Fishermans Bend
Water Sensitive City Strategy

May 2022

CRC for Water Sensitive Cities

CITY OF MELBOURNE

CITY OF PORT PHILLIP

Melbourne Water

South East Water

VICTORIA State Government | Jobs, Precincts and Regions

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Aboriginal Acknowledgement

We acknowledge the Traditional Owners of country throughout Victoria, their ongoing connection to this land and we pay our respects to their culture and their Elders past, present and future.

A thriving place that is
a leading example for
environmental sustainability,
liveability,connectivity, diversity
and innovation.

Executive summary

Fishermans Bend stretches from the doorstep of Melbourne's CBD to the mouth of the Yarra River and is Australia's largest urban renewal area. It offers an unparalleled opportunity to create a world leading, sustainable, mixed-use place to live, work, visit and invest.

Water has always played a significant role in Fishermans Bend history, from creation stories as a rich food source for Aboriginal people through to the effects of flooding in the low-lying areas affecting residents and businesses. Fishermans Bend faces significant challenges in the years ahead from climate change with stormwater, riverine and coastal flooding, coupled with Victoria's climate becoming drier and warmer, leading to water scarcity.

To ensure that Fishermans Bend addresses the current and projected impacts of climate change, a bold, collaborative water plan is required. To achieve this, a Water Sensitive City Strategy is proposed.

The *Fishermans Bend Framework* (adopted by Government in 2018) identifies eight Sustainability Goals that are underpinned by a series of Targets. Objectives and Strategies.

The Water Sensitive City Strategy builds on three overarching pillars; Flood Management, Climate Resilient Water System and Urban Ecology underpinned by water sensitive priorities to create a healthy, green environment that offers social, environmental and economic benefits.

The delivery of the Water Sensitive City Strategy for Fishermans Bend relies on a range of infrastructure interventions at various spatial scales across the public and private realm:

- Green roofs, green walls and rainwater tanks in the private realm work with distributed storages, raingardens and tree pits at the street scale to provide a multi-faceted approach to stormwater run-off management, urban cooling, biodiversity and amenity outcomes.
- A water recycling plant and third pipe network to deliver on water security.
- Traditional civil engineering infrastructure of pipes, pumps and levees to ensure protection from Yarra River overflows and flood management.

Planning provisions and detailed precinct plans will underpin the implementation of the Water Sensitive Strategy. Implementation of the Strategy will require coordination through a common framework, whilst being delivered and led by the responsible organisation. A Water Sensitive City Working Group with representatives from partner organisations, established during the development of the Strategy, will perform a key role in coordinating the implementation.

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1. A place-based context

Water has played a significant role in Fishermans Bend's rich history. First for Aboriginal people before European settlement, and after that from the area's settlers through to the businesses and residents of South Melbourne and Port Melbourne today.

The lagoons, wetlands and Yarra River (called Birrarung, meaning 'river of mists' in the Boon Wurrung and Woiwurrung languages), were a central focus of life in pre-contact Melbourne. The river was a conduit rather than a barrier. Together with the land beyond its banks, it provided a rich food source for fishing, hunting and gathering. The river is the focus of many mythological and spiritual (intangible) attachments, including creation stories (Extent, 2017).

Post European settlement, Fishermans Bend took its name from the large bend in the Yarra River north of present-day Coode Island. Further east, the low-lying Montague neighbourhood was a densely populated residential area from the 1870s until the 1930s. Built upon former wetlands, it was prone to flooding, with poor drainage and sanitary conditions (Context, 2017).

Today, Fishermans Bend is Australia's most ambitious urban renewal project and a future extension to the city that is planned to accommodate 80,000 residents and 80,000 workers by 2050 (**Figure 1**). At 485 hectares, it is more than twice the size of Melbourne CBD. Fishermans Bend will play a key role in the further evolution of inner Melbourne. It will be a world renowned place to live, work, visit and invest.

FIGURE 1: *Fishermans Bend Precincts*

1.1. The challenge

In the future, Melbourne is expected to experience more heatwaves and less rainfall, as well as more extreme storm events and flooding. These changing weather patterns present a number of challenges with social, economic and environmental implications. These need to be tackled through resilient and innovative water infrastructure planning.

Victoria is becoming warmer and drier. It is also now the fastest growing state in Australia, with a population expected to almost double to 11.2 million by 2056 (DELWP 2019). This growth is and will continue to put significant strain on our rainwater dependant water supply catchments. Without diversifying our water network, water security, both now and in the future for Fishermans Bend and wider Melbourne is at risk. The resilience of Victorian communities in responding to climate change challenges will be vital to lowering our vulnerability to heatwaves, flooding and economic impacts. Our responses must include heightened awareness and education as well as planning and infrastructure to keep people safe and maintain physical and mental health.

Of the challenges presented by the industrial history and geography of Fishermans Bend, none are more complex than flooding. This is especially so when climate change impacts like sea level rise are factored in. Fishermans Bend faces a major challenge from stormwater, riverine and coastal flooding sources. Key contributing factors include:

- proximity to Port Phillip Bay and the Yarra River
- a relatively flat geography meaning stormwater is slow to drain
- low-lying land where drainage outlet pipes can become immersed, meaning stormwater does not drain freely and can cause back flow
- built up nature of both the private and public realm - these hard surfaces with low permeability mean more rain becomes stormwater.

If not effectively managed, these issues will increase with climate change, as storm activity intensifies, and sea-levels rise (projected to rise by 0.8m by 2100, Melbourne Water 2017). The cumulative impacts of this are shown in **Figure 2**. Unless appropriately managed, flooding depths could exceed one metre in low-lying parts of Montague by the year 2100.

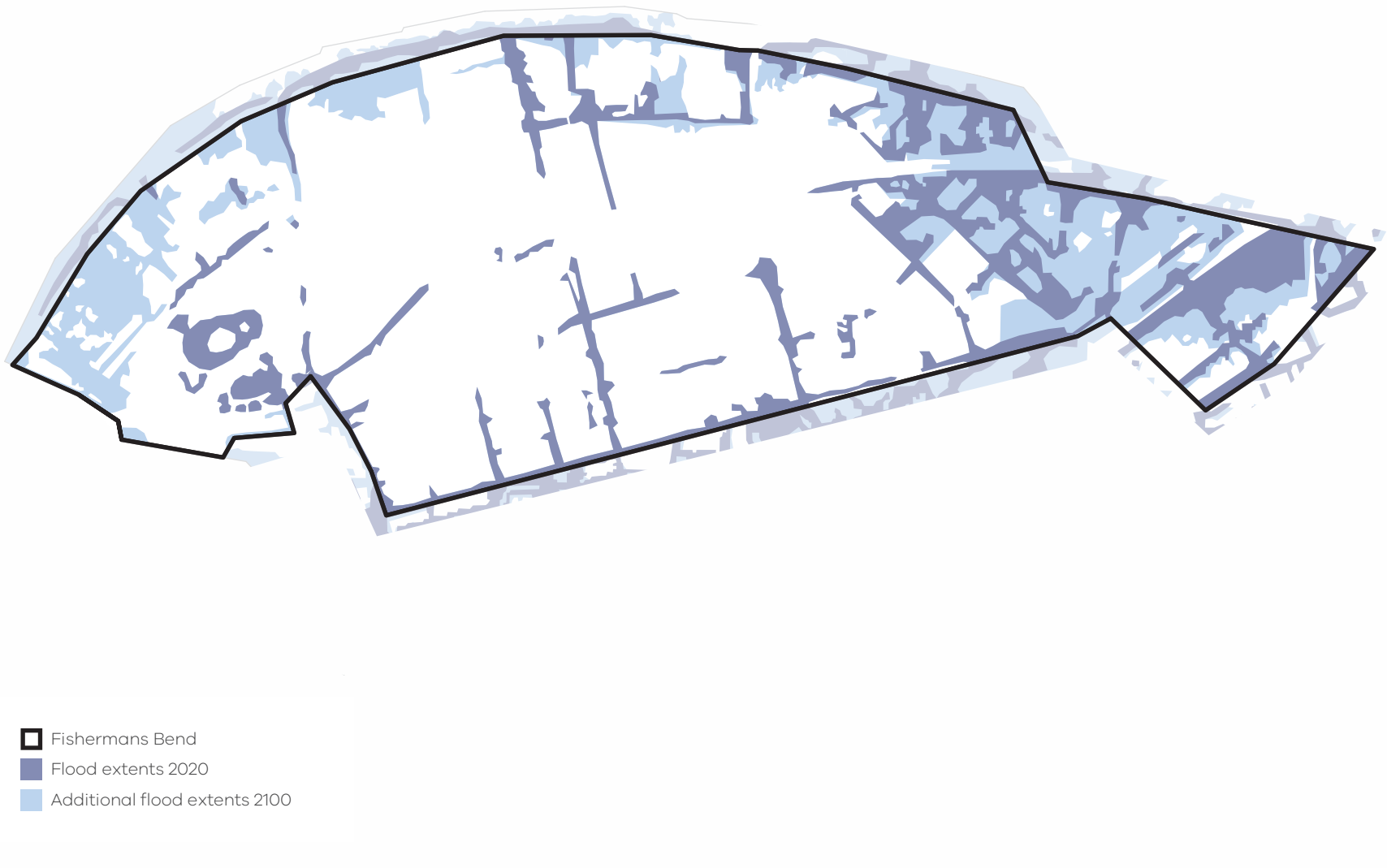


FIGURE 2: *Shows current and future one per cent AEP for flood conditions (from all sources) in Fishermans Bend.*

