



Integrated  
Water  
Management  
Forums

# IWM Forum Agenda Paper: Catchment Scale IWM Plans

The collective effort of Forum Partners over the last few years has culminated in comprehensive Catchment Scale Integrated Water Management (IWM) Plans (“the Plans”) for the five major waterway Catchments in the Greater Metropolitan Melbourne Region: Werribee, Maribyrnong, Yarra, Dandenong and Western Port.

The Plans set out clear indicators and measures to assess our progress towards the delivery of the vision and strategic outcomes for each Catchment. They provide the launching pad and guiding framework for implementation of IWM, with Forum Partners continuing to work together to identify opportunities where IWM can best enable the optimal use and management of water and land.

The Department of Environment, Land, Water and Planning is managing the project to develop the Plans in a collaborative manner on behalf of the five metropolitan Melbourne IWM Forums.

The following key messages outline the purpose and status of the Plans.

1. The Plans are the keystone project of the Greater Metropolitan Melbourne IWM Forums. They provide Forum partners with meaningful scientific evidence to guide decision-making and prioritise investment in sustainable water and land use planning, management and policy.
2. Creating a resilient and liveable future is a shared responsibility, which is why the Plans were developed through robust, Forum-endorsed collaborative processes. The Plans drew on the expertise of more than 50 stakeholder organisations.
3. The Plans reflect rigorous scientific analysis and compelling technical evidence to determine performance targets for Forum Partners to adopt at their organisations. The shorter term 2030 targets are grounded in practicality and serve to inspire action that can be delivered, while the longer term 2050 targets are aspirational and more challenging to realise, but are nevertheless credible and necessary to drive real change.
4. Performance targets are geographically and spatially unique, reflecting the unique needs of each catchment or local area. Some targets remain undefined (1.1a and 4.3), as they have been deferred to strategic planning processes underway, such as the *Central and Gippsland Region Sustainable Water Strategy* and *Water for Life, the Greater Melbourne Urban Water System Strategy*. Other targets (6.1a and 6.1b) remain as draft and serve as placeholders until further conversations with Traditional Owners can be had.
5. As a highly complex area, touching on many different functions and responsibilities, it is likely that the path to implementation will have to be adaptive and responsive to new evidence and opportunities that come to light. Accordingly, the Plans will be dynamic, living documents.
6. During the next round of Forum meetings, Forum Partners will be asked to endorse the Plans and finalised targets. In this context, “endorse” means to “express support for” the Plans and finalised targets as a basis for inclusion in Forum Partner organisations’ strategies, plans and processes that contribute to the delivery of IWM outcomes. Forum Partners will also be asked to support ongoing processes of monitoring, review, and implementation.

# Dandenong Catchment Integrated Water Management Plan

Targets Driving Outcomes



Summary  
July 2021

#### **Acknowledgement of Victoria's Aboriginal communities**

The Victorian Government proudly acknowledges Victoria's Aboriginal communities and their rich culture and pays its respects to their Elders past and present. The government also recognises the intrinsic connection of Traditional Owners to Country and acknowledges their contribution to the management of land, water and resources.

We acknowledge Aboriginal people as Australia's first peoples and as the Traditional Owners and custodians of the land and water on which we rely. We recognise and value the ongoing contribution of Aboriginal people and communities to Victorian life and how this enriches us. We embrace the spirit of reconciliation, working towards the equality of outcomes and ensuring an equal voice.

© The State of Victoria Department of Environment, Land, Water and Planning 2021

This work is licensed under a Creative Commons Attribution 4.0 International licence. You are free to re-use the work under that licence, on the condition that you credit the State of Victoria as author. The licence does not apply to any images, photographs or branding, including the Victorian Coat of Arms, the Victorian Government logo and the Department of Environment, Land, Water and Planning (DELWP) logo. To view a copy of this licence, visit [creativecommons.org/licenses/by/4.0](https://creativecommons.org/licenses/by/4.0)

ISBN 978-1-76105-673-4 (pdf/online/MS word)

#### **Disclaimer**

This publication may be of assistance to you but the State of Victoria and its employees do not guarantee that the publication is without flaw of any kind or is wholly appropriate for your particular purposes and therefore disclaims all liability for any error, loss or other consequence which may arise from you relying on any information in this publication.

#### **Accessibility**

If you would like to receive this publication in an alternative format, please telephone the DELWP Customer Service Centre on 136 186 or email [customer.service@delwp.vic.gov.au](mailto:customer.service@delwp.vic.gov.au) or via the National Relay Service on 133 677, [www.relay.vic.gov.au](http://www.relay.vic.gov.au).

This document is also available on the internet at [www.delwp.vic.gov.au](http://www.delwp.vic.gov.au)

DRRAFT

# Acknowledgements

The Dandenong Catchment Integrated Water Management Plan has been developed by the Dandenong Integrated Water Management (IWM) Forum. Members of this Forum include the Chief Executive Officers and Managing Directors of the following organisations:

**Bayside City Council**

**Bunurong Land Council Aboriginal Corporation**

**City of Casey**

**City of Greater Dandenong**

**City of Kingston**

**City of Port Phillip**

**Department of Environment, Land, Water and Planning, State Government of Victoria**

**Frankston City Council**

**Glen Eira City Council**

**Melbourne Water Corporation**

**Knox City Council**

**Maroondah City Council**

**Monash City Council**

**Mornington Peninsula Shire Council**

**Port Phillip and Westernport Catchment Management Authority (Melbourne Water from 2022)**

**South East Water Corporation**

**Southern Rural Water Corporation**

**Victorian Planning Authority**

**Whitehorse City Council**

**Wurundjeri Woi Wurrung Cultural Heritage Aboriginal Corporation**

**Yarra Ranges Shire Council**

**Yarra Valley Water Corporation**

This plan represents the collective vision and intent of these organisations and has been developed through a collaborative process. The plan development process was facilitated by the Department of Environment, Land, Water and Planning and overseen by the Dandenong IWM Forum Working Group. The Plan has been developed with assistance from the Melbourne Catchments Consortium, led by E2Designlab, and supported by Spatial Vision, Tract, Rain Consulting, Water Futures Consulting, Flying Blue Fish and the Cooperative Research Centre for Water Sensitive Cities.

The Dandenong IWM Forum is grateful to the Dandenong IWM Working Group, the Catchment Expert Groups, the Strategic Oversight Group and other advisors for the time and expertise they dedicated to guide the development of this Plan.

The Dandenong Catchment covers the traditional lands of the Kulin Nation. The Dandenong IWM Forum acknowledges these Traditional Owners as traditional custodians who have managed land and water sustainably over thousands of generations and maintain an active connection to Country.

# Contents

<b>Driving Integrated Water Management at a Catchment Scale</b>	<b>02</b>
<b>Introducing the catchment</b>	<b>05</b>
<b>Adapting to the new normal</b>	<b>06</b>
<b>Making progress</b>	<b>07</b>
Strategic Outcome 1 – Safe, secure and affordable water supplies in an uncertain future	09
Strategic Outcome 2 – Effective and affordable wastewater systems	12
Strategic Outcome 3 – Existing and future flood risks are managed to maximise outcomes for the community	15
Strategic Outcome 4 – Healthy and valued waterways and marine environments	17
Strategic Outcome 5 – Healthy and valued urban and rural landscapes	20
Strategic Outcome 6 – Community values are reflected in place-based planning	23
Strategic Outcome 7 – Jobs, economic benefits and innovation	27
Enablers – Commitment, Capacity and Collaboration	30
<b>References</b>	<b>33</b>
<b>Notes</b>	<b>34</b>
<b>Glossary of terms</b>	<b>36</b>



# Driving Integrated Water Management at a Catchment Scale

Integrated Water Management (IWM) is a collaborative approach to water planning and management that brings together organisations with an interest in all aspects of the water cycle. It has the potential to provide greater value to our communities by identifying and leveraging opportunities to optimise outcomes.

The Dandenong Catchment IWM Plan will drive an integrated approach to water management that delivers clear outcomes for the Catchment. It provides a consistent framework to coordinate action by all organisations involved in the management of the water cycle, working together towards a common vision.

Mornington Pier, Mornington Peninsula. Photographer: Greg Brave

## A Catchment Scale IWM plan

By its very nature, IWM requires collaboration and cross-outcome thinking. Often, IWM planning has focussed on specific development areas or organisational boundaries. This has limited opportunities to work together to tackle transboundary issues and recognise the connections across the water cycle at a larger scale. By planning for IWM at the catchment scale we have a unique opportunity to identify and progress strategic interventions that may not be feasible at smaller scales and to focus our attention where we can have the most impact. This approach was introduced in 2017 through the Integrated Water Management Framework for Victoria,<sup>1</sup> and the subsequent formation of IWM Forums across the five major waterway Catchments in the Greater Metropolitan Melbourne Region: Werribee, Maribyrnong, Yarra, Dandenong and Western Port.

The Catchment Scale IWM Plans are part of a broader suite of strategic actions seeking to improve the resilience, liveability and sustainability of our cities and towns. At the regional level, Forum Partners are developing strategies to secure our water supplies over the next 50 years, through the Central and Gippsland Region Sustainable Water Strategy and Water for Life, the Greater Melbourne Urban Water System Strategy. At the local level, councils are developing place-based strategies and plans to adapt to climate change, create and manage green open space, and improve stormwater management. The Catchment Scale IWM Plans provide a way to bridge the gap between regional and local level initiatives by aligning and reinforcing strategic priorities. This enables all partners in IWM to identify and prioritise on-ground initiatives and infrastructure investments that maximise the social, cultural, environmental, and economic values delivered to Victorian communities.



