

Flood Management Plan for Maribyrnong City Council and Melbourne Water June 2016-June 2021



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Approval

This Plan has been developed in consultation with Maribyrnong City Council, Melbourne Water and Victoria State Emergency Service. As lead stakeholders for managing flood risks. Melbourne Water and Maribyrnong City Council will endeavour to implement the recommendations in this plan.

Approved by	Signature	Date
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1	May 2016	Draft for comments
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Monitoring and review

Melbourne Water will initiate annual review meetings to report on progress implementing improvement actions with Maribyrnong City Council. The Plan will be revised at least every five years to reflect achievement of objectives and changes to work program priorities.

Executive Summary

The challenges of localised flooding

Floods are a natural occurrence in the Port Phillip and Westernport region. We can't stop them happening, but we can plan for and manage the risk, and reduce the consequences. Melbourne Water, Council and the Victoria State Emergency Service are working together to reduce the severity and impacts they cause to people, places and communities. One of the ways this is being achieved is through the development of Flood Management Plans.

The municipality faces a number of local flood management and drainage challenges. There are over 1600 properties known to be at risk of flooding with many flooding above floor. Adding to these challenges are future pressures on the drainage system associated with urban consolidation, increase in rainfall intensity and rising sea levels.

What is a Flood Management Plan?

This Flood Management Plan (this Plan) outlines roles and responsibilities and describes, at a high level, Council and Melbourne Water's key flood management activities. This Plan identifies specific actions to improve flood management in the municipality over the next five years.

Flood Management Plan goals and objectives

The overarching goal of the Flood Management Plan is reducing the risk and impacts of flooding on local communities. The objectives in developing and maintaining this Flood Management Plan are to:

- enhance collaboration
- identify hotspots and flood risks
- provide opportunities for information sharing
- identify achievable improvement actions
- clarify contacts at other agencies, and
- align this document with the Flood Management Strategy, Port Phillip and Westernport, 2015.

By enhancing the understanding of flood risk and improving collaboration between Melbourne Water, Maribyrnong City Council and VICSES, flood issues will be managed in an informed and efficient manner. In time the risk of floods and associated impacts on the community will be reduced.

Summary of key drainage and flood issues/'hotspots'

Whilst developing this Plan the following flooding hotspots were identified in collaboration with the City of Maribyrnong and the Victorian State Emergency Services (Vic SES). Hotspots have also been drawn from the Maribyrnong Drainage Study (1999) for medium / high flood hazard locations where the design standard is 1 in 5 year.

Location	Source
Marin Lane, Braybrook	MCC
Nicholson Street, Footscray (between Irving and Paisley Streets)	
Victoria St, Seddon (Rail Underpass)	
2 Raleigh Rd, Maribyrnong (Angler's Tavern)	
West side of Yarraville Railway Embankment between Castlemaine St and Francis St	
Lorne St, Yarraville (at the east end)	
Dempster St, West Footscray and within the Stony Creek drainage reserve	
Williamstown Rd and Bayview Rd, Yarraville	
Beverley St, Yarraville	
Stonemark Court, West Footscray (east end)	
Havelock St, Maidstone	
Beachley St, Braybrook	
Lily St, Braybrook	
George St, Blanche St and Cuming St, Yarraville	
Taylor St, Yarraville	
167 Sunshine Road	Maribyrnong Drainage Study
2 Dongola Road	
45 and 47 Powell Street	

Key management actions

A core component of this Plan is the improvement plan that identifies key issues under the following themes:

- Flooding and flood risk hotspots
- Planning, preparation and mitigation
- Community education and awareness
- Improved collaboration and communication

The four issues identified with the Maribyrnong City Council include:

1. Proactive management of flood and drainage assets.
2. Better exchange of data and intelligence between stakeholders.
3. Land Subject to Inundation Overlay (LSIO) and Special Building Overlay (SBO) within Council's Planning Scheme is inconsistent with Melbourne Water's revised flood mapping.
4. Better community awareness and understanding of how to plan, prepare and respond to flood risks in flood prone areas.

Actions have been developed to address each of the key issues and agency responsibilities for the implementation of the actions have been assigned.

Reference no.	Action	Responsibility
Issue 1: Proactive management for flood/drainage assets		
1.1	Hydraulic modelling of Council drainage system at locations with known issues in order to prioritise flood and drainage asset upgrade works. Use this work to identify opportunities for joint projects between Council and Melbourne Water.	Council
1.2	Hydraulic modelling of the Council drainage system in locations where limited pipe capacities have been previously identified.	Council
1.3	Map Council's open drains across the municipality	Council
1.4	Validation of drainage network and update of our drainage assets spatial system – Intra Maps	Council
1.5	Consider the potential impacts on the drainage system when developing climate change policy and responses	Council
Issue 2: Better exchange of data and intelligence between stakeholders		
2.1	Clarify internal processes and responsibilities regarding the internal sharing and distribution of flood related data.	Council
2.2	Key stakeholders to exchange flood intelligence as appropriate.	Melbourne Water / Council / VICSES
2.3	Identify opportunities for efficiencies within the permit application process for those areas covered by an SBO or LSIO overlays.	Melbourne Water Council
2.4	Annual meetings to review the progress of actions within this improvement plan.	Melbourne Water

2.5	Develop and implement a data sharing agreement to be reviewed annually.	Melbourne Water
2.6	Reformat the current 'Sub Flood Plan' into the Maribyrnong Flood Emergency Plan.	VICSES/Council

Issue 3: 3. Land Subject to Inundation Overlay (LSIO) and Special Building Overlay (SBO) within Council's Planning Scheme is inconsistent with Melbourne Water's revised flood mapping

3.1	<p>Undertake or update flood mapping at the following sites, focussing on the identified issues:</p> <ul style="list-style-type: none"> • Banbury Village: review levels at the site and update SBO extent as required • Braybrook/Maidstone: confirm if flood mapping is required. • Edgewater Estate: remove the new addition to the SBO as the area has been filled. • Regional Rail site: remove new addition to the SBO as the area has been filled. Note: given the loss of flood storage. Melbourne Water will need to negotiate with VicTrack to have a channel built. • Park Ave, West Footscray (Lae St development) – flood mapping is inconsistent with built form (volumetric balancing undertaken – see attached strategy) • Butler St / Marin Lane, Braybrook – flood mapping does not appear consistent with subdivision contours • 75-79 Cranwell St, Braybrook – flood mapping inconsistent with built form 	Melbourne Water
	Yarraville railway embankment: new flood mapping is required (this will form part of Action 3.1).	Council
3.2	Melbourne Water to work with Council to amend Planning Scheme based on new flood mapping (to be undertaken once Action 3.1 is completed).	Melbourne Water / Council

Issue 4: Better community awareness and understanding of how to plan, prepare and respond to flood risks in flood prone areas		
4.1	Provide community resilience and education information to the public who reside in riverine frontages flooded by Maribyrnong River (LSIO areas).	VICSES
4.2	Provide flood information to public who reside in areas covered by a SBO (e.g. drop in sessions, Planning Scheme Amendment Exhibition).	Council (with support from VICSES)
4.3	Provide flood related information to public at known hotspots.	Council
4.4	Provide flood information and local flood guide (as part of Council initiatives)	Melbourne Water/VICSES
4.5	Maintain historic flood markers including on Plantation Street Maribyrnong. Install additional signage where required (to be determined).	Council
4.6	Signage warning of flood risks to be placed at key entry points to parks situated along the Maribyrnong River	Council

The development of this Plan and the Flood Emergency Plan for the municipality provides a basis for improved coordination and collaboration between stakeholders. Coordination will be further improved with annual meetings between Melbourne Water and the Maribyrnong City Council to discuss ongoing operational and improvement opportunities.

1. Background

The Port Phillip and Westernport Region Flood Management and Drainage Strategy (Melbourne Water, 2007), recognised no single organisation and no single approach can deliver an effective response to flood management issues. A coordinated and collaborative approach by flood managers and communities is required.

A key outcome from the strategy was the commitment from Melbourne Water to work with each Council within the region to produce a local Flood Management Plan.

The new regional Flood Management Strategy released in October 2015 continues to support updating municipal flood management plans to reflect new information, local priorities and agreed flood management solutions.

2. Introduction

This Flood Management Plan has been developed in response to a recommendation from the Victorian Auditor General's Office to improve collaboration between flood management agencies. To assist Maribyrnong City Council, Melbourne Water and the Victoria State Emergency Service (VICSES) working at a local level to implement the objectives of the Port Phillip and Westernport Region Flood Management and Drainage Strategy (Melbourne Water, 2007).

The Plan outlines roles and responsibilities and describes, at a high level, Maribyrnong City Council and Melbourne Water's key flood planning and management activities. It details the flood risks for the municipality, identifying hotspot areas, and contains actions to address key gaps identified when developing the Plan.

2.1 Scope

This plan outlines key activities, roles and responsibilities for Melbourne Water and Council for flooding related to waterways and the drainage system. It considers current and future flood risks. The scope does not include flooding arising from dam failure or tsunamis. Emergency response planning is not included in this plan as it is addressed in the Flood Emergency Plan.

2.2 Objectives

The objectives in developing and maintaining this Flood Management Plan are to:

- enhance collaboration
- identify hotspots and flood risks
- provide opportunities for information sharing
- identify achievable improvement actions
- clarify contacts at other agencies, and
- align with the Flood Management Strategy, Port Phillip and Westernport, 2015.

2.3 Context

Flood management activities are guided by state, regional and local strategies, plans and legislation that operate together to support public health, safety and liveability. These strategies, plans and legislation provide a framework for Flood Management Plans and include:

- The (draft) 2014 Victorian Floodplain Management Strategy (VFMS)
This sets the framework and process for regional floodplain management strategies.
- Emergency Management Act 2013 and Interim Strategic Action Plan
These set out the State's emergency and crisis management arrangements and priority activities for implementation over the near future, focussed on risk assessment and resilience, capability and response, and relief and recovery.
- The Flood Management Strategy, Port Phillip and Westernport, 2015
This regional strategy addresses challenges and opportunities to ensure flood management activities across the region provide the best outcomes for communities.
- The vision for the Flood Management Strategy, Port Phillip and Westernport is;

Together we are aware, responsive and resilient to flooding. Communities, business and government understand flooding, plan for challenges, and take action to manage risks.

The Strategy has three objectives:

1. The right information is available at the right time to people who need it
2. Flood risks are addressed to reduce impacts and get the best social, economic and environmental outcomes
3. Land, water and emergency planning agencies work together to manage flooding.

Other related state and regional strategies include:

- Victorian Coastal Strategy
- Victorian Climate Change Adaptation Plan
- Melbourne Stormwater Strategy, and
- The Metro Framework.

