

Central Region Sustainable Water Strategy Review

October 2018



Front cover image: Ric Wallis, Melbourne Water

Acknowledgement of Victoria's Aboriginal communities

The Victorian Government proudly acknowledges Victoria's Aboriginal community and their rich culture and pays respect to their Elders past, present and emerging. We acknowledge Aboriginal people as Australia's first peoples and as the Traditional Owners and custodians of the land and water on which we rely. We recognise and value the ongoing contribution of Aboriginal Victorians and Traditional Owners and Victorian people and communities to Victorian life and how this enriches us. We embrace the spirit of reconciliation, working towards the equality of outcomes and ensuring an equal voice.

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At a glance

The *Water Act 1989* requires sustainable water strategies to be reviewed at least every 10 years. The review of the [Central Region Sustainable Water Strategy](#) started in 2016, and it is the first sustainable water strategy to be reviewed. This is the final report of the review.

Sustainable water strategy (SWS) reviews identify what was achieved, the lessons learned, where we currently are, the challenges and opportunities ahead, the things we need to think about and what we need to know to decide whether to maintain or adjust our strategic directions. The review did not develop a new strategy or new policies: the *Central Region Sustainable Water Strategy* (CRSWS) is current until a future strategy or strategies are developed for the region.

The first regional SWS

The CRSWS was Victoria's first SWS. It set out policies and 112 regional and local actions to manage demand for, and secure supply of, water for the region over the 50 years to 2055. It brought the whole region including Ballarat, Geelong, Greater Melbourne, Melton, Sunbury and the Latrobe Valley together under one regional strategy. It was also the first effort to implement the Victorian Government's 2004 *Our Water Our Future White Paper* on a regional and local scale.

Actions
in the
strategy



112

Actions
achieved



104

60 achieved and completed
and 44 achieved and ongoing

Partly
achieved



5

Not yet
achieved



3



Image: Ric Wallis, Melbourne Water

At a glance

What the strategy has achieved



A regional, coordinated, cooperative framework

The CRSWS established a common framework for decision-making by catchment management authorities (CMAs) and water corporations, beyond the scale of individual organisations. It brought together the supply, demand, augmentation and entitlements (particularly environmental entitlements) aspects of water planning and management at a regional scale. It also made regional centres and CMAs part of water planning in a region that contains a capital city.



Traditional Owners' and Aboriginal Victorians' involvement in waterway planning improved

The CRSWS formalised the engagement of Traditional Owners and Aboriginal Victorians in water planning and management, and it helped incorporate Aboriginal social, spiritual and cultural objectives in strategies and plans including regional waterway strategies and the [Victorian Waterway Management Strategy](#).

It also laid the basis for *Water for Victoria's* focus on recognising and managing for Aboriginal values.



Groundwater resource management

CRSWS actions to manage groundwater — to preserve existing groundwater resources, manage overallocated groundwater resources and manage groundwater considering the risks of low flows and climate change on groundwater resources — were achieved or are by their nature ongoing. It laid the groundwork for the more comprehensive approach to groundwater in the later Western Region SWS and ultimately for the statewide groundwater policy released in 2011.



Climate change recognised

The CRSWS was one of the first government water planning documents to implement the climate change policy direction in the *Our Water Our Future White Paper*. While water authorities including Melbourne Water had drought response plans in place in the late 1990s in line with the state's drought planning guidelines, the CRSWS gave impetus to the mandatory preparation of these plans by water corporations and CMAs and to low-inflow scenarios in seasonal watering proposals. Other water resource plans and regional SWSs followed its lead. All levels of water planning now consider potential climate change impacts as a result of the *Climate Change Act 2017*, [Victoria's Climate Change Adaptation Plan 2017-2020](#) and other initiatives.



Monitoring and reporting

CRSWS actions resulted in better monitoring and reporting of waterway health, groundwater and water consumption. They improved water accounting, demand modelling and reporting.

The CRSWS reduced demand for water



Water-use efficiency is now business-as-usual

CRSWS actions supported the locking-in of water-use efficiency measures, and water is used far more efficiently in the region than it was 20 years ago. The strategy, launched as Melbourne endured record-low inflows and serious concerns about storage levels, offered positive, practical responses to the worsening drought. Consequently, demand for water fell by over 30% in 1997–2009 despite Melbourne adding some 500,000 people. On a per-person basis, Melbourne's water consumption declined to levels not seen since the 1930s, and water managers were able to maintain supply throughout the Millennium Drought.



Making the region more water-efficient

CRSWS actions helped replace over 460,000 inefficient showerheads and over 4,500 inefficient toilets. Water restrictions and the Target 155 campaign had major behavioural change benefits. Between 2003 and July 2011, over 300,000 water-efficiency rebates were provided across Victoria, resulting in an estimated 1,758 ML a year of reduced demand for drinking water.



Water conservation on a broad scale

Other CRSWS successes include adoption of the 6-star standard by the Victorian Building Authority, trialling the implementation of digital water meters, continuing the Schools Water Efficiency Program and extending the Pathways to Sustainability program for Melbourne's top-200 water users into the WaterMAP program, which saved over 17 GL of water.

Image: Sal Ahmad, DELWP



At a glance

The CRSWS secured the region's water supplies



Regional water grid developed and extended

The CRSWS led to the construction of the Goldfields Superpipe to connect the Bendigo, Ballarat and Goulburn systems, and interconnectors between regional reservoirs were built. The government fast-tracked the strategy action to investigate a Geelong–Melbourne interconnection, and it was completed in early 2013. These and other investments add to previous efforts to develop the region's water grid and provide interconnections between the Melbourne system and Geelong, Sunbury, Melton, Cowes, Wonthaggi, Inverloch, Drouin, Warragul and Cape Patterson, with Korumburra, Poowong, Loch and Nyora recently connected. The access and bulk entitlement arrangements to the Melbourne system are an important part of realising the benefits of all of these interconnections and the potential for grid transfers between regions.



The region's water supplies augmented

CRSWS actions augmented the region's water supplies, and it is now better placed to cope with droughts. The government fast-tracked the strategy action to investigate desalination options and built the Victorian Desalination Project, which can deliver one-third of Melbourne's current needs. Strategy achievements also included creating the Anglesea groundwater bulk entitlement and doubling the capacity of Candowie Reservoir at Western Port and connecting it to the Melbourne system. As well, under the 2007 *Our Water Our Future* policy, the 70-km North–South Pipeline, now known as the Sugarloaf Pipeline, was built to carry water from the Goulburn River to Melbourne's Sugarloaf Reservoir.



Wastewater recycling increased

CRSWS actions supported the amount of wastewater treated for recycling. More recently, Melbourne Water upgraded the Eastern Treatment Plant to treat water to the highest standard for non-drinking uses and supplied it to agricultural business and residential customers via retail water company's third-pipe systems, which also reduced the environmental impact of its Bass Strait outfall. It also supplied recycled water from its Western Treatment Plant for agricultural and residential customers' use, as did Western Water. The government undertook actions that contributed to enabling dual-pipe systems for new residential subdivisions. At Ballarat's Lake Wendouree, stormwater harvesting, recycling and diversions replaced drinking water as a top-up source. Other recycling initiatives included the Gippsland Water Factory and the Phillip Island Recycled Water Scheme.



Partial success encouraging water trading

Water corporations completed some small-volume trades, and some water for the environment was traded between catchments in the region. However, various factors constrained the need (and opportunities) for trades and the resources to make them.

The CRSWS helped protect our waterways and aquifers



Environmental water reserve increased

The CRSWS was the first plan to seek to balance at the regional scale the environment's needs for water with the needs of water users, and to negotiate the trade-offs required to achieve a balance. It aimed to increase the environmental water reserve for each of the region's river basins through a combination of operating and harvesting rules (such as passing flow provisions) and designated environmental entitlements.



Water reporting established

The CRSWS established annual reporting on each environmental water reserve through the annual [Victorian Water Accounts](#).

The accounts also provide data about water availability, entitlement, distribution and use across Victoria including about environmental water entitlements for each river basin and groundwater catchment in the region, as well as about local and streamflow management plans.



Water for the environment increased

60.8 GL (or 90% of the CRSWS target of 66 GL) was made available for environmental entitlements for the Yarra, Werribee, Moorabool, Barwon, Thomson/Macalister, Latrobe and as water for the environment for the Bunyip/ Tarago basin. Record-low inflows during the Millennium Drought and larger-than-expected population growth creating unforeseen demand for water prevented the target being achieved. This report describes in detail how events affected the provision of each river's entitlement.



At a glance

Looking forward — a strategy responsive to emerging trends

An action plan and a strategy



The CRSWS, released in 2006, was Victoria's first SWS. It was an action plan as much as a strategy bringing together all the region's main planning and management actions and organising them strategically. The CRSWS was a major milestone in the evolution of water management and planning, which since 2006 has matured greatly into today's comprehensive, nested approach. The Victorian Government's 2016 Water for Victoria Water Plan sets the state's policy direction, and there are also policies for integrated catchment management, climate change, waterway management and Traditional Owners' and Aboriginal Victorians' values, with responsibilities allocated to various agencies.

The SWS process brings multiple stakeholders together to discuss water management principles, priorities, opportunities and directions in the region (such as the role of and next steps for water markets and the water grid, the entitlement framework, third-party access, alternative supplies and the role of land-use planning in water management). Principles serve as values people can use to stay true to a course as systems, challenges and priorities change. A future SWS could benefit from renewed or refreshed principles to guide decision-making.

Image: Sal Ahmad, DELWP



A strategy suited to a more-evolved water planning and management context

Water for the environment The environment's need for water is well-established and a future SWS should continue to support improvements in environmental values. The environmental health of our waterways and their contribution to liveability is highly valued, and a future SWS will need to determine the next steps to continue to protect and enhance them. It remains important to acknowledge the role of environmental flows and wetlands in maintaining waterway health and the need to continue protection of our rivers and headwaters.

All water sources / Integrated Water Management

To improve environmental values and achieve targets for water for the environment, the availability and management of all sources of water, the connectivity of water sources across catchments and land use in catchments needs to be considered. Water resource planning and management should make use of all water sources including recycled water and water reuse, as part of integrated water management for cities and towns. A future SWS should include guiding principles to support improved IWM outcomes, and it should help overcome barriers to IWM becoming business-as-usual.

Users and uses have changed too ...

Traditional Owners and Aboriginal Victorians The knowledge and expertise of Traditional Owners and Aboriginal Victorians should continue to be incorporated into water planning and management. Their tangible and intangible values should be supported through capacity-building and economic development opportunities.

Shared benefits The community wants the planning and management of the storage, distribution and use of water to provide active and passive recreational opportunities (such as water for canoeing and sites for picnicking and camping), tourism and cultural pursuits. They expect the values of Traditional Owners and Aboriginal Victorians to be recognised, and for water planning and management to provide them with opportunities for economic development. A future strategy should aim to balance the needs of the environment and of consumptive uses for water within a strong entitlements framework, while delivering shared benefits where practicable.

At a glance

More complexity and risk



Since 2006, water resource planning and management have become more complex and wide-ranging, overlapping with related issues such as catchment management, Traditional Owner group agreements, environmental management, even mine rehabilitation. Water corporations no longer manage their systems individually. Augmentation, recycled water, stormwater and desalinated water increase options for capture, treatment and supply. Water managers must be energy managers and operate in a less-carbon-intensive way. In terms of risk, climate change will reduce inflows to our storages and increase the risk of bushfires in water catchments; population and urban growth will affect water supply and demand; but the extent to which they will do so is subject to considerable uncertainty and many influences. The future holds major risks for water planners, managers and users, which also include changing national, state and local directions.

Adaptive management To manage complexity and risk in a fast-changing world, a future SWS would benefit by incorporating an adaptation pathways planning approach. Assumptions and trade-offs should be sufficiently transparent that they can be reworked in light of changed circumstances. All stakeholders should be involved in making trade-offs in a flexible, adaptive management framework that identifies desired outcomes and ways to achieve them, as water supply, the needs of users and water uses change.

Better sector links and governance Programs and actions that formed the backbone of the CRSWS are now commonly found in other strategies and action plans. A future SWS should address interdependencies between land use and water planning and between the water and energy sectors. Plans and strategies across the water sector should clearly explain and optimise these interdependencies, to maximise outcomes. They need to clearly state institutional arrangements and accountabilities, so agencies work effectively together to implement a future SWS.

Use of best-available science and data A future SWS should be informed by science and take account of the latest data and findings about the impacts of climate change and population growth on future water supply and demand and how those impacts affect the needs of all water users.

Monitoring and reporting Within an adaptive management approach, fit-for-purpose monitoring gives planners and managers the information they need to evaluate future scenarios and to understand variability and identify changes in how water is used. This includes increase knowledge on groundwater and the impacts of catchment dams and agricultural intensification. There also need to be clear, consistent metrics for setting targets and actions and reporting progress against them and for determining if outcomes are achieved.

Community engagement and involvement



Community partnerships will be increasingly important for planning and delivering water at the landscape and regional scales. If they are involved in decisions, communities better understand the trade-offs required to achieve the objectives of a healthy environment and a safe, affordable and reliable water supply for agricultural, residential and industrial users: these things are essential for people, jobs and a thriving economy. The water sector is responding to increasing community expectations to bring local knowledge into water planning and management decisions, to build capacity and to provide information so people can make decisions about how they manage water themselves. This will help make the delivery of strategy outcomes transparent and accountable.

In all, water planning and management is continuing to evolve and the best solutions will be those where water planners and managers work closely with Traditional Owners and Aboriginal Victorians and the community to address the challenges and trade-offs ahead through capacity building, information exchange and engagement. There are opportunities for a future SWS to contribute to behaviour change by setting out clear intended outcomes and goals with which the community can engage.

Where to from here

A SWS provides a strategic planning process for the use of water at the regional scale over a 50-year planning horizon. SWSs remain a meaningful way to engage thoughtfully with industry and communities to assess threats to water security by providing a policy process to assess the trade-offs required to respond to water security threats. Early engagement and preparation ahead of the next SWS will be required to develop an adaptive management approach to water resource planning at the regional scale. This includes incorporating the knowledge available from the LTWRA and other strategies and plans.

This review report will inform a future SWS or SWSs by documenting the progress of and changes in water policy and management since 2006 and the lessons learnt and opportunities available to build on the success of the CRSWS. *Water for Victoria* indicates the development of a new SWS or SWSs could start in late 2019.

1. Introduction





Image: Tony Proudfoot, Melbourne Water

About the Central Region Sustainable Water Strategy

The *Water Act 1989* empowers the Minister to prepare sustainable water strategies (SWSs) for a region of Victoria. SWSs are long-term plans for water resources in Victoria. They identify threats to water supply and quality, and they include actions to help water users, water corporations and catchment management authorities (CMAs) manage and respond to threats over the 50-year planning horizon.

The [Central Region Sustainable Water Strategy](#) (CRSWS) was released in 2006. It was Victoria's first SWS. Between 2006–11, SWSs were also produced for the Northern, Western and Gippsland regions.

The CRSWS aimed to identify threats to water availability, and secure the supply of, water for the region's people, industries and the environment over the 50 years to 2055. To do so, it included policy statements and 112 actions for implementation at a regional and local scale.

The CRSWS brought together disparate water planning activities for Ballarat, Geelong, Greater Melbourne, Melton, Sunbury and the Latrobe Valley into one regional strategy.

The CRSWS aimed to:

- ensure reliable and safe water supplies for all uses into the future
- understand the implications of climate change and be prepared for a range of possible future scenarios
- understand the implications of the record-low rainfall and inflows to our reservoirs over the past 10 years
- protect and where necessary improve the health of rivers, aquifers and estuaries
- protect the Indigenous and other heritage values associated with the region's rivers and catchments
- maximise overall community benefits and ensure that no generation or group incur unwarranted extra costs or receive additional benefits
- support high-value water use by industry and
- agriculture, with the least adverse impact
- make the best use of water resources locally and throughout the region
- further develop an appreciation of the value of water and a conservation culture in the community
- be greenhouse-gas-emission neutral.

The strategy was the basis for improved water management in the Central Region. Its important contributions — as the region endured one of the worst periods of inflow on record — included planning and action around environmental flows, water conservation and efficiency, recognition of the importance of adapting to and mitigating the effects of climate change, improving interconnections to enhance system resilience, promoting regionwide thinking and emphasising the importance of protecting the region's rivers. It also drove the integrated water management (IWM) concept, articulating ideas (such as a greater focus on place-based planning, stormwater use and the role of water in the landscape and its contribution to liveability) that contributed to the thinking that led to IWM forums being established in Victoria.

About the Central Region

The Central Region is the area south of the Great Dividing Range that includes:

- Greater Ballarat (the water for which in 2006 was mainly sourced from the Moorabool River)
- Greater Geelong (with water mainly from catchments on the upper Barwon and Moorabool rivers)
- Greater Melbourne (including the Melbourne water supply area with water from the Yarra, Tarago and Thomson rivers and from Silver and Wallaby creeks)
- Inner West (with water mainly from the Werribee and Maribyrnong rivers — with Werribee River water particularly important for Bacchus Marsh and the Werribee Irrigation District — and from the Thomson and Yarra rivers via a connection to the Melbourne system)
- West Gippsland (including water from the Tanjil and Tyers rivers as tributaries of the Latrobe River, and from the Macalister and Thomson rivers that provide water to the Macalister Irrigation District)
- Western Port (with water from Candowie and Lance Creek reservoirs).

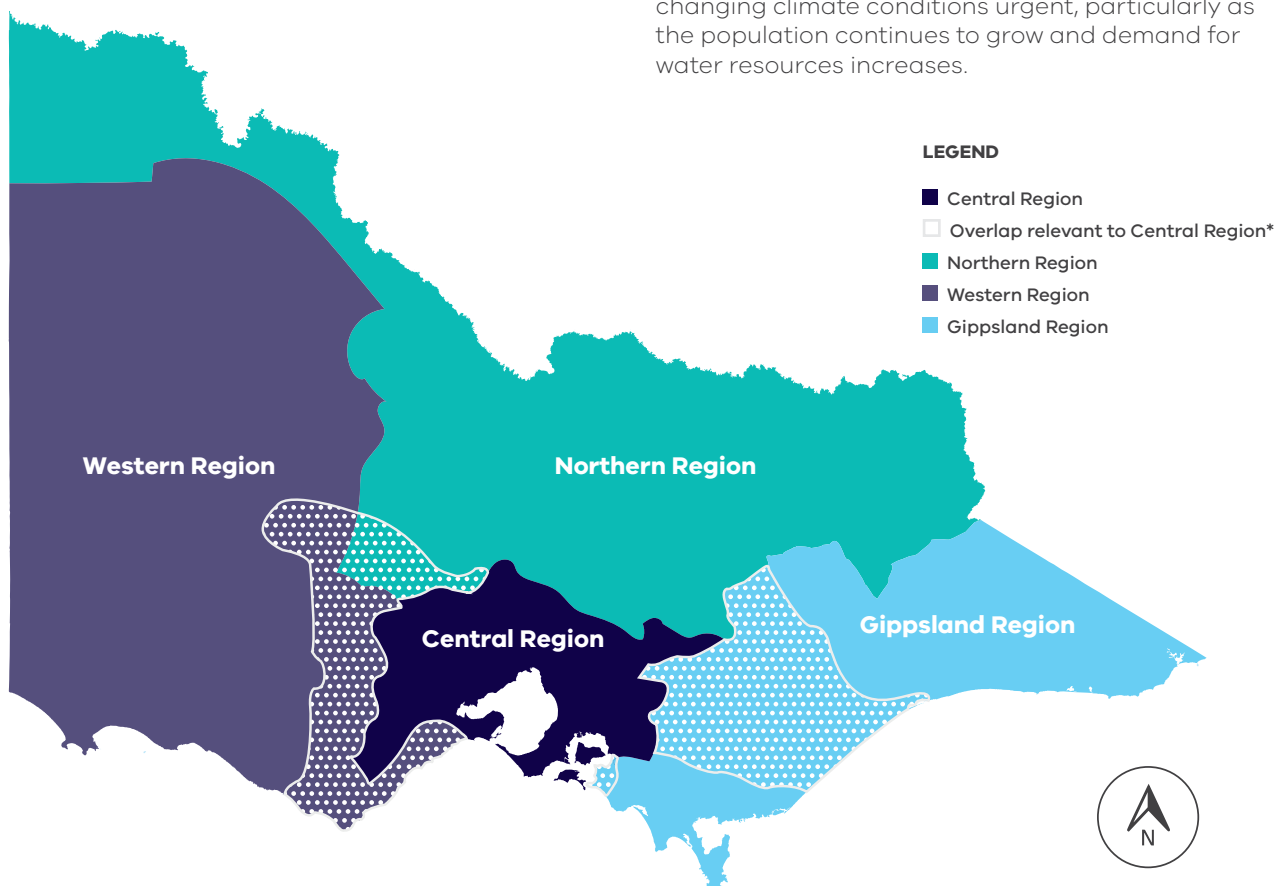
Figure 1 shows the Central Region, and it also shows where the boundaries of the CRSWS overlap with areas covered by the Western, Northern and Gippsland SWSs.

80% of Victorians live in the Central Region. Melbourne is Australia's fastest-growing city and the populations of Ballarat and Geelong are predicted to almost double in the 33 years to 2051. Melbourne's population has increased by 20% since 2007. This population growth increases water use and puts greater pressure on dams that have had below-long-term-average inflows in 18 of the past 20 years.

Changing land uses including clearing, urban development, changes in agriculture and the establishment of plantations affect inflows to catchments, resulting in changes to the available water resource.

Climate modelling indicates Victoria will become warmer and drier in the coming decades, with more extreme events including droughts, floods and heat waves. Average annual streamflows in some catchments are forecast to be far lower in future, meaning less run-off entering rivers, streams and dams and reduced groundwater recharge. These conditions will have serious consequences for everyone — households, industry, agriculture, recreation and Traditional Owner's and Aboriginal Victorians' values —, for liveability, waterway health, the environment and the economy. This makes action to mitigate climate change and adapt to changing climate conditions urgent, particularly as the population continues to grow and demand for water resources increases.

Figure 1: Sustainable water strategy regions



* The shaded areas in the other regions shows catchments that supply Melbourne, Geelong and Ballarat. The CRSWS includes actions relevant for those catchments.

Strategy consultation

The CRSWS was the result of an 18-month consultation process with local communities, farmers, businesses and industries, to understand their water needs and to identify mechanisms to help manage water risks. The process included more than 100 public meetings and stakeholder forums and 437 community submissions, and it produced an initial discussion paper, a draft strategy and a final strategy. There were similar processes to develop the [Northern Region Sustainable Water Strategy](#) (2009), the [Western Region Sustainable Water Strategy](#) (2011) and the [Gippsland Region Sustainable Water Strategy](#) (2011).

Strategy chapters

The CRSWS had five chapters:

- chapter 1, which outlined the strategy's foundation and assumptions, providing the principles for decision-making
- chapter 2, which had 17 actions to preserve the environment's existing share of water, use this existing water for the environment more effectively, increase the amount of water for the environment where it was insufficient, conduct complementary works to maximise the waterway health benefits of increasing environmental flows, and manage the impacts of low flows and climate change
- chapter 3, which had 27 actions to conserve and use existing water supplies more efficiently, interconnect water supply systems and encourage water trading, use recycled water and stormwater, and augment urban supply systems
- chapter 4, which had 53 actions for Greater Ballarat, Greater Geelong, Inner West Melbourne, Greater Melbourne, West Gippsland and Western Port to secure supplies, interconnect supply systems, establish environmental entitlements, conserve water and use it more efficiently, and investigate aquifer storage and recovery
- chapter 5, which had 15 actions to implement, monitor and adapt the strategy.

Strategy actions

The CRSWS's actions aimed to promote water conservation and efficiency, encourage local water recycling projects, provide large-scale augmentations for Melbourne, connect Ballarat to the Goulburn system, secure Geelong's water supply, upgrade water systems and increase supplies, and invest in healthier rivers and aquifers.

Water-use efficiency: the strategy identified using less water as the starting point to address the challenge of water scarcity, as it is generally the most cost-effective solution and it has little or no environmental or social drawbacks: in fact, conservation and efficiency reduce greenhouse gas emissions.

Local water recycling projects: the strategy committed the government to a range of local water recycling projects and to programs to encourage the installation of rainwater tanks and greater use of stormwater, recycled water and greywater. It recognised recycled water will become increasingly important as traditional sources become scarcer, particularly because of the impact of climate change.

