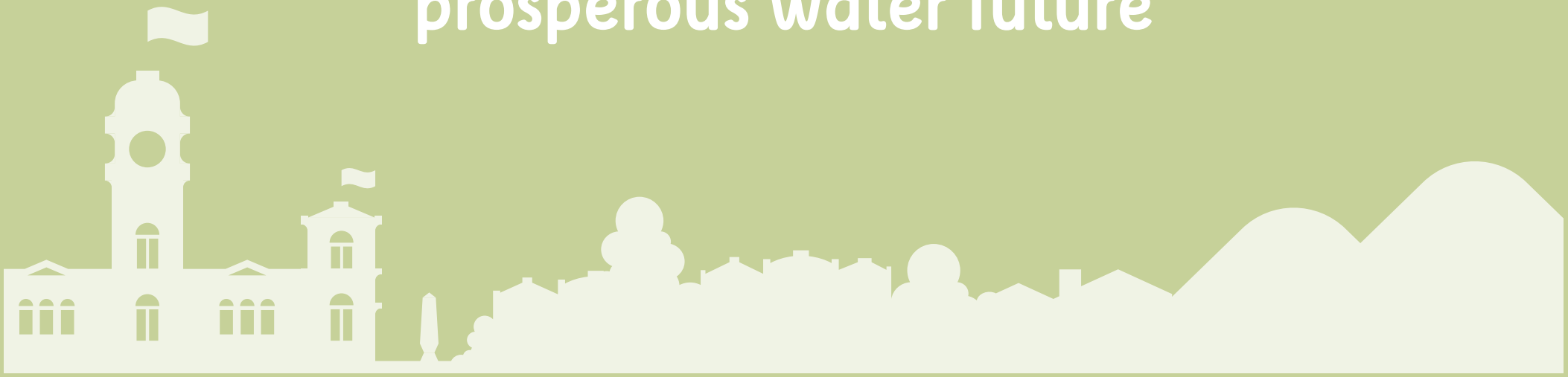
Ballarat and region's water future

A whole-of-water-cycle management framework

A fresh approach to urban water in regional Victoria livingvictoria.vic.gov.au

State Government Victoria

A greener, more liveable and prosperous water future



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Minister for Water

> "The recent experiences of the last drought has shown that now is a better time to make changes."
>
> Wendouree resident

The Ballarat region is one of Victoria's most attractive and popular regions with its abundance of green gardens and open space, beautiful lakes, wetlands and waterways and highly valued heritage towns and neighbourhoods. However, more than a decade of drought, severe water restrictions and periods of extreme heat have put these trees, green spaces and waterways under immense stress. The increasing frequency of drought and reduced rainfall pose ongoing challenges to the health of these important environmental and community assets.

As a community, we face real choices about what role water can, and should, play in maintaining and improving the liveability of the Ballarat region. The decisions we make now will affect the future generations who will live, work and play in the greater Ballarat region.

This framework will help provide a way to understand these choices and decide the best outcomes to ensure that the Ballarat region will have a greener, more liveable and prosperous water future.

A whole-of-water-cycle approach is about being smarter, more efficient and more responsible with all of our water sources – including stormwater, rainwater, groundwater and wastewater – to take the pressure off precious drinking water supplies.

It will deliver resilient water systems that can cope with future population growth and the challenges of a variable climate.

Ballarat and region's water future provides the framework to implement a whole-of-water-cycle approach across the region. This framework will also provide the blueprint to assist other regional areas to develop their own tailored whole-of-water-cycle approach to protect and enhance their natural and built environments. We will continue this process, with other regions, to help them develop their own regional whole-of-water-cycle frameworks.

I wish to thank the Chairperson and members of the Project Control Board for leading the development of this framework, using a collaborative, partnership approach to ensure the community's vision for the region is captured and acted upon. I have every confidence in seeing this vision for the Ballarat region come to fruition as a result of this framework.

The Hon Peter Walsh MLA
Minister for Water

Project Control Board Chair

On behalf of the Living Ballarat Project Control Board, I would like to extend my thanks and congratulations to the many and varied stakeholders and community members across the Ballarat region who have helped to shape our water future.

Ballarat and region's water future is a landmark piece of strategic and action oriented work, representing the values and preferences of the people and communities across our unique region.

It is evident and extremely encouraging to note that there is, and will continue to be, ongoing, strong and genuine commitment from all responsible agencies and members of our community to ensure our water future. We will continue to innovate and explore ways to make greater, cost-effective use of our local water sources (like stormwater and groundwater), so that we don't just survive through the next dry period, but thrive.

This framework is a guiding regional policy that provides a strong vision for the Ballarat region. It sets clear outcomes, performance indicators and actions so that we can deliver valuable change and use whole-of-water-cycle management to protect and enhance our liveability.

Our many conversations and engagement activities across the region have shown us that our communities are grateful for the foresight shown by our town founders, in establishing a vibrant urban and rural environment with a way of life that is steeped in character and invaluable heritage.

Today, whether you live, work, or visit towns across our region, like Ballarat, Creswick, Maryborough, Daylesford, Skipton or Ballan, it is easy to appreciate the many and varied options available to enjoy our green open spaces, sports fields, waterways and tree lined streets.

I commend this framework for providing a renewed level of foresight for the residents, businesses and industries of today and of the future across our cherished region. I look forward to continuing to work with the community, businesses, and local and state government agencies in implementing the critical actions required to deliver a plan, your plan, for, more liveable and prosperous water future for the Ballarat region.

Dr Mark Harris
Chair, Living Ballarat Project Control Board

> "A society grows great when old men plant trees whose shade they know they shall never sit in."
>
> Greek proverb, anonymous

Case studies

Introduction 1

Framework purpose

The framework outlines a new approach to urban water based on whole-of-water-cycle planning and management, and provides a clear direction for the next ten years with defined actions for the next three years. The framework identifies the objectives, the outcomes, the actions to achieve the outcomes and high-level performance indicators to monitor the progress towards the outcomes.

The framework provides guidance for implementation, outlines the governance structures to ensure the framework continues to be locally owned, and how it will be monitored and evaluated in the future. The framework also highlights exemplary whole-of-water-cycle management projects that are underway and committed to across the Ballarat region.

This framework will provide a foundation for other regional whole-of-water-cycle management frameworks to be developed.

For the Ballarat region, managing water has been integral to creating a prosperous region, from the Gold Rush to today. However, the growth and development of Ballarat and the region into Victoria's third largest urban centre has had a major impact on the long-term health of the region's rivers, wetlands and downstream environments. At the same time, the region has a history of droughts, heavy rains, high and low temperature extremes and bushfires. In recent years, more than a decade of drought, severe water restrictions and periods of extreme heat have put local green spaces and the ageing heritage tree stock under immense stress.

This framework will help address this legacy and ensure that the highly valued and unique characteristics of the Ballarat region – its green trees, attractive open spaces and beautiful natural environment – will be protected so they can continue to thrive into the future.

Ballarat and region

Ballarat and region has been broadly defined as the region covered by Central Highlands Water. The nature of the water system means it is difficult to provide clear and distinct boundaries, so the actions may extend to areas outside this boundary where physical circumstances dictate. It is also important to note the interconnectivity of regional Victoria and the relationships that Geelong and Bendigo have with the water sources also used by the Ballarat region. This framework applies to urbanised areas within the Central Highlands Water service area.

Figure 1 is a map outlining the region that is the focus of this framework.

Ballarat and region

FIGURE 1

Legend

- Waterways
- Lakes and reservoirs
- Major roads
- Water district
- Sewer district
- Wastewater treatment plants
- Water treatment plants

Catchment management authorities:

- Corangamite
- Glenelg - Hopkins
- North Central

Source: adapted from Central Highlands Water 2014-2015 Corporate Plan

Process to date

The framework has been locally developed over an 18 month period, with input and expertise from representatives across the Ballarat region community. The process has been overseen by the Living Ballarat Project Control Board, which comprises representatives from key organisations across the Ballarat region including councils, Central Highlands Water, catchment management authorities, research institutions, industry representatives and community groups.

The first stage of the process was the identification, collection and analysis of relevant data, reports and studies over a 12 month period (to view information and data sources visit livingvictoria.vic.gov.au). The second stage was the development of the consultation draft. This was a co-production process between stakeholders, local community representatives and Office of Living Victoria. A workshop attended by 59 representatives from the local community helped define a vision, objectives and outcomes for the framework.

A subset of community organisations, including those represented on the Project Control Board, were brought together to form a Project Working Group. This group was responsible for overseeing the content development for the consultation draft of the framework and providing recommendations to the Project Control Board. This collaborative process was extremely constructive and provided significant insights that were unlikely to have been raised through quantitative analysis only. The consultation draft was finalised in May 2014 and released for public consultation on 3 June 2014 for a six week period.

The entire framework process has been based on a collaborative, multi-method approach to engagement, which has continued through the public consultation period. During this time, the community was kept up to date on the project and its implications through advertisements and mainstream media, engaged through local community events including markets, expos, local government meetings, a short survey and community forums. The community was also actively involved in targeted stakeholder events including a co-design workshop and round tables. Meanwhile, the main agencies and organisations continued their collaboration to develop an implementation plan through the Project Working Group and Project Control Board.

Where are we? FIGURE 2

- Analysis
- Critical issues
- Objectives
- Consultation draft
- Public and targeted consultation
- Final framework
- Implementation

The findings from the consultation and engagement period showed strong support from the community for the vision and objectives within the consultation draft. The main comments and queries were in relation to ongoing governance of the framework, how it will be implemented and how the planning elements will fit together. Each of those issues has been responded to in the final framework. For a more detailed summary of the consultation process and feedback received visit livingvictoria.vic.gov.au.

The effectiveness of the collaborative approach to developing the framework was demonstrated through a comment from one of the key partner organisations in the process:

'Perhaps one of the most notable achievements of the project to date has been the ability to bring all institutional stakeholders and community representatives together through the collective activities of the above three groups [Project Control Board, Project Working Group and Strategy Development Team].

The benefits of the many meetings and workshops facilitated by the Office of Living Victoria has resulted in the strengthening of both formal and informal networks and the development of a better understanding of the future water challenges and intricacies involved when working with many parties.'

Ballarat and region's water future is one of a suite of three documents that also includes:

- The consultation draft
- The community and stakeholder consultation feedback summary document

These documents are a resource for everyone in Ballarat and the surrounding region. They provide a guide to the concerted effort that will be needed by the key stakeholders and the local community to ensure the framework achieves its vision. To view or download these documents visit **livingvictoria.vic.gov.au**.

Setting the scene 2

A new approach to urban water

Living Victoria is the Victorian Government's urban water reform policy, which outlines a new way of planning, managing and servicing the urban water cycle by considering drinking water, stormwater, wastewater, groundwater, the environment and urban amenity as one system.