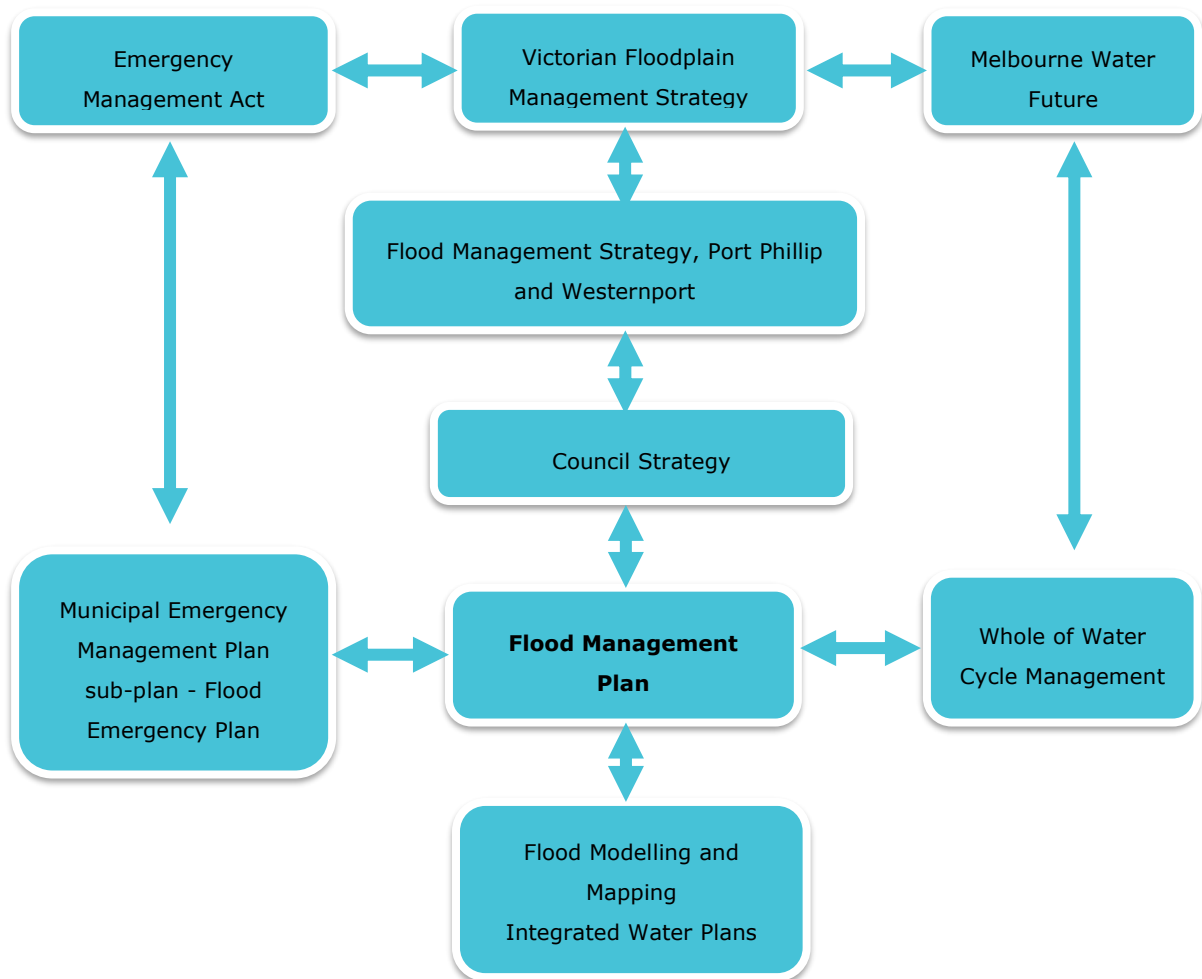


Figure 1: Victorian Flood Management Context

2.4 Target audience

This Flood Management Plan is an internal document intended for use by relevant representatives in Council, Melbourne Water and VICSES.

Community consultation

In developing this Plan Council and Melbourne Water considered whether community consultation was required. It was decided community consultation would not be undertaken as part of the development of this Flood Management as the community will be involved in a detailed level in its execution.

3. Roles and responsibilities

Many agencies share responsibilities for flood prevention, planning, response and recovery. An outline of key responsibilities for flood agencies is included below; noting only those that relate to flood prevention and planning are relevant to this plan.

The Commonwealth Government

- Supports development and implementation of national strategies by providing frameworks for floodplain and emergency management and warning systems
- Regulates flood insurance providers
- Provides natural disaster financial support to state and local governments and agencies (e.g. National Partnership Agreement on Natural Disaster Resilience)
- Through the Bureau of Meteorology, contributes to flood prediction and warning services, and provides research and data on long term climate trends.

The Victorian State Government

- Develops state wide policy, standards and frameworks for regional floodplain management and emergency response, and for water resource planning, investment and delivery
- Stores and manages flood data and information
- Develops frameworks and platforms for data sharing and provision of total flood warning (TFWS) systems
- Funding for emergency response and recovery, and some funding for flood management activities
- Develops and maintains land use planning systems and building regulations.

Melbourne Water - Regional Floodplain Management Authority

- Prepare and implement regional flood strategies in line with State Government objectives
- Conduct flood risk and mitigation studies
- Prioritise and implement local flood mitigation, floodplain management and TFWS in line with state policy and community needs
- Support emergency response planning and provision of services (TFWS)
- Advise planning authorities on appropriate land use planning and development for flood prone land through statutory referral functions
- Support coastal adaptation planning by local governments
- Manage regional drainage infrastructure in the Port Phillip and Westernport catchment (for catchment areas greater than 60 hectares)
- Manage the health and environmental function of waterways and floodplains, and consider cultural heritage values during flood mitigation investigations
- Manage flood risks to essential trunk water services.

Local Government

- Administer and enforce planning provisions and building regulations in relation to building and development on flood affected land
- Provide for and support the conservation of natural resources and areas of environmental significance through land use planning and asset management
- Contribute to development of local flood management plans and flood emergency management plans
- Participate in flood risk reduction activities and project prioritisation
- Support public awareness and access to flood risk information
- Support delivery of flood warning messages where warning systems are established
- Manage local drainage infrastructure (for catchment areas less than 60 hectares)
- Coordinate flood relief, recovery and clean-up at the local level
- Lead local adaptation processes to prepare for climate change induced flood risks, such as sea level rise.

Victoria State Emergency Service

- The control agency for flood, storm, tsunami and earthquake in Victoria
- Manages responses to emergencies and helps communities to prepare through planning and education
- Engages directly with communities, educating on how to prepare for natural hazards
- Issues warnings and notifications for flood, storm, tsunami and earthquake
- Work with Councils to develop emergency management plans, providing advice, information, education and training
- Conduct audits of Municipal Emergency Management Plans every three years
- VICSES units sandbag to protect property and infrastructure from floods, as well as assisting Victoria Police with evacuations and in search and rescue operations
- Following severe storms, SES units provide temporary repairs – like tarping – to damaged structures, and clear fallen trees and branches so they no longer pose a danger.

4. Description of the municipality

4.1.1 Location and key features

The City of Maribyrnong is situated to the west of the City of Melbourne and at 31.2 km² is the smallest and most densely populated municipality in the metropolitan area (www.liveinvictoria.vic.gov.au). As well as the City of Melbourne Maribyrnong is bordered by Moonee Valley to the North, Brimbank to the West and Hobson's Bay to the South (see Map 1).

The City of Maribyrnong is made up of the suburbs of Braybrook, Footscray, Kingsville, Maidstone, Maribyrnong, Seddon, Tottenham, West Footscray, and Yarraville and is projected to have a population of approximately 87,000 by 2016. There were 31,048 dwellings in Maribyrnong in 2011 and this was forecast to grow to 35,544 in 2016, and 56,032 in 2031 (forecast.id, 2016).

The City of Maribyrnong has and continues to undergo significant change with redevelopment of residential and industrial properties. This redevelopment has resulted in densification and increases in urban runoff that add to the demands on drainage infrastructure. The proximity to the Maribyrnong River also means that properties within the city are subject to riverine flooding.

4.1.2 Waterways

The two main waterways within the City of Maribyrnong are the Maribyrnong River and Stony Creek (Map 2) with a combined length of 32.5 kilometres. Almost all of Stony Creek is contained within the municipality while only the lower section of the Maribyrnong River is contained within the municipality.

The Maribyrnong River runs for 160 kilometres from its source on the slopes of Mount Macedon near Lancefield, about 50 km north of Melbourne, and flows through Keilor North, Keilor, Kealba, Sunshine North, Maribyrnong, Flemington, Footscray and Yarraville to Port Phillip Bay (Melbourne Water). The Maribyrnong catchment to the north-west of Melbourne covers 143 square kilometres and yields an average annual flow of 120,000 million litres.

The river is Melbourne's second major waterway behind the Yarra flowing through the Maribyrnong municipality before joining the Yarra River near Yarraville before flowing to Port Phillip Bay.

Stony Creek flows through the inner western suburbs of Melbourne including Sunshine, Tottenham, West Footscray and Yarraville. It begins on the boundary of the Maribyrnong and Brimbank municipalities (on the Brimbank side) before crossing under Sunshine Road and entering the City of Maribyrnong. It flows through the municipality and joins the Yarra River downstream of the confluence of the



Map 1: City of Maribyrnong location map

Maribyrnong and Yarra Rivers. Much of Stony Creek is highly modified and the surrounding catchment is mostly urban and industrialised. Natural reaches exist along some of the parks and reserves adjacent to the Creek, and it is a popular recreational asset with bike paths and walking tracks along the majority of its length.

4.1.3 Drainage

There are approximately 408.5 kilometres of drains within Maribyrnong City Council. Melbourne Water is responsible for 75.4 km while Maribyrnong City Council is responsible for the other 333.1 km.

Melbourne Water is responsible for the installation and maintenance of drainage systems and flood mitigation works, for catchments with an area greater than 60 hectares. Council is responsible for the installation and maintenance of drainage systems and flood mitigation works, for catchments with an area smaller than 60 hectares.

The drains associated with major roads are owned and maintained by VicRoads.

The location and details of each drain and associated infrastructure are available from Melbourne Water and Maribyrnong City Council's Geographical Information Systems (GIS).

Below is a map of the municipality showing the main drains, waterways and the 1% AEP flood extents for rivers and underground drains (Map 3).

