City of Melbourne
Flood Emergency Plan

A Sub-Plan of the Municipal Emergency Management Plan

For City of Melbourne
And
VICSES Unit(s) St Kilda and Footscray

Final Version 2.0, September 2012

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Document Transmittal Form / Amendment Certificate

This Municipal Flood Emergency Plan (MFEP) will be amended, maintained and distributed as required by VICSES in consultation with the City of Melbourne

Suggestions for amendments to this Plan should be forwarded to VICSES Regional Office Victoria State Emergency Service Central West, 239 Proximity Dr. Sunshine West 3020.

Amendments listed below have been included in this Plan and promulgated to all registered copyholders.

Amendment Number	Date of Amendment	Amendment Entered By	Summary of Amendment
1	1/3/2012	Alison Tuxworth	Population of template
2	21/5/2012	Alison Tuxworth	Amended references to ensure currency
3	5/9/2012	Anna Brooke	Final Version revised and endorsed by MEMPC

This Plan will be maintained on the City of Melbourne and VICSES website.

www.melbourne.vic.gov.au and www.ses.vic.gov.au

List of Abbreviations & Acronyms

The following abbreviations and acronyms are used in the Plan:

AEP	Annual Exceedance Probability
AHD	Australian Height Datum (the height of a location above mean sea level in metres)
AIIMS	Australasian Inter-service Incident Management System
AoCC	Area of Operations Control Centre / Command Centre
ARI	Average Recurrence Interval
ARMCANZ	Agricultural & Resource Management Council of Australia & New Zealand
AV	Ambulance Victoria
BoM	Bureau of Meteorology
CEO	Chief Executive Officer
CERM	Community Emergency Risk Management
CFA	Country Fire Authority
CMA	Catchment Management Authority
RERC	Regional Emergency Response Coordinator
RERCC	Regional Emergency Response Coordination Centre
DHS	Department of Human Services
DH	Department of Health
DoI	Department of Infrastructure
DPI	Department of Primary Industries
DSE	Department of Sustainability and Environment (successor body to DNRE)
EMMV	Emergency Management Manual Victoria
EMT	Emergency Management Team
EO	Executive Officer
FO	Floodway Overlay
FWS	Flood Warning System
FZ	Floodway Zone
IC	Incident Controller
ICC	Incident Control Centre
IMT	Incident Management Team
IMS	Incident Management System
EMLO	Emergency Management Liaison Officer
LSIO	Land Subject to Inundation Overlay
MECC	Municipal Emergency Coordination Centre
MEMP	Municipal Emergency Management Plan
MEMPC	Municipal Emergency Management Planning Committee
MERC	Municipal Emergency Response Coordinator
MERO	Municipal Emergency Resource Officer
MFB	Metropolitan Fire and Emergency Services Board
MRM	Municipal Recovery Manager
PMF	Probable Maximum Flood
RCC	Regional Control Centre
RDO	Regional Duty Officer
SBO	Special Building Overlay
SCC	State Control Centre
SEWS	Standard Emergency Warning System
SHERP	State Health Emergency Response Plan
SOP	Standard Operating Procedure
VicPol	Victoria Police
VICSES	Victoria State Emergency Service

Part 1. INTRODUCTION

1.1 Municipal Endorsement

This Municipal Flood Emergency Plan (MFEP) has been prepared by the City of Melbourne and with the authority of the [MEMPC – (refer to section 1.6 endorsement of plan)] pursuant to Section 20 of the Emergency Management Act 1986 (as amended).

This MFEP is a sub plan to the City of Melbourne Municipal Emergency Management Plan (MEMP), is consistent with the Emergency Management Manual Victoria (EMMV) and the Victoria Flood Management Strategy (DNRE, 1998a), and takes into account the outcomes of the Community Emergency Risk Management (CERM) process undertaken by the Municipal Emergency Management Planning Committee (MEMPC).

The Municipal Flood Emergency Plan is consistent with the Regional Flood Emergency Plan and the State Flood Emergency Plan.

This Municipal Flood Emergency Plan is a result of the cooperative efforts of the City of Melbourne and VICSES.

This Plan is endorsed by the City of Melbourne MEMPC as a sub-plan to the MEMPlan.

Endorsement

……..……..
Ray Jasper (Regional Manager Vic SES Central Regional) Date

……..……..
Chair – Municipal Emergency Management Planning Committee Date

1.2 The Municipality

An outline of City of Melbourne in terms of its location, demography and other general matters is provided in the MEMP. An outline of the flood threat is provided in Appendix A of this Plan.

1.3 Purpose and Scope of this Flood Emergency Plan

The purpose of this MFEP is to detail arrangements agreed for the planning, preparedness/prevention, response and recovery from flood incidents within the City of Melbourne.

As such, the scope of the Plan is to:

- Identify the Flood Risk to the City of Melbourne;
- Support the implementation of measures to minimise the causes and impacts of flood incidents within the City of Melbourne;
- Detail Response and Recovery arrangements including preparedness, Incident Management, Command and Control;
- Identify linkages with Local, Regional and State emergency and wider planning arrangements with specific emphasis on those relevant to flood.

1.4 Responsibility for Planning, Review & Maintenance of this Plan

This Municipal Flood Emergency Plan must be maintained in order to remain effective.

VICSES through the MEMPC has responsibility for preparing, reviewing, maintaining and distributing this plan.

The plans should be reviewed:

- Following any new flood study;
- Change in non-structural and/or structural flood mitigation measures;
- After the occurrence of a significant flood event within the Municipality to review and where necessary amend arrangements and information contained in this Plan.
- When Rainfall Intensity Frequency Duration data is changed by the Bureau of Meteorology

1.5 Endorsement of the Plan

The MFEP will be circulated to MEMPC seeking endorsement of the draft plan with the recommendation to include the MFEP as a sub-plan of the MEMPlan.

Part 2. PREVENTION / PREPAREDNESS ARRANGEMENTS

2.1 Community Awareness for all Types of Flooding

Details of this MFEP will be released to the community through local media, the FloodSafe program, websites (VICSES and the Municipality) upon formal adoption by the City of Melbourne

VICSES with the support of the City of Melbourne will coordinate community education programs for flooding within the council area. e.g. FloodSafe / StormSafe.

A Community Engagement Plan (CEP) to support this plan will be developed in conjunction with VICSES local units. VICSES local units will lead the delivery of the CEP with support from Melbourne City Council and VICSES Central Region.

2.2 Structural Flood Mitigation Measures

Refer to appendix A and C for detailed information of structural flood mitigation measures.

2.3 Non-structural Flood Mitigation Measures

2.3.1 Exercising the Plan

Arrangements for exercising this Plan will be at the discretion of the MEMPC. This Plan should be regularly exercised, preferably on an annual basis. Refer to section 4.7 of the EMMV for guidance.

2.3.2 Flood Warning

Arrangements for flood warning are contained within the State Flood Emergency Plan and the EMMV (Part 3.7) and on the BoM website . http://www.bom.gov.au

Specific details of local flood warning system arrangements are provided in appendix E.

2.3.3 Flood Wardens

Flood Wardens provide a means of gathering information in real time on flood behaviour along a stream system, and a network for the distribution of community information and warnings to the community along the stream system.

No Flood Wardens have been established

Part 3. RESPONSE ARRANGEMENTS

3.1 Introduction

3.1.1 Activation of Response

Flood response arrangements may be activated by the Regional Duty Officer (RDO) VICSES Central Region or Incident Controller.

The Incident Controller/RDO VICSES will activate agencies as required and documented in the State Flood Emergency Plan.

3.1.2 Responsibilities

There are a number of agencies with specific roles that will act in support of VICSES and provide support to the community in the event of a serious flood within the City of Melbourne These agencies will be engaged through the EMT.

The general roles and responsibilities of supporting agencies are as agreed within the City of Melbourne MEMPlan, EMMV (Part 7 'Emergency Management Agency Roles'), State Flood Emergency Plan and Regional Flood Emergency Plan.

3.1.3 Municipal Emergency Coordination Centre (MECC)

Liaison with the MECC will be through the established Division/Sector Command and through Municipal involvement in the Incident EMT, in particular the Municipal Emergency Response Coordinator (MERC). The VICSES RDO / ICC will liaise with the MECC directly if no Division/Sector Command is established.

The function, location, establishment and operation of the MECC will be as detailed in the City of Melbourne MEMPlan.

3.1.4 Escalation

Most flood incidents are of local concern and an appropriate response can usually be coordinated using local resources. However, when these resources are exhausted, the State's arrangements provide for further resources to be made available, firstly from neighbouring Municipalities (on a regional basis) and then on a State-wide basis.

Resourcing and event escalation arrangements are described in the EMMV ('State Emergency Response Plan' – section 3.6).

3.2 Strategic Control Priorities

To provide guidance to the Incident Management Team (IMT), the following strategic control priorities shall form the basis of incident action planning processes:

1. Protection and preservation of life is paramount - this includes:

    a. Safety of emergency services personnel, and;

    b. Safety of community members including vulnerable community members and visitors/tourist located within the incident area.

2. Issuing of community information and community warnings detailing incident information that is timely, relevant and tailored to assist community members make informed decisions about their safety;

3. Protection of critical infrastructure and community assets that supports community resilience;

4. Protection of residential property as a place of primary residence;

5. Protection of assets supporting individual livelihoods and economic production that supports individual and community financial sustainability

6. Protection of environmental and conservation values that considers the cultural, biodiversity, and social values of the environment;

Circumstances may arise where the Incident Controller is required to vary these priorities, with the exception being that the protection of life should remain the highest. This shall be done in consultation with the State Controller and relevant stakeholders based on sound incident predictions and risk assessments.

3.3 Command, Control & Coordination

The Command, Control and Coordination arrangements in this Municipal Flood Emergency Plan must be consistent with those detailed in State and Regional Flood Emergency Plans. For further information, refer to sections 3.3, 3.4, 3.5 & 3.6 of the EMMV.

The specific details of the Command, Control and Coordination arrangements for this plan are to be provided in Appendix C.

3.3.1 Control

Functions 5(a), 5 (b) and 5(c) at Part 2 of *the Victoria State Emergency Service Act 1986 (as amended)* detail the authority for VICSES to plan for and respond to flood.

Part 7.1 of the EMMV prepared under the *Emergency Management Act 1986 (as amended)*, identifies VICSES as the Control Agency for flood. It identifies DSE as the Control Agency responsible for "*dam safety, water and sewerage asset related incidents*" and other emergencies

All flood response activities within the City of Melbourne including those arising from a dam failure or retarding basin / levee bank failure incident will therefore be under the control of the appointed Incident Controller, or his / her delegated representative.

3.3.2 Incident Controller (IC)

An Incident Controller (IC) will be appointed by the VICSES (as the Control Agency) to command and control available resources in response to a flood event on the advice of the Bureau of Meteorology (or other reliable source) that a flood event will occur or is occurring. The Incident Controller responsibilities are as defined in Part 3.5 of the EMMV

3.3.3 Incident Control Centre (ICC)

As required, the Incident Controller will establish an Incident Control Centre (ICC) from which to initiate incident response command and control functions. The decision as to if and when the ICC should be activated, rests with the Control Agency (i.e. VICSES).

Pre-determined Incident Control Centre locations are

- Sunshine
- Mulgrave
- Ferntree Gully
- Woori Yallock

3.3.4 Divisions and Sectors

To ensure that effective Command and Control are in place, the Incident Controller may establish Divisions and Sectors depending upon the complexity of the event and resource capacities.

The following Divisions and Sectors may be established to assist with the management of flooding within the Municipality:

Division	Sector
St Kilda Unit	To be allocated on a as needs basis
Footscray Unit	To be allocated on a as needs basis

Pre-determined Division Command locations are:

- St Kilda SES Unit
- Footscray SES Unit

Pre-determined Sector Command locations are:

- To be allocated on a as needs basis

3.3.5 Incident Management Team (IMT)

The Incident Controller will form an Incident Management Team (IMT).

Refer to 3.5 of the EMMV for guidance on IMTs and Incident Management Systems (IMSs).

3.3.6 Emergency Management Team (EMT)

The Incident Controller will establish a multi-agency Emergency Management Team (EMT) to assist the flood response. The EMT will consist of key personnel (with appropriate authority) from stakeholder agencies and relevant organisations who need to be informed of strategic issues related to incident control and who are able to provide high level strategic guidance and policy advice to the Incident Controller for consideration in developing incident management strategies.

Organisations, including the City of Melbourne required within the EMT will provide an Emergency Management Liaison Officer (EMLO) to the ICC if and as required as well as other staff and / or resources identified as being necessary, within the capacity of the organisation.

Refer to 3.5 of the EMMV for guidance on EMTs.

3.3.7 On Receipt of a Flood Watch / Severe Weather Warning

Incident Controller or VICSES RDO (until an incident controller is appointed) will undertake actions as defined within the flood intelligence cards (appendix C). General considerations by the Incident Controller/VICSES RDO will be as follows:

- Review flood intelligence to assess likely flood consequences
- Monitor weather and flood information – www.bom.gov.au
- Assess Command and Control requirements.
- Review local resources and consider needs for further resources regarding personnel, property protection, flood rescue and air support
- Notify and brief appropriate officers. This includes Regional Control Centre (RCC) (if established), State Control Centre (SCC) (if established), Council, other emergency services through the EMT.
- Assess ICC readiness (including staffing of IMT and EMT) and open if required
- Ensure flood bulletins and community information are prepared and issued to the community
- Monitor watercourses and undertake reconnaissance of low-lying areas
- Develop media and community information management strategy
- Ensure flood mitigation works are being checked by owners
- Develop and issue incident action plan, if required
- Develop and issue situation report, if required

3.3.8 On Receipt of the First and Subsequent Flood Warnings

Incident Controller/VICSES RDO (until an incident controller is appointed) will undertake actions as defined within the flood intelligence cards (appendix C). General considerations by the Incident Controller/VICSES RDO will be as follows:

- Develop an appreciation of current flood levels and predicted levels. Are floodwaters, rising, peaking or falling?
- Review flood intelligence to assess likely flood consequences. Consider:
    - What areas may be at risk of inundation
    - What areas maybe at risk of isolation
    - What areas maybe at risk of indirect affects as a consequence of power, gas, water, telephone, sewerage, health, transport or emergency service infrastructure interruption
    - The characteristics of the populations at risk
- Determine what the at-risk community need to know and do as the flood develops.

- Warn the at-risk community including ensuring that an appropriate warning and community information strategy is implemented including details of:
  - The current flood situation
  - Flood predictions
  - What the consequences of predicted levels may be
  - Public safety advice
  - Who to contact for further information
  - Who to contact for emergency assistance
- Liaise with relevant asset owners as appropriate (i.e. water and power utilities)
- Implement response strategies as required based upon flood consequence assessment.
- Continue to monitor the flood situation – www.bom.gov.au/vic/flood/
- Continue to conduct reconnaissance of low-lying areas

3.4 Community Information and Warnings

Guidelines for the distribution of community information and warnings are contained in the State Flood Emergency Plan.