Enhanced liveability for Victorians will require our urban water systems to have greater flexibility, resilience and security. The Living Victoria policy recognises that alternative water sources such as rainwater, groundwater and treated stormwater and wastewater could be used for purposes such as flushing our toilets and watering our parks and gardens, to help protect our valuable drinking water supply.

The Living Victoria policy is based on the need to plan for future water services holistically and incorporate the analysis of all costs and benefits into the decision-making process. This involves:

- supporting system resilience and actively addressing system risks and uncertainty through improved planning and management processes;
- providing a coordinated, integrated approach to the planning and provision of urban water services; and
- supporting increased competition and efficiency and promoting innovation.

A regional and rural focus for urban water

People living in Victoria's regional and rural areas have traditionally taken a holistic approach to managing and planning for water. The impacts of a variable climate are more directly felt where a significant amount of local industry relies upon the land and agricultural productivity. People in regional and rural areas know they cannot rely upon regular rainfall and catchments to supply their water needs. They understand they need to plan to capture water in times of plenty for use in times of low rainfall, recycle water where possible and increase efficiency in water use.

Much of the knowledge in regional and rural areas is based on experience and intuition founded on a close connection to the land. As rural and regional centres become more urbanised, and more people migrate from other urban centres and capital cities, there is a risk that people in regional urban areas will rely more on water from catchments and less on holistic water management practices.

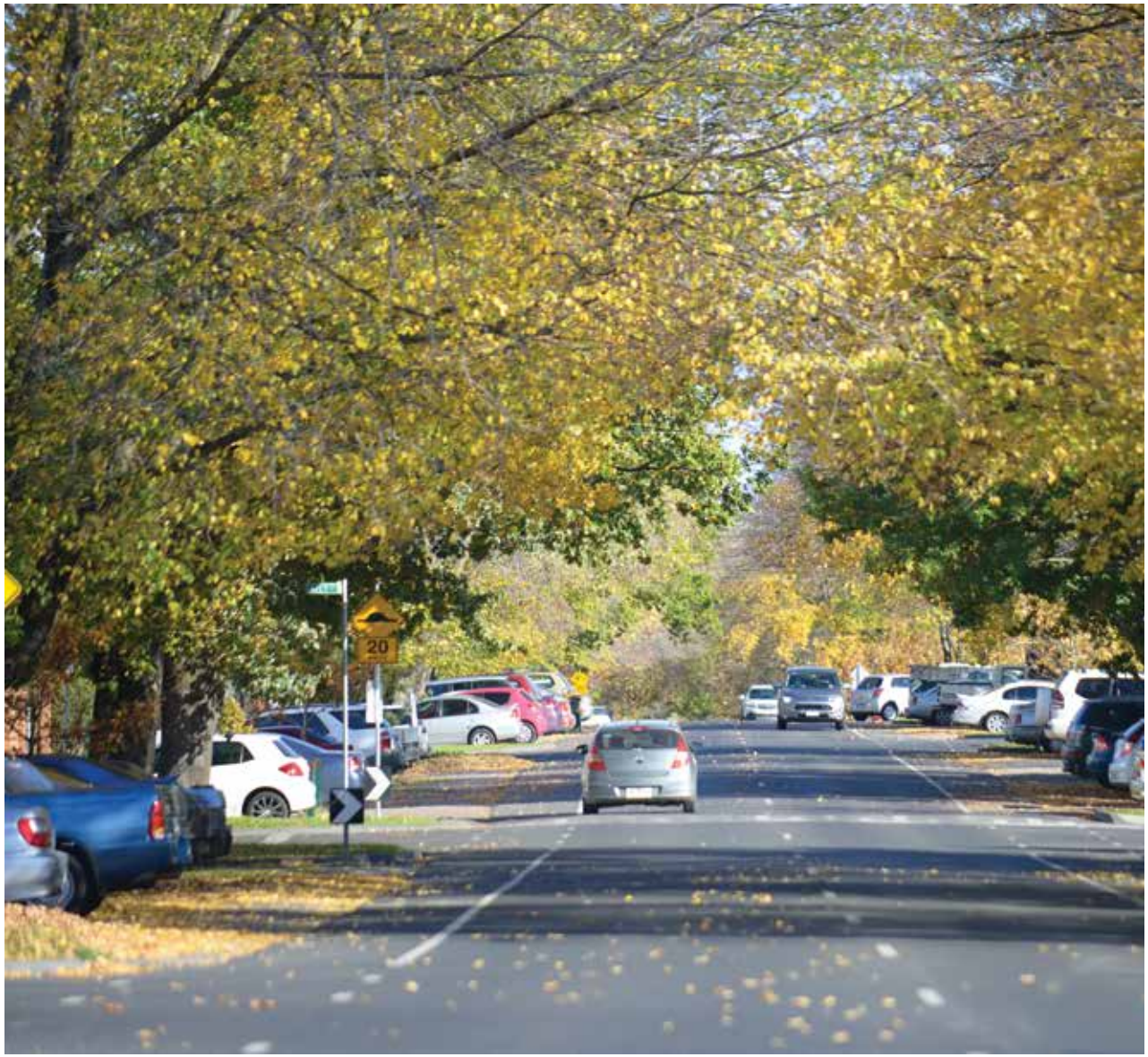
To protect and build upon the history and knowledge of whole-of-water-cycle management in Victoria's regional centres, the Victorian Government has committed to work closely with regional water corporations, catchment management authorities, local councils and regional communities to develop tailored whole-of-water-cycle strategies for each regional city. The whole-of-water-cycle framework for the Ballarat region is a place-based approach tailored to the local and regional needs and circumstances of Ballarat and the surrounding region.

The broader national and state water policy context is outlined in the supporting technical documentation available at livingvictoria.vic.gov.au. This website also provides a substantial body of work addressing the economic, social and environmental future of the region.

Policy integration

Whole-of-water-cycle management is about integration, not just across the water cycle, but integration between urban and rural water cycles, water planning and land-use planning, across organisations and each tier of government.

Ballarat and region's water future is focused primarily on the urban water cycle, however it needs to be closely integrated with other policies and projects regarding the non-urban water cycle and land use planning more broadly. Some of these include the Central Highlands Regional Growth Plan, the Victorian Waterway Management Strategy, the draft Victorian Floodplains Management Strategy and subsequent Regional Floodplain Management Strategies, the water authorities' Supply Demand Strategies and Water Plans, the three Regional Waterway Strategies and local precinct structure plans, among others.



What is whole-of-water-cycle management?

Whole-of-water-cycle management captures the idea that all parts of the water cycle from source to consumption, and all parts of the community including government, industry, developers and residents, have a role to play in managing and planning the water cycle.

The water cycle includes all potential water sources from surface water, groundwater and rainwater through to treated stormwater and wastewater. Whole-of-water-cycle management ensures the appropriate water quality for different uses and balances the environmental value of water with the urban value of water. It also considers all external influences on water supply and consumption, including climactic variability, population growth, economic conditions and the regulatory environment, and ensures these considerations are understood and applied at a range of scales.

A fundamental part of whole-of- water-cycle management is ensuring that the right water source is matched to the appropriate use and that land use planning, infrastructure development and building construction considers and includes mechanisms to ensure this occurs.

Whole-of-water-cycle management is also about understanding and managing the impacts of the changing urban environment and population growth on the natural environment. Expanding urban areas result in increased stormwater run-off, which creates a significant risk to waterway health and places increased pressure on green spaces and the natural environment.

It is only by taking a holistic view of water cycle planning and management that the optimal benefits can be achieved. Using a whole-of-water-cycle approach enables different considerations to be applied at household, precinct, suburb, local, regional and metropolitan scales to better reflect local conditions and needs.

Ballarat and region's water cycle

The management of the Ballarat region's water system has changed significantly over the past 150 years. The region has moved from being primarily focused on agriculture and mining to becoming increasingly urbanised.

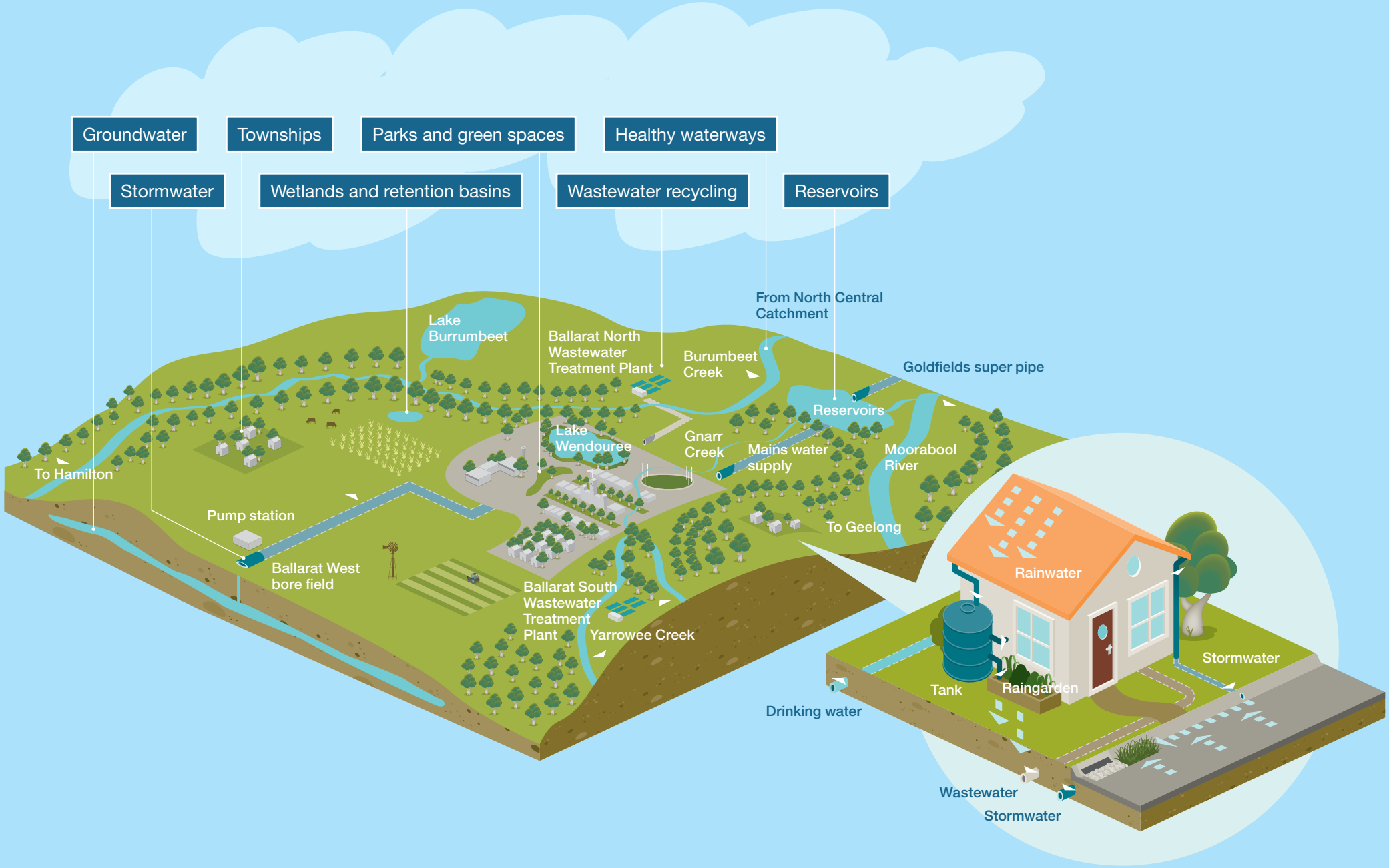
Water sources have changed significantly as the population has grown and regional water infrastructure has improved. The Ballarat region can now source water from river catchments, reservoirs, rainwater, groundwater, stormwater and recycled water. All these sources are interconnected and have different impacts and costs. Changes to the climate, continuing population growth and urbanisation will continue to influence the water system both from a supply and demand perspective as well as the economy and regulatory environment.