Photographer: Chris Kopa. Courtesy: Melbourne Water

**This Plan provides the launching pad and a guiding framework for implementation of integrated water management, with IWM Forum partners continuing to work together to identify on-ground projects and initiatives that will deliver the strategic outcomes for the catchment.**

**The IWM Forums are the first of their kind in Australia and the Catchment Scale IWM Plans for the Greater Metropolitan Melbourne Region are the keystone for the IWM Program.**

### The Purpose of the Plan

The collective effort of the Forum Partners over the last few years has culminated in a comprehensive Catchment Scale IWM plan for the Dandenong Catchment which sets out clear indicators and measures to assess our progress towards the delivery of the vision and strategic outcomes for the Catchment.

The Plan includes outcome-focused targets which will guide and inform decision-making and strategic investment of major infrastructure over the next 30 years. The targets were developed by nominated catchment representatives through a Forum-endorsed deliberative process, drawing on the latest evidence and expertise. Delivering these targets will require

a bold step-change in the way we manage water. The journey to meet our 2050 targets is uncharted and will require ongoing commitment, collaboration and innovation to deliver landmark outcomes for the Dandenong Catchment and the communities it supports. Our 2030 targets set us on the trajectory to achieve our strategic outcomes and recognise the opportunities that can be delivered in the short-term.

# Introducing the catchment

Situated in the foothills of the Dandenong Ranges and stretching to the coast of Port Phillip Bay, the Dandenong catchment contains a breadth of iconic Victorian landscapes ranging from cool temperate rainforests and wet heathlands to sandy bay beaches.

The IWM Forum Area includes sub-catchments flowing into Port Phillip Bay, stretching from Port Melbourne to Point Nepean. The catchment covers some of Victoria's fastest urbanising areas and will be the site of substantial population growth and economic development in the coming years.

Preservation and management of the catchment's landscapes will have a positive impact on the long term health and security of the catchment's waterways.



# Adapting to the new normal

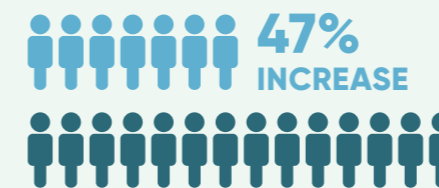
In the Dandenong Catchment, now, more than ever, we need to re-frame our approach to water management. By working together to create holistic solutions that deliver a range of outcomes across the water cycle, we will create a cooler, greener and more resilient catchment.

## Population growth

The Dandenong Catchment had an estimated population of 1.53 million people in 2016 and is predicted to rise to 2.25 million by 2050.<sup>2</sup> Significant densification is predicted for many suburbs across the catchment, through infill development and subdivision in established suburbs.

## POPULATION GROWTH

**1,530,000** 2016  
**2,250,000** BY 2050



## Climate change

The future climate in the region will be hotter and drier, with lower rainfall expected to reduce inflows to reservoirs and decrease river flows, placing further strain on the water supplies servicing the catchment.<sup>3</sup> While there will be a reduction in average annual rainfall, the Catchment is predicted to see more frequent, intense rainfall events that will increase the risk of flooding, which is already a major challenge for the Dandenong catchment. These changes, combined with increased development and growing populations, will place more pressure on water services and waterways in the Catchment.

By 2040, temperatures across the Greater Melbourne Metropolitan Region are expected to rise by an average of 1.3°C under a medium climate change scenario.<sup>4</sup> The risk of fire in forests and grasslands will remain high under these conditions posing a serious threat to the Catchment's communities, infrastructure and high-value native forests including water supply catchments and ecosystems. The impact of the urban heat island effect will also increase, with greater densification in urban areas meaning they will be more vulnerable to heat waves than more rural or peri-urban areas. The ongoing availability of water in the environment will be vital to reduce the risk of heat stress and improve cooling in the most vulnerable areas of the Catchment.

# Making progress

## Catchment Vision

By valuing water in its entirety, the Dandenong catchment is a well-planned, healthy, resilient and thriving environment for people and nature – now and into the future.

## Measures



**Safe, secure and affordable water supplies in an uncertain future**

- 1.1A Residential potable water use
- .....
- 1.1B Non-residential potable water use
- .....
- 1.2A Proportion of water use which is provided from alternative water sources
- .....
- 1.2B – Alternative water sources that substitutes potable mains water supply



**Effective and affordable wastewater systems**

- 2.1A Recycled water delivered to customers
- .....
- 2.1B Nitrogen recovered at treatment facilities for beneficial use
- .....
- 2.1C Carbon recovered at treatment facilities for beneficial use



**Existing and future flood risks are managed to maximise outcomes for the community**

- 3.1 Reduction in Annual Average Damage (AAD) delivered by flood management initiatives
- .....
- 3.2 Effective flood storage volume created as part of multi-functional assets
- .....
- 3.3 Projects that cross-consider IWM and flood mitigation opportunities as part of their design



**Healthy and valued waterways and marine environments**

- 4.1 Mean annual runoff volume reduction
- .....
- 4.2a Mean annual Total Suspended Solids (TSS) prevented from discharging to receiving waters
- .....
- 4.2b Mean annual Total Nitrogen (TN) prevented from discharging to receiving waters
- .....
- 4.3 Additional water allocated to environmental water reserve that increases environmental benefits in waterways



**Healthy and valued urban and rural landscapes**

- 5.1 Street trees that are supported with permanent (active or passive) irrigation from an alternative water supply
- .....
- 5.2a Active public open space (sports fields and organised recreation) supported by an alternative water source
- .....
- 5.2b Passive public open space (parkland and gardens) supported by an alternative water source
- .....
- 5.3 Reduction in land surface temperature attributed to IWM in urban areas



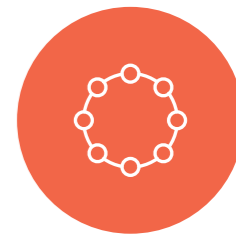
**Community values are reflected in place-based planning**

- 6.1a Traditional Owners' capacity to partner in IWM programs, policy, planning and projects
- .....
- 6.1b Other IWM partner organisations' capability to partner with Traditional Owners in IWM programs, policy, planning and projects
- .....
- 6.2 Blue-green infrastructure created or enhanced by IWM as a proportion of land area
- .....
- 6.3 Community literacy regarding the water cycle
- .....
- 6.4 Whether water is a key element in city planning and design process



**Jobs, economic benefits and innovation**

- 7.1a Alternative water supplied to agricultural production
- .....
- 7.1b Alternative water supplied to businesses and industry (>10ML/year)



**Enablers**

- E1 Vision, leadership and long-term commitment through vision statement and objectives articulated in corporate documents
- .....
- E2 Knowledge, skills and organisational capacity
- .....
- E3 Cross-sector institutional arrangements and processes

The vision and strategic outcomes for the Catchment were collaboratively developed by the IWM Forum and described in the **Dandenong Strategic Directions Statement** in 2018. This Plan now sets out a series of indicators and measures tailored to assess our progress towards those outcomes, creates a baseline representing our current performance and sets targets for 2030 and 2050 to drive our forward journey.

Data from all organisations will be collected and mapped against the Plan's measures to assess our progress over time. The indicators, measures and targets for each strategic outcome, and for the enablers that will underpin delivery of all outcomes, are set out in the following sections of this Plan for the catchment and for the Greater Metropolitan Melbourne Region as a whole, combining all five major catchments

● Lagging measures for monitoring    ● Leading measures with 2030 and 2050 targets





**Strategic Outcome 1**  
Safe, secure and affordable water supplies in an uncertain future

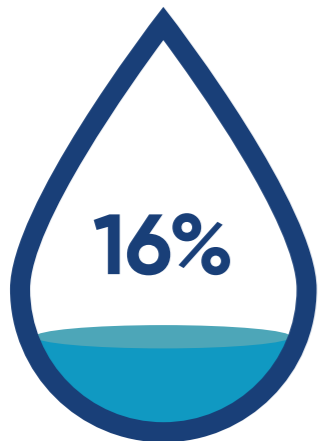
The safety, security and affordability of our water supply can be improved by reducing the demand on our potable water resources. Making the best use of alternative water resources, such as rainwater, stormwater and recycled water can help us reduce our reliance on declining potable water supplies. The indicators and measures in this strategic outcome focus on understanding how we are working to protect and conserve our precious potable water resources, and how effectively we are delivering alternative water supplies.

**The case for change**

**Potable water**

The safety, security and affordability of our water supply can be improved by reducing the demand on our potable water resources. Making the best use of alternative water resources, such as rainwater, stormwater and recycled water can help us reduce our reliance on declining potable water supplies.