Large-scale augmentation for Melbourne: with climate change likely to greatly reduce inflows into Melbourne's reservoirs, the strategy proposed a plan for large-scale augmentation of Melbourne's water supplies (such as by the Eastern Water Recycling Proposal and by investigating the feasibility of desalination).

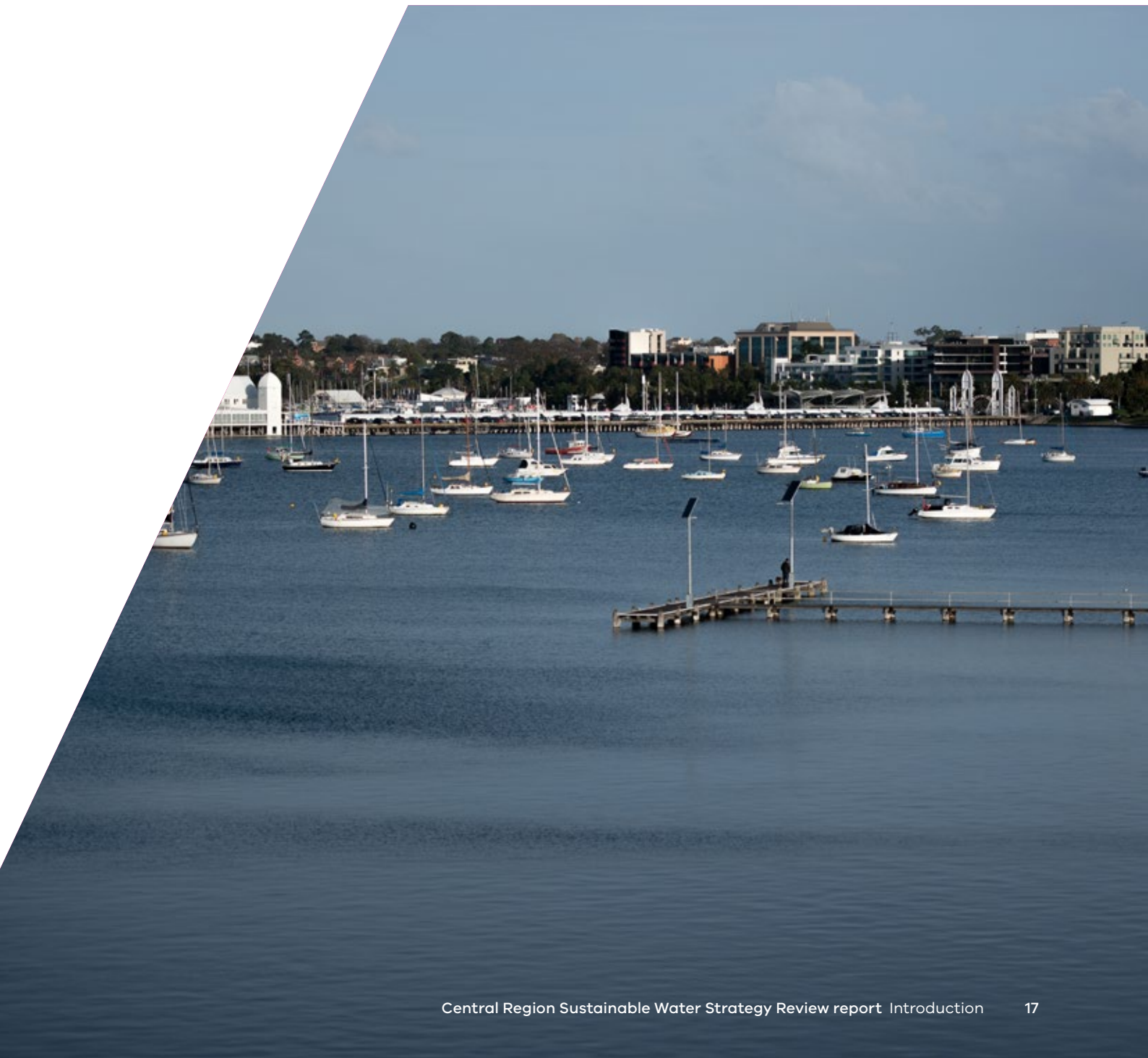
Connecting Ballarat to the Goulburn system: strategy actions aimed to address Ballarat's urgent need for water and secure its future supplies.

Securing Geelong's water: strategy actions included making more water available from Lal Lal Reservoir for Geelong, assessing a bulk entitlement for the deep Jan Juc aquifer and investigating longer-term augmentation options.

Upgrading water systems and increasing supplies: strategy actions included upgrading dams to maximise their efficiency and reintroducing existing dams (including Tarago Reservoir) and diversion weirs to supply systems.

Investing in healthier rivers and aquifers: the strategy recognised the importance of the region's rivers and waterways not just for providing water but for recreation, tourism, sense of place, Traditional Owners and Aboriginal Victorians, and ecosystem values and services. To protect these, the strategy created environmental water reserves for each of the region's major river systems.

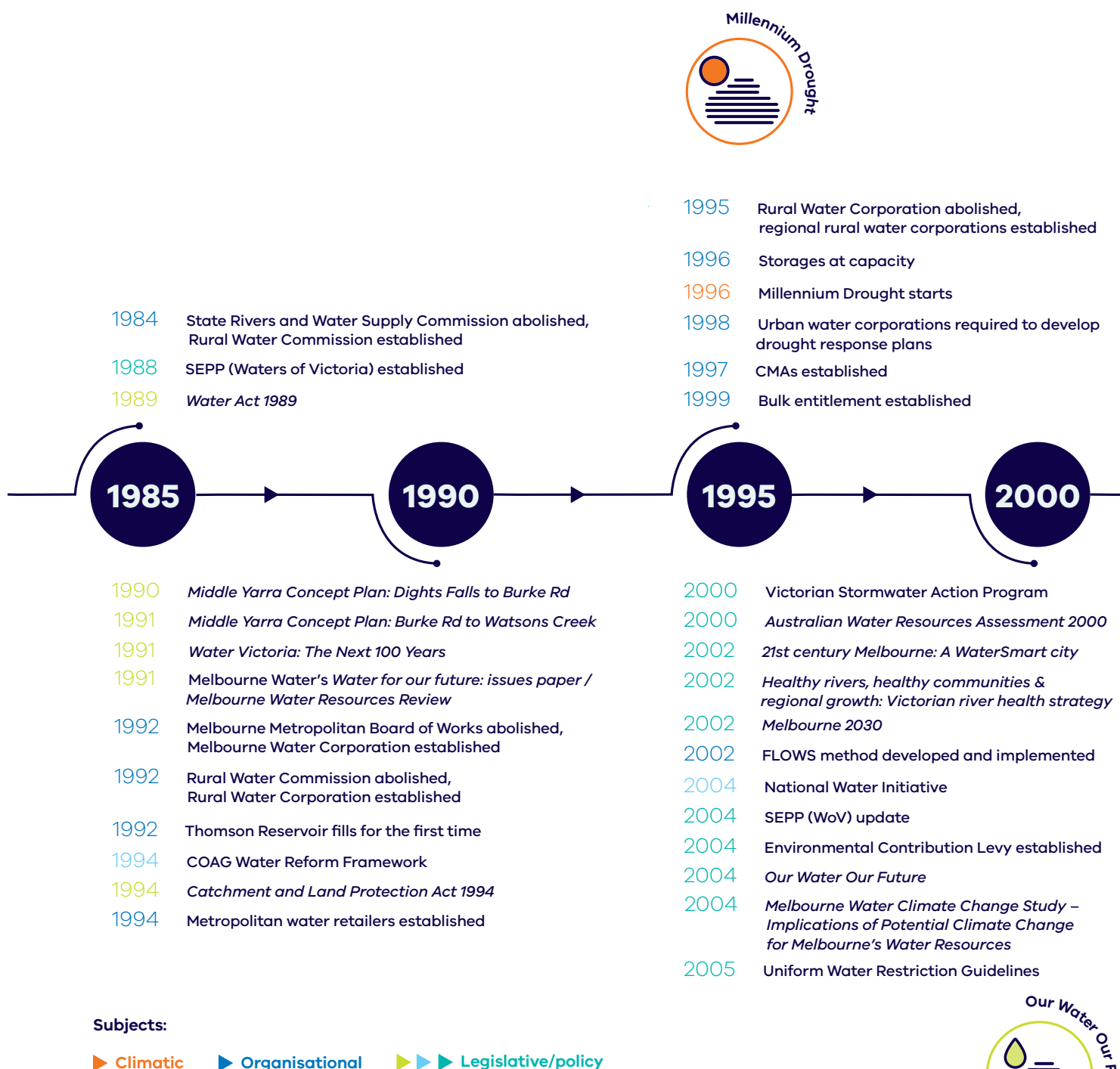
Image: DELWP

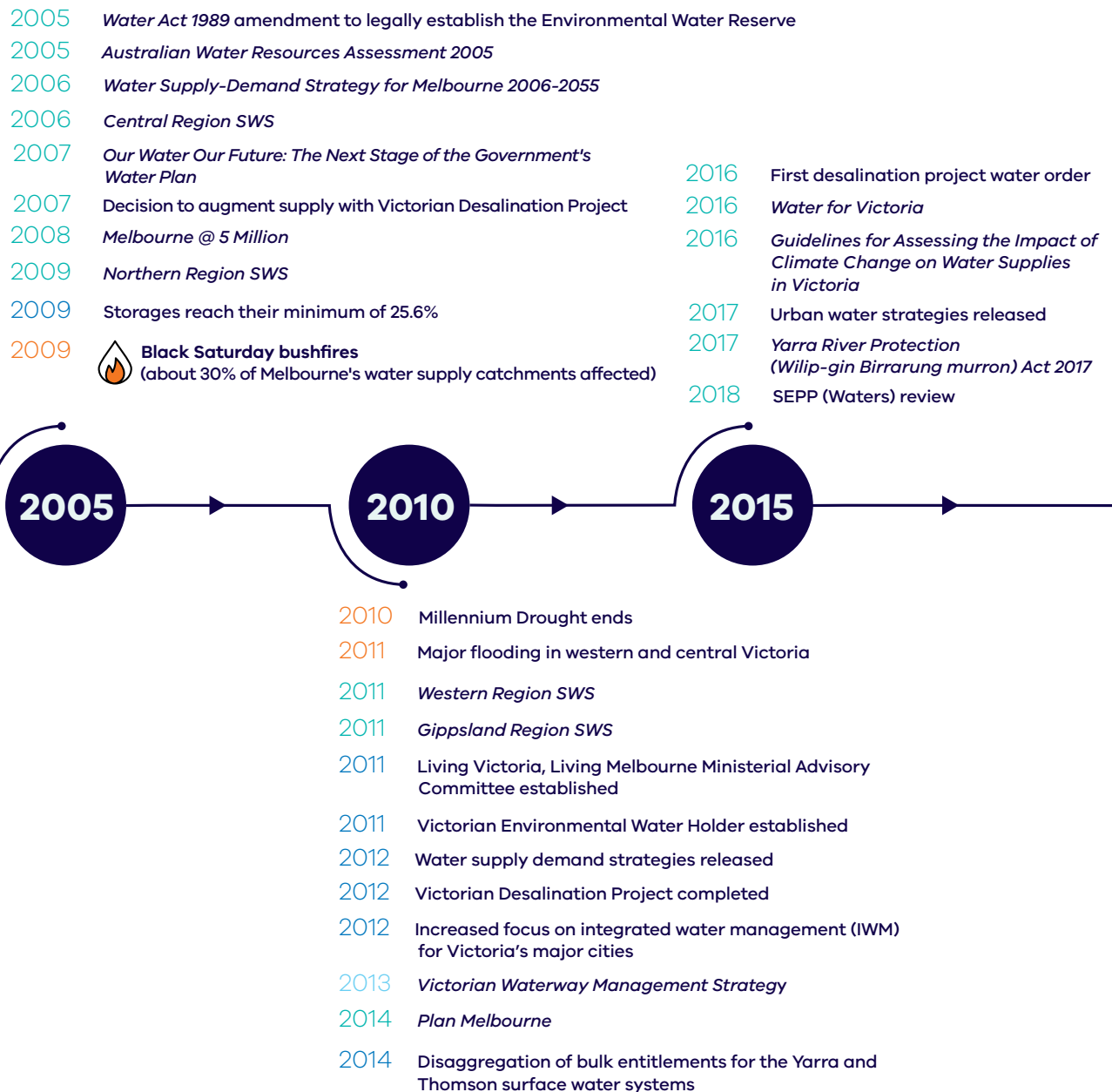


The evolving water management context

The period leading up to 2006 and the subsequent CRSWS period have seen major changes in water management. Figure 2 shows some of the key events and their year.

Figure 2: Water management key events, 1984–2018





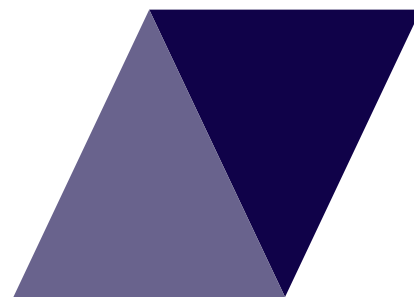
The key events include:

- proclamation of the *Water Act 1989*, the basis for Victoria's water entitlement and planning frameworks
- the establishment of bulk entitlements, starting in 1995, to describe sharing arrangements for access to a water resource and to allow for an explicit, enforceable cap on water extracted by water corporations
- the 2002 development and implementation of the FLOWS method for determining environmental flow requirements, which allowed for a consistent approach across the state
- the 2004 *Our Water Our Future White Paper*, which provided the impetus to develop regional SWSs: it had 110 actions over a 50-year timeframe relating to restoration of stressed rivers, urban consumption and pricing, irrigation, water allocations and entitlements and institutional reform
- the 2005 introduction of uniform water restriction guidelines, to make demand management and water restrictions consistent
- amendments in 2005 to the *Water Act 1989* to clarify the distinction between consumptive entitlements and water for the environment, to establish the environmental water reserve, and to create a new provision for allocating environmental entitlements
- the 2007 [*Our Water Our Future: The Next Stage of the Government's Water Plan*](#), which responded to the Millennium Drought's record-low inflows across the state. Melbourne went onto Stage 3a restrictions in April 2007 and 457 Victorian towns were on water restrictions by July of that year. The plan set out supply augmentation initiatives including the Victorian Desalination Project and the North–South Pipeline
- the establishment in 2011 of the Victorian Environmental Water Holder (VEWH) as an independent statutory body to hold and manage Victoria's environmental water entitlements.

There have been many other changes since the CRSWS was released in 2006 to water planning and management including:

- changing system allocation policies, to allow more water to be held in storage, to buffer the impacts of low-inflow years
- continuing to acknowledge the importance of rivers and waterways for farming and agriculture, and to acknowledge the investments made by communities, businesses and individuals to ensure their water use and farming practices are as efficient as possible
- formalising the environmental water reserve and VEW, to greatly increase the volume of water made available for the environment through held entitlements and via rules-based arrangements
- introducing carryover for specified surface water systems and some groundwater systems, to allow water users more flexibility about when they use their water
- investing in large- and small-scale infrastructure, to reduce seepage and evaporation
- unbundling surface water entitlements and more advanced water-trading rules in declared systems, to move water to where it is most valued.

During the life of the CRSWS, community values and expectations about water planning and management changed. There is now a greater recognition of the cultural and recreational values of waterways and the importance of environmental protection, and a greater expectation by the community to be consulted about water planning and management decisions.

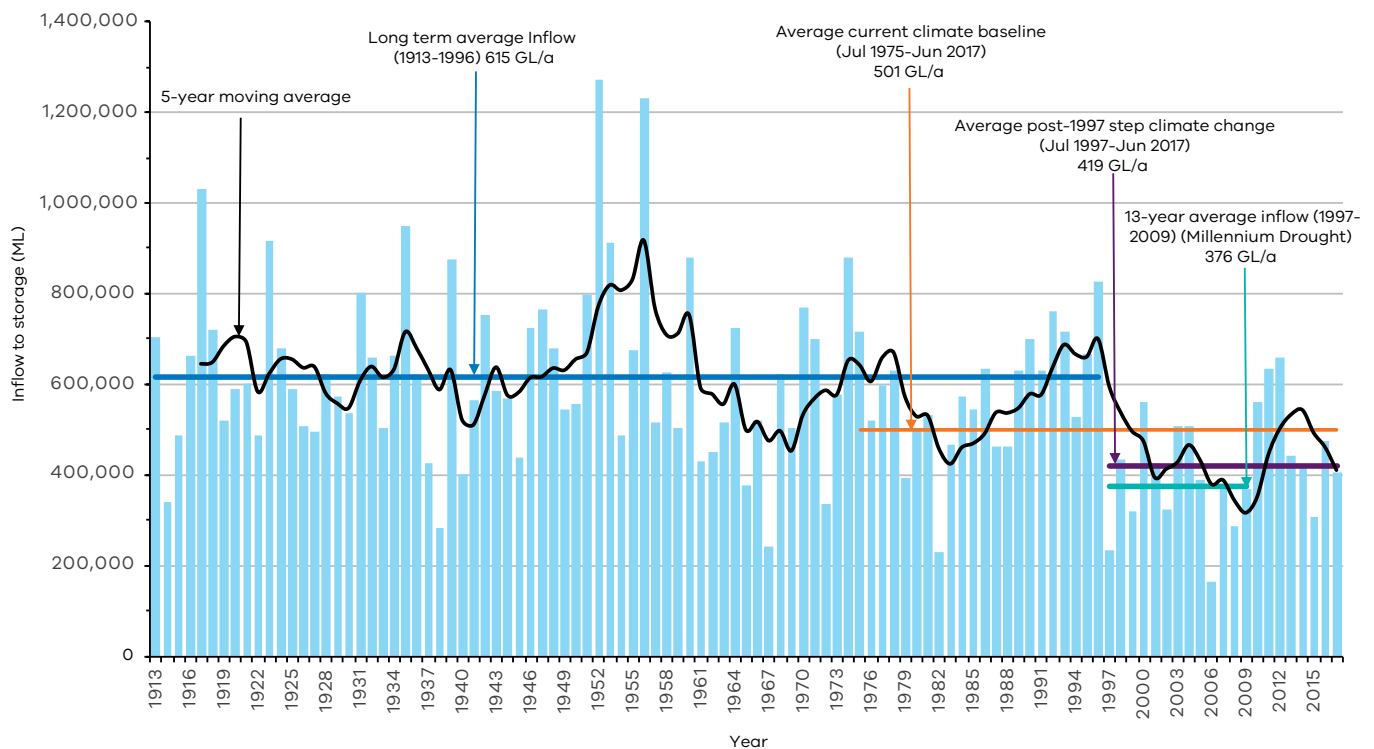


The Millennium Drought

The CRSWS took effect in 2006, around the time when the scale and significance of the Millennium Drought became apparent. The drought, which began with low rainfall in late 1996 and ended in 2010, resulted in the lowest inflows on record into many of the region's catchments.

Figure 3 shows annual streamflow at Melbourne's major harvesting reservoirs: the Thomson, Upper Yarra, O'Shannassy and Maroondah reservoirs. It shows the effects of the three major El Niño events during the drought — in 1997–98, 2002–03 and 2006–07 — which resulted in many years being below the 13-year average inflow, which was itself about 40% lower than the long-term (1913–96) average. In 2006, streamflows were almost 30% lower than the previous lowest streamflows, which occurred during the 1982 drought. These inflows were far less than the worst-case forecasts of Victoria's water managers.

Figure 3: Annual streamflow at Melbourne's major harvesting reservoirs, 1913–2015



Source: Melbourne Water

Note: Relevant data for the Ballarat system is only available from 2001.

Figure 4 shows the monthly storage capacity for the Melbourne and Ballarat systems. It shows that in the mid-1990s the Melbourne system was close to full capacity, but by 2009 both systems had steadily dropped. The Melbourne system hit a minimum of 25.6% in June 2009: the Thomson Reservoir was only 16% in that month. The Ballarat system minimum — of 7.2% — occurred in May 2008.

In late 2010 and early 2011, the Millennium Drought broke with major flooding across Victoria, which greatly improved the volume of water in urban and rural storages. The focus of water policy shifted, of which one aspect was the development of IWM solutions to better manage water in the landscape.

The Millennium Drought had a major effect not just on implementation of the CRSWS but on water use in Victoria. It lasted long enough to ensure a structural, generational reduction in water use. Per capita water use returned to the levels of the 1920s and 1930s. As well, there is now a much-greater recognition of climate change, changes in water availability and the wider range of extremes for which planning is required.

Water planning and management in Victoria

Since the CRSWS was released, water planning and management has evolved significantly, and relatively quickly. There is comprehensive state policy, and there are strategies and action plans for regions, catchments and waterways. There is a strong climate change mitigation and adaptation framework, with legislation and action plans; and the influence of other factors (such as population growth and land use) on water supply and demand are better understood and addressed in water planning and management.

Figure 4: Monthly storage capacity, Melbourne and Ballarat systems, 1985–2018

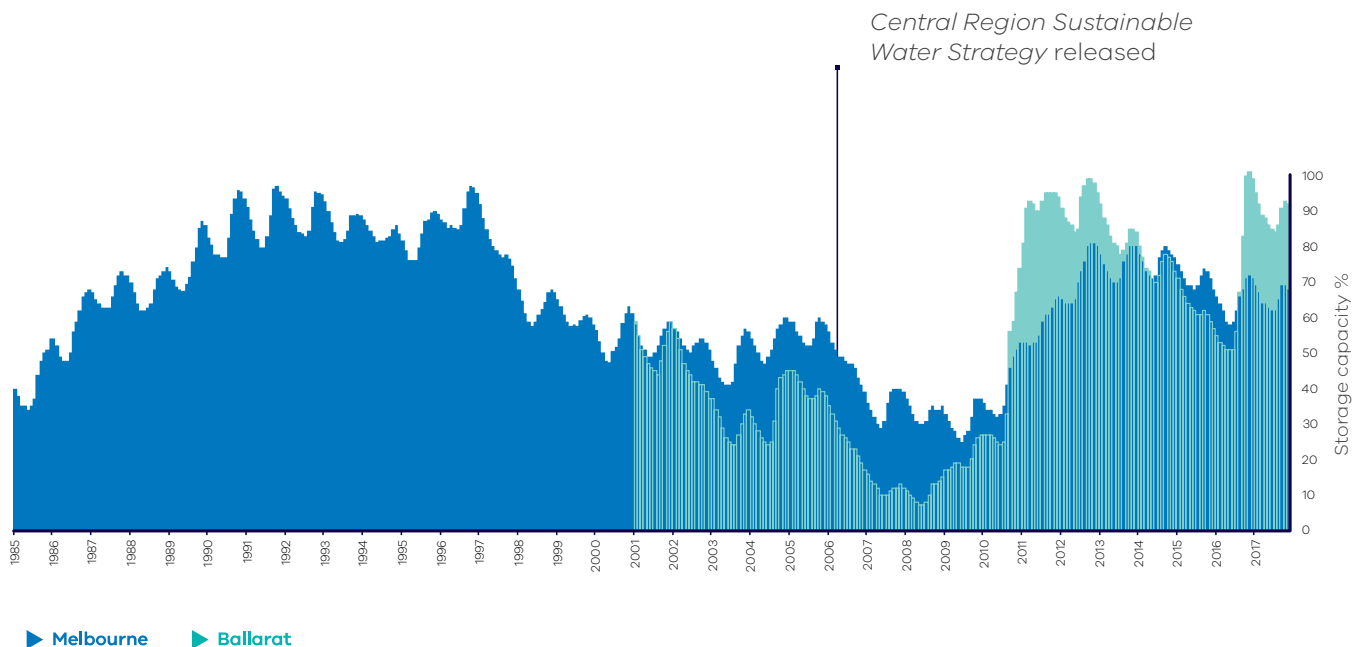


Figure 5: Key water strategies and plans

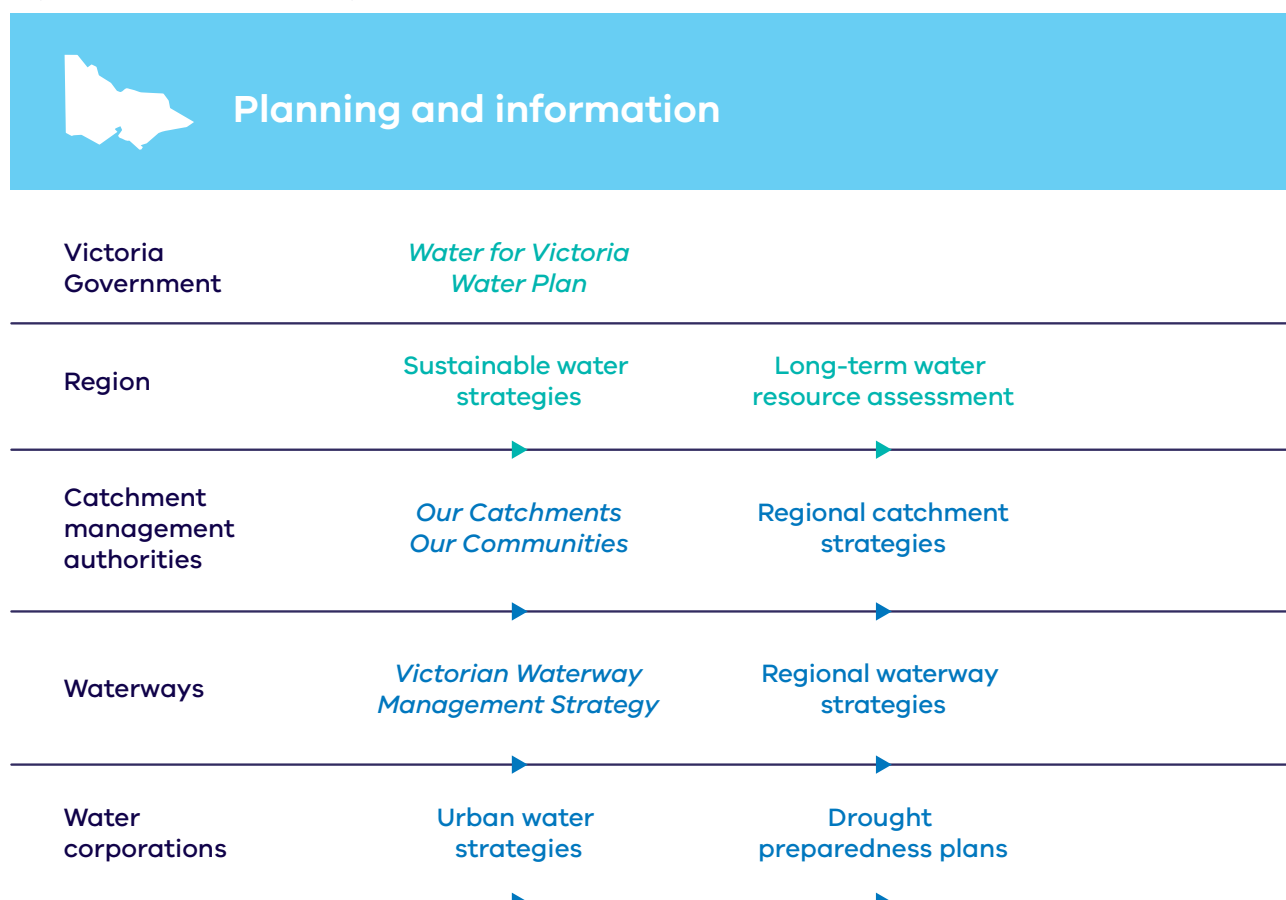


Figure 5 shows key strategies and plans to manage water in Victoria.

