows considerations that have been taken into account for options that include use of diverse sources of water or water efficiency. By using rainwater or stormwater positive benefits can be delivered for waterways or the bay. Enabling and activating green spaces increases their use and value. Using water more efficiently within households, particularly where this results in using less hot water, can lead to significant energy and greenhouse gas savings.

By considering complementary benefits we seek to deliver the broader outcomes the community expects. This work will act as a companion to other strategies and policies as described in Section 1.4.

Key findings

The *Water for Life* Adaptive Plan has been developed with readily available information. Noting that it is a dynamic plan, there are multiple ongoing activities that have been identified through this process and included in the draft strategy and as they are completed they will add to the development of the Adaptive Plan.

Key outcomes from this work include:

- Greater Melbourne is potentially facing a **significant supply-demand shortfall** over the medium to long term.
- **Investment in readiness activities is needed** to ensure augmentation options are available when required, and we have as many options as are available to choose from when needed.
- Addressing the supply-demand shortfall gives us room to **pursue broader benefits** and our Adaptive Plan approach, including a diverse portfolio of options, will enable all of these other benefits.
- A **significant water efficiency opportunity** remains in replacing inefficient fixtures, addressing losses from leakage and in encouraging water efficient behaviours.
- An **IWM approach to using diverse sources of water** presents significant opportunities to defer and avoid augmentation.
- Overcoming network constraints will require significant investment.
- **Governance and monitoring will be critical** to the successful delivery of readiness activities and the adaptive plan.

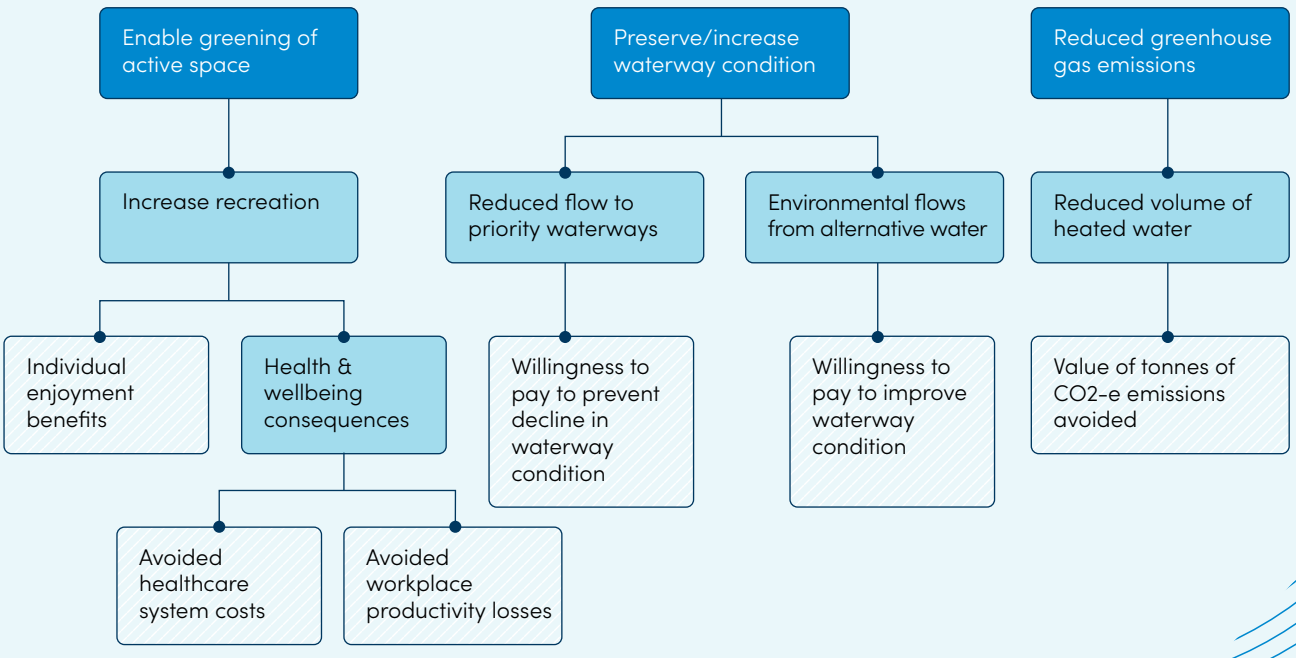


Figure 4: Monetised non-market benefits

Appendix B
Reference Guide

Reference guide to Greater Melbourne's water supply and sewerage system

Water is delivered to customers via a network of distribution pipelines from reservoirs, which store water sourced from both waterways and the Victorian Desalination Project. The sewage from our household toilets, showers and kitchens, and from commercial or industrial uses, is removed and treated using a different network of pipelines and sewage treatment plants.

The bulk water supply system is managed by Melbourne Water, the wholesale service provider, which treats and supplies drinking and recycled water, and removes and treats most of Melbourne's sewage.

The retail water corporations - Greater Western Water, South East Water and Yarra Valley Water - then deliver drinking water, recycled water and sewerage services to their customers and the community. The retail water corporations treat and re-use some sewage through local treatment plants.

Water can be supplied from Greater Melbourne's water grid to Barwon Water, Gippsland Water, South Gippsland Water and Westernport Water, which supplements local supplies.

Townships in the north-west of the region receive water from local reservoirs which are managed by Southern Rural Water.

Overview of Melbourne's Water Supply System

Figure 1 depicts Melbourne's water supply system, a complex network of natural and built infrastructure, which includes:

- catchments – the land areas that produce streamflow when it rains
- rivers, creeks and streams – the natural flow paths for water through the landscape
- weirs and dams – built structures to capture and either divert (weirs) or store (dams) water from a river, creek or stream
- reservoirs – the storage for water formed behind a dam
- aqueducts and pipes – open (aqueducts) and closed (pipes) conduits used to transfer water between two locations
- pumps – used to move water where gravity transfer is not possible
- treatment plants – used to improve the quality of water for use.

Water supply reservoirs

The Greater Melbourne water supply system includes infrastructure that enables water to be harvested from the Thomson, Yarra, Bunyip, Werribee and Goulburn basins, and transferred from the Victorian Desalination Project.

Within the Melbourne water supply system there are on-stream reservoirs, used to harvest streamflow, and off-stream reservoirs, used to store and transfer diverted flows. Details of these are in Table 1.