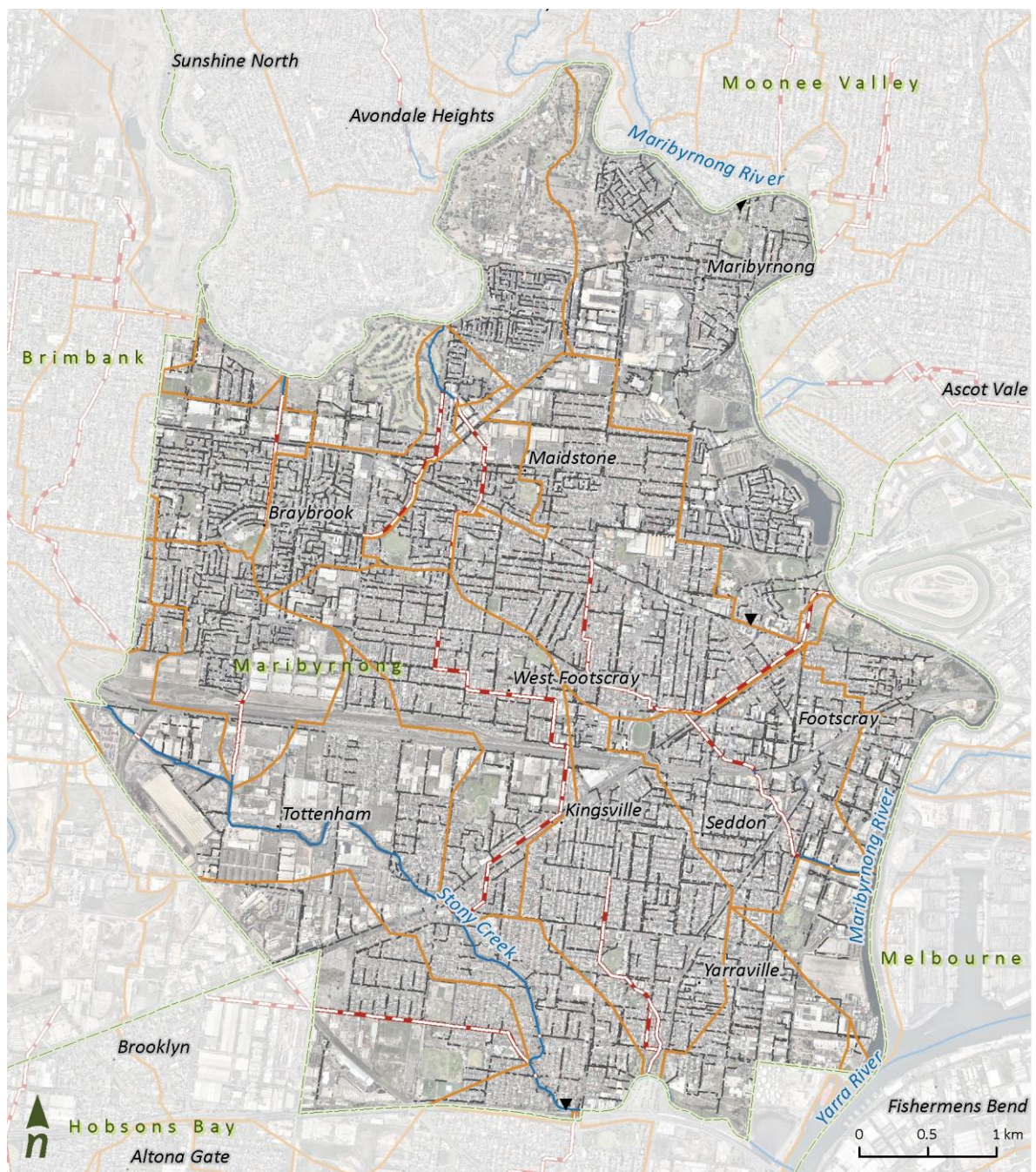
Strategy

Maribyrnong City Council has an existing drainage strategy that was developed in 1999. This strategy is under review with the intent of releasing a revised strategy in 2016. A flood mapping study (Hyder, 1999) informed the development of the existing drainage strategy and provided advice on:

- deficiencies (e.g. capacity issues) in Council's drainage system
- identification of overland flow paths (i.e. areas where flow occurs when drainage capacity is exceeded) and guidance on development controls for these areas
- drainage design standards, and
- a capital works program which recommended \$ 10.1 million of works to meet new drainage standards.

Other recommendations included:

- incorporating overland flow paths identified in the study into Council's planning scheme (i.e. as a Special Building Overlay or SBO), and
- development of a capital works program based on the areas prioritised in the study.



Legend

- ▼ Hydrographic monitoring point
- Council drainage pipe
- Waterway
- Melbourne Water drain
- Catchment
- Municipal Boundary

Map 2: Sub-catchments and waterways

The existing drainage strategy has a number of objectives, including delivering environmental and landscape benefits, protecting existing buildings from major storms, ensuring floodwaters do not present unacceptable risk to the community, ensuring piped drains have sufficient capacity to minimise impact of minor storms, and ensuring new buildings and subdivisions are protected from major storms and do not have impact on major and minor flooding as well as water quality downstream.

Guidelines

Maribyrnong City Council has a number of guidelines that are relevant for development in flood-prone areas including:

- Guidelines for New Council Drainage
- Guidelines for New Property Drain Connections
- Operations and Maintenance Legal Point of Discharge Guidelines
- Guidelines for new developments which include on-site detention and retention and WSUD (Water Sensitive Urban Design) assets.

Melbourne Water has also developed the "Guidelines for Development in Flood prone Areas" (Melbourne Water, 2008) to assist property owners, developers, designers and builders to understand the broad principles and specific requirements that apply to property development in flood-prone areas within the Melbourne metropolitan area. The guidelines address requirements in both floodplain and overland flow path areas and supplement the Land Development Manual (Melbourne Water, 2009).

A number of drainage studies have been undertaken in the City of Maribyrnong (see Appendix 5).

Melbourne Water has recently revised flood mapping extents along its drains and waterways within the municipality. Revised mapping was completed in 2013 and was based on new LiDAR (Laser Imaging Detection and Ranging) data that was collected in 2007.

4.1.4 Flood history and issues

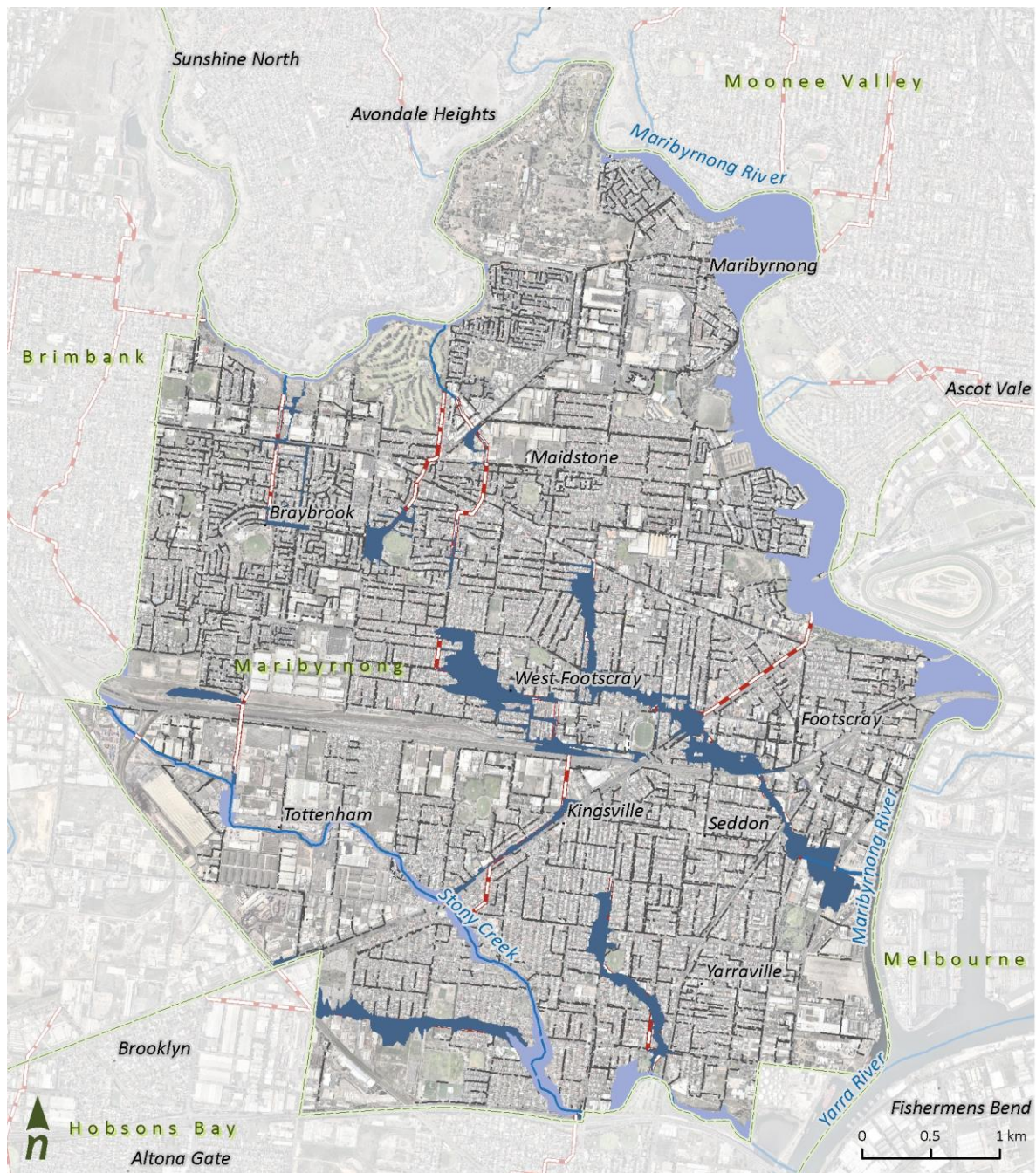
There have been several floods in the Maribyrnong municipality since its establishment. Since 1891 there have been 25 recorded occurrences of the Maribyrnong River breaking its banks. Other flooding has occurred away from the Maribyrnong River within the suburbs of the Maribyrnong municipality. Notable floods occurred in:

- September 1906
- 1916
- May 1974
- 1987
- December 1992
- September 1993, and
- February 2005.

The 1974 flood was one of the worst on record and resulted in damage to residential, industrial and public utilities. At the time there were no warning or alert systems. The peak occurred during the night of May 15th 1974 and resulted in the evacuation of many people from the Maribyrnong floodplain by emergency services, private citizens, coastguard and the army. Water was flowing at depths of between 90cm and 120cm across the floodplain and most of the major road access routes were cut off for approximately 18 hours.

There are areas within the Maribyrnong municipality which are known to be prone to flooding, these include:

- The Maribyrnong Township
- Francis Street
- Stony Creek Valley, particularly near Francis Street
- Churchill Avenue near Ashley Street
- Area between Summerhill Road, Barkly, Gordon and Essex Streets
- Windsor Street and Darling Street
- Waratah Street and Somerville Road
- Ballarat Road at Summerhill Road
- Victoria Street at railway underpass
- Highpoint Shopping Centre
- Braybrook and Maidstone housing commission.