The Victorian Government's 2016 [Water for Victoria Water Plan](#) is a long-term plan with 69 actions to manage Victoria's water resources. The plan:

- aims to maximise shared benefits for all water users without compromising the needs of the environment, agriculture, towns and businesses. For instance, water corporations can now time releases of water from storages for Aboriginal customary or spiritual purposes (known as cultural flows)
- aims to secure water supplies for communities, industries and the environment in the face of climate change, population growth and reducing water availability in the future
- commits water authorities to help mitigate the impacts of climate change by reaching net-zero emissions
- emphasises working with communities and government agencies
- outlines principles for public investment in rural water infrastructure, which recognise climate change, regional plans and the health of the environment
- recognises the importance of recreational opportunities at waterways and water storages, and requires the water sector to consider these values in the way it manages water
- recognises the values water has for Traditional Owners and Aboriginal Victorians and supports Aboriginal participation in water planning and management.



Image: Craig Moodie, DELWP

[Long-term water resource assessments](#) (LTWRAs) determine whether long-term water availability has changed and, if so, whether there has been a disproportionate effect on consumptive users or the environment. If there has been any deterioration in waterway health for reasons related to flow, a CRSWS review is required. This open, consultative review must consider social, environmental and economic matters and determine how to restore the balance between consumptive and environmental use. Under the Water Act, a LTWRA must be done every 15 years. The first LTWRA started in August 2018. The current requirements for a LTWRA review may overlap with a SWS.

[Our Catchments, Our Communities](#) is Victoria's first statewide strategy for integrated catchment management. This strategy aims to ensure catchment management partners work effectively together to manage catchments to benefit our environment, community and economy. This strategy supports implementation of chapter 3 of *Water for Victoria*.

[Regional catchment strategies](#) are the primary, integrated planning framework for the management of land, water and biodiversity resources in each catchment. They aim to integrate community values and regional priorities with state and federal legislation and policies.

The [Victorian Waterway Management Strategy](#) provides a detailed policy for managing Victoria's waterways over the period 2013–21. It aims to maintain or improve the condition of our waterways so they support environmental, social, cultural and economic values important to communities.

[Regional waterway strategies](#) are planning documents for managing the rivers, estuaries and wetlands in each region. They determine priority waterways for the eight-year planning period and implement the management approach in the *Victorian Waterway Management Strategy*.

[Urban water strategies](#) are developed by Victoria's urban water corporations. They provide detailed 50-year forecasts of demand, as well as supply options, taking account of the latest data and advice about how to assess the impact of climate change on water supplies. This is particularly important given some estimates that demand for water in

Melbourne and its surrounds could almost double over the next 40 years, and annual inflows from our major water supply catchments could decrease by more than 50%. The strategies must be consistent with *Water for Victoria* and aim to:

- encourage the sustainable use of water resources including rainwater, stormwater and recycled water in a fit-for-purpose way
- identify key climate change adaptations to ensure secure water and sewerage services.

Water corporations will update their urban water strategies in 2022.

Under ministerial guidelines and the *Water Industry Act 1994*, a water corporation must prepare a drought preparedness plan including a drought response plan that establishes four stages of water restrictions. These plans ensure timely short-term responses to water shortages.

Other strategies, plans and reviews

[Victoria's Climate Change Adaptation Plan 2017–2020](#) is a blueprint to prepare the state to meet the challenges of climate change by increasing understanding of our exposure to climate change risks and impacts, catalysing partnerships that respond to climate change and taking immediate action to reduce climate change risks. One of the actions in the plan is a pilot water sector climate change adaptation action plan. It includes all water sources, sewerage, drainage and flood management. Waterway health, ecology and biodiversity are out of scope of the pilot and will be included in the natural environment adaptation plan in 2021.

The [Melbourne Water System Strategy](#) outlines Melbourne Water's actions to make sure Melbourne continues to have safe, secure and affordable water over the next 50 years, especially in light of its growing population and changing climate. Melbourne Water revises the strategy every five years.

The Melbourne Sewerage Strategy, action 5.4 of *Water for Victoria*, is currently being developed. It will more explicitly bring wastewater into long-term water planning.

Melbourne Water's [Healthy Waterways Strategy](#) guides investment for waterway health in the Port Phillip and Western Port areas and defines a vision for the region, identifies priority areas and management actions and sets out targets to measure the effectiveness of these actions. Melbourne Water is currently reviewing this strategy for the ten-year period 2018–28.

The new [Yarra River protection](#) actions and the development of the [Yarra Strategic Plan](#) will also interact with CRSWS policy issues.

[Victoria's IWM Framework](#) is Australia's first systematic approach to collaborative IWM at the statewide scale. It aims to bridge water-cycle systems, leading to a bigger range of solutions and solutions integrated across systems, and so more shared benefits. The framework establishes IWM forum areas. Each forum develops a strategic directions statement to state the vision, strategic outcomes and future prioritised IWM opportunities.

The recently released [National Water Reform Productivity Commission Inquiry Report](#) identified that governments need to continue to respond to the challenges posed by population growth, climate change and changing community expectations. Key priorities include:

- enhancing national policy settings in:
 - urban water management, including clearer roles and responsibilities for supply augmentation planning, improving economic regulation, enabling decentralised solutions and more outcomes-focused environmental regulation
 - environmental water management, including better integration with waterway management, strengthened and streamlined institutional, governance and management arrangements, and improved monitoring and evaluation for adaptive management
 - new infrastructure, where the focus needs to be on ensuring environmental sustainability and financial viability before any government resources are committed for construction
- maintaining the key foundations of water management, preventing the re-emergence of outdated policies and avoiding the erosion of hard-won reforms through backsliding
- revising national policy settings in a range of areas, including entitlement and planning arrangements for extractive industries, and the water needs of Indigenous Australians.

The report concludes that water reform requires perseverance, continuity and long-term commitment from governments. Failure to act now risks the gains made to date and means opportunities for greater efficiency, improved liveability and more sustainable environments would be lost.

Reviewing the CRSWS

The *Water Act 1989* requires SWSs to be reviewed at least every 10 years, and the review of the CRSWS started in late 2016 and was completed with the publication of this report in 2018.

The review process included a stocktake to identify progress in implementing each action and extensive consultation with water corporations, CMAs, the VEWH and the community to review the findings of the stocktake and identify the main achievements of the SWS and opportunities to consider in a future SWS or SWSs incorporating the Central Region.

The Minister for Water appointed a consultative committee to the review process, which reviewed community and stakeholders' feedback about the draft CRSWS review report, to ensure the feedback is considered adequately in the final review report.

The members of the consultative committee are Christine Forster AM (independent Chair), Dr Tamara Boyd, Tony Wright, Dr Rohan Henry and Chris Williams. The consultative committee provided strategic guidance and advice about the preliminary draft and final review reports.

Engagement with Traditional Owners and Aboriginal Victorians

The CRSWS acknowledged the importance of Aboriginal values, and the review recognised the contribution of Traditional Owners and Aboriginal Victorians to reviewing the strategy and contributing to future strategies. As explained in *Water for Victoria*, it is important to identify and consider opportunities for achieving shared benefits for Aboriginal values of water and opportunities to access water for economic development by Aboriginal Victorians.

Traditional Owners and Aboriginal Victorians and the Victorian Government are currently working together on the [Aboriginal water program](#). The program is helping develop greater knowledge across the water sector, government and communities about Aboriginal water values and uses and access to water for economic development. It is supporting Traditional Owners and Aboriginal Victorians with knowledge about water planning and management; and it is strengthening their skills and capacity to influence and make decisions about how to access water for economic development and for cultural, customary and spiritual practices.

2. Strategy achievements





Image: Sue Porter, DELWP

Introduction

The review of the CRSWS started with an assessment by consultants of the state of achievement of the 112 actions in the strategy, which formed the basis for consultation with the regions' CMAs, water corporations and the VEWH to review achievements and identify issues for the review.













Table 1 shows, for each CRSWS chapter (and subchapter in the case of chapter 4):

- 44 actions were achieved and ongoing (the actions have been achieved and the strategy's requirements met, but ongoing effort is needed to ensure the intended outcome of the action continues to be maintained)

- 60 actions were achieved and completed (the action has been completed in full)
- 5 actions were partly achieved (part but not all of the action was achieved, with work continuing to fully achieve them)
- 3 actions are not yet achieved (with implementation either continuing or progressing through another strategy).

Appendix 1 shows, for each action in the CRSWS, the status of the action and the delivery period.

Table 1: Status of CRSWS actions, February 2018

Actions				
Chapters	Achieved 	Partly achieved 	Not yet achieved 	Total
 Chapter 2	15	2	-	17
 Chapter 3	27	-	-	27
 Chapter 4: Ballarat	7	1	-	8
 Chapter 4: Geelong	9	-	-	9
 Chapter 4: Inner West	7	2	3	12
 Chapter 4: Greater Melbourne	12	-	-	12
 Chapter 4: West Gippsland	7	-	-	7
 Chapter 4: Westernport	5	-	-	5
 Chapter 5	15	-	-	15
Total	104	5	3	112

The CRSWS improved planning, management and engagement

Coordinated regionwide planning

The CRSWS established a common framework for decision-making by CMAs and water corporations, particularly about augmentation and entitlements, beyond the scale of individual organisations.

The CRSWS brought together the supply, demand, augmentation and entitlements (particularly environmental entitlements) aspects of water management at a regional scale. It enabled the government, agencies and the community to address the predicted decline in streamflows and the resultant impact of that decline on supply and on the environment, and the increasing risks of climate change.

The process of developing and implementing the CRSWS helped formalise and strengthen previously limited, informal and ad hoc relationships between personnel in water authorities, many of whom were still learning how to work together after amalgamations and restructures; and it provided a common language and focus to discuss and resolve water supply security at a regional scale. In particular, for a region that contains a capital city, it made regional centres and CMAs part of water planning in the broader Central Region.

The CRSWS was the first effort to implement the Victorian Government's 2004 *Our Water Our Future White Paper* on a regional and local scale, with policy statements and 112 actions. The White Paper was an important step forward in the management of the state's water resources, and it established Victoria as leaders in the development of the National Water Initiative.

The CRSWS provided a regional means for water corporations and CMAs to be involved in water planning and to consider water supply security at a scale beyond each water corporation. Collaboration is far more developed and effective now than in 2006.

Before the CRSWS, the region's water planning tended to focus on Melbourne and its issues. The broader, regional focus provided for planning at a larger scale, such as is required to interconnect and make the whole supply system more consistent. It also ensured local actions were aligned with the strategic principles set out in chapters 2 and 3 of the strategy.

The CRSWS provided opportunities for state government funding for some actions. For others, it allowed water corporations to develop business plans and to incorporate them in pricing submissions to the Essential Services Commission.

Approaches to water management throughout the region in 2006 during the drought were somewhat reactive, and they are now more proactive.

Traditional Owners' and Aboriginal Victorians' involvement in water planning and cultural values

Recognising the value of water to Traditional Owners and Aboriginal Victorians, CRSWS actions sought to engage Aboriginal communities to ensure waterway plans and strategies incorporate Aboriginal social, spiritual and cultural objectives.

CMAs prepare regional waterway strategies and update them every eight years. DELWP amended its *Guidelines for preparing regional strategies for healthy rivers and wetlands* to require CMAs to engage with Traditional Owners and Aboriginal Victorians when preparing and updating regional waterway strategies.

Many Traditional Owners, Aboriginal Victorians and their representatives were involved in developing the *Victorian Waterway Management Strategy* including the Victorian Traditional Owner Land Justice Group, Native Title Services Victoria, the (then) Department of Sustainability and Environment and Department of Justice Native Title Units, the (then) DSE Indigenous Facilitators Network, the Catchment Management Authority Indigenous Facilitators Network, Aboriginal Affairs Victoria and the Victorian Aboriginal Heritage Council.

There is also formal, active engagement with Aboriginal communities in the development processes for other waterway planning and management documents (such as environmental water management plans and seasonal watering proposals).

CRSWS actions formalised the engagement of Traditional Owners and Aboriginal Victorians in water planning and management, and it helped incorporate their social, spiritual and cultural objectives in strategies and plans including regional waterway strategies and the *Victorian Waterway Management Strategy*. It also laid the basis for *Water for Victoria's* focus on recognising and managing for Traditional Owners' and Aboriginal Victorians values.

Groundwater resource management

The CRSWS's actions to manage groundwater — to preserve existing groundwater resources, manage overallocated groundwater resources and manage groundwater considering the risks of low flows and climate change on groundwater resources — were achieved or are by their nature ongoing.

A permissible consumptive volume (PCV) is the maximum volume of surface water or groundwater or both that can be taken from a river, basin, aquifer or other defined area. Declaring a limit on licences to extract groundwater provides certainty to licence holders, while also protecting water for the environment. Where the licensed volume is equal to the PCV, those who want to obtain a licence to extract groundwater or increase their current licensed volume must trade a volume of water from another licence holder in the area. PCVs are listed in the annual [Victorian Water Accounts](#) and on DELWP's [Managing groundwater](#) web page. From their introduction in 2004, PCVs were declared for individual areas. In 2009, the Minister combined all declared PCVs into one order, increasing the transparency of water management.

Policies were developed for managing take and use licences and [ministerial guidelines](#) issued for groundwater licensing and the protection of high-value, groundwater-dependent ecosystems. [Policies](#) were also developed for managed aquifer recharge schemes and in situ desalination. Private interests and water corporations are exploring opportunities for managed aquifer recharge. Groundwater resource availability and use are reported annually in the Victorian Water Accounts. DELWP also developed a [groundwater resources map](#) so landholders know what groundwater resources are available.

Advances in groundwater management

The CRSWS addressed groundwater management primarily in terms of sustainably using groundwater as an alternative source of water for urban supply. It laid the groundwork for the more comprehensive approach to groundwater in the Western Region SWS, which set out new policies and actions including for groundwater trading, developed an approach to managing groundwater-dependent ecosystems and considered the impacts of land use changes and extractive industries.

Consequently, the [Victorian Aquifer Framework](#) was developed, expanding on mapping work completed by Southern Rural Water for southern Victoria. The framework enables development of innovative tools including DELWP's [groundwater resource reports](#) and Federation University Australia's [Visualising Victoria's groundwater](#) tool covering all of Victoria. Southern Rural Water incorporated their mapping into three groundwater atlases and other tools on their [Groundwater Hub](#). The Bureau of Meteorology has also developed national tools incorporating The Victorian Aquifer Framework.

The Western Region SWS groundwater management approach became statewide policy in 2011.

Climate change recognised

The CRSWS was an early leader in recognising the impact of climate change on water supply and demand. It acknowledged the strong scientific evidence for climate change, and it used modelled climate change scenarios based on initial CSIRO estimates of the impacts of climate change to look at low, medium and high climate change risks over the 50-year period in detail. It was one of the first government water planning documents to take the policy direction on climate change in the government's 2004 *Our Water Our Future White Paper*.

Other water resource plans and regional SWSs have since followed this lead. For example, in 2006 four metropolitan water companies revised the [Water supply demand strategy for Melbourne 2006 - 2055](#) to incorporate the science about the potential impact of climate change on water resources. The 2013 *Victorian Waterway Management Strategy* also includes a framework and actions to respond to climate change.

The potential impacts of climate change are now addressed at all levels of water planning as a result of legislative and policy initiatives including the *Climate Change Act 2017*, Victoria's *Climate Change Adaptation Plan 2017-2020* and the *Guidelines for Assessing the Impact of Climate Change on Water Supplies in Victoria*. Urban water corporations prepared water supply demand strategies in 2012 and urban water strategies in 2017: these strategies took account of Victoria's legislation and policy about climate change at the time.

A CRSWS action was to develop environmental drought response plans. Such plans predated the strategy, but it gave CMAs and water authorities extra impetus to prepare these plans, also called drought response plans, in the mid- 2000s; and it also confirmed their importance. As well, the seasonal watering proposals CMAs and Melbourne Water prepare for the VEWB now address a drought scenario. These proposals feed into a seasonal watering plan the VEWB prepares. The seasonal watering plan shows the potential environmental watering that could occur in each waterway system using environmental water entitlements under a range of potential seasonal condition or water availability scenarios: drought, dry, average and wet-to-very-wet.

The CRSWS integrated climate change into water planning with mandatory preparation of drought response plans by water corporations and CMAs.

Monitoring, reporting and improvement

The CRSWS had actions to monitor:

- groundwater: real-time data from the statewide system of monitoring bores is now accessible online through the state's [Water Measurement Information System](#)
- water consumption, which water corporations monitor and report on their annual reports
- waterway health: the index of stream condition has been undertaken three times since 1999 and a program established in 2005 to monitor and assess ecosystem responses to environmental watering in rivers is still underway.

The CRSWS also had actions to improve:

- demand modelling: which has been achieved as part of developing water demand strategies
- reporting: the statement of obligations was amended in 2015 for water corporations and in 2007 for CMAs to include provisions to report on *Our Water Our Future: The Next Stage of the Government's Water Plan* and SWS actions
- water accounting: statewide water accounting now occurs annually in the *Victorian Water Accounts*, which are available online.

To prepare the CRSWS, consultants investigated the economic, environmental and social impacts of all options, to inform the best mix of actions. The strategy set the lead for this type of multifactor options analysis, which continued to be developed and which is evident in *Water for Victoria*.



CASE STUDY: Target 155

In 2016–17, residential water use in Melbourne was an average 161 L a person a day, down from 166 L a day the year before and from 188 L in 2006–07. That was just 6 L — about two-thirds of a bucket of water — above Target 155, the campaign by the Victorian Government and Melbourne’s water corporations to encourage households to keep water use at or below 155 L of water a person a day.

Target 155 was first introduced during the most severe stages of the Millennium Drought, was replaced with other water-saving initiatives when it ended and was reactivated in March 2016. While the Millennium Drought has passed, we all know circumstances can change quickly and our water storages can drop sharply. With the Central Region’s growing population and with climate change threatening further decreases in inflows,

we must use our water with maximum efficiency.

As part of the campaign, water corporations promote tips about smart water use for households (such as keeping a shower to four minutes, installing efficient showerheads — a water-efficient showerhead can save up to 13,500 L a person a year —, mulching gardens and using a front-loading washing machine). They also offer water-saving advice about irrigation, gardening, swimming pool operation, car washing and other water-consuming activities. They also advise about rainwater harvesting and greywater systems and usage and promote Melbourne’s permanent water-use rules, restrictions that promote sensible use of water.

TARGET
155

The CRSWS successfully enabled reduced demand

Water conservation and efficiency

The CRSWS had many actions to conserve water and lock in water-use efficiency measures in a time of low water availability, and the community came to see water efficiency as business-as-usual. Consequently, water is used much more efficiently in the Central Region today than it was 20 years ago.

Water conservation was top-of-mind for the public during the Millennium Drought. The drought, which began with low rainfall in late 1996 and ended in 2010, resulted in the lowest inflows on record into many of the region’s catchments. The strategy was launched in 2006, just before the 2006–08 period, which was the driest on record for many parts of Australia. The impact of streamflows 30% below the previous lowest saw Melbourne’s water storage levels drop by about 20% in 2006, triggering widespread community concern.

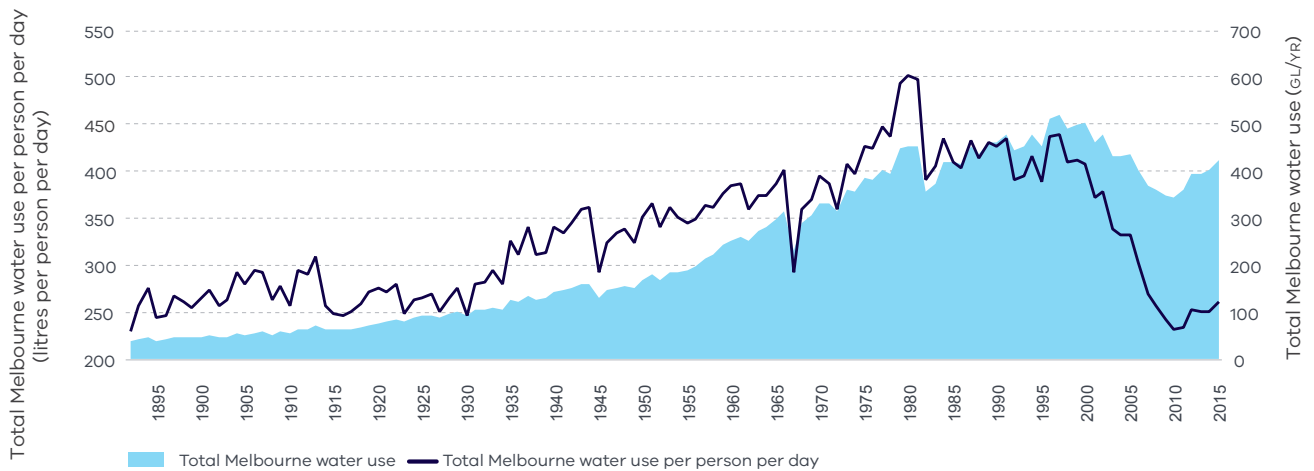
The strategy’s focus on water conservation and demand management through behaviour change and water-saving measures has had the long-term

effect of reducing household demand and improving overall water-use efficiency. This focus was particularly effective as it offered positive, practical responses to increasing public concern about the worsening drought. Water-use efficiency also helps delay the need to augment the water supply system over the longer term.