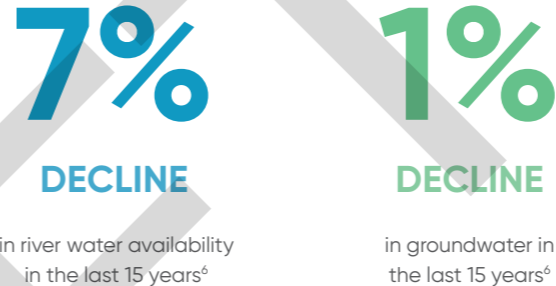
The indicators and measures in this strategic outcome focus on understanding how we are working to protect and conserve our precious potable water resources, and how effectively we are delivering alternative water supplies.<sup>5</sup>



increase in potable water use in the catchment expected by 2050<sup>a</sup>



Potential shortfall in the Melbourne Water system by 2050 under a high climate change and high population growth scenario<sup>b</sup>

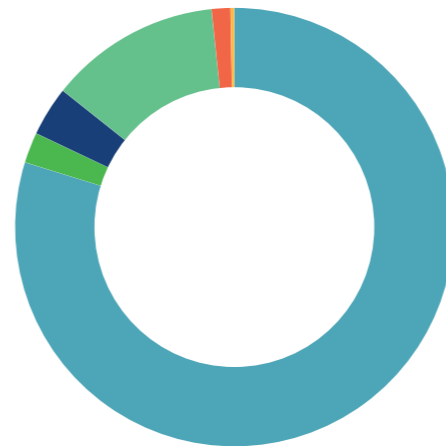
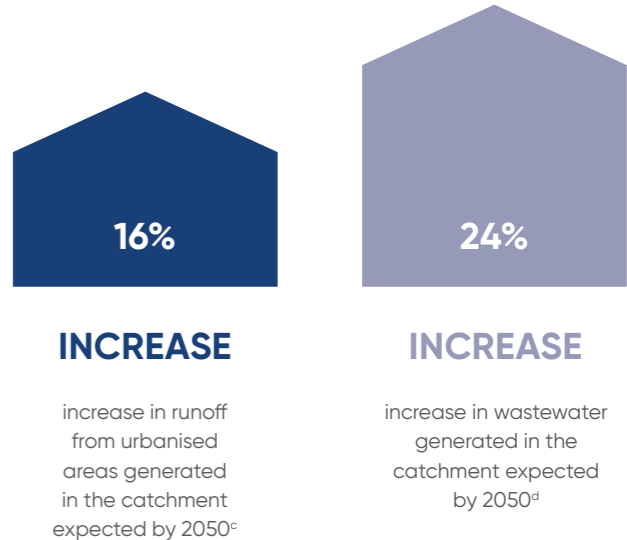


**River water and groundwater**

River water and groundwater are drawn on locally in the catchment to support agriculture and rural water users. River water in particular has is declining with a changing climate, resulting in reduced flows being available for the environment as well as for water supplies.

**Alternative water resources**

While other water resources are expected to decline, alternative water resources are expected to increase in the catchment. In this sense, alternative water resources can be considered sustainable, climate-resilient sources of water. Rainwater runoff from roofs and stormwater runoff from hard surfaces will increase as our catchment becomes more urbanised. Also, as our population grows we will use more water and create more wastewater, contributing to a growing potential recycled water resource.



**Current mix of water used in the catchment**

Water Type	Megalitre/Year
Potable Water	121,308
River Water	3,444
Groundwater	5,545
Recycled Water	19,227
Rainwater	2,115
Stormwater	409

## Measuring the change we want to make

Our measures	Scale	Our current performance (2019)	Our catchment target for the future		How will this measure drive change?
			2030	2050	
1.1a. Residential potable water use. <i>Note: Calculation method differs to Target 155 monitoring - see footnote 'e'</i>	Catchment	168 litres per person per day	–	–	By understanding residential potable water use on a per person basis, we can learn more about how communities use water, and track our progress in reducing demand for potable water resources in our homes.
	Region	172 litres per person per day	To be defined by Water for Life: Greater Melbourne Urban Water Systems Strategy		
1.1b. Non-residential potable water use.	Catchment	27 Gigalitres /year	For monitoring only		This measure helps us to understand where the hot spots are for non-residential water use, and therefore where we can prioritise initiatives to increase access to alternative supplies or increase efficiency of water use.
	Region	111 Gigalitres /year			
1.2a. Percent of total water use which is provided from alternative water sources.	Catchment	14.3 %	For monitoring only		By understanding the full water use picture, we can track our overall progress in matching alternative water use for fit-for-purpose demands.
	Region	12.5 %			
1.2b. Alternative water sources that substitute potable mains water supply.	Catchment	6 Gigalitres/year	11 Gigalitres/year	–	By driving an increase in alternative water supplies that will substitute potable water supplies, we will significantly reduce the risk of future shortfalls by diversifying our water supplies and making use of resources that might otherwise be wasted.
	Region	18 Gigalitres/year	53 Gigalitres/year	150 Gigalitres/year	



## Strategic Outcome 2 Effective and affordable wastewater systems

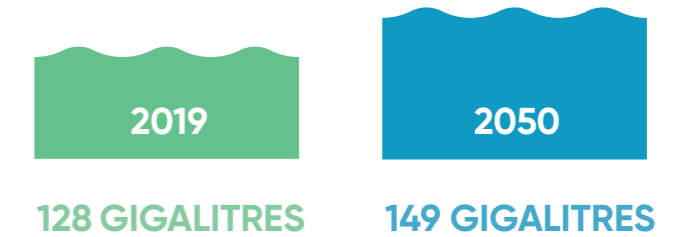
Providing effective and affordable wastewater systems in the region is the remit and responsibility of water corporations, and various performance indicators are already tracked to monitor and drive progress. The indicators and measures selected for this Plan focus on how we can better utilise wastewater as a resource and transition towards a circular economy.

### The case for change

#### Managing our wastewater

The majority of the Catchment's wastewater is transferred to the Eastern Treatment Plant, managed by Melbourne Water. However, there are also local wastewater treatment plants at Mt Martha and Boneo which are managed by South East Water. The Eastern Treatment Plant is a major wastewater management asset which is located in the Dandenong Catchment. It receives wastewater from neighbouring catchments, and treats approximately 35% of the total wastewater generated in the region.

The provision and efficacy of wastewater management services vary across the catchment. More than 16,000 unsewered properties along the Mornington Peninsula between Rye and Portsea, as well as numerous rural properties in the upper Dandenong catchment, continue to rely on septic tank systems and on-site domestic treatment plants to manage household sewage. Many of these are poor-performing and have the potential to pollute waterways, impacting public and environmental health. To address this, water corporations are working with their communities to connect properties to a reticulated sewer system, discharging into local wastewater treatment plants.



Treated wastewater produced annually in the catchment which could be recycled, and which will otherwise be released to the environment.<sup>f</sup>

#### A growing resource

At the Eastern Treatment Plant, wastewater is treated to a level high enough for re-use. Recycled water produced by the Eastern Treatment Plant is currently used to irrigate crops, parklands and sporting fields and also for non-potable uses in homes and businesses in the Cranbourne and Keysborough areas. Recycled water supplies are also distributed to housing estates in Cranbourne for a range of domestic uses, such as laundry, washing cars and watering the garden. However, the majority of treated wastewater is not currently reused and is transferred to Bass Strait at Boags Rock via the South Eastern Outfall. As the population in the catchment grows, so too will wastewater generation, providing further opportunity for reuse locally and in areas along the route of the outfall. Cross-catchment working across the Dandenong and Western Port Catchments will be important to drive reuse opportunities here.



Water For Victoria. Photographer: Craig Moodie. Courtesy: DELWP

**N**

**10%**  
**NITROGEN**

from the catchment's wastewater is recovered and used beneficially.<sup>9</sup>

**C**

**25%**  
**CARBON**

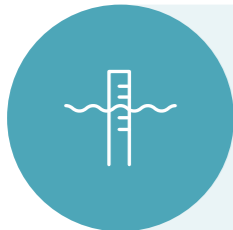
from the catchment's wastewater is recovered and used beneficially.<sup>9</sup>

**Harnessing resources and avoiding waste**

It has been recognised that we need to move away from a linear 'treat and discharge' system to a 'resource recovery' system to support a circular economy and drive more sustainable outcomes.<sup>7</sup> We have started this journey by progressively using more recycled water. However, there are other resources from wastewater that could also be harnessed to fertilise crops or generate energy.

**Measuring the change we want to make**

Our measures	Scale	Our current performance (2019)	Our catchment target for the future		How will this measure drive change?
			2030	2050	
2.1a Recycled water delivered to customers. <sup>h</sup>	Catchment	10 Gigalitres /year	85 Gigalitres /year (with Western Port catchment)	–	This measure gives insight into the use of recycled water to support needs in the community. In achieving the targets for this measure, the Melbourne region will be a world leader in advancing a circular economy and will be on track to beneficially use 100% of our water and resources by 2070 while ensuring affordability for current and future generations of Melburnians.
	Region	44 Gigalitres /year	85 Gigalitres /year	230 Gigalitres /year	
2.1b Nitrogen recovered at treatment facilities for beneficial use. <sup>9</sup>	Catchment	10 %	–	–	These measures have been chosen to enable tracking of the recovery of two of the more valuable components of wastewater, nitrogen and carbon. The proposed 2050 targets are based on the concept of a major paradigm shift in how we manage wastewater. These targets will drive a change that re-frames wastewater as a key resource, from which resources can be harvested for beneficial use. The target is weighted by inflows, giving focus to where the greatest impacts can be made – primarily at the Western and Eastern Treatment Plants which service the majority of the region.
	Region	8 %	–	94 %	
2.1c Carbon recovered at treatment facilities for beneficial use. <sup>9</sup>	Catchment	25 %	–	–	
	Region	17 %	–	67 %	



### Strategic Outcome 3

Existing and future flood risks are managed to maximise outcomes for the community

Flooding can have major impacts on communities and businesses, and needs to be considered as part of an IWM approach. To date, flood risk management has often been managed separately from the rest of the water cycle, but there are many ways in which flood risk management initiatives can deliver multiple benefits to the water cycle, and in which other stormwater management and greening initiatives can reduce flood risk.