Legend

- Waterway
- Council drainage pipe
- Melbourne Water drain
- Municipal Boundary
- LSIO Maribyrnong region
- SBO Maribyrnong region

Map 3: Main drains, waterways and 1% AEP flood extents

Some of the factors contributing to flooding are outlined below:

- **Building on floodplains:** Floodplains convey overbank flows from rivers when they flood. Any buildings and properties in these areas will therefore also flood.
- **Undersized drains for current and future levels of development:** In Maribyrnong, like many other older municipalities the drains were designed for more pervious catchments. As development progressed, increased imperviousness has resulted in greater runoff that is required to be carried by drains. The design runoff in some areas is now greater than the pipes and overland flow paths can carry.
- **Private properties being built on former creek and overland flow path alignments.** In times of flood, flows run through properties situated on these alignments.
- **Drains becoming blocked by litter (organic and inorganic).** Drains in areas with significant leaf litter or regions of high inorganic litter (bottles, wrappers etc.) have a higher likelihood of flooding due to blockages of pipes occurring. Such areas are usually flagged for more regular cleaning and maintenance.

4.1.5 Flood data and information

A variety of flood information and data is held by Council, Melbourne Water and VICSES including reports, studies, datasets and spatial information.

Table 1: Flood knowledge for Council

Information	Comments	Custodian
Maribyrnong Flood Mapping Study	Completed by Hyder Consulting in 1999	Maribyrnong City Council
Melbourne Water revised flood mapping extents	LSIO and SBO extents revised in 2013	Melbourne Water
Flash flooding locations	Recorded flash flooding data	VICSES
Flooding hotspots	Documented and anecdotal evidence of locations that are regular flooding locations	Maribyrnong City Council
Customer Service Requests	Customer complaints related to flooding	Maribyrnong City Council
Historical flood incident including photos	Database of incidents and photos	Maribyrnong City Council

5. Flood risk

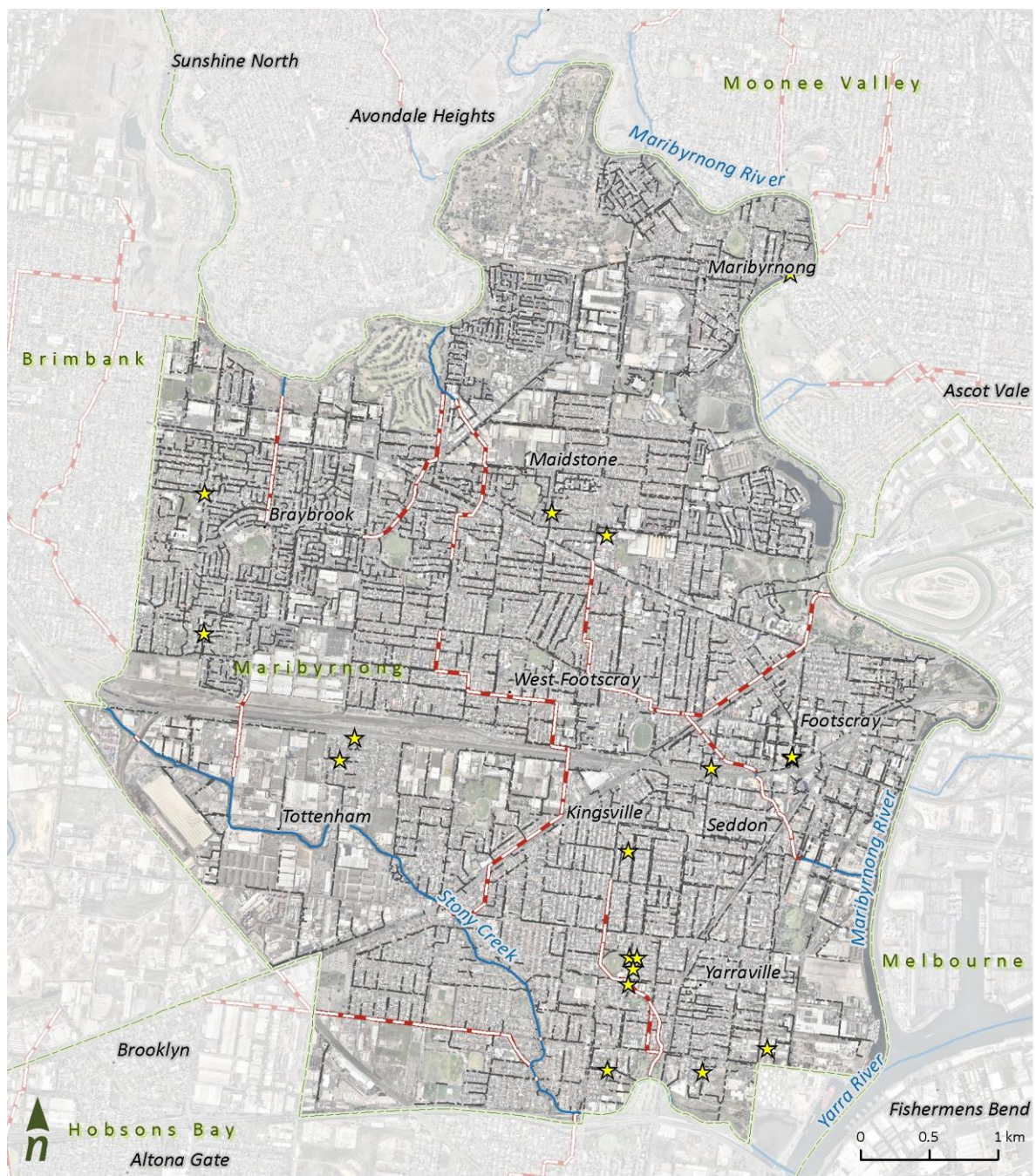
This section describes issues relating to current and future flood risks within the municipality.

5.1.1 Current flood risks

Current flood risks are identified through previous studies, flood and hydraulic modelling and mapping. Customer complaints can also be used to identify local flood hotspots. Hotspots are shown on **Map 4** below and listed in Appendix 3.

Modelling undertaken by Melbourne Water to date has identified approximately 1622 properties within the municipality that are affected by flooding from waterways and overland flows.

Council does not currently have a process to rate or prioritise flood risks.



Legend

- ★ Flash flooding (Hotspot)
- Council drainage pipe
- Waterway
- Melbourne Water drain
- ▭ Municipal Boundary

Map 4: Flooding hotspots

5.1.2 Flood risk assessment

Melbourne Water currently uses the Flood Risk Assessment Framework (Melbourne Water, 2010) to identify and assess flood risks. The Framework assesses risk using likelihood and consequence factors relating to public health and safety, environment, service, political, regulation and financial. The Framework was developed in consultation with Metropolitan Councils and other stakeholders to assess flood risks and identify the benefits of flood risk management measures. Flood risks are classified by catchment, as low, medium, high or extreme.

The only sub-catchment within the Maribyrnong City Council boundary that is rated as extreme using the Melbourne Water Flood Risk Assessment Matrix is the 'Maribyrnong River'. The current list of flood risks, by catchment, within the Maribyrnong City Council is provided in Appendix 4.

The regional Flood Management Strategy outlines a new approach to making decisions about flood management. To provide a platform for consistent and transparent decision making across the region, Melbourne Water are currently developing a series of clear, transparent, easy to understand and easy to use decision making tools, that can be shared with all agencies involved in flood management across the Port Phillip and Westernport region.

The tools will be developed with significant stakeholder input and engagement to ensure local community and broader agency needs are incorporated. The tools will allow for the prioritisation of locations for flood modelling and mapping, the assessment of flood effects, prioritisation of locations for flood management activity, and for the identification of the appropriate mix of solutions to be implemented in prioritised locations.

Once Melbourne Water's flood risk prioritisation tools have been finalised the flood risk ratings for catchments across the municipality will in due course be updated.

5.1.3 Future flood risks

Increased development, urbanisation and population

As described above, the City of Maribyrnong the 31,048 dwellings within Maribyrnong in 2011 is expected to grow to 56,032 by 2031(forecast.id, 2016). This growth will be through a combination of small scale redevelopments (i.e. single lots subdividing into two or more lots) and larger, more significant developments.

There are several areas within Maribyrnong where significant urban expansion is expected (see Table 2 below) that will result in increased pressure on the existing drainage network.

Table 2 Areas of urban expansion

Locations	Details
Bradmill site	<ul style="list-style-type: none">• A new Neighbourhood Activity Centre containing a supermarket, specialty retail outlets, cafes, a library, medical centre and other facilities.• Approximately 1,700 new dwellings.• Low rise dwellings of 2 storeys fronting Francis Street to provide an appropriate interface to the existing residential development.• Transition to medium density (2-4 storeys) residential development internal to the site.• Higher density housing up to 8 storeys near the Neighbourhood Activity Centre.
Braybrook/Maidstone	<ul style="list-style-type: none">• Central West Activity Centre around the corner of Ashley Street and South Road in Braybrook.• The Centre will be a key employment node, supported by complementary uses including shops, commercial, and community facilities.
North Maribyrnong Defence Site	<ul style="list-style-type: none">• A project by Vic Urban with the potential for over 3,000 dwellings.• In the early design phase.
2A Beachley St, Braybrook	<ul style="list-style-type: none">• Approximately 450 dwellings on brownfield site (approved)
Emu Rd, Maidstone	<ul style="list-style-type: none">• 100-1200 dwellings on brownfield site (at master planning stage)
VU student village	<ul style="list-style-type: none">• Early design phase, expected to reach master-planning stage within 1-2 years



Map 5: Hampstead Road development sites

Urban consolidation and infill development

Urban consolidation involves development or subdivision of individual lots. An example in Maribyrnong City Council is the Medium Density Development in Footscray (Bambury Village) consisting of approximately 300 townhouses. This and similar developments typically increase the impervious area, stormwater runoff and volume of stormwater to be conveyed by the drainage network. This can have the effect of either creating new or exacerbating existing drainage/flooding problems.

Council assesses urban consolidation and infill development on a case by case basis ensuring that floor levels are set at the correct height. To avoid exacerbating existing drainage or flooding problems Maribyrnong City Council has existing guidelines for new developments which include the requirement for on-site detention and retention, however these are not generally enforced.

The issue of enforceability is a common one across Metropolitan Councils and it may be that a regional solution is required e.g. a common set of stormwater detention standards across neighbouring Councils.

To enable informed decisions to be made it is important that Councils planning schemes are regularly amended to incorporate the best available planning and flood modelling information. This is discussed further in Section 7.3.

Climate change

Climate change has the potential to increase flood risk within the Port Phillip and Westernport region and hence the municipality. While the latest predictions are for a long-term reduction in runoff volumes it is likely the intensity of extreme rainfall events will increase (e.g. on average a 32% increase in rainfall intensities is expected to occur across the Port Phillip and Westernport region by 2100). The change in rainfall patterns is likely to lead to less frequent (but possibly larger) riverine floods and more frequent flash flooding and overland flow events associated with localised storm activity. At the same time, sea levels are expected to rise resulting in additional flooding pressures in some coastal areas.