In response to water restrictions and voluntary water-efficiency programs implemented through the strategy during the Millennium Drought, total Melbourne water use declined by about 30% in 1997–2009 despite Melbourne adding some 500,000 people to its population during that period.

Figure 6 shows that on a per-person basis, Melbourne’s total — residential and business — water consumption has declined to levels not seen since the 1930s. Peak day demands have also declined, from a high of over 3 GL a day in 1996–97 to less than 2 GL a day in recent years. These reductions in water consumption, as well as reduced environmental water releases, enabled water managers to maintain supplies throughout the Millennium Drought.

Figure 6: Total Melbourne water use per person per day, 1895–2015

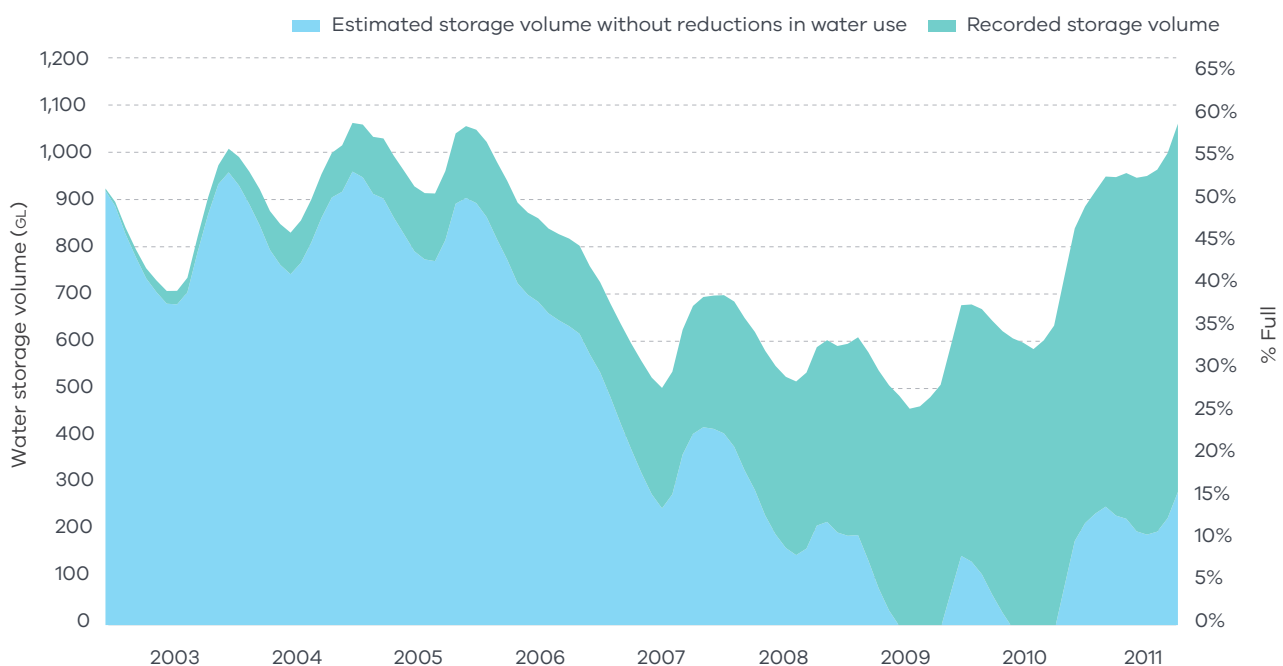


Source: Melbourne Water System Strategy 2017

Figure 7 shows the effect of reduced water consumption on storage levels throughout the Millennium Drought. By July 2011, reduced water consumption had saved about 780 GL of water — almost three-quarters of the capacity of Thomson Reservoir — and had also saved Melbourne running

out of water. During the Millennium Drought, environmental water releases were also reduced. This reduced demand on water storages by about 150 GL, but it also increased environmental risks. Environmental water releases returned to normal in late 2010.

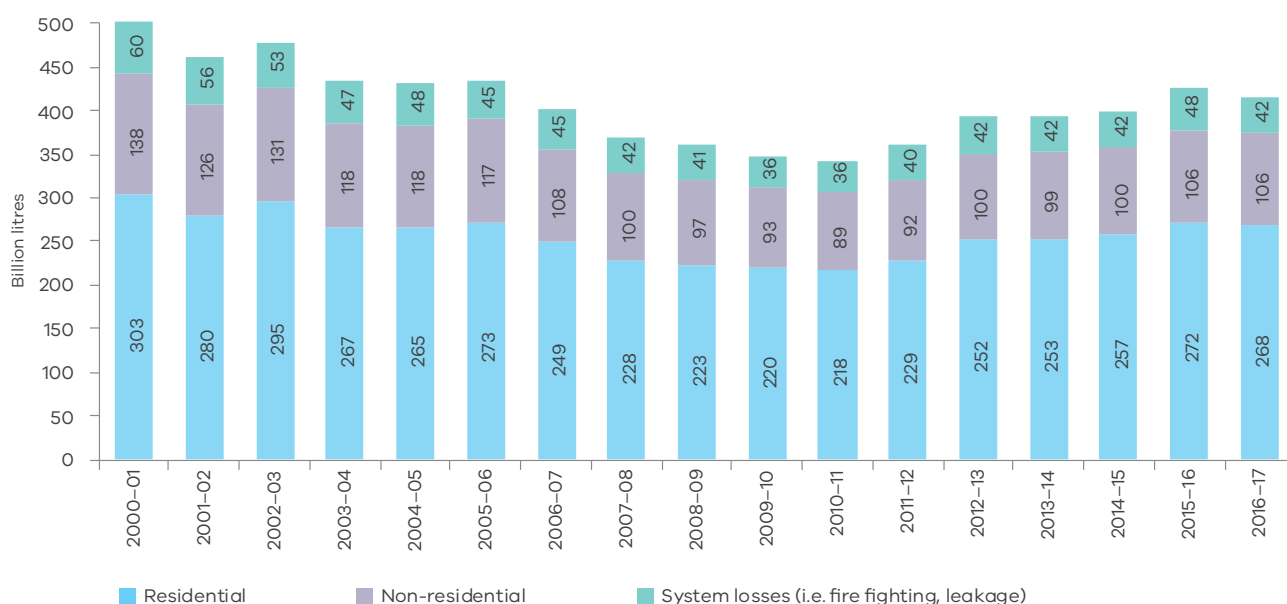
Figure 7: Melbourne’s water storage volumes, 2002–11, actual and estimated without water-use reductions



The water-efficiency and conservation actions taken during the drought, including severe water restrictions, resulted in impacts to the liveability of our city and region was affected. For example, many sports fields became unsuitable for use, to the detriment of the health and wellbeing of the community. However, research indicates the community generally regard water restrictions as an important tool for encouraging people to conserve and use water efficiently.

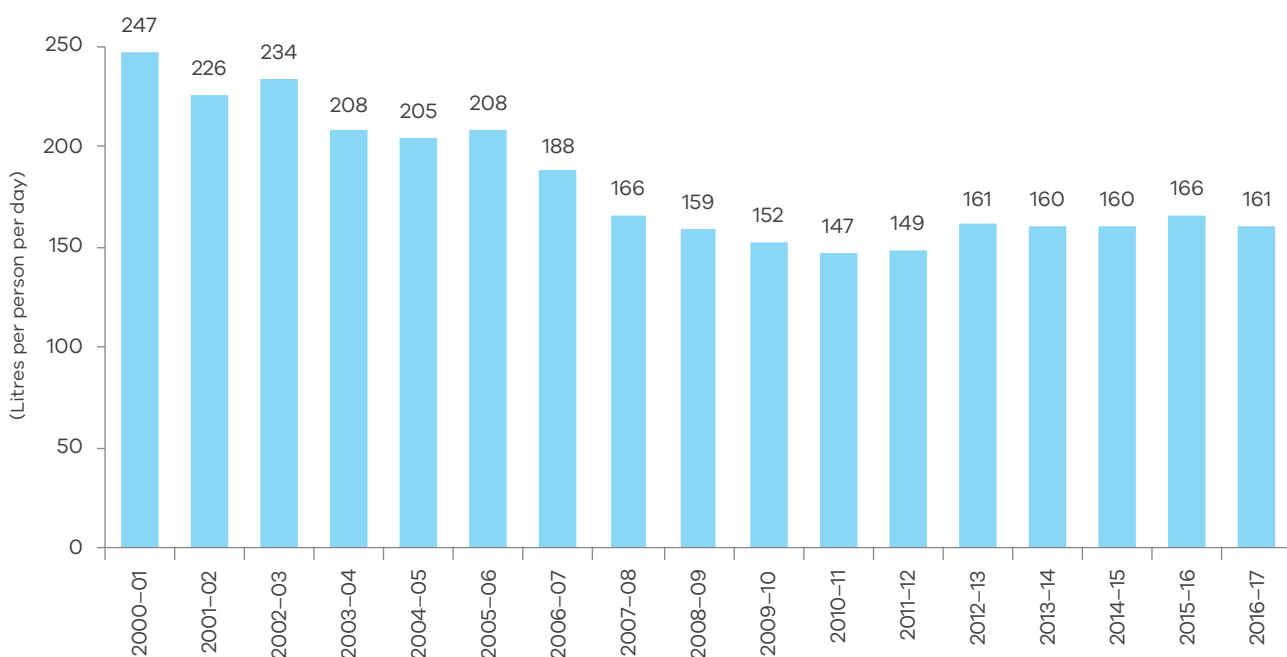
Figures 8 and 9 show that water consumption has increased slightly since the end of the Millennium Drought, but not to pre-drought levels. Permanent water-use rules remain in place, helping maintain efficient water-use practices. Water efficiency has become part of life: in a 2010 study, *Australians' water conservation behaviours and attitudes* by the University of Wollongong, 92% of respondents said they conserve water wherever they can.

Figure 8: Total water use, Melbourne, by segment, 2000–17



Source: Melbourne Water Outlook 2018

Figure 9: Residential water use, Melbourne, 2000–17



Source: Melbourne Water Outlook 2018



CASE STUDY: Schools Water Efficiency Program

Launched in 2006, the Schools Water Efficiency Program (SWEP) has helped more than 1,103 schools across Victoria save water and promote water education through auditing and retrofitting water-efficient devices. CRSWS action 3.12 was to continue the program.

In 2012, SWEP was changed to provide Victorian schools with data loggers, which are attached to their water meter and which continuously track how much water is being used. They transmit a daily file each night, which is uploaded to the program's website. Facility managers, teachers and students can then view up-to-date water consumption data through an easy-to-use website.

If schools can find leaks early, they save water and money: money that is better spent on computers, equipment and other resources.

SWEP also provides students with an opportunity to learn about water efficiency in a practical

environment. Schools have access to a specifically developed curriculum, which uses the school's water data for mathematics and sciences teaching, and which provides students with useful water-saving messages they can apply at home.

At Mill Park Secondary College, the data alerted the Facilities Manager to multiple leaks that were wasting more than 520 L an hour. After joining the program, the school's water bills dropped a dramatic 50% compared to the previous year. At Little River Primary School, the program helped the school make the most efficient use of their 90,000 L rainwater tank. And Wodonga Senior Secondary College identified a leak of 20 L a minute. In all, SWEP has saved an estimated 5.2 GL of water, which would have cost schools over \$15.5 million, since its inception. In April 2018, 1031 schools were registered with the program.

For more about the program go to <https://www.myswep.com.au/>.

Saving water during the Millennium Drought

During the Millennium Drought, retail water corporations and the Victorian Government, supported by Melbourne Water, and regional urban water corporations took many water efficiency and conservation initiatives including:

- conducting the Target 155 campaign
- introducing water restrictions
- increasing community awareness of efficient water-use practices
- providing over 300,000 water-efficiency rebates across Victoria (2003–11)
- regular reporting of water storage levels
- replacing over 460,000 inefficient showerheads and over 4,500 inefficient toilets (by 2010–11)
- working with large, business users to develop more than 1,190 water management action plans by 2010–11.

Many of these initiatives were through the Water Smart Gardens and Homes Rebate Scheme. In July 2007, the scheme was extended for an extra four years, and it was then replaced by the Living Victoria Water Rebate Program which ran until 30 June 2015. As well as supporting households to replace inefficient showerheads and toilets, it also supported them to connect rainwater tanks and reuse greywater. The rebates resulted in an estimated 1,758 ML a year of reduced demand for drinking water. These water savings will be

ongoing, as the scheme made water conservation business-as-usual.

The community also saved water. Many people replaced their top-loading washing machines with more-efficient front-loading models, put buckets in their showers and kitchen sinks, replaced European-style gardens with well-mulched native gardens, installed rainwater tanks and washed their cars more water-efficiently.

Using water efficiently has many other benefits including:

- helping keep water affordable (and helping keep energy affordable too, if it's hot water)
- delaying the need to augment the water supply system and increasing the capacity of the water supply transfer system to meet peak period water demand
- helping control uncertain factors that drive future water consumption, making planning for future investments in the water supply system easier and more certain
- reducing drawdown from our major reservoirs, safeguarding more water for times of low inflow
- reducing energy consumption and greenhouse emissions resulting from treating and pumping water around the water supply system.

At a time when the public was highly aware of and receptive to the water conservation message, behaviour change programs locked in public acceptance of the message and provided the means to act on it. Behaviour change programs were scaled back in 2009–10, coinciding with the breaking of the Millennium Drought, the recovery of water storages and the lifting of water restrictions. Rebates for water-efficient appliances were maintained and extended in 2010 to small businesses and households not connected to the water supply. After 10 years of rebates, the focus changed in 2015 to a rebates program for vulnerable and hardship customers. In March 2016, Target 155 was reactivated as a voluntary water-efficiency program in metropolitan Melbourne and a similar program — Target Your Water Use — was started in regional Victoria.

Other water conservation successes of the CRSWS were:

- continuing the Schools Water Efficiency Program
- extending the Pathways to Sustainability program for Melbourne's top-200 water users into the WaterMAP program; WaterMAP worked with thousands of Victorian businesses to achieve 17 GL of water savings
- introducing penalty infringement notices for breaching water restrictions or permanent water-saving rules
- the Victorian Building Authority adopting the 6-star standard, which requires new homes to install either a solar hot water system or a rainwater tank for toilet flushing
- trialling the implementation of digital water meters.

The continuing need for water efficiency

Water efficiency is defined as ‘any measure that reduces the amount of water used per unit of a given activity, without compromising the achievement of the value expected from that activity’. Investing in water efficiency reduces demand on water storages and helps defer the need to augment water supply systems to cope with population growth, which increases demand for water, and climate change. It’s essential to continue to invest in efficiency, to guard against relaxation by users of the water-efficient behaviours they adopted during the Millennium Drought.

Recent community engagement and customer research shows strong support for water corporations to continue investing in water efficiency and helping people be more water-efficient.

The CRSWS focused on managing demand through behaviour change and infrastructure, to conserve and use existing water supplies more efficiently.

CASE STUDY: Shared benefits for Thomson River recreational users

The West Gippsland CMA provides environmental water releases from Thomson Reservoir in autumn (April–May) to encourage breeding and recruitment of the vulnerable Australian grayling.

The CMA also recognises the releases can improve conditions for kayakers and other recreational users along the Thomson River and works with peak bodies to give advanced notice of the water releases and where possible to adjust the timing to suit users. Water is usually released in late April, early May, late October and early November. Where possible, release are timed for weekends and public holidays. This approach achieves environmental objectives while sharing the benefits of environmental water management in the Thomson River with recreational users.



Kayakers enjoying the benefit of an autumn fresh flow at Coopers Creek in the Thomson River valley. Image: Stephanie Suter, West Gippsland CMA

The CRSWS secured our water supplies

Water grid developed and extended

The CRSWS announced the government's intention to develop and extend the water grid so managers could move water to where, and when, it is needed, subject to the entitlement framework. This would better protect households, businesses and the environment from low inflows and enable the region's water markets to expand. As part of the development of the water grid, the strategy identified possible interconnections for drinking water between Melbourne and Geelong, and Melbourne and Western Port; for recycled water from the Eastern Treatment Plant to the Latrobe Valley; and for water from Blue Rock Reservoir in Gippsland to the Cardinia Reservoir in the Melbourne system.

The Waranga interconnector concept became the Goldfields Superpipe connecting the Bendigo, Ballarat and Goulburn systems. The 133-km Goldfields Superpipe was completed ahead of schedule in May 2008. It can supply Bendigo with up to 36 GL and Ballarat with up to 18 GL from the Goulburn system. In very dry years, the superpipe can improve Geelong's water security: as it supplies Ballarat with some water, Ballarat can take less water from Lal Lal Reservoir which is shared with Geelong. Water being held for Ballarat in Lal Lal Reservoir can then supply Geelong down the Moorabool River.

Smaller interconnections — White Swan Reservoir with Cosgrave Reservoir and White Swan Reservoir with Newlyn Reservoir — were also built to supply the Ballarat system, and Central Highlands Water also built infrastructure to supply water from the Cardigan Aquifer to Ballarat.

The government fast-tracked the CRSWS action to investigate a Geelong–Melbourne interconnection, due to the increasingly severe drought and Geelong's dwindling water supplies. The interconnection was completed in early 2013 and bulk entitlement of up to 16 GL a year from the Melbourne supply system was secured for Barwon Water. The Melbourne to Geelong Pipeline has the capacity to deliver up to 16 GL of water a year — equivalent to roughly half of the region's current usage.

CRSWS actions to develop and extend the region's water grid and augment supply improved the region's water resilience — its ability to deliver water where and when it's needed. The actions enable water managers to move water from low-value to high-value uses, essential for maintaining productivity in times of drought. And water resilience gives the region an important competitive advantage, particularly when investment decisions about water-intensive industrial processes are being made.





White Swan Reservoir, a critical supply for the Ballarat system, near its lowest level — 946 ML, or 6.7% of capacity — in April 2008. The total Ballarat system bottomed out at 4,693 ML (7.2%) — about three months' supply — in May 2008. Image: Central Highlands Water

The region's water grid, through previous investment and as outcomes of the CRSWS, provide interconnections between the Melbourne system and Geelong, Sunbury, Melton, Cowes, Wonthaggi, Inverloch, Drouin, Warragul and Cape Patterson, with Korumburra, Poowong, Loch and Nyora recently connected. It has created new links between the north and south of the state. It is important to recognise that interconnection does not automatically mean access to the connected resource: water entitlement rules continue to apply. It does, however, create the opportunity to purchase water from other sources.

Supply augmentation

The CRSWS contained many actions to augment the region's water supplies to make it better-placed to deal with droughts.

The strategy announced the government's intention to work with metropolitan water authorities to conduct a feasibility study of desalination options and a business case if appropriate. It also noted its intention to build a water treatment plant at Tarago Reservoir and to reconnect the reservoir to the Melbourne supply system.

The Anglesea groundwater bulk entitlement was also created, permitting water to be taken for water supply purposes from the Jan Juc groundwater management area.

Tarago Reservoir was reconnected in 2009 after the new water treatment plant was commissioned.

In the Western Port area, the capacity of Candowie Reservoir was doubled, an infrastructure connection and bulk entitlement providing water from the Melbourne supply system was created and supply was established from the Corinella Aquifer. The CRSWS identified these augmentations as options but they were brought forward in the face of the worsening drought.

The 2007 *Our Water Our Future: The Next Stage of the Government's Water Plan* included two new initiatives for the region. The first was the 70-km North–South Pipeline, now known as the Sugarloaf Pipeline, which can carry up to 75 GL a year from the Goulburn River to Melbourne's Sugarloaf Reservoir. The pipeline allows for one-third of water savings in the Northern Victoria Irrigation Renewal Project to be made available to Melbourne urban water users. Melbourne's water retailers contributed \$300 million to the project to secure access to this water. A second initiative was the Victorian Desalination Project, which was built at Dalyston, near Wonthaggi. The plant has the capacity to deliver up to 150 GL a year — one-third of Melbourne's current needs.

Action 9.1 of *Water for Victoria* is to develop a grid oversight function to inform strategic regional and systemwide — across water corporations' boundaries — water planning and investment decisions. The aim is to get maximum value from the augmented system, which now has many cross-boundary assets.

The Victorian Desalination Project strengthens Melbourne's water security by providing a buffer against drought. It can deliver up to 150 GL a year and produce water on call.

Water reuse and recycling

The CRSWS set out the case for greater reuse and recycling of water: the medium climate change scenario would reduce the supply of water from our rivers and reservoirs by 25% by 2055; and the potential volume of recycled water will not reduce as a direct result of climate change, making it a secure future supply of fit-for-purpose water.

The strategy had several actions to increase the amount of wastewater treated for recycling. In 2012, Melbourne Water upgraded the Eastern Treatment Plant to treat water to Class A standard, the highest grade for non-drinking uses. The plant supplies the Eastern Irrigation Scheme, which has more than 80 business customers using the recycled water for horticulture, irrigation and industrial purposes; it also supplies some housing estates in Cranbourne. The improved quality of the discharge and greater use of recycled water from the plant reduced the environmental impact of its Bass Strait outfall, which was the primary aim of the upgrade. Melbourne Water also supplies recycled water from its Western Treatment Plant to Werribee irrigation users; and it supplies Class A recycled water to City West Water, which treats the water further to reduce salinity and then supplies it to residential customers. Southern Rural Water is continuing to investigate opportunities to supplement river water with recycled water in irrigation areas in the Werribee catchment.

In 2016–17, Western Water provided recycled water to 67,776 properties. In 2016–17, 72% of the recycled water it produced was reused, well above the 56% used in 2011–12.

Residential uptake of recycled water requires dual-pipe systems — separate pipes for drinking and recycled water. In line with the strategy, the government revised the *Water Act 1989* and the Victoria Planning Provisions to enable new residential subdivisions to have dual-pipe systems. Dual-pipe estates were developed at Dandenong, West Werribee, Epping and Sandhurst; and planning authorities are continuing to identify and assess opportunities for dual-pipe systems in Melbourne's growth areas. Dual pipe is now being revisited with some changes in demand, due perhaps to smaller lot sizes.

Each year, Lake Wendouree receives an average 1.76 GL a year of rainfall and run-off, and it also used to receive additional water from Gong Gong Reservoir. The CRSWS resulted in this reservoir water being substituted with an additional 1.9 GL on average a year from stormwater harvesting, recycling and diversions.

The Gippsland Water Factory opened in 2013. It can treat 35 ML of wastewater a day from nine towns and a major pulp mill in central Gippsland; and it supplies the mill with recycled water, safeguarding central Gippsland's supply of drinking water.

The Phillip Island Recycled Water Scheme was commissioned in 2012. The scheme supplies Class A recycled water from the Cowes Wastewater Treatment Plant for residential, business and agricultural use. The scheme uses 2–5% of the water processed by the treatment plant.



CASE STUDY: Eastern Treatment Plant upgrade

Action 3.20 was to upgrade Melbourne Water's Eastern Treatment Plant at Bangholme to produce water to Class A standard. The plant treats about 40% of Melbourne's sewerage.

The \$400 million upgrade project aimed to improve the quality of treated water discharged to Bass Strait near Gunnamatta Beach on the Mornington Peninsula and to produce high-quality, recycled water for a range of non-drinking uses (such as watering sports grounds, toilet flushing and irrigating vegetables).

The upgrade was completed in 2012. It made the Eastern Treatment Plant one of the most sophisticated sewage treatment facilities in the world. It uses ozone to disinfect and oxygenate

the water as it moves downstream to biological media filters, which remove particles, biodegrade organic compounds and reduce ammonia.

The water then passes through an ultraviolet disinfection system and is chlorinated to kill viruses, bacteria and other pathogens. Other systems remove solids (such as litter and fats).

The result is that 40% of Melbourne's sewage — 360 ML a day —, which goes through the plant, is treated to a much-higher standard than in the past. This reduces the visibility of the plume at the Bass Strait outfall, odours, suspended solids and residual ammonia. It also provides a reliable source of water to reduce reliance on drinking water for outdoor uses in the south-east.

Making the CRSWS flexible for changing circumstances

Part of the CRSWS' first 10 years coincided with the Millennium Drought, the most significant single post-European settlement event affecting the region's water supply. As one water manager noted, 'We were living an inflow scenario that was worse than the worse-case scenario we used for planning'.