The Ballarat region's water cycle is complex. The region comprises 15 water districts, three catchment management areas and six local government areas with 15 water treatment plants and 12 wastewater treatment plants.

The water cycle for Ballarat and region

FIGURE 3

Interactions between different parts of the water system in Ballarat and region with urban and agricultural areas



> “Creating a culture that understands there is more than one water source will be important.”
>
> Workshop participant, Ballarat

Ballarat and region water sources

Ballarat and region primarily uses three water source types: surface water, groundwater and rainwater/stormwater.

Surface water is the largest source of water for the region and is mainly sourced from the Moorabool River catchments (and to a lesser extent the Yarrowee/Leigh River system) utilising three significant water storages – the Moorabool, Lal Lal and White Swan Reservoirs. The Moorabool River catchment also services other users and communities such as agricultural producers and the greater Geelong region. The Moorabool and Yarrowee/Leigh Rivers are highly stressed. Extractions of fresh water from both these rivers are over-allocated and their locations mean that their management is split between several agencies and organisations. One of the desired outcomes from this framework is to build upon the existing and positive partnerships between agencies and organisations, to help decrease the region’s reliance on these systems through increased use of alternative water sources wherever possible.

Groundwater is another primary water source for the Ballarat region, particularly for many of the smaller town and rural living areas not connected to the main Ballarat water supply system. The largest mass supply of high quality groundwater for the region is from the Cardigan Aquifer via the Ballarat West bore field. However, there are many other groundwater sources available. Groundwater’s role in the water cycle is not just to provide water for human and agricultural needs as it also plays a key role in protecting and sustaining the health of the region’s waterways and groundwater dependent ecosystems, particularly during droughts. Groundwater is a finite resource and, like surface water, aquifers can become depleted when extraction rates exceed replenishment rates. Ensuring sustainable and appropriate use of groundwater by balancing the inputs and outputs from groundwater and managing water quality is another desired outcome of this framework.

Other major water sources for the Ballarat region are harvested rainwater and stormwater. These water sources are currently underutilised and provide considerable opportunity for improving the self-sufficiency of the region in future. Rainwater typically refers to water that is collected in rainwater tanks from roofs, while stormwater is defined as the water that runs off hard surfaces such as roads and footpaths. Traditional drainage systems are designed to quickly convey even the smallest rainfall volumes away from properties and people and into waterways. This is a substantially different process to how water would flow in the natural system and has subsequent impacts on soil moisture content and the ability for it to be harvested for use by the community. In the Ballarat region, rainwater harvesting is usually undertaken at an individual level as most households have installed a rainwater tank for use around the home and garden. A number of businesses, institutions and schools have also started harvesting rainwater to supply some of their water needs. A primary outcome from this framework is increased use of rainwater and stormwater for a variety of purposes at a precinct, town or city level.

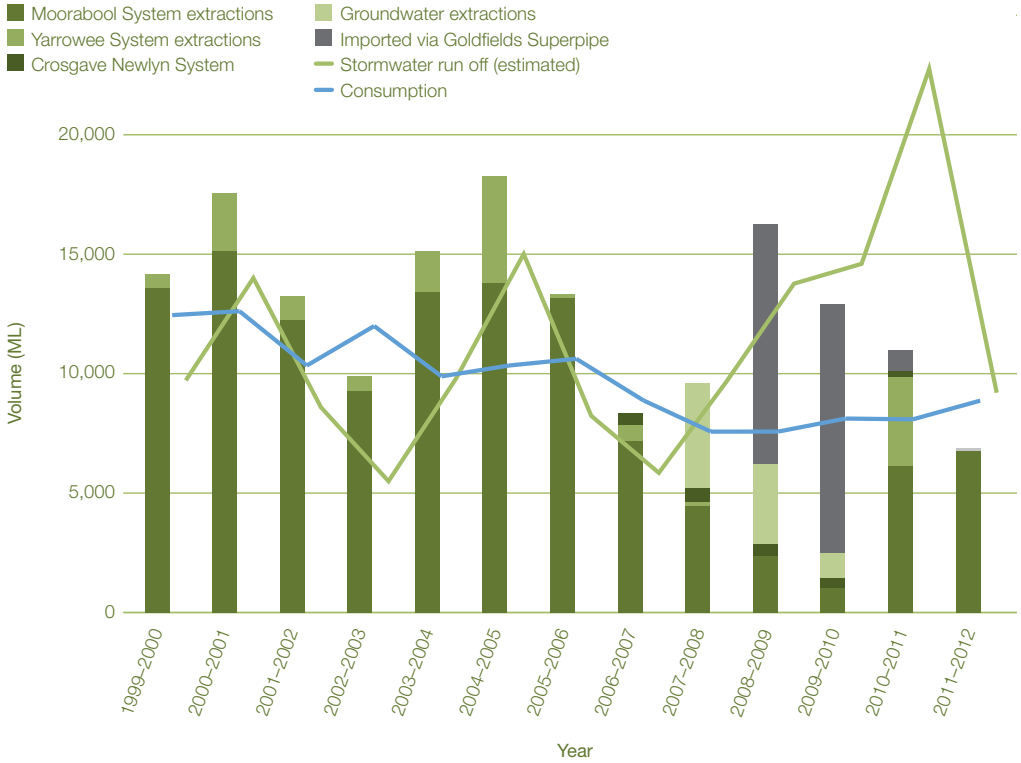
Each of these water sources has variable water quality requiring different levels of treatment depending on their primary use. For example, drinking water for towns, communities and houses requires very high quality water, while water for irrigation or stock can be lower quality. Good water quality is vital to support plants and animals as well as the health of receiving waters. Water quality can be affected when the physical, chemical or biological attributes of water change outside their normal range. This can be caused by contaminants in urban stormwater run-off, over-extraction of water, poorly managed intensive agriculture, inappropriate catchment development, forestry, drought, extreme events such as bushfire and flood, as well as waste and wastewater management from homes, businesses and industrial areas. Adopting preventative measures to protect water quality can significantly reduce the need for expensive water treatment options, a challenge that is responded to through this framework.

As Figure 4 shows, the mains tap water supply for the Ballarat district is largely sourced from the Moorabool River system. During the last drought the Moorabool ceased to flow and the water level in the reservoirs dropped significantly. In 2007, the water supply system was augmented with groundwater and severe water restrictions were implemented to reduce demand until the completion of the Goldfields Superpipe enabled water to be imported from the Goulburn and Campaspe River systems. Once the drought ended and the reservoirs were sufficiently refilled, the Moorabool River system returned to being the primary mains tap water supply for the Ballarat region.

Figure 4 also demonstrates how water consumption gradually declined before remaining relatively steady over the past three years. It is interesting to note that the volume of urban stormwater run-off is significant, even in drier years. Depending on cost and practicality this could provide a viable alternative water source and support a move towards fewer extractions from the Moorabool River.

Water balance for the Ballarat and district water supply system

FIGURE 4



Source: Data supplied by Central Highlands Water, 2014
Stormwater data is an estimate generated from the integrated systems analysis.

Key influences on Ballarat and region's water cycle

Ballarat and region has a high level of variation in climate, demographics, land uses, topography and water management strategies. This variability has generated a range of challenges for managing the water system and significantly impacts upon the health of waterways, the security of water supply and the liveability of the region. Four of the most important challenges that influence the region's water cycle are climactic variability, population growth, economic conditions and the regulatory environment.

Climatic variability	Population growth	Economic conditions	Regulatory environment
More frequent extreme weather events with lower total annual rainfall and stream flows will create increased pressure on waterways, the natural environment, parks, gardens and green spaces	There will be increasing water demand and wastewater flows, and an increase in hard surfaces causing higher volume run-off	There is likely to be a change in economic activities, economic structure, locations and nature of employment and assets as well as a change to existing industries, new industries and technological advances	The complex regulatory environment may not keep pace with more diversified local water use. Regional councils and organisations may not have capacity to implement or adjust to any new regulatory requirements that result in additional complexity
This will result in more variable and less reliable natural water flows, more stressed/less resilient natural systems and increased need for secure water sources to support parks, gardens and green spaces	This will result in higher water run-off, increased flood risk, enhanced urban heat island effect and pressure on green infrastructure, amenity and liveability	This creates a need for flexible and resilient water services and systems that can respond and adapt to new and changing industry needs	This creates a need for regulatory streamlining to be accompanied by a regulatory impact statement, and assistance in implementation, including capacity-building

Climate

The climate has a significant impact on the region's water quality and security of supply and is one of the most important factors in how the system has performed in the past. The climate in the Ballarat region varies naturally from year to year, with substantial disparity in rainfall between wetter and drier years. There is also significant variability in the climate within the region. For example, the average annual rainfall of the Ballarat Aerodrome is 155 mm drier than Kirks Reservoir, just 16 km away.

Data and analysis from the Bureau of Meteorology shows that the Central Highlands region, like the rest of south-eastern Australia, has demonstrated incremental increases in temperature, decreases in rainfall and increases in evaporation. The frequency of extreme weather events has also changed, with more droughts, floods and bushfires.

Droughts have significantly impacted stream flows and the natural environment. They have also affected the urban environment by decreasing soil moisture content, which affects roads, footpaths and sporting fields. A lack of soil moisture also severely affects the health and lifespan of established trees, which decreases the attractiveness and usefulness of public open spaces.

The region has also experienced an increase in the number of extreme heat days which has flow-on effects for public health, as well as increasing the number and severity of extreme fire-weather days.

CSIRO and the Bureau of Meteorology have estimated that the Ballarat region will continue to experience incremental annual increases in temperature. In addition, annual average rainfall is likely to decrease with fewer and heavier rainfall days and more consecutive dry days, although multi-year wet periods are still predicted. Intense rainfalls are also likely to become more extreme.