In the Maribyrnong municipality an additional 34 properties that are expected to be included in the flood extent due to increasing sea levels. This number does not account for water backing up pipes and flooding areas upstream (where higher water levels results in smaller level differentials between the Port Phillip Bay and the drains).

Melbourne Water now incorporates climate change scenarios into their modelling and provide data from this to Council. However, there is no control in the Council Planning Scheme to trigger referral to Melbourne Water for permit applications in flood prone areas associated with climate change.

An action for Council from in this Flood Management Plan is to consider climate change and its potential impacts on the drainage system when developing climate change policy and responses.

6. Flood risk management

This section describes issues relating to work done within the Municipality to understand, identify and treat flood risks; plus what is planned to improve the management of existing, future and residual flood risks. Flood control measures can be structural or non-structural.

6.1.1 Flood modelling and mapping

Accurate survey and modelling of floodplains and overland flow paths is required to determine flood depths and delineate areas subject to inundation on floodplains and along overland flow paths. This information is aimed at improving community safety through informed planning (ensuring that new development is designed to take into account floodplain and overland flow paths and associated flow depths) and emergency response. The mapped information is therefore required by Melbourne Water as the floodplain management authority, municipal planning departments, emergency response organisations, other infrastructure providers, land developers, prospective land purchasers and existing land owners and occupiers.

The flood information developed by the project will be used to give flood advice on properties affected by overland flow and / or flood inundation along Melbourne Water and Council drains, and to enable Melbourne Water and the City of Maribyrnong to set capital works programs by identifying relative flood risks. The information will also be used to assist in determining land development issues and appropriate development of sites.

Melbourne Water's survey and modelling of rivers, creeks and main drains usually generates flood levels and extents for multiple AEP events up to the 1% chance (1% AEP or 100 year ARI) flood, new flood studies consider the probable maximum flood (PMF). The 1% AEP event is the current design standard for new developments it is considered adequate for managing flood risk and associated issues relating to property development and flood mitigation. Reported 1% AEP flood extents are incorporated as a Special Building Overlay, Land Subject to Inundation Overlay, Floodway Overlay or Urban Floodway Zone as appropriate, in the Maribyrnong Planning Scheme under the Victorian Planning Provisions.

Maribyrnong City Council undertook a flood mapping project (Hyder, 1999) that mapped the overland flow paths for nominated storm intervals for all Council drainage catchments within the municipality (see Map 2). This information has complemented Melbourne Water's flood mapping. In particular, it has been used to give flood advice on properties affected by overland flow and/or flood inundation along Council drains, and to enable Council to set capital works programs by identifying relative flood risks. The information has also been used to assist in determining land development issues.

Maribyrnong City Council will undertake a new flood mapping study in 2017 to update its flood mapping information. This study will use the latest data on Council drainage assets – levels, inlet efficiency, drain connectivity, condition and age profile – which will be collected in 2016. Table 3 summarises flood mapping status for Maribyrnong City Council.

Table 3. Flood mapping status

Mapping study	Status	Catchments	AEP events	Scenarios
Melbourne Water's survey and modelling of rivers, creeks and main drains	Latest update in 2013	Priority areas	1% AEP event	Land development based on 2007 LiDAR information
Maribyrnong City Council Flood mapping project (Hyder, 1999)	1999	All	1% AEP event	
Maribyrnong City Council Flood mapping project	Proposed in 2017	All	1% AEP event	

6.1.2 Drainage

Drainage assets within the Maribyrnong municipality vary in age with the majority constructed during the period 1920's to the 1980's. The materials for construction vary from brick drains, to bluestone blocks and reinforced concrete. Halcrow Pacific P/L undertook a review of the condition of Councils stormwater pipes within the Maribyrnong municipality in 2010. A representative selection of pipe sizes, location and age equivalent to 3% (9.65 kilometres) of the 346 kilometre network were surveyed using CCTV technology.

They survey found that reinforced concrete pipes have been commonly installed over the last 20 years, with a rubber ring joint which provides a hydraulic seal that also accommodates pipe joint deflection. However, Council's drainage network has approximately 90% butt jointed pipes, which over time do not provide the same protection from joint deflection. As a result, a significant number of pipes within

Council's network had displaced joints. This joint displacement deteriorates assets, and results in a shorter expected life. In addition, this joint displacement, and the generally flat grade of the pipes, resulted in many of these pipes containing sediment and other debris.

6.1.3 Flash flooding

Flash flooding in Victoria is defined as flooding that occurs within six hours of the start of the rain that caused it (Comrie, 2011). The majority of the catchments in Maribyrnong City Council experience flash flooding associated with the drainage network and from waterways.

This plan is primarily concerned with flash flooding as a result of drainage capacity and topography issues, and less so with other factors that can cause flash flooding including blocked street drains, collapsed easement drains etc.

Issues resulting from flash flooding include property and roadway inundation.

6.1.4 Riverine flooding

Riverine flooding is typically slower in nature than flash flooding or other flooding issues relating to drainage. There are locations within Maribyrnong that have been mapped as being subject to riverine flooding, causing inundation and damage to private and public property.

6.1.5 Coastal tidal and storm surge flooding

Extreme weather or ocean tides above normal sea levels can flood coastlines and nearby tidal rivers. This type of flooding is usually predictable, there are limited telemetry and warning systems (lower Maribyrnong) in place to monitor it, refer to section 6.1.8.

6.1.6 Asset management and capital works

Melbourne Water drainage assets are managed in accordance with the Asset Management Guidelines and Strategic Asset Management Plans, with a level of service of 'no failure or collapse of significant drains'. Melbourne Water main drain conditions are assessed and reported annually in the State of the Assets Report.

Drainage and flood mitigation assets are maintained to a 'fit for purpose' state to ensure they work as designed during a flood. All Melbourne Water drainage assets and waterways have an ongoing inspection and maintenance program.

Waterways have ongoing maintenance programs to remove flow restrictions such as dumped rubbish, shopping trolleys and willow trees.

A list of main drains is provided in Appendix 8.

The condition of Council drains is summarised in section 6.1.2. Maribyrnong City Council will collect new data on its drainage assets including levels, inlet efficiency, drain connectivity, condition and age profile in 2017 as part of planned network investigation and modelling works.

Capital works

Both Melbourne Water and Maribyrnong City Council undertake a range of capital works relating to drainage and flood management in the municipality.

Drainage Improvement Capital Works Program (Melbourne Water)

Melbourne Water's Water Plan documents proposed capital works across the Port Phillip and Westernport region. The current Water Plan covers the period 2013-18 and includes expenditure for drainage and flood protection works in the Port Phillip and Westernport region. There are now drainage improvement capital works planned within the Maribyrnong City Council however, where budget is available Melbourne Water and Council can collaborate to undertake minor Drainage Improvement Capital Works.

Drainage Improvement Capital Works Program (Maribyrnong City Council)

Drainage capital works are currently included in Maribyrnong City Council's capital works program as needed and there is no current capital works program for drainage infrastructure.

Council will undertake a drainage audit in 2017 with one of the objectives of that study being the ability to identify and prioritise capital works that will in turn be used to update Council's Capital Renewal Strategy.

6.1.7 Planning controls and policy

Melbourne Water policy

Melbourne Water is the Floodplain Manager and Regional Drainage Authority for the Port Phillip and Westernport region. Applications for subdivision and developments in areas covered by the Land Subject to Inundation Overlay (LSIO) and Special Building Overlay (SBO) are referred by Council to Melbourne Water, as the authority responsible for the administration of the Planning Scheme, under Section 55 of the *Planning and Environment Act (1987)*. Some types of minor works are excluded from requiring a planning permit (and referral). Melbourne Water comments on development applications and, if necessary, places conditions on planning permits to ensure that the drainage system continues to function properly and any new

developments are adequately designed to protect people and property from floods and to protect the health of local waterways (Melbourne Water, 2012).

Council policy

Under the Local Government Act 1989, councils are required “to ensure that resources are used efficiently and effectively and services are provided in accordance with Best Value Principles to best meet the needs of the local community”. Councils are also responsible for “providing and maintaining community infrastructure”.

Under the Emergency Management Act 1986, councils must prepare a municipal emergency management plan and appoint a municipal emergency resource officer. Responsibility for the immediate response to a flooding emergency rests with the Victorian State Emergency Service, but councils coordinate recovery activities such as the clean-up of debris. When a more widespread “municipal emergency” is declared, the council municipal emergency resource officer, MERO, coordinates the immediate response (City of Maribyrnong, 2011).