The story of the strategy's implementation is substantially one of being well-placed by being able to determine which strategy actions still made sense in light of the dramatically changed circumstances, which actions needed to be changed or dropped, how the unforeseen circumstances would change the assumptions on which some actions were based, and how unforeseen-but-now-necessary actions would affect the strategy.

Accordingly, this review identified instances where assumptions about both the supply of and demand for water were quite different from what actually happened, affecting implementation of the strategy's actions.

For example, the feasibility of some recycled water schemes, which the CRSWS proposed to investigate, was affected by changes in demand and patterns of use; and the extreme drought made it necessary to bring forward other supply options.

Melbourne's population grew much faster than predicted, and a bigger population means greater demand for water for drinking, industrial and other purposes. In 2002, Melbourne had an estimated population of 3.5 million people. *Melbourne 2030*, published that year, predicted Melbourne would have about 4.7 million people by 2031, a figure exceeded in 2018 when Melbourne's population reached about 5 million. This population growth drove changes in the Urban Growth Boundary and continues to change types of development, including residential block sizes.

Such changes can quickly make assumptions about demand for drinking and recycled water obsolete. For example, closer to the city, higher-density living results in smaller gardens needing less water and less demand for recycled water: increased growth further from the city calls for new developments, which offer opportunities for dual-pipe systems, although smaller residential block sizes mean less demand for water. Such changes particularly affect outer metropolitan subregions.

In response to unprecedented low inflows, *Our Water Our Future: The Next Stage of the Government's Water Plan* included two initiatives — the North–South Pipeline and the Victorian Desalination Project — to increase Melbourne's water supply. While the CRSWS had an action to investigate the desalination option, the 2007 initiatives were examples of state policy overriding a regional plan in response to the unprecedented conditions. The public interest generated by these initiatives, and the end of the drought, caused the discussion to shift to water pricing and away from demand management through behaviour change; and the Target 155 campaign was terminated.

The combined effect of changes in water supply and demand resulted in some actions no longer being viable as envisaged in the CRSWS. Reducing demand affected the anticipated uptake and feasibility of the supply of recycled water. Additional water sources connected into the supply system (such as the Sugarloaf Pipeline and the Victorian Desalination Project) also changed water availability assumptions, affecting the timeframes and in some cases the cost-effectiveness of recycled water schemes.

While the severity of the drought could not have been predicted on the basis of historical data, the effect of locking in particular infrastructure solutions and their impacts on other aspects of the strategy should be considered when preparing future SWSs. Changed circumstances are inevitable. A SWS can accept this by:

- including clear triggers that would lead to actions being reviewed
- making assumptions sufficiently transparent they can be reworked in light of changed circumstances
- recognising that *Water for Victoria* now requires five-yearly assessments, which provide the opportunity to address changed circumstances
- setting long-term timeframes
- setting out an adaptation pathways planning framework
- using scenario analysis to test the resilience of the strategy to shocks.



CASE STUDY: Lake Wendouree

Ballarat's Lake Wendouree, the recreational heart of the city, was originally a swamp that was dammed at the end of the Gold Rush for the enjoyment of the Ballarat community. It is an integral part of the city: the area around it prospered in the land boom of the Victorian era and it is now surrounded by many impressive homes, large mansions and even a bluestone gothic Bishop's palace; and it hosted the 1956 Olympic Games rowing and canoeing events. The lake and its shores are today popular with rowers, sailors, cyclists, runners and walkers, both competitive and recreational.

As an artificially created waterway, Lake Wendouree is naturally fed by stormwater from a small urban catchment, small mainly because the lake is 450 m above sea level. In the mid-2000s, towards the end of the Millennium Drought, the lake dried out completely. The idea arose that, rather than drawing down the city's limited water supplies, other sources including stormwater should be used to supply the lake.

CRSWS action 4.3 was to substitute river water with recycled water in Lake Wendouree. In 2006, the Victorian Government allocated \$7 million for infrastructure projects to supply to the lake an estimated 825 ML a year of harvested stormwater: 480 ML from Redan Wetland, 270 ML from the Ring Road Reserve Detention Basin and 75 ML from the Warrenheip Creek catchment. This will increase over the next few years to 955 ML. The infrastructure also provides an extra 189 ML a year of stormwater to irrigators, replacing drinking water supplies and has improved the lake's water quality.

As well, other projects supplied the lake with Class-A-treated wastewater from Ballarat West Treatment Plant, bore water from the Cardigan Aquifer and stormwater run-off via the North Gardens wetlands and Wendouree Parade.



Windsurfing on Lake Wendouree. Image: DELWP

Water trading

A CRSWS action was to develop a governance framework to guide urban authorities participating in the water market. Water corporations completed a small number of small-volume trades, and some water for the environment was traded between catchments in the region. However, complex trading arrangements and the need to focus on demand management and major interconnection and augmentation projects constrained the need for (and opportunities for) trades and the resources to make them. Also, some trade opportunities were delayed, acknowledging community concerns.

The CRSWS helped protect our waterways and aquifers

Environmental water

The CRSWS stated that 66 GL would be recovered for the environment for the Yarra, Werribee, Moorabool, Barwon, Thomson/Macalister, Latrobe and Bunyip/Tarago rivers. Of this, 60.8 GL (or 90% of the target) has been recovered to date. The main reason the target has not yet been fully achieved is because the assumptions underpinning the strategy did not eventuate: heavily restricted inflows and measures to augment the water supply system changed the strategy's supply assumptions, while population growth beyond that predicted for the region changed the demand assumptions.

In the years leading up to the CRSWS, Victoria had taken steps to recognise the environment's right to water. In 1999, Victoria undertook Australia's first statewide benchmarking of the environmental condition of its major rivers and streams; a follow-up study in 2004 showed many rivers and streams were under significant stress from inadequate flow. Consequently, the *Water Act 1989* was amended in 2005 to establish the environmental water reserve as the legally recognised share of water for the environment and to provide for the development of SWSs for Victoria's regions.

There were no environmental entitlements in the Central Region in early 2006. The CRSWS was the first plan to seek to balance the requirements of the environment and consumptive users at a regional scale and to successfully negotiate trade-offs between different water users to achieve that balance. Its intention to establish an environmental water reserve for each of the region's river basins was achieved through a combination of operating and harvesting rules (such as passing flow provisions) and designated environmental entitlements.

The CRSWS also established annual reporting on each reserve: the Victorian Water Accounts have

reported on environmental water reserves since the 2006–7 accounts. The accounts also provide key data about water availability, entitlement, distribution and use across Victoria including about environmental water entitlements for each river basin and groundwater catchment in the region, as well as local and streamflow management plans.

The *Yarra River Environmental Entitlement 2006* — of 17 GL — was among the first environmental entitlements to be created. However, due to the severity of the drought, water was not made available to the entitlement until 2012. The *Tarago and Bunyip Rivers Environment Entitlement 2009* provided 3 GL of storage and 10.3% share of inflows to meet the strategy's target.

The CRSWS set a target of 6 GL of water to be recovered for the environment in the Moorabool River. To date, 5.5 GL has been recovered. The *Moorabool River Environmental Entitlement 2010* provided the Moorabool River with 11.9% of inflows share and storage capacity in Lal Lal Reservoir. Investigations are currently underway as part of implementing *Water for Victoria* to investigate options to recover the remaining 500 ML.

The Millennium Drought also delayed water recovery in the Werribee and Maribyrnong rivers. The *Werribee River Environmental Entitlement 2014* provided the Werribee River with a 10% share of inflows into Lake Merrimu, which is short of the 6 GL target in the strategy.

The Maribyrnong does not have an environmental entitlement as yet, but it does receive water for the environment from temporary transfers of regulated diversion licence volumes by Melbourne Water diverters. This is not a secure environmental entitlement: it is only possible because Melbourne Water and the VEWH purchase the water annually. This is not a long-term solution as it relies on there being sufficient willing sellers and funding to purchase the water in future.

Environmental water recovery targets for the Maribyrnong River have not yet been fully achieved, however, as for the Moorabool and Werribee, options are being investigated to recover the remaining water recovery commitments, and they are restated in *Water for Victoria*.

A CRSWS action was to increase environmental flows in the Barwon River by 4.7 GL by 2015. A combination of treated wastewater (2 GL), treated groundwater from a quarry (1.7 GL) and the *Upper Barwon River Environmental Entitlement 2018* (1 GL) fulfilled this action in 2018. This is in addition to the *Barwon River Environmental Entitlement 2011* which provides water for the lower Barwon wetlands. The Millennium Drought considerably delayed implementation of this action.

The CRSWS aimed to increase environmental flows in the Thomson/Macalister River by 15 GL by 2012. The *Macalister River Environmental Entitlement 2010* was originally due by 2007 but was delayed by the drought and other factors; the CRSWS target was then exceeded with 12.5 GL of high-reliability and 6.2 GL of low-reliability water share transferred to the environment. The Thomson River water recovery target was not met by 2012 and the action was restated in the *Gippsland Region Sustainable Water Strategy*. The *Bulk Entitlement (Thomson River Environment) Order 2005* was amended in 2017 to include an additional 8 GL of storage capacity and a 3.9% share of annual inflows.

The CRSWS's target for an extra 10 GL of water for the environment for the Latrobe River was restated in the *Gippsland Region Sustainable Water Strategy*. This was achieved by creating the *Blue Rock*

Environmental Entitlement 2013, which provides a 9.45% share of annual inflows and storage capacity in Blue Rock Reservoir.

In recognising the provision of water for the environment, in some cases the water provided did not always meet all the outcomes sought. Where the water was released into waterways, the delay in getting access to water for the environment and the qualification of environmental water back to consumptive uses during the Millennium Drought influenced the effectiveness of environmental water recovery. The CRSWS did, however, provide for a share of water for the environment, embedded environmental water into planning and increased the volume of water for the environment. The management of environmental water is established and is maturing: the VEWB did not exist in 2006.



CASE STUDY: Native fish return to the Werribee River

The Werribee River has benefited from environmental water releases since 2013. The biggest release was delivered late in 2016, aiming to stimulate native fish breeding including by the River blackfish and the vulnerable Australian grayling species.

Water-quality monitoring in the lower Werribee River during environmental water releases has confirmed that providing summer fresh flows helps maintain the river's water quality in the drier months, which is important for keeping the river healthy.

The Werribee River is still recovering from the long-term impacts of the Millennium Drought and the consequent lack of environmental flows, so releases made possible through the *Werribee River Environmental Entitlement 2011* have benefited the Australian grayling.

Over the last two years, larger environmental water releases in spring have aimed to encourage migratory native fish to move into the river from the estuary. Monitoring by research scientists after the releases found large numbers of native fish moving into the river, including the Australian grayling.

A fish ladder installed in the lower reach of the Werribee River and other waterway health activities have complemented the environmental water releases to allow native fish to migrate and reproduce further up the river than ever before.

The environmental water releases made to implement CRSWS actions are a start to making the Werribee River a healthy, thriving waterway for the long-term enjoyment of the whole community.

Fishway in the lower Werribee River during the fish monitoring program. Image: Bill Moulden, Melbourne Water





Identifying the Wadawurrung cultural values of the Barwon River for a new environmental FLOWS study to inform management of the new Upper Barwon Environmental Entitlement. Image: Corangamite CMA

CASE STUDY: Upper Barwon River Environmental Entitlement

The Upper Barwon River Environmental Entitlement 2018 implements action 4.17b of the CRSWS, to provide 1 GL a year for the upper Barwon River. This achieves environmental outcomes for the river, and it also delivers shared benefits as explained in the Corangamite CMA's [Waterway Strategy 2014-2022](#).

In 2017, the CMA established the Upper Barwon Surface Water Advisory Group, a dedicated group of individuals, community groups and government representatives who contribute technical knowledge, historical information and an understanding of government policy and community values. With the CMA, it identified the overall site objective: 'To improve the Barwon River's flow-dependent ecological values and services through the provision of environmental water. The delivery of environmental water will also provide for social and cultural values for future generations.'

Together with an independent scientific advisory committee, the group is working to determine ecological values, objectives, threats and opportunities for the upper Barwon River to inform an update to the 2006 FLOWS study, which identified the river's environmental and

ecological objectives in terms of vegetation, fish, geomorphology, macroinvertebrates and water quality.

The CMA also intends to achieve shared benefits through environmental water releases, which will improve the health and aesthetic value of the river's reaches. This will attract more visitors, increase use of the river's parks, picnic sites, lookouts and historic bridges and improve opportunities for birdwatching, walking, fishing, camping, kayaking, canoeing and swimming.

The CMA is working with a Traditional Owners group — the Eastern Maar Aboriginal Corporation and Wadawurrung — to initiate cultural mapping to better understand Aboriginal water values. A representative of Wadawurrung is involved in the 2018 FLOWS study, which will update the 2006 study. They will join the Environmental Flows Technical Panel to help identify Aboriginal values in each reach relevant to Wadawurrung Country.

Although good progress has been made to date, there is still plenty of work to do, and action is ongoing.

3. Strategy lessons and the future





Image: Corangamite CMA

Introduction

In 2006, the CRSWS broke ground by bringing planners and managers together to coordinate their actions regionally around strategic directions. Now, there is a far more-evolved policy and planning environment, many more involved parties and greater community expectations for shared benefits. There is more complexity and risk, including from the knowns and unknowns with climate change, population growth and urban growth.

Chapter 1 explains that the CRSWS was Victoria's first SWS, bringing together water planning activities for the region. It was a major milestone for water management and planning, which has continued to evolve into today's comprehensive, nested approach. Many of today's planning and management documents include the types of actions that were considered appropriate to include in the CRSWS — indeed, that formed the substantive content of the CRSWS, as the CRSWS is an action plan as well as a strategic plan.

Accordingly, the CRSWS review identified the need to redefine the role and functions of a SWS in this more evolved and more-complex world of water planning, management and use, particularly as Victoria moves to an IWM Framework and addresses the impacts of climate change, population growth and urban growth.

Many CRSWS actions are fully completed and require no ongoing action, but some, by their nature, need ongoing action. As well, the actions that are partly achieved or yet to be achieved need further action.

In terms of the strategic directions of successfully reducing demand, securing water supplies and helping protect waterways and aquifers, consolidating the strategy's achievements to strengthen and extend each strategic direction will be important for the future. The review also identified policy and operational shifts toward the idea of shared benefits including water for the environment, Traditional Owners' and Aboriginal Victorians' values and capacity building, and recreational uses of water.

These findings are supported by the recently released *National Water Reform Productivity Commission Inquiry Report*. It identifies that governments need to continue to respond to the challenges posed by population growth, climate change and changing community expectations. Water reform requires perseverance, continuity and long-term commitment from governments. Failure to act now risks the gains made to date and means opportunities for greater efficiency, improved liveability and more sustainable environments would be lost.

In terms of the processes of water planning and management, the review identified the increased need to manage complexity and risk, and multiple points at which the planning and management process could be improved.

This chapter therefore examines these key issues, which the process to refresh or replace the CRSWS will need to address:

- continuing achievement of actions
- integrated water management
- strengthening and extending strategic directions
- managing risk and complexity
- community engagement and involvement.



Summary of considerations for a future sustainable water strategy

The review identified a range of opportunities to get the most of the SWS process. A summary of key considerations is provided below.

Key considerations

This chapter discusses the need for a future SWS to continue to deliver on ongoing actions, further integrate water management, strengthen and extend strategic directions and manage risk and complexity, including by addressing emerging water-management issues.

A future SWS incorporating the Central Region should consider, among other things:

- building capacity across the water and planning sectors to inform better water management
- integration of local knowledge into ongoing water management
- managing risk and complexity using adaptation pathways planning
- options to optimise the use of water resources in an interconnected system
- the integration of shared benefits in the operation and use of Victoria's water resources
- the next steps required to meet environmental outcomes, deliver shared benefits and increase productivity
- the role of alternative water supplies (such as recycled water, stormwater and desalinated water) in meeting future water demands and what entitlement regime would support maximum use of alternate supplies
- the role of information and data-sharing to inform corporate and individual decision-making
- the role of integrated water management in providing long-term water sustainability
- the role of land use planning to provide opportunities to manage threats to and gain benefits from water resources
- the role of the entitlement framework in ensuring sustainable water use
- the role of third-party access and system security in water management
- the role of water markets in balancing supply and demand across rural, urban, environmental, Traditional Owners and Aboriginal Victorians, and recreational uses of water
- the transparent accountability and reporting of implementation of the strategy

Submissions on this section highlighted the need for:

- community engagement
- continuing to build on catchment knowledge of water sources and threats to water supply
- whole-of-catchment planning for future water security, with clear governance arrangements.
- a shift to an outcome-focused approach in addition to an actions approach
- community-centred engagement, knowledge transfer, capacity-building and avenues to assess trade-offs for water use
- implementation of comprehensive, high-quality monitoring programs to include all sources of water including groundwater
- water resource planning that recognises regional population growth and development.
- climate change modelling and science informing the strategy's direction

Respondents want to see in a future SWS:

- a holistic approach to water-use planning at a regional scale and consideration of water issues across the catchment and water supply system
- a focus on the intersecting issues, challenges and actions that cut across or fall between different agencies

Continuing achievement of actions

While some CRSWS actions are fully completed and require no ongoing action, many by their nature require ongoing effort to achieve the action or the outcome intended from it. As well, many actions that are partly achieved or not yet achieved require further effort to achieve them or the intended outcome.

Chapter 2 detailed the many achievements of the strategy to date. It is important that these achievements are locked in. This may need, for actions and the outcomes that were intended to result from them, consideration of how best to support the achievement into the future.

Table 2 shows strategy actions partly achieved or not yet achieved. It also shows the proposed steps to achieve or otherwise address the action.

The Waterways of the West Ministerial Advisory Committee (WoWMAC) and Barwon Ministerial Advisory Committee will provide directions on the future management of these waterways.

Table 2: CRSWS actions not yet or partly achieved

System	Topic	Actions	Status	Proposed step
Regionwide	Environmental water recovery	2.2, 2.7	Partly achieved – ongoing	<p>Action 3.5 of <i>Water for Victoria</i> is to investigate ways to recover the remaining environmental water, and a future SWS will include this.</p> <p>Flow studies will be updated to inform environmental water requirements for a future SWS, incorporating the latest climate change knowledge.</p> <p>The LTWRA being prepared will determine whether resource availability has changed and, if so, the extent of impact on environmental and consumptive use.</p>
Moorabool River	Environmental water recovery	4.8c	Partly achieved – ongoing	<p>Flow studies will be updated to inform environmental water requirements for the Moorabool River for inclusion in a future SWS.</p> <p>The LTWRA being prepared will determine whether resource availability has changed and, if so, the extent of impact on waterway health.</p>
Werribee River	Environmental water recovery	4.22	Partly achieved – ongoing	<p>Western Water will continue to identify shared benefits and determine the conditions for providing recycled water for environmental flows in the Werribee and Maribyrnong, as per its urban water strategy action SA20. Melbourne Water as the waterway manager has a Werribee catchment work program to support the <i>Healthy Waterway Strategy</i>.</p> <p>Updated flow studies will inform environmental water requirements for the Werribee River and any further intrasystem transfers.</p>
Werribee River	Environmental water recovery	4.28a	Not yet achieved – ongoing	<p>Implementation of stages 4 and 5 of the Werribee Irrigation Modernisation Project is supported.</p> <p>The LTWRA being prepared will determine whether resource availability has changed and, if so, the extent of the impact on environmental and consumptive use.</p>

System	Topic	Actions	Status	Proposed step
Werribee River	Supply augmentation	4.24, 4.26	Not yet achieved – ongoing	<p>DELWP will identify the best outcome for allocating unallocated water in Lake Merrimu.</p> <p>Action MR1 in the Western Water Urban Water Strategy 2017 to purchase entitlement in Pykes Creek Reservoir to augment supply will be completed.</p>
Maribyrnong River	Environmental water recovery	4.29a, b, c, d	Not yet achieved – ongoing	<p>Flow studies will be updated to inform environmental water requirements for the Maribyrnong River and any further intrasystem transfers.</p> <p>The LTWRA being prepared will determine whether resource availability has changed and, if so, the extent of the impact on environmental and consumptive use.</p>

Achieving environmental water recovery and enhancing environmental values

Rivers and catchments are natural ecological systems that provide essential functions. They

cannot be replicated once degraded past a certain point. They help us move water around for uses, but they are much more than just a distribution system.

Submissions on this section highlighted the need for:

- acknowledgment that environmental flows and wetlands have a role in maintaining waterway health
- community partnerships to assist in planning and implementation
- continued recovery of water for the environment
- making use of all sources of water
- use of the water grid in the future

Respondents want to see in a future SWS:

- a balance between the needs of land uses, water supply and protection of environmental values
- agency coordination that enables environmental benefits to be achieved through the transfer of water between systems
- allowances for adaptive management, incorporating new science and learnings as they become available

- clearer reporting on water for the environment allocations
- community involvement in planning at a larger landscape/regional level, to ensure the optimum use of all water sources
- determination of water requirements for the environment, including above-cap water
- measures to better secure water for the environment in unregulated waterways and for groundwater-dependent ecosystems
- protection of rivers, headwaters and waterway health as a key part of future consumptive supply security
- stronger connections between land use and water use planning
- use of alternative water sources, rather than reductions in environmental allocations
- viable strategies to ensure sufficient water for the environment, considering the impacts of farm dams and large-scale groundwater extraction

Figure 10: IWM planning process

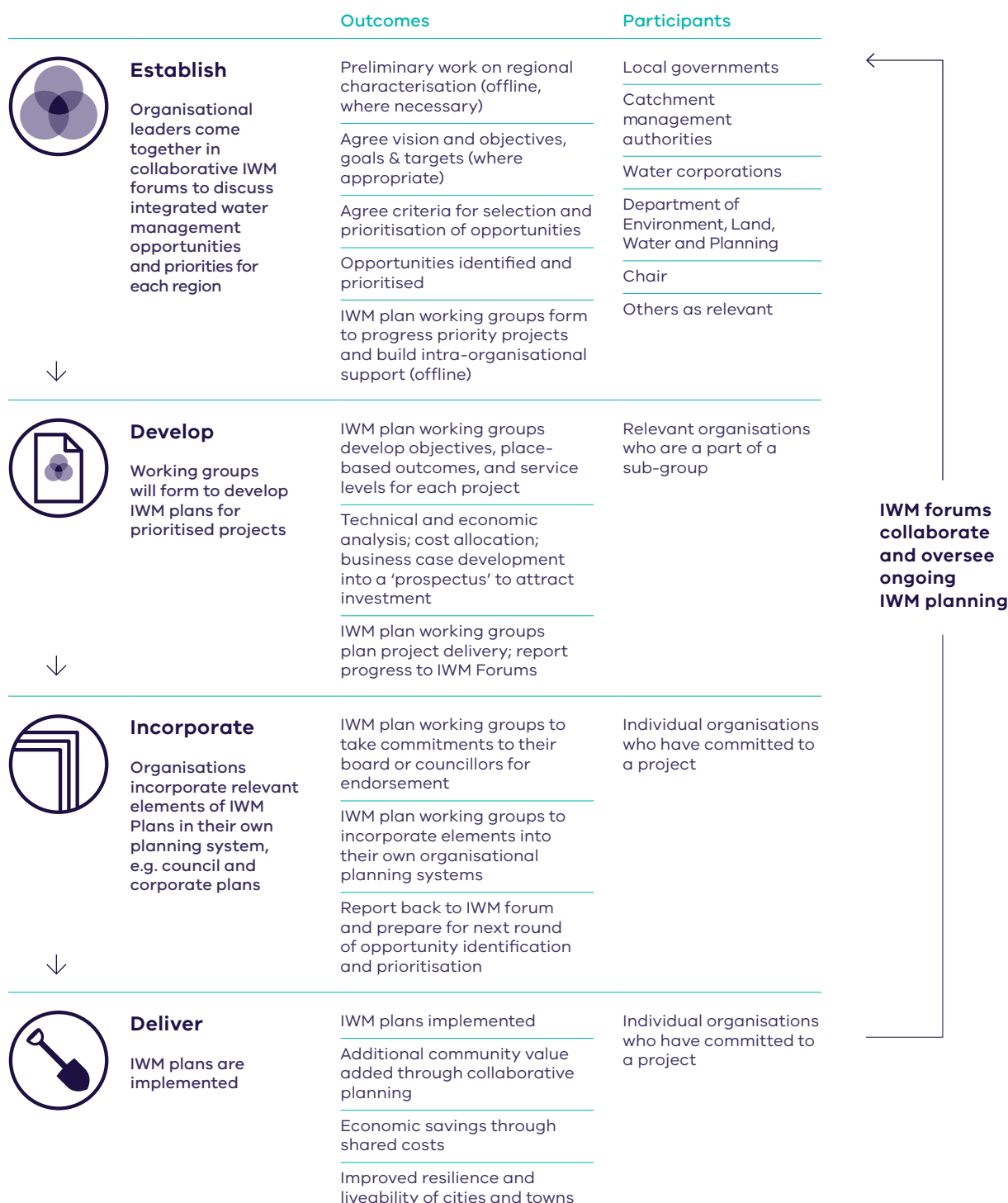


Figure 11: IWM outcome areas



Integrated water management

IWM is helping address the water sector's big issues — increasing the emphasis on shared benefits, engaging with local communities, negotiating and making trade-offs and managing complexity and risk — as the sector works to ensure water security and maintain the state's liveability.