#### The case for change

##### Increasing impacts of flooding

In urbanised areas, flooding of the stormwater drainage system can cause significant damage and disruption. This is particularly an issue in older and more established parts of the catchment, where neighbourhoods have developed and changed over time since the drainage system was planned. When there is more runoff than underground drains or designated overland flow paths can accommodate, water can spill into surrounding land, flooding roads and properties. The Dandenong Catchment has chronic issues with flooding of the underground drainage system, which routinely impact communities, infrastructure and amenities. As our population continues to grow and development of urban areas intensifies, the impacts of flooding will increase. Furthermore, while the future climate is expected to be drier, more intense rainstorms are anticipated to exacerbate flooding.

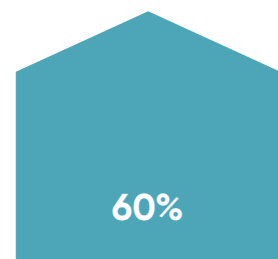
##### An IWM approach to flood management

An IWM approach can reduce the impacts of flooding from drainage systems by harvesting rainwater or stormwater, retaining more water in the landscape, or creating more storage in urban catchments to slow flows to the drainage system. Equally, flood management infrastructure such as retarding basins and floodplains can be designed to enhance recreation opportunities and provide greater amenity. Better integration between flood management and other IWM initiatives will ensure we deliver cross-benefits to the community.



**\$735.5**  
MILLION

is the estimate of the annual average damage (AAD) caused by flooding in the region (2020 baseline).<sup>8</sup>



**INCREASE**

in the economic impact of damages from flooding could be seen by 2050 if no action is taken.<sup>8</sup>

### Measuring the change we want to make

Our measures	Scale	Our current performance (2019)	Our catchment target for the future		How will this measure drive change?
			2030	2050	
3.1 Reduction in Annual Average Damage (AAD) delivered by flood management initiatives.	Catchment	Zeroed to 2020 baseline	\$9-64 million <sup>i</sup>	–	This measure considers progress in reducing the estimated AAD from flooding through physical interventions, policy changes or education. It is baselined against the AAD estimation for 2020. A 2050 target has been set for the region which seeks to negate the increases expected due to both climate change and urban consolidation, thereby ensuring that the impacts of flooding in the region do not significantly increase in the future.
	Region	Zeroed to 2020 baseline	\$37-102 million <sup>i</sup>	\$408 million	
3.2 Effective flood storage volume created as part of multi-functional assets.	Catchment	61,000 m <sup>3</sup>	For monitoring only		This measure seeks to understand how well we are integrating flood mitigation through an IWM process by delivering multi-functional assets that also provide flood storage.
	Region	106,000 m <sup>3</sup>			
3.3 Projects that cross-consider IWM and flood mitigation opportunities as part of their design	Catchment	No data	100 %	100 %	This measure is designed to drive a change in practice and build stronger interrelationships between flood management and other aspects of IWM.
	Region	No data	100 %	100 %	



## Strategic Outcome 4

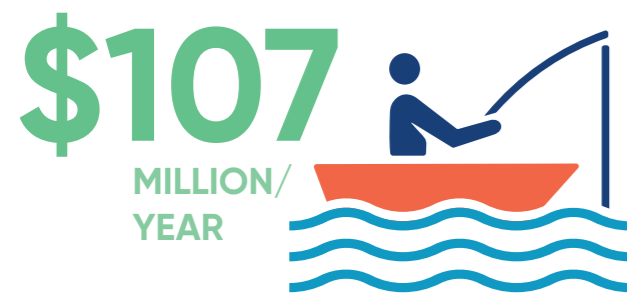
### Healthy and valued waterways and marine environments

An understanding of the health of our waterways and marine environments is crucial to IWM as they interact with many parts of the water cycle and support a range of community and environmental values. This strategic outcome explores how IWM can improve the health of our waterways and bays. It also explores the impacts of the use of river catchments for water supplies and how we are improving the amount of water available for the environment in waterways.

### The case for change

#### Our waterways and Port Phillip Bay

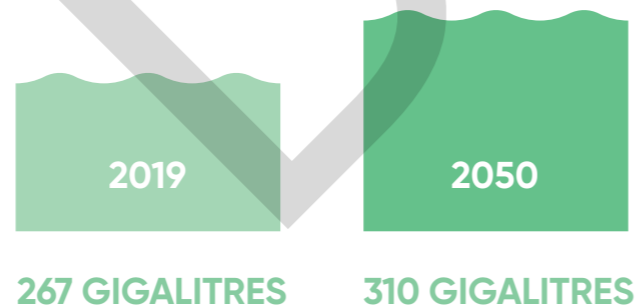
The Dandenong catchment contains an array of significant and biologically diverse waterways ranging from expansive rivers, small ephemeral creeks and the eastern shoreline of Victoria's iconic Port Phillip Bay, which is a treasured centrepiece for the Region. On the western boundary of the catchment, sandy bay beaches and rocky shores span the coast from Port Melbourne to Portsea on the southern tip of the Mornington Peninsula. Many of the small creeks and waterways within the Dandenong Catchment have been straightened or concrete lined, contributing to decreased water quality and loss of stream habitats in the region.



The estimated impact on the economy if pollution entering Port Phillip Bay results in more persistent algal blooms and poor water quality at beaches.<sup>10</sup>

#### Changes in stormwater runoff volumes

Increasingly, the volume of stormwater runoff from urbanised areas entering waterways is being recognised as a key predictor of waterway health.<sup>9</sup> As an area is developed and more hard surfaces are introduced, more stormwater runoff is created and directed to waterways through the drainage system instead of soaking into the ground, evaporating or being absorbed by plants. These large volumes of runoff enter waterways very quickly and with greater intensity, disrupting natural flow patterns and degrading waterway forms and habitats. The Dandenong Catchment is becoming increasingly urbanised, changing the volume, location and timing of runoff entering waterways.



Runoff generated from urban areas in the catchment in excess of that which would runoff a natural landscape, which, if not retained or harvested, is drained to receiving environments.<sup>6</sup>

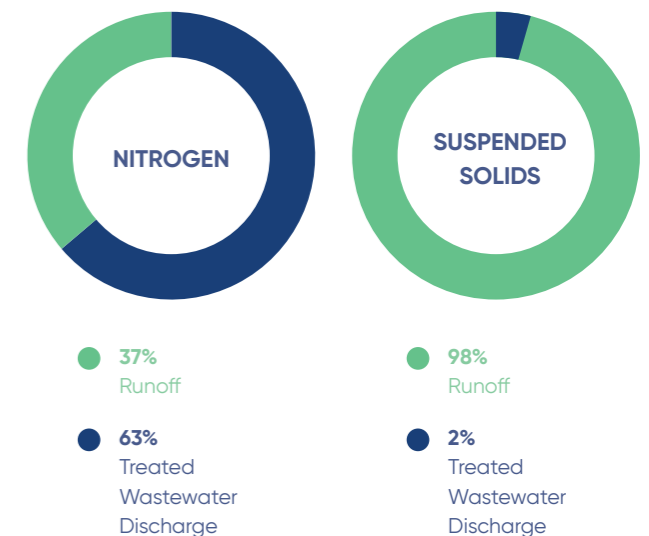
#### Changes in water quality

Poor or declining water quality in our waterways and bays has long been recognised as an issue in the region.<sup>9</sup> Two key sources of pollution of our waterways and the Bay are land runoff (from both rural and urban areas) and releases of treated wastewater. Over the last three decades, there has been considerable work done in the Melbourne region to improve water quality through improved treatment and local recycling of stormwater and wastewater, and improved management of rural land and our waterway corridors. However, as our population grows, so too will the potential pollution of our receiving environments.

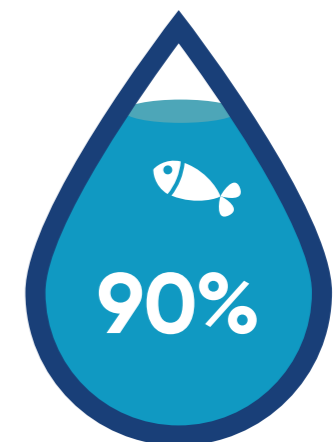
Despite the large populations living near its coastline, Port Phillip Bay is generally in good health, offering high water quality and an abundance of marine flora and fauna. Along the coast, water quality tends to be lower than in the protected marine parks within the bay, and this is largely related to urban and rural influences on stormwater runoff to the bay. Increases to nitrogen levels in Port Phillip Bay could increase the risk of algal blooms or over-stimulate the growth of other marine plants. Sediments, and the pollutants they carry, reduce water quality of our waterways and the Bay. In the Dandenong Catchment, most of the pollutants entering the environment arise from runoff. Pollutants from treated wastewater in the catchment do not enter Port Phillip Bay, and are instead transferred to Bass Strait at Boags Rock via the South Eastern Outfall.