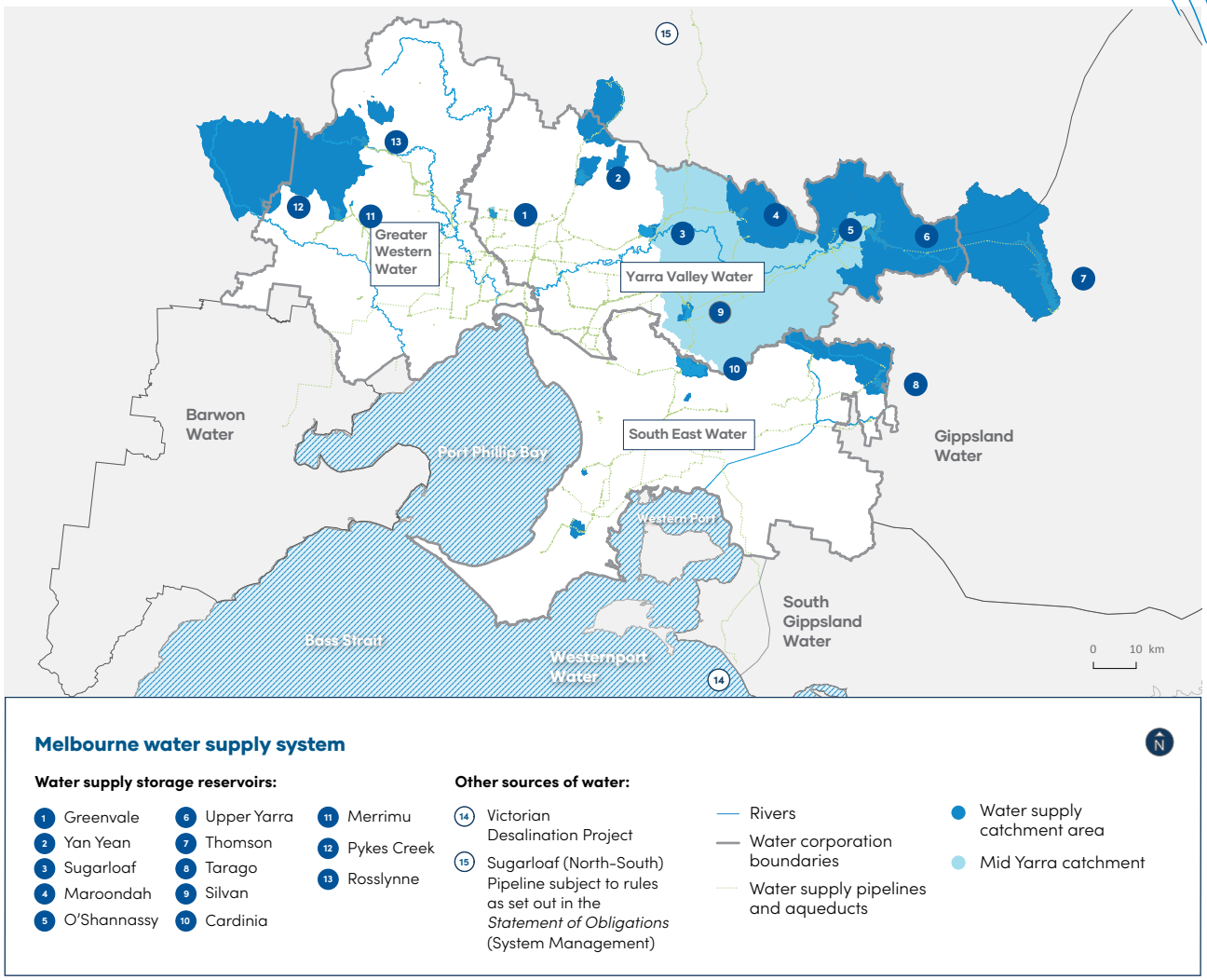


Figure 1: Overview of Melbourne's water supply system

Table 1: Major water supply reservoirs

Reservoir	Year built	Type	Storage manager	Water sources	Capacity at full supply level [ML] (table note 1)	Maximum reservoir capacity [ML] (table note 3)	Volume below Minimum Operating Level [ML]
Thomson	1984	On-stream	Melbourne Water	Thomson River	1,068,000	1,123,089	55,089
Upper Yarra	1957	On-stream	Melbourne Water	Yarra River	200,579 (table note 2)	204,985	4,406
Maroondah	1927	On-stream	Melbourne Water	Watts River and diversions from Graceburn Creek	22,179	28,199	6,020
O'Shannassy	1928	On-stream	Melbourne Water	O'Shannassy River	3,123	3,123	N/A
Tarago	1968	On-stream	Melbourne Water	Tarago River	37,580	37,580	N/A
Yan Yean	1857	On-stream	Melbourne Water	Diversions from Silver and Wallaby creeks and Plenty River via Toorourrong Reservoir	30,266	33,085	2,819
Silvan	1932	Off-stream	Melbourne Water	Transfers from Thomson and Yarra system reservoirs and weirs	40,445	40,581	136
Cardinia	1973	Off-stream	Melbourne Water	Transfer from Silvan Reservoir and Victorian Desalination Project	286,911	288,964	2,053
Sugarloaf	1981	Off-stream	Melbourne Water	Pumped from Yarra and Goulburn rivers, pumped and transfer from Maroondah Reservoir	96,253	99,222	2,969
Greenvale	1971	Off-stream	Melbourne Water	Transfers from Silvan Reservoir	26,839	27,501	662
Merrimu	1972	On-stream	Southern Rural Water	Pyrites Creek and diversions from Lerderderg River and Goodman Creek	32,181	32,516	335
Rosslynne	1974	On-stream	Southern Rural Water	Jacksons Creek	25,169	25,368	199
Pykes Creek	1911	On-stream	Southern Rural Water	Pykes Creek	20,196	22,119	1,923

Note 1. Does not include dead storage (the volume of water stored below the level of the lowest outlet (the minimum supply level)).

Note 2. Upper Yarra Reservoir is held at a level below 185,000 ML for spill and flood mitigation.

Note 3. Including dead storage.

Note 4. Water is pumped into Sugarloaf Reservoir from the mid-Yarra catchment at Yering Gorge, which has an area of approximately 136,773 hectares.

	Catchment area [ha]	Top water level elevation [m AHD]
	48,700	453.5
	33,670	366.6
	12,904	139.4
	11,880	363.5
	11,400	157.9
	2,250 (minimal catchment)	183.2
	904 (minimal catchment)	246.5
	2,540 (minimal catchment)	167.0
	900 (minimal catchment) (table note 4)	178.0
	350 (minimal catchment)	167.2
	8,500	174.1
	9,000	450.9
	12,900	396.6

There are smaller reservoirs that provide water for individual townships. These are:

- Garden Hut Reservoir
- Campaspe Reservoir
- Graham Brock Reservoir
- Kerrie Reservoir.

The four major harvesting catchments

Greater Melbourne receives water from four major harvesting reservoirs (Thomson, Upper Yarra, Maroondah and O'Shannassy) which collect and store water from more than 100,000 hectares of forested water supply catchments. Water from these four reservoirs is supplemented with water harvested by Sugarloaf, Tarago and Yan Yean reservoirs, as well as weirs on tributaries of the upper Yarra River.

Melbourne's forested water supply catchments are largely closed to public access. Combined with catchment management activities, this helps to protect water quality from public health risks. Water from these sources currently receives minimal treatment – disinfection and fluoridation only. More extensive water treatment can be costly and energy intensive, so the protection of water quality in forested water supply catchments helps to keep water affordable and manage our greenhouse emissions.

Another advantage of these high-lying catchments is that most water can be supplied into Greater Melbourne using gravity. This significantly reduces the need to use large pumps to move water. Additionally, the energy from this gravitational flow of water is used to generate electricity at certain points in the water supply system, which offsets the cost of running the supply system.

