MUNICIPAL INTEGRATED WATER MANAGEMENT PLAN

JULY 2017

CITY OF MELBOURNE

AN ECO CITY

We provide solid foundations for the sustainability of Melbourne's communities. We embrace the unfamiliar if it helps us achieve our ambitions. We continue to encourage our community to take positive actions and we lead by example locally, nationally and globally.

The City of Melbourne respectfully acknowledges the Traditional Owners of the Land. For the Woiwurrung (Wurundjeri), Boonwurrung, Taungurong, Dja Dja Wurrung and the Wathaurung groups who form the Kulin Nation, Melbourne has always been an important meeting place for events of social, educational, sporting and cultural significance. Today we are proud to say that Melbourne is a significant gathering place for all Aboriginal and Torres Strait Islander peoples.

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CONTENTS

July 2017

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1.0 OVERVIEW

Water is fundamental to the liveability of the city and the health and wellbeing of our community. As our climate changes, intense rainfall, flooding, extreme heat events and drought are becoming more common in Melbourne and across the world. Our municipality is also experiencing stronger population growth than previously forecast. New development is increasing, with a significant proportion of this growth in low-lying urban renewal zones that are subject to flooding.

To enable this growth and manage the added challenge of climate change, we need an integrated holistic approach that will provide multiple benefits. We need open space, smart flood mitigation solutions and fit-for-purpose water, recognising the role of water and green infrastructure in responding to the effects of climate change.

The City of Melbourne practices Integrated Water Management, defined as the coordinated management of all components of the water cycle including water consumption, rainwater, stormwater, wastewater and groundwater, to secure a range of benefits for the wider catchment.

We have been at the forefront of Integrated Water Management for many years, under the direction of our Total Watermark strategy. The first Total Watermark strategy was adopted in 2004 and subsequently revised in 2009 and 2014. Our current vision of 'a healthy city in a healthy catchment' has been in place since 2009 and is supported by a series of objectives, short and medium term targets and a four-year implementation plan. With the implementation plan coming to an end, we need to consider how the many changes since 2014 will influence our work in Integrated Water Management into the future.

Focus areas

This Municipal Integrated Water Management Plan (Plan) sets the strategic direction on water management across the municipality, using a place-based and catchment approach. It guides our effort, thinking and investment for the next four years.

Place-based actions have been developed for Fishermans Bend, Arden-Macaulay and Moonee Ponds Creek, Southbank and the Yarra River. Implementation of our existing Integrated Water Cycle Management Plan for the Elizabeth Street Catchment has also been included in this Plan, as well as actions that cover the whole municipality and a range of place-based actions for the rest of the municipality.

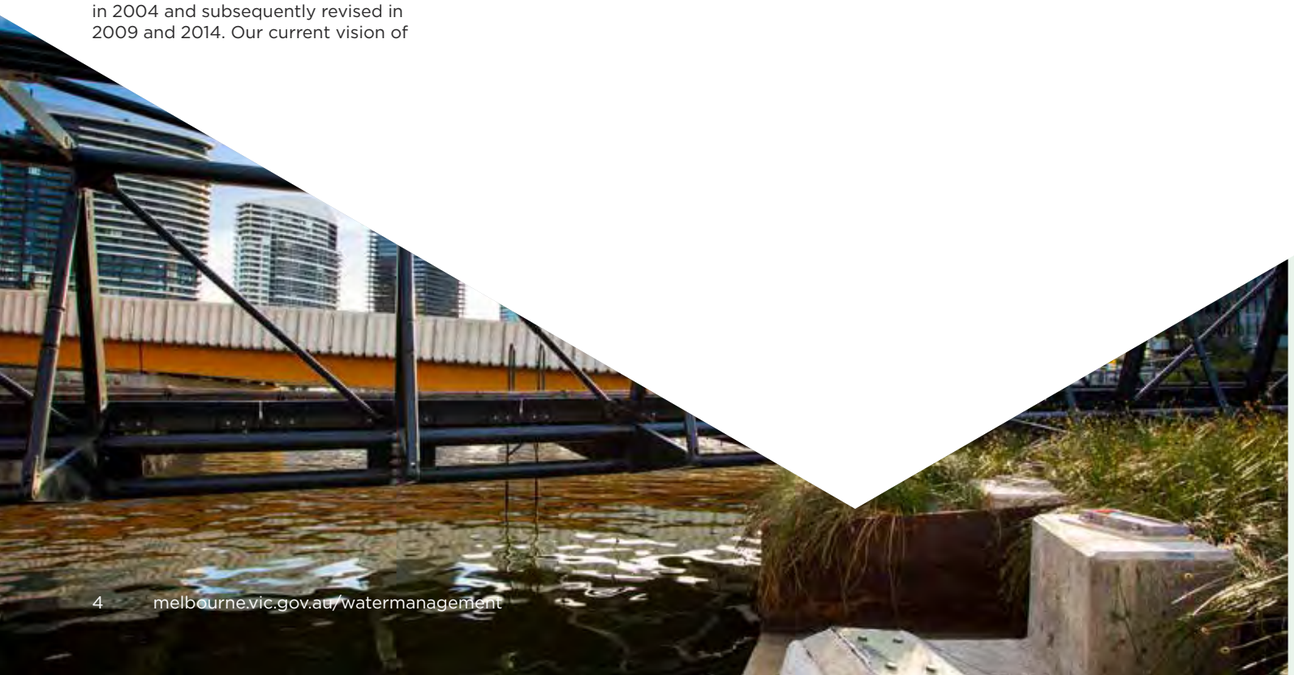
The Plan takes stock of changes and achievements since Total Watermark 2014.

Progress since Total Watermark 2014

Over the past four years we have completed many actions from Total Watermark including:

- Enhancing our open space and streetscapes to be more water sensitive
- Implementing a 10-year stormwater harvesting and flood mitigation program
- Irrigating our parks and gardens using up to 25 per cent non-potable, alternative water sources including rainwater and stormwater
- Reducing the Total Nitrogen pollution in stormwater runoff by 13 per cent.

There is still work to be done to achieve targets outlined in our Total Watermark strategy. In particular, stronger direction and action is needed to upgrade our drainage network to a 1:20 average recurrence interval (ARI) drainage standard to cope with increased intense rain events. In addition to this, we need to increase permeability in catchments to improve water quality and reduce flood impacts.



The Figure below illustrates how we implement water management and key strategies to successfully adapt to the impacts of climate change and enable population growth and density.

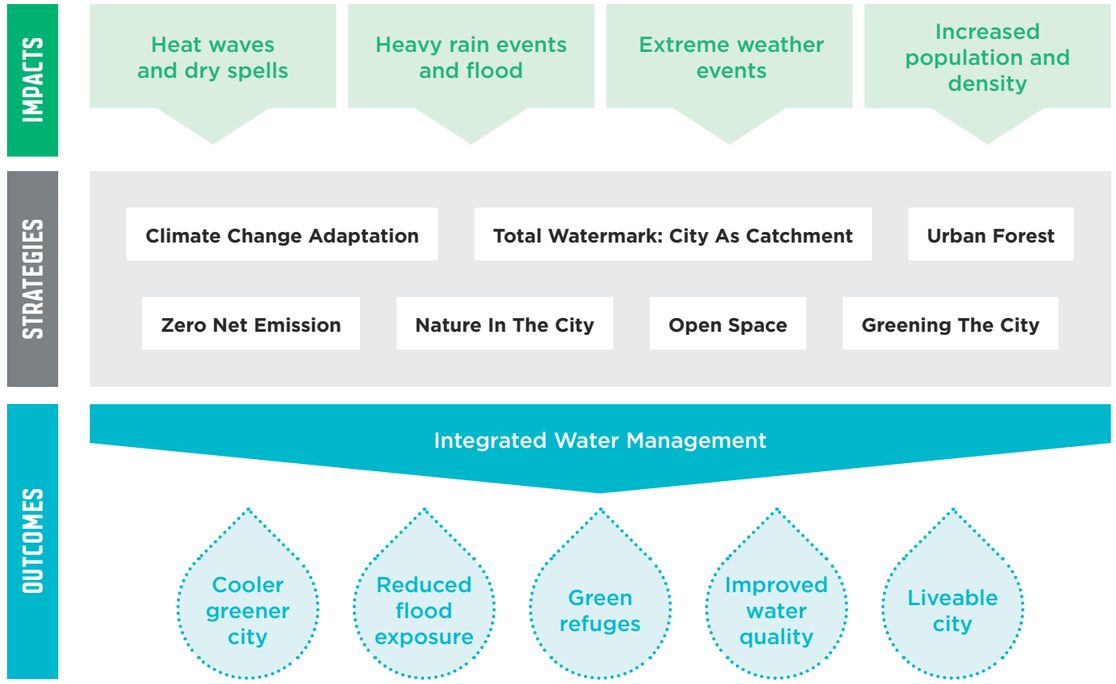


Figure 1: Outcomes of the City of Melbourne's Integrated Water Management approach

What is Integrated Water Management?

City of Melbourne practices integrated water management and defines it as *the coordinated management of all components of the water cycle including water consumption, rainwater, stormwater, wastewater and groundwater, to secure a range of benefits for the wider catchment.*

Our successful management of water within our municipality helps us maintain a high standard of liveability in the face of increasing pressures. Examples include:

- Stormwater harvesting systems that reduce our reliance on potable water, reduce pollution to waterways and decrease flooding impacts.
- Improved soil management to increase infiltration, optimising rainfall and reducing irrigation.
- Requiring stormwater management through the Melbourne Planning Scheme, mostly implemented by installing rainwater tanks.
- Passive irrigation systems supporting street trees such as the structural soil trench with smart soaker pits in Flinders Street.
- The existing sewer mine plant in Yarra Park and the proposed plant for Fishermans Bend.
- Permeable pavements installed win Collins Street and Eades Place.
- Converting pavement to green open space to achieve multiple benefits, including increased permeability and reduced stormwater runoff.
- Combining flood mitigation and stormwater harvesting at the Carlton Squares project.

2.0 CONTEXT FOR INTEGRATED WATER MANAGEMENT

2.1 Our role

The City of Melbourne relates to water in its various forms in many ways. We:

- Manage extensive public parks, gardens and vegetation to a high standard of presentation.
- Achieve this high standard of presentation and maximise vegetation health by irrigating the majority of our open spaces, which makes us one of the biggest water users in the municipality.
- Own assets that enable the implementation of water-sensitive design, in buildings, streetscapes, road and parks.
- Promote the use of green infrastructure to provide shade and cooling during summer, to intercept, retain and infiltrate rainwater, and for amenity and other ecological benefits.
- Implement, own and advocate for non-potable, alternative water supply projects.
- Can improve water management and outcomes in the private realm, as the Responsible Authority for planning applications less than 25,000 m2 of floor area.
- Influence strategic planning for whole precincts through the production of structure plans and advocacy.
- Have received a direct mandate from our communities to care for the environment and particularly capture and reuse stormwater.
- Coordinate our flood and extreme weather response with the State Emergency Service and other relevant agencies.