#### Environmental flows in waterways

Natural flow patterns in some waterways in the Dandenong Catchment have been altered by irrigation diversions, though the impacts are considerably less in the Dandenong Catchment than other catchments.



Proportion of pollutants released to the environment in the Catchment.<sup>1</sup>



Current share of the flows in the Bunyip Basin for the environment.<sup>6</sup>

## Measuring the change we want to make

Our measures	Scale	Our current performance (2019)	Our catchment target for the future		How will this measure drive change?
			2030	2050	
4.1 Mean annual urban runoff volume reduction.	Catchment	8 Gigalitres/year	11 Gigalitres/year	19 Gigalitres/year	This measure focuses on runoff volume reductions from urban areas, reflecting the desire to reduce the adverse impact that increases in stormwater runoff have on waterways. The target aims to remove a majority of anticipated increases in stormwater runoff in targeted locations where our waterways are most vulnerable to flow increases.
	Region	22 Gigalitres/year	70 Gigalitres/year	197 Gigalitres/year	
4.2a Mean annual Total Suspended Solids (TSS) prevented from discharging to receiving waters. <sup>l</sup>	Catchment	79,000 tonnes/year	Achieve pollutant removals necessary to the State Environmental Protection Policy (Waters) targets for Port Phillip Bay noting the Saving and Transitional provisions that may come into effect from the amended Environmental Protection Act 2017, applies from 1 July 2021. <sup>k</sup>		These measures focus on how well we are employing water management techniques to improve water quality by measuring the reduction in two key pollutants transferred to receiving environments. These targets will protect the health of Port Phillip Bay by avoiding an increase in the pollutant loads entering the Bay.
	Region	205,000 tonnes/year			
4.2b Mean annual Total Nitrogen (TN) prevented from discharging to receiving waters. <sup>l</sup>	Catchment	7567 tonnes/year			
	Region	20,377 tonnes/year			
4.3 Additional water allocated to environmental water reserve that increases environmental benefits in waterways.	Catchment	0 Gigalitres/year	To be defined by the Central and Gippsland Region Sustainable Water Strategy.		This measure explores the impact of IWM on the provision of environmental flows, which are important for waterways where natural flow patterns have been significantly altered by bulk water supply or irrigation diversions.
	Region	0 Gigalitres/year			



## Strategic Outcome 5 Healthy and valued urban and rural landscapes

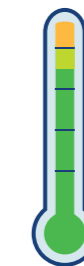
Water is integral to the health and wellbeing of our landscapes. By supporting and enhancing vegetation and green spaces, water helps to provide greater amenity, better opportunities for recreation, improved ecological value and localised cooling that gives relief to communities during hot weather. Landscapes that harness alternative water supplies can also enhance resilience during droughts, when potable water supplies may be restricted, and provide water to landscapes that may not otherwise receive irrigation.

### The case for change

#### Active and passive open space

Public open space is an important asset for communities. These spaces are diverse, including 'active' open space such as sportsgrounds and ovals, and 'passive' open space such as parklands and gardens. Provision of irrigation to these spaces can increase greening and amenity, but also enhance usability and safety for sports. To date, irrigation has been prioritised for active open spaces, but there is increasing recognition of the importance of improving passive open spaces for communities and creating local cooler, greener environments during heat waves. Alternative water supplies can provide irrigation of open space by harvesting stormwater runoff or connecting to a recycled water supply.

**50%**  
OPEN SPACE  
WITH IRRIGATION



**5°** TEMPERATURE  
REDUCTION

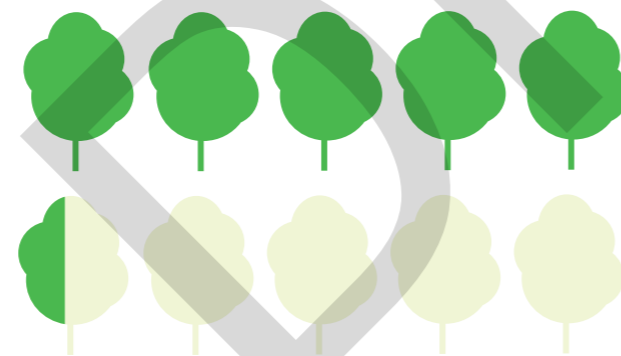
The proportion of open space with irrigation which will reduce the average land surface temperature across an urban area by up to 5 degrees Celsius on an extreme heat day.<sup>15</sup>

## Measuring the change we want to make

Our measures	Scale	Our current performance (2019)	Our catchment target for the future		How will this measure drive change?
			2030	2050	
5.1 Street trees that are supported with permanent irrigation from an alternative water supply.	Catchment	2 %	11 %	23 %	This target for tree irrigation using alternative water sources will drive a change in practice across the region that will support our healthy, thriving street trees in a sustainable way.
	Region	2 %	12 %	23 %	
5.2a Active public open space (sports fields and organised recreation) supported by an alternative water source. <sup>1</sup>	Catchment	5 %	19 %	45 %	By delivering the target for 5.2a, we will support sport and recreation, and cool our neighbourhoods during heat waves, increasing the resilience and liveability of our neighbourhoods.
	Region	7 %	19 %	48 %	
5.2b Passive public open space (parkland and gardens) supported by an alternative water source. <sup>1</sup>	Catchment	0 %	4 %	10 %	By delivering the target for 5.2b, we will ensure we take opportunities to support passive open space irrigation where it makes sense, to enrich communities by providing healthier, greener and multi-functional open spaces.
	Region	2 %	6 %	28 %	
5.3 Reduction in land surface temperature attributed to IWM in urban areas.	Catchment	No data	For monitoring only		Where IWM increases shade, vegetated surfaces or the presence of water in the landscape, there is the potential to reduce local air and land temperatures. By measuring this impact, we can better articulate the change we are making.
	Region	No data			

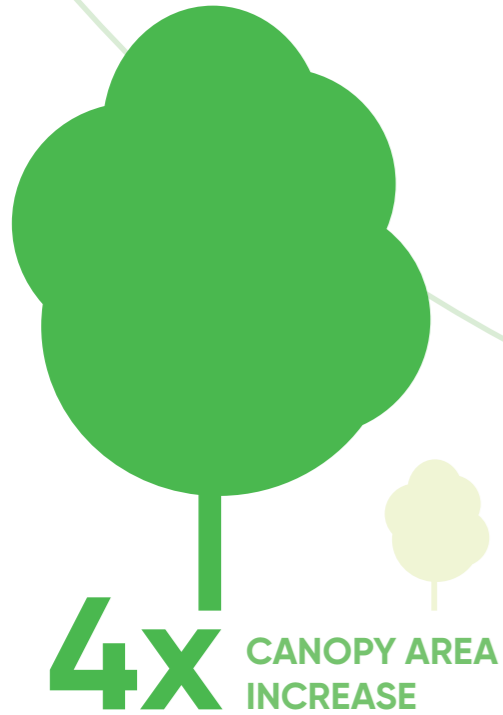
### Trees and canopy cover

The benefits of trees in the urban environment are well-known, providing shade, amenity and biodiversity.<sup>12</sup> Trees with a large, healthy canopy provide the greatest benefits, and provision of irrigation is often necessary to support healthy tree canopies in urban environments where trees are planted in constrained areas and have limited access to water through their root systems. In the future, drier and hotter conditions are likely to make this need even greater. There are hot-spot areas in the Catchment with low canopy cover where increases in tree cover will be crucial, particularly in Greater Dandenong and Casey.<sup>12</sup> Generally, tree canopy cover in the catchment is higher than the western areas of the region, contributing to the leafy character of the established neighbourhoods. However, a recent study of tree resilience identified that a substantial proportion of trees in Melbourne would not be able to survive future climates.<sup>13</sup> To manage this risk, provision of irrigation is a key strategy to improve survival rates. Street trees can be supported by alternative water resources, by directing runoff from roads to trees or by irrigating with a recycled water supply.



**54% EXISTING TREES**

Of existing trees across ten local government areas in Melbourne were found to be at risk under future climate conditions.<sup>13</sup>



Canopy area increase when irrigation is provided to a street tree planted in typical conditions in urban Melbourne.<sup>14</sup>

### Urban heat

Temperatures in urban areas tend to be significantly higher than rural areas because of higher concentrations of paved surfaces that retain heat, and less vegetation cover. Our future climate is likely to be hotter and drier, with increased regularity of heat waves. Heat waves and high temperatures pose a significant threat to human health, particularly for vulnerable populations such as the elderly and young children. The Dandenong Catchment has areas with high vulnerability to urban heat, in Greater Dandenong, Frankston and Kingston in particular. Adapting our cities to mitigate the impacts of urban heat through better integration of water and vegetation is a key priority for the Melbourne region, recognising the importance of this for both liveability and resilience.<sup>11</sup>



### Strategic Outcome 6

Community values are reflected in place-based planning

This strategic outcome explores the benefits provided to local communities through effective IWM planning. Measures for this outcome include community understanding of water and Traditional Owner perceptions around how well IWM initiatives incorporate Aboriginal values, as well as how proposed initiatives support amenity, health and well-being which are important values to all communities.