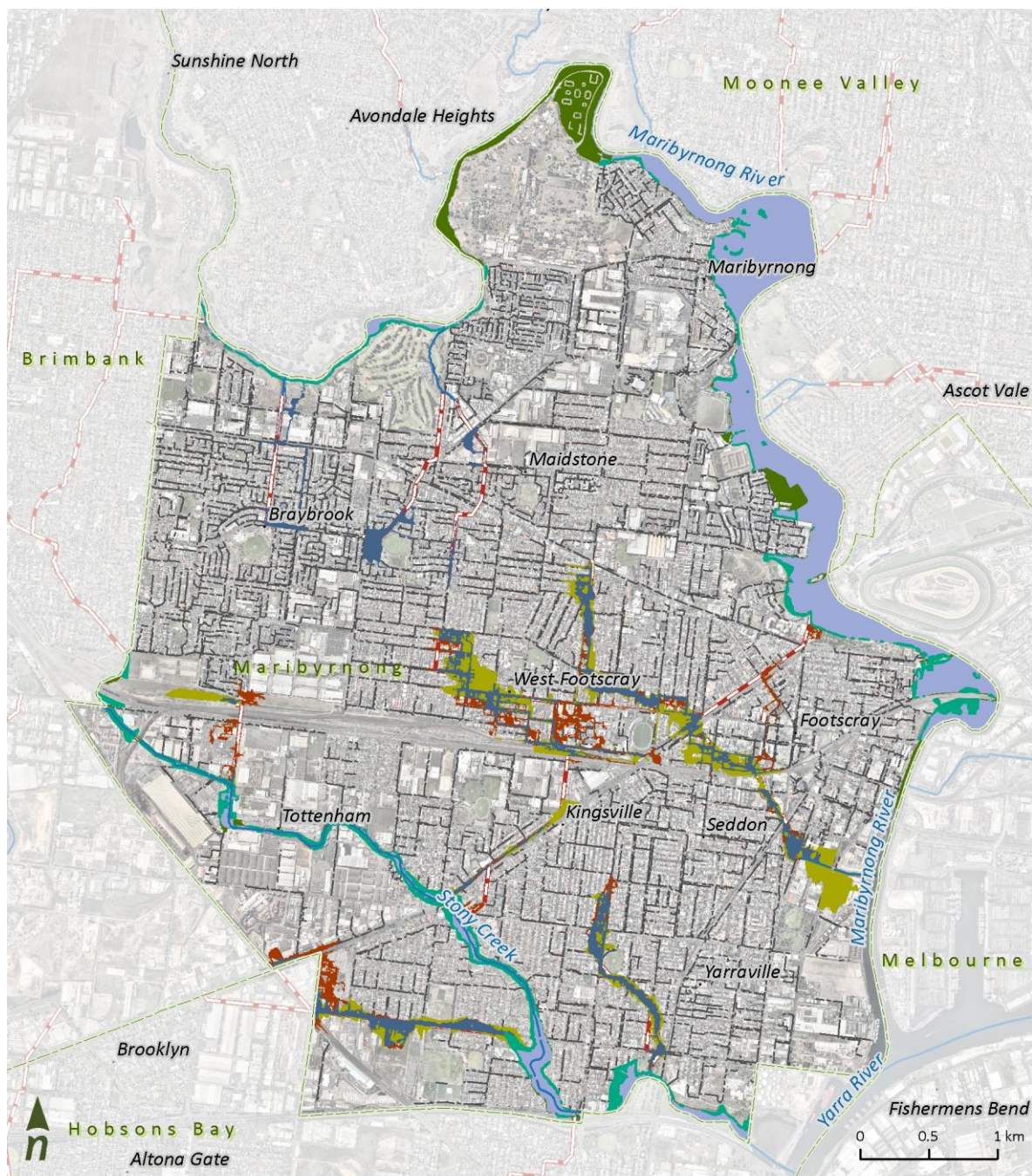
Planning controls

Maribyrnong City Council manages Planning Permit and Building applications for development within areas likely to be subject to inundation. For applications in areas covered by the Melbourne Water Land Subject to Inundation Overlay (LSIO) and Special Building Overlay (SBO), Council refers all applications to Melbourne Water (see Map 6).

A different planning application process applies for properties included in each overlay.

For applications in areas outside of Melbourne Water Overlays but known to Council to be prone to flooding (e.g. hotspots based on anecdotal evidence and Council drain flood mapping studies), Council can request more detailed applications. This is to ensure that new developments are protected from flooding and to ensure these developments do not cause increased risk to surrounding properties by causing a significant rise in flood levels, or water flow velocities.

Revised 1% AEP flood extents are estimated through flood mapping recently undertaken by Melbourne Water that will be incorporated into Special Building Overlays, Land Subject to Inundation Overlays, Floodway Overlays or Urban Floodway Zones as appropriate. Similarly properties and areas that are no longer within those overlays will be removed from Council Planning Schemes under the Victorian Planning Provisions.



Legend

- | | | |
|-----------------------------|----------------------------|---------------------------|
| — Waterway | — Municipal Boundary | — SBO Subtractions region |
| - - - Council drainage pipe | — LSIO Subtractions region | — SBO Maribyrnong region |
| - - - Melbourne Water drain | — LSIO Maribyrnong region | — SBO Additions region |
| | — LSIO Additions region | |

Map 6: 100 year flood extent and flood related planning scheme overlays, including Melbourne LSIO and SBO overlays.

6.1.8 Flood warning

Melbourne Water operates and maintains rainfall and river level stations within the Maribyrnong catchment. There are devices located on the Maribyrnong River in Maribyrnong, Stony Creek in Spotswood and Footscray (rainfall gauge only). The purpose of these devices is to provide flood level and flow rates for the purpose of flood warning within the area and historical record. This information is provided to the Bureau of Meteorology who issue public warnings.

The Bureau of Meteorology also operates a rainfall gauge at the Flemington Racecourse.

A summary of the existing gauges is:

- Flemington Racecourse (0860339)
- Footscray (587053)
- Stony Creek at Spotswood (587052).
- Maribyrnong River at Maribyrnong (587015)
- Maribyrnong River downstream of Canning Street Weir (15364).

6.1.9 Flood emergency planning

VICSES, working with partner agencies such as MFB, CFA and VicPol, have developed a Business Flood Safe plan that can be used by businesses to plan for the potential impacts of flash and riverine flooding on their business. The toolkit is available for download on the VICSES website and has been rolled out in several council areas.

In 2016/17, VICSES will look to develop linkages with businesses in the Maribyrnong Council area (with the support of Council's Economic Development area) to promote all hazard emergency planning to businesses, especially for those at risk of flooding.

Flood response and recovery arrangements are detailed within the Municipal Emergency Management Plan (MEMP) and the Flood Emergency Plan (FEP).

The Flood Emergency Plan details arrangements agreed for the planning, preparedness, prevention, response and recovery from flood incidents within Maribyrnong. It is a sub-plan to the Municipal Emergency Management Plan. The plan is consistent with the Emergency Management Manual Victoria (EMMV), which defines VICSES as the control agency for floods.

The Flood Emergency Plan is developed by the VICSES in conjunction with Council and the MEMP Committee and is maintained by and available from the Municipal Emergency Response Officer (MERO).

Information and intelligence gathered as part of this Flood Management Plan will be made available to the MERO and VICSES (Manager Regional Emergency Management, Central Region) for consideration and incorporation into the Flood Emergency Plan.

7.Improvement Plan

This section identifies key issues and improvement actions. The actions outline the agreed approach to managing existing regional flood problems within the municipality. They were identified through a series of workshops held in relation to flood mitigation and management measures.

The four identified issues are:

1. Proactive management of flood and drainage assets (section 7.1).
2. Better exchange of flooding data and intelligence between stakeholders (section 7.2).
3. Land Subject to Inundation Overlay (LSIO) and Special Building Overlay (SBO) in Council Planning Scheme are inconsistent with Melbourne Water revised flood mapping (section 7.3).
4. Better community awareness and understanding of how to plan, prepare and respond to flood risks in flood prone areas (section 7.4).

The actions identified under each section are detailed in Appendix 1, which has a summary of the key issues and actions, responsibilities for implementation, and expected timeframes.

7.1 Proactive management of flood and drainage assets

There are a range of issues that contribute to flooding within the City of Maribyrnong including limitations to existing drainage capacity and continued development within the municipality placing greater strain on the network. The location and nature of flood risks have been identified through flood mapping of most of the municipality and through the Maribyrnong Drainage Strategy report (Hyder, 1999). Customer complaints and flash flooding data have also been used to identify local flooding hotspots. Hotspots are shown on [Map 4](#) and listed in Appendix 3.

Management of flood and drainage assets was discussed during the workshop series, with the aim of being more proactive and less reactive regarding the key issues that influence system capacity. For instance, it was identified that:

- The council drainage system is to be cleaned once a year as from 2016
- The council drainage assets in flood prone areas are planned to be cleaned four times a year as from 2016
- A drainage audit is underway that will improve Council's understanding of their network and assets including location, depth, invert levels, connectivity, condition and age. This together with additional flood mapping that is planned for 2017 will identify regions with limited pipe capacities, prioritise capital works and flooding risks where new developments are proposed.

The Council is also actively seeking opportunities to work collaboratively with Melbourne Water to complete the flood mapping study and undertake minor Capital Works Improvements.

The current Maribyrnong Drainage Strategy is also under review with the intent that the new strategy will have a more integrated approach for planning, operating and maintaining flood/drainage assets. This will allow operation and maintenance to be involved earlier in the planning process. The strategic Asset Management Plan (October 2016) will be used to inform works across other strategies including capital renewal and maintenance.

7.1.1 Improvement Actions

Table 4. Issue 1 improvement actions

Reference no.	Action	Responsibility
Issue 1: Proactive management of flood and drainage assets		
1.1	Hydraulic modelling of Council drainage system at locations with known issues in order to prioritise flood and drainage asset upgrade works. Use this work to identify opportunities for joint projects between Council and Melbourne Water.	Council
1.2	Hydraulic modelling of the Council drainage system in locations where limited pipe capacities have been previously identified.	Council
1.3	Map Council's open drains across the municipality.	Council
1.4	Validation of drainage network and update of our drainage assets spatial system – Intra Maps	Council
1.5	Consider the potential impacts on the drainage system when developing climate change policy and responses	Council

7.2 Better exchange of flooding data and intelligence between stakeholders

Melbourne Water, Councils and other flood management stakeholders have recognised the need for an integrated approach to managing flood risks. While key agencies have specialised flood management skills in the planning, response and recovery there are opportunities to strengthen regional flood management arrangements through greater collaboration and efficient use of resources.

Objectives to strengthen flood management arrangements and increase communication and collaboration include:

- Raising the profile of Flood Management Plans;
- Improving understanding of Melbourne Water's and Council's role and challenges in flood management;
- Promoting achievements of Council and Melbourne Water collaboration;
- Aligning flood mitigation objectives/priorities; and
- Aligning of external affairs: Councils and Melbourne Water have joint responsibility for flood and drainage management in communications with residents, Councillors, politicians and media.

Agencies are also required to share information with the public to ensure they have access to information about flooding and flood risk. This is achieved through:

- Responding to requests for Property Information Statements which contain information on land liable to flooding
- An annual GIS data exchange currently occurs between Melbourne Water and Maribyrnong City Council and involves the sharing of the following datasets:
 - Underground Drain locations (Abandoned Centreline, Centreline & Alignment)
 - Channel Drain locations (Alignment, Centreline) & Structures
 - Natural Drain locations (Alignment, Centreline)
 - Underground Drain Manholes
 - Natural Drain Features
 - MWC Catchments
 - 1% AEP Flood Extent - Underground Drain & Natural Drain

One of the areas for improvement that has been identified is how Council manages the internal distribution of new flood mapping data e.g. from Melbourne Water. On uploaded, the existence of new data could be better advertised across Council. This includes identifying who within Council needs to be notified.

The Council 'IntraMap' contains data such as drainage layout, depth to invert levels, AHD data, pit information and drainage connectivity. This is available to all staff and agencies. There are plans that this will inform 'Dial Before You Dig' in the near future.

It was discussed in the workshops that the SBO referral process to Melbourne Water is working well, however all parties are aiming to work together to identify efficiencies that can save time in the referral process.

7.2.1 Improvement Actions

Table 5. Issue 2 improvement actions

Reference no.	Action	Responsibility
2.1	Clarify internal processes, accountability and responsibilities regarding the sharing and distribution of new flood data	Council
2.2	Key stakeholders to exchange flood intelligence as appropriate	Melbourne Water / Council VICSES
2.3	Identify opportunities for efficiency gains in the permit application process in areas covered by SBO or LSIO overlays	Melbourne Water Council
2.4	Annual meetings to review the progress of actions in the improvement plan	Melbourne Water
2.5	Develop and implement an annual data share agreement	Melbourne Water
2.6	Reformat current Sub Flood Plan into the Maribyrnong Flood Emergency Plan	VICSES/Council

7.3 LSIO and SBO extents in Council Planning Scheme inconsistent with Melbourne Water revised mapping

During the development of this plan Council, Melbourne Water and VICSES identified an issue with the time delay in amending the Planning Scheme when new flood mapping has been done. . This issue causes administrative burden and costs for Council and the community e.g. permit applications for a subdivision within an area no longer covered by an SBO in the latest flood mapping but not amended in the Planning Scheme is treated as being within an SBO. Changes to the SBO can affect a large number of properties. It was agreed that a long term solution needs to be identified at the State level to enable quicker turn-around of Planning Scheme Amendments. Revised mapping is useful as it enables Council to request further information for permit applications within new SBO or LSIO additions and to refer those applications to Melbourne Water.