1.2. Planning and policy context

The *Fishermans Bend Framework* and planning provisions represent the position of the Victorian Government in relation to the delivery of its vision for *"a thriving place that is a leading example for environmental sustainability, liveability, connectivity, diversity and innovation"*. The Vision and Framework are underpinned by eight Sustainability Goals with Targets, Objectives and Strategies that outline how each Sustainability Goal will be reached. Of most relevance to this Strategy are Sustainability Goals four, five and six (**Figure 3**) and the targets contained in **Table 1**.

An Urban Ecology Study (background technical analysis to inform the development implementation plans for each Fishermans Bend precinct) has been prepared to investigate how these goals and targets may be achieved.

Fishermans Bend is registered as a Green Star Community and has planning provisions for the Green Star Design and As Built tool. Permits granted to construct a new building, to carry out works, alterations or additions require that projects must be registered as a minimum four or five Star Green Star Design and As-Built rating (or equivalent), dependant on typology with the Green Building Council of Australia. For certification, this must be submitted to the satisfaction of the responsible authority within 12 months of occupation. Green Star tool and credits are identified throughout the Strategy with the required actions.

Eight sustainability goals

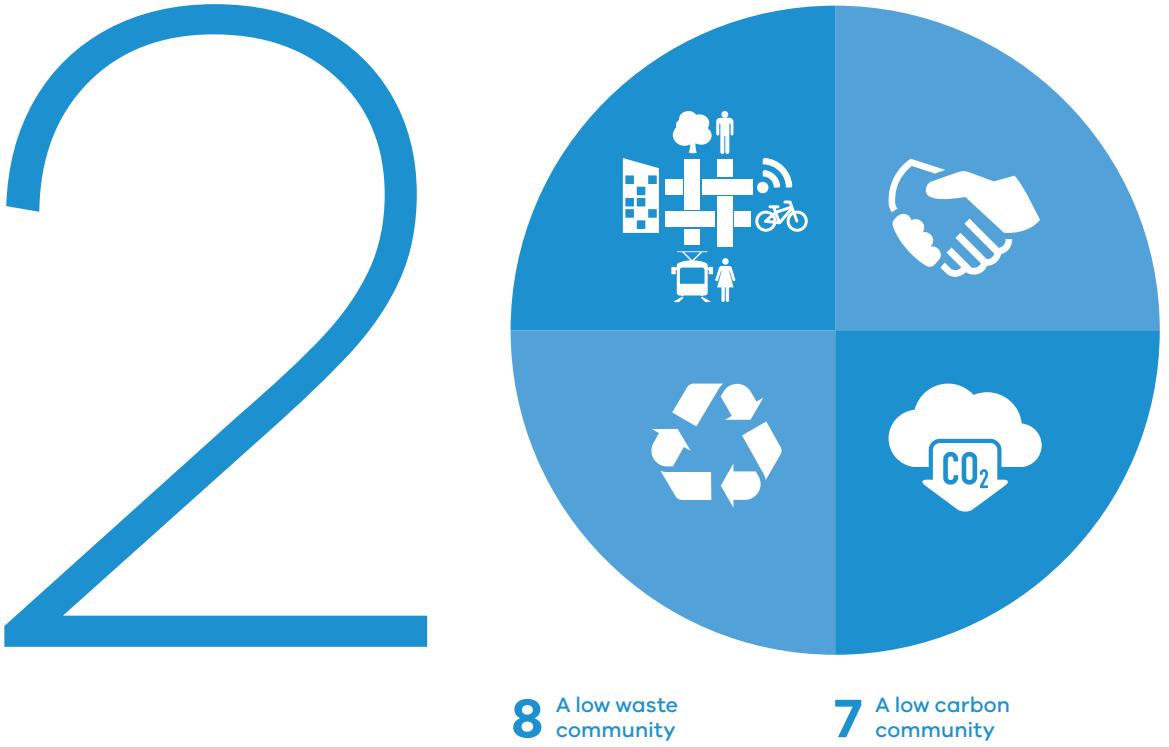
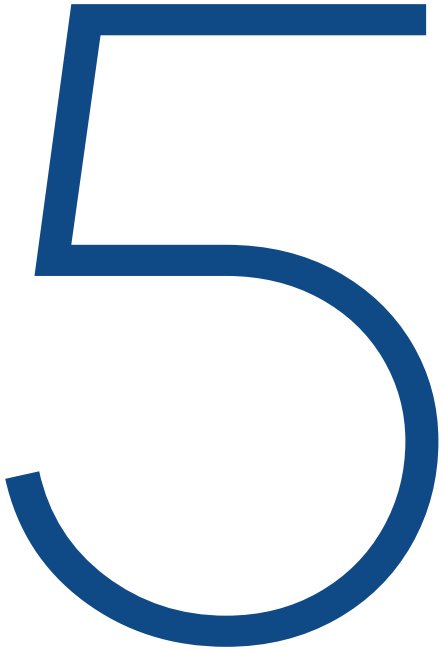
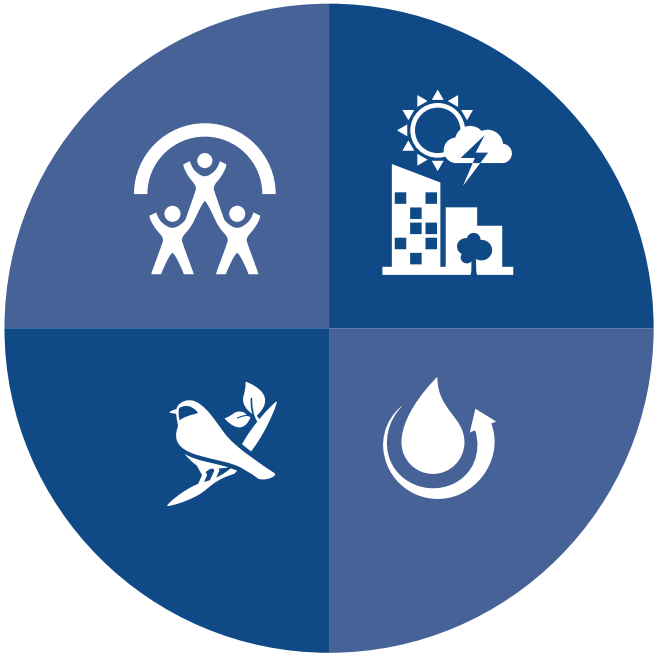


FIGURE 3: *Fishermans Bend Vision and Framework Goals*





3 An inclusive and healthy community

4 A climate resilient community

6 A biodiverse community

5 A water sensitive community

Targets for 2050

The urban heat island effect is reduced so that Fishermans Bend will be no hotter than inner Melbourne

The community is resilient to the shocks and stresses of climate change

Reduced impact of storm and flood events, including sea level rise

Nutrient discharges from stormwater and treated effluent to Port Phillip Bay are reduced

Net sewage discharge reduced by 50 per cent

Potable water demand of less than 100 litres per person per day

More than 90 per cent of the trees will be in good health by 2050

Greater diversity of plant species and fauna recorded compared to 2017 levels

TABLE 1: *Sustainability Goals and Targets of the Fishermans Bend Framework relevant to this Strategy*

1.3. Need for a water sensitive city approach

Fishermans Bend presents an ideal opportunity to build a city where water plays a pivotal role in ensuring economic, social and environmental sustainability. To achieve this, a bold collaborative and integrated water plan is required: A Water Sensitive City Strategy.

Sustainability Goal five, A Water Sensitive Community, aligns Fishermans Bend with *Water for Victoria*, as both commit to the need for a water sensitive city approach to manage water in urban environments. This goal articulates the need for active consideration of the urban water cycle and its role in delivering liveability, sustainability and climate resilience across public and private realms to benefit future residents and workers.