Bushfires pose a threat to forests in the catchment (see Chapter 2, Figure 15). In order to minimise the risk of bushfires, there are measures in place, such as:

- planned burns to reduce undergrowth
- access roads maintained for fire crew access
- early detection systems and other controls.

Reservoir capacity volume relative to volume of inflows

Each of the four major harvesting catchments has unique hydrological characteristics. The differences in vegetation, geology and rainfall, among other factors, influence the volume of inflow into each reservoir.

The annual average volume of inflows from Maroondah catchment, for example, is more than three times the full supply capacity of the reservoir. Maroondah Reservoir typically experiences spillway flows during the wetter months each year. These flows contribute to the environmental health of the downstream waterway and are subject to conditions specified in Melbourne Water's bulk entitlement to harvest water from the Yarra River.

Thomson Reservoir is quite different in that the annual average inflows are approximately one-fifth of the reservoir's full supply volume.

The relationship between reservoir volume and inflow volume affects the way the water supply system is operated. For example, Maroondah Reservoir is managed to minimise spill volumes and Thomson Reservoir is managed to minimise transfers out to Upper Yarra Reservoir and to maximise drought reserves.

Bulk entitlements and sharing arrangements

In Victoria, water is managed through an entitlement framework that provides clear and consistent entitlements to different sources of water, allowing certainty for water users about their rights to access available water. Information about water availability and tools like water trading and carryover provide flexibility for water users to manage and adapt to our changing climate. The entitlement framework establishes mechanisms for users to access surface water and groundwater, and any associated conditions on the access and use of water across the region.

Bulk entitlements for the Greater Yarra System – Thomson River Pool

There are four source bulk entitlements that permit Melbourne Water to take water directly from the Thomson, Yarra, Silver and Wallaby, and Tarago and Bunyip river basins to supply water to our customers. These are:

- Bulk Entitlement (Yarra River – Melbourne Water) Order 2014
- Bulk Entitlement (Silver and Wallaby creeks – Melbourne Water) Order 2014
- Bulk Entitlement (Tarago and Bunyip rivers – Melbourne Water) Order 2014
- Bulk Entitlement (Thomson River – Melbourne Water) Order 2014*.

* Melbourne Water's Thomson bulk entitlement was amended in 2017 as a consequence of changes to the VEWH's Thomson bulk entitlement.

The retail and regional water corporations (except Gippsland Water and Southern Rural Water) are Primary Entitlement Holders in the Greater Yarra System - Thomson River Pool. Melbourne Water allocates water to the Primary Entitlement Holders who receive water allocations against their bulk entitlements through seasonal determination issued each month. The volumes of each bulk entitlement held by the retail and regional water corporations are shown in Table 2. These volumes establish the relative proportions of the total available water resources that will be allocated against each entitlement – they do not reflect the actual volume of water that will be allocated.

Apart from the Primary Entitlement Holders in the Greater Yarra System - Thomson Pool, Gippsland Water and Southern Rural Water hold entitlement in the Greater Yarra System – Thomson River Pool. These entitlements are:

- Bulk Entitlement (Thomson Macalister – Southern Rural Water) Conversion Order 2001
- Bulk Entitlement (Tarago River – Southern Rural Water) Conversion Order 2009
- Bulk Entitlement (Tarago River – Gippsland Water) Conversion Order 2009.

Table 2: Bulk entitlement volumes for Primary Entitlement Holders in the Greater Yarra System – Thomson Pool

Primary Entitlement Holder	Entitlement volume (ML)	Relative proportion to total entitlement volume in the pool (%)
Greater Western Water (former City West Water entitlement*)	152,797	24.8
Greater Western Water (former Western Water entitlement)	18,250	3.0
South East Water*	206,281	33.5
Yarra Valley Water*	219,776	35.7
Barwon Water	16,000	2.6
South Gippsland Water	1,000	0.2
Westernport Water	1,000	0.2
TOTAL*	615,104	

* These bulk entitlements were amended in 2017 as a consequence of changes to the VEWH's Thomson bulk entitlement.

Seasonal determinations

Each month Melbourne Water assesses the annual volume of water that is likely to be available from the Greater Yarra System Thomson Pool. This assessment is used to make water allocations to the Primary Entitlement Holders based on their relative entitlement volumes in the pool. This is referred to as a seasonal determination.

Water resources available for allocation through seasonal determinations include:

- volume of water stored in the Melbourne Headworks system (excluding Southern Rural Water's share and the VEWH's share) at the start of the month
- volume of water delivered to Primary Entitlement Holders from 1 July to the start of the month
- estimated historical minimum inflows for the remainder of the year.

The following volumes are not available for allocation through seasonal determinations:

- volumes below minimum operating level
- carryover volumes from previous water (financial) year(s)
- transfers from the Victorian Desalination Project, Sugarloaf (North-South) Pipeline or other water systems
- water reserved for making passing flows and other commitments in the environmental entitlements
- water reserved to supply for Gippsland Water and Southern Rural Water bulk entitlements
- estimated headworks or transfer system losses for the remainder of the year.

Melbourne Water maintains an extensive hydrologic data collection network, and associated records and databases, to support the administration of bulk entitlement accounting and allocation processes.

Carryover rules

The Primary Entitlement Holders (except Gippsland Water and Southern Rural Water) are entitled to carryover any unused water allocation (from the final water allocation announced on 1 June) and carryover from one financial year to the next. This is subject to conditions such as available storage space in the Melbourne water supply system, reservoir spillway flows and evaporation losses.

Diversion limits

A diversion limit is the maximum amount of water that Melbourne Water can take from a system in any year. The diversion limits applied for bulk entitlements in the Melbourne water supply system are shown in Table 3.

Table 3: Table of diversion limits for the Greater Yarra System – Thomson Pool

System	Diversion Limit (cap)
Silver and Wallaby creeks	66 GL/y (assessed using three year rolling average)
Tarago and Bunyip	24.95 GL/y and 5.6 GL/y (assessed using five year rolling average)
Sugarloaf (North-South) Pipeline	75 GL/y (refer to note 2 below)
Victorian Desalination Project	150 GL/y averaged over five years
Yarra River	Refer to note 1 below
Thomson River	Refer to note 1 below
Combined Yarra River, Silver and Wallaby creeks, Thomson River	Refer to note 1 below

- Note 1. As required by its bulk entitlements to water from these sources, Melbourne Water proposed a diversion limit compliance method based on an agreed baseline hydrologic model of the Melbourne water supply system. The hydrologic modelling calculates an annual diversion limit target which varies with climate. The proposed method was approved by the Minister for Water in 2017/18.
- Note 2. The transfer of water from the Sugarloaf (North-South) Pipeline is subject to conditions in the *Statement of Obligations* (System Management), explained further below.

Bulk entitlements for the Greater Western Water townships

There are a number of surface water and groundwater source bulk entitlements that permit Greater Western Water to take water from a number of smaller rivers, creeks and aquifers to supply water to customers.