2.2 Community and stakeholders

The way we deliver our role is guided by a series of strategic documents developed and implemented together with our community and stakeholders. In addition to our direct influence on the way that water is managed in the municipality, we have a privileged understanding of, and access to, the community through the direct services we provide. We have also established relationships with many stakeholders that can also become drivers of Integrated Water Management.

Community

Future Melbourne 2026 sets out the community's aspirations for the future of Melbourne and was developed through extensive consultation with the community. Through Future Melbourne, 2000 people shared their ideas on a variety of topics including the environment and climate change. The community felt strongly about:

- Capturing and reusing stormwater to reduce potable demand and reduce pollution going into waterways.
- Maintaining the urban biosphere through enhancing the urban forest and green roofs and reducing the heat island effect.
- Adapting to climate change through world's best practice.

Through the development of the Climate Change Adaptation Strategy, the community also identified the urban heat island effect and more frequent flood events as key challenges. To respond to these challenges the community proposed to increase green permeable spaces and design the city to better cope with extreme weather events. Water was also a key theme that emerged through the workshops and the online forum during the Nature in the City Strategy development.

Stakeholder organisations

We work closely with many Victorian Government stakeholders and other partners to deliver Integrated Water Management.

The place-based summaries included in this Plan outline how we interact with each of the organisations in Figure 2 below.

Figure 2: The strategic context for our work in Integrated Water Management

2.3 Melbourne's habitats, blue and green spaces

The municipality of Melbourne encompasses a wide range of different habitats, blue and green spaces including waterways, marine and estuarine habitats, green infrastructure (street trees, green roofs, parks and median strips), residential gardens, formal parks (such as Fawkner Park and Fitzroy Gardens), native ecosystems with substantial remnant vegetation including Royal Park and those that have been restored such as Westgate Park. Small and fragmented patches of habitat are often considered lower value than larger or continuous patches; however their potential value as both habitat and to facilitate the movement of wildlife should not be overlooked. For example, swales instead of stormwater drains can provide habitat links for certain species.

Waterways in the municipality currently act as critical biodiversity corridors for water and land based species, particularly birds, reptiles and frogs. The municipality sits in a unique location with the convergence of three important waterways in metropolitan Melbourne – the Yarra River, the Moonee Ponds Creek and the Maribyrnong River.

Soil health is key to supporting biodiversity and ecosystem health. Challenges such as underground infrastructure, soil compaction and chemical use reduce the capacity of soil to allow the movement of water and soil biota (fungi and invertebrates) and gaseous exchange.

Integrated Water Management helps us improve habitat availability and soil and waterway health on land managed by the City of Melbourne and within the private realm.

2.4 Changes in our operational environment since 2014

There have been many significant changes in our operational environment since Total Watermark 2014. A full list is provided in Appendix 1 and a summary below. We are factoring these changes into our approach to Integrated Water Management across the city.

Population growth has exceeded forecast. It was previously forecast in 2009 that the residential population would grow to over 145,000 people in 2031 from 76,000. Based on new forecasting done in 2016, the municipality's residential forecast is now expected to grow from 136,000 in 2016 to 262,000 in 2036.

The extent of new development has also increased. The expansion of the central city is revitalising and reinventing areas along Melbourne's waterways (Southbank, Docklands, Arden-Macaulay, E-Gate, Dynon and Fishermans Bend). The contemporary growth areas for central Melbourne all are in low-lying environments that are prone to flooding, and have a rich and varied history on which we can build to enliven our urban environment and places.

Place-based guidance is needed for each of these areas to ensure that water is engaging with urban form and can become a design inspiration for our places, not just an engineering issue.

The number of urban renewal areas and other major infrastructure and asset renewal projects provide an urgent driver to set local plans of action for meeting cross-council objectives. They also offer once-in-a lifetime opportunities to influence how new buildings and surrounding public space are constructed. We need to consistently advocate within council and to Victorian Government agencies involved in approvals for the best outcomes in Integrated Water Management.

There is an increased focus on the health and management of Melbourne Rivers, including the 2017 Victorian Government's Yarra River Action Plan.

Our 2014 flood objectives do not fully reflect the legal context. We currently have gaps between what is gazetted as Land Subject to Inundation Overlay or Special Building Overlay in the Melbourne Planning Scheme and the new flood extents that we have mapped with Melbourne Water. The new flood extents have to be taken into account under the Building Regulations.

We need stronger emphasis on increasing permeability as the city grows. We can reduce runoff and flood risk while cooling the city by using green roofs, increasing the permeability of our pavements or converting them to open space. Lack of permeability correlates to reduced soil moisture and vegetation health. It also increases stormwater runoff and flood risk.

A stronger focus in the private realm will also be required to achieve the increased permeability needed to reduce runoff and flood risk.

There has been an increase in collaborative and co-creation approaches adopted by organisations to deliver strategic goals.

Water management is increasingly playing a key role in our response to the effects of climate change, as shown in Figure 4 on page 10.

Figure 3: Historic waterbodies west and south of Melbourne

2.5 Our achievements to date

The City of Melbourne is recognised as a leader in Integrated Water Management and, since 2014, has delivered many actions within the municipality to meet its targets. The 2014 implementation plan for Total Watermark included 66 actions in four areas:

- climate change adaptation and flood
- water for liveability
- water for the environment
- water use.

The majority of these actions are now completed, business as usual or ongoing activities, as detailed in Appendix 2. In particular, we have:

- Enhanced the urban planning processes by introducing planning application requirements for Water Sensitive Urban Design (WSUD) for new development applications pursuant to Clause 22.23 of the Melbourne Planning Scheme.
- Enhanced planning processes through including policies in the Melbourne Planning Scheme to encourage reduced use of potable water and the use of non-potable water.
- Enhanced open space through improved irrigation efficiencies and soil management practices that maximise infiltration.
- Progressed the reduction of flood impacts through upgrading our drainage network, increasing permeability and harvesting stormwater.
- Developed and begun to implement a 10-year stormwater harvesting plan (see Appendix 3), resulting in the use of fit-for-purpose water to irrigate and cool our parks and gardens. We currently have the capacity to provide up to 25 per cent of our irrigation demand from non-potable, alternative water sources including rainwater and stormwater harvesting.
- Begun implementing the Elizabeth Street Catchment Integrated Water Management Plan.

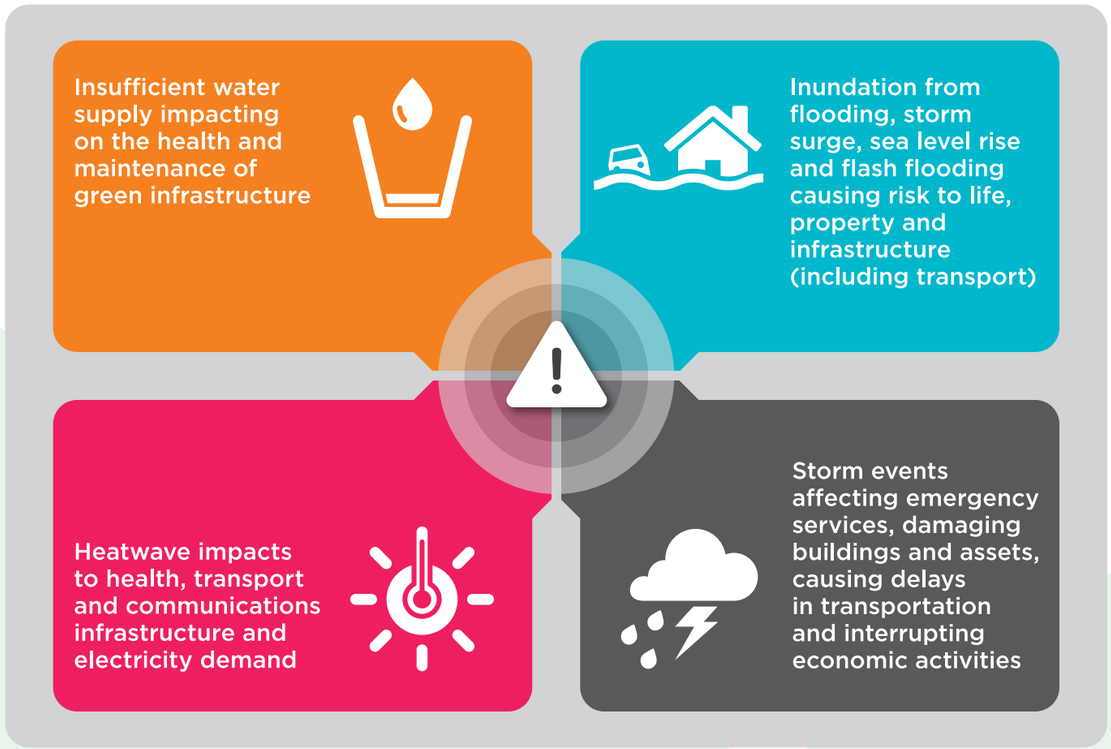


Figure 4: Climate change risk clusters

Through these actions, we have progressed towards the achievement of our targets:

- Water pollution has reduced by 20 per cent (mean kg/yr Total Suspended Solids), 13 per cent (mean kg/yr Total Nitrogen) and 18 per cent (mean kg/yr Total Phosphorus) since 2005. The Total Watermark target for 2018 is 20 per cent reduction in Total Nitrogen.
- Stormwater runoff volume has reduced by 10 per cent or 1010 ML since 2005 (mean ML/yr).
- Alternative water use for the municipality has been modelled to have increased by 5 per cent or 1164 ML since 2005 (mean ML/yr). The Total Watermark target for 2018 is 8 per cent for the municipality and 30 per cent for council. Council's actual alternative water use for 2015-16 and 2016-17 was 14 and 15 per cent respectively.

Our stocktake has identified six outstanding actions in the 2014 implementation plan for Total Watermark. The table below lists these actions and their status.

TOTAL WATERMARK ACTION	KEY STAKEHOLDERS	STATUS
Increase community education and awareness on insurance	Resilient Melbourne DELWP	We are planning to do more in this area by: • Partnering with Resilient Melbourne to deliver the Resilient Melbourne Strategy action to *support innovative approaches that make fit-for-purpose insurance affordable to more Melburnians.* • Working with DELWP to progress the action in their Climate Change Adaptation Plan to *host a forum on managing climate-related insurance risks.* These actions have been incorporated in the 2017 Climate Change Adaptation Strategy Refresh.
Undertake research on the urban heat island effect	City of Melbourne	This will action will be carried out as part of the 2017 Climate Change Adaptation Strategy Refresh. No further action required within this plan.
Undertake research on human health and access to waterways and public open spaces	RMIT	Literature review underway.
Undertake research on human health and water quality and availability	Melbourne Water	Future work included in this Plan.
Integrated Climate Adaptation Model	University of Melbourne	The model has been completed. We are now determining how best to host it on our system, keep it updated and make it useful to multiple work areas across council.
Update of the WSUD Guidelines	Melbourne Water	Last updated in 2009. Melbourne Water has recently created a web based WSUD guidelines for the western group of councils. Action 6.3.1 'Develop a business case to update the WSUD guidelines for our municipality' included in this Plan.