The Fishermans Bend Water Sensitive City Strategy supports that role and includes various water initiatives that respond to environmental, geotechnical and spatial constraints and will make Fishermans Bend an exemplar water sensitive city in international standards. They include collection and re-use of rainwater, treatment and use of recycled water, plus flood protection at a variety of scales and the integration of water in the landscape. These initiatives will boost community awareness of local conditions and encourage a risk-based approach to managing life within a floodplain.

1.4. Definitions

Alternative water sources
Non-drinking water that is harvested, treated and re-used. Includes rainwater, stormwater, and recycled water.

Annual Exceedance Probability (AEP)
The probability that a given flooding event will be exceeded in any one year. For example, a flood event with a one per cent AEP has a one per cent chance of being exceeded in any one year.

Integrated water management
A collaborative approach to planning that brings together all elements of the water cycle including sewerage, drinking water, stormwater and water treatment.

Precinct implementation plans
Each precinct in Fishermans Bend will have its own place-based implementation plan that elaborates on how the Fishermans Bend Vision and Framework will be achieved at a greater level of detail.

Green infrastructure
For the purpose of this strategy, defined as 'tree canopy, multi-layered vegetation, green roofs, green walls and green facades'. Green infrastructure is infrastructure that directly provides ecosystem services or supports the provision of those services within the urban environment.

Private realm
Property area that is privately owned and managed. Examples include residential, commercial, industrial, retail, parks, plazas, spaces and places that are predominately restricted but may be accessible to everyone, privately owned.

Public realm
Spaces and places that are open and freely accessible to everyone, regardless of their economic or social conditions. These spaces can include streets, laneways and roads, parks, public plazas, waterways and foreshores.

Stormwater
Water that falls on roads and other impermeable surfaces. Stormwater includes rainwater collected from traffi able areas (including terraces, driveways, paths, and other impervious surfaces at ground level). Unless captured or diverted to a filtration system (natural or manmade), stormwater will flow untreated into an urban creek, waterway or receiving water body.

Rainwater
Water that falls on roofs and other appropriate rainwater harvesting surfaces that can be collected and stored in a rainwater storage.

Smart rainwater tank
A rainwater tank that uses weather forecasting data and water level control technology to optimise the storage capacity to assist with flood management in major storm events.

Water recycling plant
For the purpose of this Strategy, a plant that uses multiple treatment processes to treat sewerage to a Class A standard, the highest grade of recycled water in Australia, so that it can be recycled for non-drinking water end uses. These end uses include toilet fl shing, washing machines, garden irrigation and wash down (e.g. cars).

1.5. Structure

This strategy is structured into two parts:

1. **The water sensitive strategy:** vision, purposes and priorities that outline key outcomes for Fishermans Bend will be achieved.

2. **Delivery and implementation:** a multi-scale infrastructure framework describing who will be responsible for various components of this whole-of-government strategy.

2. Water Sensitive City Strategy

2.1. Vision

A water sensitive, climate resilient, biodiverse and liveable Fishermans Bend.

2.2. Purpose

The *Fishermans Bend Water Sensitive City Strategy* outlines how water will be managed and integrated into the urban landscape to meet the *Fishermans Bend Vision* (2016) and objectives of the *Fishermans Bend Framework* (2018).

2.3. Strategic pillars and priorities

Flood management

WATER SENSITIVE PRIORITIES

Avoid climate change shock

Flood mitigation

Flood-sensitive urban design

Community resilience

Climate resilient water system

WATER SENSITIVE PRIORITIES

Provide a climate resilient, fit for purpose water supply

Reduce potable water demand and effluent discharge to Port Phillip Bay

Enable water use efficiency

Urban ecology

WATER SENSITIVE PRIORITIES

Minimise nutrient discharge

Reduce urban heat island effect

Green infrastructure

FIGURE 4: *The Strategy has three overarching pillars, with ten underlying priorities.*

2.3.1. Flood management

Reducing the magnitude and impact of flooding is vital for the ongoing social and economic prosperity of Fishermans Bend.

Service level objectives

To appropriately manage flood risks now and into the future, overall design solutions identified in the Strategy were guided by service level objectives from the City of Melbourne, the City of Port Phillip and Melbourne Water, quantified in terms of its AEP, as shown in the below in **Figure 5**.

Flood management solutions to meet these service level objectives are informed by projected increases in rainfall intensity and sea levels associated with climate change. The minimum service level is five per cent AEP with all mitigation measures in place. This reduces the extent of major flood events significantly, as shown in **Figure 6**.

These surfaces must remain free of flooding up to a **five per cent** AEP:	• streets • footpaths • bike paths • private realm • public open space
These Surfaces must remain free of flooding up to a **one per cent** AEP:	• footpaths • private realm

Note: the five per cent AEP level of service excludes those areas of the public space, designated for distributed storage

FIGURE 5: *Flooding and drainage level of service objectives, where flooding is defined as a water depth greater than 50mm.*

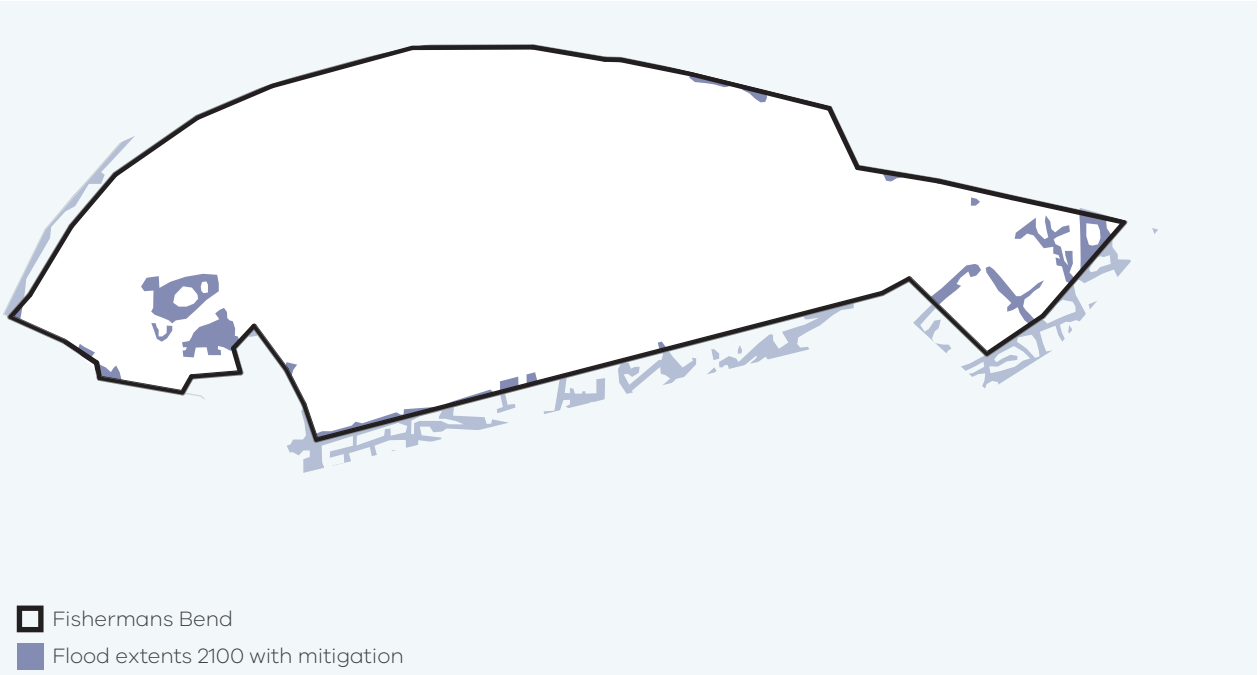


FIGURE 6: *Flood extent in 2100 at five per cent AEP with all mitigation measures in place.*

Avoid climate change shock and stresses

Current flooding depths are up to one metre in the low-lying areas of Montague and Lorimer. Increased storm intensities and sea level rise associated with climate change will see these depths rise to as much as 1.5 metre by 2100.

The main defence against sea level rise will be a levee along the northern boundary of Fishermans Bend. The levee will provide protection against flooding events up to the one per cent AEP in 2100 under projected climate change conditions. Potential design opportunities include incorporating the levee into landscaping features in public open space and integrating a levee into the design of buildings or streets.

Increased storm intensities will be offset by increased permeability in the catchment. New parks, together with greening of streetscapes and the private realm, will increase permeability throughout Fishermans Bend. With less impermeable surfaces such as concrete and bitumen, and more permeable surfaces such as grass, green walls and green roofs, more water will be retained during storm events, leading to less stormwater run-off. These will contribute to drainage and flood mitigation, whilst also bringing other benefits such as urban cooling, amenity and biodiversity.

GREEN STAR TOOL AND CREDIT

Green Star Communities

Credit 04 – Adaptation and Resilience

To encourage and recognise projects that are resilient to the impacts of a changing climate and natural disasters.