Romsey-Lancefield System

Lancefield Bulk Entitlement Summary	
Bulk Entitlement	Bulk Entitlement (Lancefield) Conversion Order 2001
Water Sources and Storages	Garden Hut Creek, Monument Creek; Garden Hut Reservoir
Annual Entitlement Volume	315 ML (299 ML from Garden Hut Reservoir; 195 ML from Monument Creek diversion weir)
Daily Diversion Limit	1.1 ML/d from Garden Hut Reservoir 0.85 ML/d from Monument Creek diversion weir

Lancefield Groundwater Licence Summary	
Take and Use Licence	BEE023700 (Bore No. 1 & 2), BEE024680 (Bore No.3)
Water Sources and Storages	Bore No. 1, Bore No. 2 and Bore No. 3
Annual Licence Volume	Bore No. 1: 128 ML Bore No. 2: 165.6 ML Bore No. 3: 292.0 ML
Daily Diversion Limit	Bore No. 1: 0.7 ML/d Bore No. 2: 0.8 ML/d Bore No. 3: 0.8 ML/d

Romsey Bulk Entitlement Summary	
Bulk Entitlement	Bulk Entitlement (Romsey) Conversion Order 2001
Water Sources and Storages	Bolinda Creek; Kerrie Reservoir
Annual Entitlement Volume	460 ML + 280 ML drought reserve
Daily Diversion Limit	Max. 32 ML/d for Bolinda Creek flow > 35.8 ML/d

Riddells Creek Bulk Entitlement Summary	
Bulk Entitlement	Bulk Entitlement (Riddells Creek) Conversion Order 2001
Water Sources and Storages	Main Creek; Forster and Wright reservoirs
Annual Entitlement Volume	300 ML
Daily Diversion Limit	April to January: Max. 1 ML/d for Main Creek flow > 1 ML/d February and March: 0 ML/d

Romsey Groundwater Licence Summary	
Bulk Entitlement	Romsey Groundwater Licence
Water Sources and Storages	Glenfern Road Bore (WRK060881) Emergency Bore (S59433/1)
Annual Licence Volume	Glenfern Road Bore: 300 ML Emergency Bore: 300 ML
Daily Diversion Limit	Glenfern Road Bore: 0.6 ML/day Emergency Bore: 1.5 ML/day

Myrniong System

Myrniong Bulk Entitlement Summary	
Bulk Entitlement	Bulk Entitlement (Myrniong) Conversion Order 2004
Water Sources and Storages	Pykes Creek; Pykes Creek Reservoir
Annual Entitlement Volume	58 ML (may be restricted by the Werribee Entitlement Holder (Southern Rural Water) under specified conditions
Daily Diversion Limit	0.47 ML/d

Rosslynne System

Maribyrnong – Western Water Bulk Entitlement Summary	
Bulk Entitlement	Bulk Entitlement (Maribyrnong – Western Water) Conversion Order 2000 Bulk Entitlement (Maribyrnong – Western Water) Conversion Amendment Order 2006
Water Sources and Storages	Slaty Creek, Jacksons Creek, Salty Creek, Gisborne Creek; Rosslynne Reservoir
Annual Entitlement Volume	6,100 ML on average, over consecutive five-year period
Daily Diversion Limit	69 ML/d
Share of Storage Capacity	86% of Rosslynne capacity (24,670 ML at Full Supply Level)
Share of Flow	86%, after meeting passing flow requirements at Jackson Creek gauging stations (Gisborne and Sunbury)
Passing Flow	Rosslynne Reservoir: managed by Southern Rural Water on capacity share basis

Macedon and Mount Macedon Bulk Entitlement Summary	
Bulk Entitlement	Bulk Entitlement (Macedon and Mount Macedon) Conversion Order 2004
Water Sources and Storages	Railway Creek, Turitable Creek, Willimigongon Creek; Willimigongon Reservoir, Orde Hill Reservoir, Andersons Reservoir, McDonalds Reservoir, Kitty English Reservoir, Frank Mann Reservoir
Annual Entitlement Volume	873 ML in any one year and 3,225 ML in any consecutive five-year period

Macedon and Mount Macedon Bulk Entitlement Summary	
Daily Diversion Limit	1.7 ML/d from Andersons Reservoir and McDonalds Reservoir 2.0 ML/d from Orde Hill Reservoir and Willimigongon Reservoir 2.0 ML/d from Kitty English Reservoir and Frank Mann Reservoir 0.8 ML/d from Gillespies Weir (Turritable Creek) May to November inclusive: 5.0 ML/d from all waterways to Rosslynne Reservoir via Slatey Creek

Gisborne Bulk Entitlement Summary	
Bulk Entitlement	Bulk Entitlement (Gisborne – Barringo Creek) Conversion Order 2004
Water Sources and Storages	Barringo Creek; Pierce Reservoir
Annual Entitlement Volume	585 ML in any one year and 1,600 ML in any consecutive five-year period
Daily Diversion Limit	June to October: Max. 4 ML/d for Barringo Creek flow > 6.4 ML/d November to May: 0 ML/d

Merrimu System

Merrimu – Western Water Bulk Entitlement Summary	
Bulk Entitlement	Bulk Entitlement (Werribee System – Western Water) Conversion Order 2004
Water Sources and Storages	Pyrites Creek, Lerderderg River, Goodmans Creek, Coimadai Creek, Djerriwarrh Creek; Merrimu Reservoir and Djerriwarrh Reservoir
Annual Entitlement Volume	Merrimu Reservoir: 12,263 ML Djerriwarrh Reservoir: 1,486 ML
Daily Diversion Limit	Merrimu Reservoir: 83.5 ML/d Djerriwarrh Reservoir: 19 ML/d
Share of Storage Capacity	80% of Merrimu Reservoir storage capacity 100% of Djerriwarrh Reservoir storage capacity
Share of Flow	80%(1) of Merrimu Reservoir, after meeting passing flow requirements 100% of Djerriwarrh Reservoir, after meeting passing flow requirements
Passing Flow	Merrimu Reservoir: managed by Southern Rural Water on capacity share basis Djerriwarrh Reservoir: 1.5 ML/d (or natural)

Woodend System

Woodend Bulk Entitlement Summary	
Bulk Entitlement	Bulk Entitlement (Woodend) Conversion Order 2004
Water Sources and Storages	Campaspe River, Falls Creek, Smokers Creek, Barbour Spring, Kavanagh Spring; Campaspe Reservoir, Reservoir B, Reservoir C
Annual Entitlement Volume	470 ML (332 ML in total from Falls Creek, Smokers Creek, Barbour Spring and Kavanagh Spring)
Daily Diversion Limit	3.5 ML/d from Campaspe Reservoir 1.2 ML/d from Falls Creek Weir 1.2 ML/d from Smokers Creek Weir

Northern Victoria bulk entitlements

The water corporations have contributed funding towards irrigation system modernisation works in northern Victoria to receive one-third (one-ninth for each authority) of the water savings recovered across the Goulburn Murray Irrigation District. This water can be transferred to Sugarloaf Reservoir via the Sugarloaf (North-South) Pipeline under the conditions set in the *Statement of Obligations* (System Management). The six bulk entitlements listed below specify the retail water corporations' rights to water from the Goulburn System and the Murray River:

Table 4: Melbourne retail water corporations' rights to water from the Goulburn System and the Murray River

Goulburn System	Murray River
• Bulk Entitlement (Goulburn System – South East Water) Order 2012 • Bulk Entitlement (Goulburn System – City West Water) Order 2012* • Bulk Entitlement (Goulburn System – Yarra Valley Water) Order 2012	• Bulk Entitlement (Murray River – South East Water) Order 2012 • Bulk Entitlement (Murray River – City West Water) Order 2012 • Bulk Entitlement (Murray River – Yarra Valley Water) Order 2012

* Bulk entitlement held by Greater Western Water since 1 July 2021

In addition to the conditions set out in the above bulk entitlements, the Minister for Water issued a Statement of Obligations (System Management) to Melbourne Water and the retail water corporations to impose obligations related to operating the Sugarloaf (North-South) Pipeline. Under this instrument, the Sugarloaf (North-South) Pipeline cannot be used during the period 1 December to 30 November unless all of these conditions are met:

- Melbourne's total system storage level is less than 30 per cent on the day before 1 December
- allocations have been made against high-reliability water shares in the Goulburn system for the irrigation season current at 1 December
- there is sufficient storage space forecast to be available in the Yarra Basin reservoirs to accept water from the Sugarloaf (North-South) Pipeline without increasing the risk of spills.

There is an exception that up to 300 ML of water can be used each year to maintain the operational capability of the pipeline so that it is kept in good working order and is ready for firefighting purposes.

Victorian Desalination Project bulk entitlements

The retail water corporations each have the following entitlements to water sourced from the Victorian Desalination Project and transported to the Melbourne Water headworks system:

- Bulk Entitlement (Desalination Water – City West Water) Order 2014*
- Bulk Entitlement (Desalination Water – Yarra Valley Water) Order 2014
- Bulk Entitlement (Desalination Water – South East Water) Order 2014.

Water orders are placed annually by the Minister for Water by 1 April for volumes of 0, 15, 50, 75, 100, 125 or 150 GL. The decision is supported by advice from Melbourne Water and the retail water corporations.

Environmental water entitlements

The VEWH holds a number of water entitlements within the Melbourne water supply system:

- Bulk Entitlement (Thomson – Environment) Order 2005
- Yarra Environmental Entitlement 2006
- Tarago and Bunyip rivers Environmental Entitlement 2009
- Silver and Wallaby creeks Environmental Entitlement 2006.

The VEWH also holds a water entitlement in the Werribee River:

- Werribee River Environmental Entitlement 2011.

These entitlements give the VEWH rights to inflows, passing flows, and storage capacity as summarised in Table 5. Passing flows are also specified in a number of related water entitlements held by Melbourne Water, Gippsland Water and Southern Rural Water.

Melbourne Water prepares seasonal watering proposals for the rivers it is responsible for managing (Werribee, Maribyrnong, Yarra and Tarago rivers) – in consultation with community advisory groups. The West Gippsland CMA prepares the seasonal watering proposal for the Thomson River. These proposals outline the environmental water releases needed to support environmental values throughout the year.

The proposals are submitted to the VEWH to support its preparation of the seasonal watering plan for Victoria, which sets the priorities for where, when, how and why environmental water will be used annually in rivers and wetlands under wet, dry and average climate scenarios. The seasonal watering plan is implemented adaptively in response to the climate conditions actually observed through the year.

Once the VEWH finalises the seasonal watering plan, Melbourne Water implements the plan:

- for the Yarra and Tarago rivers, it plans and delivers environmental water releases through the year
- in the Werribee and Maribyrnong rivers, it plans environmental water releases, and then works with Southern Rural Water to deliver the releases from the storage reservoirs on those rivers which it manages.
- in the Thomson River, the West Gippsland CMA plans environmental water releases, and then Melbourne Water operators deliver the releases from the Thomson Reservoir.

Table 5. VEWH entitlements in the Melbourne water supply system and the Werribee River system

System	Share of storage capacity [ML]	Share of inflows [ML/y]	Passing flow requirements
Thomson	18,000	10,000 (note 1) and 3.9% of inflows to Thomson Reservoir	Yes (note 2)
Yarra	17,000	17,000 (note 1)	Yes
Tarago and Bunyip	3,000	10.3% of net inflows	Yes (note 3)
Silver and Wallaby	-	-	Yes
Werribee	Note 4	10% of inflows to Lake Merrimu and the lesser of 15 ML/d and natural flows into Melton Reservoir (based on certain conditions) (note 5)	Yes (note 6)

- Note 1. Volume is allocated to VEWH at the start of each financial year.
- Note 2. Southern Rural Water's *Bulk Entitlement (Thomson Macalister – Southern Rural Water) Conversion Order 2001* also specifies more passing flow requirements downstream of those specified in Melbourne Water's *Bulk Entitlement (Thomson River – Melbourne Water) Order 2014.*
- Note 3. In addition to the passing flow requirements specified in the VEWH Environmental Entitlements, there are further passing flow requirements specified in *Bulk Entitlement (Tarago and Bunyip Rivers – Melbourne Water) Order 2014* and*Bulk Entitlement (Tarago River – Gippsland Water) Conversion Order 2009* for the Tarago and Bunyip rivers.
- Note 4. VEWH is entitled to store its share of inflow in any of the other entitlement holders' shares of capacity in Lake Merrimu and Melton Reservoir not being used by the other entitlement holders.
- Note 5. Between May to August (inclusive), when Melton Reservoir is above the target storage volume for minimum passing flows, VEWH is entitled to the lesser of 15 ML/d and the natural flow at Melton Reservoir less the Melton Target passing flow, until such time as Melton Reservoir spills.
- Note 6. The Werribee River passing flows are specified in *Bulk Entitlement (Werribee System – Irrigation) Conversion Order 1997.*

Overview of Melbourne's sewerage system

Sewage is water which has been used in our homes or in businesses. While it picks up some contaminants during use, sewage remains 98 per cent water. While a small minority of houses treat their water onsite through septic systems, most sewage across Greater Melbourne is collected through the sewerage network and treated to a high quality before the water is re-used or discharged to the environment. The water that is re-used is classified as recycled water.

The primary function of the sewerage system is to protect public health and environment values through delivery of an essential service to customers. These values guide the delivery of the best possible services to customers to enhance life and liveability for Greater Melbourne.

Melbourne Water treats around 90 per cent of Melbourne's sewage at the Western Treatment Plant in Werribee and the Eastern Treatment Plant in Bangholme. The remaining 10 per cent of Melbourne's sewage is treated by 26 localised treatment plants (LTPs). Melbourne's existing metropolitan sewerage system includes over 25,000 kilometres of gravity sewers. Figure 2 depicts Melbourne's sewerage system including the LTPs, Western and Eastern treatment plants and large sewers.