Table 1: Outstanding actions from the 2014 Total Watermark implementation plan

3.0 STRATEGIC DIRECTION

In reviewing the Total Watermark strategy for the development of this Plan we have determined that the strategy's vision, objectives and targets are still relevant, with two exceptions: flood risks and permeability.

3.1 Vision, objectives and targets

Our vision is a healthy city in a healthy catchment. Seeing our city as a catchment means that we recognise the important roles of the natural and man-made catchments, including roads, roofs and impermeable surfaces. We want the whole of Melbourne's community – residents, workers and businesses alike, to think about water and its role in our future, to help create a healthy city in a healthy catchment.

Based on the analysis above, we are implementing changes to continue to stay on track to achieve our vision and meet our 2030 targets. Changes include:

- Complementing the existing objectives of Total Watermark with two additional objectives:
  1. **Reduce the municipality's exposure to flood risk and impacts.**
  2. **Mimic the natural water cycle by retaining more rainwater in the upper catchment and reducing runoff.**
- Adding new targets on flood risk reduction and increase in permeability (see Figure 5 on page 13).
- Retaining Total Watermark as a strategy, but replacing the Total Watermark implementation plan with this Plan, which is place-based and reinforces the benefits of cost effective, green and multipurpose approaches to Integrated Water Management.

VISION	A healthy city in a healthy catchment.
OBJECTIVES	1. Adaptation and flood risk embedded into the strategic planning process. 2. Reduce the municipality's exposure to flood risk and impacts. 3. The Melbourne municipality has an aware and prepared community. 4. Water and liveability embedded in the strategic planning processes. 5. Access to waterways and public open spaces help support a healthy population. 6. Our major waterways are healthy and clean. 7. Soil moisture supports a healthy urban forest. 8. Optimise stormwater quality. 9. Optimise fit-for-purpose water use. 10. Water supply infrastructure is planned for current and future demand. 11. To mimic the natural water cycle by retaining more rainwater in the upper catchment and reducing runoff.

TARGETS	**2018 TARGETS**	**2030 TARGETS**
	Council: 30% of all water use sourced from alternative water sources. Municipal: 8% of all water use sourced from alternative sources.	Council: 50% of all water use sourced from alternative water sources. Municipal: 20% of all water use sourced from alternative sources.
	20% reduction in Total Nitrogen contributed to the waterways from the municipality of Melbourne's catchment (baseline year 2000).	30% reduction in Total Nitrogen contributed to the waterways from the municipality of Melbourne's catchment (baseline year 2000).
	All habitable finished floor levels within private development is free from flooding from Council drains during a 100 year ARI rainfall event while ensuring good urban design outcomes.	Minimum 20 per cent of each catchment's surface is considered permeable by 2030.
	1:20 Average Recurrence Interval (ARI) (or equivalent) flow capacity of all council drains within the central city and growth areas.	

Figure 5: Our vision and enhanced objectives and targets

New Total Watermark

Our objectives and targets are supported by a range of council and Victorian Government policies, and will help us achieve related strategic objectives, including to:

- Increase public realm canopy cover to 40 per cent or more across the city by 2040 (Urban Forest Strategy 2012).
- Increase the provision of open space in line with the Open Space Strategy and Structure Plans.
- Improve tree and vegetation health through good levels of soil moisture year round (Urban Forest Strategy).
- Create healthy green spaces for healthy people without increased potable water use (Open Space Strategy).
- Adapt to climate change-induced extreme weather events, flooding and water scarcity (Climate Change Adaptation Strategy 2017).
- Create a beneficial symbiotic relationship between Integrated Water Management, Nature in the City and the strategic action plan to green our city.
- Integrate good urban design principles with engineering solutions.

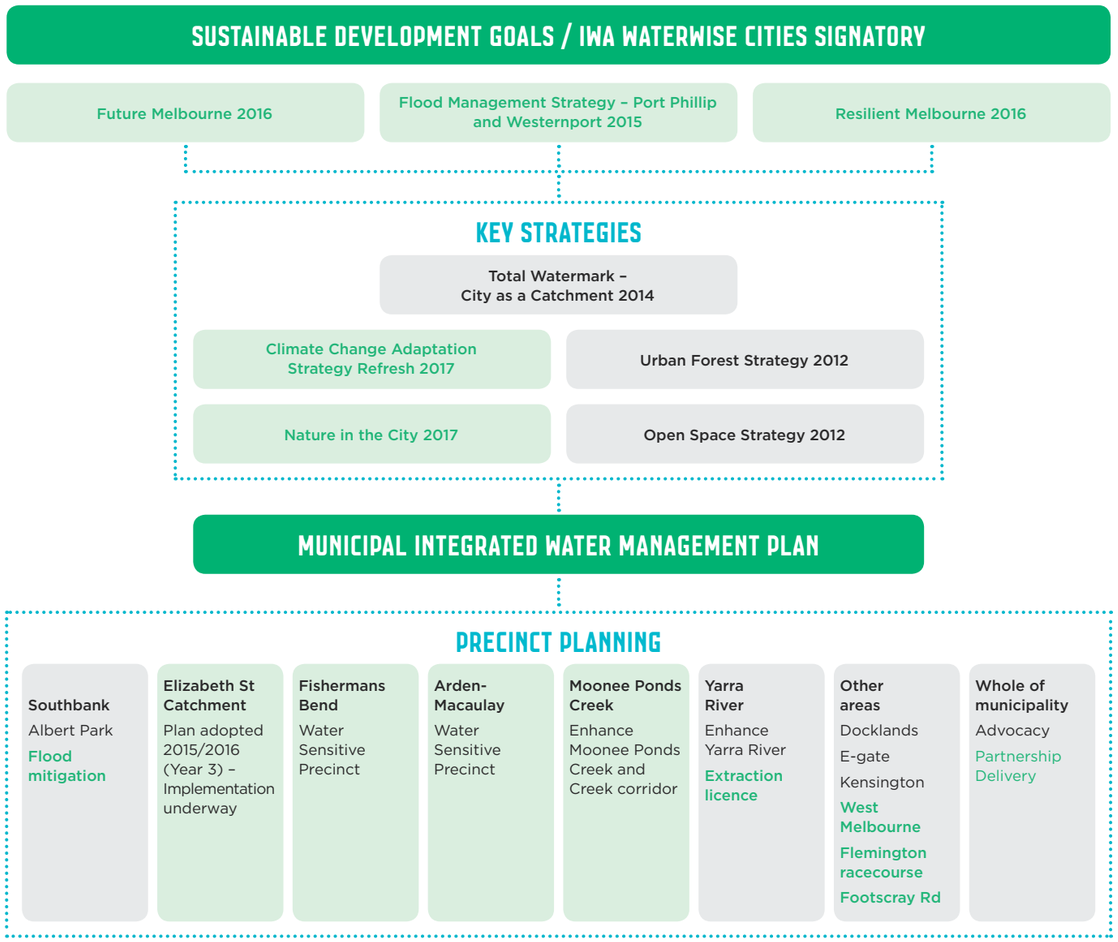


Figure 6: Role of this Plan in the context of internal and external drivers

3.2 Delivering the Plan

The tools available to the City of Melbourne to deliver its Integrated Water Management vision, objectives and targets include:

- Direct delivery via council or external grant funding for operation or capital projects.
- Partnering with external agencies for mutual benefits.
- Advocating through precinct planning or other processes for better outcomes.
- Improving renewal or maintenance processes to minimise or avoid failures.
- The Melbourne Planning Scheme: In its present form or amended via structure plans or other processes, the Scheme enables us through development applications to require the private realm to implement Water Sensitive Urban Design under the requirements of Clause 22.23 Stormwater Management (see break-out box).

The successful implementation of the Plan will result in:

- Reduced flood exposure and risk for the municipality with shared responsibility and management between public and private landowners and agencies.
- Multi-purpose, cost-effective infrastructure that provides flood mitigation, maintained or reduced water consumption and improved waterway health.
- Increased availability and use of alternative, non-potable water for the municipality.
- Increased resilience of vegetation and improved waterway health through using and absorbing rainwater within our catchment.
- Increased resilience to extreme heat for people in the municipality.
- Where flooding and sea level rise are significant issues, a consistent, whole of government approach where water is embedded as a key driver for planning and design of urban renewal areas and is part of the identify of these areas.
- Avoiding significant urban design issues from raising floor levels in areas at risk of flooding. This can be addressed by adopting regional approaches to water management that reduce flood risks and the need to raise floor levels, or by designing building foyer areas to flood in extreme conditions so that a good connection to the street is maintained.

Figure 7: Raised floor level in flood risk area

Melbourne Planning Scheme clause 22.23 Stormwater Management (Water Sensitive Urban Design)

Objectives:

- To achieve the best practice water quality performance objectives set out in the Urban Stormwater Best Practice Environmental Management Guidelines.
- To promote the use of water sensitive urban design, including stormwater reuse.
- To mitigate the detrimental effect of development on downstream waterways.
- To minimise the peak stormwater flows and stormwater pollutants.

Melbourne Planning Scheme clause 22.19 Energy, Water and Waste Efficiency

Objectives:

- To ensure buildings achieve high environmental performance standards at the design, construction and operation phases.
- To minimise the city's contribution to climate change by reducing greenhouse gas emissions.
- To improve the water efficiency of buildings and encourage the use of alternative water sources.
- To minimise the quantity of waste going to landfill and maximise the recycling and reuse of materials.
- To minimise the impacts of waste on the community.
- To encourage the connection of buildings to available or planned district energy, water and waste systems in urban renewal areas in order to achieve additional energy, water & waste efficiency arising from a precinct-wide approach to infrastructure where appropriate.

4.0 PLACE-BASED IMPLEMENTATION AND ACTION PLAN

Our review of Total Watermark and analysis of changes in our operating environment has highlighted four priority areas. These are:

- The two urban renewal areas of **Fishermans Bend** and **Arden-Macaulay and the Moonee Ponds Creek corridor** that face significant flood challenges and for which water supply and treatment, open space, drainage and flood mitigation will be redesigned in the next few years to service significant growth (80,000 new residents and 60,000 jobs by 2050 in Fishermans Bend and up to 25,000 new residents and 43,500 jobs by 2051 in Arden-Macaulay).
- **Southbank,** which is subject to significant flooding, and the iconic Yarra River corridor.
- **The Elizabeth Street Catchment**, for which we already have a place-based plan.