ACTION: A project specific Climate Adaptation Plan has been developed in accordance with a recognised standard **Fishermans Bend Climate Readiness Strategy**.

Flood Mitigation

The existing drainage infrastructure at Fishermans Bend generally meets modern flood mitigation standards. However, with the changed land use from industrial to capital city zoning, this service level needs to increase. To address this, new pipes and up to seven new water pumping stations will be required. These pipes and pumps will work in concert with rainwater tanks, distributed storages and the levee to ensure modern central city standards are achieved.

Public Realm

Flood mitigation solutions for the public realm include pumps, pipes and distributed storages. These solutions will be integrated into the public realm. New pipes will be underground and largely unseen by the public. Pumps will be housed in small unobtrusive buildings. Distributed storages, as per **Figure 7**, will be incorporated into the public realm.

FIGURE 7: *Distributed storages approximate locations in open space and streetscapes.*

Note: *The future urban structure of the Employment Precinct and the subsequent approach to public realm water management will be determined as part of the Implementation Plan for this precinct.*

GREEN STAR TOOL AND CREDIT

Green Star Communities Integrated Water Cycle

Credit 24A

To encourage and recognise best practice sustainable urban water management.

ACTION: The project will demonstrate that post-development, a peak AEP event discharge from the project site does not exceed the pre-development peak AEP event discharge.

Pumps are required to ensure stormwater can be drained from Fishermans Bend at all times. The current stormwater pipe outlets that drain from Fishermans Bend to the Yarra River often get sub-merged due to high tides and in the future through sea level rise. This means that stormwater is not always able to drain to the river via gravity. When this occurs, backflow prevention devices on the pipe outlets will close, preventing any backwash of river water into stormwater pipes. Pumps will then be activated to transfer stormwater from Fishermans Bend into the Yarra River.

GREEN STAR TOOL AND CREDIT

Green Star Communities Integrated Water Cycle

Credit 24A

To encourage and recognise best practice sustainable urban water management

ACTION: Flow paths will be identified during the urban design phase. Flows will be contained within 'major system conveyance' – roads, verges, public open space, living streams, waterways and wetlands.

Distributed storages

Distributed storages are surface and underground storages used to store and detain stormwater. These storages slow the release of floodwater to the pipe network, thereby reducing or eliminating the need for pipe infrastructure upgrades. They can also mitigate the impacts of pump failure by safely holding water until it can be freely drained.

Surface storages will be built into other best practice water sensitive urban design elements in streets such as raingardens and tree pits. This will create an integrated system where water detained in storages is made visible within the landscape while being treated as well as allowing for passive irrigation and evapotranspiration. This sets a strong precedent for urban renewal, consistent with the *Fishermans Bend Framework* and more specifically, Sustainability Goal five 'A Water Sensitive Community'.

Open space can also be designed to detain stormwater in extreme rain events when service levels cannot be met through street distributed storages. This is achieved by lowering the open space and making it multipurpose. These spaces can be designed to offer social and active amenity value during dry periods and a temporary stormwater storage basin during wet periods. This need is currently projected in one sub-catchment only that requires a small area of detention within JL Murphy Reserve. As with the street network, this provides the added benefit of creating social resilience to flooding by making water visible in the landscape in large rain events. Most of the time, these spaces will be dry and usable for social, recreational and environmental uses.

The Strategy only proposes distributed storage options where:

- they provide the equivalent level of service (five per cent AEP) as would be achieved through pipe upgrades;
- they are competitive when compared with pipe upgrades from a cost-benefi perspective.
- the groundwater table is deeper than 1.4 metres from the surface.

A design flowchart has been developed to guide design of all sub-catchments and streetscapes in relation to distributed storages (see **Figure 8**). Storages will be incorporated into streets as they are redesigned and landscaped.

Private Realm

Rainwater tanks enable the capture and re-use of rainwater run-off. Along with WSUD measures of green roofs and increase of permeable surfaces decreases rainwater run-off in the private realm before it can enter and thus overburden the street stormwater network.

Rainwater tanks

It is a requirement for the construction of a building or for carrying out works in the Montague, Lorimer, Sandridge and Wirraway precincts under relevant planning schemes – Capital City Zone, Schedule 1 (Port Phillip) and Capital City Zone, Schedule 4 (Melbourne):

- that rainwater is harvested from roof and suitable podium catchment areas of all buildings and is captured in a retention (rainwater) tank. With an effective volume of 0.5m^3 per 10m^2 catchment area;
- harvested rainwater is then to be used as the primary source of non-potable water within the development. A third pipe network is also to be provided to enable supply of all non-potable outlets (toilets flushing, washing machine, garden watering) with rainwater and recycled water.

The smart retention rainwater tanks are also required to pre-emptively discharge before a major storm event, thereby maximising their flood storage function in advance of high intensity rainfall events.

Local policies (Clause 22.15 of Port Phillip Planning Scheme and Clause 22.27 of Melbourne Planning Scheme) include a requirement for "development and public realm layout and design should integrate best practice Water Sensitive Urban Design".

The regulations pertaining to the provision and the operation of this infrastructure is currently being determined by the Responsible Authority.

GREEN STAR TOOL AND CREDIT

Green Star Design and As Built

Potable Water Credit 18

To encourage building design that minimises potable water consumption in operations.

ACTION: Developments will demonstrate a reduction of predicted potable water consumption from the use of sanitary fixtures, appliances, HVAC, irrigation systems and swimming pools. Rainwater storage tanks and precinct recycled water supply will contribute to this reduction.

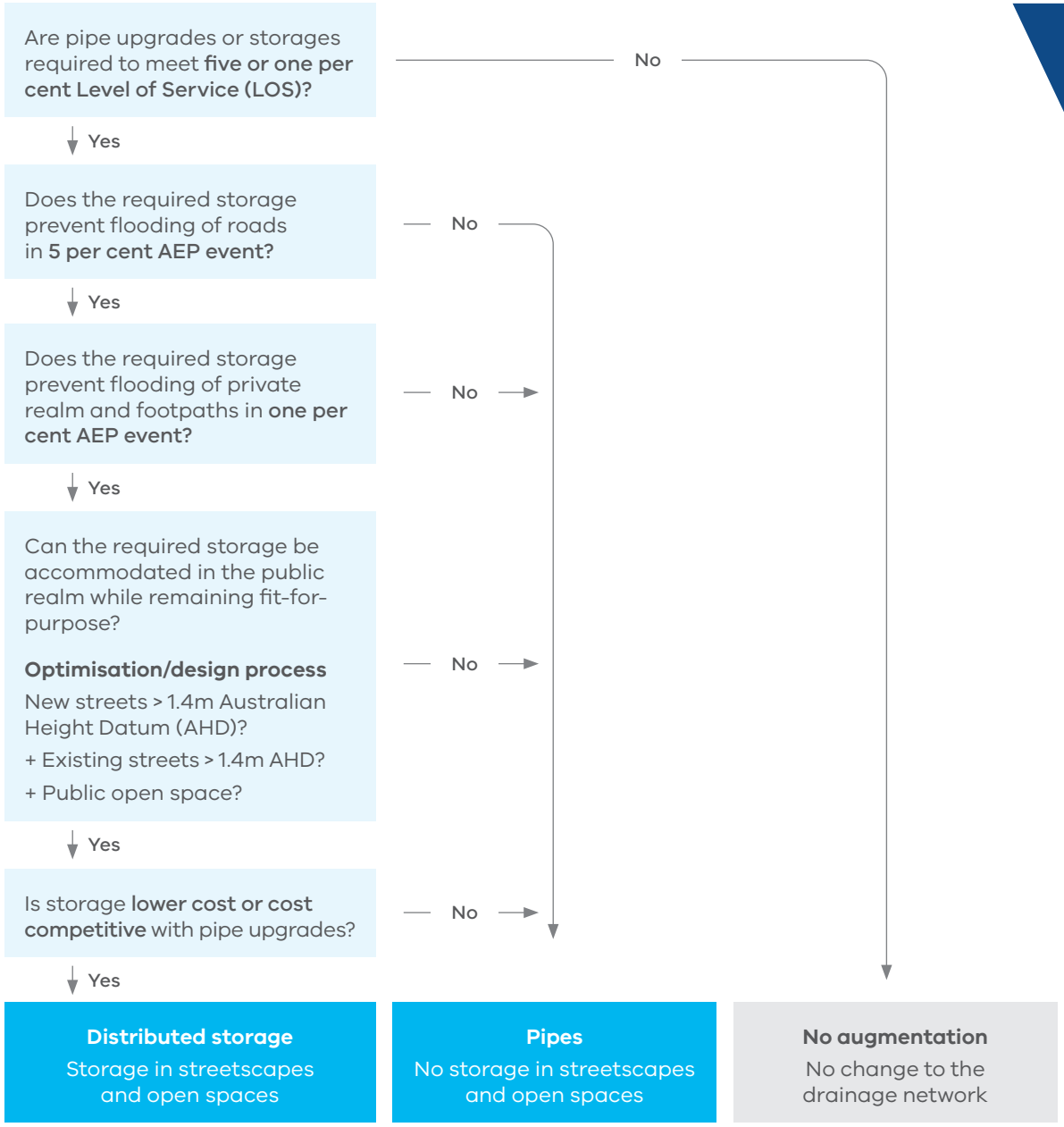


FIGURE 8: *Catchment based decision-making framework for distributed storage and pipe infrastructure (GHD July 2019).*

Flood-sensitive urban design

The planned flood mitigation infrastructure will reduce flooding at Fishermans Bend, but it will not eliminate it entirely. For this reason, flood-sensitive urban design is required. Streets will be designed to convey overland flows, so the private realm can be away from floodwaters. New buildings will be further protected through the raising of finished floor levels. Where this is required opportunities to make commensurate changes to levels in the public realm will be considered to ensure integrated design outcomes.