Community information and warnings communication methods available include:

- Emergency Alert;
- Phone messages (including SMS);
- Radio and Television;
- Two-way radio;
- Mobile and fixed public address systems;
- Sirens;
- Verbal Messages (i.e. Doorknocking);
- Agency Websites;
- VICSES Flood Storm Information Line;
- Variable Message Signs (i.e. road signs);
- Community meetings;
- Newspapers;
- Email;
- Telephone trees;
- Community Flood Wardens;
- Fax Stream;
- Newsletters;
- Letter drops;
- Social media and/or social networking sites (i.e. twitter and/or facebook).

Refer to Appendix C and E for the specific details of how community information and warnings are to be provided.

The release of flood bulletins and information with regard to response activities at the time of a flood event is the responsibility of VICSES, as the Control Agency.

Council has the responsibility to assist VICSES to warn individuals within the community including activation of flood warning systems, where they exist. Responsibility for public information, including media briefings, rest with VICSES as the Control Agency.

Other agencies such as CFA, DSE and VICPOL may be requested to assist VICSES with the communication of community flood warnings.

In cases where severe flash flooding is predicted, dam failure is likely or flooding necessitating evacuation of communities is predicted, the Incident Controller may consider the use of the Emergency Alert System and Standard Emergency Warning System (SEWS).

DH will coordinate information regarding public health and safety precautions.

3.5 Media Communication

The Incident Controller through the Information Unit established at the ICC will manage Media communication. If the ICC is not established the RDO will manage all media communication.

3.6 Rapid impact assessment

A rapid impact assessment can be conducted in accordance with part 3 of the EMMV to assess and record the extent and nature of damage caused by flooding. This information may then be used to provide the basis for further needs assessment and recovery planning by DHS and recovery agencies.

3.7 Preliminary Deployments

When flooding is expected to be severe enough to cut access to towns, suburbs and/or communities the Incident Controller will consult with relevant agencies to ensure that resources are in place if required to provide emergency response. These resources might include emergency service personnel, food items and non-food items such as medical supplies, shelter, assembly areas, relief centres etc.

3.8 Response to Flash Flooding

Emergency management response to flash flooding should be consistent with the guideline for the emergency management of flash flooding contained within the State Flood Emergency Plan.

When conducting pre-event planning for flash floods the following steps should be followed, and in the order as given:

1. Determine if there are barriers to evacuation by considering warning time, safe routes, resources available and etc;

2. If evacuation is possible, then evacuation should be the adopted strategy and it must be supported by a public information capability and a rescue contingency plan;

3. Where it is likely people will become trapped by floodwaters due to limited evacuation options safety advice needs to be provided to people at risk advising them not to attempt to flee by entering floodwater if they become trapped, and that it may be safer to seek the highest point within the building and to telephone 000 if they require rescue. This advice needs to be provided even when evacuation may be possible, due the likelihood that not all community members will evacuate.

4. For buildings known to be structurally un-suitable an earlier evacuation trigger will need to be established (return to step 1 of this cycle).

5. If an earlier evacuation is not possible then specific preparations must be made to rescue occupants trapped in structurally unsuitable buildings either pre-emptively or as those people call for help.

During a flash flood it will often be difficult, due the rapid development of flooding, to establish emergency relief centres ahead of actually triggering the evacuation as is normal practice but this is insufficient justification for not adopting evacuation.

Refer to City of Melbourne MEMPlan for response arrangements for flash flood events.

3.9 Evacuation

The decision to recommend or warn people to prepare to evacuate or to evacuate immediately rests with the Incident Controller.

Once the decision is made VicPol are responsible for the management of the evacuation process where possible. VICSES and other agencies will assist where practical. VICSES is responsible for the development and communication of evacuation warnings.

VicPol and/or Australian Red Cross may take on the responsibility of registering people affected by a flood emergency including those who have been evacuated.

Refer to section 3.8 of the EMMV and the Evacuation Guidelines for guidance of evacuations for flood emergencies.

Refer to City of Melbourne MEMPlan for detailed evacuation arrangements for the City of Melbourne

3.10 Flood Rescue

VICSES may conduct flood rescues. Appropriately trained and equipped VICSES units or other agencies that have appropriate training, equipment and support may carry out rescues.

Rescue operations may be undertaken where voluntary evacuation is not possible, has failed or is considered too dangerous for an at-risk person or community. An assessment of available flood rescue resources (if not already done prior to the event) should be undertaken prior to the commencement of Rescue operations.

Rescue is considered a high-risk strategy to both rescuers and persons requiring rescue and should not be regarded as a preferred emergency management strategy. Rescuers should always undertake a dynamic risk assessment before attempting to undertake a flood rescue.

Rescue Manager appointed by Vic Police to Coordinate Rescues with support from SES Units.

3.11 Aircraft Management

Aircraft can be used for a variety of purposes during flood operations including evacuation, resupply, reconnaissance, intelligence gathering and emergency travel.

Air support operations will be conducted under the control of the Incident Controller.

The Incident Controller may request aircraft support through the State Air Desk located at the State Control Centre who will establish priorities.

Suitable airbase facilities are located at:

- Essendon
- Moorabbin

3.12 Resupply

Communities, neighbourhoods or households can become isolated during floods as a consequence of road closures or damage to roads, bridges and causeways. Under such circumstances, the need may arise to resupply isolated communities/properties with essential items.

When predictions/intelligence indicates that communities, neighbourhoods and/or households may become isolated, VICSES will advise businesses and/or households that they should stock up on essential items.

After the impact, VICSES can support isolated communities through assisting with the transport of essential items to isolated communities and assisting with logistics functions.

Resupply operations are to be included as part of the emergency relief arrangements with VICSES working with the relief agencies to service communities that are isolated.

3.13 Essential Community Infrastructure and Property Protection

Essential Community Infrastructure and Property (e.g. residences, businesses, roads, power supply etc.) may be affected in the event of a flood.

The City of Melbourne maintains a small stock of sandbags, and back-up supplies are available through the VICSES Regional Headquarters. The Incident Controller will determine the priorities related the use of sandbags, which will be consistent with the strategic priorities.

If VICSES sandbags are becoming limited in supply, then priority will be given to protection of Essential Community Infrastructure. Other high priorities may include for example the protection of historical buildings.

Property may be protected by:

- Sandbagging to minimise entry of water into buildings
- Encouraging businesses and households to lift or move contents
- Construction of temporary levees in consultation with the CMA, LGA and VICPOL and within appropriate approval frameworks.

The Incident Controller will ensure that owners of Essential Community Infrastructure are kept advised of the flood situation. Essential Community Infrastructure providers must keep the Incident Controller informed of their status and ongoing ability to provide services.

3.14 Disruption to Services

Disruption to services other than essential community infrastructure and property can occur in flood events. Refer to City of Melbourne MEMPlan for arrangements to respond to service disruptions in the City of Melbourne.

3.15 Road Closures

The City of Melbourne and VicRoads will carry out their formal functions of road closures including observation and placement of warning signs, road blocks etc. to its designated local and regional roads, bridges, walking and bike trails. City of Melbourne staff may also liaise with and advise VicRoads as to the need or advisability of erecting warning signs and / or of closing roads and bridges under its jurisdiction. VicRoads are responsible for designated main roads and highways and Council's are responsible for the designated local and regional road network.

VICROADS and City of Melbourne will communicate community information regarding road closures.

3.16 Dam Failure

DSE is the Control Agency for dam safety incidents (e.g. breach, failure or potential breach / failure of a dam), however VICSES is the Control Agency for any flooding that may result.

Major dams with potential to cause structural and community damage within the Municipality are contained in Appendix A. Refer also to DSE Dam Safety Plan.

3.17 Waste Water related Public Health Issues and Critical Sewerage Assets

Inundation of critical sewerage assets including septic tanks and sewerage pump stations may result in water quality problems within the Municipality. Where this is likely to occur or has occurred the responsibility agency for the critical sewerage asset should undertake the following:

- Advise VICSES of the security of critical sewerage assets to assist preparedness and response activities in the event of flood;
- Maintain or improve the security of critical sewerage assets;
- Check and correct where possible the operation of critical sewerage assets in times of flood;
- Advise the ICC in the event of inundation of critical sewerage assets.

It is the responsibility of the City of Melbourne Environmental Health Officer to inspect and report to the MERO and the ICC on any water quality issues relating to flooding.

3.18 After Action Review

VICSES will coordinate the after action review arrangements of flood operations as soon as practical following an event.

All agencies involved in the flood incident should be represented at the after action review.

Part 4. EMERGENCY RELIEF AND RECOVERY ARRANGEMENTS

4.1 General

Arrangements for recovery from a flood incident within the City of Melbourne is detailed in the City of Melbourne MEMPlan

4.2 Emergency Relief

The decision to recommend the opening of an emergency relief centre rests with the Incident Controller. Incident Controllers are responsible for ensuring that relief arrangements have been considered and implemented where required under the State Emergency Relief and Recovery Plan (Part 4 of the EMMV).

The range and type of emergency relief services to be provided in response to a flood event will be dependent upon the size, impact, and scale of the flood. Refer to 4.4 of the EMMV for details of the range of emergency relief services that may be provided.

Suitable relief facilities identified for use during floods are detailed in the MEMPlan.

Details of the relief arrangements are available in the MEMPlan.

4.3 Animal Welfare

Matters relating to the welfare of livestock and companion animals (including feeding and rescue) are to be referred to DPI.

Requests for emergency supply and/or delivery of fodder to stranded livestock or for livestock rescue are passed to DPI.

Matters relating to the welfare of wildlife are to be referred to DSE.

Details relating to Animal Welfare and Shelters are available in the MEMPlan

4.4 Transition from Response to Recovery

VICSES as the Control Agency is responsible for ensuring effective transition from response to recovery. This transition will be conducted in accordance with existing arrangements as detailed in Part 3 Section 3.10 of the EMMV.

APPENDIX A - FLOOD THREATS FOR CITY OF MELBOURNE

General

The City of Melbourne municipality encompasses an area of 37.6 square kilometres and is surrounded by the Cities of Hobsons Bay and Maribyrnong to the east, Cities of Moonee Valley and Moreland to the north, cities of Yarra and Stonnington to the west, and the City of Port Phillip to the south.

The City of Melbourne municipality includes the Melbourne Central Business District (CBD) as well as a number of inner city suburbs: Port Melbourne; Fishermans Bend; West Melbourne; Flemington; Kensington; North Melbourne; Parkville; Carlton North; Carlton; East Melbourne; Jolimont; South Yarra (part); Southbank; South Wharf; and Docklands.

The City of Melbourne municipality contains a wide range of business and industrial areas including (City of Melbourne, 2011e):

- The Melbourne CBD with retail, financial, legal, recreational, tourist and entertainment facilities;
- The West Melbourne industrial area with the Dynon rail hub, Coode Island petrochemical facility, Swanson, Victoria and Appleton Docks and parts of the Port of Melbourne; and
- Parkville with major hospital, research and institutional facilities including the Royal Melbourne Hospital and the University of Melbourne.

The City of Melbourne municipality is at the hub of a radial road, rail and tram transport network that services the wider Melbourne region.

The City of Melbourne municipality is located at the bottom of the Port Phillip Bay catchment where waterways are saline, groundwater is shallow, and pollution occurs from upstream sources (City of Melbourne, 2009b). The City of Melbourne municipality contains three major waterways: the Yarra River; the Maribyrnong River; and Moonee Ponds Creek.

Riverine Flooding

Large severe floods within the Municipality generally occur as a result of a moist warm airflow from northern Australia bringing moderate to heavy rainfall over a period of 12 hours or more following a prolonged period of general rainfall. The period of general rainfall “wets up” the catchments and (partially) fills both the on-stream dams and the natural floodplain storage. These combine to increase the runoff generated during the subsequent period of heavy rainfall.

Large but less severe floods result from sequences of cold fronts during winter and spring that progressively wet up the catchments and fill the on-stream dams and the natural floodplain storage. Prolonged moderate to heavy rain leads to major flooding.

Flash Flooding & Overland Flows

Short Duration, high intensity rainfall (usually associated with thunderstorms) can also cause localised flooding within the municipality along overland flow paths when the local urban drainage system surcharges. Such events, which are mainly confined to the summer months, do not generally create widespread flooding since they only last for a short time and affect limited areas. Flooding from these storms occurs with little warning and localised damage can be severe.

High intensity rainfall such as associated with thunderstorms giving average rainfall rates of more than 20mm/hour for an hour or more is likely to lead to flash flooding and / or overland flows, across the municipality.

Blocked or capacity impaired stormwater drains can also lead to overland flows and associated flooding: the drain surcharges and excess water flows above ground.

Flooding within City of Melbourne catchments is generally caused by short duration thunderstorm events because these produce the highest rates of runoff in hard-lined drainage systems serving relatively small and highly impervious catchments.

Tidal Flooding & Storm Surges

Moderate to heavy rainfall, coupled with a high or incoming tide from Port Phillip Bay can exacerbate flooding within the municipality or create areas of flooding in and around the drainage network. Due to the proximity of the Municipality to Port Phillip Bay and its flat terrain, tidal flows from Port Phillip Bay may reduce the capacity of the stormwater drains to discharge runoff back into the bay, while extreme storm events can cause backflow to the point where water surcharges back above ground around the drainage pits and channels.

Description of Major Waterways and Drains

The Yarra River begins its journey in the Yarra Ranges to the east of Melbourne and runs through the Yarra Valley and Melbourne's eastern suburbs before dissecting the City of Melbourne municipality, and discharging into Port Phillip Bay. The Yarra River drains much of eastern and northern Melbourne with the City of Melbourne municipality constituting less than one per cent of its entire catchment area.

The Maribyrnong River catchment covers 1,430 square kilometres; it rises to the north-west of Melbourne and drains into the Yarra River. The Maribyrnong River is the western border of the City of Melbourne municipality.

The Moonee Ponds Creek catchment covers a total area of 145 square kilometres and flows through Melbourne's northern suburbs before entering the City of Melbourne municipality. The Moonee Ponds Creek flows into the Yarra River upstream of Appleton Dock through a realigned channel beside the Bolte Bridge.

Other waterways or drainage systems within the City of Melbourne municipality include Royal Park Wetland, the Dynon Road Tidal Canal, and Hanna Street Main Drain.