Integrated Water Management action will also continue in other areas of the municipality and whole of municipality actions will also be required to address challenges and opportunities that apply across all or several precincts. These are described in sections 4.5 on page 27 and 4.6 on page 29.

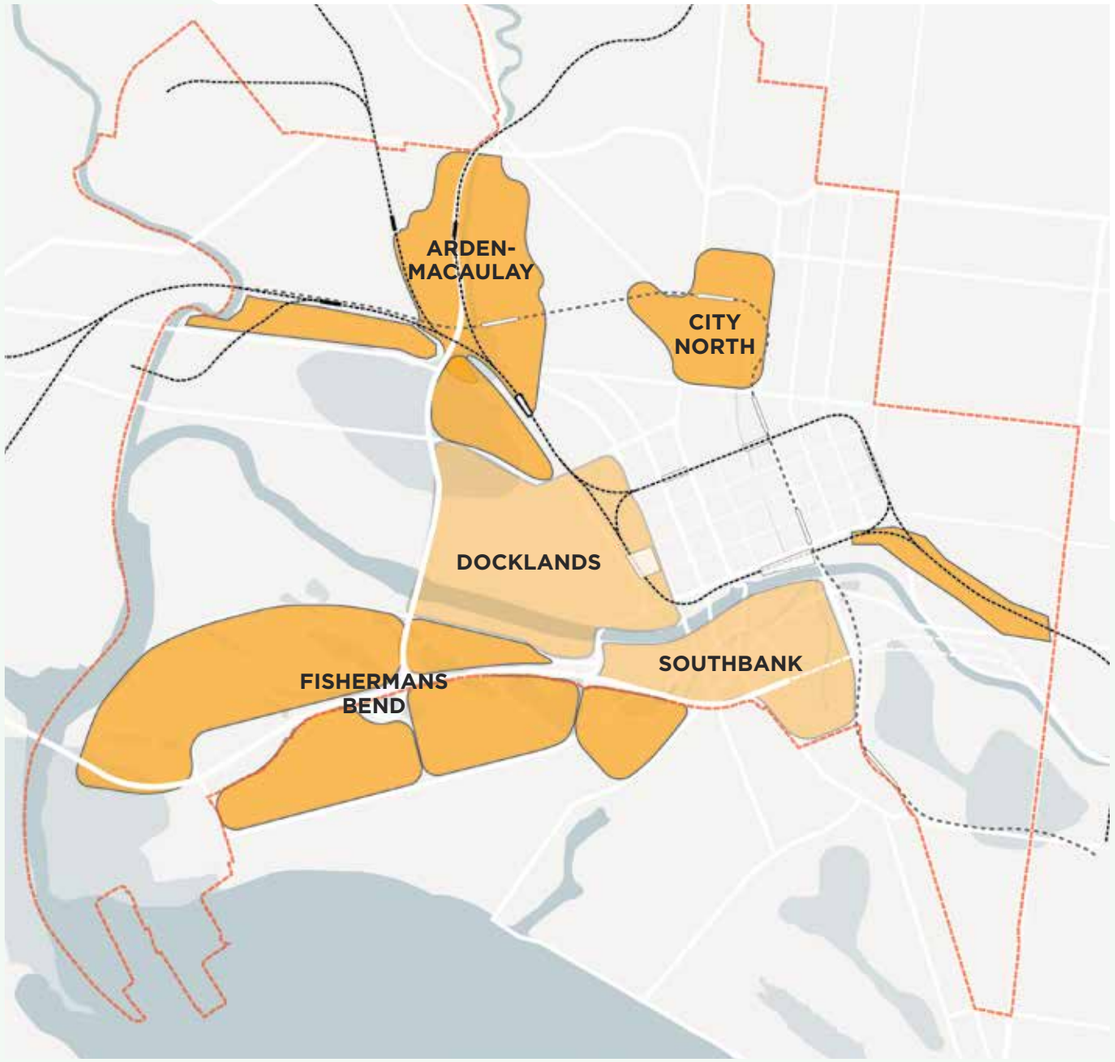


Figure 8: Areas of growth and focus areas for the Plan

4.1 Fishermans Bend

Fishermans Bend will be transformed over the next 30 years to house 80,000 residents and 60,000 workers by 2050. Fishermans Bend includes five precincts located in two water catchments. Lorimer and the Employment Precinct are located within the City of Melbourne and drain to the Yarra River. The three other precincts (Sandridge, Montague and Wirraway) are located within the City of Port Phillip and drain both to the Yarra River through Lorimer and to Port Phillip Bay.

Key issues and opportunities

Water must be recognised as a key driver of planning and design for Fishermans Bend as the area faces several challenges:

- Sea level rise is expected to exacerbate flooding in Montague, Lorimer and the Employment Precinct, with effects already expected this century.
- Shallow and contaminated groundwater, as well as contaminated soil, limits the ability to construct underground infrastructure.
- South East Water is proposing to build the first large-scale sewer mining plant in an inner city area within the Employment Precinct.

In response to these challenges, we are working with key stakeholders to develop a water management approach for Fishermans Bend. Proposed approaches include:

- Implementation of a third pipe network supplied by a precinct sewer mine that will also have the ability to supply surrounding areas.
- Requirement for “smart” rainwater tanks above ground within buildings that capture rainwater to assist in mitigating flooding. These will also link into the third pipe network to enable rainwater reuse and tank emptying for the next rain event, thus maximising capture.
- Upgrades to the current drainage network.
- Development of an approach to control sea level rise impacts in the future. This may include a perimeter levee and drainage pump stations.
- Prepare options which articulate how water will drive the planning and design of Fishermans Bend including: holistic, whole of catchment solutions, integrated engineering and landscape approaches and the celebration of water in the landscape.

Figure 9: Fishermans Bend renewal area and precincts

Action Plan for Fishermans Bend

The complexity of managing water in Fishermans Bend calls for an inter-agency collaborative approach. Key actions for the City of Melbourne include:

Continue to advocate for integrated outcomes that deliver multiple benefits in alignment with its strategies and policies (Action 4.1.1). In particular:

- Advocate/partner with Melbourne Water to update the Land Subject to Inundation Overlay to best current knowledge and accepted flood mapping.
- Partner with The Fishermans Bend Taskforce, Department of Environment, Land, Water and Planning, State Emergency Service and others to determine the minimum access and egress requirements for buildings if we are to live with flooding or tidal inundation.

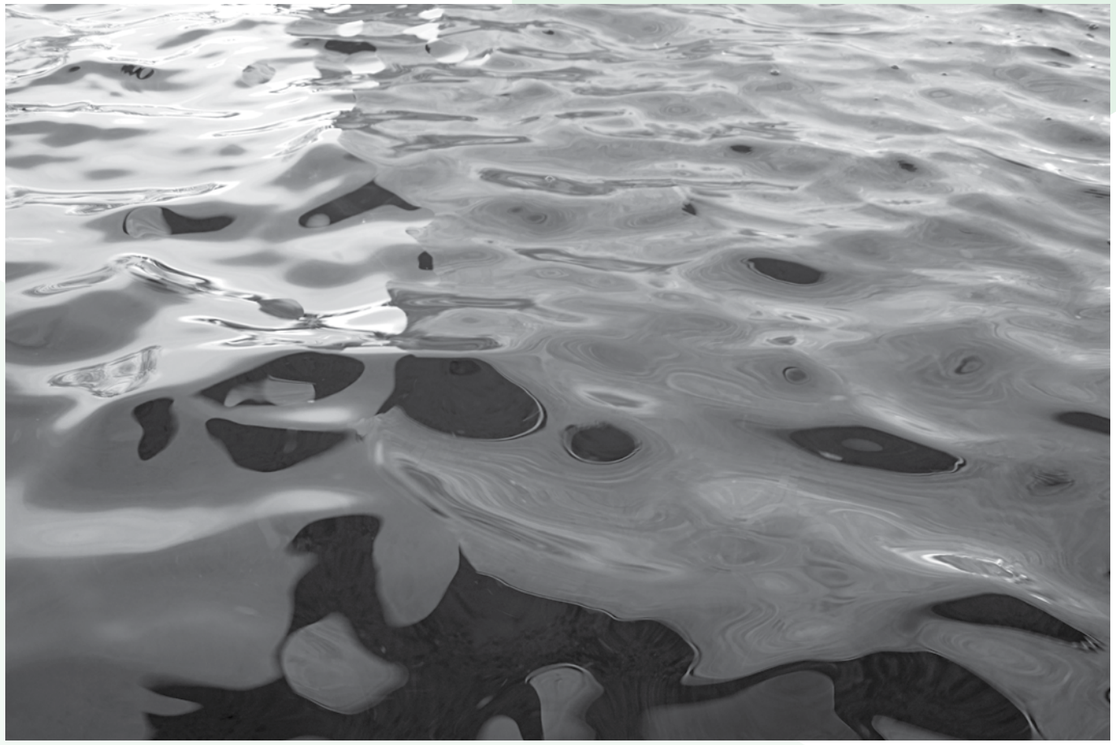
Partner with key stakeholders in the development of an Integrated Water Management Plan for Fishermans Bend by 2018 (Action 4.1.2) that will:

- Address the challenges and opportunities.
- Celebrate water in the landscape.
- Inform the precinct plans.
- Develop place-based targets for permeability and level of service for flood management.
- Be aligned with the directions in City of Melbourne’s strategies.

Plan and partner to deliver augmentations to the drainage system (Action 4.1.3) including:

- Augment the drainage along Clarendon Street to mitigate the current frequent flooding and transport disruption in this area.
- Advocate to Melbourne Water and deliver increased monitoring and maintenance of drainage outlet to tidal river system (Lower Yarra River and Moonee Ponds Creek).
- Plan for flood protection from increased Yarra River levels due to sea level rise.
- Partner with Melbourne Water to investigate, design, build and manage pumped drainage systems for low-lying areas including a sustainable funding pool, increased reliability and reduced maintenance.

The Fishermans Bend Integrated Water Management Plan and associated strategies will consider how best to integrate water management and urban design outcomes, who is best placed to finance the infrastructure required, when to build, and how to ensure the systems function effectively and are appropriately maintained.



4.2 Arden-Macaulay and the Moonee Ponds Creek corridor

The Arden-Macaulay renewal area is located in Kensington and North Melbourne, either side of the Moonee Ponds Creek. It is currently a mix of industrial, mixed use and residential areas. It is expected to grow from 3,231 residents to 25,000 by 2051 and have a jobs growth from 6,527 to 43,500 over the same period.

Key issues and opportunities

The City of Melbourne has a vision of Moonee Ponds Creek as a natural habitat and open space corridor to serve its rapidly growing population and manage climate risks. Our commitment to the revitalisation of the Moonee Ponds Creek corridor is to: expand and upgrade the Moonee Ponds Creek corridor to improve habitat values, provide new opportunities for recreation and links to improved open spaces in the E-Gate and Docklands sections of the creek corridor.