Any requirements for flood-sensitive design will be considered in the broader context of good urban design. Setting floor levels above the street level without consideration of human scale can impact upon equitable access and street activation, reduce the street's social and economic vitality and create safety issues.

Equitable access with minimal level changes between the public and private realms delivers on the principles of Universal Design. Interventions such as accessible platform lifts and ramps can offer equitable access, but they may be time consuming and perceived as undignified. Equitable access is preferably achieved via well designed gentle grade changes in the public realm or through appropriate interventions inside a building. These include appropriately transitioned spaces supported by lifts, where people can maintain their privacy.

Crime Prevention Through Environmental Design (CPTED) principles identify at-grade or close to at-grade maintain eye level interactions between people and contribute to the ease of flow of people between the public and private realm. This passive surveillance contributes to a sense of safety within buildings and on street activation being more easily achieved.

By contrast, if the private realm is too far above the public realm the connection between people inside a building and out on the street is lost. This outcome will be avoided and minimised wherever possible.

Where standard flood-sensitive requirements impact on street activation and equitable access, the floodplain manager (Melbourne Water) will work with other authorities and property developers to agree on an optimal outcome. Investigations by Melbourne Water, local government and Fishermans Bend Taskforce have indicated that for the vast majority of cases, all three design outcomes (good urban design, street activation, equitable access) are achievable at Fishermans Bend. Where this cannot be achieved, innovative urban design and discretion on flood-sensitive design requirements will be explored collaboratively by relevant authorities and developers.

The Good Design Guide for Buildings in Flood Affected Areas in Fishermans Bend, Arden and Macaulay is currently in development and will provide further guidance on Flood-sensitive urban design.

Community resilience

Community resilience in response to climate change is an issue that is global and local, with governments and communities each having a role in decreasing the vulnerability of people and places to the adverse effects of climate change. This spans from impacts on water supply to issues of safety around property and infrastructure, to the sustainability of our natural environments and physical and mental health of people. Community resilience is a key outcome of the *Fishermans Bend Climate Readiness Strategy* developed by AECOM in 2017 to inform the planning for Fishermans Bend.

Public Realm

The use of water sensitive urban design such as raingardens, swales and detention storages integrated within the urban form will improve community resilience to flooding, as water will be regularly visible in the landscape, normalising it and thereby raising community awareness to flood conditions in a controlled manner.

In areas of increasing urbanisation like Fishermans Bend, social and health costs can be minimised by:

- policy development and implementation
- action towards disaster resilience and fostering community cohesion to mitigate the effect of urban heat and storm events.

Sustainability Goal four "A climate resilient community" commits Government to creating a community that is resilient to extreme weather events – including flooding, drought, heat waves and storm surges associated with sea level rise. This can help deliver a community with a high degree of social cohesion, creating an environment that enhances community resilience (DELWP 2017).

Private Realm

Education and awareness can be improved over time through behavioural change programs and community events that increase awareness of stormwater and flood. The establishment of a community resilience plan will ensure that people are prepared for extreme weather events and can recover quickly after they occur. These initiatives aim to empower communities to take active responsibility for their own and each other's wellbeing, safety and health in the face of climate change. They ensure that people have emergency management protocols in place for safe access, exit and refuge.

The outcome of providing a flood mitigation strategy that meets the service level objectives is shown in **Figure 6**. The reduction of the impact of flooding is prominent in the Montague and Lorimer precincts, where flood depths of over one metre are projected to occur if no mitigation strategy is put in place.

GREEN STAR TOOL AND CREDIT

Green Star Communities

Credit 04 – Adaptation and Resilience

To encourage and recognise projects that are resilient to the impacts of a changing climate and natural disasters.

ACTION: A project specific Community Resilience Plan (CRP) will be developed that addresses preparation during and post disaster communication, safety and response.

2.3.2. Climate resilient water system

Diversifying our water supply sources to reduce reliance on rainfall dependant catchments and enabling fit for purpose water supply are vital to help prepare Fishermans Bend and the broader area for decades to come. By reducing potable water use, Fishermans Bend can have a secure and climate resilient water supply, which is a key pillar to enable a liveable and sustainable community. This innovative and unique water system will showcase Fishermans Bend, setting a water management standard for urban planning in the future.

Provide a climate resilient, fit for purpose water supply

The proposed climate resilient water supply for Fishermans Bend delivers a combined water system across the precinct, street and building scales crossing both public and private realms.

Rainwater collected from the roofs and podiums of buildings and Class A recycled water from a precinct scale water recycling plant will provide alternative water sources for non-potable uses in Fishermans Bend.

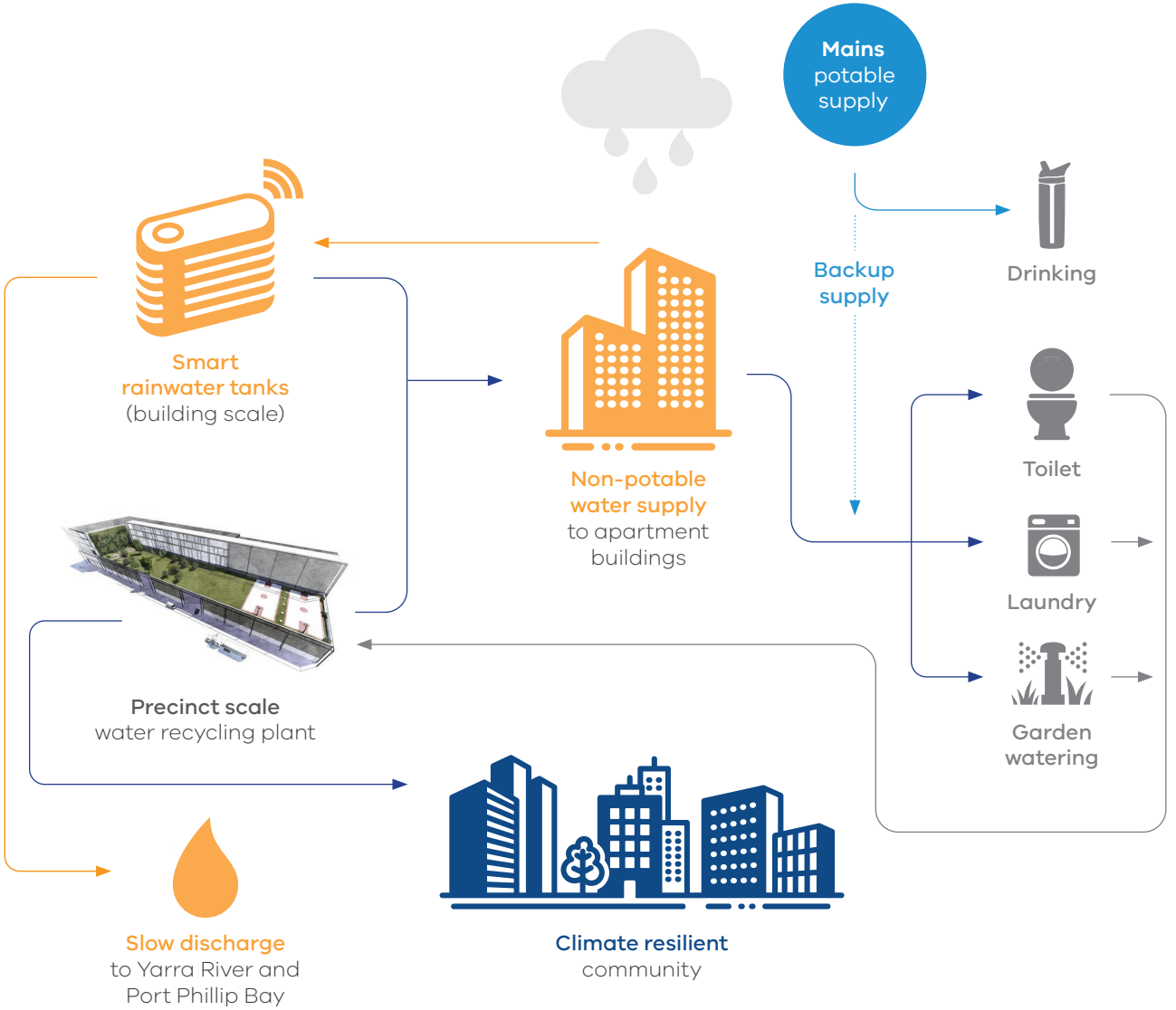


FIGURE 9: *Alternative water supply for Fishermans Bend*

Water recycling plant

A water recycling plant will be built within the Fishermans Bend and is planned to be operational by 2030. The plant will have a capacity of 18 megalitres per day and is expected to be delivered in three stages. It will mine sewage from the Hobsons Bay Sewer Main and treat it to Class A recycled water standards. This water will be supplied across the precinct for non-potable uses.