Victoria's IWM Framework will improve regional responses to water supply, management and demand challenges and opportunities. There is a greater need than ever to join up the many different agencies, strategies and plans specific to each region and move towards more-collaborative IWM.

Water for Victoria reinforced the concept of IWM: a collaborative approach to planning that brings together all elements of the water cycle including waterways and bays, wastewater management, potable and alternative water supplies, stormwater management and water treatment, considering environmental, economic, social and other shared benefits.

The [Integrated Water Management Framework for Victoria](#):

- is Australia's first systematic approach to collaborative IWM at the statewide scale
- aims to bridge water-cycle boundaries, leading to a wider range of solutions considering integration across systems and thus more shared benefits.

An IWM approach holistically considers the entire water cycle. In a Victorian context, this requires each organisation with water planning and management responsibilities to know about and value the vision, strategies and actions of the others. IWM options arise when visions, strategies and actions overlap and interact. The entire water cycle covers a major part of community life: Figure 10 shows some IWM outcome areas.

The IWM Framework:

- explains that IWM planning can contribute to urban water strategies, local government strategies and catchment management activities across Victoria
- explains the rationale for establishing collaborative IWM forums across the state
- outlines the process for ongoing holistic, collaborative integrated planning at a range of scales.

Guided by the IWM Framework, ten IWM forum areas in regional Victoria (based on urban water corporation boundaries) and five IWM forum areas (based on catchments) in metropolitan Melbourne — Werribee, Maribyrnong, Yarra, Dandenong and Western Port — have been established.

Some examples of strategic policy priorities and challenges identified by IWM forums which are being analysed by DELWP's Resilient Cities and Towns Reference Group are:

- better integration with land use and urban planning
- catchment-scale planning
- clearer accountabilities and governance arrangements for multi-function assets
- clearer rights and rules around the use of stormwater and recycled water
- decision-making frameworks: economic evaluation and funding.

Other supporting strategic enabling actions identified include:

- community engagement and the development of water literacy
- ongoing capacity-building
- the development of a clear, big-picture narrative
- collaborative Traditional Owners' and Aboriginal Victorians' engagement and capacity building.

Figure 10 shows the IWM planning process.

The IWM approach includes identifying, prioritising and enabling:

- policy: overcoming barriers to implementing integrated water planning and projects
- guidance: robust reference and direction to analyse, design, implement, operate and maintain particular aspects of IWM
- opportunities: strategic and place-based projects that overcome organisational and water cycle separators.

At the regional level, each IWM forum will develop a strategic directions statement, which is a statement of shared vision, objectives and prioritised opportunities to achieve the vision.

Submissions on this section highlighted the need for:

- alternative sources of water to supply multiple needs (such as urban, environmental and agricultural) and keep cities and towns cool and green in the face of urban densification
- IWM as a place-based planning process to collaborate and provide long-term planning solutions at the local level
- making use of all sources of water
- water recycling and re-use including the management and harvesting of stormwater to retain water in the landscape and use recycled water for multiple uses

Respondents want to see in a future SWS:

- assistance to overcome barriers and enable opportunities identified in IWM forums
- support for improved outcomes through IWM with guiding principles

Strengthening and extending strategic directions

The CRSWS set firm strategic directions for water planning and management: successfully reducing demand, securing water supplies and helping protect waterways and aquifers. Some of its strategic directions have since seen increasing policy and operational focus: shared benefits, Traditional Owner and Aboriginal Victorian values and capacity building, and climate change mitigation and adaptation.

Shared benefits

A key factor driving a greater joining-up of water-sector planning and investment is increasing community expectations of water planners and managers to deliver 'shared benefits'. These are the additional benefits water planners and managers can provide through operational changes without compromising existing entitlements for the environment, agriculture, towns and businesses including investments in infrastructure as well. It looks at whether benefits additional to its primary use can be delivered through the storage and movement of water to where it is to be used, and through how the water is used. A SWS process enables communities to discuss how to achieve shared benefits, help set targets and identify trade-offs and social and economic costs without compromising the rights of entitlement holders or the needs of the environment.

Water for Victoria identified shared benefits in terms of:

- the health and long-term sustainability of the environment: one of the most significant contributors to shared benefits outcomes is environmental water management
- active and passive recreational opportunities (such as water for canoeing and sites for picnicking, camping and contemplating the beauty and aesthetics of waterways and nature in general)
- heritage, cultural and economic opportunities for Traditional Owners and Aboriginal Victorians
- the quality of life — the liveability — of all Victorians.

For example, people want their rivers, lakes and bays to be healthy and enjoyable for recreation, particularly at priority sites. They want infrastructure and information at water storages for better recreational experiences and they want sites to be safe to visit (for example, from fire). Traditional owners and Aboriginal Victorians want their values recognised, and for water planning and management to provide opportunities for their economic development.

Water planning and management can also provide physical and mental health benefits. The [Victorian Public Health and Wellbeing Plan 2015-2019](#) recognises that interacting with nature helps reduce chronic disease risk factors, increases social inclusion and builds strong communities. Engaging children with nature increases the likelihood that as adults they will be more actively concerned about biodiversity conservation. A recent review analysing the findings of 35 scientific studies found that spending time close to lakes, rivers and the sea has a positive effect on mental health and promotes physical activity.

[Recognising Recreational Values](#) is a *Water for Victoria* initiative. It will support the sector to provide services that support recreational objectives; provide better information to the community about opportunities for and limitations on recreational use of waterways and explain decisions about these; and develop site- and region-specific case studies about management approaches to achieve recreational and social values.

The sector may want to consider how to provide shared benefits in addition to its traditional role of providing water to users. Water managers can sometimes move water in a way that provides shared benefits without affecting existing entitlement holders or their primary obligations. This means that under some conditions, for example in times of low inflow, it may be difficult or impossible to provide shared benefits. The sector also needs to identify the effects of water restrictions on liveability and on recreational values and provide opportunities to involve other sectors with an interest in shared benefits (such as the health and welfare sector).

Submissions on this section highlighted the need for:

- local liveability enhancement through connection to water in the landscape including green infrastructure
- shared-benefits outcomes as an important consideration
- water for many uses including agricultural, recreation, environment and Traditional Owners' and Aboriginal Victorians' needs

Respondents want to see in a future SWS:

- better promotion and communication of shared benefits through multiple lenses (such as social and environmental) to reach broader audiences both within local communities and within and across agencies
- consideration of liveability in future water use
- coordinated regional land use and water planning to achieve liveability outcomes
- understanding and inclusion of new water-use needs (such as recreational and Traditional Owners' and Aboriginal Victorians' values)

Traditional Owners', Aboriginal Victorians' values and capacity building

Water for Victoria recognised the cultural and economic value of water for Traditional Owners and Aboriginal Victorians. *Water for Victoria* action 6.3 is to support Aboriginal access to water for economic development. Progress to recognise and manage for Aboriginal values includes:

- a requirement in *Water for Victoria* that Traditional Owners be represented on the consultative committee for a SWS review
- greater Aboriginal representation on CMA and water corporation boards, and the appointment of an Aboriginal Commissioner to the VEWH
- more cooperative working arrangements between CMAs, Traditional Owners and Aboriginal Victorians and water corporations
- the Aboriginal water program, established in 2016, is a four-year, \$9.7 million investment in a statewide approach to incorporating Aboriginal values and expertise into water management. It includes developing a roadmap for Aboriginal Victorians to access water for economic development and building the capacity and capability of Traditional Owners to participate effectively in SWS processes
- the [Water for Country Project Control Group](#), formed in 2017, which will improve Aboriginal involvement in water planning and management.

The review gathered a range of ideas about how SWS processes could support Traditional Owners and Aboriginal Victorians to participate in water planning and management, including to:

- advocate for the amendment of legislation and regulations as necessary to enhance the capabilities and operations of groups
- align government timeframes with those of Traditional Owners
- promote greater understanding, documentation and application of Aboriginal values, traditional knowledge, interests and expectations in water planning and management, including through Aboriginal stories and voices that improve understanding of water and cultural values
- strengthen education, training and capacity building to improve participation in water planning and management, including to ensure Traditional Owners understand public sector ways of operating and how to influence them
- support representatives and communities to strengthen group processes and interactions between their group and other groups, to make participation in water planning and management more effective.

Submissions on this section highlighted the need for:

- engagement with Traditional Owners and Aboriginal Victorians in decision-making for water planning and management
- protection of sites of cultural significance
- providing water for cultural values (cultural flows)
- including Traditional Owners and Aboriginal Victorians in the development of water values

Respondents want to see in a future SWS:

- capacity-building and water-based economic development opportunities for Traditional Owners and Aboriginal Victorians
- the needs and values of Traditional Owners and Aboriginal Victorians considered, and increased opportunities to strengthen Traditional Owners' outcomes and inclusion in water management
- use of Traditional Owners' and Aboriginal Victorians' knowledge and expertise in future water use planning

Climate change mitigation and adaptation

The CRSWS was an early leader in recognising the impact of climate change on water supply and demand. As our understanding of the impacts of climate change improve - less rainfall resulting in less run-off into rivers and storages, more-severe and prolonged droughts and a greater probability of bushfires - this strategic direction will only become more important in future.

Water for Victoria emphasises the importance of understanding and applying climate science to water planning and management. Action 2.2 is to understand and apply climate science to water management; and action 3.5 is to improve environmental water management in a changing climate, including by taking account of LTWRAs which help identify major climate change impacts on the availability of water for consumptive users and the environment. *Victoria's Climate Change Adaptation Plan 2017–2020* also deals with the risks climate change poses to our water resources.

To help mitigate climate change the Victorian Government [intends](#) the water sector to achieve a minimum 25% renewable energy use target by 2020 and to achieve net-zero emissions by 2050, with metropolitan water corporations to achieve net-zero emissions by 2030.

In 2017, the government released its *Guidelines for Assessing the Impact of Climate Change on Water Supplies in Victoria*. A pilot climate change adaptation action plan for the Victorian water sector was released in 2018.

There are also interdependencies between the water sector and the energy sector, which is a major user of drinking and non-drinking water. The water sector accounts for an estimated one-quarter of government-controlled emissions and achieving net-zero emissions in the water sector will change how the sector uses energy. The decline of coal-fired electricity generators and their mines will reduce demand for operational water, however will require additional water to manage the closure of coal mines to maintain stability.

Submissions on this section highlighted the need for:

- a greater capacity for the bulk entitlement framework to reflect changing catchment conditions
- clear management actions under climate change for water recovery and use.

Respondents want to see in a future SWS:

- adaptive management to understand the impacts of climate change and population growth on future water recovery and water use during droughts
- climate change modelling and science informing the strategy's direction
- greater understanding of the interdependencies between the water and energy sectors
- monitoring of the water resource base, to understand the impacts of climate change

Managing risk and complexity

The review identified an increased need to manage complexity and risk.

Managing complexity

Since the CRSWS was released, water resource planning and management have become more evolved. There are more strategies, plans and planning processes including urban water strategies, waterway strategies, catchment management strategies, agreements with Traditional Owners, IWM regional plans and specific plans (such as the [Yarra River Action Plan](#) and the [Port Phillip Bay Environmental Management Plan](#)). For example, the Yarra River Action Plan aims to align the activities and decisions of relevant agencies and councils, prioritise collaborative community processes and partner with Traditional Owners to manage natural resources and the complexity of doing so.

In bringing together the actions of the whole region, the CRSWS addressed many of the issues in the above strategies and plans: what has changed is these issues and the actions arising from them are now more comprehensively addressed in other documents. This is now a much larger, more comprehensive and nested picture, and there is a need for all parties to work together to provide easy-to-understand-and-use information about how strategies, policies, programs, actions and processes at the local, regional, state, national and international levels integrate.

There is far greater interconnection of water systems, making cooperation across the sector about strategic coordination, planning and management increasingly necessary. This interconnection also increases opportunities for a water market to develop and mature, providing additional ways to manage changes in supply and demand across the water grid.

The main role for water corporations is to provide water for human consumption, agricultural and industrial purposes. They will continue to do this while seeking ways they can share benefits to other

sectors. For example, storage managers may manage storages and time releases to provide shared benefits to recreational users.

Water demand is no longer met just with stored water released down rivers to end users. Nowadays, alternative water sources (such as recycled water, stormwater and desalinated water) are important sources, increasing the number of capture, treatment and supply options and the complexity of cost-effectively integrating them to meet users' demands through an expanding water grid and the opportunities it provides to further develop the water market. For example, Southern Rural Water shandies river water with recycled water from the Western Treatment Plant to increase the volume of water of acceptable quality and salinity supplied to the Werribee Irrigation District.

Water for Victoria commits the water sector to achieve net-zero emissions, requiring water managers to also be energy managers and to operate energy-efficiently with reduced carbon intensity.

Other areas of government planning and action also intersect with the SWS and influence the success of the actions. They include land use, sport and recreation, and health and welfare. There is a need to identify relevant obligations and commitments from other policy areas and take a consistent approach to them, clarifying boundaries and overlaps. For example, there is a need to define the relationships between water planning and management and planning instruments such as urban planning and liveability. Outside of government, there are other challenges and interdependencies that affect water planning and management, and which offer opportunities for cross-sectoral solutions.

A future SWS or SWSs also need to consider improving the relationship between water resource management and complementary measures (such as riparian planting and other onground works) essential to achieving the aim of sustainable water management. An example of this is the 36 large-scale waterway management projects in *Water for Victoria* action 3.4.



Image: Tony Proudfoot, Melbourne Water

Managing risks

Factors that are likely to have a significant effect on water planning and management in the future include:

- climate change and catastrophic events (such as bushfires in catchments), which could reduce catchment yields and water quality and could drive the need for major reallocations of water if the onset of climate change impacts is rapid
- increasing community expectations about how water planning and management can deliver shared benefits
- other emerging trends in water planning and management (such as increasing expectations for data discoverability, third party access, greater use of technology, customers' expectations to manage their own water and to leave the water grid, off-the-grid energy and the implications of decentralised energy)
- population growth, which will increase demand and change stormwater run-off impacts on waterways
- urban growth, changing housing densities and changing preferences in types of housing, aspect of each will both increase and decrease demand.

Both the quantum of these factors and the extent to which they will increase or decrease supply and demand is difficult to forecast: that is, it is clear the situation will change but not clear precisely how it will change. This poses considerable risks for water planners and managers, more so in terms of supply than demand.

Submissions on this section highlighted the need for:

- an adaptive management focus within the decision-making framework to plan and manage risks and threats
- consideration and assessment of trade-offs
- scenario planning of future threats and risks
- understanding planning interdependencies and accountabilities across the water sector

Respondents want to see in a future SWS:

- clarity about how plans and strategies across the water sector can work together to address challenges in the future
- flexibility in how outcomes are achieved, to ensure shared benefits are delivered
- increased community knowledge about the components and inter-connectivity of the macro water system
- integrated water planning across the whole of the water industry, to plan for risks and threats and assist decision-making for future water use

Using adaptation pathways planning for flexibility and resilience

Adaptation pathways planning involves the early identification of critical limits (such as severe water availability, climate change or population growth scenarios), the likely pathways to those limits and the policy and rules that would apply in the event the limits were reached. This type of planning allows knowledge to be gathered, community understanding built and values shared for a range of scenarios well before they occur. It involves close monitoring and evaluation of the present and the ability to amend plans to address changing circumstances so progress continues toward the specified outcomes. A future SWS, and key policies and actions in it, could have a statement of the adaptation pathways planning approach that could be taken to ensure achievement of its outcomes.

Mapping a range of possible future scenarios using the best-available information, modelling and analysis about climate change and population growth is a simple, easy-to-understand method of generating options and preparing for a range of possibilities, including for a worst-case scenario. It also allows for evidence, options and scenarios to be discussed with communities, ensuring transparency. Scenario planning also:

- can assess the costs and benefits of options to make decisions about trade-offs and investment, and these assessments can help set achievable actions and provide evidence for when actions might need to be changed in future
- helps managers, planners and communities understand how the various options affect environmental, recreational, cultural and Traditional Owners' and Aboriginal Victorians' values
- informs decisions about environmental water recovery in a refreshed or replaced strategy.

The adaptation pathways planning approach also needs high-quality water resource modelling and analysis, including groundwater resource modelling if required. Modelling and analysis provide insights essential for understanding the resource, including longer-term water availability outlooks and climate change projections. Water resource modelling and analysis capabilities need to be updated, to support

short- and long-term water management decisions (such as oversight of the water grid and Southern central market). For example, there is a need to improve:

- population projections by location
- the integration of water supply system models
- understanding climate and catchment risks
- urban stormwater projections.

Submission of this section highlighted the need for:

- an adaptive management approach to understand and response to emerging issues

Respondents want to see in a future SWS:

- engagement of the community in the adoption pathways planning approach to understand and communicate trade-offs that will need to be made in the future

Improving research and knowledge management

Water planners, managers and users need accurate, relevant and understandable information across an increasingly diverse range of topics.

Strategic programs (such as LTWRA) will be a valuable contribution to understanding how resource availability has changed and, if so, the severity of the impact on consumptive and environmental use.

There is also a need to identify strategic research priorities affecting water supply, demand and use, and to identify any preparatory work required to improve planning and management. This may include additional FLOWS studies — studies of the minimum flow a river needs for environmental health — or updates to past studies, to ensure our understanding of the environmental water requirements of the region's major rivers and

wetlands is up-to-date. Updating FLOWS studies is particularly important as climate change decreases run-off in catchments.

The assumptions, options, pros and cons and decisions generated when a SWS is developed, including options that didn't proceed, should be documented. Such documentation makes a strategy more robust and useful. A record of options, even if not included in the strategy, would allow them to be considered as contributions to future actions.

Water for Victoria action 9.1 is to develop a grid oversight function, which includes coordinating the publication of a biennial statement with a forward view of water availability and a portfolio of potential grid augmentation options. The first biennial statement titled *Enhancing the Grid* was released in October 2018. This is one of the steps being taken to ensure documentation about the state's water security is up-to-date and meaningful.

Submissions on this section highlighted the need for:

- increased and robust monitoring of water resources
- preparedness for water scarcity and droughts
- transparent and measurable targets for water use
- use and integration of local knowledge, to support decision-making

Respondents want to see in a future SWS:

- engagement with the community to understand and discuss trade-offs, in preparation for droughts and water scarcity
- furthering of the science and understanding of our groundwater resources to inform decision-making
- integration of water and land use planning to ensure secure water supplies in the future

Governance and reporting

A SWS should include responsibilities for tracking the implementation of its actions. In the CRSWS, many water-sector organisations were responsible for implementing the actions. Another approach would be to have a separate governance structure for implementing the whole SWS, with governance linked to monitoring and evaluation. This would strengthen accountability and potentially make adaptation pathways planning more straightforward. Also, responsibility for implementation can be weakened if the department restructures: this might be addressed by considering tracking as a function rather than a project of the department.

Submissions on this section highlighted the need for:

- understanding of planning interdependencies and accountabilities across the water sector

Respondents want to see in a future SWS:

- a focus on the intersecting issues, challenges and actions that cut across or fall between different agencies
- clarity about how plans and strategies across the water sector can work together to address challenges in the future
- clearer institutional arrangements and the overcoming of barriers for water delivery
- clearer, transparent reporting about whether actions have been completed and use of the same metrics on which targets were based

Community engagement and involvement

Water for Victoria emphasises the need to build the capacity and capability of Victorians to engage in an ongoing conversation about water. This needs open, transparent and accessible information. And it needs to be timely: people now want information quickly, and they will want it even quicker as digital technologies develop. If the water sector can deliver more-timely and user-friendly reporting about water management, communities will better understand what the sector is doing, and why.

Decision-making and risk management will require the best-available evidence including local knowledge about a broad range of water supply and demand topics, expert analysis, modelling capability and high-quality reporting.

The DELWP *Community charter* expresses the department's commitment to communicate openly and honestly in all its work. The community expects a proactive approach to transparency, actively facilitated community involvement, many public consultation opportunities and high-quality documentation of processes and options.

Severe water restrictions reduce liveability: restrictions are a blunt instrument. A more-diverse water supply mix is likely to improve liveability, but it comes at a cost. These types of trade-offs are complex but considering them will become increasingly important for the community.

Submissions on this section highlighted the need for:

- a commitment to behaviour change and community education programs

Respondents want to see in a future SWS:

- engagement with the community, Traditional Owners and Aboriginal Victorians, to build capacity and exchange knowledge
- transparent communication of the challenges facing the community in the future

Where to from here

SWSs are a strategic planning process to provide for the use of water at the regional scale over the 50-year planning horizon. SWSs remain a meaningful way to engage thoughtfully with industry and community to assess threats and trade - offs through a range of scenarios to respond to future challenges such as water scarcity under climate change, land use change and population growth.

The valuable feedback of respondents has contributed greatly to the review identifying ways to deal with future challenges. The review identified the relevance of principles as values to stay true to a course of action as systems, challenges and priorities change. Future SWSs could stand to benefit from renewed or refreshed principles to guide decision-making as new challenges arise and systems change.

We can make use of new tools to address future challenges. For instance, an adaptation pathway planning approach is a structured tool for planning and adapting to deep uncertainty where change is rapid. It supports decision - making processes to address the future challenges

Early engagement and preparation ahead of the next SWS will be required to build an adaptation pathways planning approach to meet future challenges and water resource planning at the regional scale.

In the future, the outcomes from the LTWRA will be important for shaping water resource management directions. The findings of the first LTWRA, currently underway and due for completion in mid-to-late 2019, will begin to identify changes in the water resource and any impacts on waterway health. A future SWS or SWSs incorporating the Central Region will be developed with an understanding of the LTWRA's findings.

Water for Victoria indicates the review and potential development of a new SWS or SWSs could start in late 2019. This review report will inform the new SWS or SWSs by documenting the progress of and changes in water policy and management since 2006 and the lessons learnt and opportunities available to build on the success of the CRSWS.

Image: DELWP



Appendix 1: Action status and delivery period



Image: Tony Proudfoot, Melbourne Water







Chapter 2 Protecting our waterways and aquifers

#	Action	Status	Delivery period	Comments
2.1	Engage Aboriginal communities in developing regional river health strategies	Achieved 	September 2013 – ongoing	<p>The action contributed to long-term changes to water planning and management to incorporate the water values of Traditional Owners and Victorian Aboriginals. The <i>Guidelines for preparing regional strategies for healthy rivers and wetlands</i> directed CMAs to engage with Traditional Owners and Aboriginal Victorians when updating regional river health strategies. Traditional Owners and Aboriginal Victorians were also consulted during the development of the <i>Victorian Waterway Management Strategy</i> and regional waterway strategies and will continue to be involved in other planning activities (such as seasonal watering proposals).</p> <p><i>Water for Victoria</i> strengthened the requirement to consider Traditional Owners' values in water management and has an action (8.7) to ensure this is part of future SWSs.</p>
2.2	Establish the environmental water reserve for each river in the Central Region	Partly achieved 	Over several years – ongoing	<p>The systems in the Central Region that can receive environmental water are the Yarra, Tarago (and Bunyip), Barwon (lower Barwon Wetlands and upper Barwon), Maribyrnong, Moorabool, Werribee, Latrobe, Thomson and Macalister river systems.</p> <p>Since the Central SWS was released, FLOWS studies for the Latrobe River (2006) and estuary (2013) were completed. A FLOWS update and environmental water management plan were completed for the Macalister River in 2016, and a shortfalls update is underway. A FLOWS and shortfalls update is about to start for the Latrobe River, in collaboration with the Latrobe Valley Regional Rehabilitation Strategy regional water studies. A FLOWS and shortfalls update for the Thomson River is scheduled to start later in 2018–19. Flow studies will continue to be updated to provide information for a future SWS. Updates are also underway for the upper Barwon, Yarrowee/Leigh and Maribyrnong rivers.</p>
2.3	Annual compliance reporting of the environmental water reserves	Achieved 	July 2007 – ongoing	The action improved transparency in the use of water for the environment. The <i>Victorian Water Accounts</i> have reported water set aside in the environmental water reserve since the 2006–07 edition, and reporting is planned to continue.
2.4	Issue new entitlements or licences to extract additional water from rivers only if river health is protected	Achieved 	July 2010 – ongoing	The action helped protect river health. The <i>Victorian Water Accounts</i> list environmental water entitlements. New take and use licences may only be issued in accordance with sustainable diversion limits. Permissible consumptive volumes (PCVs) have been set by Ministerial Order for each basin in the region. This action requires ongoing review to remain current and to ensure it continues to help protect river health.