#### The case for change

##### Traditional Owner values

Traditional Owners and aboriginal Victorians have a strong cultural, spiritual and economic connection to water, gathered from the sustainable management of land, water and resources over thousands of generations. Water for Victoria<sup>16</sup> outlines Traditional Owners and Aboriginal Victorians' role in the management of the state's water resources.

It includes provisions to recognise and incorporate Aboriginal values and knowledge in water planning and to support Aboriginal participation in water management. Respecting the connection to Country of Traditional Owners can positively impact on health, well-being and cultural identity.

637x  
MELBOURNE CRICKET GROUND



= 1,275 HECTARES

Of blue-green infrastructure has already been created or enhanced through IWM initiatives in the catchment.<sup>17</sup>

##### Sense of place and amenity

Sense of place and satisfaction with local amenity are broad concepts that planners and local governments work hard to enhance. Water can play a significant role in enhancing amenity and local character through the integration and enhancement of blue-green infrastructure, such as waterways, wetlands, and other stormwater management assets. Greener neighbourhoods and access to quality open space, waterways, lakes and beaches have been shown to significantly improve both physical and mental health.<sup>17</sup> Recently, the COVID-19 pandemic has led to a growing community appreciation of the multiple health and well-being benefits that blue-green spaces in urban areas can provide. Through better integration of IWM with neighbourhood planning, we can enhance amenity and benefits for the community.

##### Community understanding of the water cycle

Community understanding of the water cycle has progressively changed over recent years, with a greater acknowledgement of the role that water can play in enhancing community health and well-being, local amenity and overall urban liveability. The Millennium Drought highlighted the importance of water for communities, with water restrictions directly impacting neighbourhood amenity and bringing water use and efficiency front of mind. It has been shown that Australians have a good knowledge of some water issues, however, Victorians tended to have some of the lowest levels of water knowledge.<sup>19</sup> A number of organisations play an important role in supporting and facilitating increased community understanding and connections to the water cycle, including councils, water corporations, local Landcare groups and schools.



74%

Of Australians were found to have a clear or general sense of how the water cycle works.<sup>18</sup>



Braeside Park. Courtesy: Parks Victoria



## Measuring the change we want to make

Our measures	Scale	Our current performance (2019)	Our catchment target for the future		How will this measure drive change?
			2030	2050	
6.1a Traditional Owners' capacity to partner in IWM programs, policy, planning and projects (Rating out of 5).	Catchment	Insufficient data <sup>n</sup>	To be confirmed	To be confirmed	Representatives of the Registered Aboriginal Parties in the metropolitan Catchments report unsustainable levels of demand for their interest and insight, which is impacting their capacity to genuinely partner in IWM. This measure aims to understand the amount or volume of work placed on Traditional Owners, and their ability or power to deliver outputs.
	Region	Insufficient data <sup>n</sup>	To be confirmed	To be confirmed	
6.1b Other IWM partner organisations' capability to partner with Traditional Owners in IWM programs, policy, planning and projects (Rating out of 5). <sup>o</sup>	Catchment	2.3	To be confirmed	To be confirmed	Organisations involved in IWM have obligations to include Traditional Owners and consider Aboriginal values in their organisational activities. This measure helps us track our progress in improving partnerships with Traditional Owners.
	Region	2.5	–	–	

Our measures	Scale	Our current performance (2019)	Our catchment target for the future		How will this measure drive change?
			2030	2050	
6.2 Blue-green infrastructure created or enhanced by IWM as a proportion of land area. <sup>m</sup>	Catchment	1.05 %	For monitoring only		This measure recognises that where green-blue infrastructure is either added or significantly enhanced, it is likely to improve local amenity and sense of place, as well as the health and well-being of the community. By measuring this impact, we can articulate how IWM supports amenity.
		0.59 %			
6.3 Community literacy regarding the water cycle (Rating out of 5). <sup>p</sup>	Catchment	2.6	4.5	5	Community connection and understanding of the water cycle are important contributors to water sensitive placemaking. This target will drive community confidence and participation in IWM solutions.
	Region	2.6	4.5	5	
6.4 Whether water is a key element in city planning and design process (Rating out of 5). <sup>p</sup>	Catchment	2.6	4.5	5	This measure considers the degree to which water system planning is integrated into urban planning and design. This target will drive an integrated approach to planning at all scales, which plans for and enables the delivery of IWM.
	Region	2.7	4.5	5	



## Strategic Outcome 7 Jobs, economic benefits and innovation

This outcome explores how IWM can enhance business and local economies by supporting food production, tourism and commercial activities. It is difficult to directly attribute increases in business revenue to IWM, but measures have been selected for this outcome which recognise the essential role of water to support agriculture, production and major industries.

### The case for change

#### Economic support and stimulation

Water is vital for our economy. Many productive businesses and industries, including manufacturing, agriculture, food processing, energy, and mining, rely on safe, secure and affordable water supplies. IWM can support and stimulate local economies by providing resources to businesses and industry which leverage a circular economy and add resilience in times of drought. "One man's waste is another man's treasure" is a sentiment that can be true for complementary water resources. For example, wastewater is an excellent resource for many types of agriculture, where both a reliable source of water and rich nutrients are needed to increase yield. Equally, alternative sources of water can be suitable for certain industrial and commercial water users, and for those who use large amounts of water as they depend on a sustainable water supply in determining their business viability and selection of location.



of the food needs of greater Melbourne's population can currently be met by Melbourne's food bowl.<sup>19</sup>



in the agriculture, forestry and fishing sector in the South Study Area of the Melbourne Region.<sup>20</sup>

#### Supporting our local food bowl

Agriculture and horticulture in the Greater Metropolitan Melbourne Region are crucial to the economic success and the future resilience of the region. Melbourne's food bowl includes multiple relatively small areas of food production scattered around the city fringe, which are highly productive and are an important industry for the region. Conventionally, agricultural areas have relied on water from groundwater and river water resources, however these are in decline due to the impacts of climate change and increasing and competing pressure on resources. Supporting and enhancing agricultural production with alternative water supplies will be important for the resilience of our region.

Notable tourism and commercial activities occur throughout the Catchment, particularly along the Mornington Peninsula where recreation and tourism to the Catchment's coastal attractions and vineyards contributed an estimated \$700 million to the local economy.<sup>20</sup>

#### Supporting our industries and businesses

As the region grows and changes, commercial and industrial uses of water will also change. Water corporations expect that on a per hectare basis, non-residential water use will increase over time, however the proportion of land in urban areas dedicated to non-residential use is generally declining. The growth areas on the fringe of Melbourne will include commercial and industrial areas, creating opportunities for shared water resources.

The Dandenong Catchment includes a major growth corridor in southeast Victoria comprising several areas designated for population and economic growth. The Dandenong National Employment and Innovation Cluster (NEIC) currently employs more than 66,000 people through a range of international and domestic businesses spanning the manufacturing, health and education sectors, as well as wholesale trade, retail, transport, postal services and warehousing. The Monash NEIC is also partly within the Dandenong Catchment and comprises Melbourne's largest concentration of jobs outside the central business district. The Catchment's largest manufacturing centres, Kingston and Dandenong, provide 44 per cent of Victoria's total manufactured product.<sup>21</sup>



supported in the Dandenong National Employment and Innovation Clusters in the Catchment.<sup>21</sup>

## Measuring the change we want to make

Our measures	Scale	Our current performance (2019)	Our catchment target for the future		How will this measure drive change?
			2030	2050	
7.1a Alternative water supplied to agricultural production	Catchment	6 Gigalitres /year	9 Gigalitres /year	11 Gigalitres /year	Conventionally, agriculture has been dependent on river water and groundwater, the availability of which is declining with climate change and other pressures. This target will support Melbourne's population with local food supply (continuing the existing proportion of 41%), by enhancing the Melbourne region's food bowl through the supply of alternative water resources.
	Region	34 Gigalitres /year	63 Gigalitres /year	112 Gigalitres /year	
7.1b Alternative water supplied to businesses and industry (>10ML/year)	Catchment	392 Megalitres /year	For monitoring only		The measure reflects the provision of alternative water sources to major water users, where water is likely to be a key resource impacting the viability of their production process or business.
	Region	3393 Megalitres /year			