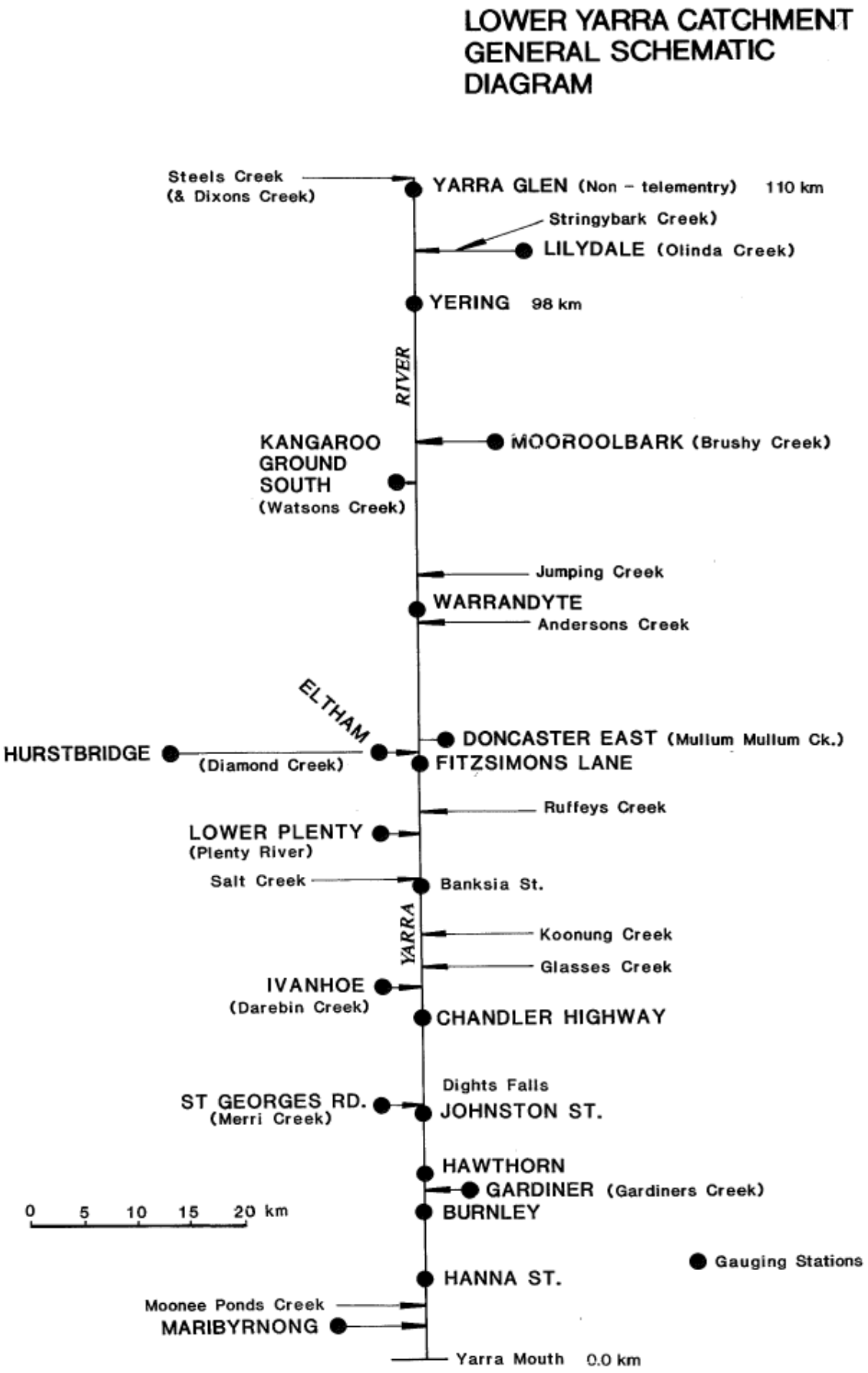


Figure A1 – Schematic of the Lower Yarra River showing tributaries from Yarra Glen to the River Mouth