Chapter 2 Protecting our waterways and aquifers

#	Action	Status	Delivery period	Comments
2.5	Further work on impacts and ways of mitigating impacts of small catchment dams	Achieved 	March 2011	The action provided a mechanism to understand the impact of small-catchment dams and to incorporate it into future planning and management. A statewide policy on dams was included in the Northern Region SWS in 2009 and registration of dams in rural residential areas was introduced in 2011. This policy lapsed in 2017. <i>WfV</i> action 8.4 identifies the need to report on significant users of water.
2.6	Review current operating and harvesting rules to improve river health benefits	Achieved 	Ongoing	<p>The action provided and will continue to provide ongoing opportunities to revise operating rules to benefit river health. Operating rules were reviewed when bulk entitlements were created or amended. Bulk entitlements were amended during and after the Millennium Drought to increase management flexibility to minimise the impact of dry conditions on the environment. This included the <i>Bulk Entitlement (Maribyrnong -Southern Rural Water) Conversion Amendment Order 2010</i> and the <i>Bulk Entitlement (Werribee System Irrigation) Conversion Amendment Order 2011</i>. Other improvements included the more efficient use of environmental bulk entitlements including modifying passing flows from the Thomson Dam to enable 'banking' of water for use at other, more critical times.</p> <p>The VEW's process for preparing seasonal watering plans considers options for managing existing environmental water holdings under existing operating rules. Where there is some flexibility in an environmental entitlement about how passing flows are provided, this will be part of the seasonal watering plan.</p>
2.7	Increase the environmental water reserve by 66 GL by 2015	Partly achieved 	Ongoing	The environmental water reserve has increased by 60.8 GL. Action 3.5 of <i>Water for Victoria</i> commits the government to investigate options to meet previous environmental water commitments to the Moorabool, Werribee and Maribyrnong rivers. It also flags that any additional environmental water recovery will be part of a future SWS.
2.8	Pilot the Water Swap program	Achieved 	June 2009	The action piloted an approach to help with water management. The (then) Department of Sustainability and Environment and the West Gippsland CMA piloted this program in the Macalister Irrigation District in 2008–09. The pilot was completed and a review could be carried out to determine lessons learnt.



Chapter 2 Protecting our waterways and aquifers

#	Action	Status	Delivery period	Comments
2.9	Evaluate the effectiveness of stream frontage programs and assess options to accelerate their implementation	Achieved 	2015	<p>The action contributed to further resourcing of stream frontage management. Between 2002–03 and 2015–16, state government funding contributed to over 10,000 km of riparian fencing and 36,000 ha of riparian land fenced off and works undertaken (such as revegetation and weed management).</p> <p>Numerous audits and evaluations of riparian projects by CMAs found projects were generally well managed, technically sound and able to demonstrate the outputs achieved (such as fencing and revegetation).</p> <p>To accelerate the implementation of riparian works, in 2015 the Victorian Government launched the Regional Riparian Action Plan, a five-year plan to accelerate onground riparian management works across regional Victoria to improve the health of riparian land along Victoria's regional rivers, estuaries and wetlands. It has also provided a further \$40 million for riparian works from 2015–20 to implement the plan. Priorities were informed by regional waterway strategies.</p>
2.10	Develop environmental drought response plans	Achieved 	2006–07 – ongoing	The action led to the development of an approach to help manage water resources during drought. Water authorities and CMAs now develop dry inflow contingency plans, and the seasonal watering proposals CMAs and Melbourne Water submit to the VEWB each year address the impact of low inflows on the environment.



Chapter 2 Protecting our waterways and aquifers

#	Action	Status	Delivery period	Comments
2.11	Approach to manage the potential impacts of climate change on river health	Achieved ✓	Ongoing	<p>The action identified approaches to consider climate change impacts, which are now incorporated into other management approaches. The potential impacts of climate change are now addressed at all levels of water planning as a result of legislative and policy initiatives including the <i>Climate Change Act 2017</i> and <i>Victoria's Climate Change Adaptation Plan 2017-2020</i>.</p> <p>The 2013 <i>Victorian Waterway Management Strategy</i> included updated policies to manage the state's rivers, estuaries and wetlands in the context of climate change. These guided the next generation of regional waterway strategies. CMAs have also finalised climate change adaptation plans, to better integrate climate change planning into their regional natural resource management (including waterway management) activities.</p> <p><i>Water for Victoria</i> sets the long-term direction for managing water resources, including waterway health, in the face of climate change and a growing population. It will guide how the water sector adapts to and manages the impacts of climate change on the state's water resources in coming decades. The water sector will lead climate change adaptation actions resulting from <i>Victoria's Climate Change Adaptation Plan 2017 – 2020</i> and the review of the <i>Climate Change Act 2010</i>.</p>
2.12	Establish environmental water reserves (EWRs) for all areas where groundwater is found in reasonable quality and quantity	Achieved ✓	Date not available	The intent of this action has effectively been achieved by incorporating environmental impacts of groundwater extraction into the ongoing groundwater management and licence assessment process. Specifically, Section 40 (1)d outlines that the Minister must have regard to any adverse effect that the allocation or use of water under the entitlement is likely to have on a waterway, drainage regime or the maintenance of the environmental water reserve in accordance with the environmental water reserve objective.
2.13	Establish permissible consumptive volumes for each groundwater management area	Achieved ✓	June 2009	PCVs for each groundwater management area were declared in the late 1990s and early 2000s. PCVs continue to be revised as part of the review of groundwater management plans and water supply protection area management plans. Groundwater in northern Victoria was capped by Commonwealth legislation under the <i>Basin Plan 2012</i> .
2.14	Annual compliance reporting of the use and recharge of aquifers	Achieved ✓	Ongoing	The action improved transparency about groundwater resources including water recharged into aquifers as part of managed aquifer recharge schemes. Groundwater licensed volume and use are reported annually in the <i>Victorian Water Accounts</i> .



Chapter 2 Protecting our waterways and aquifers

#	Action	Status	Delivery period	Comments
2.15	Approach to sustainably manage aquifers	Achieved ✓	2011	<p>The action contributed to greater consideration of groundwater management, laying the groundwork for further reforms to groundwater management in the Western Region SWS. This addressed groundwater trading, developed an approach to managing groundwater-dependent ecosystems (GDEs) and considered the impacts of land use changes and extractive industries. Western Region SWS outcomes were incorporated into the statewide groundwater policy in 2011.</p> <p>Further actions on groundwater were incorporated into the Western Region and Gippsland Region SWSs to further this action.</p>
2.16	Identify and develop underutilised groundwater resources and explore aquifer recharge opportunities	Achieved ✓	Date not available	<p>The action contributed to greater consideration of groundwater management. This was further addressed in the Western Region SWS, which included policies for managed aquifer recharge. Water corporations in the region have run aquifer recharge programs (such as City West Water's trial using treated wastewater). For example, a groundwater resource assessment identified additional water that could be used in the Parwan Groundwater Management Area (GMA) and the Jan Juc GMA (Anglesea).</p>
2.17	Issue new groundwater entitlements or licences if long-term sustainability of aquifers and groundwater-dependent ecosystems are protected	Achieved ✓	Date not available	<p>The action contributed to greater consideration of groundwater management and access to additional groundwater resources. The additional groundwater identified in the Parwan Groundwater Management Area (GMA) was made available through an auction. The additional groundwater in the Jan Juc GMA was incorporated into Victoria's first bulk entitlement for groundwater to supply Geelong. This was further addressed in the Western Region SWS. See action 2.15.</p>



Chapter 3 Securing our water supplies

#	Action	Status	Delivery Period	Comments
3.1	Water authorities to implement water conservation programs to achieve conservation targets	Achieved ✓	Ongoing	<p>The action encouraged residences and businesses to more efficiently use water.</p> <p>The Water Smart Gardens and Homes Rebate Scheme provided incentives for households to buy water-efficient appliances and home potable substitution systems (such as connected rainwater tanks and greywater reuse). Between 2007–11, nearly 140,000 rebates resulted in an estimated 1,758 ML per year (ongoing) of reduced demand.</p> <p>Water corporations have implemented conservation and efficiency measures since the strategy started. These measures were integral to maintaining water supplies to the region during the drought. Water use per person decreased dramatically during the drought and remains below pre-drought levels.</p>
3.2	Extend the regional Our Water Our Future behavioural change program until 2015	Achieved ✓		<p>Target Your Water Use is program for regional Victoria similar to Target 155. Target Your Water Use was designed for regional urban areas, where population growth is placing increasing pressure on water storages. Like Target 155, this program takes a longer-term view of water usage habits, while providing locals easy access to the information they need to make informed decisions about the amount of water they use. It also recognises that each regional water corporation faces a unique set of circumstances and a one-size-fits-all approach does not work. It was reintroduced in 2016.</p>
3.3	Extend the metropolitan Our Water Our Future behavioural change program until 2015	Achieved ✓	Ongoing	<p>Target 155 is a voluntary water-efficiency program to encourage metropolitan Melbourne householders to limit their consumption to 155 L a person a day. The program was discontinued in 2010 and reintroduced in 2016.</p>
3.4	Introduce on-the-spot fines for breaching water restrictions or permanent water-saving rules	Achieved ✓	June 2007	<p>The action supported enhanced water efficiency. The ability to issue penalty infringement notices for breaching water restrictions was introduced in 2007 through the <i>Water Act Amendment (Enforcement and Other Matters) Act 2007</i>.</p> <p>Further reform of the compliance regime was considered in the <i>Water Bill 2014</i> but the government did not pursue it.</p>
3.5	Reform the water component of the 5-star standard for buildings	Achieved ✓	Date not available	<p>The action contributed to more-efficient water use in new buildings. All new homes, home renovations, additions, alterations and relocations must now comply with the 6-star standard, which among other things requires the installation of a solar hot water system or a rainwater tank for toilet flushing.</p>



Chapter 3 Securing our water supplies

#	Action	Status	Delivery Period	Comments
3.6	Water Efficiency Labelling and Standards scheme	Achieved ✓	Ongoing	The action contributed to more-efficient residential water use. The scheme was reviewed in 2015 and found to be effective. The scheme's website explains how it works.
3.7	Trial of smart water meters	Achieved ✓	Date not available	South East Water trialled AquaTrip, a water use monitoring device, in 2014–15.
3.8	Continue to support the Smart Water Fund	Achieved ✓	December 2017	After water corporations reviewed this fund, it no longer invested in new projects and ceased operations in December 2017.
3.9	Extend the Water Smart Homes and Gardens Rebates scheme for a further four years	Achieved ✓	June 2014	The action contributed to more-efficient water use. Rebates for water-efficient appliances were maintained and extended in 2010 to small businesses and non-reticulated households. In 2015, the focus changed to vulnerable and hardship customers.
3.10	Distribute about 160,000 water-efficient showerheads over the next three years	Achieved ✓	Over several years	The action contributed to more-efficient water use in the region. Since 2006, over 550,000 showerheads across Victoria have been replaced with water-efficient models, mostly in Melbourne.
3.11	Develop a web-based ready-reckoner to help home owners choose water-saving options	Achieved ✓	Date not available	The action contributed to more-efficient water use in the region. Ready-reckoners were developed and now appear as tips for saving water on the major water corporation websites.
3.12	Continue the Sustainable Water Efficiency Program for schools	Achieved ✓	Ongoing	The action contributed to more-efficient water use. The Schools Water Efficiency Program started in 2006. The government allocated \$3 million to fund phase 2 of the program in 2011. The government has continued the program as part of its continued water-efficiency program. The program won a United Nations Environment Day award in 2014. As of April 2018, the 1,031 participating schools have saved 5.2 GL of water which equates to \$15.5 million in water and sewerage-related charges.
3.13	Extend the Pathways to Sustainability program throughout the region	Achieved ✓	Date not available	The action contributed to more-efficient water use in the region. The program worked with Melbourne's top 200 water users to reduce their consumption by 6 GL between 2001–02 and 2007. The WaterMAP program built on the success of the program between 2007 and 2010–11, working with thousands of Victorian businesses to achieve 17 GL of water savings. After a 2011 statewide review of water restrictions and permanent water-saving rules, a voluntary WaterMAP program for all non-residential customers (5 ML/year or greater water use) was introduced.



Chapter 3 Securing our water supplies

#	Action	Status	Delivery Period	Comments
3.14	Explore alternative pricing options for industry and investigate how to develop water markets that could be open to large industrial water users	Achieved ✓	Ongoing	<p>The action helped to explore ways to maximise flexibility for water sharing across the region. Investigations were conducted into pricing and development of a water market but were not pursued.</p> <p><i>Water for Victoria</i> supports greater development of the south-central water grid to further support water-sharing opportunities through a trail commenced in 2017.</p>
3.15	Water authorities to report annually to the Minister for Water on large, non-residential water users	Achieved ✓	Ongoing	The action improved transparency regarding non-residential water users. Water corporations report on large, non-residential water users in their annual reports.
3.16	Water authorities to set new recycling targets	Achieved ✓	Date not available	Recycling targets were implemented through water supply demand strategies for each water corporation. The targets were exceeded.
3.17	Water authorities to mandate dual-pipe systems for suitable areas	Achieved ✓	October 2015	<p>The action helped to enhance the use of alternative sources of water and to improve water supply reliability. This was achieved by revising the definition of water in the <i>Water Act 1989</i> and with Clause 56.07 of the Victoria Planning Provisions for new residential subdivisions.</p> <p>Several dual-pipe estates were developed in Melbourne including at Dandenong, West Werribee, Epping and Sandhurst.</p> <p>Opportunities to include recycled water in the forward servicing strategy for new urban growth corridors are being assessed.</p>
3.18	The Growth Areas Authority to promote water conservation and recycling in new developments in the growth areas of Melbourne	Achieved ✓	October 2009	The action contributed to more-efficient water use in the region. Guidelines providing a step-by-step guide to preparing precinct structure plans were developed in 2009. These guidelines help integrate planning of new urban areas.
3.19	Continue to research and explore aquifer storage and recovery opportunities	Achieved ✓	Over several years	The action contributed to greater consideration of the use of groundwater systems for water storage. The Western Region SWS set out new groundwater policies including about managed aquifer recharge. Water corporations have undertaken managed aquifer recharge programs in the region.



Chapter 3 Securing our water supplies

#	Action	Status	Delivery Period	Comments
3.20	Upgrade the Eastern Treatment Plant to Class A standard	Achieved ✓	2012	The action helped to enhance the use of recycled water and improve water supply reliability in the region. The Eastern Treatment Plant was upgraded in 2012 to treat water to a Class A standard. The plant treats nearly half of Melbourne's sewage (330 ML a day).
3.21	Proceed to business case for the Eastern Water Recycling Proposal	Achieved ✓	Early 2000s	The action helped to enhance the use of recycled water and improve water supply reliability in the region. The Eastern Water Recycling Proposal investigated piping recycled water from the Eastern Treatment Plant to the Latrobe Valley for use in power generation.
3.22	Continue to monitor the quality and volume of the ocean outfall at Boags Rocks	Achieved ✓	Ongoing	The action improved transparency. Melbourne Water publishes weekly statistics about water quality at the Boags Rocks outfall in accordance with its EPA licence.
3.23	Expressions of interest for a portion of the 35,000 ML of recycled water available from the Western Treatment Plant	Achieved ✓	July 2017	The action helped to enhance the use of recycled water and improve water supply reliability in the region. Melbourne Water now supplies recycled water from the Western Treatment Plant to the Werribee Park Tourism Precinct, the Werribee Irrigation District, the Werribee National Employment and Innovation Cluster and MacKillop College.
3.24	Complete feasibility studies for large-scale stormwater reuse options, in particular at Dight's Falls (proceed to business case if appropriate)	Achieved ✓	June 2007	The feasibility of large-scale stormwater reuse was investigated, and the options identified were not feasible due to technical and environmental constraints.
3.25	Interconnect water supply systems and expand water markets in the Central Region	Achieved ✓	Over several years	<p>The action maximised flexibility for water sharing across the region. The North–South Pipeline and the Melbourne to Geelong Pipeline were built.</p> <p>This action was superseded by more-detailed actions in <i>Our Water Our Future: The Next Stage of the Government's Water Plan</i> in 2007, which fast-tracked big interconnection projects in the face of the worsening drought and the lowest three years of inflows on record.</p>



Chapter 3 Securing our water supplies

#	Action	Status	Delivery Period	Comments
3.26	Develop a governance framework to guide urban authorities participating in the water market	Achieved ✓	Ongoing	The action helped to build a framework to maximise flexibility for water sharing across the region. The existing governance framework for urban water authorities provides guidance and can be used to enhance governance for water markets as required. <i>Water for Victoria</i> includes actions to further trial water markets in the south-central part of the state, which incorporates the Central Region SWS area.
3.27	Monitor the advances in desalination technology and complete a feasibility study for desalination options for Melbourne (proceed to business case if appropriate)	Achieved ✓	2012	The action helped to ensure reliable and safe water supply in the region. This action was superseded by more-detailed actions in <i>Our Water Our Future: The Next Stage of the Government's Water Plan</i> in 2007, which fast-tracked actions related to desalination in the face of the worsening drought and the lowest three years of inflows on record. Consequently, the Victorian Desalination Project was built at Dalyston, near Wonthaggi. The plant can deliver up to 150 GL a year.





Chapter 4 Greater Ballarat

#	Action	Status	Delivery Period	Comments
4.1	Reduce total per capita water consumption by 25% by 2015 and 30% by 2020	Achieved 	July 2011	The action contributed to more-efficient water use in Greater Ballarat. Per capita water use in Ballarat fell from an average 501 L a person a day in the 1990s to 250 L in 2010–11, a 50% reduction.
4.2	Implement a range of conservation and efficiency programs	Achieved 	Ongoing	The action contributed to more-efficient water use in Greater Ballarat. The Ballarat District Water Supply System Strategic Plan 2011-2060 outlines previous, current and future demand reduction strategies.
4.3	Substitute river water with recycled water in Lake Wendouree and for use by industry	Achieved 	2005–11	The action helped to better manage water security for Greater Ballarat. After evaluating water supply substitution options for Lake Wendouree, in 2006 the Victorian Government allocated \$7 million for water substitution, which began in the same year. The strategy resulted in reservoir water being substituted with an additional 1.9 GL on average a year from stormwater harvesting, recycling and diversions.
4.4	Interconnect Cosgrave Reservoir to White Swan Reservoir	Achieved 	2006	The action maximised flexibility for water sharing. The Cosgrave – White Swan interconnection was completed in late 2006, to allow access to Central Highlands Water’s then unused entitlement. It enabled an additional supply of 495 ML to the Ballarat system in 2006–07 and 345 ML in 2007–08.
4.6	Interconnect to the Goulburn system (Waranga Channel)	Achieved 	May 2008	The action maximised flexibility for water sharing. The Ballarat–Goulburn interconnection was completed ahead of schedule in May 2008. By the end of 2015–16, the pipeline had contributed more than 22 GL to the Ballarat system.
4.7	Groundwater from Cardigan Aquifer	Achieved 	July 2007	The action helped to better manager water security for Greater Ballarat. The Cardigan Aquifer project was completed in July 2007 and provided 2,200 ML to the Ballarat system in 2007–08, including water to substitute for river water in Lake Wendouree.
4.8	Increase environmental flows in the Moorabool River by 6,000 ML by 2015	Partly achieved 	Ongoing	There is an ongoing commitment to recover further water for the Moorabool, but whether the full 6,000 ML can be recovered is unclear.
4.8 a	Redirect the treated groundwater discharge from the Fyansford quarry to the lower Moorabool River	Achieved 	June 2011	The action helped protect and improve river health. In 1980, the Moorabool River was diverted around the Batesford limestone quarry near Fyansford, and a concrete-lined diversion channelled installed to reroute the river and stop water infiltration. Despite these works, water still seeped into the quarry and was pumped directly out into Corio Bay. In June 2011, an agreement was reached to return this treated water to the river.



Chapter 4 Greater Ballarat

#	Action	Status	Delivery Period	Comments
4.8b	Transfer part of the water authorities' water entitlements in the west and lower Moorabool catchments to the environment	Achieved 	October 2010	The action helped protect and improve river health. The <i>Moorabool River Environmental Entitlement 2010</i> provides a 11.9% inflow and storage capacity share in Lal Lal Reservoir.
4.8c	Voluntary buy-back scheme for unregulated surface water diversion licences in selected areas of the Moorabool catchment and transfer the water to the environment	Partly achieved 	Ongoing	DELWP are undertaking further investigations into the cost-benefit of the voluntary buy-back of unregulated licences program to recover water for the environment. Further investigations are underway by DELWP to determine water recovery options.



Chapter 4: Greater Geelong

#	Action	Status	Delivery Period	Comments
4.9	Reduce total per capita water consumption by 25% by 2015 and 30% by 2020	Achieved ✓	March 2012	The action contributed to more-efficient water use in Greater Geelong. Per capita water use in Geelong fell in the mid-2000s from a 40-year average of about 470 L a person a day to about 270 L, a 42% reduction.
4.10	Implement a range of conservation and efficiency measures	Achieved ✓	Ongoing	The action contributed to more-efficient water use in Greater Geelong. The Barwon Water Supply Demand Strategy 2012 to 2062 outlines previous, current and future demand reduction strategies.
4.11	Line the Wurdee Boluc Inlet Channel and Ballan Channel	Achieved ✓	2016	The action contributed to reduce system losses and improved water quality. Reconstruction of sections of the two channels was completed in 2016.
4.12	Substitute river water with recycled water for on-site use at the Shell Refinery	Achieved ✓	April 2013	The action helped to better manage water security for the Geelong Region. The Northern Water Plant, built adjacent to the Shell Refinery, provides the refinery with up to 2 GL of recycled water a year, reducing Geelong's demand for drinking water and reducing the volume of water discharged to the ocean.
4.13	Conduct an initial trial of aquifer storage and recovery	Achieved ✓	March 2012	Barwon Water completed its Aquifer Storage and Recovery research program to investigate to investigate options for storage and recovery. The volumes in the CRSWS of 2,700 ML/y by 2030 and 12,500 ML/y in 2055 will need to be reviewed and not automatically carried forward to the next SWS.
4.14	Feasibility study of groundwater resource at Newlingbrook aquifer and possible Melbourne–Geelong connection	Achieved ✓	December 2012	The Newlingbrook groundwater feasibility study concluded the option was costly and lacked community support. The Melbourne to Geelong Pipeline was successfully constructed as an Our Water Our Future initiative in 2007, reducing the need to identify new water sources.
4.15	Entitlement for the use of the Jan Juc deep aquifer	Achieved ✓	June 2009	The action ensured a reliable and safe water supply to increase water supply options for Greater Geelong. Barwon Water was granted an entitlement to access Anglesea groundwater in 2009.
4.16	Reinstate the Dewing Creek diversion into the Wurdee Boluc Inlet Channel	Achieved ✓	No date available	The Dewing Creek diversion weir was reinstated.