Opportunities for improvements are:

- Melbourne Water to commence the amendment process as soon as Council accepts revised mapping.
- Melbourne Water to support Council in understanding new flood mapping data and to be available on expert panels (e.g. at VCAT).
- Melbourne Water and Maribyrnong City Council to develop an interim solution. Melbourne Water to notify Council when there are new additions and subtractions, and Council to notify Melbourne Water when there are applications in SBO additions. This is not currently happening. This may be done through a Memorandum of Understanding (MOU).

The public also needs to be more aware of the implications of changes to the SBO and LSIO and this is discussed further in section 7.4.

7.3.1 Improvement Actions

Table 6. Issue 3 improvement actions

Reference no.	Action	Responsibility
3.1	Undertake or update flood mapping at the following sites, focussing on the identified issues: <ul style="list-style-type: none"> • Banbury Village: review levels at the site and update SBO extent as required • Braybrook/Maidstone: confirm if flood mapping is required. • Edgewater Estate: remove the new addition to the SBO as the area has been filled. • Regional Rail site: remove new addition to the SBO as the area has been filled. Note: given the loss of flood storage. Melbourne Water will need to negotiate with VicTrack to have a channel built. • Park Ave, West Footscray (Lae St development) – flood mapping is inconsistent with built form (volumetric balancing undertaken – see attached strategy) • Butler St / Marin Lane, Braybrook – flood mapping does not appear consistent with subdivision contours • 75-79 Cranwell St, Braybrook – flood mapping inconsistent with built form 	Melbourne Water
	Yarraville railway embankment: New flood mapping required and this will form part of Action 3.1.	Council
3.2	Melbourne Water to work with Council to amend Planning Scheme based on new flood mapping (to be undertaken once Action 3.1 is completed).	Melbourne Water / Council

7.4 Better community awareness and understanding of how to plant, prepare and respond to flood risks in flood prone areas

Council, Melbourne Water and VICSES are committed to working together to improve community education and awareness around flood risks. This involves working to ensure that the community:

- Are aware of their personal flood risk at their property
- Have access to information on how to protect themselves and their property against flood (e.g. personal flood planning)
- Know the location of evacuation centres or how to find those locations
- Are aware of the importance of advising police when they make their own decisions to evacuate
- Are aware of the general contents of the MEMP Flood Emergency Plan.

Council also recognises the need to ensure residents, business owners/operators and visitors in the municipality are aware of the flood risks and the appropriate flood response actions.

In areas covered by LSIO, Council has undertaken door knocking initiatives to improve community flood education and awareness. However, continued action by VICSES for vulnerable communities is required.

VICSES has recently produced a new Local Flood Guides for the Maribyrnong, Footscray and Yarraville areas that provide detailed information for communities at risk of flooding.

VICSES will work with Council and the Footscray SES Unit on developing a community education strategy for delivering community resilience and education information to community members and residents in the Maribyrnong area.

There is a gap of community flood education and awareness in areas covered by SBO and at known flooding hotspots. It is important that this is addressed so that existing and future resident and business owners can plan, prepare and respond, as well as being aware of the implications of being in an area covered by SBO e.g. extensions and subdivisions, property purchases, insurance requirements etc. It is also important given recent the nature of SBO additions and subtractions.

There are already precedents of other Councils undertaking flood awareness and education programs in areas covered by SBO. Education and awareness programs can be in the form of a drop in session, which could be part of the exhibition for new SBO additions and subtractions. Melbourne Water can support these programs by providing flood information and local flood guide (e.g. pamphlets written in simple language).

Within workshops it was also identified maintain existing flood markers along the Maribyrnong River was important. Furthermore, given that Parks Victoria has recently passed management of several parks including Pipemakers Park to Council, Council may now be responsible for managing signage warning of flood risks at entry points to parks on the Maribyrnong River.

7.4.1 Improvement Actions

Table 7. Issue 4 improvement actions

Reference no.	Action	Responsibility
4.1	Provide community resilience and education information to the community for immediate riverine frontages flooded by Maribyrnong River (LSIO areas).	VICSES
4.2	Provide flood related information to the community for areas covered by SBO including Planning Scheme Amendment Exhibitions	Council (with support from VICSES)
4.3	Provide flood related information to the community at known flooding hotspots	Council
4.4	Provide the community with flood information and local flood guide (as part of Council initiatives)	Melbourne Water
4.5	Maintain historic flood markers including on Plantation Street Maribyrnong. Additional new signage as determined by Council.	Council
4.6	Sign warning of flood risks to be placed at key entry points to parks on the Maribyrnong River	Council

8. How this document was developed

Melbourne Water, Maribyrnong City Council and the Victoria State Emergency Service worked in partnership to develop this Flood Management Plan.

The Plan was developed through a series of interviews, file reviews, meetings, site tour and workshops to gather background information, identify flood risk management and mitigation activities, and undertook a gap analysis to develop an improvement plan.

The significant contribution of employees of Council, VICSES and Melbourne Water, in preparing this document should be acknowledged.

Appendix 6 details the names of those who attended the inception meeting, site tour and workshops.

9. Abbreviations and Acronyms

The following abbreviations and acronyms are used in this Flood Management Plan:

AEP	Annual Exceedance Probability
ARI	Average Recurrence Interval
FEP	Flood Emergency Plan
FO	Floodway Overlay
IWM	Integrated Water Management
IWCM	Integrated Water Cycle Management
LSIO	Land Subject to Inundation Overlay
MEMP	Municipal Emergency Management Plan
MERO	Municipal Emergency Resource Officer
PMF	Probable Maximum Flood
PMP	Probable Maximum Precipitation
SBO	Special Building Overlay
SWMP	Stormwater Management Plan
UFZ	Urban Floodway Zone
VPP	Victorian Planning Provisions
VICSES	Victoria State Emergency Service
WoWCM	Whole of Water Cycle Management
WSUD	Water Sensitive Urban Design

10. Glossary

Below are terms defined for the purpose of this Plan:

Term	Definition
Drainage system	A series of drains and waterways into which surface and storm water flows. Features of a drainage system can include underground pipe drains, open channels, retarding basins, floodways, waterway improvements, water quality works and environment protection measures. Generally drainage under 60 ha is maintained and operated by Council.
Overland flooding	Inundation by local runoff caused by heavier than usual rainfall. Overland flooding can be caused by local runoff exceeding the capacity of an urban stormwater drainage system or by the backwater effects of mainstream flooding causing urban stormwater drainage system to overflow.
Floodplain	Area of land adjacent to a creek, river, estuary, lake, dam or artificial channel, which is subject to inundation by the probable maximum flood.
Natural drainage systems	Flow-paths which are largely undeveloped by human sources, these include rivers, streams, natural depressions and wetlands. All natural systems greater than 60 ha are managed by Melbourne Water.
Hotspot	A known flood problem area which has a history of repeat flooding of a road, crossing or property, often highlighted through anecdotal information and customer complaints. It is a localised issue which will vary from Council to Council.
Runoff	The amount of rainfall that enters the stormwater drainage system, (underground pipes, overland flow paths, floodway and waterways) after losses such as infiltration has been taken into account.
Flash flooding	Sudden unexpected flooding caused by local heavy rainfall or rainfall in another area. Often defined as flooding which occurs within six hours of the rain which causes flooding.

11. References

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Land Development Manual (Melbourne Water, 2009).

Hyder (1999), Maribyrnong drainage strategy

Melbourne Water uses a Flood Risk Assessment Framework (Melbourne Water, 2010)

City of Maribyrnong (2011), Asset Management Plan

Appendix 1 – Improvement plan

Table 8 Improvement plan

Action No.	Issue	Action	Priority (Low Medium High)	Organisation(s) Responsible for Implementation (lead in bold)	Lead Person (name/ position)	Due Date	Relevant Section (insert section number and heading)
1.1	Continued proactive management for flood/drainage assets	Hydraulic modelling of Council drainage system at locations with known issues in order to prioritise flood and drainage asset upgrade works. Use this work to identify opportunities for joint projects between Council and Melbourne Water.		Council			
1.2		Hydraulic modelling of the Council drainage system in locations where limited pipe capacities have been previously identified.		Council			
1.3		Mapping of Council open drains across the municipality		Melbourne Water			
1.4		Validation of drainage network and update of our drainage assets spatial system – Intra Maps		Council			

Action No.	Issue	Action	Priority (Low Medium High)	Organisation(s) Responsible for Implementation (lead in bold)	Lead Person (name/ position)	Due Date	Relevant Section (insert section number and heading)
1.5		Consider the potential impacts on the drainage system when developing climate change policy and responses		Council			
2.1	Better exchange of flooding data and intelligence between stakeholders	Clarify internal accountability and responsibility on how flooding data is shared and distributed internally		Council			
2.2		Key stakeholders to exchange flood intelligence as appropriate		Melbourne Water / Council VICSES			
2.3		Identify opportunities for efficiency gains in the permit application process in areas covered by an SBO or LSIO overlay		Melbourne Water / Council			
2.4		Annual meetings to review the progress of actions in the improvement plan		Melbourne Water			
2.5		Develop and implement an annual data share agreement		Melbourne Water			

Action No.	Issue	Action	Priority (Low Medium High)	Organisation(s) Responsible for Implementation (lead in bold)	Lead Person (name/ position)	Due Date	Relevant Section (insert section number and heading)
2.6		Reformat current Sub Flood Plan into the Maribyrnong Flood Emergency Plan		VICSES/Council			
3.1	LSIO and SBO extents in Council Planning Scheme inconsistent with Melbourne Water revised flood mapping	<p>Flood mapping to be undertaken or updated at the following sites:</p> <ul style="list-style-type: none"> • Banbury Village: review levels at the site and update SBO extent as required • Braybrook/Maidstone: confirm if flood mapping is required. • Edgewater Estate: remove the new addition to the SBO as the area has been filled. • Regional Rail site: remove new addition to the SBO as the area has been filled. Note: given the loss of flood storage. Melbourne Water will need 		Melbourne Water			

Action No.	Issue	Action	Priority (Low Medium High)	Organisation(s) Responsible for Implementation (lead in bold)	Lead Person (name/ position)	Due Date	Relevant Section (insert section number and heading)
		<p>to negotiate with VicTrack to have a channel built.</p> <ul style="list-style-type: none"> • Park Ave, West Footscray (Lae St development) – flood mapping is inconsistent with built form (volumetric balancing undertaken) • Butler St / Marin Lane, Braybrook – flood mapping does not appear consistent with subdivision contours • 75-79 Cranwell St, Braybrook – flood mapping inconsistent with built form 					
		Yarraville railway embankment: New flood mapping required. This will form part of Action 3.1.		Council			
3.2		Melbourne Water to work with Council to amend Planning Scheme based on new flood		Melbourne Water / Council			