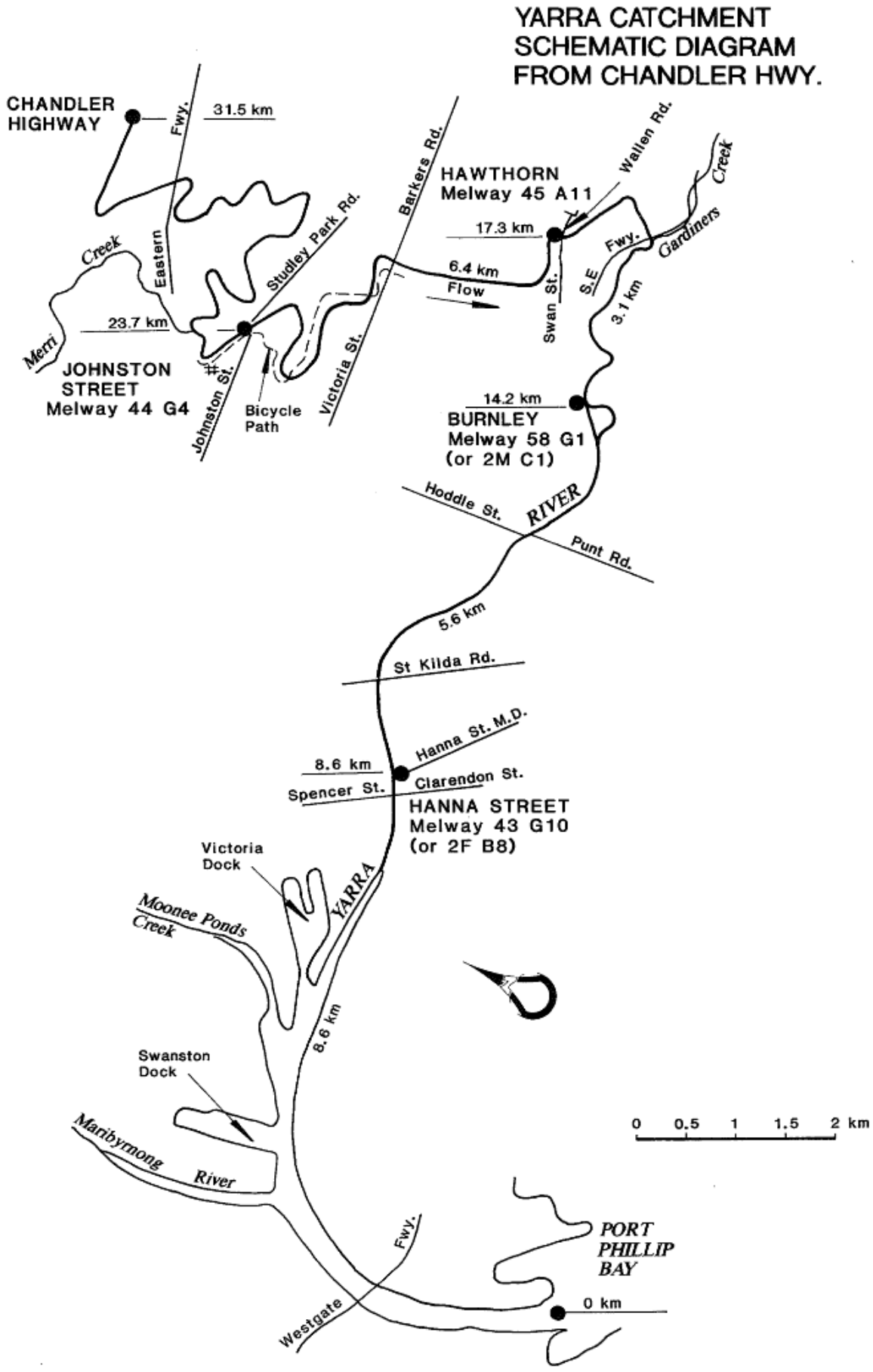


Figure A2 – Schematic of Yarra River from Chandler Hwy to the River Mouth

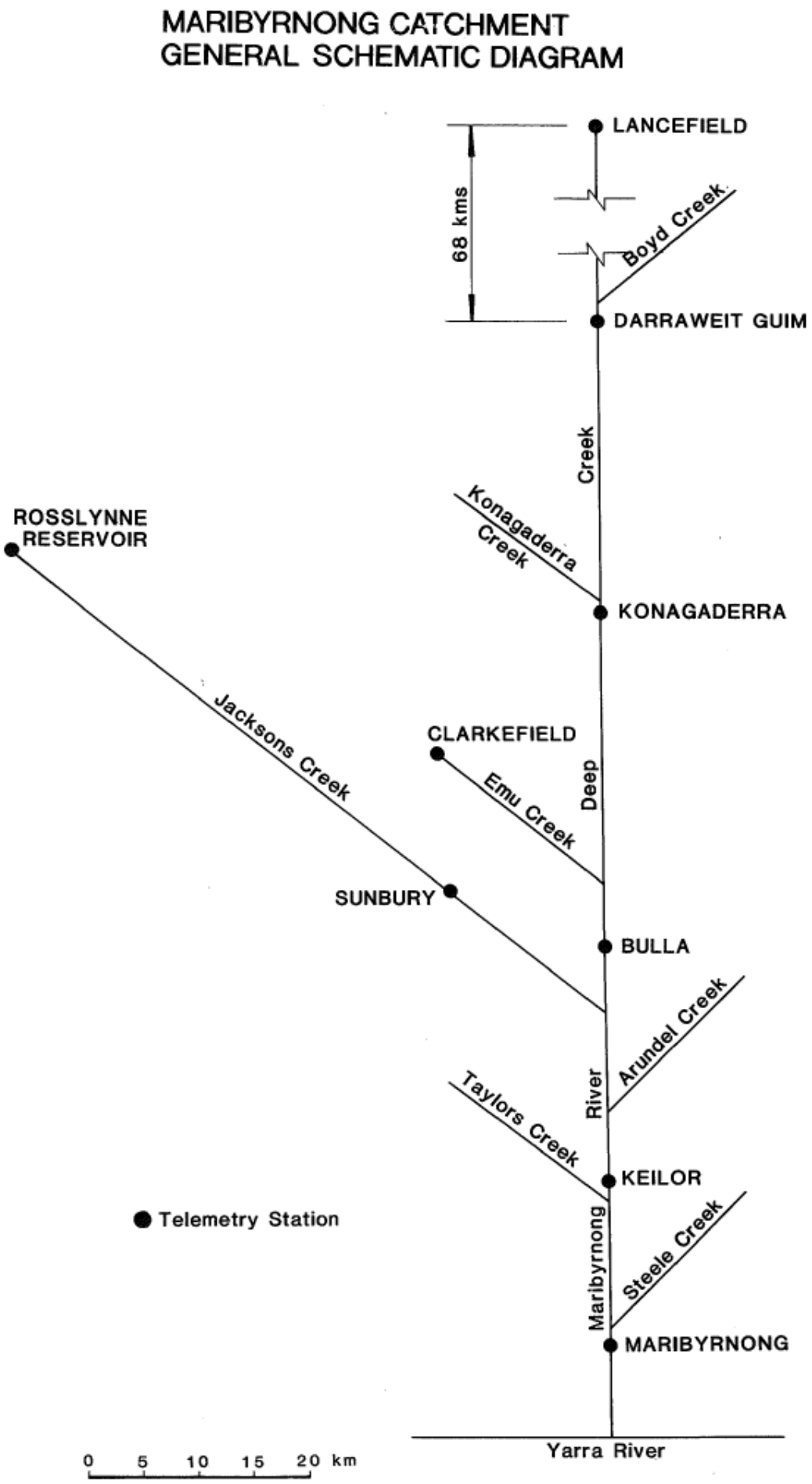


Figure A3 – Schematic of Maribyrnong River showing Tributaries

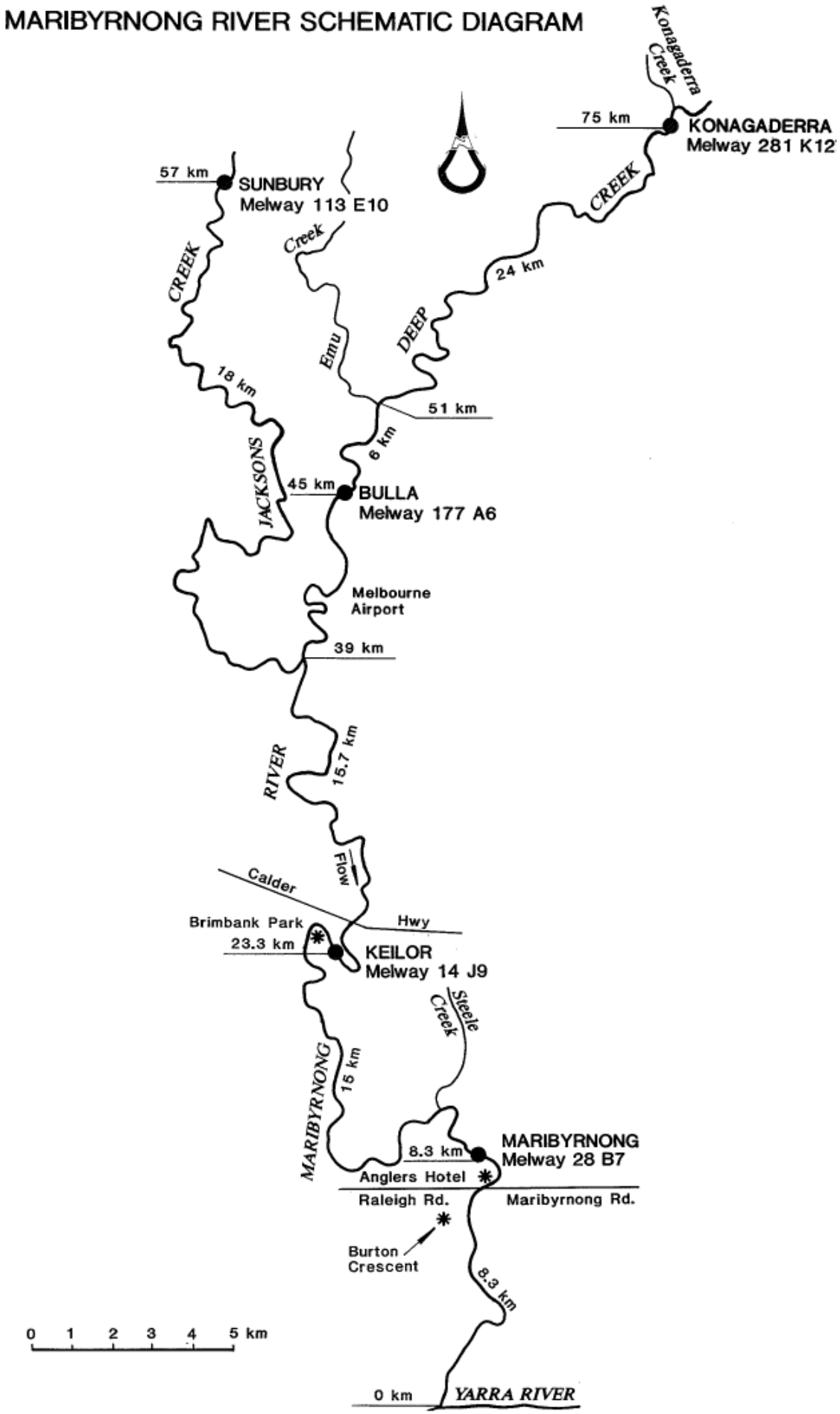


Figure A4 – Schematic of Maribyrnong River

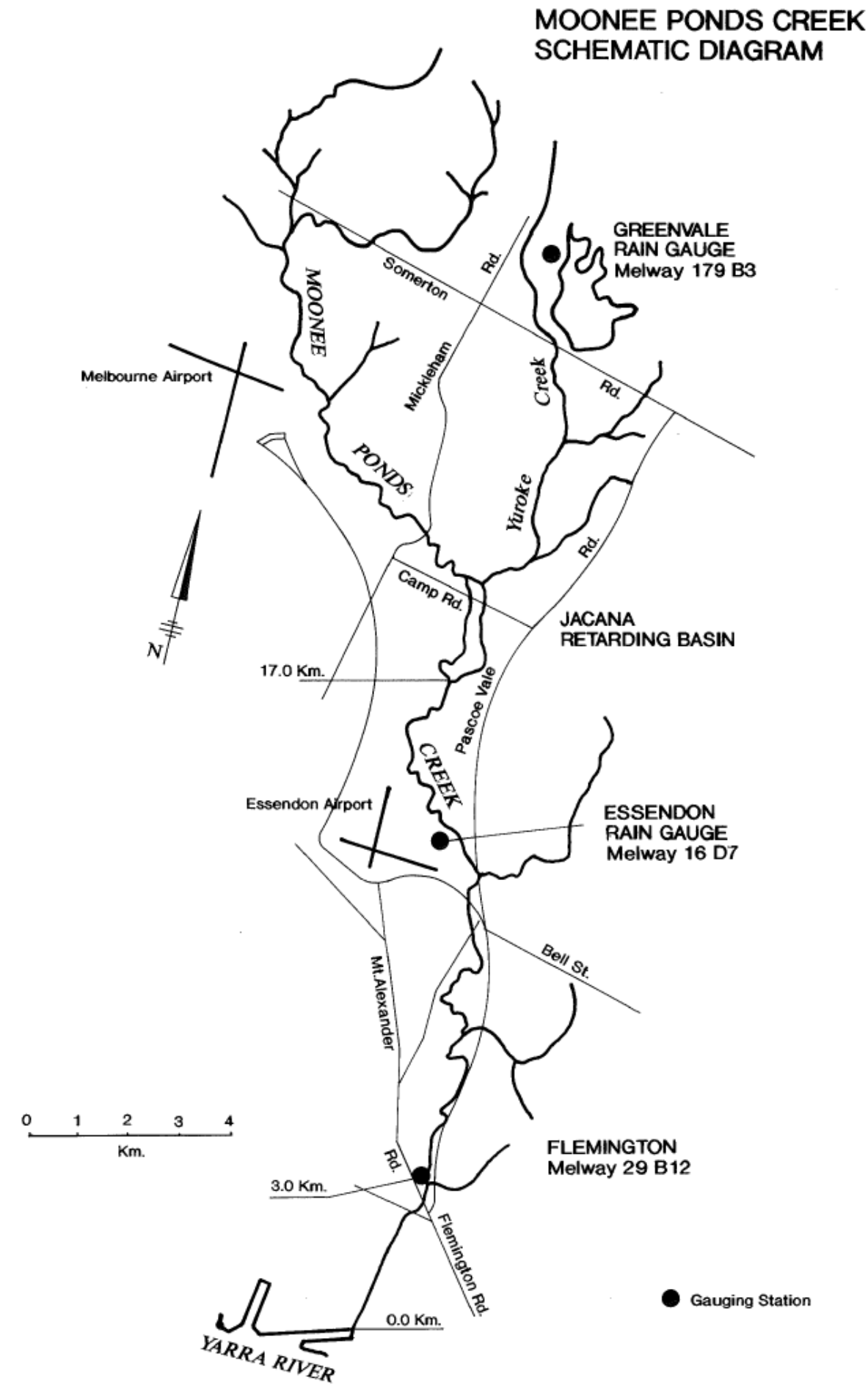


Figure A5 – Schematic of Moonee Ponds Creek

Flood Mitigation Systems

Flood mitigation has predominantly been developed in the form of 10 pumping stations, 5 levees and 3 retarding basins. These flood mitigation systems are as follows in the tables below.

Pump Stations

Pump Station	Suburb	Owner	Melway
Crown Casino, Spencer St	Southbank	Melbourne Water	2FB9
Royal Park	Parkville	Melbourne Water	29C12
Corner Stubbs & Smith St	Kensington	Melbourne City Council	2AB3
Sutton St	North Melbourne	Melbourne City Council	2AC3
Corner Macaulay & Stubbs St	Kensington	Melbourne City Council	2AB5
Corner Macaulay & Bent St	Kensington	Melbourne City Council	2AB5
Corner Macaulay & Langford St	North Melbourne	Melbourne City Council	2AC5
Langford St (near Gracie St)	North Melbourne	Melbourne City Council	2AC7
Kensington Rd (near Dynon Rd)	West Melbourne	Melbourne City Council	2TC8
Docklands Dr (near Waterfront Way)	Docklands	Melbourne City Council	2ED3

Levees (Melbourne Water)

Levee on Drain/ Waterway	Reach	Side	Levee Height (m)	Levee Length (km)	Levee Shape	Levee Material	Melway Ref
Moonee Ponds Creek	Mt Alexander Rd to Manningham Rd	East	2.2	0.3	Trapezoid	Earth	43B1
Moonee Ponds Creek	Macaulay Rd to Mt Alexander Rd	West	2.6	1.0	Trapezoid	Earth	43B1-43A3
Moonee Ponds Creek	Macaulay Rd to Mt Alexander Roast	East	2.6	1.0	Trapezoid	Earth	43B1-43A3
Moonee Ponds Creek	Arden St to Macaulay Rd	East					
Moonee Ponds Creek	Arden St to Macaulay Rd	West					

Retarding Basins (Melbourne CC)

Retarding Basin	Embankment Height (m)	Capacity at Spillway Level (ML)	FSL (m AHD)	Spillway Level (m AHD)	Melway Ref
Riverside Park, Kensington					2TC5
Royal Park Wetlands, Parkville					29C11
Fawkner Park, South Yarra					2LC6

Historic Floods

Examples of past flooding in the City of Melbourne municipality include (Melbourne Water, 2007):

- The Great Flood of 1891 when the Yarra River rose 14 metres above its normal level in some areas, flooding the riverside suburbs of Collingwood, Richmond and Prahran and leaving approximately 3,000 people homeless.
- In 1934, 350mm of rain fell in 48 hours over the Yarra catchment, with 140mm falling over metropolitan areas. Riverine flooding was widespread with 6,000 left homeless and 18 deaths.
- Major floods also inundated the floodplains of the lower Maribyrnong River in September 1906, September 1916 and May 1974.

The City of Melbourne municipality has been especially affected by overland flows, such as on Elizabeth and Flinders Streets. For example, on 17 February 1972, 78.5mm of rain fell in one hour over the Melbourne CBD, causing significant disruption to transport and businesses and extreme flooding on Elizabeth Street (Melbourne Water, 2007).

Major riverine flooding occurred across the City of Melbourne municipality in February 2005, causing little property damage but significant widespread disruption to transport infrastructure. Flash flooding in the CBD in 2010 caused hundreds of thousands of dollars damage to property (Melbourne Water, 2010).

Significant floods to have occurred within the City of Melbourne are as follows in the table below. To view the locations of these floods, see map E in Appendix F.

Date	Height (m)	Flood Class	Date	Height (m)	Flood Class
July 1891	2.24 @ Yarra River, Spencer St Gauge	Major	December 1954	2.98 @ Maribyrnong River, Chifley Drive Gauge	Major
September 1906	4.50 @ Maribyrnong River, Chifley Drive Gauge	Major	January 1956	1.08m AHD @ Moonee Ponds Creek & Dynon Rd (North)	
September 1916	4.20 @ Maribyrnong River, Chifley Drive Gauge	Major	September 1960	1.69m AHD @ Moonee Ponds Creek & Dynon Rd (North)	
September 1918			January 1963		
August 1924	2.98 @ Maribyrnong River, Chifley Drive Gauge	Major	February 1972		
December 1933			May 1974	4.20 @ Maribyrnong River, Chifley Drive Gauge	Major
December 1934	1.61 @ Yarra River, Spencer St Gauge	Major	December 2003	2.29m AHD @ Moonee Ponds Creek, Arden St	
February 1946	2,13 @ Maribyrnong River, Chifley Drive Gauge	Minor	February 2005	1.37 @ Yarra River, Spencer St Gauge	Moderate
July 1952	1.59m AHD @ Moonee Ponds Creek & Dynon Rd (North)		November 2010	3.24 @ Yarra River, Johnston St Gauge	Minor

Dam Failure

Flooding resulting from failure of the following dams has the potential to cause significant structural and community damage within the City of Melbourne. Note that if the storage capacity is reached and water flows over the spillway, this is not to be referred to as a flow release or a storage breach or failure.

Dam Name	Location	Owner	Dam Capacity at FSL (ML)	Full Supply Level (FSL) (m AHD)	Melway Reference
Greenvale Reservoir	Greenvale	Melbourne Water	27,195	167.12	179D6
Sugarloaf Reservoir	Christmas Hills	Melbourne Water	93,411	178.00	
Upper Yarra Reservoir	Reefton	Melbourne Water	200,051	366.53	

APPENDIX B - TYPICAL FLOOD PEAK TRAVEL TIMES

In using the information contained in this Appendix, consideration needs to be given to the time of travel of the flood peak. A flood on a 'dry' waterway will generally travel more slowly than a flood on a 'wet' waterway (eg. The first flood after a dry period will travel more slowly than the second flood in a series of floods). Hence, recent flood history, soil moisture and forecast weather conditions all need to be considered when using the following information to direct flood response activities.

Note that flooding will start some time ahead of the time indicated by the following travel times – these are the time between the flood peaks at respective sites.

1. Cumulative Hours

Location From (gauge)	Location To (gauge)	Typical Travel Time (hrs)	Comments
YARRA RIVER			
Milgrove (Upper Catchment)	Spencer St, Southbank	Around 54 hours	
Yarra Glen	Spencer St, Southbank	34 hours	Minor Flood
Banksia St, Heidelberg	Spencer St, Southbank	12 hours	Minor Flood
Yarra Glen	Spencer St, Southbank	39 hours	Moderate Flood
Banksia St, Heidelberg	Spencer St, Southbank	14 hours	Moderate Flood
Yarra Glen	Spencer St, Southbank	42 hours	Major Flood
Banksia St, Heidelberg	Spencer St, Southbank	15 hours	Major Flood
MARIBYRNONG RIVER			
Darraweit Guim (Deep Creek) (Upper Catchment)	Maribyrnong	Around 15 hours	
Jacksons Creek, Sunbury	Maribyrnong	10.5 hours	Minor Flood
Deep Creek, Bulla	Maribyrnong	8.5 hours	Minor Flood
Jacksons Creek, Sunbury	Maribyrnong	10 hours	Moderate Flood
Deep Creek, Bulla	Maribyrnong	8 hours	Moderate Flood
Jacksons Creek, Sunbury	Maribyrnong	10 hours	Major Flood
Deep Creek, Bulla	Maribyrnong	7.5 hours	Major Flood
MOONEE PONDS CREEK			
Jacana Retarding Basin	Flemington	XX hours	Minor Flood
Jacana Retarding Basin	Flemington	XX hours	Moderate Flood
Jacana Retarding Basin	Flemington	XX hours	Major Flood

2. Point to Point Hours

Location From	Frequency (yrs)	Gauge Level (m)	Flood Class	Flow (m3/s)	Location To	Distance to Travel (km)	Typical Travel Time (hrs)	Comments
YARRA RIVER								
Burnley	Bank Full	1.1			Spencer St, Southbank	5.6	1.0	Tidal flows from Port Phillip Bay may affect conditions at Spencer St, Southbank
	5						1.0	
	10	2.9					1.0	
	20	3.6					1.0	
	50	4.9					1.0	
	100	5.5					1.0	
Spencer St, Southbank	Bank Full	1.1	Minor		Port Phillip Bay	8.6	1.6	Tidal flows from Port Phillip Bay may affect travel times to Port Phillip Bay
		1.3	Moderate				1.6	
		1.6	Major				1.6	
MARIBYRNONG RIVER								
Chifley Dr, Maribyrnong	Bank Full	1.3		230	Yarra River	8.3		Tidal flows from Port Phillip Bay may affect conditions along stretch of river
	5	1.5		275				
		1.68	Minor					
	10	2.28 2.4	Moderate	405				
	20	2.88	Major	535				
	50	3.78		710				
	100	4.52		880				
MOONEE PONDS CREEK								
Flemington	Bank Full	3.7		70	Yarra River	3		Travel times between Flemington and The Yarra River to be added when available
	5	4.0		110				
	10	4.1		140				
	20			180				
	50			225				
	100			260				

APPENDIX C1 – MELBOURNE/ SOUTHBANK/ SOUTH WHARF & DOCKLANDS FLOOD EMERGENCY PLAN

Overview of Flooding Consequences

Melbourne, Southbank, South Wharf & Docklands are located in the centre of the Melbourne Metropolitan region in an area of mixed high rise commercial and residential development. The Yarra River is the prominent watercourse in the area, flowing from the Yarra Ranges in the east. High Intensity, short duration rainfall events can cause flash flooding in and around Melbourne, Southbank, South Wharf & Docklands, while prolonged rainfall may see the Yarra River flood. The area sees moderate to slow water movement due to the relative flatness of the terrain. As a result, flooding may last for a number of days where ponding occurs. See maps 2-4 & 9 in Appendix F for more insight into flooding in the area.

Warning Times

For flooding expected along the Yarra River in Southbank, warning times of between 12-54 hours may be given depending on where the flooding originates from along the catchment. Gauges along the Yarra River may provide some warning of expected flooding. See the Melbourne Water website for more information on these gauges: http://www.melbournewater.com.au/content/rivers_and_creeks/rainfall_and_river_level_data/rainfall_and_river_level_data.asp. See also Appendix B for flood peak travel times if available. No formal warning times have been established for flooding along the Yarra River resulting from Tidal Surges or Port Phillip Bay Flooding. It is advised that residents monitor the Bureau of Meteorology's website http://www.bom.gov.au/ and the VicSES website http://www.ses.vic.gov.au/ for any thunderstorm, flood or severe weather warnings present for their area.