Chapter 4: Greater Geelong

#	Action	Status	Delivery Period	Comments
4.17	Increase environmental flows in the Barwon River by 4,700 ML by 2015	Achieved ✓	2018	Treated groundwater outflows from the Fyansford quarry were modified to discharge via the lower Moorabool benefiting the lower Barwon (1,700 ML). Part of the treated discharge from the Ballarat South Wastewater Treatment Plant was released as environmental flows into Leigh Creek and the Barwon (2,000 ML) plus a 1 GL transfer of water to the environment was completed in 2018 as a result of supply augmentations for Geelong.
4.17 a	Continue release of part of the discharge from the South Ballarat Treatment Plant for environmental flows in the Leigh/ Barwon rivers	Achieved ✓	Ongoing	The action helped protect and improve river health. Recycled water is being discharged into the Barwon system. 28,091 ML was discharged in 2013–14 and 27,507 ML in 2014–15.
4.17 b	Transfer part of water authorities water entitlements in the West Barwon Reservoir to the environment	Achieved ✓	Ongoing	The intention of this action was to protect and improve river health. The creation of the <i>Upper Barwon River Environmental Entitlement 2018</i> was completed in April 2018. It provides a long-term average of 1 GL a year of water for the environment through a 3.8% share of inflows and 2 GL storage capacity share of West Barwon Reservoir.



Chapter 4: Inner West

#	Action	Status	Delivery Period	Comments
4.18	Reduce total per capita water consumption by 25% by 2015 and 30% by 2020	Achieved 	July 2017	The action contributed to more-efficient water use in Inner West. Between 2003–04 and 2015–16, drinking water consumption per person decreased by 27%, despite rapid population growth in the area.
4.19	Implement a range of conservation and efficiency measures	Achieved 	Ongoing	The action contributed to more-efficient water use in Inner West. The Western Water Urban Water Strategy 2017 outlines previous, current and future demand reduction strategies.
4.20	Substitute recycled water for non-potable uses in new residential and commercial developments in Eynesbury and Melton South	Achieved 	Ongoing	The action helped to reduce the risk of shortfalls. In 2016–17, the number of properties with recycled water services grew by 4% over the previous year, mostly in new developments around Melton and Sunbury.
4.21	Increase the use of recycled water from local treatment plants	Achieved 	Ongoing	The action helped to reduce the risk of shortfalls. Between the 2012 and 2017 financial years, Western Water increased its production of recycled water from 7,544 ML to 12,170 ML, and increased the use of this water from 56% to 72%.
4.22	Continue to investigate opportunities to substitute river water for recycled water in irrigation areas in the Werribee catchment	Partly achieved 	Ongoing	The action contributed to greater consideration of recycled water for environmental flows in other strategies. The <i>Western Water Urban Water Strategy 2017</i> includes a medium-term action — SA20 — to investigate the feasibility of delivering a benefit through the substitution of river water for treated wastewater.
4.23	Upgrade the existing Melbourne–Inner West connection and purchase additional water rights from the Melbourne pool	Achieved 	2004, June 2014	The action maximised flexibility for water sharing and ensured a reliable, safe water supply. Western Water made connections to the Melbourne system in 2004 and has an entitlement — in <i>Bulk Entitlement (Greater Yarra System - Thomson River Pool Western Water) Order 2014</i> — to 18,250 ML in the Melbourne system.
4.24	Transfer 50% of the unallocated inflows in Lake Merrimu to Western Water	Not yet achieved 	Ongoing	This action was explored and water was temporarily made available to Western Water to meet critical demand. A reduced catchment yield has changed the viability of the transfer. DELWP continues to explore the best options for allocation of the remaining water from Merrimu Reservoir.
4.25	Develop a wellfield between Romsey and Lancefield	Achieved 	November 2013	The action ensured a reliable, safe water supply. The Romsey–Lancefield bore field was completed in 2013 and supplied 10% of Romsey's drinking water in the 2014 financial year.



Chapter 4: Inner West

#	Action	Status	Delivery Period	Comments
4.26	Purchase additional entitlements from Pykes Creek Reservoir	Not yet achieved 	Ongoing	This action was to help secure water supplies for Western Water. Action MR1 in the <i>Western Water Urban Water Strategy 2017</i> is to continue to pursue the purchase of additional entitlements from Pykes Creek Reservoir to supplement alternate supplies from the Melbourne system.
4.27	Increase storage capacity in the Romsey/Lancefield system	Achieved 	November 2013	The action ensured reliable and safe water supply. The increased storage was provided by access to groundwater (see action 4.25).
4.28	Increase environmental flows in the Werribee River by 6,000 ML by 2015	Partly achieved 	May 2014, ongoing	The intention of this action was to protect and improve river health. The <i>Werribee River Environmental Entitlement 2014</i> provides a 10% share of inflows into Lake Merrimu to be used to improve environmental outcomes in the Werribee River. Actions are ongoing for other water recovery options.
4.28 a	Pipe the Werribee Irrigation District and transfer the water saved for environmental flows in the Werribee River	Not yet achieved 	Ongoing	Three of the five construction phases are funded for completion with an agreed one-third of verified water savings going to the environment. DELWP and Southern Rural Water are continuing to pursue other opportunities for funding the remaining construction stages. Implementation of the Werribee Irrigation District Modernisation project has commenced.
4.28b	Substitute river water with recycled water in the Werribee Tourist Precinct to free up water for environmental flows in the Werribee River	Achieved 	Ongoing	The action helped protect and improve river health. Recycled water is now supplied to the Werribee Park Tourist Precinct: in the 2017 financial year, Melbourne Water supplied the precinct with 121 ML.
4.28c	Transfer 50% of the unallocated inflows in Lake Merrimu as an environmental entitlement for the Werribee River	Achieved 	May 2014	The action helped protect and improve river health. The Werribee River Environmental Entitlement was created in 2014. Environmental flows in the Werribee system consist of a share of flow, rather than a held entitlement.
4.29	Increase environmental flows in the Maribyrnong River by 3,000 ML by 2015	Not yet achieved 	Ongoing	This action is recommitted through <i>Water for Victoria</i> action 3.5. The <i>Healthy Waterways Strategy</i> for the Melbourne Water catchments is expected to be released in 2018 and may include consideration of updated flow studies for key catchments such as the Maribyrnong, with proposed water recovery targets.
4.29 a	Transfer part of Western Water's Rosslynne Reservoir entitlement to the environment	Not yet achieved 	Ongoing	Actions such as transferring water from Rosslynne Reservoir to the environment should be reviewed pending updated flow studies.



Chapter 4: Inner West

#	Action	Status	Delivery Period	Comments
4.29b	Voluntary buy-back scheme for unregulated surface water diversion licences in selected areas of the Maribyrnong catchment and regulated diversion licences on Jacksons Creek to retire the licences and transfer the water to the environment	Not yet achieved 	Ongoing	DELWP are undertaking further investigations into the cost-benefit of the voluntary buy-back of unregulated licences program to recover water for the environment.
4.29c	Transfer part of Western Water's Baringo Creek entitlement to the environment	Not yet achieved 	Ongoing	Actions such as transferring water from Baringo Creek to the environment should be reviewed pending updated flow studies.



Chapter 4: Greater Melbourne

#	Action	Status	Delivery Period	Comments
4.30	Reduce total per capita water consumption by 25% by 2015 and 30% by 2020	Achieved ✓	July 2015	The action contributed to more-efficient water use in Greater Melbourne. In 2016–17, per capita residential water consumption in Melbourne was 161 L a person a day and total water consumption was 1,170 ML, compared to 1,475 ML at the peak of consumption in 1997. This equates to a 26% reduction in water use.
4.31	Maintain existing water savings (350,000 water-efficient gardens and work with 140,000 householders)	Achieved ✓	Ongoing	The action contributed to more-efficient water use in Greater Melbourne. The Victorian Government continued to emphasise the importance of efficient use of water around the house and garden through the purchase and installation of rainwater tanks through the new Living Victoria Water Rebate Program (1 July 2012 to 30 June 2015). Target 155 was first introduced during the Millennium Drought, was replaced with other water-saving initiatives when it ended and was reactivated in March 2016.
4.32	Implement conservation and efficiency programs (water-efficient showerhead program; water-efficient washing machine program; water-efficient evaporative air conditioners)	Achieved ✓	Ongoing	The action contributed to more-efficient residential water use in Greater Melbourne, where consumption fell from 188 L per person a day in 2006–07 to 161 L in 2016–17. Water conservation and efficiency initiatives included the Living Victoria Water Rebate Program and showerhead exchange schemes. Cities and towns across Victoria also had water restrictions. The 2017 <i>Melbourne Water System Strategy</i> also includes water-efficiency initiatives. Non-residential water conservation and efficiency initiatives included the Schools Water Efficiency Program and the WaterMAP program.
4.33	Continue to manage the water distribution system efficiently and reduce leakage	Achieved ✓	Ongoing	The action contributed to ongoing investments in efficiency and to reduce system losses. Melbourne's water retailers continue to invest in leak detection and investigation programs. For example, in 2014–15 Yarra Valley Water program saved 4 GL and South East Water saved 767 ML.
4.34	Expand the Pathways to Sustainability program and implement other programs to achieve the non-residential conservation target	Achieved ✓	Ongoing	The action contributed to more-efficient water use in Greater Melbourne. Outcomes for this action are reported under action 3.13.
4.35	Implement efficiency measures in irrigation systems within the Yarra catchments	Achieved ✓	2010	The action contributed to more-efficient water use in Greater Melbourne. Melbourne Water installed remote-access data loggers on many diverter customers' water meters. Uses for the data include checking compliance with restrictions and bans, and irrigators can use it to manage farm irrigation.



Chapter 4: Greater Melbourne

#	Action	Status	Delivery Period	Comments
4.36	Invest in local water recycling and reuse schemes	Achieved ✓	Ongoing	The action helped to reduce the risk of shortfalls. The region's water companies report annually on recycled water, stormwater and dual-pipe initiatives. For example, in 2014–15 Melbourne Water issued 38 stormwater harvesting licences totalling 2,008 ML, and it delivered 46.6 ML of recycled water for non-drinking purposes. In 2012, an estimated 28% of Melbourne households had rainwater tanks. Melbourne Water's Stormwater Strategy 2013–18 notes actions to manage and harvest stormwater. Melbourne Water is currently reviewing the strategy.
4.37	Establish an industry working group to investigate opportunities to reuse and recycle 30,000 ML of local water sources	Achieved ✓	Ongoing	The action helped to reduce the risk of shortfalls and ensured a reliable and safe water supply. A formal committee was not established. However, the task is assessed as complete as the region's water companies have pursued local reuse and recycling initiatives related to local water sources.
4.38	Business cases will be completed for the Eastern Water Recycling Proposal, desalination options and stormwater reuse options	Achieved ✓	Date not available	The action helped to reduce the risk of shortfalls. Outcomes for this action are reported under actions 3.21, 3.24 and 3.27.
4.39	Meet the scientific flow recommendations in the Yarra River by 2007	Achieved ✓	Ongoing	The action helped protect and improve river health. All rivers in the Central Region have PCVs, and bulk entitlements include provisions for passing flows. The <i>Yarra Environmental Entitlement 2006</i> entitles the environment to 17 GL a year.
4.39 a	Reduce the cap on entitlements in the Yarra River and establish an environmental entitlement of 17,000 ML	Achieved ✓	October 2006	The action helped protect and improve river health. The <i>Yarra Environmental Entitlement 2006</i> entitles the environment to 17 GL a year.
4.40	Investigate options to provide water to wetlands where it is not possible to provide overbank flows	Achieved ✓	July 2015	<p>An initial mapping and high-level prioritisation of billabongs in Melbourne Water's region was completed in 2012. In 2013, a more-detailed report was completed on four, high-priority billabong sites. Billabong watering is now a priority watering action to achieve environmental objectives in the Yarra system.</p> <p>Melbourne Water also waters floodplain wetlands. For example, in 2014 water for the environment was delivered to the Yering Backswamp via the Maroondah Aqueduct.</p>



Chapter 4: Greater Melbourne

#	Action	Status	Delivery Period	Comments
4.41	Increase environmental flows in the Tarago/Bunyip rivers by 3,000 ML by end 2006	Achieved ✓	March 2009	The action helped protect and improve river health. The <i>Tarago and Bunyip Environmental Entitlement 2009</i> provides 3 GL of storage and 10.3 % share of flows.
4.41 a	Create an environmental entitlement for the Bunyip/Tarago Rivers	Achieved ✓	March 2009	The action helped protect and improve river health. The outcome for this action is reported under action 4.41.
4.41b	Conduct a scientific study of the flow requirements of the Bunyip / Tarago rivers	Achieved ✓	April 2007	The environmental flow determination for the Bunyip / Tarago rivers was completed in 2007.



Chapter 4: West Gippsland

#	Action	Status	Delivery Period	Comments
4.42	Establish benchmarks and refine conservation targets for total water use (excluding major industry)	Achieved ✓	2007, ongoing	The action contributed to more-efficient water use in West Gippsland. The Gippsland Water Water Supply Demand Strategy 2012 noted progress made on all five actions relating to efficiency in the previous strategy. The Gippsland Water Urban Water Strategy 2017 includes ongoing efficiency actions.
4.43	Develop a separate target for major industry, based on industry best practice	Achieved ✓	2012	The action contributed to greater consideration of industry efficiency targets in other strategies. The <i>Gippsland Water Water Supply Demand Strategy 2012</i> reported progress on its commitment to work with industry to achieve a 15% saving in water used by 2020.
4.44	Implement conservation and efficiency programs, including replacing the water turbine pump from Blue Rock Reservoir to Moondarra with an electric pump	Achieved ✓	Ongoing	The action contributed to more-efficient water use in West Gippsland. Gippsland Water has installed an electric pump at Blue Rock Reservoir and continues to implement conservation and efficiency measures.
4.45	Complete Stage 1 of the Gippsland Water Factory to enable the substitution of river water with recycled water for industry	Achieved ✓	January 2013	The action helped to reduce the risk of shortfalls. The Gippsland Water Factory, which started operating in January 2013, treats up to 35 ML of wastewater a day from nine towns in central Gippsland, serving the needs of more than 48,000 domestic customers and 300 local businesses.
4.46	Future water available from the Eastern Water Recycling Proposal, Stage 2 of the Gippsland Water Factory or groundwater	Achieved ✓	2010	The action helped to reduce the risk of shortfalls. Gippsland Water has a total share of Blue Rock Lake of 17.08% in the <i>Bulk Entitlement (Gippsland Water - Blue Rock) Conversion Order 1997</i> .
4.47	Increase environmental flows in the Latrobe River by 10,000 ML by 2006 for seven years	Achieved ✓	July 2013	The action helped protect and improve river health. The <i>Blue Rock Environmental Entitlement 2013</i> provides a 9.45% inflow and storage capacity share equivalent to a modelled, annual, long-term average of 10 GL. This action was achieved through the <i>Gippsland Region Sustainable Water Strategy</i> .



Chapter 4: West Gippsland

#	Action	Status	Delivery Period	Comments
4.47 a	Temporarily transfer part of the unallocated share of Blue Rock Reservoir and unallocated entitlements in Lake Narracan to provide 10,000 ML of water a year for flows (for seven years) in the Latrobe River	Achieved ✓	July 2013	The outcome for this action is reported under action 4.47.
4.47b	Conduct a seven-year research program on the Latrobe River to confirm the flow requirements and necessary complementary works	Achieved ✓	2014	This action was achieved through the <i>Gippsland Region Sustainable Water Strategy</i> .
4.48	Increase environmental flows in the Thomson/Macalister River by 15,000 ML by 2012	Achieved ✓	May 2017	The action helped protect and improve river health. The Macalister River target has been exceeded with 12,460 ML of high-reliability water and 6,229 ML of low-reliability water transferred to the environment through the <i>Macalister River Environmental Entitlement 2010</i> . The Thomson River water recovery target has not been met and has been transferred to the <i>Gippsland Region Sustainable Water Strategy</i> . A 2017 amendment to the <i>Bulk entitlement (Thomson River-Environment) Order 2005</i> provides an additional 8 GL a year for the environment through a 3.9% share of inflows and additional 8 GL of storage capacity in Thomson Reservoir.
4.48 a	Continue to invest in channel automation technology in the MID and progressively transfer the water saved (15,000 ML) to the Thomson and Macalister Rivers	Achieved ✓	Ongoing	Modernisation of the Macalister Irrigation District is continuing, and water savings sourced from the Macalister modernisation projects have been used to deliver environmental benefits. Information about completed and progressing projects can be found on the Southern Rural Water website.




Chapter 4: Western Port

#	Action	Status	Delivery Period	Comments
4.49	Reduce total per capita water consumption (excluding major industry) by 25% by 2015 and 30% by 2020	Achieved ✓	Date not available	The action contributed to more-efficient water use in Western Port. Westernport Water has reduced per capita water use since the 1990s by 47%.
4.50	Implement conservation and efficiency programs	Achieved ✓	Ongoing	<p>The action contributed to more-efficient water use in Western Port. Westernport Water's water conservation and efficiency measures implemented since 2006 include permanent water-saving rules, community education, water audits and rebate programs.</p> <p>The <i>Westernport Water Urban Water Strategy 2017</i> includes conservation and efficiency actions including leakage detection and education and community awareness programs.</p>
4.51	Increase use of recycled water from the Cowes Wastewater Treatment Plant and Westernport Water's purification plant	Achieved ✓	2012, ongoing	The action helped to reduce the risk of shortfalls. The Philip Island Recycled Water Scheme was commissioned in 2012. Reuse of water from the Cowes Wastewater Treatment Plant increased from 3% in 2011–12 to 5% in 2014–15.
4.52	Comparative assessment of augmentation options (for implementation by 2008), including an interconnection with: the Bass River; groundwater bores near the Candowie Reservoir; Corinella Aquifer; and the Melbourne supply system	Achieved ✓	Over several years	The action ensured reliable and safe water supply. The Candowie Reserve upgrade was completed in 2013 and has a bulk water entitlement of 1 GL to the Melbourne system — the <i>Bulk Entitlement (Greater Yarra System - Thomson Pool - Westernport Water) Order 2014</i> . The Corinella Aquifer is included in the supply system. The Bass River to Candowie interconnection has been completed and supplies established from the Corinella Aquifer. These augmentations were brought forward in the face of worsening drought conditions.



Chapter 4: Western Port

#	Action	Status	Delivery Period	Comments
4.53	Investigate a range of long-term augmentation options, including an interconnection with: the Bass River; groundwater bores near the Candowie Reservoir; Corinella Aquifer; the Melbourne supply system; and aquifer storage and recovery using the Wonthaggi coal mine	Achieved 	Over several years	The action ensured reliable and safe water supply. The Candowie Reservoir was upgraded in 2013. Westernport Water has access to 1 GL of water in the Melbourne system — the <i>Bulk Entitlement (Greater Yarra System - Thomson Pool - Westernport Water) Order 2014</i> .



Chapter 5 Delivering the strategy

#	Action	Outcome	Period	Comments
5.1	Specify in water authorities' and catchment management authorities' statements of obligations a requirement to deliver strategy projects and services	Achieved ✓	2015	The action enhanced transparency and shared responsibility among organisations. Statements of obligations for water corporations issued in 2015 refer to SWSs. Statements for CMAs issued in 2007 refer to the preparation, but not implementation, of strategies.
5.2	Water authorities will ensure they can provide safe reliable water supplies and conserve water and secure water supplies for the future	Achieved ✓	Ongoing	<p>The action contributed to more-efficient water use and to ensure reliable and safe water supply. Regional urban water corporations deliver the action through water supply demand strategies. For example, see the <i>Barwon Water Water Supply Demand Strategy 2012 to 2062</i>. A WSDS for Melbourne was released in 2006 to address the action but it was not renewed in 2012.</p> <p>Water corporations' statements of obligation require them to prepare an urban water strategy or the Melbourne Water System Strategy, which address continuing implementation of the action. Water corporations must comply with the <i>Safe Drinking Water Act 2003</i> and its regulations.</p>
5.3	Catchment management authorities will manage the environmental water reserve to optimise environmental outcomes and provide for healthy rivers	Achieved ✓	Ongoing	The action helps to protect and improve river health. The VEWB was created in 2011 to manage environmental water in partnership with CMAs. Its seasonal watering plan shows the potential environmental watering that could occur during the year in each waterway system using water available under all environmental water entitlements held in Victoria. Day-to-day, CMAs manage environmental water at the system level.
5.4	Provide funding to support sustainable water management and improve river health	Achieved ✓	Ongoing	The action helped to ensure reliable and safe water supply and to protect and improve river health. There is strong, ongoing investment in sustainable water management in Victoria. For example, between 2004–05 and 2013–14, \$70.1 million was invested in environmental water planning and management and \$149.8 million in waterway health.
5.5	Continue to monitor and improve understanding of river health	Achieved ✓	Ongoing	The action improves transparency and helps to protect and improve river health. The <i>Third Index of Stream Condition</i> was published in 2010. The Water Measurement Information System maintains up-to-date records of water quantity and quality. The Victorian Environmental Flows Monitoring and Assessment Program was established in 2005 to monitor and assess ecosystem responses to environmental watering.



Chapter 5 Delivering the strategy

#	Action	Outcome	Period	Comments
5.6	Continue to monitor groundwater and examine opportunities to expand coverage to include groundwater-dependent ecosystems and rivers/wetlands	Achieved ✓	Ongoing	The action helps to manage risk and uncertainty and to protect groundwater. Groundwater is monitored through a system of statewide bores. Real-time data can be accessed online through the Water Measurement Information System. Work continues to understand the distribution, condition and environmental values of GDEs, particularly those of high environmental value and at high risk from groundwater extraction.
5.7	Continue to implement and improve existing water accounting system	Achieved ✓	Ongoing	The action improved transparency. The <i>Victorian Water Accounts</i> are published annually and available online.
5.8	Continue to monitor water consumption and population trends to enable comparison with forecasts	Achieved ✓	Ongoing	The action helps to manage risk and uncertainty and reduce the risk of shortfalls. Water corporations monitor water consumption trends and population growth impacts on water demand and report in their annual reports, plans and strategic documents.
5.9	Maintain water supply models across the region and upgrade where necessary	Achieved ✓	Ongoing	The action helps to manage risk and uncertainty and reduce the risk of shortfalls. Melbourne Water and DELWP have resource allocation models and have procedures to maintain them.
5.10	Monitor results of climate change studies occurring nationally and internationally	Achieved ✓	Ongoing	The action helps to manage risk and uncertainty and reduce the risk of shortfalls. Stage II of the South Eastern Australian Climate initiative was completed in 2012. In 2013, DELWP, the Bureau of Meteorology and the CSIRO launched the Victorian Climate Initiative to provide guidance about climate variability, predictability and change. The initiative builds on the work of the South Eastern Australian Climate Initiative and aims to understand how climate has changed and is likely to change in the future, and to improve understanding of our ability to predict climate at seasonal scales.
5.11	Establish a system to monitor and report on progress in achieving greenhouse neutrality	Achieved ✓	2018	Action 2.1 of <i>Water for Victoria</i> sets the objective of net-zero emissions in the water sector. This is implemented through the March 2018 <i>Statement of Obligations (Emission Reduction)</i> , and it includes monitoring and reporting targets.
5.12	Improve demand modelling and forecasting ability	Achieved ✓	Ongoing	The action helps to manage risk and uncertainty and reduce the risk of shortfalls. Demand modelling has been improved as part of developing water supply demand strategies.



Chapter 5 Delivering the strategy

#	Action	Outcome	Period	Comments
5.13	Investigate whether the adoption of water conservation measures reduces the effectiveness of water restrictions during drought periods	Achieved ✓	Ongoing	The action helps to manage risk and uncertainty and reduce the risk of shortfalls. While there was no study specifically of demand hardening, the 2011 review of water restrictions in Victoria considered the issue and recommended water corporations take an adaptive approach to demand estimation. The 2011 <i>Guidelines for the Development of a Water Supply Demand Strategy</i> allowed for such an adaptive approach.
5.14	Review and enhance the methodology behind environmental flow studies	Achieved ✓	Ongoing	The action helps to protect and improve river health. The original FLOWS method was implemented in 2002, and Flows – a method for determining environmental water requirements in Victoria, Edition 2 was published in 2013. The updated method drew on experience managing waterways through the Millennium Drought.
5.15	Improve understanding of the impacts on rainfall and streamflow of interactions between the El Niño –Southern Oscillation and fluctuations in the Indian Ocean	Achieved ✓	Ongoing	The action helps to manage risk and uncertainty and reduce the risk of shortfalls. As explained under action 5.10, Stage II of the South Eastern Australian Climate Initiative was completed in 2012. In 2013, DELWP, the Bureau of Meteorology and the CSIRO launched the Victorian Climate Initiative.