Action No.	Issue	Action	Priority (Low Medium High)	Organisation(s) Responsible for Implementation (lead in bold)	Lead Person (name/ position)	Due Date	Relevant Section (insert section number and heading)
		mapping (to be undertaken once Action 3.1 is completed).					
4.1	Better community awareness and understanding of how to plan, prepare and respond to flood risks in flood prone areas	Provide community resilience and education information to the public for immediate riverine frontages flooded by Maribyrnong River (LSIO areas).		VICSES			
4.2		Provide flood related information to public for areas covered by SBO (e.g. drop in sessions, Planning Scheme Amendment Exhibition)		Council (with support from VICSES)			
4.3		Provide flood related information to public at known hotspots		Council			
4.4		Provide flood information and local flood guide (as part of Council initiatives)		Melbourne Water			
4.5		Maintenance of historic flood markers including on Plantation Street Maribyrnong. Additional		Council			

Action No.	Issue	Action	Priority (Low Medium High)	Organisation(s) Responsible for Implementation (lead in bold)	Lead Person (name/ position)	Due Date	Relevant Section (insert section number and heading)
		new signage where required (to be decided).					
4.6		Signage warning of flood risks to be placed at key entry points to parks on the Maribyrnong River		Council			

Appendix 2 – Key performance indicators

The objectives of the Flood Management Plan and key performance indicators to measure their success are:

Objective	KPI
Enhance collaboration and strengthen relationships between Melbourne Water, Maribyrnong City Council and Victoria SES	Relationship before FMP process, versus after FMP process (based on survey / evaluation form)
Identify, understand and reduce local flood risk	Number of hotspots / flood risks identified / number of new hotspots identified
Sharing information on local 'hotspot' flooding areas	Survey question: How would you evaluate the FMP process provided opportunities for sharing information (1 low opportunities to 5 high)
Consolidate and document important flood information into the one accessible location	
Determine priority management actions to address local flood risks	Identified as actioned improvement actions (could be expressed as a percentage per annum)
Clarify roles and responsibilities of flood management agencies	Survey question: I am aware of relevant flood contact at other agencies (yes / no)
Align with Melbourne waters Regional Floodplain Management Strategy	Qualitative assessment of alignment with flood strategy vision by participants (based on survey)
Enable better planning, preparation and management of floods in the future	

Appendix 3 – Flood hotspots

Below is a table of flood hotspots identified in the workshop listing locations and information on flood issues and history.

Table 9 List of flood hotspots

Location	Source
Marin Lane, Braybrook	MCC
Nicholson Street, Footscray (between Irving and Paisley Streets)	
Victoria St, Seddon (Rail Underpass)	
2 Raleigh Rd, Maribyrnong (Angler's Tavern)	
West side of Yarraville Railway Embankment between Castlemaine St and Francis St	
Lorne St, Yarraville (at the east end)	
Dempster St, West Footscray and within the Stony Creek drainage reserve	
Williamstown Rd and Bayview Rd, Yarraville	
Beverley St, Yarraville	
Stonemark Court, West Footscray (east end)	
Havelock St, Maidstone	
Beachley St, Braybrook	
Lily St, Braybrook	
George St, Blanche St and Cuming St, Yarraville	
Taylor St, Yarraville	
167 Sunshine Road	Maribyrnong Drainage Study
2 Dongola Road	
45 and 47 Powell Street	

Appendix 4 – Flood risk assessment

Below is the flood risk assessment for this municipality by catchment, from Melbourne Water's Flood Risk Assessment Framework and Matrix, noting the catchments with medium, high or extreme risk ratings. This is for Melbourne Water managed catchments only.

Table 10 List of flood risks by catchment within the City of Maribyrnong as at [date]

Catchment name	No of commercial/ industry properties within 1% AEP flood extent	No of residential properties within 1% AEP flood extent	No of properties in total	Risk score (out of 10)	Risk rating (med, high, extreme)
Footscray Main drain	21	653	674	8	High
Graingers Road Main Drain	51	419	470	7	Medium
Maidstone / Braybrook	3	111	114	7	Medium
Maribyrnong River	10	293	303	10	Extreme
Stony Creek (Lower)	9	52	61	8	High

Appendix 5 – Flood studies

Flood study	Date
Maribyrnong Drainage study by Hyder Consulting	1999
Redevelopment Scheme Investigation for Footscray and Summerhill Road Main Drains	2004
Flood Mapping for Footscray Main Drain catchment. This includes Footscray Main Drain, Vine Street, Churchill Avenue, Bosquet Street and Summerhill Road Main Drain	20xx
Flood Mapping for Stony Creek catchment. This includes Stony Creek Lower, Yarraville Main Drain, Graingers Road Main Drain and Tottenham Stores Main Drain	20xx
CMPS&F Drainage study for City of Maribyrnong	1997
Melbourne Water revised flood mapping extent	2013

Appendix 6 – Meeting and workshop attendees

Table 11 Attendees at workshop 1 [10 March 2016]

Name	Position	Organisation
Daniel Szych	Development Coordinator	Maribyrnong City Council
Virginia Howe	Coordinator Strategic Planning	Maribyrnong City Council
Mark Dalrymple	Emergency Management - Community	Maribyrnong City Council
Sam Ortisi	Coordinator Maintenance Systems	Maribyrnong City Council
Mike Kearney		Melbourne Water
Nicole Sutherland	Project Manager, Flood Partnerships	Melbourne Water
Luke Cunningham	Consultant	Water Technology
Harry Virahsawmy	Consultant	Alluvium
Dan O'Halloran	Consultant	Alluvium

Table 12 Attendees at workshop 2 [12 April 2016]

Name	Position	Organisation
Daniel Szych	Development Coordinator	Maribyrnong City Council
Virginia Howe	Coordinator Strategic Planning	Maribyrnong City Council
Leon Berry	Manager Operations & Maintenance	Maribyrnong City Council
Sam Ortisi	Coordinator Maintenance Systems	Maribyrnong City Council
Leslie Wee	Drainage engineer - Operations and maintenance	Maribyrnong City Council
Stuart MacDougall	GIS Support	Maribyrnong City Council
Maria Theodosiou	Acting Program Leader- Strategic Projects	Melbourne Water
Nicole Sutherland	Project Manager, Flood Partnerships	Melbourne Water
Luke Cunningham	Consultant	Water Technology
Harry Virahsawmy	Consultant	Alluvium
Dan O'Halloran	Consultant	Alluvium

Table 13 Attendees at workshop 3 [10 May 2016]

Name	Position	Organisation
Daniel Szych	Development Coordinator	Maribyrnong City Council
Virginia Howe	Coordinator Strategic Planning	Maribyrnong City Council
Leon Berry	Manager Operations & Maintenance	Maribyrnong City Council
Steve Lionakis	Manager Urban Planning	Maribyrnong City Council
Paul McKeon	Manager Regulatory Services	Maribyrnong City Council
Mark Dalrymple	Resilience Coordinator	Maribyrnong City Council
Didrie Anderson	Manager Communications & Engagement	Maribyrnong City Council
Maria Theodosiou	Acting Program Leader-Strategic Projects	Melbourne Water
Nicole Sutherland	Project Manager, Flood Partnerships	Melbourne Water
Mike Kearney		Melbourne Water
Luke Cunningham	Consultant	Water Technology
Harry Virahsawmy	Consultant	Alluvium
Dan O'Halloran	Consultant	Alluvium

Appendix 7 – GIS layers

Table 14 GIS layers

Map Number	GIS layers used in this map	
	Council GIS	Melbourne Water GIS
1	Drainage_pipe	
2	Drainage_pit	
3	Council_property	
4	Council_title_register	
5	Open_space	
6	Council_flow_paths	
7		LSIO_additions
8		LSIO_additions_region
9		LSIO_Maribyrnong
10		LSIO_Maribyrnong_region
11		LSIO_Subtractions
12		LSIO_Subtractions_region
13		SBO_additions
14		SBO_Maribyrnong
15		SBO_subtractions

Appendix 8 – Key Asset list

Only the waterways and main drains are listed here. Following consultation with Council it was agreed that drainage assets would not be listed as they can be referred to via GIS systems.

Table 15 Asset list

Waterways and canals
Maribyrnong River
Stony Creek
Dynon Road tidal canal
Main drains
Footscray
Footscray main drain
Summerhill Road
Vine Street
Bosquet Street
Churchill Avenue
Graingers Road
Graingers Road
Tottenham stores
Yarraville Main Drain

Appendix 9 - International Association for Public Participation (IAP2) Spectrum

The key principles for engagement are:

Values-based: Appreciates that values held by the community form their opinions, concerns and aspirations

Decision-oriented: That participation of the public can affect the decision or outcome

Goal-driven: Specific, purposeful, productive outcomes are to be achieved with the public throughout the phases of the project (e.g. information is communicated, feedback is sought).

Key to the success of this approach will be the selection of the most appropriate engagement methods for the process. We will use a proven outcome-driven method using different engagement methods from the IAP2 spectrum (see Table 1).

Appropriate engagement will assist in building community confidence in the engagement and consultation process.

Table 16 IAP2 Public participation spectrum (adapted from: IAP2, 2014)

INCREASING LEVEL OF PUBLIC PARTICIPATION 					
	Inform	Consult	Involve	Collaborate	Empower
Public participation goal	To provide the public with balanced and objective information to assist them in understanding the problem, alternatives, opportunities and/or solutions.	To obtain public feedback on analysis, alternatives and/or decisions.	To work directly with the public throughout the process to ensure that public concerns and aspirations are consistently understood and considered.	To partner with the public in each aspect of the decision including the development of alternatives and the identification of the preferred solutions.	To place final decision-making in the hands of the public.
Promise to the public	We will keep you informed.	We will keep you informed, listen to you and acknowledge concerns and aspirations and provide feedback on how public input influenced the decision.	We will work with you to ensure that your concerns and aspirations are directly reflected in the alternatives developed and provide feedback on how public input influenced the decision.	We will look to you for advice and innovation in formulating solutions and incorporate your advice and recommendations into the decisions to the maximum extent possible.	We will implement what you decide.
Example techniques	<ul style="list-style-type: none"> ■ Fact sheets ■ Website ■ Open houses 	<ul style="list-style-type: none"> ■ Public comment ■ Focus group ■ Surveys ■ Public meetings 	<ul style="list-style-type: none"> ■ Workshops ■ Deliberative polling 	<ul style="list-style-type: none"> ■ Citizen advisory committees ■ Consensus-building 	<ul style="list-style-type: none"> ■ Ballots ■ Citizen juries ■ Delegated decision ■ Referendum