Flooding in Arden-Macaulay is significant now and will get worse by 2100. Current flooding is caused by catchment runoff trapped behind the levees and pumps station not being able to keep up or failing. Moonee Ponds Creek's flows are mostly contained by the current levees at present but they will not be by 2100. Melbourne Water is working to develop a flood mitigation strategy that will reduce future flooding and enable land development.

The urban renewal of the precinct offers opportunities to optimise the flood mitigation strategy by integrating it with open space requirements and an attractive urban design that embraces water as an element of the identity of the precinct.

Currently only standard Melbourne Planning Scheme clauses apply, Clause 22.19 for energy waste and water efficiency within buildings and Clause 22.23 for stormwater management (see page 15 for more details).

Figure 10: The Arden-Macaulay renewal area

Action Plan for Arden-Macaulay and the Moonee Ponds Creek corridor

Managing water in Arden-Macaulay is complex and will require a collaborative approach. The City of Melbourne will:

- Advocate to/Partner with Melbourne Water to update the Land Subject to Inundation Overlay to best current knowledge and accepted flood mapping (Action 4.2.1).
- Advocate for the incorporation of a new Special Building Overlay in the Planning Scheme to align with the current flood extents (Action 4.2.2).
- Partner with Victorian Planning Authority and Melbourne Water to develop an Integrated Open Space and Drainage Strategy for Arden-Macaulay that builds on international best practice and opportunities to capture water upstream in the Moonee Ponds catchment (Action 4.2.3) and implement agreed actions.
- Partner with City West Water and Melbourne Water to develop a place-based Integrated Water Management plan to guide the implementation of the strategy and inform the structure plans developed for the precincts (Action 4.2.4).
- Partner with other stakeholders to collaboratively manage the Moonee Ponds Creek catchment including advocating for good urban design, enhanced amenity and ecology, and improved access to and across Moonee Ponds Creek while providing adequate flood protection (Action 4.2.5).
- Complete the investigation and, if feasible, build the stormwater harvesting system at Ievers Reserve (Action 4.2.6).
- Construct the stormwater diversion and associated amenity improvements and, if feasible, stormwater harvesting at Elliott Avenue (Action 4.2.7).

Key elements we will advocate for in water management in the precinct include:

- Mitigating current and projected 2100 flooding without compromising urban design.
- Increasing access to and minimising connectivity barriers across Moonee Ponds Creek.
- Celebrating water in the landscape.
- Integrating water management with open space without overly encumbering the open space.
- Developing place-based targets for permeability and level of service for flood management.
- Meeting best practice stormwater quality discharge.
- If feasible, providing alternative, non-potable water supply to the precinct and beyond.

Figure 11: Water Square Bethemplein, Netherlands: Using engineering and landscape approaches to drive different water management solutions

4.3 Southbank and the Yarra River corridor

The projected population for Southbank is up to 74,000 residents by 2040 based on development capacity available within the new built form recommendations. There is a significant shortfall in open space.

The Yarra River is one of Victoria's most iconic waterways, integral to Melbourne's identity and the liveability of the city. Before it arrives at the City of Melbourne and empties into Port Phillip Bay the river traverses more than 200 kilometres of urban and rural landscapes. It is the major source of Melbourne's drinking water and a biodiversity corridor supporting diverse life forms. The Yarra River has particular spiritual and cultural significance for Aboriginal communities. To the Wurundjeri people the river, known as Birrarung, was the life source and an important meeting place. The City of Melbourne was founded on the banks of the Yarra River as it provided a supply of fresh water to what is now Southbank and ships could anchor safely close to shore.

The development of Southbank and the continued development downstream, including Docklands and Fishermans Bend, have embraced to value of the Yarra River as an iconic feature of Melbourne.

Key issues and opportunities

In 2015 the City of Melbourne commissioned flood modelling, including future climate scenarios, for the Southbank precinct. This work has shown that there is a significant flood risk to the Southbank precinct currently and that this risk will increase into the future due to the expected impacts of climate change on both extreme rainfall intensity and sea level rise. The study highlighted opportunities for Integrated Water Management that would help alleviate some of this flood risk.

Work undertaken to develop the Fishermans Bend integrated water management approach also identified an opportunity to connect Southbank to the Fishermans Bend third pipe network, however at present no such provision exists.

Population growth, not just in the City of Melbourne, will continue to put pressure on the health of the Yarra River. Unless managed properly, urban development will increase stormwater run-off and negatively impact the health of the Yarra and the bay.

Action Plan for Southbank and Yarra River corridor

Key actions for the City of Melbourne addressing the issues and opportunities in Southbank and the Yarra River include:

- Work towards the successful delivery of the Yarra River Action Plan through active participation at multiple levels in the development of the Yarra River Strategic Plan, The Yarra River Protection Bill and the Community Vision for the River (Action 4.3.5).
- Deliver Water Sensitive Urban Design and flood mitigation interventions as part of the Southbank Boulevard redevelopment (Action 4.3.6).
- Partner with Parks Victoria and City of Port Phillip to further investigate the flood mitigation opportunity of the Albert Park Lake Stormwater Harvesting project (Action 4.3.4).
- Incorporate our integrated water management objectives in the City River Concept Plan that will drive integrated public realm improvements along the river (Action 4.3.7).
- Advocate for Melbourne Water to update the Land Subject to Inundation Overlay to the best current knowledge and accepted flood mapping (Action 4.3.1).
- Partner with Melbourne Water to investigate, design, build and manage pumped drainage systems for low-lying areas including a sustainable funding pool, increased reliability and reduced maintenance (Action 4.3.3).

Figure 12: Southbank and Yarra River corridor precinct

4.4 Elizabeth Street Catchment

Covering 308 ha, the Elizabeth Street Catchment sits entirely within the municipality of Melbourne and includes both the Swanston Street and Elizabeth Street drain systems. The catchment starts at College Crescent in Carlton and finishes where the Elizabeth Street drain joins the Yarra River below Flinders Street Station.

Key issues and opportunities

The Elizabeth Street catchment is categorised by Melbourne Water as being at extreme flood risk – the highest level. The City of Melbourne has developed a place-based Integrated Water Management plan to respond to this risk, while considering opportunities to improve all elements of the water cycle: water consumption, rainwater, stormwater, wastewater and groundwater management.

The objectives of the Elizabeth Street Integrated Water Management Plan are to:

- Reduce the Catchment's Melbourne Water flood rating from Extreme to High.
- Increase open space, permeability and soil moisture in Elizabeth Street Catchment.
- Mimic the natural water cycle by retaining more rainwater in the upper catchment and reducing the volume running off.
- Improve the health of existing vegetation through irrigation from alternative water sources.

A suite of strategic, advocacy, partnership and capital actions to be delivered over five years has been developed as part of the plan.

We have commenced delivery of these actions, including:

- Installing a 2,000,000 litre storage tank in Lincoln Square.
- Completing flood modelling to inform options for the conveying of overland flow past and through the Flinders Street Railway Station.
- Establishing a reference group.

Action Plan for Elizabeth Street Catchment

- Continue to implement the actions of the Elizabeth Street Catchment Plan (Action 4.4.1).
- Advocate that Melbourne Water updates its Special Building Overlay to reflect latest flood modelling results (Action 4.4.2).
- Develop a new council Special Building Overlay in the Catchment in line with the new flood model (Action 4.4.3).