### Enablers Commitment, Capacity and Collaboration

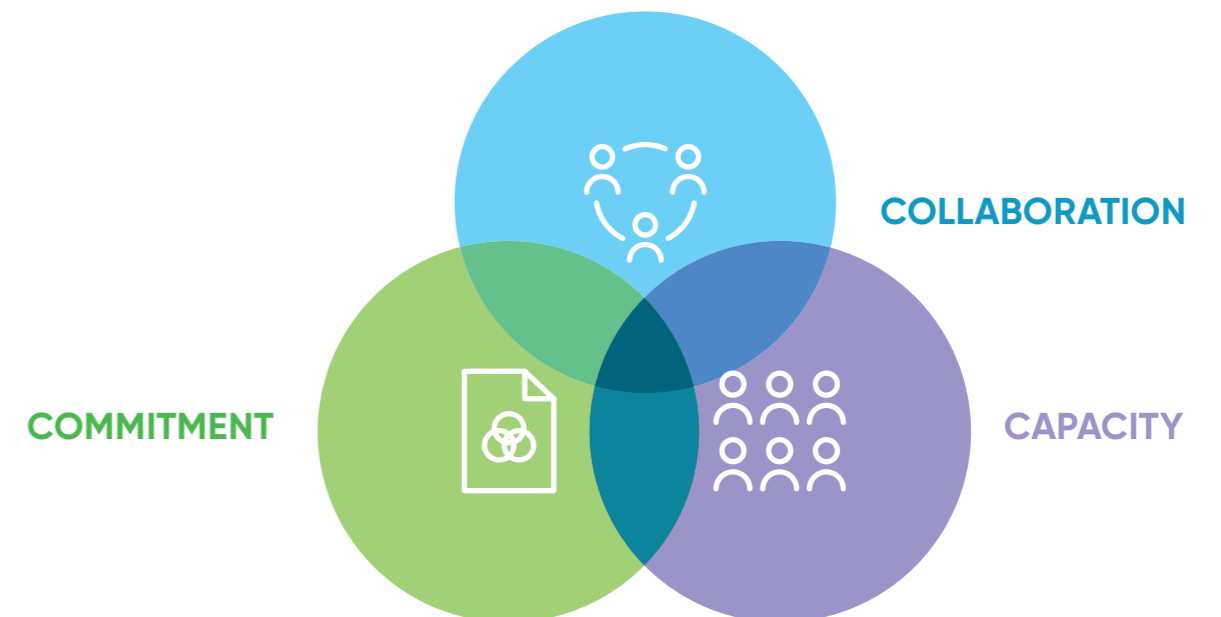
Strategic enablers represent a series of useful indicators and measures that are overarching to the success of the seven key strategic outcomes. Without these fundamental factors in place, the mainstreaming of IWM will remain challenging. This is in recognition of the fact that across Greater Metropolitan Melbourne there are multiple organisations that hold responsibility for managing the urban water cycle, with a collaborative and integrated approach essential for effective planning and delivery of IWM initiatives.

### The case for change

#### Transitioning to integrated water management

Conventionally, the water cycle has been managed in separate parts, with water supply, wastewater management, and stormwater drainage infrastructure typically being managed by different organisations, and in a centralised manner. However, population growth and a changing climate has led to stressed ecosystems and increasing unpredictability around

water supply, requiring a more integrated approach to water management. The evidence-based targets specified in this Plan provide an important basis for ongoing commitment, capacity and collaboration to implement IWM. These three factors are considered critical to transitioning towards more widespread integrated water management practices.<sup>22</sup>



### A continued cross-organisational approach

The Forum brings together 22 organisations with an interest in water cycle management across the Dandenong Catchment. To ensure IWM is successful and enduring across the Catchment, the Dandenong IWM Forum partners commit to promote a collaborative and shared values culture within their own organisations and through their work with local communities and water cycle delivery partners. This ongoing commitment, collaboration and investment in capacity to deliver IWM is crucial to drive this Plan forward.

### Acting early to embed change

This Plan sets out ambitious targets for IWM in the Dandenong Catchment and the broader Greater Metropolitan Melbourne Region. To enable this step-change in approach, it is crucial that the right conditions are put in place early to enable this transition.

## Measuring the change we want to make

Our measures	Scale	Our current performance (2019)	Our catchment target for the future		How will this measure drive change?
			2030	2050	
E1 Vision, leadership and long-term commitment through vision statement and objectives articulated in corporate documents (Rating out of 5) <sup>P</sup>	Catchment	3.4	4.5	5	This measure tracks the degree to which organisational leadership is supportive of the adopted vision and water management agenda, and able to strategically commit to and initiate IWM initiatives.
	Region	3.1	4.5	5	
E2 Knowledge, skills and organisational capacity (Rating out of 5) <sup>P</sup>	Catchment	3.0	4.5	5	This measure rates the knowledge and skills of key water related organisations in the Catchment, together with organisational capacity to successfully deliver IWM.
	Region	2.9	4.5	5	
E3 Cross-sector institutional arrangements and processes (Rating out of 5) <sup>P</sup>	Catchment	2.9	4.5	5	This measure assesses whether the institutional arrangements and processes required to achieve IWM are in place and embedded across the sector.
	Region	2.7	4.5	5	

# References

1. State Government of Victoria (2017). Integrated Water Management Framework for Victoria.
2. State Government of Victoria (2019). Victoria in Future 2019 (VIF2019).
3. State Government of Victoria (2021). Central and Gippsland Region Sustainable Water Strategy. Draft.
4. State Government of Victoria (2020). Guidelines for Assessing the Impact of Climate Change on Water Supplies.
5. Melbourne Water (2017) Melbourne Water Systems Strategy.
6. State Government of Victoria (2020) Long-term water resource assessment – Southern Victoria.
7. Melbourne Water (2020) Melbourne Sewerage Strategy.
8. Melbourne Water (2021) Draft Flood Management Strategy Port Phillip and Westernport 2021-2031.
9. Melbourne Water (2018) Healthy Waterways Strategy.
10. Environment Protection Agency (2020) Draft Urban Stormwater Guidelines.
11. State Government of Victoria (2016) Plan Melbourne 2017-2050
12. Nature Conservancy and Resilient Melbourne (2019). Living Melbourne: our metropolitan urban forest.
13. Clean Air and Urban Landscapes Hub (2017). Risks to Australia's urban forest from climate change and urban heat.
14. Hitchmough, J (1994). 'Roof gardens and other landscapes involving finite volumes of artificial soils', Hitchmough J (ed) Urban landscape management. Sydney, Inkata Press.
15. Urich, C., Hardy, M. (2020) Cooling and Greening Melbourne – Future scenarios. Cooperative Research Centre for Water Sensitive Cities.
16. State Government of Victoria (2018). Water for Victoria, Chapter 6.
17. Kendal, D., Lee, K., Ramalho, C., Bowen, K. and Bush, J., 2016. Benefits of urban green space in the Australian context.
18. Fielding, K., Karnadewi, F., Newton, F., & Mitchell, E. (2015). A National Survey of Australians' Water Literacy and Water-related Attitudes. Melbourne, Australia: Cooperative Research Centre for Water Sensitive Cities.
19. Sheridan, J., Larsen, K. and Carey, R. (2015) Melbourne's food bowl: Now and at seven million. Victorian Eco-Innovation Lab, The University of Melbourne.
20. State Government of Victoria (2020) Planning for Melbourne's Green Wedges and Agricultural Land, Consultation Paper May 2020.
21. Dandenong IWM Forum (2018) Dandenong Strategic Directions Statement.
22. Brown, R., Rogers, B., Werbeloff, L. (2016). Moving toward Water Sensitive Cities: A guidance manual for strategists and policy makers. Melbourne, Australia: Cooperative Research Centre for Water Sensitive Cities.

# Notes

- a. Based on comparison of 2018/2019 potable water use data with projected potable water use in 2050 under the Reference State examined by the Plan. Potable water use projections will be updated in Water for Life: Greater Melbourne Urban Water Systems Strategy 2022.
- b. Based on modelling in Melbourne Water (2017) Melbourne Water Systems Strategy. Supply-demand shortfall projections will be updated in Water for Life: Greater Melbourne Urban Water Systems Strategy 2022.
- c. Based on adaptation of a Source Catchments model of the Port Phillip and Western Port Catchment (DELWP/Melbourne Water 2020) comparing runoff generated in the developed catchment model compared with natural grassland model to determine the 'urban excess runoff'.
- d. Based on residential and commercial/industrial water use in the catchment factored by 0.8.
- e. Based on the total potable water use (2018/2019) for the five catchment areas in the region divided by the most recent population data of that area (Census data August 2016). The Melbourne Water Outlook 2020 reported an average of 162 litres per person per day for 2018/2019, which is calculated to a different boundary (the service areas of City West Water, Dandenong Valley Water and South East Water) and using a population projection for those service areas.
- f. Based on reported total releases of treated wastewater to the environment in 2018/2019 and projected additional wastewater (minus projected recycled water use) in 2050 under the Reference State examined by the Plan.
- g. A weighted average based on wastewater inflow volumes to the wastewater treatment plants.
- h. This measure includes recycled water provided to customers, and does not include recycled water utilised by water authorities within the treatment process or to irrigate land owned by the water authority.
- i. Range to be further refined through feasibility testing and optioneering.
- j. Represents pollutants released to the environment within each sub-catchment. Pollutants from runoff generated in the catchments was estimated using a Source Catchments model of the Port Phillip and Western Port Catchment (DELWP/Melbourne Water 2020), minus estimated removals from stormwater treatment, harvesting and management initiatives and assets within each sub-catchment. Pollutants from treated wastewater based on reported releases of treated wastewater to the environment in 2018/2019.
- k. As outlined in Environment Protection Authority Victoria (2019) Development of environmental quality indicators and objectives for SEPP (Waters). Publication 1733, the SEPP (Waters) targets for Port Phillip Bay include a nitrogen (TN) target that seeks to ensure that "nitrogen loads entering the Bay should not exceed current levels to reduce the risk of frequent and intense algal blooms" and a sediment (TSS) target "to improve water quality and reduce pollutants that are typically bound to sediment particles". Western Port has a sediment (TSS) target "intended to prevent an increase in catchment sediment inputs to allow in-bay sediments to be naturally removed by tides and currents". The relationship between pollutant removal within a catchment, and pollutant loads entering Port Phillip Bay and Western Port is complex but can be represented through catchment scale modelling. Further work is required to recommend the most effective pollutant reduction strategies and locations to meet the SEPP targets. However, in broad terms the targets seeks to ensure pollutant loads do not increase further beyond the baseline levels determined for Port Phillip Bay (2017) and Western Port (2018).