The water recycling plant will use state-of-the-art treatment processes, providing a robust and space efficient treatment system and enhanced odour management within the treatment complex. This creates an opportunity for the water recycling plant to be used as a multipurpose space (**Figure 4**). It also contributes to the delivery of an Employment Precinct that is internationally renowned as a centre of innovation in advanced manufacturing, engineering and design.

If sufficient land is available for the facility and demand warrants service to beyond Fishermans Bend, it will be designed to be scalable up to 32 megalitres per day.

Public realm

The use of stormwater to passively irrigate green infrastructure in the public realm will be delivered through the adoption of water sensitive urban design elements.

The water recycling plant will also provide a climate resilient water supply for open space irrigation within Fishermans Bend. Continuous water availability for green spaces will ensure they remain healthy and green, even during periods of low rainfall or drought. This will ensure the amenity, active spaces and urban heat island mitigation benefits that green infrastructure can provide are available when needed most.

Private Realm

Harvested rainwater will be the first source of non-potable water used within all buildings for toilet flushing, washing machine use, wash down (bins, cars, bikes, etc.) and garden watering (including green roofs and facades).

This will enable both reduction of potable water use through fit-for-purpose water use as well as helping to ensure the rainwater tanks are empty before the next rain event; required as part of the flood mitigation strategy. Smart tank technology will be used when usage alone isn't enough to empty the tanks before a rain event.

When rainwater tanks are empty, non-potable water will be supplemented from the water recycling plant, ensuring a secure supply of non-potable water for all end uses.

To ensure the climate resilient water supply is implemented and operates at the intended service level, rainwater tanks and third pipe plumbing (to connect to a future precinct scale recycled water network) is mandated within all buildings under planning controls for the area. South East Water's condition of connection also supports this through a third pipe requirement whose design and construction must enable connection to a future precinct scale recycled water network.

Reduce potable water demand and effluent discharge to Port Phillip Bay

The adoption of a diverse water supply network will ensure that the potable water consumption target will be less than 100 litres per person per day by 2050. The reduction of potable water use is likely to delay, or possibly eliminate the need to upgrade the trunk potable water infrastructure network for the area.

By 2050, the use of Class A recycled water will reduce the volume of effluent entering Port Phillip Bay by fifty per cent when compared to a scenario of having no source of Class A water in Fishermans Bend.

Enable water use efficiency

The installation of efficient water appliances will also help to reduce the volume of potable water use and effluent discharge.

Planning provisions for Fishermans Bend require all buildings to meet a minimum rating of five stars through the Green Building Council of Australia's 'Design' and 'As-built' assessment tools (four star if the proposal is for less than 10 dwellings or 5,000 square metres), or equivalent through an agreed alternative rating tool.

As part of this, a specific Water Efficiency Labelling and Standards (WELS) rating for all water use appliance will be required to ensure efficient water use by residents and workers within Fishermans Bend.

GREEN STAR TOOL AND CREDIT

Green Star Communities Integrated Water Cycle

Credit 24A

To encourage and recognise best practice sustainable urban water management.

ACTION: A reduction of at least 48 per cent of potable water demand is being targeted for the precinct.

GREEN STAR TOOL AND CREDIT

Green Star Design and As Built

Potable Water Credit 18

To encourage building design that minimises potable water consumption in operations

ACTION: Highly efficient WELS fixtures to be installed, will contribute to private buildings Green Star Design and As Built ratings .

2.3.3. Urban ecology

Reducing the urban heat island effect

Building and landscape elements that reduce urban heat island impacts will be part of the urban design for Fishermans Bend.

These elements include reflective roof and permeable pavement materials, shade structures, water features, tree canopy and multi-layered vegetation and other elements across the public and private realm. The Fishermans Bend Urban Ecology Study (GHD, 2019) outlines how urban forestry and best practice urban and building design can influence heat, wind, and biodiversity outcomes in Fishermans Bend.

The combination of these elements will reduce the urban heat island effect and enhanced liveability for residents and workers and will ensure that the target that Fishermans Bend will be no hotter than inner Melbourne.

Green infrastructure

Providing green infrastructure that prioritises indigenous vegetation, with native and exotic planting will also contribute to reducing the urban heat island effect. The plantings provide resources for biodiversity and using alternative water sources for their irrigation will support the creation of a complex and biodiverse habitat.

Public realm

The Fishermans Bend Urban Ecology Study recommends that green biodiversity links, biodiverse vegetation and water in the landscape to be integrated with public open spaces and streetscapes.

These will be achieved by creating new local parks and enhancements to bike paths, tram lines and pedestrian paths, with vegetation to be planted where possible.

The proposed greening approach has multiple benefits in addition to urban heat island mitigation and increased biodiversity. This includes improved street activation, safe, active, healthy and connected communities.

GREEN STAR TOOL AND CREDIT

Green Star Communities

Heat Island Effect Credit 31
To encourage and recognise projects that implement measures to reduce the heat island effect.

ACTION: At least 50 per cent of the total project site area, in plan view, comprises building or landscaping elements that reduce the impact of the heat island effect.

Private realm

New development will be required to support the creation of vegetation links within Fishermans Bend to surrounding areas of biodiversity through planting selection and design.

Buildings should include deep soil zones or planter pits to accommodate canopy trees, green facades and water efficient rooftop, podium or terrace plantings. These features will be located and designed to be sustainable, viable, resilient and appropriate to micro-climate conditions.

The adoption of green infrastructure with green roofs, green walls and facades can extend evaporative surface area for cooling, the availability of alternative water sources and reduce stormwater flows. Contibuting to the social and environmental function of these spaces during hot and dry weather.

Green roofs and walls

Roof and podium catchment areas are multipurpose spaces that provide social and environmental functions for residents and workers. To meet urban heat island and urban forest targets, the Urban Ecology Study sets out recommendations for green infrastructure on buildings such as green roofs and facades. This infrastructure could provide a secondary benefit whereby soil profiles of green roofs contribute to stormwater detention and run-off reduction to the street stormwater network.

Design considerations: To ensure compatibility, design of onsite green infrastructure needs to be designed and delivered in conjunction with retention (rainwater) tank design. Policy guidance may be required to encourage these matters to be considered earlier in the planning of new developments.

GREEN STAR TOOL AND CREDIT

Green Star Design and As Built

Heat Island Effect Credit 25

To encourage and recognise projects that reduce the contribution of the project site to reduce the heat island effect.

ACTION: At least 75 per cent of the total project site area comprises building or landscaping elements that reduce the impact of the heat island effect.

Minimise nutrient discharge

Best practice strategies will be used to manage rainwater, stormwater and recycled water in Fishermans Bend.

This will involve implementation of onsite multifunctional infrastructure at all the development spatial scales.

These strategies will reduce the nutrient discharges and minimise the environmental impacts to Port Phillip Bay.

Rainwater and stormwater

Fishermans Bend will achieve the water quality performance objectives in Urban Stormwater Best Practice Environmental Management Guidelines and referenced in the Environment Protection Act (2017) (or as amended) as a minimum standard.

This means best practice water sensitive urban design features and optimised re-use of rainwater and stormwater in public and private realm will be required to achieve the objectives.

Public realm

Water sensitive urban design will be integrated into public open spaces, streetscapes and with other infrastructure such as distributed storages.

This includes features like raingardens, stormwater harvesting schemes for public open space irrigation and passive irrigation of suitable tree canopy and biodiverse understorey plantings.

These water sensitive urban design features will treat captured stormwater, improve water quality and reduce nutrient discharge to Port Phillip Bay.

Private realm

The adoption of stormwater management and green infrastructure in the private realm are critical for the delivery of this Strategy.