Approximately 400 GL of water is treated annually by the treatment plants. Figure 3 shows what happens to the water after it has been treated. The majority of sewage across Melbourne is treated to a high standard and discharged to the environment. For Western Treatment Plant and Eastern Treatment Plant this is Port Phillip Bay and Bass Strait, respectively. Each treatment plant, including the LTPs, operate under strict conditions to ensure that what is discharged does not negatively impact the environment.

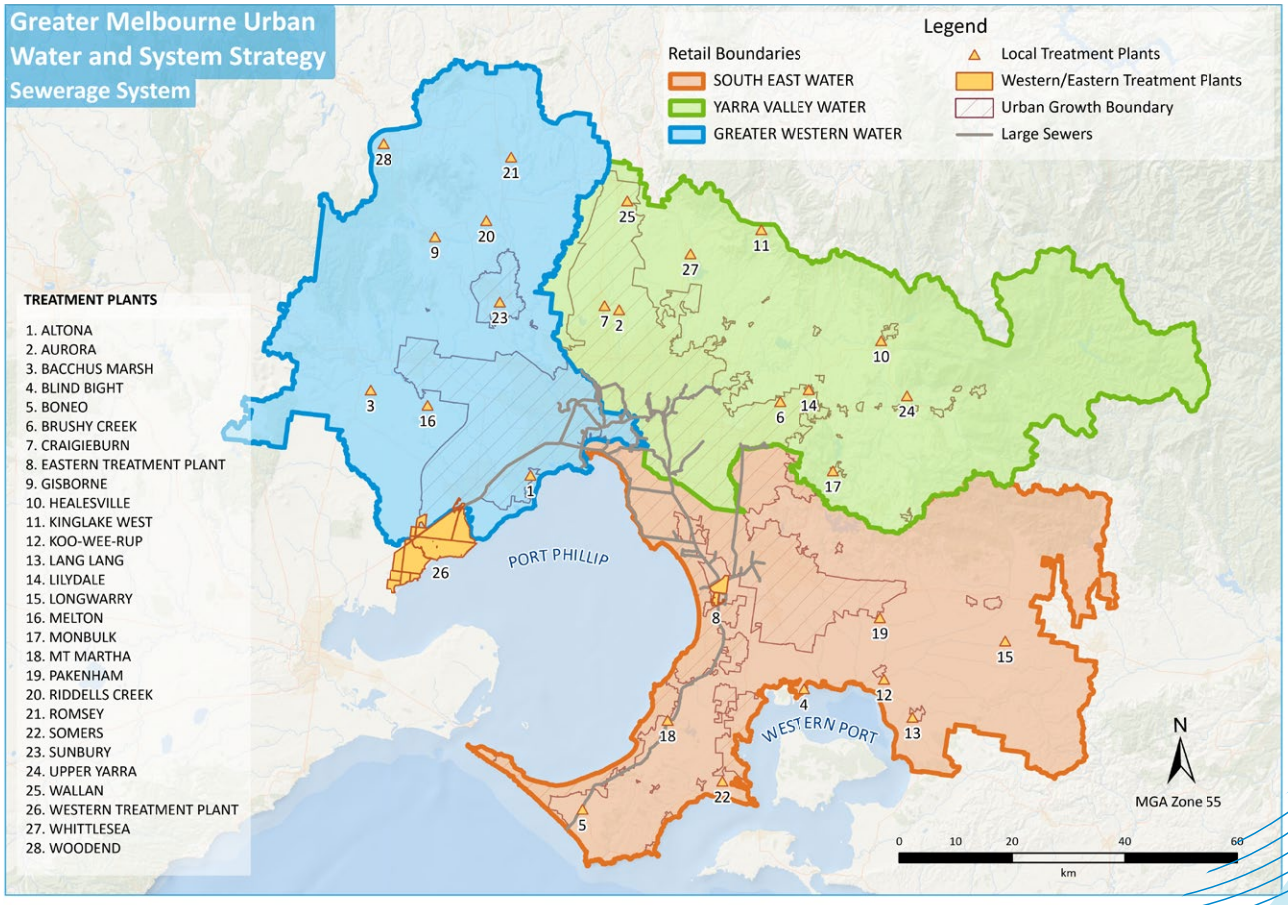


Figure 2: Melbourne sewerage system treatment plants

Recycled water use

Since the Millennium Drought, the Greater Melbourne water corporations have invested in Class A 'third pipe' recycled water schemes to reduce drinking water demands of greenfield residential and commercial developments. Further schemes such as the Eastern Irrigation Scheme have enabled recycled water to be provided as a climate independent water resource for agriculture, which has increased the resilience of these irrigation districts.

Approximately 40 GL of recycled water is re-used annually for beneficial use, which includes:

- domestic use for toilet flushing, clothes washing and outdoor use for about 100,000 households
- commercial and industrial uses
- irrigation and agriculture
- re-use onsite for treatment processes
- biodiversity conservation.

Given the significant volumes of recycled water available at treatment plants across Melbourne, there is an opportunity to find financially viable or strategically beneficial ways to utilise this recycled water source, including further schemes for residential, commercial, industrial and agricultural use. Irrigation in Victoria already uses large volumes of water; however, irrigation demand is seasonal and not often located near treatment plants. This can limit the financial and technical viability of schemes. To facilitate greater volumes of this water resource to be used beneficially we need to find seasonally independent uses that will utilise recycled water in larger volumes throughout the year.