In 2012, CSIRO reported that:
'South-eastern Australia has experienced a range of climate extremes in recent times (both drought and floods). These conditions reflect both the inherent natural variability of the climate system, as well as an underlying drying trend which appears to be partly attributable to climate change. Future conditions across the region are expected to be warmer and drier, although there is considerable uncertainty about the magnitude and timing of projected changes.'

Population growth and the urban context

Ballarat is the largest inland city in Victoria and has experienced rapid population growth over the past 10 years. Between 2008 and 2013, the population increased by an average of 1.5 per cent annually, compared to a metropolitan average of 2 per cent and a regional Victorian average of 1 per cent. There are a high number of people aged between 18 and 24, particularly compared to the rest of regional Victoria, which is a positive sign for the region. Ballarat is the main service centre for the region, with two hospitals over three locations, three universities, 11 secondary schools and 54 primary schools.

It is also the location for all state government services and offices for the region, providing employment for people living in nearby towns and local government areas. The Victoria in Future 2014 projections indicate the Central Highland region's population is expected to grow by around 80,000 persons to 235,000 people by 2041. The City of Ballarat is likely to experience the highest rate of growth with a population increase of approximately 47,000 persons to reach 142,000 people by 2031. While this population growth has many productivity and liveability benefits, it will place increasing pressure on resources such as water and the natural environment. A larger population will increase demand for water for all uses and will also increase wastewater flows. Finding a sustainable long-term supply of water for non-drinking purposes is essential to support population growth in the region. A growing population can result in increased hard and impervious surfaces, such as roads, footpaths, driveways and other concrete surfaces, and surface run-off, as well as a higher risk of urban heat effects, flash flooding and urban encroachment on the natural environment.

Population growth and new developments also offer new opportunities for improved water efficiency when planned appropriately through water efficient building features and landscaping, new wetlands and water features that contribute to waterway health and additional open space that has sustainable water management features embedded in the planning and design stage. Good planning and management that recognises the risks and is prepared to make trade-offs in the community's interest can help minimise the challenges faced by an increasing population and maximise the benefits and opportunities.

> "In developing an approach, the impact of drought also has to be considered"
>
> Local council

The economy

One of the strengths of the Ballarat region is its diverse economy. Despite considerable structural change over the past decade, the Central Highlands region's economic diversity has helped it adjust to changing economic conditions and grow at a similar rate to the state average. Ballarat is the focus of economic growth in the region and has experienced one of the highest rates of economic growth in regional Victoria over the past decade. However, economic growth has not been evenly experienced, with lower levels of economic growth in smaller towns.

The region has traditionally been strong in the fields of agriculture/agribusiness, mining and manufacturing, although the top four employment sectors are currently retail trade, health and community services, manufacturing and education. These sectors depend upon a secure and reliable water supply, to keep existing businesses and attract new industries.

The manufacturing industry currently provides almost a third of Ballarat's economic activity and is a heavy water user. Manufacturing is beginning to transition to new technologies, businesses and skills bases. This is likely to change water requirements and provide new opportunities for whole-of-water-cycle management in new businesses and industries. Agriculture is the second highest export sector and a significant employer outside Ballarat city. Production consists mainly of livestock (predominantly sheep), cropping and vegetables. There is also a growing organic industry, along with grapes and pig and poultry production.

While agriculture/agribusiness, mining and manufacturing are likely to remain strong over the next 30 years, the industry outlook also identifies other high growth sectors, including healthcare and social assistance, professional, scientific and technical services, accommodation and food services and tourism. These industries rely on the secure and reliable supply of water, now and in the future, to ensure they can grow and innovate.

Changes in industry sectors can have a significant impact on water demand yet can also provide opportunities for embedding whole-of-water-cycle management into new or growing industries at an early stage.

Regulatory environment

Over the past 100 years, Victoria's water system has serviced the state well. However, technological advances, emerging capabilities and new understandings have provided a new perspective into the complex challenges of the water cycle. Governance structures and regulatory arrangements have been identified as key areas for review in order to improve the operation and efficiency of the water system.

In the Ballarat region, there are a large number of organisations and people involved in the management and oversight of the water system. A collaborative approach to implementation and decision-making is required to maximise the benefits for the community.

Understanding the water cycle in future

Planning for Ballarat and region's water system requires a long-term perspective and an understanding of the impacts of different climate, land use and population. This framework is underpinned by data, systems analysis and insights from a range of sources and reports. This is the first time that the planning for all elements of the water cycle have been analysed together, enabling identification of the impacts that decisions made about one part of the water cycle will have on other elements, and other regions.

The analysis identified that:

1 Ballarat has a wide range of potential water supply sources of varying quality including rainwater and stormwater (beyond environmental needs), fresh water extractions, groundwater and recovered wastewater from treatment plants, as well as the option to import water via the Goldfields Superpipe. Stormwater harvesting and aquifer storage in particular, provide significant opportunities for the region's communities. This range of available water resources provides the region with significant flexibility in how the water systems are managed and operated, and will help to ensure the right water is used for the various uses required in our community.

2 Water supply to support the greening of open space, street trees, gardens, parks and waterways is at greater risk of securing water allocation, especially in drier periods.

3 Urban flooding is a significant issue across much of the region. In Ballarat, a large number of buildings are potentially impacted from a combination of riverine flooding and urban stormwater run-off. The intensity of storms can also lead to higher impact flash flooding events. The frequency of severe storms is likely to increase over time, leading to increased urban flooding risks.

4 Waterway health is a critical issue as the Ballarat region's water supply is largely sourced from extractions from the Moorabool River system. Waterways throughout the region are subject to increasing cumulative impacts, including loads of contaminants and diminishing fresh water flows.

5 Access to data is critical — a whole-of-water-cycle approach needs to combine and consider significant volumes of detailed data from multiple sources. Significant data gaps were found during the analysis stage, primarily due to difficulty in collecting spatially referenced data.

These findings have been used to help develop the outcomes and actions to ensure that the framework considers all aspects of the future water system, that it recognises how decisions impact the whole water system and that the outcomes are achievable and will provide a significant benefit to the community.

Further information regarding the data and analysis is available at livingvictoria.vic.gov.au.

Achieving change

To continue improving our management of the water cycle, we need a new approach based on whole-of-water-cycle planning and management. Many elements of this approach are already in place within the Ballarat region, with local communities applying innovative solutions to respond to water cycle challenges. Many public spaces, parks and gardens are supported by local water sources and a number of new developments and buildings have been designed with a whole-of-water-cycle approach in mind. There is opportunity for the community to expand upon this knowledge and experience, so the benefits of this innovation can be adopted across the region.

This framework will assist the Ballarat and region communities to consistently apply a whole-of-water-cycle approach in order to achieve their desired future.

Regional whole-of-water-cycle management guidelines

FOUNDATION PROJECT

One of the major findings during the development of the framework was the lack of relevant data and the need for consistent standards and templates when collecting, analysing and using data, developing plans, monitoring and reporting on progress and undertaking financial assessments.

As a result of this finding, the Project Control Board decided to undertake a cross-agency project to develop consistent regional whole-of-water-cycle management guidelines. The purpose of the guidelines is to provide a consistent approach to whole-of-water-cycle planning and decision-making across the Ballarat region.

At the completion of this project, the Ballarat region will have whole-of-water-cycle planning and decision-making guidelines that will cover:

- development of city and town 10 year whole-of-water-cycle management plans;
- whole-of-water-cycle management infrastructure plans for urban growth area precincts;
- methods for economic evaluation of whole-of-water-cycle management options and investment decisions;
- community engagement guidelines;
- data integrity and sharing protocols; and
- monitoring and evaluation.

The guidelines will also provide a template for a whole-of-water-cycle approach for other regional cities and rural towns across Victoria.

The framework 3

The vision

A greener, more liveable and prosperous water future for the city and towns of the Ballarat region

This vision is underpinned by seven objectives that guide the outcomes and actions. The objectives are the long-term changes that the framework is trying to achieve. The objectives are interconnected as the communities within the region will only fully benefit from the achievement of one objective if the others are also achieved.

The outcomes are the improvements that will lead towards achievement of the objectives. The outcomes will be measureable to ensure that the region is making good progress towards the objectives. The high-level indicators are one of the ways that the progress and success of the framework will be measured. The framework contains a mixture of short and medium-term actions under each outcome. Each action specifies the agency or organisation responsible for implementing it and the likely timeframe for implementation.

Objectives and outcomes

Objective 1
A community engaged in whole-of- water-cycle management

1.1 Community involvement in whole-of-water-cycle planning

1.2 Community use of the right water for the job

1.3 Community activities and projects

Objective 2
Affordable water services

2.1 Fairer Water Bills initiative

2.2 Innovation in asset management

2.3 Efficient servicing of small towns

Objective 3
Liveable neighbourhoods

3.1 Greener neighbourhoods

3.2 Reduced urban flooding risks

Objective 4
Reliable and resilient water systems

4.1 Innovative public projects that enhance water system resilience or utilise local water sources

4.2 Ground water supplies better utilised

4.3 Water quality protected and water system resilience improved

Objective 5
Healthy waterways, lakes and wetlands

5.1 Improved health of waterways, lakes and wetlands

5.2 Sufficient water available for the natural environment

Objective 6
Whole-of-water-cycle management integrated with urban planning

6.1 Smarter use of water in our homes and businesses

6.2 Local water use planned through city, town and precinct whole-of-water-cycle planning

Objective 7
Sustainable and productive economy

7.1 Productive use of the existing allocations for surface water and groundwater

7.2 Local businesses adopt cost-effective local water options

Objective 1

A community engaged in whole-of-water-cycle management

Key performance indicator

Improvement in annual community survey results in changes to community participation in whole-of-water-cycle management

The Ballarat region community has demonstrated a passionate interest in protecting their natural environment, waterways, lakes and green spaces; and in ensuring that a secure water supply exists to support these features through future dry periods and droughts.

Genuine involvement of the community at all stages of water cycle planning and implementation is essential to ensuring the Ballarat region remains greener in the short and long term, and that water cycle managers can make informed decisions based on community priorities.

Development of this framework has highlighted the importance of community engagement in whole-of-water-cycle planning and management. The consistency of community feedback regarding what is important for the region's future helped shape the vision, objectives and outcomes of the framework, and ongoing engagement will help ensure delivery agencies continue to reflect the aspirations of the local communities while implementing the framework.

Outcome 1.1
Community involvement in whole-of-water-cycle planning

The whole-of-water-cycle planning and management process will involve trade-offs between priorities, funding decisions and actions on a range of scales, including regional, local and household level. The local community needs to be actively and meaningfully engaged in all stages of planning and managing the water cycle.

A key element to this is ensuring that local agencies and organisations continue to work closely together to plan and manage the whole-of-water-cycle, implement the strategy and share relevant information with local communities.