It is a requirement in Fisherman Bend that the rainwater captured from 100 per cent of roof rainwater harvesting areas (including suitable podiums) must be used for toilet flushing, washing machine, wash down (bins, cars, bikes, etc.) and irrigation.

This means rainwater from tanks in a stormwater treatment must have fit for purpose treatment. Rainwater from multifunctional roofs will need disinfection, colour and odour management before it's used, as it can be a pollutant source if not managed appropriately.

Stormwater treatment will need to be achieved for total site run-off and not limited to excess run-off generated by new development.

Guidelines will be provided to help the development industry ensure appropriate treatment and re-use of rainwater, stormwater and greening in the private realm is achieved.

These initiatives will result in a greener Fishermans Bend and reduce the nitrogen and phosphorus loads entering Port Phillip Bay.

GREEN STAR TOOL AND CREDIT

Green Star Communities Integrated Water Cycle

Credit 24A1.2

To encourage and recognise best practice sustainable urban water management.

ACTION: The following minimum reductions in total pollutant load from the developed part of the project site must be achieved:

- 80 per cent reduction in total suspended solids
- 60 per cent reduction in total phosphorous
- 45 per cent reduction in total nitrogen
- 90 per cent reduction in gross pollutants

Raingardens

The urban renewal of the existing public realm and the delivery of new public spaces will utilise stormwater treatment measures that improve the quality and reduce the flow of water discharged to receiving waters. This includes measures like the collection and re-use of rainwater and stormwater on site and raingardens. The requirements for fit-for-purpose stormwater treatment are specified in the Amendment VC154 and in the local policies (Clause 22.15 of Port Phillip Planning Scheme and Clause 22.27 of Melbourne Planning Scheme).

Directing run-off from hard surfaces to raingardens and tree pits with understorey vegetation will also increase greening, contribute to cooling and bring amenity benefits to the building surrounds.

Sewage

The water recycling plant will provide an alternative non-potable water source for Fishermans Bend.

A third pipe network will supply Fishermans Bend with Class A recycled water from the recycling plant. This water will be directed to toilet flushing, washing machines, wash down (bins, cars, bikes, etc.) and garden uses (including green roofs and facades).

Use of recycled water will reduce net sewage discharge by more than 50 per cent and reduce the nutrient run-off load to Port Phillip Bay.

The multifunctional purpose of precinct infrastructure elements means that multiple targets around nutrient reduction, biodiversity and urban heat are met through this integrated approach (outlined in **Figure 10**).

GREEN STAR TOOL AND CREDIT

Green Star Design and As Built

Stormwater Credit 26.2

To reward projects that minimise peak storm water outflows from the site and reduce pollutants entering the public sewer infrastructure or other water bodies.

ACTION: The following minimum reductions in total pollutant load from the project site must be achieved:

- 80 per cent reduction in total suspended solids
- 60 per cent reduction in total phosphorous
- 45 per cent reduction in total nitrogen
- 90 per cent reduction in gross pollutants
- 90 per cent reduction in total petroleum hydrocarbons
- 90 per cent reduction in free oils

Infrastructure asset	Benefit	RELATED TARGET
Distributed stormwater storages Integrated with water sensitive urban design features	Holds water within the landscape during flood events and provides passive irrigation for vegetation, evapotranspiration and multiple ecosystem services.	**More than 90 per cent of trees will be in good health by 2050.** **+** **Reduced impact of storm and flood events.**
	Integrates with best practice water sensitive urban design features such as raingardens that incorporate various plant species for amenity and water treatment.	**Greater diversity of plant species compared to 2017 levels.**
	Enables treatment of stormwater before entering Port Phillip Bay.	**Reduce nutrient discharge to the bay.**
	Improved community resilience and amenity benefits.	**The community is resilient to the shocks and stresses of climate change**
Water recycling plant To provide a climate resilient water supply	Ensures tree watering requirements are met even in times of drought.	**More than 90 per cent of trees will be in good health by 2050.**
	Does not limit plantings to drought tolerant plant and tree species. Enables choice of a variety of plants that offer different benefits: • biodiversity and amenity • canopy cover for shade • use of deciduous trees that let in light in winter • evapotranspiration potential.	**Greater diversity of plant species compared to 2017 levels.** **+** **The urban heat island effect is reduced so that Fishermans Bend is no hotter than inner Melbourne by 2050.**
	Use of recycled water reduces total nutrient load to Port Phillip Bay.	**Reduce nutrient discharge to the bay.**
	Reduces reliance on traditional water sources.	**Potable water demand of less than 100 litres per person per day**
Private building green infrastructure Green walls, roofs or raingardens etc.	Provides benefits to building occupants including: • insulation of building • shading in summer inside buildings and in private open spaces.	**The urban heat island effect is reduced so that Fishermans Bend is no hotter than inner Melbourne by 2050.**
	Contributes to cooling of the public realm.	
	Creates the opportunity to enable the 50 per cent tree canopy cover target.	
	Uses best practice environmental management and design to enable treatment of stormwater for nutrient removal.	**Reduce nutrient discharge to the bay.**
Rainwater tanks	Reduces nitrogen and phosphorus load entering Port Phillip Bay.	**Reduce nutrient discharge to the bay.**

FIGURE 10: *Multi-functional use and benefits of infrastructure elements of the WSC Strategy and how they tie climate resilience, nutrient discharge and biodiversity targets.*


ANZ

3. Delivery and implementation

3.1. Multi-scale implementation framework

Various infrastructure interventions are planned or in development to deliver the Water Sensitive City Strategy. These will be implemented at various spatial scales in the public and private realm. **Figure 11** shows how interventions relate to Framework Sustainability Goals. **Table 2** outlines the proposed implementation approach, including the timing, scale and agency responsible for delivery and operation.

Multi-scale water sensitivity Approach

Fishermans Bend scale

Onsite water recycling plant and third pipe network
Levee
Green spines

Precinct and street scale

Water sensitive urban design
Above ground distributed storages

- Streetscape tree pits
- Multi-functional streetscape
- Multi-functional open spaces

Pipes and pumps

Building scale

Smart tanks for flood protection
Rainwater harvesting
Compatible uses at ground floor
Green roofs and green walls

Sustainability goals and targets

A climate resilient community
Urban heat island mitigation
Resilience to extreme weather variation

A water sensitive community
Reduce sewage discharge
Reduce nutrient discharge
Maximised water re-use
Flood protection