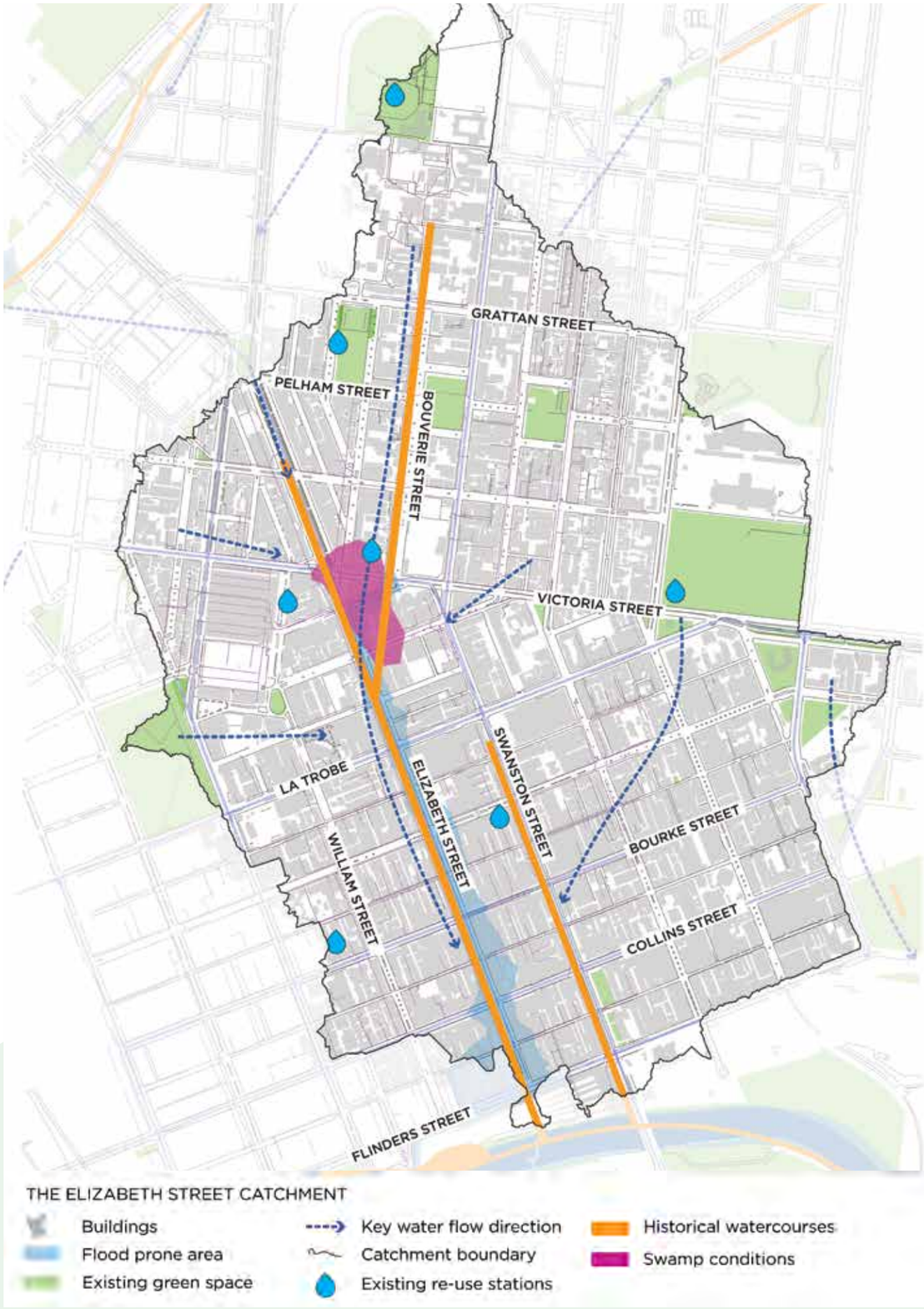


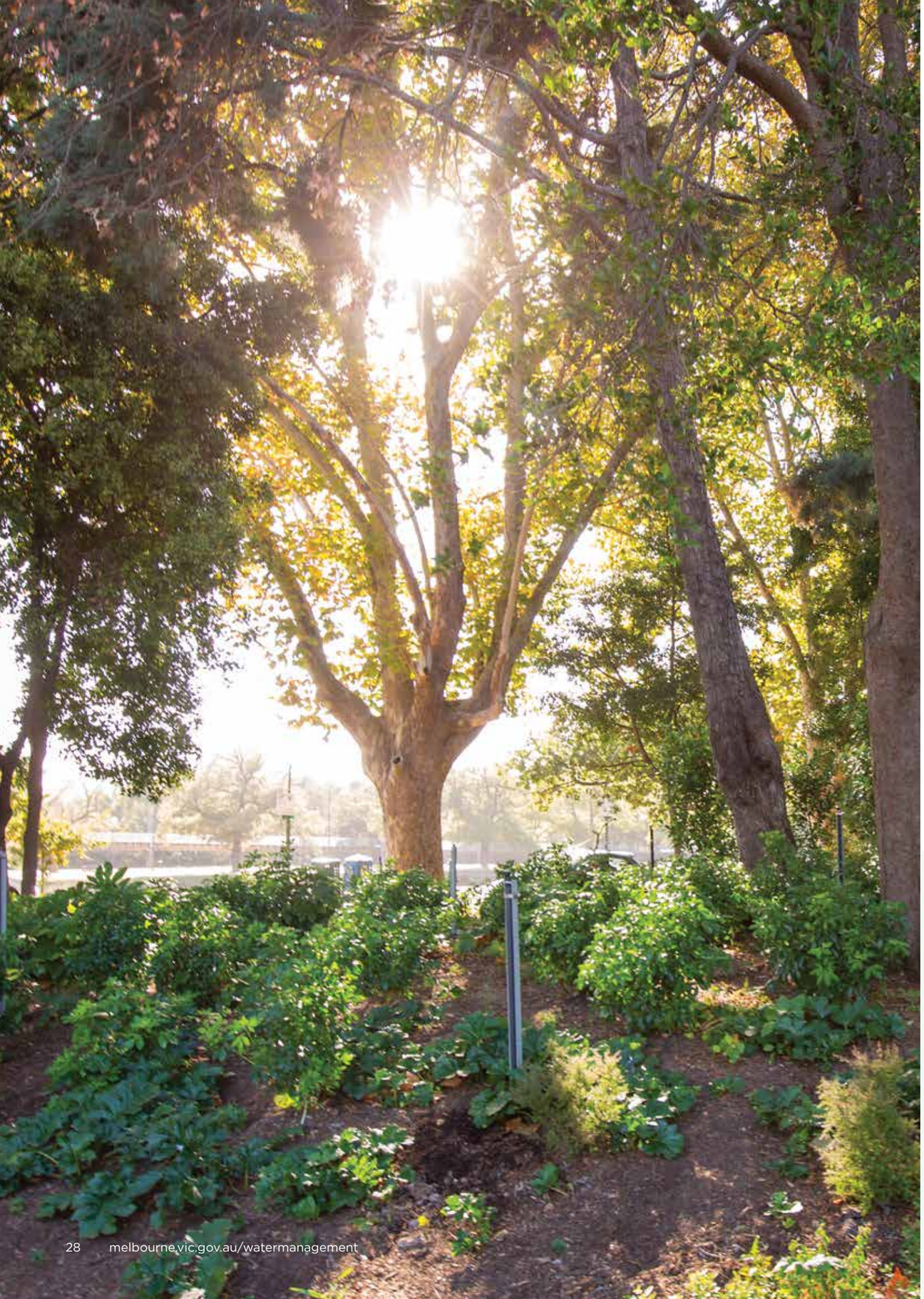
Figure 13: Elizabeth Street Catchment

4.5 Other areas in the municipality

There are priority areas and catchments across the rest of the municipality that require attention. Key actions for the City of Melbourne addressing the issues in these areas of the municipality include:

- Undertake flood and sea level rise modelling for renewal areas early in the planning process such as E-Gate (Action 4.5.2.1) and retrospectively in Docklands (Action 4.5.1.1).
- Capture and infiltrate rainwater and stormwater within the West Melbourne Structure Plan area to reduce flooding impact in Dudley Street (Action 4.5.3.1).
- Advocate for and improve the quality of the water and open space along the Dynon Road tidal channel and bird sanctuary (Action 4.5.4).
- Partner with Melbourne Water to mitigate the flooding in Hobsons Road in Kensington and explore stormwater harvesting opportunities (Action 4.5.5.1 and 4.5.5.2).
- Continue to partner with Parks Victoria and the City of Port Phillip to further investigate and deliver the Albert Park Lake Stormwater Harvesting scheme to provide an alternative water source for irrigating Fawkner Park and St Kilda Road (Action 4.5.12).
- Partner with Melbourne Water to maintain the Royal Park wetland system to best practice standard (Action 4.5.11.1) and implement improvements to the Galada Avenue swale to maximise usability and improve stormwater quality outcomes (Action 4.5.11.2).

Figure 14: Trin Warren Tam-Boore wetlands in Royal Park



4.6 Whole of municipality actions

Several of our advocacy, partnership and delivery actions apply to the whole of the municipality and are listed in Appendix 4.

Some key actions include:

- Advocate for a consistent Planning Scheme approach across Victoria for climate change and extreme weather event mitigation including provision for onsite/on-lot flood retention in flood prone catchments (Action 6.1.1).
- Advocate for a 1 in 20 year ARI drainage standard for high-density areas (Action 6.1.2) (central city, growth areas, commercial precincts).
- Advocate for a consistent, whole-of-government approach to sea level rise mitigation (Action 6.1.3) and a resourcing strategy to support this long term action (Action 6.1.4).
- Advocate for major projects and developments (such as Metro Rail, Westgate Tunnel) to meet the City of Melbourne's sustainability targets including those in Total Watermark (Action 6.1.5).
- Advocate for increased permeability of the city in private and public realms (Action 6.1.7).
- Advocate for an increase in the quantity and quality of green roofs, including for the capture and retention of rainwater (Action 6.1.8).
- Advocate for Open space used for flood management only over and above the un-encumbered open space requirement set out in the open space strategy and/or the planning scheme (Action 6.1.9).
- Partner with Resilient Melbourne to develop decision-support tools that encourage water sensitive urban design and integrated water management (Action 6.2.1).
- Partner with academic institutions, such as the CRC for Water Sensitive Cities to learn from and further best practice (Action 6.2.2).
- Partner with international associations of cities such as C40 and ICLEI to share and learn from international best practice (Action 6.2.3).
- Continue to partner with the plumbing industry, water authorities, Municipal Association of Victoria and other local governments on developing an approach to best manage on site storages to ensure flood benefit (Action 6.2.4).
- Continue to partner with City West Water, South East Water, Melbourne Water and/or others to further investigate the feasibility of an Alternative Water ring main around the inner city, connecting the many alternative water supplies for optimal use (Action 6.2.5).
- Partner with the Department of Environment, Land Water and Planning and others to consider the benefits of an impermeability charge to incentivise the private realm to provide green space, retain rainwater and provide urban cooling and improved amenity (Action 6.2.6).
- Continue to partner with Melbourne Water and other councils to deliver on the relevant actions from the Port Phillip Bay and Westernport Flood Management Strategy (Action 6.2.7).
- Share our learnings and practices through keeping the Urban Water website updated and providing tours, case studies and presentations (Action 6.3.2).
- Investigate how to best use the Yarra River water gifted to City of Melbourne at the closure of the AMCOR paper mill (Action 6.3.3).
- Maintain, renew and upgrade, as required, council's drainage network to achieve the level of service targets described in the Drainage Asset Management Plan (Action 6.3.4).
- Update the Drainage Asset Management Plan (Action 6.3.5).

5.0 MONITORING AND EVALUATION

A robust, ongoing monitoring and evaluation program will be fundamental to understanding the success of our actions, helping to track progress towards our targets and guide future decisions.

To assess the effectiveness of our actions, we will establish an ongoing monitoring program to track changes over time. The City of Melbourne will:

- Conduct a twice-yearly check-in of the action plan (Sept-Oct for input into capital and budget planning and April-May for final input into business planning).
- Request data and/or models for all capital works projects and planning application to track progress towards stormwater quality and water use targets.
- Conduct a strategic review (including modelling) every second year towards achievement of our IWM targets.

APPENDIX 1: SUMMARY OF CHANGES IN THE OPERATIONAL ENVIRONMENT SINCE 2014

Economic and social	• Fishermans Bend has become an urban renewal area expected to accommodate 80,000 residents and 60,000 employees. • The land use across the municipality is changing with an expectation of far higher densities by 2050. This will create higher demands on water use, on access/use of open space and expose more people and businesses to the impacts of flooding. • Increase in population expected from 136,000 in 2016 to 262,000 in 2036. • The City of Melbourne and the Royal Botanic Gardens have been gifted Yarra River extraction licences that where formally held by the Amcor paper mill in Alphington. Access to this water is yet to be determined. • Future Melbourne 2026 sets out the community's aspirations for the city. The plan includes, as Goal 1: A city that cares for its environment with: - FM 2026 Priority 1.4: Capture & reuse stormwater Melbourne will conserve water and improve the health of its waterways by capturing stormwater. This will reduce both the potable water demand for irrigation and the pollution entering our waterways.
Technological	• The East West link has been scrapped; this has renewed progress on the Arden-Macaulay urban renewal area, and shelved ideas of transferring water across the north of the municipality via these works. • Metro Rail has progressed instead. This will have a significant impact on the city, with underground stations in Arden, Parkville, Swanston St and the Domain. All these areas are flood affected to some extent and the works will impact on our drainage system as well as many other assets and operations. • Detailed flood studies and recommended base flood solutions have been developed for Southbank, Fishermans Bend and Arden-Macaulay. • South East Water is moving ahead with plans to build a sewer mine and associated third pipe network for Fishermans Bend. • The City of Melbourne has built the Carlton Squares flood mitigation and stormwater harvesting project, the first to include a purge function that will allow us to release any water in the tank prior and during heavy rainfall events, reducing flooding in Bouverie and Elizabeth Streets.
Legal	• Reform to the Water Act proposed under the previous Victorian Government has been shelved. • The State Environmental Protection Policies (SEPP) – Water of Victoria and Groundwaters of Victoria are being reviewed by DELWP. The review will have an emphasis on on-site domestic water and stormwater management. • Independent Inquiry into the EPA – part of the Victorian Government's response to the Ministerial Advisory Committee's recommendations is to modernise the EPA Act. They will also pilot Environment Protection Officers placed within local governments. • Yarra River Act. • Updated flood mapping by Melbourne Water and the City of Melbourne has created a gap between what is gazetted as Land Subject to Inundation or Special Building Overlay and our legal liability through the Building Regulations.
Environmental	• The flood levels experienced in the municipality will also change in the future under a changing climate. • Stormwater quantity is the limiting factor to ecological health of waterways.