Outcome 1.2
Community use of the right water for the job

The Ballarat community has a proud history of using tap water responsibly, and permanent water use rules means the community can enjoy using this precious resource wisely. Up to 90 per cent of residents in some neighbourhoods make use of rainwater to keep their trees and garden beds healthy, flush toilets and wash cars. At the same time, treated stormwater run-off from roads is used to irrigate local parks and green spaces and treated wastewater is being used for a range of non-drinking purposes such as irrigating the Maryborough Golf Course and other local sporting fields. Continuing this approach of using alternative water sources, and ensuring that the water source is matched to the use, is an essential part of better managing the water cycle.

Outcome 1.3
Community activities and projects

Many whole-of-water-cycle projects and initiatives are generated at the local community level. To achieve the best possible outcomes, these activities and projects need support through example projects, information sharing and capacity building. A community led approach to whole-of-water-cycle planning and management will help ensure the long term viability of projects and initiatives implemented across the Ballarat region.

Action plan

Actions	Lead	Participating organisations	Commencing
Develop community engagement guidelines for use during whole-of-water-cycle planning	Department of Environment and Primary Industries	All partners	September 2014
Expand the annual survey to monitor and understand community attitudes and behaviour towards whole-of-water-cycle planning, water efficiency and the use of alternative water sources	Central Highlands Water	Local councils	Ongoing
Continue to run locally relevant water programs to promote use of the right water including delivering water efficient gardens and efficient household water use	Central Highlands Water	Local councils	Ongoing
Measure and report on the water efficiency and local water use for public buildings and open spaces	Local councils	Central Highlands Water	September 2014
Facilitate and promote innovative ideas and projects that provide a new approach to whole-of-water-cycle management	Department of Environment and Primary Industries	Local councils Central Highlands Water Catchment management authorities	Ongoing

Corangamite Waterwatch

Waterwatch is a successful community engagement program that has been operating across Victoria since 1993. Central Highlands was one of the first Waterwatch programs to be established in 1993, followed by the Corangamite program in 1994. In 2013, Corangamite Waterwatch celebrated its 20 year anniversary in Ballarat.

The purpose of the Waterwatch program is to engage with the community and link awareness raising and information collection to on-ground action such as planting indigenous vegetation along waterways. The Corangamite program supports volunteers to gather information about water quality, and the Coranga-mites Action in the Catchment schools' education program is engaging with six primary and secondary schools in the Ballarat region in 2014. The Corangamite Waterwatch program has supported community groups to monitor the health of rivers and creeks around Ballarat including the Yarrowee River and its tributaries as it travels south to pass in to the Leigh Gorge (significant for its high regional environmental values and spectacular escarpments), and become the Leigh River.

Volunteers also monitor the many tributaries of Lal Lal Creek and West Moorabool River that fill the Bungal Dam that delivers water to Ballarat households and is a source of environmental water for the Moorabool River.

The Corangamite Waterwatch program also raises awareness of water issues in the wider Corangamite community in a variety of ways, including a Fibre Art Competition which coincided with World Environment Day in June 2014.

There are strong partnerships that support the Waterwatch schools' education program and community monitors in Ballarat including Central Highlands Water, Leigh Catchment Group, City of Ballarat and Grampians Resource Smart AuSSI Vic Consortium.

Objective 2

Affordable water services

Key performance indicator

Central Highlands Water meets efficiencies set by Fairer Water Bills Initiative

The ongoing and improved delivery of affordable water services is an essential part of Victoria's urban water policy. Affordable water services are a key element in helping maintain the cost of living at reasonable levels while balancing the need to deliver new infrastructure and services and maintain existing infrastructure and services.

Outcome 2.1
Fairer Water Bills Initiative

Fairer Water Bills is a positive initiative to reduce household water bills for the benefit of the Victorian community. It comprises two parts:

- an efficiency review of Victoria's urban water corporations to identify cost savings that can be passed to Victorian households in the form of lower water bills; and
- a review of the economic regulation of the water sector to assess the efficiency and effectiveness of the price review process.

The review also supports the delivery of the final strategy for the Ballarat region by identifying priority areas for regulatory reform and ensuring that the economic regulation framework is fundamentally aligned with efficient and effective whole-of-water-cycle management.

Central Highlands Water has supported the Government's initiative by committing to reductions of $16.5 million operating expenditure and $6.2 million of capital expenditure over the next four years. The savings are being returned in total to customers in the form of a 20 per cent reduction in the fixed Water Access Fee. In addition, Central Highlands Water recently reduced its long-term debt by $8 million, which will further reduce long-term pressure on customer prices.

Outcome 2.2
Innovation in asset management

Asset management is important for large organisations such as councils and water corporations who are responsible for the ongoing management of assets such as building, pipes, plants and equipment valued at hundreds of millions of dollars.

Councils and water corporations in the Ballarat region are highly active in the area of asset management and constantly strive to improve the performance of their assets. It is important that these efforts continue and that ideas and approaches from state, national and international innovators continue to be used to improve the effectiveness of asset management in the Ballarat region.

Outcome 2.3
Efficient servicing of small towns

Small towns need to have water services to support economic development and promote tourism. Traditionally, small towns in the region and across Victoria have had mass water servicing solutions applied, however, many have been inefficient and costly to implement and maintain. Instead, services for small towns should be developed using an innovative, place-based approach that matches the servicing option to the particular characteristics of the town, while balancing the use of right water, with local preference, cost and reliability.

Action plan

OBJECTIVE 2

Actions	Lead	Participating organisations	Commencing
Implement efficiencies identified as part of the Fairer Water Bills Initiative and deliver the agreed benefits to customers	Central Highlands Water	Department of Environment and Primary Industries	July 2014 (early start)
Continue to work with industry associations and other similar organisations to share ideas and emerging technologies that improve asset management practices and increase asset performance	Local councils Central Highlands Water	Department of Environment and Primary Industries	Ongoing
Prepare a demonstration, small town whole-of-water-cycle management plan that demonstrates efficient, small scale and place based sanitation services including septic and sewerage services, in combination with locally sourced water	Central Highlands Water	Department of Environment and Primary Industries Relevant local council	July 2015

New sustainable approach saves money at Maryborough

Central Highlands Water is extracting and dewatering sewage sludge from the Maryborough Wastewater Treatment Plant to improve the effectiveness of the plant's sewage treatment.

Biosolids generated as a result of the extraction will be transported to farmers within a 10-15km radius of the treatment plant to improve the productivity of local agricultural land. The project started in March 2014 and is expected to be completed in June 2015.

It is anticipated that this project will deliver up to 75 per cent savings on business as usual costs for biosolids management, achieve a major reduction in carbon emissions by reduced transportation distances and deliver significant benefits to the local agricultural sector in the reuse of this valuable product. This project also supports Central Highlands Water's biosolid reuse target of 100 per cent reuse.

Objective 3

Liveable neighbourhoods

Key performance indicators

Increase in public open space and playing fields that are watered and drained year round

Increase in tree canopy coverage

Reduce the flood risk of assets in the urban area that are subject to a 1 in 100 year flood

Increase water retention and use in urban landscapes

Ballarat is renowned for its parks, gardens and heritage tree-lined boulevards. Liveable, green and beautiful neighbourhoods are highly valued by the local community.

They also improve air quality, reduce greenhouse gas emissions, provide cooler public spaces in the heat, assist in stormwater management by reducing and slowing run-off flows, provide habitat for a wide range of species, improve community cohesion and identity, encourage outdoor activity and improve mental well-being.

An increase in tree canopy cover, vegetation cover and soil moisture helps develop cooler microclimates on hot days and improves opportunities for stormwater management. However, the recent drought demonstrated how vulnerable local trees, parks and gardens are without a secure supply of water. Supporting better quality open spaces and streetscapes in new and existing neighbourhoods is a key focus of this framework.

Outcome 3.1
Greener neighbourhoods

Ballarat Imagine, Ballarat's largest ever community conversation, demonstrated how important green neighbourhoods are to the Ballarat community and how trees, parks, lakes and the natural environment are an essential part of the region's identity and future.

They provide the location for major community activities and sporting events as well as being significant tourism attractions in their own right, which contribute to the region's economy all year round. Trees, open spaces, sporting grounds and water bodies are highly vulnerable to drought and need a secure, affordable supply of water to ensure they survive, even in times of drought. Protecting and supporting the Ballarat region's green areas is essential to the ongoing sustainability and liveability of the region.

There are many possible sources of water that could be used for this purpose, aside from water from agricultural catchments. Recycled water, harvested and treated stormwater, groundwater and treated wastewater are just some of the options available to help provide secure and affordable water supplies for non-residential public purposes in the Ballarat region.

Outcome 3.2
Reduced urban flooding risks

Urban flooding is a regular occurrence across the Ballarat region with considerable financial, economic and human costs. The projected impacts of climate change are likely to increase both the frequency and severity of urban flooding across the region. The actions in this framework, combined with the Victorian Floodplain Management Strategy (currently in draft form), will help councils develop flexible, resilient stormwater management systems that are able to tolerate drought as well as periods of heavy rainfall, reducing the risks and impacts of urban flooding.

Action plan

Actions	Lead	Participating organisations	Commencing
Increase security of water supplies and green infrastructure to keep green areas, trees and aspects of the natural environment considered as priority community assets, thriving all year round, including in times of drought	City of Ballarat	Central Highland Water Rural water corporations Catchment management authorities	September 2014
Conduct an assessment of local water supply opportunities for applying an urban forestry approach to the development of local schools, sporting facilities and other public open space assets. This could take place as part of city or town whole-of-water-cycle planning	City of Ballarat	Local councils Central Highlands Water	September 2014
Measure and report on the use of local water sources for streetscapes, open spaces and water bodies, prioritising places that are important for events and tourism	Local councils	Central Highlands Water	September 2014
Continue identifying, mapping and modelling the extent of urban flood risks for existing and proposed urban areas	Local councils	Department of Environment and Primary Industries Catchment management authorities Central Highlands Water Rural Water Corporations State Emergency Services	Ongoing
Establish a multi-agency taskforce to develop a new approach to urban stormwater management	City of Ballarat	Catchment management authorities Central Highlands Water	September 2014
Establish additional continuous rainfall and surface water flow data collection and monitoring processes for the Ballarat urban area that will aid agency planning and flood response	City of Ballarat	Catchment management authorities Department of Environment and Primary Industries State Emergency Services	September 2014
Timely adoption of latest flood risk information into local planning schemes	Local councils	Catchment management authorities	Ongoing

Stormwater and Urban Flood Management Taskforce

FOUNDATION PROJECT

The Living Ballarat Project identified a significant stormwater resource opportunity for the Ballarat region. Making better use of this stormwater resource could reduce the need for extractions from the region's natural streams and waterways, leading to increased self-sufficiency for the region and improved waterway health.

At the same time, the stakeholder engagement process identified urban flooding as a significant issue across much of the region, particularly in Ballarat. This urban flooding has considerable financial, economic and human costs and the projected impacts of climate change are likely to increase both the frequency and severity of urban flooding across the region.