A biodiverse community
Healthy trees
Enhanced biodiversity

FIGURE 11: *Multi-scale Water Sensitive City Strategy Approach*

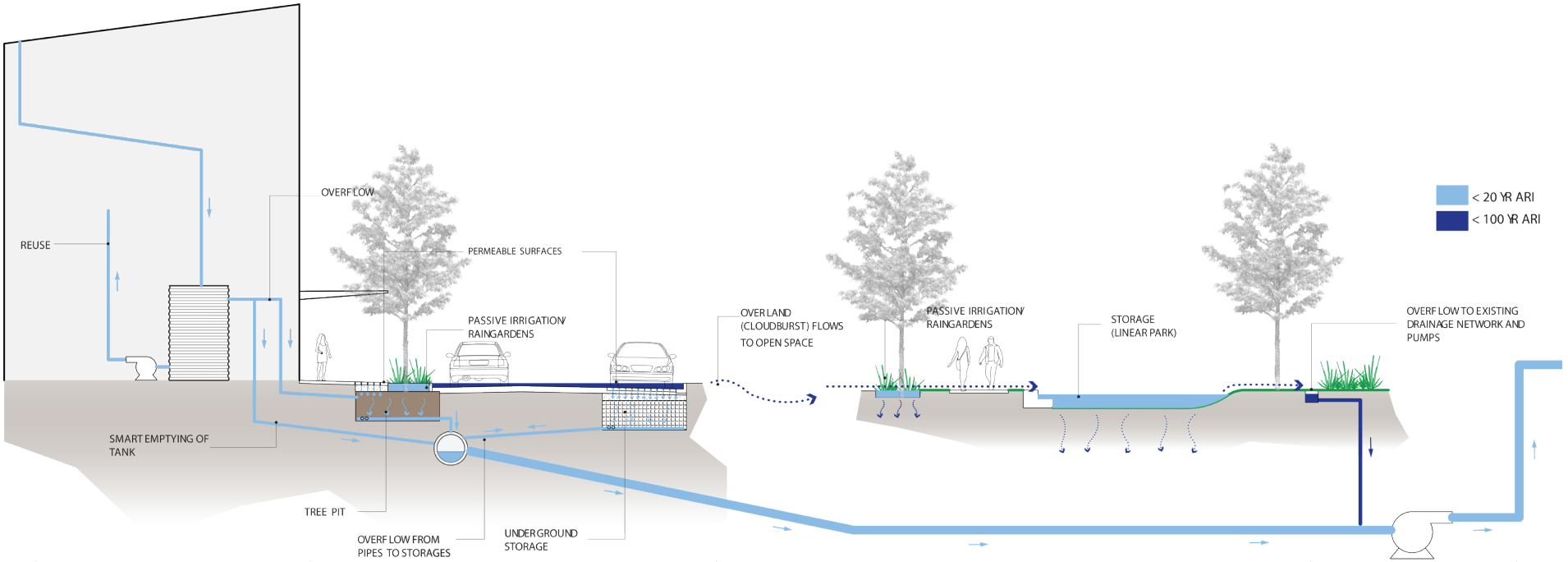
3.2. Implementation Plan

Project	Component	Delivery	Responsible	Scale
Water Recycling Plant (WRP) and reticulation network	WRP site selection	2021 – 2024	South East Water	Fishermans Bend
	WRP construction	2030 – 2050 (in three stages to meet demand)		
	3rd pipe network rollout	Ongoing		
Precinct Implementation Plans	N/A	2021 – 2023	DJPR	Precinct
Levee	N/A	2040 – 2100	Melbourne Water	Precinct
Pumps	N/A	2034 – 2060		
Pipes (New & Upgraded)	N/A	2025 – 2030		
Distributed Storages	N/A	Ongoing	Councils and / or relevant state agency	Street
Retention (Rainwater) Tanks	N/A	Ongoing	Developers	Building
Within building 3rd pipe	N/A	Ongoing		
Green Infrastructure	N/A	Ongoing	Developers Councils	Building Street

TABLE 2: *Fishermans Bend Water Sensitive City Implementation Plan flood management solution*

3.3. Flood management solution

To meet service level objectives, the Water Sensitive City Strategy for Fishermans Bend works at multiple scales to achieve multiple outcomes. Green roofs, green walls and rainwater tanks in the private realm work with distributed storages, raingardens and tree pits at the street scale to provide a multi-faceted approach to stormwater run-off management, urban cooling, and greening outcomes. These initiatives are supported by a water recycling plant and to deliver on water security. Protection from Yarra River overflows and flood management use traditional civil engineering infrastructure of pipes, pumps and levees. The infrastructure elements and how they work together is illustrated in **Figure 12**. The resulting effect of with and without mitigation in 2100 is illustrated in **Figure 13**.



PRIVATE REALM

- Rainwater tanks
- Reuse
- Onsite permeation

PUBLIC STREET

- Storage
- Permeable paving
- Raingardens
- Passive irrigation

PUBLIC OPEN SPACE

- Storage
- Permeable paving
- Raingardens
- Passive irrigation

DRAINAGE INFRASTRUCTURE

- Pits
- Pipes
- Pumps

FIGURE 12: *Conceptual drawing of how the different infrastructure and water sensitive urban design elements work together to mitigate stormwater, riverine and coastal flooding (GHD, July 2019).*

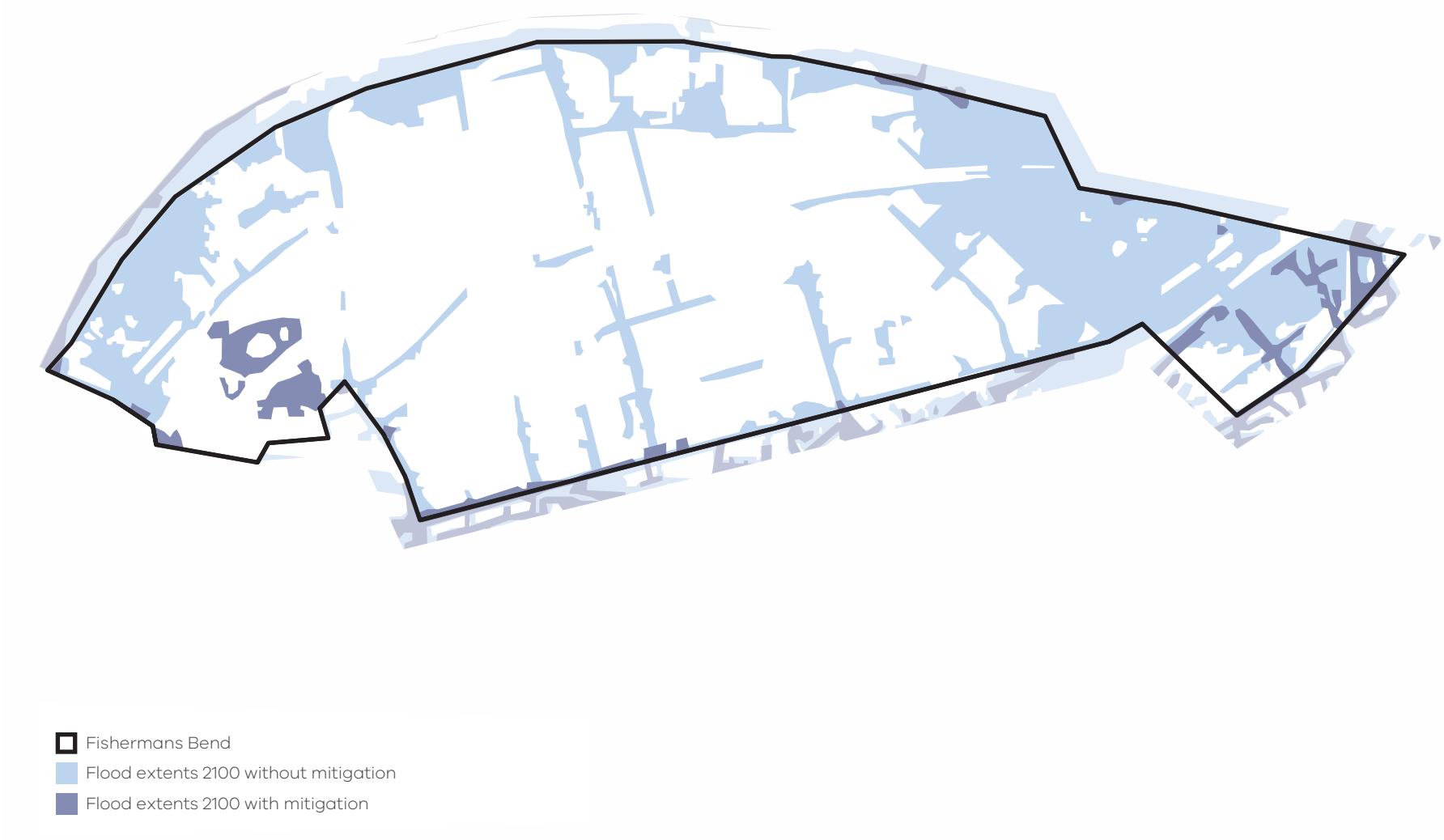


FIGURE 13: *One per cent AEP with and without mitigation 2100*

3.4. Implementation governance

The Strategy will be jointly delivered by:

- Melbourne Water (levee, pumps, larger pipes).
- South East Water (water recycling plant).
- Other state government agencies (distributed storages/water sensitive urban design in current/future arterial roads and higher order parks).
- City of Melbourne and City of Port Phillip (distributed storages/ water sensitive urban design in higher order local streets and parks, and upgrades to existing smaller pipes).
- Developers as part of works associated with development (drainage / water sensitive urban design infrastructure in local streets and laneways, rainwater tanks and third pipe).

It is also likely that developers will deliver some assets attributed to other parties in lieu of making contributions via a development contribution mechanism.

Decisions will be made during implementation of the Strategy. For example:

- **Distributed Storages** After streetscapes are designed, decisions will arise on the volume and location of distributed storages. These decisions will be informed by the Strategy and other factors such as landscape outcomes, transport outcomes and engineering feasibility.
- **Multipurpose nature of roofs and podiums of buildings** Roofs of buildings will be used to provide a variety of outcomes, that improve liveability, beyond a harvesting catchment for rainwater, This creates complexities around ensuring water quality for end uses is maintained and will require assessment and management on a site by site basis. Partnerships between multiple stakeholders across the design, operation and ongoing maintenance will be integral to the long term function and overall success of the proposed measures.

Detailed design decisions about assets will be made by the lead organisation for delivering and maintaining each asset.

For this reason, the inter-governmental working group established during development of the Strategy, with representatives from partner organisations, will continue to perform a key role in coordinating the implementation of strategic priorities during early years of implementation. This arrangement will adapt to the changing needs of the project and partner organisations over time.

Each organisation will review its progress in meeting objectives of the Strategy for which they are responsible for. If, for whatever reason, any objective is not being delivered in accordance with the Strategy, this must be communicated to all other effected organisations through the inter-governmental working group, so delays can be factored into planned five-yearly reviews of the Strategy.

4. Publications

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