APPENDIX 2: PROGRESS AGAINST 2014 TOTAL WATERMARK IMPLEMENTATION PLAN

CLIMATE CHANGE ADAPTATION AND FLOOD				
Action	**BAU or Ongoing**	**Key achievements**	**Gaps**	**Key Partners**
Enhance the urban planning process	✓	Considering flood risk in future design for Elizabeth St, Fishermans Bend and Arden-Macaulay		City of Melbourne External
Enhance infrastructure	✓	Modelling effects of green infrastructure on reducing flooding. Included in flood models for renewal		City of Melbourne External
Increasing community education and awareness	✓ ✗	Re-issuing warnings from the relevant agencies (SES) and broadcasting Heat Health Alerts from the Department of Health and Human Services	Insurance education and awareness campaign. This will be a future project under the climate adaptation strategy	City of Melbourne External
Undertake research	✗	Climate projection built in Integrated Climate Adaptation Model	Urban heat island effect, climate projection updates have not yet been undertaken	External
Enhance the public realm and waterways	✓	Waterways strategy, increased boating access, implementing open space enhancement works		City of Melbourne
WATER FOR LIVEABILITY				
Enhance the urban planning process	✓	Flood and Integrated Water Management infrastructure investigated or included in the structure plans for renewal areas		City of Melbourne External
Enhance Melburnians' health and amenity	✓	1:20 ARI standard being included in renewal area structure plans as new minimum service standard. Alternative water used to irrigate open space		External
Ensure access to clean, affordable water	✓	City of Melbourne advocate to ensure equity for our community. The Victorian Government manages water pricing		Water Corporations
Undertake research	✗		Further understand the linkages between human health and access to waterways and public open spaces	External
Enhance public open spaces and the use of fit-for-purpose water to cool the environment	✓	Growing Green Guide developed in 2014. Alternative water used to irrigate open space		City of Melbourne

WATER FOR THE ENVIRONMENT				
Action	**BAU or Ongoing**	**Key achievements**	**Gaps**	**Key Partners**
Enhance our waterways – Yarra River, Maribyrnong River, Moonee Ponds Creek	✓	Parks and Waterways are implementing the Docklands Waterways Strategic Plan		City of Melbourne External
Enhance stormwater quality	✓	Stormwater harvesting systems, passive irrigation, infiltration pits and trenches, expanded open space		City of Melbourne
WATER USE				
Enhance fit-for-purpose water use	✓	Alternative water used to irrigate open space		City of Melbourne External
Enhance infrastructure and buildings	✓	Rainwater tanks, 5-Star Green Star rated buildings incorporating water efficiency, recycled water systems		City of Melbourne External

APPENDIX 3: 10-YEAR STORMWATER HARVESTING PLAN (2014-2024)

PROJECTS	CATCHMENT	IMPLEMENTATION YEARS	STATUS	BUDGETS ESTIMATES
Carlton Squares	Elizabeth St	2015-17	Tanks complete, control system under construction	$2,500,000
Elliott Avenue Billabong	Arden/Moonee Ponds Creek	Stage 1 2017-2018 Stage 2 2019-2021	Current concept design and investigation.	$2,250,000
Ievers Reserve	Arden	2018-2020	Current concept design and investigation.	$3,500,000
Fawkner Park/Albert Park Lake	Southbank	2019-2021	Developing business case with Parks Victoria and City of Port Phillip.	$4,300,000
JJ Holland Park	Kensington	2020-2021	Current concept design and investigation.	$5,000,000
Amcor water pipeline	N/A Investigation of how to best access the 1,000,000,000L water take and use licence gifted to City of Melbourne at the closure of the AMCOR paper mill.	tbc	Under Investigation.	$4,730,000 (initial estimate)
QVM/Elizabeth St	Elizabeth St	tbc	Being considered as part of the QVM renewal.	$4,800,000
Arden Street Reserve	Arden	tbc	Possible flood mitigation solution as part of the Arden-Macaulay precinct.	$2,500,000

APPENDIX 4: DETAILED PRIORITISED MUNICIPAL IWM ACTIONS TABLES

NON PLACE SPECIFIC ACTIONS (WHOLE OF MUNICIPALITY)					
Actions			**Rationale**	**Priority**	**Business impact**
Advocate for	6.1.1	A consistent Planning Scheme approach across Victoria for climate change and extreme weather event mitigation including provision for onsite/on-lot flood retention in flood prone catchments.	Consistent approach with developers regarding stormwater quality and flooding, maximising water that is retained upstream.	High	Business as usual budgets
	6.1.2	1 in 20 year ARI drainage standard for high density areas (central city, growth areas, commercial precincts).	Current drainage is 1 in 5 year ARI, reduce impacts of floods on businesses and communities.	High	Subject to annual plan and budget
	6.1.3	Consistent, whole-of-government approach to sea level rise mitigation.	Protecting all low lying areas from sea level rise impacts not just the renewal areas.	Medium	Business as usual budgets
	6.1.4	Resourcing strategy to support the planning and building of expensive, long term mitigation action (such as for sea level rise).	Require large, multi-year budgets to implement, multiple beneficiaries, multi implementation agencies.	Medium	Business as usual budgets
	6.1.5	Major project and developments (such as Metro Rail, Westgate Tunnel etc.) to meet City of Melbourne's sustainability targets including those in Total Watermark.	Ensure city changing project leave an improved, positive legacy.	High	Business as usual for general advocacy, subject to business case for extra resources
	6.1.6	Above ground water storages in low lying areas to avoid saline water intrusion.	Avoid past failures of design and implementation. Risk is very high of saline water intrusion into underground storage in our low-lying areas.	Medium	Business as usual budgets
	6.1.7	Increased permeability of the city in private and public realms.	Reduced UHI effect, increased infiltration thus reducing stormwater run-off, increased opportunity for biodiversity and soil healthy.	High	Business as usual budgets
	6.1.8	An increase in the quantity and quality of green roofs, including for the capture and retention of rainwater.	Reduced UHI effect, increased infiltration thus reducing stormwater run-off, increased opportunity for biodiversity, open space and building insulation.	High	Business as usual budgets
	6.1.9	Accepting open space used for flood manage over and above the unencumbered open scape requirement set out in the open space strategy and/or the planning scheme.	To maximise the utility and amount of open space.	High	Business as usual budgets

NON PLACE SPECIFIC ACTIONS (WHOLE OF MUNICIPALITY)					
Actions			**Rationale**	**Priority**	**Business impact**
Partner with	6.2.1	Resilient Melbourne to develop decision-support tools that encourage water sensitive urban design and integrated water management.	Consistent and easier implementation of WSUD across Melbourne.	High	Business as usual budgets
	6.2.2	Academic institutions, such as the CRC for water sensitive design to learn from and further best practice.	Stay abreast of and inform the best practice.	Medium	Subject to annual plan and budget
	6.2.3	International associations of cities such as C40 and ICLEI to share and learn from international best practice.	Stay abreast of and inform the best practice.	Medium	Subject to annual plan and budget
	6.2.4	Plumbing industry, water authorities, MAV (and other local governments) on developing an approach to best manage on site storages to ensure flood benefit.	Guidance currently not available, high risk of developer and contractor installing sub-optimal systems.	High	Subject to annual plan and budget
	6.2.5	City West Water, South East Water, Melbourne Water and/or others to further investigate the feasibility of an Alternative Water ring main around the inner city, connecting the many alternative water supplies for optimal use.	Reduce potable water use, maximise the reuse opportunity for individual systems. Avoid high cost, building scale solutions to alternative water supply.	Medium	Business as usual and subject to annual plan budget and business case
	6.2.6	DELWP and others to consider the benefits of an impermeability charge to incentivise the private realm to provide green space, retain rainwater, provide urban cooling and improved amenity. Consider rewarding land owners who have taken action.	Mechanism for promoting permeability or aligned interventions such as green roofs and water tanks. Collected fees used for council permeability projects or as a fund for implementation of permeability on private land.	Medium	Business as usual and subject to annual plan budget and business case
	6.2.7	Melbourne Water and other councils to deliver on the relevant actions from the Port Phillip Bay and Westernport Flood Management Strategy.	Contribute to and provide improved flood management in collaboration with Melbourne Water and other agencies for improved community outcomes.	High	Business as usual and subject to annual plan budget and business case

NON PLACE SPECIFIC ACTIONS (WHOLE OF MUNICIPALITY)					
Actions			**Rationale**	**Priority**	**Business impact**
Deliver	6.3.1	Develop a business case for the update of the City of Melbourne's Water Sensitive Urban Design Guidelines.	Last update in 2009, the guidelines do not reflect current best practice.	High	Business case
	6.3.2	Share our learnings and practices through keeping the Urban Water website updated and providing tours, case studies and presentations.	Continue to share knowledge with the industry, develop networks and grow City of Melbourne's reputation as a world leader in integrated water management.	Medium	Business as usual or business cases for extra resources
	6.3.3	Investigate how to best use the Yarra River water gifted to City of Melbourne at the closure of the AMCOR paper mill.	Access to the water could meet a large part of City of Melbourne's irrigation needs.	High	Subject to annual plan and budget
	6.3.4	Maintain, renew and upgrade, as required, council's drainage network to achieve the level of service targets described in the Drainage Asset Management Plan.	Ensure council's drainage network is fit for purpose and accords with the Life Cycle Management principles described in the Drainage Asset Management Plan.	High	Current budgets, business as usual, and subject to business case for projects
	6.3.5	Update the Drainage Asset Management Plan.	Improved information around flood depth and extents as well as drainage asset condition data since previous document was prepared in 2012.	High	Business as usual