The importance of these issues, and the need for a local, targeted approach, has led the Project Control Board to immediately start a foundation project through the creation of a Stormwater and Urban Flood Management Taskforce.

The Taskforce's objectives are:

- Improve the City of Ballarat's ability to manage urban flooding and reduce the financial, economic and human costs resulting from floods;
- Identify opportunities to better utilise the available stormwater resource;
- Reduce the need for extractions from the Moorabool system and reduce the impacts of stormwater run-off into local waterways, particularly the Yarrowee/Leigh and Burrumbeet systems;
- Support a 'greener city plan' to protect and enhance Ballarat's attractiveness and liveability; and
- Develop an improved understanding of stormwater flows, flash flooding, peak flows and management costs.

The Taskforce will develop a stormwater and urban flood management plan for the City of Ballarat, consistent with a whole-of-water-cycle management approach. The plan will include a review of land use planning controls, identification of short and long-term infrastructure needs and pilot projects that could help achieve the objectives.

Lydiard Street, Ballarat. Photography courtesy of The Courier, Ballarat

Objective 4

Reliable and resilient water systems

Key performance indicator

Increase in the mix of water sources used to meet urban demand for non-drinking purposes

The development of a more diversified, flexible and resilient system that increases the use of local alternative water sources will enable all aspects of the local water system to better adapt to shocks to the system or respond to unexpected pressures and events.

Many uncertainties affect the long-term future of Ballarat's water cycle, particularly as the City of Ballarat depends on water sources that are capped or over allocated, located outside the region or highly susceptible to variations in rainfall or extreme dry periods. Our water catchments, rivers and aquifers need to be protected to maintain water quality and to ensure access to as many water sources as possible for as many uses as possible. At the same time, the City of Ballarat and many of the smaller towns within the region rely on the same water sources as the agriculture and food production sectors. This creates the need for governments and communities to make difficult choices in dry times or during drought periods, which could potentially be decreased or avoided by having a more resilient and diversified water supply.

Outcome 4.1
Innovative public projects that enhance water system resilience or utilise local water sources

State and local governments have a unique opportunity to lead the way and demonstrate new approaches to water use by building whole-of-water-cycle management into the design or maintenance of public buildings.

Government demonstrations of whole-of-water-cycle projects for rainwater collection, stormwater harvesting and treatment, mitigation of stormwater and wastewater treatment and re-use are essential to provide local knowledge and expertise for wider application and the ongoing development of a resilient water system for the Ballarat region.

Outcome 4.2
Groundwater and aquifers increase the resilience of the water system

Groundwater can provide a useful alternative to mains drinking water supplies being extracted from the Moorabool River system, particularly during dry years. The quality of groundwater varies across the region, however Central Highlands Water already uses groundwater from deeper aquifers in several areas as part of its drinking water supply system.

Groundwater aquifers provide a proportion of the drinking water used by Ballarat and several other towns in the region. These aquifers are also widely used by organisations and individuals across the region for irrigating green spaces such as schools, sporting fields and golf courses, irrigating crops, drinking water for stock, as well as for industrial purposes.

Groundwater also plays an important role in sustaining the environment. Over the past 20 years, there have been considerable advances in how groundwater is managed and stored, with a corresponding increase in regulation and management.

Outcome 4.3
Water quality protected and water system resilience improved

Water quality is a major management issue for waterways in urban areas. Water quality can be affected when the physical, chemical or biological attributes of water change outside their usual range. This can be caused by urban stormwater run-off, over-extraction of water, poorly managed intensive agriculture, inappropriate catchment development, forestry, drought, extreme events such as bushfire and flood, as well as waste and wastewater management from homes, businesses and industrial areas.

The water quality in large catchments can significantly impact the health of receiving environments and waterways. Environmental conditions may be threatened by poor water quality from upstream areas or adjacent waterways. Adopting preventative measures to protect water quality can significantly reduce the need for expensive water treatment options.

The Victorian Government is committed to ensuring public health is not compromised by water cycle risks, and notes that the requirements and processes for ensuring safe use of sewage, greywater and stormwater are the subject of a discussion paper released in March 2013 by the Department of Health, Review of the public health regulatory framework for alternative water supplies in Victoria: Supporting the safe use of sewage, greywater and stormwater.

Action plan

OBJECTIVE 4

Actions	Lead	Participating organisations	Commencing
Progress the Cardigan Aquifer Storage and Recovery concept study to project feasibility and engineering design stages	Central Highlands Water	Department of Environment and Primary Industries City of Ballarat Southern Rural Water	July 2015
Continue to assess and report on the availability, use and management of groundwater resources and licences in the Ballarat region	Rural water corporations	Local councils	Ongoing
Investigate the ability to increase the use of aquifer storage and recovery of stormwater in the region	Central Highlands Water	Rural water corporations Local councils	Ongoing
Continue to protect water supply catchments and strategically plan development to have regard to regionally significant water assets	Central Highlands Water	Catchment management authorities Environment Protection Authority Local councils	Ongoing
Continue to develop and implement domestic wastewater management plans to enable effective planning for the type of settlement and economic activity that can occur in these areas	Local councils	Central Highlands Water Rural water corporations Environment Protection Authority	Ongoing

Ballarat West Growth Area Cardigan Aquifer Storage and Recovery

CASE STUDY

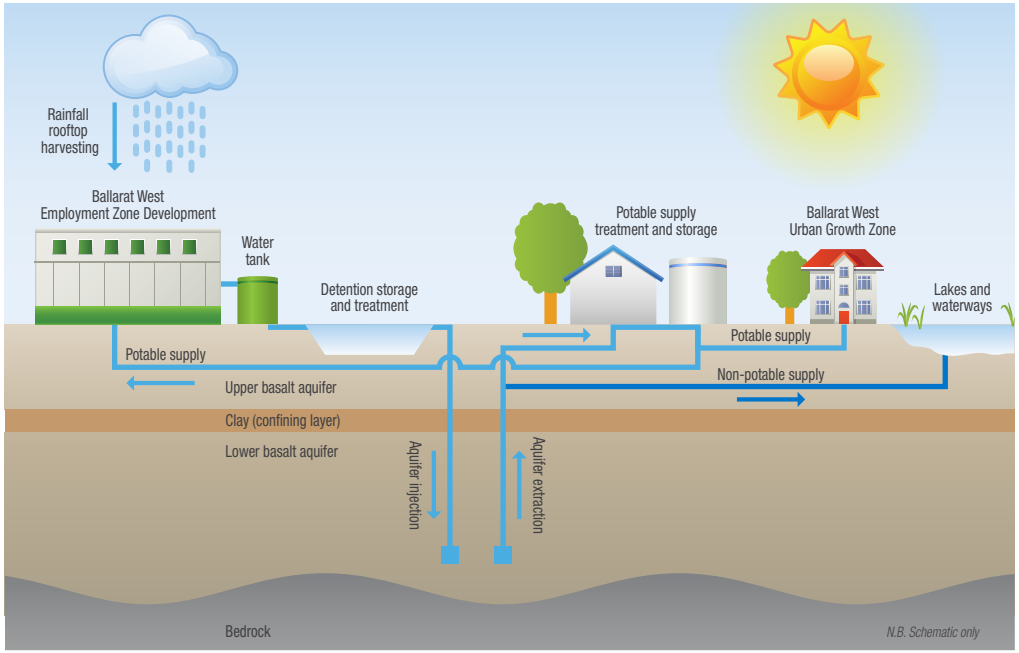
The development of the Ballarat West Employment Zone provides a unique opportunity to introduce innovative water management that builds climate change resilience, provides greater water security to a growing population, enhances waterway health and creates a greener precinct.

The Ballarat West Urban Growth Area comprises 1675 HA with 18,000 new houses and an expected population of over 40,000 in the next 35 years. It is also expected to generate 9,000 jobs and approximately $5 billion of economic output through the Ballarat West Employment Zone. Rainfall run-off generated from the rooftops of new development sites is a valuable source of high quality water that can be captured, stored and transferred for injection into the underlying Cardigan Aquifer. Water stored in the aquifer can then be redrawn when required, be treated using existing facilities and introduced into the drinking water supply network or used to improve the amenity of the area.

This joint Central Highlands Water and City of Ballarat proof of concept demonstration project, with the Office of Living Victoria as a funding partner, was designed to ensure urban planning and whole-of-water-cycle management are integrated and to demonstrate that the aquifer can sustainably generate potable water supply needs for the entire growth area and employment zone.

The project is well progressed and preliminary findings include:

- in excess of 4 ML of water per day has been successfully injected into the deep basalt aquifer in the Cardigan Management Area. Extensive monitoring of the interactions between water quality and water levels within the aquifer was undertaken to support this finding. Higher injection rates may be feasible but are subject to further testing and assessment;
- high-quality stormwater suitable for aquifer storage and recovery can be harvested from large scale industrial rooftops. Rooftop water harvesting and quality analysis was completed for 10 separate rainfall events over the 2013/14 summer period. The analysis found that with appropriate controls and levels of monitoring and treatment this approach could support future water supply needs in the Ballarat West Employment Zone; and



- the project also demonstrated that while the aquifer is able to support sustainable extractions of 1700 ML per year, it has also identified that on average, over 300 ML of water per year could be harvested from rooftop areas of the future Ballarat West Employment Zone and potentially be stored in the aquifer to support future water supply needs.

Comprehensive evaluation of the project options, costs and benefits, and recommended next steps is scheduled for completion in early 2015.

> "Aquifers are the dams of the future."
>
> Workshop participant, Ballarat

Objective 5

Healthy waterways, lakes and wetlands

Key performance indicator

Progress towards achieving the regional waterway strategies' goals and condition targets

The discussion regarding water supply has tended to focus on human and agricultural needs, however the environmental needs of waterways also require consideration when planning and managing the region's water systems.

Ballarat and region's rivers, creeks and wetlands, which include the Yarrowee/Leigh, Woady Yaloak, Moorabool, Hopkins and Loddon, are among the communities' most valuable natural assets and are an integral part of the region's liveability and identity. These rivers, creeks and wetlands are located within the Central Highlands region of the Great Dividing Range and comprise the headwaters of several river basins that flow north to the Murray River, south to the Southern Ocean and Bass Strait and inland to the Western District Lakes.

These waterways are important natural assets that support diverse populations of animals and plants, provide habitat for a range of fish and bird species and contain riverside vegetation that supports habitat for many terrestrial animal species. The region's waterways and floodplains are also vital for the movement and cycling of sediments and nutrients, and are an important interface between the surrounding catchments and downstream receiving waters, which include major urban centres such as Geelong and Warrnambool and internationally significant wetlands like the Ramsar-listed Lake Connewarre complex.