# Glossary of terms

- l. The current total area of public open space is calculated using the data set from the Victorian Environmental Assessment Council (2011) Public open space categories in the entire metropolitan Melbourne area. The State of Victoria. Active open space is equated to 'organised recreation areas' and passive open space includes 'parkland and garden' and 'services and utilities areas'.
- m. Including stormwater treatment assets that include vegetation or open water, naturalised waterways, open spaces that have been created or enhanced through water management.
- n. A baseline rating for measure 6.1a could not be determined by the time of publication due to insufficient data being available. It is acknowledged that IWM Forum engagement and partnership with Traditional Owner Corporations has been consistent throughout the development of the Catchment Scale IWM Plans, including the co-creation of a survey to acquire data for this indicator. It is therefore reasonable to accept that a rating (out of five) of Traditional Owners' capacity to partner in IWM programs, policy, planning and projects is not "zero", however it would not reflect best practice to infer an overall rating for this measure without an adequately representative sample. This outcome further substantiates what all IWM Forum partners, including Traditional Owner Corporations, have come to understand from experience: significant capacity constraints continue to prevent Traditional Owner partners from meaningfully contributing to IWM in a manner that is consistent with their Corporations' priorities and the principles of self-determination. This result strengthens the position stated by other IWM Forum partner organisations (i.e. organisations not identifying as a Traditional Owner Corporation) that more must be done to empower Traditional Owner as partners in IWM.
- o. Ratings were compiled for each catchment area based on a survey of IWM Forum organisations.
- p. Ratings were compiled for each municipality area based on Water Sensitive City Index records (where available) and a Council survey (2020). Respondents were encouraged to collectively agree a rating with other stakeholders involved in IWM in the municipality.

## **Aboriginal Victorians**

An Aboriginal Victorian is a person of Aboriginal descent who identifies as an Aboriginal and is accepted as such by the Victorian Aboriginal community in which he or she lives.

## **Algal blooms**

A rapid increase in the population of algae that can occur in waterways, often caused by excess nutrients (particularly phosphorus and nitrogen).

## **Assets**

Assets are resources that provide benefit. This includes, for example, infrastructure such as treatment plants, pipes and pumps, water assets such as dams, bores and wetlands, and community assets such as sporting facilities, public gardens and street trees. Natural assets are assets of the natural environment, for example waterways and vegetation, also known as natural capital.

## **Biodiversity**

The numbers and variety of plants, animals and other living beings, including micro-organisms, across our land, rivers and oceans. It includes the diversity of their genetic information, the habitats and ecosystems in which they live and their connections with other life forms.

## **Blue-green infrastructure**

Green infrastructure refers to key vegetation features such as street trees, parklands, grassed sports fields and vegetated walls. Blue infrastructure refers to waterways, wetlands, recreational lakes, stormwater retarding basins, or other water body features. Blue-green infrastructure brings these assets together through integrated approaches to deliver community benefits.

## **Catchment**

An area where water falling as rain is collected by the landscape, eventually flowing to a body of water such as a creek, river, dam, lake or ocean; or into a groundwater system.

## **Climate change**

A long-term change of the earth's temperature and weather patterns, generally attributed directly or indirectly to human activities such as fossil fuel combustion and vegetation clearing and burning.

## **Community**

Includes individuals, public and private landholders, community groups and business owners.

## **Department of Environment, Land, Water and Planning (DELWP)**

Supports Victoria's natural and built environment to ensure economic growth and liveable, sustainable and inclusive communities. The department assists the minister, develops and implements state policies and programs, and oversees the administration of organisations including catchment management authorities.

## **Ecosystem**

A dynamic complex of plant, animal, fungal and microorganism communities and the associated non-living environment interacting as an ecological unit.

## **Environmental water**

Water to support environmental values and ecological processes.

## **Fit for purpose**

Water of a quality that is appropriate for its intended use.

## **Floodplain**

Low-lying land adjacent to a river or stream with unique ecosystems dependent on inundation from flood events.

## **Flow**

Movement of water – the rate of water discharged from a source, given in volume with respect to time.

## **Gigalitre (GL)**

One billion (1,000,000,000) litres. One gigalitre is the equivalent of approximately 400 Olympic size swimming pools.

**Greater Metropolitan Melbourne Region**

The Port Phillip and Western Port Bay catchment area, including the Werribee, Maribyrnong, Yarra, Dandenong and Western Port catchments.

**Greenfield land**

Undeveloped land identified for residential or industrial/commercial development, generally on the fringe of metropolitan Melbourne.

**Groundwater**

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

**Growth areas**

Locations on the fringe of metropolitan Melbourne designated in planning schemes for large-scale transformation, over many years, from rural to urban use.

**Impervious area**

A surface or area within a catchment that significantly restricts the infiltration of water. Impervious surfaces can include concrete, road surfaces, roofs and saturated ground such as a lake or pond.

**Infrastructure**

Basic facilities and networks needed for the functioning of a local community or broader society.

**Integrated water management (IWM)**

A collaborative approach to planning that brings together all elements of the water cycle including wastewater management, water supply, stormwater management and water treatment, considering environmental, economic and social benefits.

**Integrated Water Management Forum**

A meeting of urban water management organisations to identify, prioritise and commit to the investigation of integrated water management opportunities.

**Integrated water management opportunity**

A servicing need that has the potential to leverage broader benefits when undertaken collaboratively, using an integrated water management approach.

**Liveability**

A measure of a city's residents' quality of life, used to benchmark cities around the world. It includes socioeconomic, environmental, transport and recreational measures.

**Megalitre (ML)**

One million (1,000,000) litres.

**National employment and innovation clusters (NEIC)**

Designated concentrations of employment distinguished by a strong core of nationally significant knowledge sector businesses and institutions that make a major contribution to the national economy and Melbourne's positioning in the global economy.

**Open space**

Includes land reserved for natural landscape, parklands, recreation and active sports.

**Potable**

Water of suitable quality for drinking.

**Rainwater**

Water that has fallen as rain or has been collected from rainfall.

**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 individuals, communities, institutions, businesses, systems and infrastructure to survive, adapt and grow, no matter what chronic stresses or shocks they encounter.

**Runoff**

The portion of rainfall which actually ends up as streamflow, also known as rainfall excess.

**Stormwater**

Runoff from urban areas. The net increase in runoff and decrease in groundwater recharge resulting from the introduction of impervious surfaces such as roofs and roads within urban development.

**Stormwater flooding**

Inundation by local runoff. Stormwater flooding can be caused by local runoff exceeding the capacity of an urban stormwater drainage system or by the backwater effects of mainstream flooding causing the urban stormwater drainage system to overflow.

**Sub-catchment**

A minor waterway catchment within one of the major waterway catchments in the region. There are 69 sub-catchments defined by the Healthy Waterways Strategy (Melbourne Water, 2018) in the Port Phillip Bay and Western Port Region, which are used as the spatial unit for the Plan analysis.

**Traditional Owners**

People who, through membership of a descent group or clan, are responsible for caring for Country. Aboriginal people with knowledge about traditions, observances, customs or beliefs associated with a particular area. A Traditional Owner is authorised to speak for Country and its heritage.

**Urban greening**

Growing plants wherever possible in cities to contribute to urban vegetation coverage and providing a connection to nature.

**Urban heat island effect**

When the built environment absorbs, traps, and in some cases directly emits heat, causing urban areas to be significantly warmer than surrounding non-urban areas.

**Urban renewal**

The process of planning and redeveloping underutilised medium and large-scale urban areas, precincts or sites for mixed land-use purposes.

**Urban water cycle**

The cycle of water through urban environments. Distinguished from the natural urban water cycle by the transfer of water through built infrastructure and the high runoff rates generated by impervious surfaces.

**Wastewater**

Water that has had its quality affected by human influence, deriving from industrial, domestic, agricultural or commercial activities.

**Water corporations**

Victorian 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 infrastructure**

Facilities, services and installations needed for the functioning of a water system.

**Water sector**

Organisations involved in water management, including water corporations, local government and catchment management authorities.

**Waterways**

Rivers and streams, their associated estuaries and floodplains (including floodplain wetlands) and non-riverine wetlands.

**Waterway health**

Waterway health is an umbrella term for the overall state of key features and processes that underpin functioning waterway ecosystems (such as species and communities, habitat, connectivity, water quality, riparian vegetation, physical form, and ecosystem processes such as nutrient cycling and carbon storage).

**Wetlands**

Areas, whether natural, modified or artificial, subject to permanent or temporary inundation, that hold static or very slow-moving water and develop, or have the potential to develop, biota adapted to inundation and the aquatic environment. Wetlands may be fresh or saline.

DRAFT

For more information visit:

[www.water.vic.gov.au/liveable/integrated-water-management-program](http://www.water.vic.gov.au/liveable/integrated-water-management-program)



Environment,  
Land, Water  
and Planning