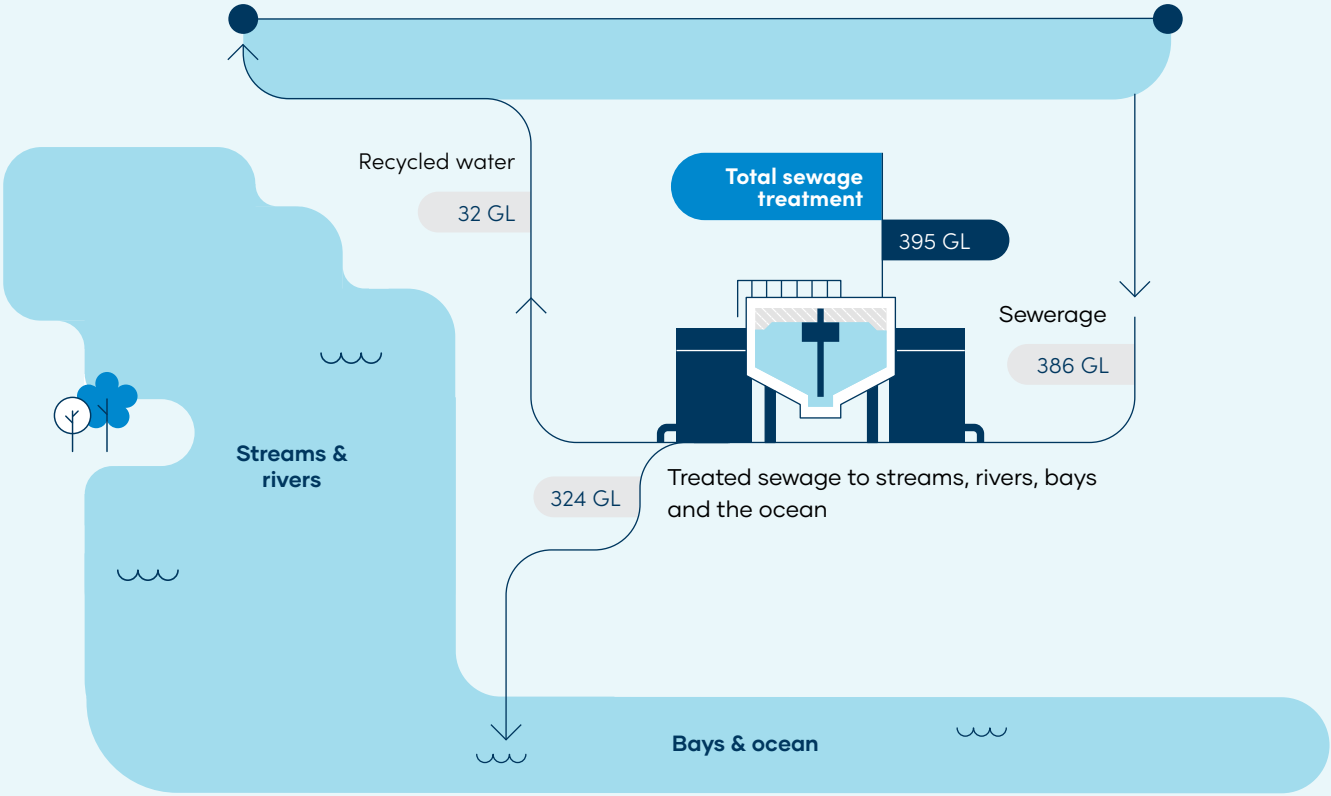


Figure 3: Water balance demonstrating volume of treated water that is re-used

Beneficial products

The components of sewage, besides water, are shown in Figure 4. While these other components take energy and chemicals to treat, they present an opportunity to produce other resources from sewage. These beneficial products are biosolids and biogas.

Biosolids are the solid organic material remaining after sewage treatment. Biosolids have been re-used in land application for agricultural purposes, or as construction material, such as landfill geotechnical capping. Technological advancements, as well as market development to provide more financially sustainable alternatives, are required to enable us to leverage greater re-use opportunities from biosolids.

As part of the biological treatment process, methane-rich biogas is generated. At both the Western Treatment Plant and Eastern Treatment Plant as well as some of the LTPs, biogas from the treatment process is captured and transferred to onsite power stations where it is combusted into renewable energy (electricity). Biogas is methane rich and has associated greenhouse gas emissions. Re-use of this biogas reduces these emissions and subsequent impacts on climate change.

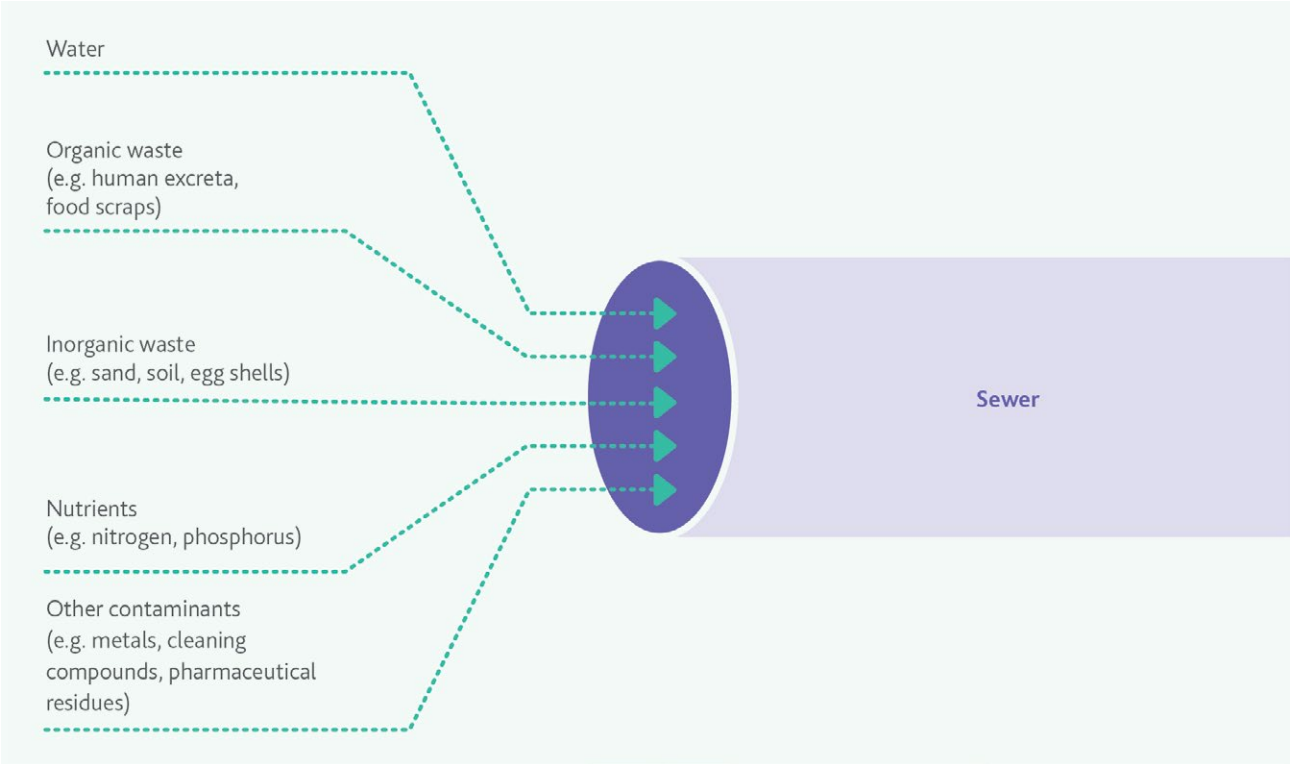


Figure 4: Composition of sewage

Future challenges

Population growth

The volume of sewage needed to be treated is expected to continue to grow in line with Melbourne's growth with forecasts shown in Figure 5 and outlined in more detail in Chapter 2. In addition to a greater volume of water, an increasing population and number of commercial and industrial businesses will increase the amount of other contaminants that need to be treated. This will require infrastructure investment to continue to expand the capacity of our treatment plants and there could be new ways of managing the sewage at source, such as industrial customers re-using it within their processes onsite.

As more sewage will be entering our treatment plants, the associated increase in volumes of treated water presents an opportunity to provide for the increasing water demands from Greater Melbourne and the surrounding agricultural districts. Agricultural re-use and fit-for-purpose re-use through third pipe are potential options for increased use. By re-using water in this form, and offsetting the cost of treatment by providing additional water, it can also assist in managing affordability constraints associated with the infrastructure investment needed to manage increasing volumes.