Areas Affected

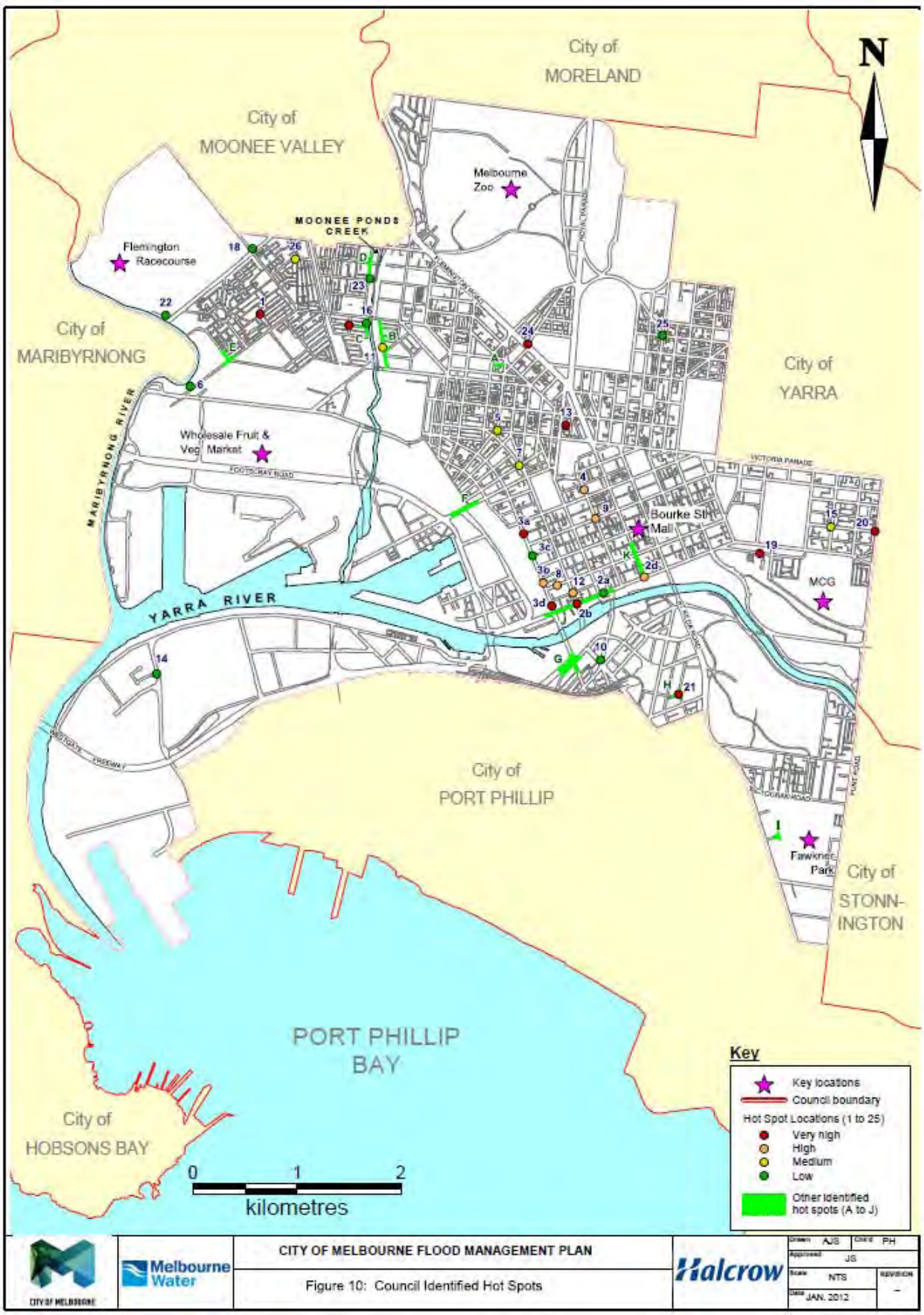


Figure C1 – Melbourne City Council Identified Hot Spots (City of Melbourne Flood Management Plan 2012)

Melbourne

Areas of Melbourne that may be affected by flooding during an extreme rainfall event are highlighted in Figure C1 and on Maps 2-3 in Appendix F. Hot Spots identified in Figure C1 include:

Figure C1 Reference	Street	Flooding description	Melbourne City Council Flood Risk Rating
2a	Flinders St (Queen St to Market St)	Stormwater ponds outside Banana Alley	Low
2b/c	Flinders St (Market to Spencer Sts)	Flooding at Waterside Hotel	Very High
2d	Flinders St & Swanson St	Stormwater ponds at corner of Swanston and Flinders Sts (assumed to be north-east corner)	High
3a	Spencer St (La Trobe St to Little Lonsdale Str	Flooding in basement of Atlantis Hotel (300 Spencer St)	Very High
3b	Spencer Street (Collins St to Little Collins St)	Stormwater ponds outside of Gloria Jeans (620 Collins St)	High
3c	Spencer Street (Bourke St to Little Bourke St)	Location to be determined	Low
3d	Spencer St (Flinders St to Flinders La)	Location to be determined – assumed to be outside of Grand Hotel (33 Spencer St)	Very high
4	Queen St (La Trobe to A'Beckett Sts)	Stormwater ponds on the north-east corner of the intersection between Queen and La Trobe St	High
8	Collins St (King St to Spencer St)	Stormwater ponds on the northern side of Collins St	High
9	Lonsdale St from Queen St	Location to be determined	High
12a	Flinders La to King St (west side)	Flooding of properties	High
12b	Flinders La to King St (east side)	Flooding of properties	High
J	Flinders St	Flinders St between King and Elizabeth St experiences frequent minor flooding.	High
K	Elizabeth St (Flinders St end)	Occasional nuisance flooding, inundation of retail premises, two known instances of extreme flooding.	
I	Armadale St	Frequent flooding of Fawkner Park adjacent to Armadale St. Apartment building adjacent to Fawkner Park experiences flooding of basement, possibly from downpipes connected to surcharging or 'at capacity' stormwater system	

Additional Hot Spots identified in mapping in Appendix F include:

- Elizabeth St
- St Francis Catholic Church (Mel Ref 2FD2)
    - 326 Lonsdale St, Melbourne, Ph: (03) 9663 2495
- Franklin St & A'Beckett St
- Flinders St
- Bond St

Southbank

Areas of Southbank that may be affected by flooding during an extreme rainfall event are highlighted in Figure C1 and on Map 4 in Appendix F. Hot Spots identified in Figure C1 include:

Figure C1 Reference	Street	Flooding description	Melbourne City Council Flood Risk Rating
10	City Rd from under Kings Way	Location to be determined	Low
21	Wells St from Grant St	Flooding of properties along Wells St	Very high
G	Normanby R & Clarendon St	Regular flooding up to 0.5m causing disruption to arterial traffic. Drainage system effectiveness often limited by flood and/or tidal level of Yarra River	
H	Wells St	Regular flooding of nearby properties. Overflowing downpipes connected to surcharging or 'at capacity' stormwater system	Very High

Additional Hot Spots identified in mapping in Appendix F include:

- Queens Bridge St & Fresh Water Pl
- Kings Way
- Clarendon St & Whiteman St
- Sturt St, Miles St & Moore St
- Coventry St & Dorcas St
- City Rd, Kavanagh St & Balston St
- Moray St, Catherin St & Hancook St
- Haig St, Haig La & Blakeney Pl
- Crown Entertainment Complex
- Southbank Promenade
- Yarra Promenade

South Wharf

Areas of South Wharf that may be affected by flooding during an extreme rainfall event are highlighted on Maps 4 & 9 in Appendix F. Specific areas of note in and around these maps include:

- Convention Centre Pl
- Melbourne Convention Centre
- South Wharf Promenade

Docklands

Areas of Docklands that may be affected by flooding during an extreme rainfall event are highlighted on Map 9 in Appendix F. Specific areas of note around this map include:

- Lorimer St
- South Wharf Dr
- Hartley St & Boundary St
- Wurundjeri Way near Batmans Hill Dr

- North Wharf Rd
- Merchant St, Import La & Seafarer La
- Harbour Esp
- Melbourne Central City Sudios

Properties Affected

Properties on streets listed in the table below are at risk from flooding above floor level. As more intelligence becomes available, this list may grow. For more information on the properties below, see the intelligence card for Melbourne, Southbank, South Wharf and Docklands.

Sum of Properties	Street	Suburb	On Watercourse/ Drain	Flood Risk Type
11	CITY ROAD	MELBOURNE SOUTH	HANNA ST M.D.	Flash
2	CLARKE STREET	SOUTHBANK	HANNA ST M.D.	Flash
1	HANCOCK STREET	MELBOURNE SOUTH	HANNA ST M.D.	Flash
5	MORAY STREET	MELBOURNE SOUTH	HANNA ST M.D.	Flash
29	BOURKE STREET	MELBOURNE	ELIZABETH ST DRAIN	Flash
1	COLLINS STREET	MELBOURNE	ELIZABETH ST DRAIN	Flash
129	ELIZABETH STREET	MELBOURNE	ELIZABETH ST DRAIN	Flash
47	FLINDERS LANE	MELBOURNE	ELIZABETH ST DRAIN	Flash
2	FRANKLIN STREET	MELBOURNE	ELIZABETH ST DRAIN	Flash
3	LTL COLLINS STREET	MELBOURNE	ELIZABETH ST DRAIN	Flash
1	LITTLELONSDALE ST	MELBOURNE	ELIZABETH ST DRAIN	Flash
46	LONSDALE STREET	MELBOURNE	ELIZABETH ST DRAIN	Flash
2	MILL PLACE	MELBOURNE	ELIZABETH ST DRAIN	Flash

Isolation

No major isolation risks exist for Melbourne, Southbank, South Wharf or Docklands. Some localised short-duration isolation may occur due to flash flooding.

Essential Infrastructure

- **VicSES Head Quarters**, Sturt St, Southbank may experience inundation to the Moore St Entrance of the premises during flash flooding or tidal surge events.
- **South Melbourne MFB Station**, Moray St, Southbank may become isolated to all but 4X4 vehicles and trucks during flash flooding or tidal surge events.
- **Melbourne Central City Loop Railway Station**, Elizabeth St (Western) Entrance may become inundated during flash flooding along Elizabeth St.

Apart from the roads outlined below, all other essential infrastructure and services in Melbourne CBD, Southbank, South Wharf and Docklands are expected to remain mainly dry during an intense rainfall event.

Road Closures

The following roads are subject to closure during flooding around Melbourne CBD, Southbank, South Wharf and Docklands. Note that many minor roads may also be inundated.

- Elizabeth St, Melbourne between Victoria St & Flinders St
- Flinders St, Melbourne between Swanston St & William St
- Kings Way, Southbank

- Clarendon St, Southbank
- Sturt St, Southbank
- City Rd, Southbank
- Lorimer St, Docklands
- Harbour Esp, Docklands

Flood Mitigation

Pump Stations

Pump Station	Suburb	Owner	Melway
Crown Casino, Spencer St	Southbank	Melbourne Water	2FB9
Docklands Dr (near Waterfront Way)	Docklands	City of Melbourne	2ED3

Retarding Basins (Melbourne CC)

Retarding Basin	Embankment Height (m)	Capacity at Spillway Level (ML)	FSL (m AHD)	Spillway Level (m AHD)	Melway Ref
Fawkner Park, South Yarra					2LC6

Flood Impacts and Required Actions

Refer to the following action tables for Yarra River at Spencer St, Southbank.

Command, Control and Coordination

VICSES will assume overall control of the response to flood incidents. Other agencies will be requested to support operations as detailed in this Plan. Control and coordination of a flood incident shall be carried out at the lowest effective level and in accordance with the State Emergency Response Plan (EMMV Part 3). During significant events, VICSES will conduct incident management using multi-agency resources.

Gauge: Yarra River at Spencer St, Southbank

Location – Spencer St, Crown Casino, Southbank (Mel Ref 2FB8)

Gauge Zero – 0.000mAHD

River Height (m)	Flow (m3/s)	Flood Class & Annual Exceedance Probability	Consequence / Impact	Action *
0.28			Zero clearance at Spencer St Bridge – this may affect boating	
0.9				- Commence monitoring rainfall and tide level - If tide is expected to reach 1.0m – 1.05m VicSES to inform City of Melbourne that Queens Bridge St near Crown Casino (Mel Ref 2FD8) may get flooded due to overflow of stormwater drain system.
1.0				If water level is expected to reach 1.1m, VicSES to inform City of Melbourne that the water level in the Yarra River is about to reach Yarra Promenade level (Mel Ref 1CJ3)
1.0-1.05			Local flooding at Queens Bridge Street just downstream of Queens Bridge (Mel Ref 2FD8)	
1.1		Minor Flood Level	Yarra Promenade (Mel Ref 1CJ3) starts to get flooded	
1.22		20% AEP (5yr ARI) Tide Level		
1.29		10% AEP (10yr ARI) Tide Level		
1.3		Moderate Flood Level		
1.37		February 2005 Flood Level		
1.38		5% AEP (20yr ARI) Tide Level		
1.50		2% AEP (50yr ARI) Tide Level		
1.6		Major Flood Level & 1% AEP (100yr ARI) Tide Level		
1.61		December 1934 Flood Level		
2.24		July 1891 Flood Level		

Note: flood intelligence records are approximations. This is because no two floods at a location, even if they peak at the same height, will have identical impacts. Flood intelligence cards detail the relationship between flood magnitude and flood consequences. More details about flood intelligence and its use can be found in the Australian Emergency Management Manuals flood series.

APPENDIX C2 – MARIBYRNONG RIVER & MOONEE PONDS CREEK FLOOD EMERGENCY PLAN

Overview of Flooding Consequences

Maribyrnong River & Moonee Ponds Creek, running through or adjacent to the inner city suburbs of Flemington, Kensington, North Melbourne & West Melbourne are located approximately 3km north-west of Melbourne in an area of mixed residential and heavy industrial. Maribyrnong River & Moonee Ponds Creek both flow from the northern fringes of Metropolitan Melbourne, connecting up to the Yarra River in West Melbourne before flowing into Port Phillip Bay. High Intensity, short duration rainfall events can cause flash flooding in and around Flemington, Kensington, North Melbourne & West Melbourne, while prolonged rainfall may see Maribyrnong River and Moonee Ponds Creek flood. The area sees Moderate to slow water movement due to the flat terrain in the area. Flooding may last for several days around West Melbourne, Kensington & Flemington. See mapping in Appendix F for more insight into flooding in the area.

Warning Times

For flooding expected along Maribyrnong River in Kensington & West Melbourne, warning times of between 8-16 hours may be given once flooding begins in the upper catchment. No formal warning times have been established for Moonee Ponds Creek, although gauges at Jacana Retarding Basin and also at Flemington may provide some warning of expected flooding. See the Melbourne Water website for more information on these gauges: http://www.melbournewater.com.au/content/rivers_and_creeks/rainfall_and_river_level_data/rainfall_and_river_level_data.asp. See also Appendix B for flood peak travel times if available. It is advised that residents monitor the Bureau of Meteorology's website http://www.bom.gov.au/ and the VicSES website http://www.ses.vic.gov.au/ for any thunderstorm, flood or severe weather warnings present for their area.