Ballarat and region's waterways, lakes and other wetlands provide attractive settings for community gatherings, encourage outdoor activity, help regulate the climate and have educational, aesthetic, cultural heritage, recreation and tourism values. Some of the region's waterways and lakes, such as Lakes Wendouree, Learmonth and Burrumbeet, are also important to maintaining the local event and tourism economy, and provide a range of recreational benefits (boating, angling etc) to the local community and visitors to the region. For example, Lake Wendouree is listed on the Directory of Important Wetlands in Australia and is also a significant recreational lake that hosts international level rowing, fishing and yachting events.

Ensuring that the region's waterways, lakes and wetlands are healthy is a fundamental part of this framework.

Outcome 5.1
Improve the health of waterways, lakes and wetlands

The more effectively that stormwater and wastewater are managed, the cleaner and healthier the region's waterways, lakes and wetlands will be. Increasing urbanisation creates several challenges for waterways, lakes and wetlands and is a significant threat to their environmental condition. The condition of the region's waterways and wetlands can be significantly affected by the quantity, velocity and quality of urban stormwater run-off and the discharge of wastewater.

In line with the Victorian Waterway Management Strategy released in 2013, catchment management authorities are finalising regional waterway strategies for their respective catchments to ensure that the long-term management of the region's waterway is feasible and that waterway health will improve. This framework aligns with and supports these strategies.

Outcome 5.2
Sufficient water available for the natural environment

Ensuring there is sufficient water available to protect and support the natural environment is an essential component in the management of waterway systems for the Ballarat region.

Adequate stream flows are required to support long term waterway health and related ecosystem services. Flows improve water quality in habitat pools, increase fish movement and create additional habitat for macro-invertebrates, fish and platypus. Stream flows also help to flush organic matter such as leaves into the river increasing nutrients and food sources for water bugs and fish, as well as flushing sediments from the river and encouraging vegetation growth. Ensuring sufficient water is available for the natural environment is a critical part of this whole-of-water-cycle framework.

Action plan

OBJECTIVE 5

Actions	Lead	Participating organisations	Commencing
Examine mechanisms to offset the use of alternative water sources with allocation of increased volumes to the environment	Department of Environment and Primary Industries	Catchment management authorities Central Highlands Water Rural water corporations Local councils	September 2014
Ensure guidelines for treated wastewater discharges are met	Central Highlands Water	Catchment management authorities Environment Protection Authority	Ongoing
Improve the health of identified high value waterways in line with regional waterway strategies	Catchment management authorities	Local councils Central Highlands Water Rural water corporations	Ongoing
Identify and prioritise measures to reduce the impact of stormwater run-off on the health of the region's waterways	Local councils	Catchment management authorities Central Highlands Water	Ongoing
Ensure that part of the discharge from the South Ballarat Treatment Plant continues to be released for environmental flows in the Leigh/Barwon rivers, and examine opportunities to better replicate natural flow regimes	Central Highlands Water	Corangamite Catchment Management Authority Environment Protection Authority	Ongoing

"There is a strong need for urban water quality improvement before it is discharged into the streams."

Resident, Ballarat

Breathing Life into the Yarrowee

Breathing Life into the Yarrowee is a state government funded project to address the health of the Yarrowee River for the local community of Ballarat. The project aims to improve the water quality in the Yarrowee, reduce litter, control weeds, stabilise eroding banks, protect and enhance native habitat, improve pedestrian and cycle access and build community custodianship of the river corridor.

The project is being delivered as a partnership between the Corangamite Catchment Management Authority and the City of Ballarat to deliver on-ground project outcomes and the implementation of a community engagement program. The $1m government funding initiative commenced in November 2013 and is being delivered over three years. The project includes surveys of existing use and attitudes, adequate survey, design and approval timeframes for significant works, adequate weed control and site preparation for new plantings and a range of community activities.

The project focuses on 13 sites along the Yarrowee River between Brown Hill and Magpie. Community engagement activities will be also undertaken to build awareness, encourage behaviour change and support the broader Ballarat community to take custodianship of the whole waterway network.

Objective 6

Whole-of-water-cycle management integrated with urban planning

Key performance indicators

Increase in local water use at a neighbourhood, precinct and small town level

Whole-of-water-cycle plans and guidelines are adopted in relevant local planning schemes

Land use planning is the basis for how a community grows and develops and is critical to making sure a community achieves the outcomes it desires. Urban planning and urban development can help ensure that water is managed and used in a way that improves liveability, protects waterways and minimises the impacts of flooding or drought.

To obtain the full benefits of a whole-of-water-cycle approach, urban land use planning and whole-of-water-cycle planning needs to be integrated at all stages of the planning process, from the development of principles and objectives, to concept design and master planning, right down to the design of individual buildings.

Integrated land use and water cycle planning is founded upon knowledge and understanding of the interconnections and inter-relationships between all parts of the water cycle and local land uses. Ensuring that land use and water cycle planning have a strong and shared evidence base will help the community identify key drivers for change and assess the possible regional and local impacts of these changes. This will ensure that the community is able to make decisions based on the best available information.

In the future, planning for the use of local water will be conducted at the same time as planning for local communities to ensure that new communities have the same or higher level of water efficiency than established areas. In existing urban areas, stormwater renewal projects and other local water infrastructure projects will help ensure existing communities also enjoy the benefits of the new planning approach.

A crucial component within whole-of-water-cycle management is water sensitive urban design (WSUD). This process looks to manage the impacts of stormwater from development by integrating water cycle management into urban planning and design. WSUD considers, among other things, urban design, infrastructure design, streetscapes, roads and drainage systems and aims to protect and improve waterway health by mimicking the natural water cycle as closely as possible.

A planning hierarchy is a key part of this framework and is explained in more detail at Figure 5.

Whole-of-water-cycle planning across the region

FIGURE 5

Regional whole-of-water-cycle management framework

Eg. **Ballarat and region's water future**

Strategy
Governance
Implementation plan

City and town whole-of-water-cycle management plans

Eg. Ballarat whole-of-water-cycle management plan
Ballan whole-of-water-cycle management plan

Local policy and strategic planning guidelines
Performance outcomes
Stormwater management plan
Supply demand strategy
Water and resources balances
Green infrastructure strategy

Precinct whole-of-water-cycle management plans

Eg. Ballarat West
Ballarat West Employment Zone

Infrastructure plan as part of structure planning
Development servicing schemes
Planning controls

A regional whole-of-water-cycle framework

This framework is aligned with other regional strategies, including the Central Highlands Regional Growth Plan. It has been developed locally, with all relevant organisations and the wider community working in partnership. One of the major outcomes is to provide a coordinating planning framework for the development of local plans within the region. This will help ensure that all towns and precincts are working toward the same vision and objectives, using localised initiatives and approaches that take into account local circumstances.

City, town and precinct whole-of-water-cycle plans

The best way to implement the framework in Ballarat, local towns and development precincts like Ballarat West Urban Growth Area is by using a place-based, localised approach. This will ensure that solutions and actions are tailored to the needs of each community and that investment, programs and future planning is clearly targeted and prioritised.

The Ballarat city plan will be developed by Central Highlands Water, while the town and precinct whole-of-water-cycle plans will be developed by either the local council or Central Highlands Water in partnership with other relevant organisations and the local community. It is intended that these whole-of-water-cycle plans will form part of the local land use planning arrangements.

The plans will differ depending on the size of the city, town or precinct, yet each will be consistent with the framework. The plans will build on the planning work already undertaken by local councils, Central Highlands Water and other local organisations and will include some or all of the following elements:

- aspirational goals for reduced use of tap water and wastewater flows, increased use of local water sources, reduced stormwater run-off volumes and pollutants, increased canopy coverage and vegetation, improved waterway health, liveability and community health indicators;
- local infrastructure planning (within the parameters of reasonable projections of likely future expenditure);
- analysis of environmental characteristics, land use, existing infrastructure, existing water use, wastewater production and demographic, social, economic and cultural factors affecting the local area.
- application of the regional whole-of-water-cycle planning guidelines and approach to economic evaluation.

Outcome 6.1
Smarter use of water in our homes and businesses

Smarter use of local water sources matches the right water to the right use. Whole-of-water-cycle management uses local alternative water sources where it is efficient and effective, to replace or supplement tap water.

Locally available water sources such as groundwater and treated stormwater and wastewater can be used for purposes such as gardening, flushing toilets and washing clothes and cars, which do not need high quality drinking water. Education and information provision is an essential part of encouraging behaviour change in homes and businesses, as are improved standards and regulation for all new buildings and subdivisions.

Outcome 6.2
Local water use planned through city, town and precinct whole-of-water-cycle planning

Several key elements are required to effectively implement a new approach to water cycle planning and integrate it with land use planning. These elements include adopting long term planning horizons and developing whole-of-water-cycle plans at geographic scales suited to local circumstances. While this framework covers a broad region, Central Highlands Water and local councils will need to work with individual towns and precincts to develop their own local whole-of-water-cycle plans, with the City of Ballarat leading the way.

Town and precinct plans will initially be developed in locations where population growth is occurring or a new land use plan is underway, so that whole-of-water-cycle planning can be integrated with land use planning. These plans will build on work already undertaken by local councils and will reflect the objectives of the regional framework.

Action plan

OBJECTIVE 6

Actions	Lead	Participating organisations	Commencing
Establish minimum water performance standards for all new buildings and subdivisions as part the development of whole-of-water-cycle management plans	City of Ballarat	Central Highlands Water Department of Environment and Primary Industries	January 2016
Develop a whole-of-water-cycle management plan for Ballarat	Central Highlands Water	City of Ballarat Department of Environment and Primary Industries Catchment management authorities Southern Rural Water	September 2014
Prepare whole-of-water-cycle precinct plans for high growth urban areas starting with Ballarat West, Ballarat West Employment Zone and Ballan	Local councils	Central Highlands Water	July 2015 (City of Ballarat)
Develop regional whole-of-water-cycle management guidelines	Office of Living Victoria	Central Highlands Water Catchment management authorities Local councils Rural water corporations	September 2014

Ballarat whole-of-water-cycle plan

One of the primary outcomes of this framework is the development of city, town and precinct whole-of-water-cycle plans and their adoption into relevant local planning schemes.

Central Highlands Water is leading the way with a foundation project to develop a whole-of-water-cycle plan for Ballarat.

The plan aims to demonstrate how the objectives and principles of this framework can be applied on the ground, to facilitate the preservation and attractiveness of Ballarat's urban environment, enhance the city's liveability and continue to support a partnership approach to whole-of-water-cycle planning.

The plan is dependent upon other activities underway or in development by partner organisations, making a collaborative, transparent approach to the delivery of this project even more important.

By mid-2016, Central Highlands Water, in partnership with City of Ballarat, Department of Environment and Primary Industries and other relevant agencies, will have developed a whole-of-water-cycle plan for Ballarat that:

- reflects local community values and preferences;
- increases the use of local water sources;
- supports green infrastructure;
- mitigates flood risk; and
- increases the resilience of the natural and built systems.