FISHERMANS BEND

Actions			Rationale	Priority	Business impact
Advocate for	4.1.1	Integrated outcomes that deliver multiple benefits in alignment with council's strategies and policies. In particular: • Advocate/partner with Melbourne Water to update the Land Subject to Inundation Overlay's (LSIO) to best current knowledge and accepted flood mapping. • Partner with Victorian Planning Authority, DELWP, SES and others to determine the minimum access and egress requirements for buildings if we are to live with flooding or tidal inundation.	Provide best whole of community outcomes.	High	Business as usual and business case for discrete projects
Partner with	4.1.2	Key stakeholders in the development of an IWM plan for Fishermans Bend by 2018 that will: • Address the challenges and opportunities. • Celebrate water in the landscape. • Inform the precinct plans. • Develop place-based targets for permeability and level of service for flood management. • Be aligned with the directions in City of Melbourne's strategies.	Action by Victorian Planning Authority.	High	Business as usual and business case for discrete projects
Deliver	4.1.3	Plan and partner to deliver augmentations to the drainage system including: • Augment the drainage along Clarendon St to mitigate the current frequent flooding and transport disruption in this area. • Advocate for and deliver increased monitoring and maintenance of drainage outlet to tidal river system (Lower Yarra River and Moonee Ponds Creek). • Plan for flood protection from increased Yarra River levels due to sea level rise. • Partner with Melbourne Water to investigate, design, build and manage pumped drainage systems for low-lying areas including a sustainable funding pool, increased reliability and reduced maintenance.	Mitigate current and expected future drainage, flooding and sea level rise impacts.	High	Business as usual budgets and subject to business case for infrastructure improvements

ARDEN-MACAULAY AND MOONEE PONDS CREEK

Actions			Rationale	Priority	Business impact
Advocate for	4.2.1	And partner with Melbourne Water to update the Land Subject to Inundation Overlay (LSIO) to best current knowledge and accepted flood mapping.	Reduce risk and duplicate work load for City of Melbourne and Melbourne Water during the planning process.	High	Business as usual budgets and subject to business case for amendments
	See 4.1.3	And deliver increased monitoring and maintenance of drainage outlets to tidal river systems (Lower Yarra River and Moonee Ponds Creek).	Reduce flood frequency and risk.	High	Business as usual budgets and subject to business case for infrastructure improvements
	4.2.2	The incorporation of a new Special Building Overlay in the Melbourne Planning Scheme to align with current known flood extents.	Achieve flood resilient property development through planning controls.	High	Business as usual budgets and subject to business case for amendments
Partner with	4.2.3	Victorian Planning Authority and Melbourne Water to develop an Integrated Open Space and Drainage Strategy for Arden-Macaulay that builds on international best practice and opportunities to capture water upstream in the Moonee Ponds catchment and implement the agreed actions.	Reduced flood risk while enhancing liveability and connectivity.	High	Business case
	4.2.4	City West Water and Melbourne Water to develop a place-based IWM plan to guide the implementation of the strategy and inform the structure plans developed for the precincts.	Action by City West Water.	High	Business case
	4.2.5	Other stakeholders to create a collaborative approach for the management of the Moonee Ponds Creek catchment including advocating for good urban design, enhanced amenity and ecology and improved access to and across Moonee Ponds Creek while providing adequate flood protection.	Improved management of the creek leading to reduced flooding impacts within City of Melbourne.	High	Annual plan budgets
Deliver	4.2.6	Complete the investigation and, if feasible, build the stormwater harvesting system at Ievers Reserve	Flood mitigation, improved stormwater quality and provision of alternative water.	High	Current budget and business case
	4.2.7	Construct the stormwater diversion and associated amenity improvements and, if feasible, stormwater harvesting at Elliott Avenue.	Amenity enhancement, stormwater quality and soil moisture improvements, reduced stormwater runoff and possible alternative water supply.	High	Current budget and business case

SOUTHBANK AND THE YARRA RIVER

Actions			Rationale	Priority	Business impact
Advocate for	4.3.1	Melbourne Water to update the Land Subject to Inundation Overlay's (LSIO) to best current knowledge and accepted flood mapping.	Reduce risk and duplicate work load for City of Melbourne and Melbourne Water during the planning process.	High	Business as usual budgets and subject to business case for amendments
	See 4.1.3	And deliver increased monitoring and maintenance of drainage outlet to tidal river system (Lower Yarra River and Moonee Ponds Creek).	Reduce flood frequency and risk.	High	Business as usual budgets and subject to business case for infrastructure improvements
	4.3.2	The connection to the Fishermans Bend third pipe network.	Reduced cost to developers for building scale alternative water supply.	Medium	Business as usual budgets
Partner with	4.3.3	Melbourne Water to investigate, design, build and manage pumped drainage systems for low lying area including a sustainable funding pool, increased reliability and reduced maintenance.	Early planning to reduce risk exposure to sea level rise and storm surge impacts.	Medium	Business as usual and annual plan budgets
	4.3.4	Parks Victoria and City of Port Phillip to further investigate the flood mitigation opportunity of the Albert Park Lake project.	Possibility of reducing flooding in Southbank.	High	Business as usual budgets and subject to business case for infrastructure.
	4.3.5	Melbourne Water and other stakeholders to work towards the successful delivery of the Yarra River Action Plan through active participation at multiple levels in the development of the Yarra River Strategic Plan, The Yarra River Protection Bill and the Community Vision for the River.	Improved management and health of the Yarra River.	High	Business as usual budgets
Deliver	4.3.6	WUSD and flood mitigation interventions in Southbank boulevard redevelopment.	Flood mitigation, reduced stormwater runoff and pollution.	High	Current budget
	4.3.7	Incorporate our integrated water management objectives in the City River Concept Plan that will drive integrated public realm improvements along the rivers.	Alignment of objectives.	High	Business as usual

ELIZABETH STREET CATCHMENT

Actions			Rationale	Priority	Business impact
Advocate for	4.4.1	Melbourne Water to update its Special Building Overlay to reflect latest flood modelling results.	Reduce risk and duplicate work load for City of Melbourne and Melbourne Water during the planning process.	High	Business as usual budgets and subject to business case for amendments
Deliver	4.4.2	Continue to implement the actions of the Elizabeth Street Catchment Plan.	Successfully implement the endorsed plan.	High	Current budgets, Business as usual budgets and subject to business case for projects
	4.4.3	Develop a new council Special Building Overlay in the Catchment in line with the new flood model.	Reduce risk for City of Melbourne and community of future flood damages.	High	Business as usual budgets and subject to business case for amendments

REST OF MUNICIPALITY, PRIORITY AREAS OR CATCHMENTS, ASSOCIATED KEY ISSUES, OPPORTUNITIES, ACTIONS.

Area		Key IWM issues and opportunities	Proposed way forward		Priority	Business impact
1	Docklands	Flood/sea level rise.	4.5.1.1	Undertake flooding and sea level rise modelling similar to Fishermans Bend.	High	Subject to annual plan and budget
		Challenge maintaining WSUD assets.	4.5.1.2	Provide improvements to infrastructure design and work with Serco/Citywide to develop a sustainable maintenance/ rectification approach.	Medium	Business as usual budgets
		Intrusion of saline water to harvesting systems.	4.5.1.3	Decommission affected systems, recommend against building harvesting system in saline water table or near the bay.	Medium	Subject to budget approval
2	EGate	Moonee Ponds Creek flooding/sea level rise.	4.5.2.1	Undertake flood modelling early in the planning for the development.	High	Subject to annual plan and budget
		Impact of West Gate Tunnel Project.	4.5.2.2	Advocate for minimal impact of the road to the future development including best practice treatment of stormwater runoff.	High	Business as usual budgets
		Interface with the creek.	4.5.2.3	Advocate for a positive connectivity to Moonee Ponds Creek.	High	Business as usual budgets
3	West Melbourne	Low permeability and the associated stormwater runoff volume. Relieve flooding in Dudley Street.	4.5.3.1	Reduce runoff in the West Melbourne Structure Plan area (and improve stormwater quality and provide alternative water supply) by requesting on-site retention (Rainwater tanks) through the Stormwater Management planning clause.	High	Business as usual budgets
			4.5.3.2	Implement opportunistic streetscape WSUD interventions in collaboration with the Urban Forest Strategy precinct plan.	Medium	Subject to budget and business case
4	Dynon Road	Extremely poor water quality in the Dynon Road tidal channel and bird sanctuary.	4.5.4	Advocate for improved runoff quality from the rail yards and transfer station.	Medium	Business as usual budgets
5	Kensington Road	Flooding in Kensington Road. Maribyrnong River flooding.	4.5.5.1	Model flooding and proposed flood mitigation option to allow development in Kensington and Hobsons Roads.	High	Current budget
		Reduced flood plain capacity due to renewal from industrial to residential.	4.5.6.1	Determine appropriate action and funding allocation. Implemented flood mitigation options.	High	Subject to annual plan and budget, or business case

REST OF MUNICIPALITY, PRIORITY AREAS OR CATCHMENTS, ASSOCIATED KEY ISSUES, OPPORTUNITIES, ACTIONS.

Area		Key IWM issues and opportunities	Proposed way forward		Priority	Business impact
6	East Melbourne	Catchment well covered by stormwater harvesting schemes.	4.5.6	Continue to operate and improve as required the Darling St, Fitzroy Gardens and Birrarung Marr stormwater harvesting scheme.	Medium	Business as usual budget and improvements subject to business case
7	Sports Precinct	Major sporting facilities along Swan Street.	4.5.7.1	Advocate for the state government managed land to achieve stormwater quality and alternative water supply targets.	Medium	Business as usual budgets
			4.5.7.2	Advocate for the ongoing operation and maintenance of existing system: MCG sewer mine and water tanks, Tennis centre stormwater harvesting system.	Low	Business as usual budgets
8	Carlton North	Downstream flooding in City of Yarra along Alexandra Parade.	4.5.8.1	Work with City of Yarra to determine an appropriate solution.	Low	Business as usual budgets
			4.5.8.2	Investigate options for harvesting and flood retention system in Neil Street.	Low	Business as usual budgets
9	Flemington Racecourse/ Showgrounds	Flooding / Stormwater Quality.	4.5.9	Advocate for future development to achieve TWM targets, open space and access to Maribyrnong River.	Medium	Business as usual budgets
10	Footscray Road	West Gate Tunnel Project. Wholesale market site. Port of Melbourne.	4.5.10	Advocate for future development to achieve TWM targets, open space and access to Maribyrnong River.	Medium	Business as usual budgets
11	Royal Park North/Parkville Garden	Royal Park Wetlands.	4.5.11.1	Partner with MW to maintain the Royal Park system to best practice standard.	High	Business as usual budgets
		Galada Ave swale.	4.5.11.2	Implement improvements to swale to maximise usability and improve stormwater quality outcomes.	High	Subject to annual plan and budget, or business case
12	Fawkner Park	High irrigation priority. City of Melbourne has started to investigate the possibility to divert stormwater to Albert Park Lake.	4.5.12	Continue to partner with Parks Victoria to further investigate and, if feasible, deliver the Albert Park Lake Stormwater Harvesting scheme	High	Investigation co-financed by Parks Victoria, City of Melbourne, and City of Port Phillip (2015/16 budget) Implementation subject to annual plan and budget

How to contact us

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CITY OF MELBOURNE