Areas Affected

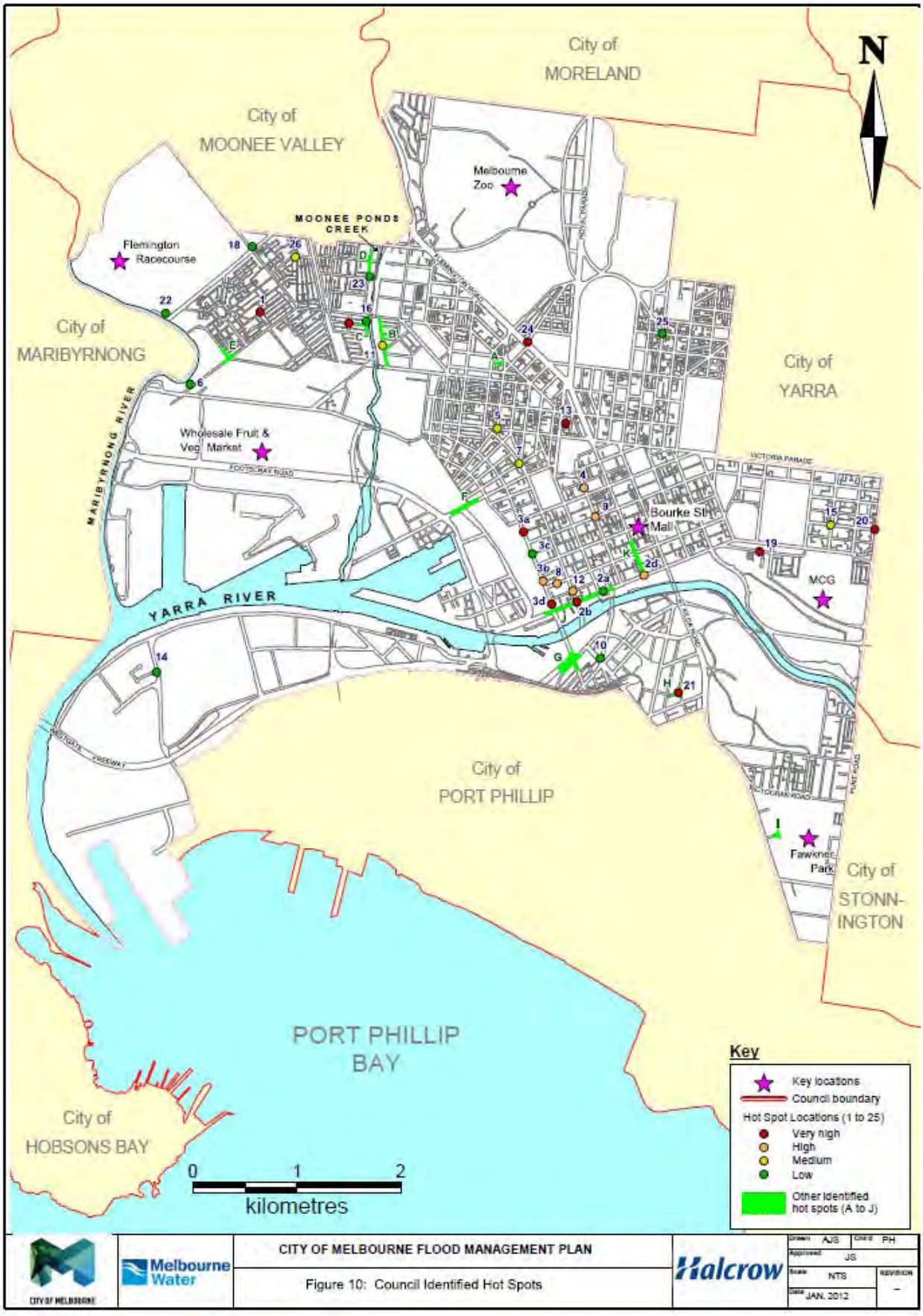


Figure C1 – Melbourne City Council Identified Hot Spots (City of Melbourne Flood Management Plan 2012)

Flemington

Areas of Flemington that may be affected by flooding during an extreme rainfall event are highlighted in Figure C1 and on Maps 5-6 in Appendix F. Hot Spots identified in Figure C1 include:

Figure C1 Reference	Street	Flooding description	Melbourne City Council Flood Risk Rating
18	Epsom Rd from Smithfield Rd	Stormwater ponds on the northern corner of the intersection of Epsom & Smithfield Rds	Low

Additional Hot Spots identified in mapping in Appendix F include:

- Flemington Racecourse
- Flemington Dr, Members Dr & Members Carpark
- Stables Dr

Kensington

Areas of Kensington that may be affected by flooding during an extreme rainfall event are highlighted in Figure C1 and on Maps 5-6 in Appendix F. Hot Spots identified in Figure C1 include:

Figure C1 Reference	Street	Flooding description	Melbourne City Council Flood Risk Rating
1	Bangalore St	Stormwater ponds on corner of Bangalore St and Cairncross La	Very High
6	Kensington Rd (Hobsons to Dynon Rd)	Stormwater ponds on Kensington St, 100m from Dynon St	Low
16	Bent St from Macaulay Rd	Stormwater ponds on the Road	Low
17	Albermarie St from Handman St	Stormwater ponds on Albermarle Rd	Very high
22	Smithfield (Hobsons Rd to Smith St)	More research required	Low
23	Stubbs St from Parson St	More research required	Low
26	Market St from McCracken St	Stormwater ponds on road at corner of McCracken & Market Sts	Low
C	Bent St	Long flood history. Small upstream catchment but combination of flood level in Moonee Ponds Creek and adjacent levee cause local flooding	
D	Stubbs St	Long flood history, regular flooding up to 1m. Single pump station adjacent, effectiveness dependant on flood level of Moonee Ponds Creek	
E	Hobson Rd & Kensington Rd	Flooded approximately twice a year	

Additional Hot Spots identified in mapping in Appendix F include:

- Hardiman St, Chelmsford St, Barrett St & Lloyd St
- Childers St
- Speakmen St & Stockmans Way
- Maribyrnong River Bicycle Trail

North Melbourne

Areas of North Melbourne that may be affected by flooding during an extreme rainfall event are highlighted in Figure C1 and on Maps 1 & 7 in Appendix F. Hot Spots identified in Figure C1 include:

Figure C1 Reference	Street	Flooding description	Melbourne City Council Flood Risk Rating
5	Errol St from Victoria St	Stormwater ponds outside of the TAB (1-5 Errol St)	Medium
11	Langford St (Arden St to Gracie St)	Stormwater ponds on the road	Medium
13	Little Cobden St from Princess St	Stormwater can potentially flood low lying adjacent properties	Very high
A	Harris St	Regular and severe flooding	
B	Langford St	Long flood history, flooding can be up to 1.2m deep, two pump stations located adjacent but effectiveness dependant on flood level of Moonee Ponds Creek	

Additional Hot Spots identified in mapping in Appendix F include:

- Macaulay Rd
- Ink La, Steel St, Straker St, Reynolds St & Gracie St
- Arden St, Green St, Henderson St & Fogarty St
- Dryburgh St, Haines St, Plane Tree Way & Abbotsford St
- Curzon St, Errol St & Courtney St

West Melbourne

Areas of West Melbourne that may be affected by flooding during an extreme rainfall event are highlighted in Figure C1 and on Map 7 in Appendix F. Hot Spots identified in Figure C1 include:

Figure C1 Reference	Street	Flooding description	Melbourne City Council Flood Risk Rating
7	King St & Rosslyn St	Stormwater floods the path outside the Indian restaurant	Medium
F	Dudley St	Regular flooding (over 1.5m) at rail underpass with significant disruption to arterial traffic. Pump station installed late 1990s as part of Docklands development and lowering of rail underpass along Dudley St	

Additional Hot Spots identified in mapping in Appendix F include:

- Dynon Rd, Lloyd St & Radcliffe St
- Kensington Rd
- Sims St
- Footscray Rd at Moonee Ponds Creek
- Dock Link Rd
- Dynon Rd Bicycle Trail
- Maribyrnong River Bicycle Trail

Properties Affected

Properties on streets listed in the table below are at risk from flooding above floor level. As more intelligence becomes available, this list is expected to grow. For more information on the properties below, see the intelligence card for North Melbourne.

Sum of Properties	Street	Suburb	On Watercourse/ Drain	Flood Risk Type
4	CURZON STREET	MELBOURNE NORTH	ARDEN ST DRAIN	Flash
2	HARRIS STREET	MELBOURNE NORTH	ARDEN ST DRAIN	Flash
1	LOTHIAN ST	MELBOURNE NORTH	ARDEN ST DRAIN	Flash
1	MACAULAY ROAD	MELBOURNE NORTH	ARDEN ST DRAIN	Flash

Isolation

No major isolation risks exist for Flemington, Kensington, North Melbourne & West Melbourne. Some localised short-duration isolation may occur due to flash flooding.

Essential Infrastructure

- **SP AusNet West Melbourne Terminal Station**, located on Arden St in Kensington (Mel Ref 2AB8) is at risk of inundation from Moonee Ponds Creek during a 100yr ARI flood event.

Apart from the roads outlined below, all other essential infrastructure and services in Flemington, Kensington, North Melbourne & West Melbourne are expected to remain mainly dry during an intense rainfall event.

Road Closures

The following roads are subject to closure during flooding around Flemington, Kensington, North Melbourne & West Melbourne. Note that many minor roads may also be inundated.

- Kensington Rd, Kensington
- Dynon Rd, West Melbourne
- Smithfield Rd, Kensington

Flood Mitigation

Pump Stations (Melbourne CC)

Pump Station	Suburb	Owner	Melway
Corner Stubbs & Smith St	Kensington	Melbourne City Council	2AB3
Sutton St	North Melbourne	Melbourne City Council	2AC3
Corner Macaulay & Stubbs St	Kensington	Melbourne City Council	2AB5
Corner Macaulay & Bent St	Kensington	Melbourne City Council	2AB5
Corner Macaulay & Langford St	North Melbourne	Melbourne City Council	2AC5
Langford St (near Gracie St)	North Melbourne	Melbourne City Council	2AC7
Kensington Rd (near Dynon Rd)	West Melbourne	Melbourne City Council	2TC8

Levees (Melbourne Water)

Levee on Drain/ Waterway	Reach	Side	Levee Height (m)	Levee Length (km)	Levee Shape	Levee Material	Melway Ref
Moonee Ponds Creek	Macaulay Rd to Mt Alexander Rd	West	2.6	1.0	Trapezoid	Earth	43B1-43A3
Moonee Ponds Creek	Macaulay Rd to Mt Alexander Roast	East	2.6	1.0	Trapezoid	Earth	43B1-43A3
Moonee Ponds Creek	Arden St to Macaulay Rd	East					
Moonee Ponds Creek	Arden St to Macaulay Rd	West					

Retarding Basins (Melbourne CC)

Retarding Basin	Embankment Height (m)	Capacity at Spillway Level (ML)	FSL (m AHD)	Spillway Level (m AHD)	Melway Ref
Riverside Park, Kensington					2TC5

Flood Impacts and Required Actions

Refer to the following action tables for Maribyrnong River at Maribyrnong and Moonee Ponds Creek at Flemington.

Command, Control and Coordination

VICSES will assume overall control of the response to flood incidents. Other agencies will be requested to support operations as detailed in this Plan. Control and coordination of a flood incident shall be carried out at the lowest effective level and in accordance with the State Emergency Response Plan (EMMV Part 3). During significant events, VICSES will conduct incident management using multi-agency resources.

Gauge: Maribyrnong River at Maribyrnong

Location – Maribyrnong River at Chifley Drive, Maribyrnong (Mel Ref 28D7)

Gauge Zero – 0.000mAHD

River Height (m)	Flow (m3/s)	Flood Class & Annual Exceedance Probability	Consequence / Impact	Action *
1.0			Tidal influence may cause back water to flow through local drainage system, resulting in local flooding at Kensington Rd near Hobsons Rd (Mel Ref 2TE7).	- Commence monitoring rainfall and river level - VicSES to inform Melbourne CC MERO if backwater flooding is known to be occurring
1.3			Flemington Racecourse potentially flooded outside Levee	
1.68	275	Minor Flood Level 20% AEP (5 year ARI)		-VicSES to issue minor Flood Warning
1.69		February 2005 Flood Level		
2.21		January 2011 Flood Level		
2.28		Moderate Flood Level		-VicSES to issue moderate Flood Warning
2.4	405	10% AEP (10 year ARI)		
2.64		July 1987 Flood Level		
2.88	535	Major Flood Level 5% AEP (20 year ARI)		-VicSES to issue appropriate Flood Warning
2.98		December 1954 Flood Level		
3.32		July 1891 Flood Level		
3.78	710	2% AEP (50 year ARI)	Dynon Rd and Smithfield Rd become Inundated	-VicSES to monitor and confirm road closure with the City of Melbourne Council and ensure that appropriate barricades and detour signs are erected.
3.86		1871 Flood Level		
4.20		May 1974 Flood Level		
4.26		September 1916 Flood Level		
4.5		September 1906 Flood Level		
4.52	880	1% AEP (100 year ARI)		

Note: flood intelligence records are approximations. This is because no two floods at a location, even if they peak at the same height, will have identical impacts. Flood intelligence cards detail the relationship between flood magnitude and flood consequences. More details about flood intelligence and its use can be found in the Australian Emergency Management Manuals flood series.

Gauge: Moonee Ponds Creek at Flemington

Location – Moonee Ponds Creek at Flemington (Mel Ref 29B12)

Gauge Zero – 2.370mAHD

River Height (m)	Flow (m3/s)	Flood Class & Annual Exceedance Probability	Consequence / Impact	Action *
2.0				Commence monitoring rainfall and river level
3.0			Possible flooding of bicycle path along the creek (Mel Ref 29A5-A11).	- Record observations for future reference
3.7		Bank Full Level	Possible risk of Levee bank overtopping between Smith St (Mel Ref 2AA3) & Robertson St (Mel Ref 2AB4)	- Record observations for future reference
4.0	110	20% AEP (5yr ARI) Flow		
4.05	123	May 1974 Flood Level & Flow	70mm Rain in 24 hours	
4.1	140	10% AEP (10yr ARI) Flow	- Levee Bank overtopped between Smith St & Roberston St, Kensington (Mel Ref 2AB4) - Possible street flooding in the Kensington area	-Intelligence requires confirmation and record for future reference -VicSES to monitor and confirm road closure with the City of Melbourne Council and ensure that appropriate barricades and detour signs are erected.
	180	5% AEP (20yr ARI) Flow	Possible property flooding in the Kensington area downstream of the gauge (Mel Ref 43A2) and Macaulay area (Mel Ref 43B3)	-Warn residents and business owners in the Kensington and Macaulay areas
	225	2% AEP (50yr ARI) Flow	Homes in Kensington & Macaulay threatened	
	260	1% AEP (100yr ARI) Flow	Homes and Factories flooded	

Note: flood intelligence records are approximations. This is because no two floods at a location, even if they peak at the same height, will have identical impacts. Flood intelligence cards detail the relationship between flood magnitude and flood consequences. More details about flood intelligence and its use can be found in the Australian Emergency Management Manuals flood series.

APPENDIX D - FLOOD EVACUATION ARRANGEMENTS

Phase 1 - Decision to Evacuate

The Incident Controller may make the decision to evacuate an at-risk community under the following circumstances:

- Properties are likely to become inundated;
- Properties are likely to become isolated and occupants are not suitable for isolated conditions;
- Public health is at threat as a consequence of flooding and evacuation is considered the most effective risk treatment. This is the role of the Health Commander of the incident to assess and manage. Refer to the State Health Emergency Response Plan (SHERP) for details);
- Essential services have been damaged and are not available to a community and evacuation is considered the most effective risk treatment.

The following should be considered when planning for evacuation:

- Anticipated flood consequences and their timing and reliability of predictions;
- Size and location of the community to be evacuated;
- Likely duration of evacuation;
- Forecast weather;
- Flood Models;
- Predicted timing of flood consequences;
- Time required to conduct the evacuation;
- Time available to conduct the evacuation;
- Evacuation priorities and evacuation planning arrangements;
- Access and egress routes available and their potential flood liability;
- Current and likely future status of essential infrastructure;
- Resources required to conduct the evacuation;
- Resources available to conduct the evacuation;
- Shelter including Emergency Relief Centres, Assembly Areas etc.;
- Vulnerable people and facilities;
- Transportation;
- Registration
- People of CALD background and transient populations;
- Safety of emergency service personnel;
- Different stages of an evacuation process.