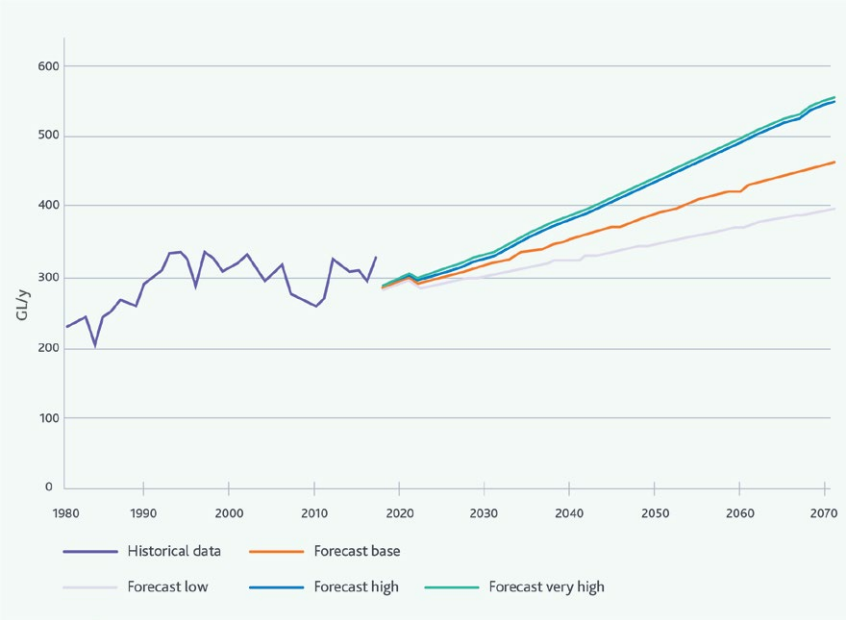


Figure 5: Forecasted sewage flows to the Western Treatment Plant and Eastern Treatment Plant

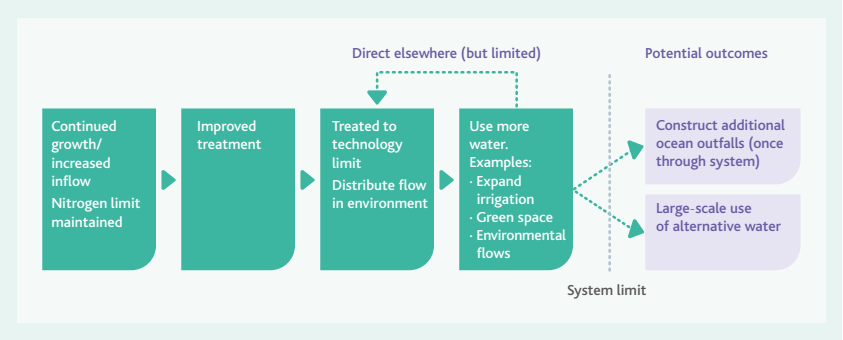


Figure 6: How we might address reaching our environmental outlet limits

Environmental discharge limits

Limits for receiving environments are highly dependent on the local characteristics, but may include flow limits, which may be seasonal to protect waterway health and concentration or load-based limits for particular components of the treated water. A typical example is nutrient limits to protect the environment from algal blooms.

Environmental limits are established so that we do not exceed the capacity of the receiving environment to withstand or buffer the polluting input, ensuring protection of the receiving environment (such as rivers, waterways, or bays).

Limits on the volume and quality of water that is discharged to Port Phillip Bay and Bass Strait waterways may place a practicable limit on the size of an individual treatment plant. New ways of managing these volumes, such as re-use of the recycled water, may be needed to manage environmental impacts. Figure 6 presents an example of how a treatment plant may be modified for servicing an increasing population while managing environmental impacts.

Future of the sewerage system

The Melbourne Sewerage Strategy was completed in 2018 in a collaboration between City West Water, Western Water (now combined as Greater Western Water since 1 July 2021), Melbourne Water, South East Water and Yarra Valley Water.

It provides the strategic direction for Melbourne's sewerage system over the next 50 years, and works in close alignment with this draft strategy.

The vision for the future of Melbourne's sewerage system is:

> A resilient and adaptable system that supports thriving, healthy communities and a liveable, flourishing environment.

To achieve our vision, we need to take measurable steps to reposition our sewerage system from being viewed as a waste disposal system to one that is a true resource recovery system and a key contributor to Melbourne's future as a water sensitive city. By 2070, Melbourne's metropolitan water industry will see the key features of our sewerage system helping to achieve the following goals:

Human health and wellbeing
The evolution of Melbourne's sewerage system enhances human health and wellbeing, now and in the future.

Enhancing the environment
Melbourne's sewerage system leads the world in protecting and enhancing natural assets including waterways, green spaces, biodiversity and marine environments.

Leveraging resources
Melbourne will be recognised as a world leader in advancing the circular economy through our commitment to beneficially using 100% of our water and resources while ensuring affordability for current and future generations of Melburnians.

Community stewardship
Our customers and community understand and care about the role the sewerage system plays in Melbourne's liveability. This fosters shared stewardship and informs the services we provide.

An enabling policy and regulatory environment
Our collaborative policy, pricing, and regulatory environment fosters an adaptive, scalable, agile and innovative system that enables us to equitably meet Melbourne's needs for the next 50 years and beyond.

These goals, although aspirational, are underpinned by the fundamental principle of ensuring affordability for our customers and community. Figure 7 shows the intended shift from the sewerage system we currently have, where most of the sewage is collected and disposed of, to one that enables resource recovery and beneficial re-use.

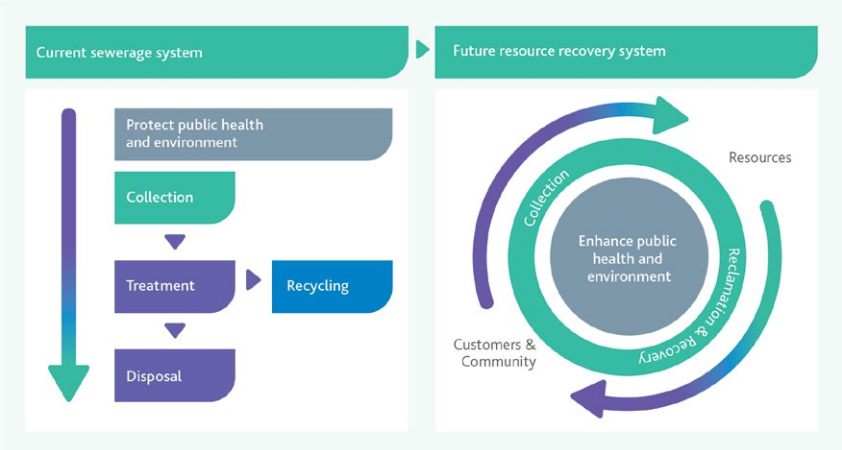


Figure 7: The transformation of Melbourne's Sewerage System from waste disposal to resource recovery

Providing recycled water that is fit-for-purpose, be that for agriculture, open space watering or residential and business customers through a third pipe, will provide benefits to the community and the environment. Shifting our current sewerage system to a future resource recovery system will allow more, and potentially better, ways to meet our future water needs as detailed in this draft strategy.