This project will also provide a template for the approach to be applied in other regional Victorian cities.

Objective 7

Sustainable and productive economy

Key performance indicator

Increase in proportion of urban water supply that is locally sourced

Urban water plays an essential role in supporting a strong and vibrant economy. Water security is one of the most important factors for businesses, industry and agricultural producers considering a long-term investment in the region.

Outcome 7.1

Productive use of the existing allocations for surface water and groundwater

Scientists advise us that the impacts of climate change are likely to lead to a reduction in annual rainfall, which will reduce stream flows and affect the rate of recharge to groundwater. The management of the Ballarat region's existing allocations for surface water and groundwater needs continuous monitoring and review to ensure water sources are being adequately replenished and to support a more sustainable use of water. This corresponding increase in the reliability and productivity of the water resource allocations regime can, in turn, help support new and existing industries within the region.

Outcome 7.2

Local businesses adopt cost-effective local water options

Non-residential water users account for approximately 30 per cent of total demand for water in the Ballarat region. Over recent years, the non-residential sector including industrial, commercial and institutional users, has made significant progress in using water more effectively. Research demonstrates that high water use businesses can significantly improve their costs and efficiencies by better understanding the broader costs of water. The Ballarat region has a range of water intensive industries that could benefit from an increased use of water from alternative sources.

Action plan

OBJECTIVE 7

Actions	Lead	Participating organisations	Commencing
Where appropriate, continue developing Local Management Plans that are catchment or aquifer based and support sustainable water use management	Southern Rural Water Goulburn Murray Water	Central Highlands Water Catchment management authorities Local councils	Ongoing
Continue to work with businesses to build their knowledge of water cycle patterns and encourage high water users to adopt local alternative water source solutions	Central Highlands Water	Local councils	Ongoing
Continue the Water Management Action Plan (WaterMAP) program, which encourages businesses using more than 5ML a year to prepare water management action plans to help achieve greater water efficiency	Central Highlands Water	Local councils	Ongoing

Governance

A collaborative, partnership-based approach to governance is the best way to ensure that the roles and inputs of all relevant organisations are respected

Whole-of-water-cycle decision-making and governance involves many different people and agencies that operate across a range of geographical scales, timeframes and jurisdictional boundaries. During the strategy development phase of the Living Ballarat project, the governance structure embodied this highly effective approach, and was a useful learning experience for all organisations involved.

The next phase of the framework requires a change in governance to reflect the shift from strategy development to implementation and project delivery. Ongoing local ownership of the strategy remains essential to achieving its outcomes in the long term.

The new governance framework provided in Figure 6 reflects the Project Control Board's intention to continue their joint ownership of the process and provides the relevant organisations with strategic oversight of the framework's implementation while recognising that each organisation has its own area of responsibility and authority. The governance structure also covers delivery of the three foundation projects as they require a high-level of cross-organisation collaboration and will have implications for all organisations across the region. The structure also includes oversight of the actions delivered by individual agencies.

Roles and responsibilities

Local Project Control Board (PCB)
The PCB is the cross-agency and cross-jurisdictional decision-making group. It will be responsible for strategic direction, local governance and oversight of the implementation of the Ballarat and region's whole-of-water-cycle framework. The composition of this group includes the heads of all agencies with delivery responsibility, who will have the authority to commit their organisation to initiatives and timelines.

Project manager
The project manager will be responsible for overseeing the day to day delivery of the framework and coordinating the various working groups and advisory groups. The project manager will also provide secretariat support to the local Project Control Board, facilitate communication across government and provide a point of contact for all individual agencies delivering actions for the framework.

Governance framework A locally led strategic partnership

FIGURE 6

Minister for Water

Department of Environment and Primary Industries

Local project control board

Project manager

Framework implementation

City whole-of-water-cycle management plan for Ballarat

Urban flooding and stormwater taskforce

Regional whole-of-water-cycle management guidelines

Other actions

Advisory groups

Technical advisory group

Stakeholder and community reference groups

Strategic partners KEY DELIVERY ROLES IN THE WATER CYCLE

Regulatory bodies

Central Goldfields Shire	Glenelg Hopkins CMA	Moorabool Shire
Central Highlands Water	Golden Plains Shire	North Central CMA
City of Ballarat	Goulburn Murray Water	Pyrenees Shire
Corangamite CMA	Hepburn Shire	Southern Rural Water

Framework implementation
Delivery of the framework actions and the three foundation projects will be coordinated across all relevant agencies. This will ensure the partnership approach to implementation continues at all stages of the delivery process and will facilitate ongoing communication and collaboration at all levels of the agencies represented on the Project Control Board.

Technical Advisory Group
This group will engage the local science community to ensure the methods and standards used in whole-of-water-cycle analysis are appropriate and consistent. The group will also help provide greater transparency on data collection and analysis.

Strategic partners
Each partner agency has key decision-making responsibilities in the local water cycle and is responsible for delivering the individual actions assigned to them and for working with the lead agency on actions where they are a participating organisation.

Stakeholder and Community Reference Group
To ensure the local community stays engaged with the whole-of-water-cycle management approach, this group will be convened at key milestones to provide input to projects and ensure that key stakeholders and community groups are involved in project development and implementation wherever relevant.

Reporting, monitoring and evaluation

To ensure the framework is achieving its outcomes, implementation of the actions needs to be monitored and evaluated. The framework includes a series of high-level indicators to help evaluate its overall success. In addition, as a detailed implementation plan is developed for each Action, targeted indicators and measures will be identified to ensure that each individual part of the framework is also playing its part.

Monitoring and evaluation will include and consider:

- the views of the local communities; and
- reports from each responsible agency or organisation on the progress of the framework and their specific actions.

It is important to note that the high-level key performance indicators could be affected by events in the wider environment that are not connected with **Ballarat and region's water future**. These events could include extreme weather events, changes to weather patterns or unforeseen population increases or decreases. Wherever possible these will be taken into account when assessing the success of the framework.

> "There must be effective, open and consistent leadership actively pursuing the common good."
>
> Brown Hill resident

Glossary

Aquifer A layer of underground sediments which holds groundwater and allows water to flow through it.

Catchment management authority (CMAs) Government authorities established to manage regional and catchment planning, and waterway, floodplain, salinity and water quality management.

Climate change An extended period (typically decades or longer) where there is a statistically significant change in the 'usual' characteristics (averages and/or variability) of a place's climate.

Critical human needs The amount of water required to supply Stage 4 restricted demand in urban areas, domestic and stock needs and operate the distribution system to deliver that water.

Desalination The process of removing salt from seawater or brackish water so that it becomes suitable for drinking or other uses.

Diversions The removal of water from a waterway via a pump.

Drainage systems The infrastructure that collects, transports and treats stormwater.

Effluent sewage Flows out of a sewage treatment plant.

Environment Protection Authority Victorian authority responsible for environmental protection

Essential Services Commission Victoria's independent economic regulator of the electricity, gas, water and sewerage, ports and rail freight industries.

Floodplain Lands which are subject to overflow during floods. Often valuable for their ecological assets.

GL (Gigalitre) This is equivalent to a billion litres. This equates to approximately 400 Olympic sized swimming pools.

Greywater Household water which has not been contaminated by toilet discharge, and can be reused for non-drinking purposes. Typically includes water from bathtubs, dishwashing machines and clothes washing machines.

Groundwater All subsurface water, generally occupying the pores and crevices of rock and soil.

Liveability A measure of a city's residents' quality of life, used to benchmark cities around the world. Includes socio-economic, environmental, transport and recreational measures.

Megalitre (ML) One million (1,000,000) litres.

Metropolitan Melbourne The area within the outer limits of the 31 municipalities that make up metropolitan Melbourne, plus an extended section of Mitchell shire within the Urban Growth Boundary.

Open space Includes land reserved for natural landscape, parklands, recreation and active sports, as well as waterways and bays.

Potable water Water that is safe or suitable for human consumption as drinking water.

Qualification of rights The Minister of Water declares a water shortage and qualifies existing water entitlements to reallocate water to priority uses.

Rainwater Water that is captured from a roof and collected in a rainwater tank.

Recharge (to groundwater) The process where water moves downward from surface water to groundwater due to rainfall infiltration or seepage/leakage.

Recycled water Water derived from sewerage systems or industry processes that is treated to a standard appropriate for its intended use.

Reservoir Natural or artificial dam or lake used for the storage and regulation of water.

Resilience The capacity of a system to continue to perform its function in spite of variability, shocks and long term change.

Run-off Precipitation or rainfall which flows from a catchment into streams, lakes, rivers or reservoirs.

Salinity The total amount of water-soluble salts present in the soil or in a stream.

Sewage Wastewater produced from household and industry.

Sewerage The pipes and plant that collect, remove, treat and dispose of sewage.

Source bulk entitlement A type of bulk entitlement held by water corporations to provide a share of inflows, storage capacity (if applicable) and releases.

Stormwater Water that runs off hard surfaces such as roofs, roads and footpaths. This water is channelled through drains and typically flows into rivers, creeks and bays.

Surface water Fresh water that is visible above ground in rivers, wetlands and storages.

Urbanisation The physical growth of urban areas, often known as urban development.

Urban renewal Improvement or rehabilitation of urban areas. Traditionally involved demolishing old or run-down buildings on brownfield sites in inner city areas to build new residential or commercial developments or large-scale public works. Can also build on an area's existing strengths to make better use of underutilised land located close to jobs, services and transport.

Urban water cycle Includes water supply, wastewater/sanitation, stormwater, river, creek and storm management, and management of parks, streetscapes, trees and open space.

Wastewater A combination of greywater and blackwater from residential dwellings including wastewater from non-residential allotments such as trade wastes.

Water Act The Water Act 1989 provides the legal framework for water management and use across Victoria, including issuing and allocating water entitlements and provision of water services by state-owned water corporations and catchment management authorities.

Water corporations Government organisations charged with supplying water to urban and rural water users. They administer the diversion of water from waterways and the extraction of groundwater. Formerly known as water authorities.

Water cycle The term water cycle is used in this document to describe the water cycle system as including the consideration of recycled water, rainwater, stormwater, wastewater, groundwater, potable water and waterways.

WaterMAP Water Management Action Plan is an individualised water efficiency program for high water use businesses.

Water plans Outline the services water corporations will deliver over a three-year regulatory period and the prices that they will charge.

Water share A water share is a legally recognised, secure share of the water available to be taken from a water system. It can be traded permanently or leased.

Wetlands Inland, standing, shallow bodies of water, which may be permanent or temporary, fresh or saline.

Whole-of-water-cycle management Captures the idea that all parts of the water cycle and all parts of the community are intrinsically interconnected.

Yield The quantity of water that a storage or aquifer produces.

Lal Lal Reservoir

A greener, more liveable and prosperous water future

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Office of Living Victoria

Department of Environment and Primary Industries

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