The decision to evacuate is to be made in consultation with the MERO, MERC, DHS, Health Commander and other key agencies and expert advice (CMA's and Flood Intelligence specialists).

The table below details triggers for evacuation, if these heights are predicted or are likely to occur evacuation should be considered

Sector	Gauge	Trigger

The table below details time required to evacuate established areas.

Sector	Likely time required for evacuation (including resource assumptions)

Phase 2 – Warning

Warnings may include a warning to prepare to evacuate and a warning to evacuate immediately. Once the decision to evacuate has been made, the at-risk community will be warned to evacuate. Evacuation warnings can be disseminated via methods listed in part 3 of this plan.

Evacuation warning messages will be developed and issued by VICSES in consultation with the MERO, MERC, DHS and other key agencies and expert advice (CMA's and Flood Intelligence specialists).

Phase 3 – Withdrawal

Withdrawal will be controlled by VICPOL. VICSES will provide advice regarding most appropriate evacuation routes and locations for at-risk communities to evacuate to, etc.

VICSES, CFA, AV and Local Government will provide resources where available to support VICPOL/VICROADS with route control and may assist VICPOL in arranging evacuation transportation.

VICPOL will control security of evacuated areas.

Evacuees will be encouraged to move using their own transport where possible.

Evacuation Routes will be determined by VICPOL, City of Melbourne and VicRoads

Special needs groups will be/are identified in City of Melbourne's MEMPlan

Phase 4 – Shelter

Relief Centres and/or assembly areas which cater for people's basic needs for floods may be established to meet the immediate needs of people affected by flooding.

Details about locations of potential Relief Centres can be found in City of Melbourne's MEMPlan

VICPOL in consultation with VICSES will liaise with Local Government and DHS (where regional coordination is required) via the relevant control centre to plan for the opening and operation of relief centres. This can best be achieved through the Emergency Management Team (EMT).

Animal Shelter

Animal shelter compounds will be established for domestic pets and companion animals of evacuees.

Details about arrangements for animals are contained in City of Melbourne's MEMPlan.

Phase 5 – Return

Return will be consistent with the Strategic Plan for the Return of Community

The Incident Controller in consultation with VICPOL will determine when it is safe for evacuees to return to their properties and will arrange for the notification of the community.

VICPOL will manage the return of evacuated people with the assistance of other agencies as required.

Considerations for deciding whether to evacuate include:

- Current flood situation;
- Status of flood mitigation systems;
- Size and location of the community;
- Access and egress routes available and their status;
- Resources required to coordinate the return;
- Special needs groups;
- Forecast weather;
- Transportation particularly for people without access to transport

Disruption to Services

Disruption to a range of services can occur in the event of a flood. This may include road closures affecting school bus routes, water treatment plant affecting potable water supplies etc.

Details about response arrangements are contained in City of Melbourne's MEMPlan.

APPENDIX E - FLOOD WARNING SYSTEMS

Flood Warning

Flood Warning products and Flood Class Levels can be found on the BoM website. Flood Warning Products include Severe Thunderstorm Warnings, Severe Weather Warnings, Flood Watches and Flood Warnings.

Flood Bulletins

VICSES distributes flood emergency information to the media through “Flood Bulletins”. Flood Bulletins provide BoM Flood Warning information as well as information regarding possible flood consequences and safety advice, not contained in BoM Flood Warning products. VICSES uses the title Flood bulletin to ensure emphasis is placed upon BoM Flood Warning product titles.

The relevant VICSES Region Headquarters or the established ICC will normally be responsible for drafting, authorizing and issuing issue Flood Bulletins, using the One Source, One Message system.

Flood Bulletins should refer to the warning title within the Bulletin header, for example Flood Bulletin for Major Flood Warning on Yarra River.

Flood Bulletins should follow the following structure

- What is the current flood situation;
- What is the predicted flood situation;
- What are the likely flood consequences;
- What should the community do in response to flood warnings;
- Where to seek further information;
- Who to call if emergency assistance is required.

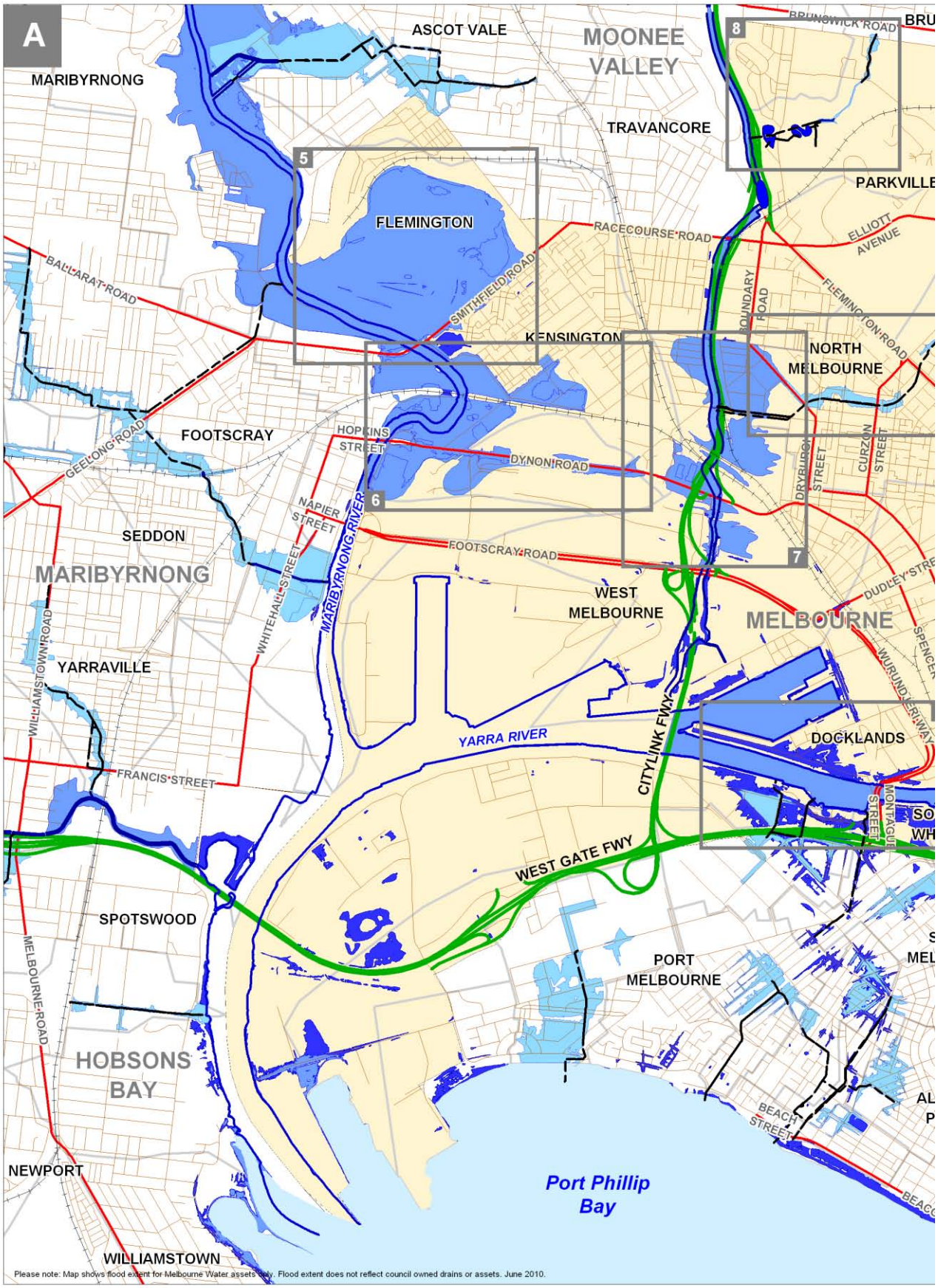
It is important that the description of the predicted flood situation is consistent with and reflects the relevant BoM Flood Warning.

Flood Bulletins should be focused on specific gauge (or in the absence of gauges, catchment) reference areas, that is the area in which flood consequences specifically relate to the relevant flood gauge.

Flood Bulletins should be prepared and issued after receipt of each Flood Watch and Flood Warning from the BoM, or after Severe Weather or Thunderstorm Warnings indicating potential for severe flash flooding.

To ensure flood bulletins are released in a timely manner, standardised flood bulletins may be drafted based on different scenarios, prior to events occurring. The standardised flood bulletins can then be adapted to the specifics of the event occurring or predicted to occur.

APPENDIX F – MAPS

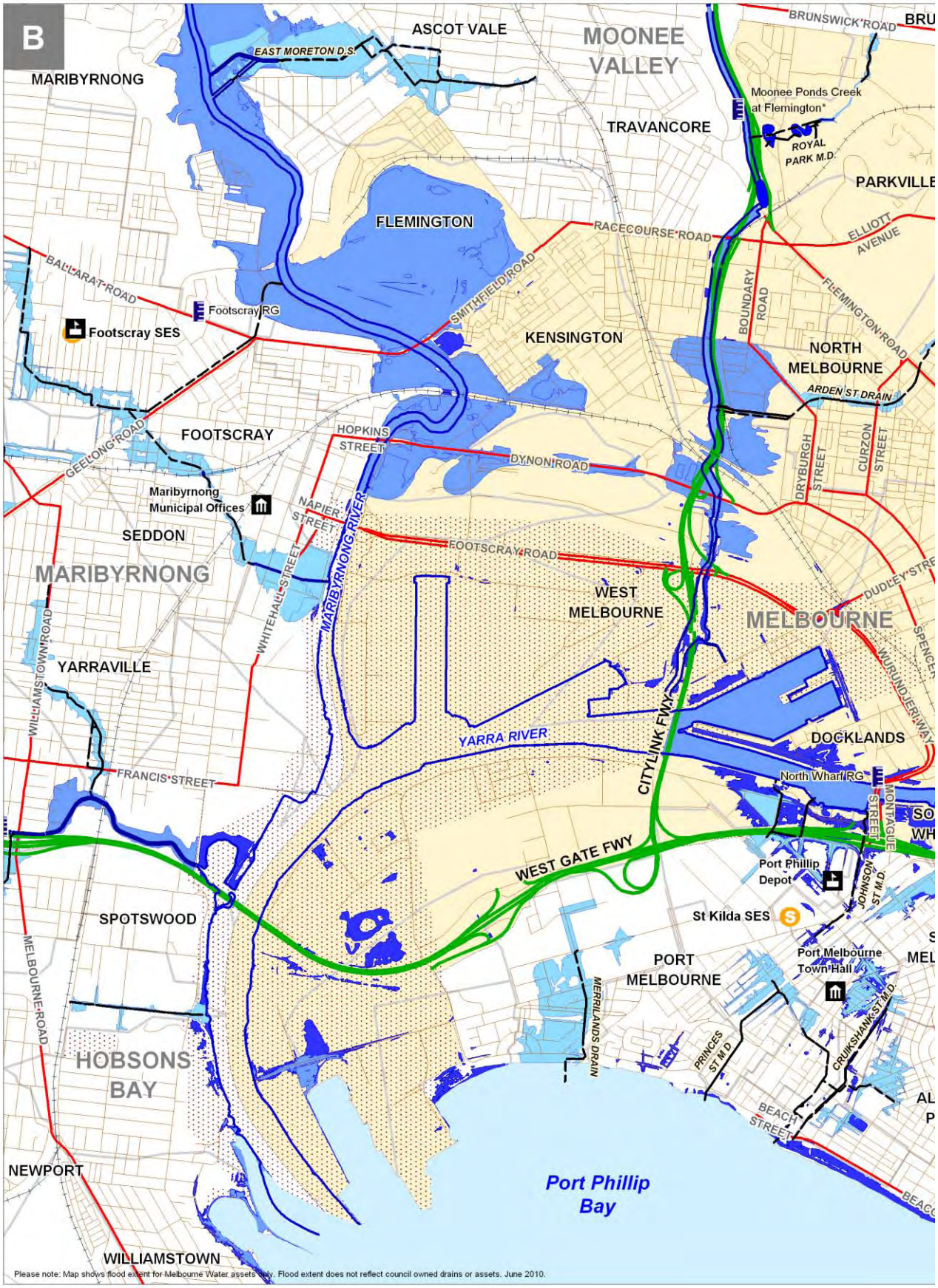


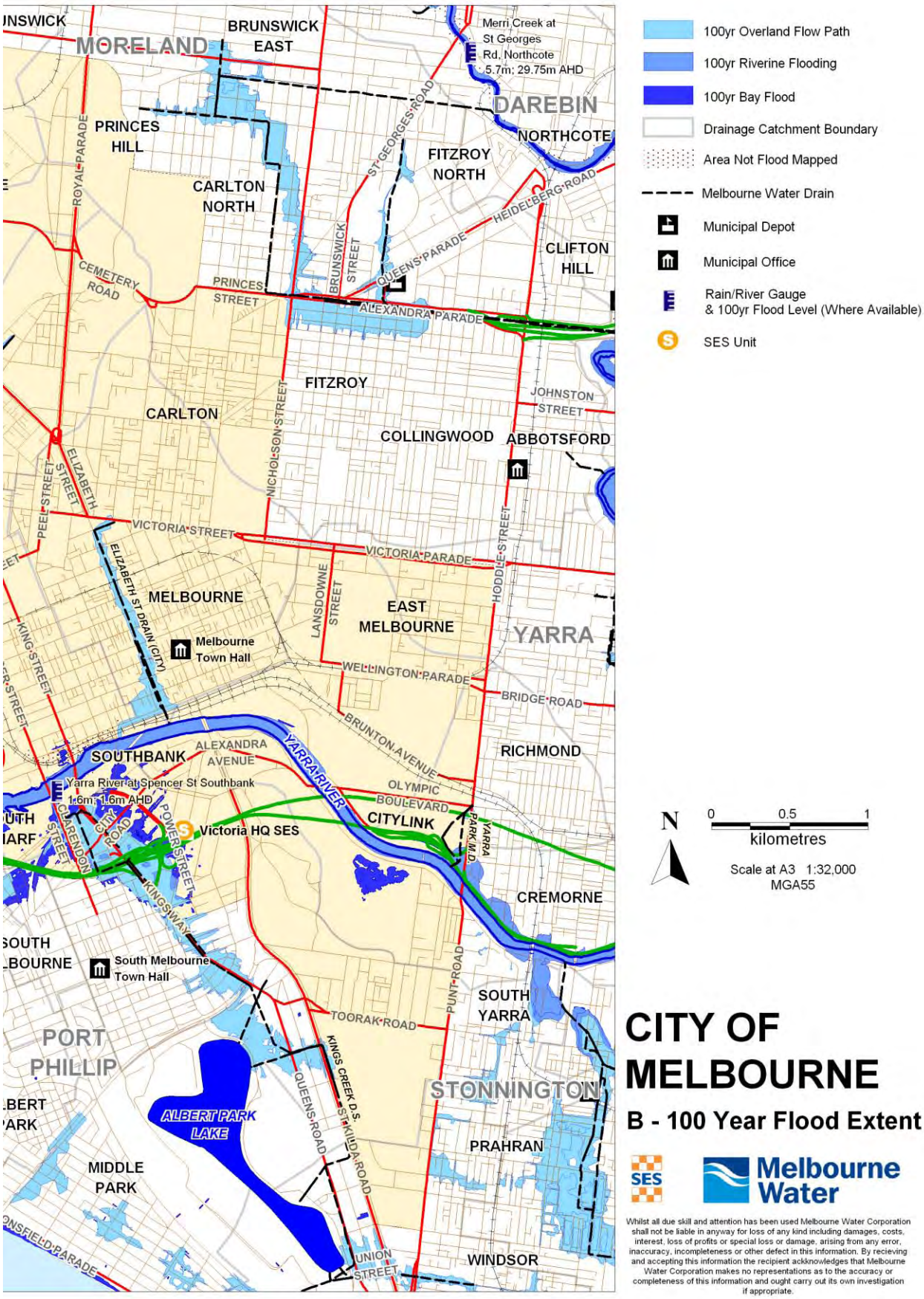
CITY OF MELBOURNE

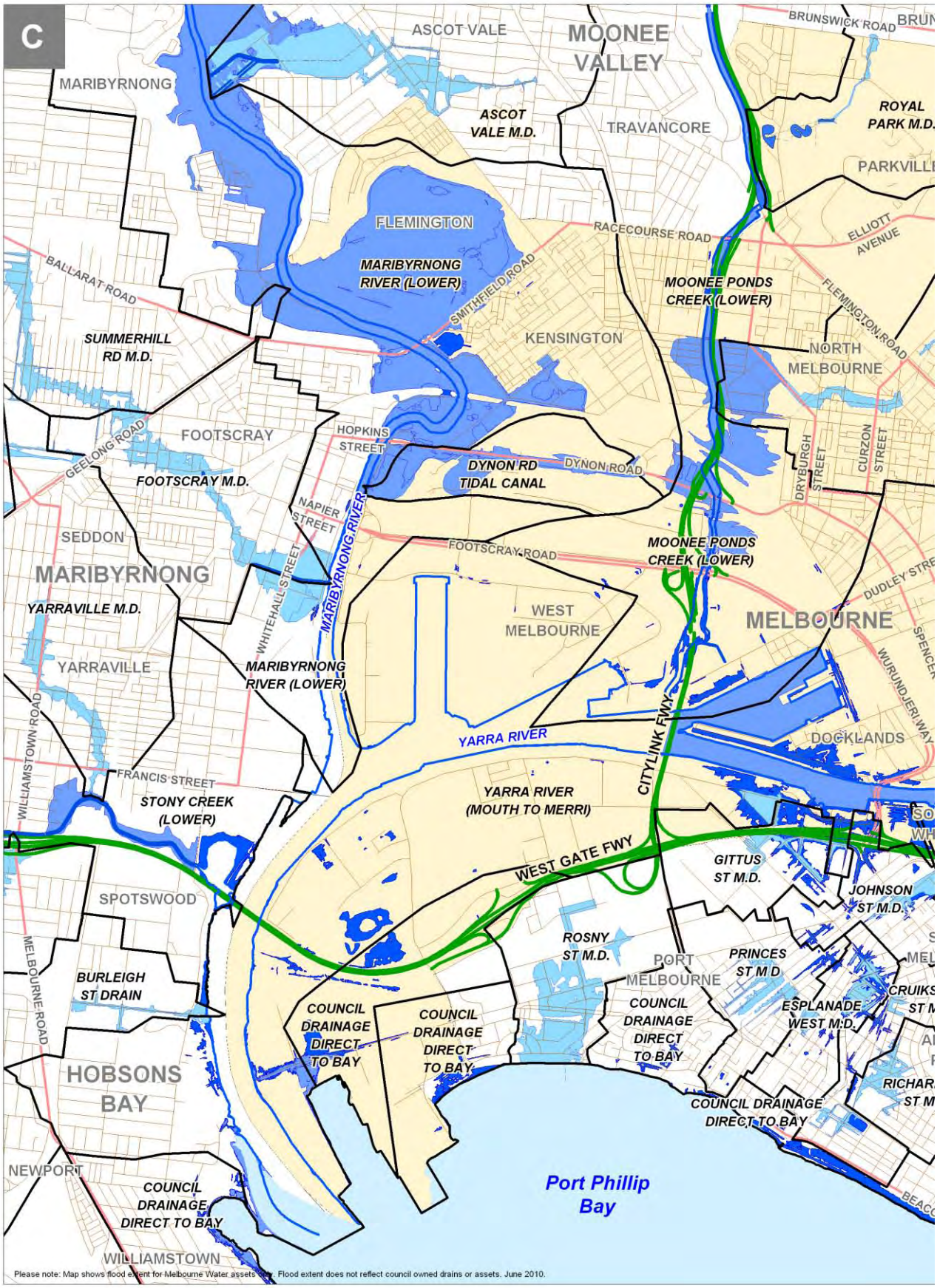
A - Flooding 'Hotspots' Index

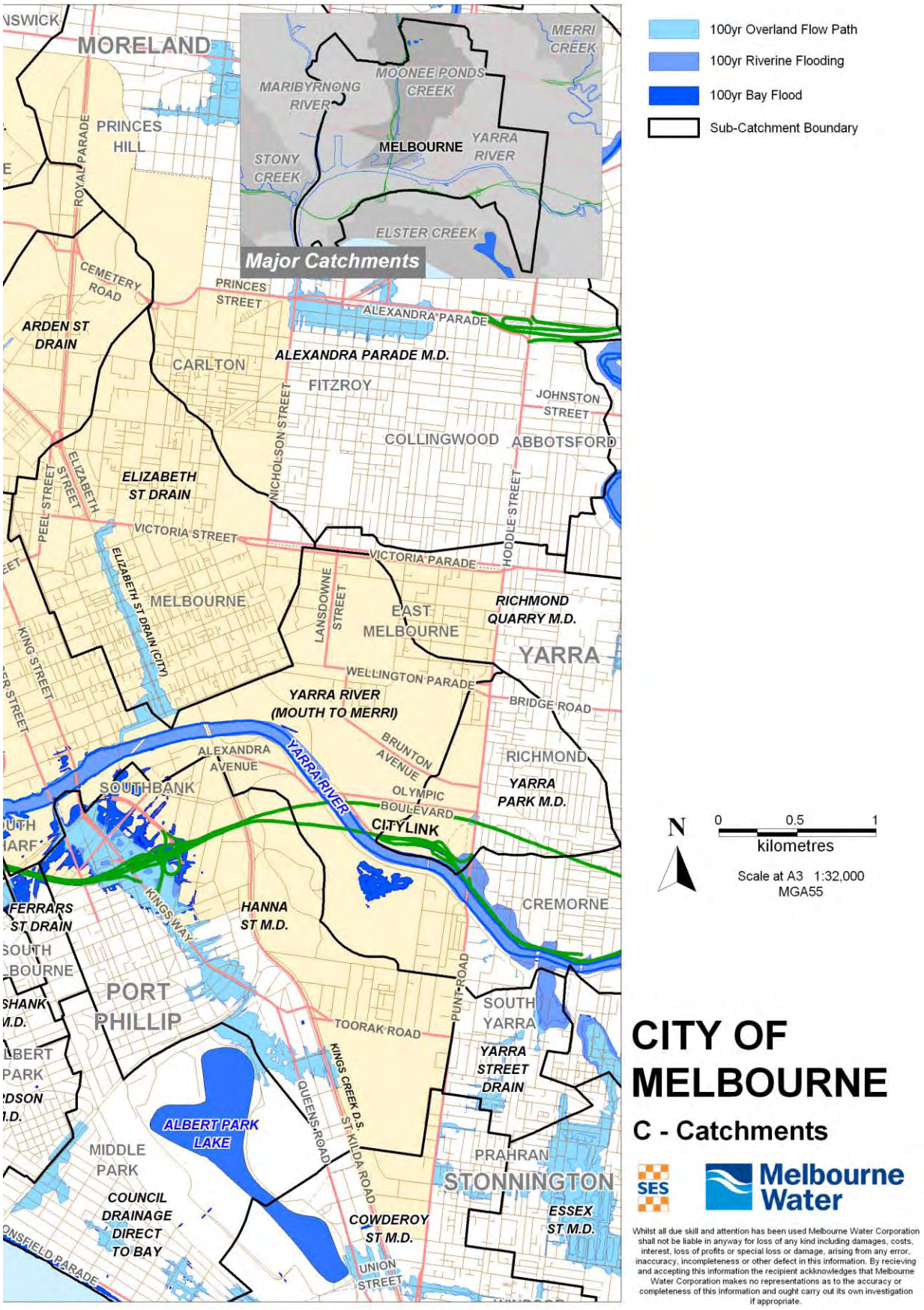
SES

Melbourne Water


B
MARIBYRNONG
ASCOT VALE
EAST MORETON D.S.
MOONEE VALLEY
BRUNSWICK ROAD
Moonee Ponds Creek at Flemington*
TRAVANCORE
ROYAL PARK M.D.
PARKVILLE
FLEMINGTON
RACECOURSE ROAD
ELLIOTT AVENUE
BALLARAT ROAD
Footscray RG
Footscray SES
SMITHFIELD ROAD
KENSINGTON
BOUNDARY ROAD
FLEMINGTON ROAD
NORTH MELBOURNE
ARDEN ST DRAIN
FOOTSCRAY
HOPKINS STREET
GEELONG ROAD
DYNON ROAD
DRYBURGH STREET
CURZON STREET
Maribyrnong Municipal Offices
NAPIER STREET
SEDDON
MARIBYRNONG RIVER
FOOTSCRAY ROAD
MARIBYRNONG
WHITEHALL STREET
WEST MELBOURNE
MELBOURNE
DUDLEY STREET
WILLIAMSTOWN ROAD
YARRAVILLE
YARRA RIVER
CITYLINK FWY
WURUNDJERI WAY
SPENCER
DOCKLANDS
North Wharf RG
FRANCIS STREET
MONTAGUE STREET
WEST GATE FWY
Port Phillip Depot
JOHNSON ST M.D.
St Kilda SES
SPOTSWOOD
PORT MELBOURNE
Port Melbourne Town Hall
MELBOURNE ROAD
MERRILANDS DRAIN
CRUIKSHANK ST M.D.
PRINCES ST M.D.
HOBSONS BAY
BEACH STREET
NEWPORT
Port Phillip Bay
WILLIAMSTOWN
Please note: Map shows flood extent for Melbourne Water assets only. Flood extent does not reflect council owned drains or assets. June 2010.


100yr Overland Flow Path
100yr Riverine Flooding
100yr Bay Flood
Drainage Catchment Boundary
Area Not Flood Mapped
Melbourne Water Drain
Municipal Depot
Municipal Office
Rain/River Gauge & 100yr Flood Level (Where Available)
SES Unit
Merri Creek at St Georges Rd, Northcote 5.7m; 29.75m AHD
Yarra River at Spencer St Southbank 1.6m; 1.6m AHD
Melbourne Town Hall
South Melbourne Town Hall
Victoria HQ SES
MORELAND
BRUNSWICK EAST
DAREBIN
NORTHCOTE
PRINCES HILL
FITZROY NORTH
CARLTON NORTH
CLIFTON HILL
CARLTON
FITZROY
COLLINGWOOD
ABBOTSFORD
MELBOURNE
EAST MELBOURNE
YARRA
RICHMOND
SOUTHBANK
CREMORNE
SOUTH YARRA
PORT PHILLIP
STONNINGTON
PRAHRAN
MIDDLE PARK
WINDSOR
ALBERT PARK LAKE
ROYAL PARADE
ST GEORGES ROAD
HEIDELBERG ROAD
BRUNSWICK STREET
QUEENS PARADE
CEMETERY ROAD
PRINCES STREET
ALEXANDRA PARADE
NICHOLSON STREET
JOHNSTON STREET
ELIZABETH STREET
PEEL STREET
VICTORIA STREET
VICTORIA PARADE
HODDLE STREET
LANSDOWNE STREET
ELIZABETH ST DRAIN (CITY)
KING STREET
WELLINGTON PARADE
BRIDGE ROAD
BRUNTON AVENUE
ALEXANDRA AVENUE
YARRA RIVER
OLYMPIC BOULEVARD
CITYLINK
CLARENDON STREET
CLARA ROAD
POWER STREET
KINGSWAY
PUNT ROAD
TOORAK ROAD
KINGS CREEK D.S.
QUEENS ROAD
ST KILDA ROAD
UNION STREET
N
0
0.5
1
kilometres
Scale at A3 1:32,000
MGA55
CITY OF MELBOURNE
B - 100 Year Flood Extent
SES
Melbourne Water
Whilst all due skill and attention has been used Melbourne Water Corporation shall not be liable in anyway for loss of any kind including damages, costs, interest, loss of profits or special loss or damage, arising from any error, inaccuracy, incompleteness or other defect in this information. By recieving and accepting this information the recipient acknowledges that Melbourne Water Corporation makes no representations as to the accuracy or completeness of this information and ought carry out its own investigation if appropriate.


C
ASCOT VALE
MOONEE VALLEY
MARIBYRNONG
ASCOT VALE M.D.
TRAVANCORE
ROYAL PARK M.D.
PARKVILLE
FLEMINGTON
MARIBYRNONG RIVER (LOWER)
RACECOURSE ROAD
ELLIOTT AVENUE
BALLARAT ROAD
SMITHFIELD ROAD
MOONEE PONDS CREEK (LOWER)
FLEMINGTON ROAD
SUMMERHILL RD M.D.
KENSINGTON
NORTH MELBOURNE
HOPKINS STREET
GEELONG ROAD
FOOTSCRAY
FOOTSCRAY M.D.
DYNON RD TIDAL CANAL
DYNON ROAD
DRYBURGH STREET
CURZON STREET
NAPIER STREET
MARIBYRNONG RIVER
SEDDON
MARIBYRNONG
FOOTSCRAY ROAD
MOONEE PONDS CREEK (LOWER)
DUDLEY STREET
YARRAVILLE M.D.
WHITEHALL STREET
WEST MELBOURNE
MELBOURNE
YARRAVILLE
MARIBYRNONG RIVER (LOWER)
WURUNDJERI WAY
SPENCER
YARRA RIVER
CITYLINK FWY
DOCKLANDS
WILLIAMSTOWN ROAD
FRANCIS STREET
STONY CREEK (LOWER)
YARRA RIVER (MOUTH TO MERRI)
WEST GATE FWY
GITTUS ST M.D.
JOHNSON ST M.D.
SPOTSWOOD
ROSNY ST M.D.
PRINCES ST M D
PORT MELBOURNE
MELBOURNE ROAD
BURLEIGH ST DRAIN
COUNCIL DRAINAGE DIRECT TO BAY
COUNCIL DRAINAGE DIRECT TO BAY
COUNCIL DRAINAGE DIRECT TO BAY
ESPLANADE WEST M.D.
HOBSONS BAY
COUNCIL DRAINAGE DIRECT TO BAY
NEWPORT
COUNCIL DRAINAGE DIRECT TO BAY
Port Phillip Bay
WILLIAMSTOWN
Please note: Map shows flood extent for Melbourne Water assets only. Flood extent does not reflect council owned drains or assets. June 2010.

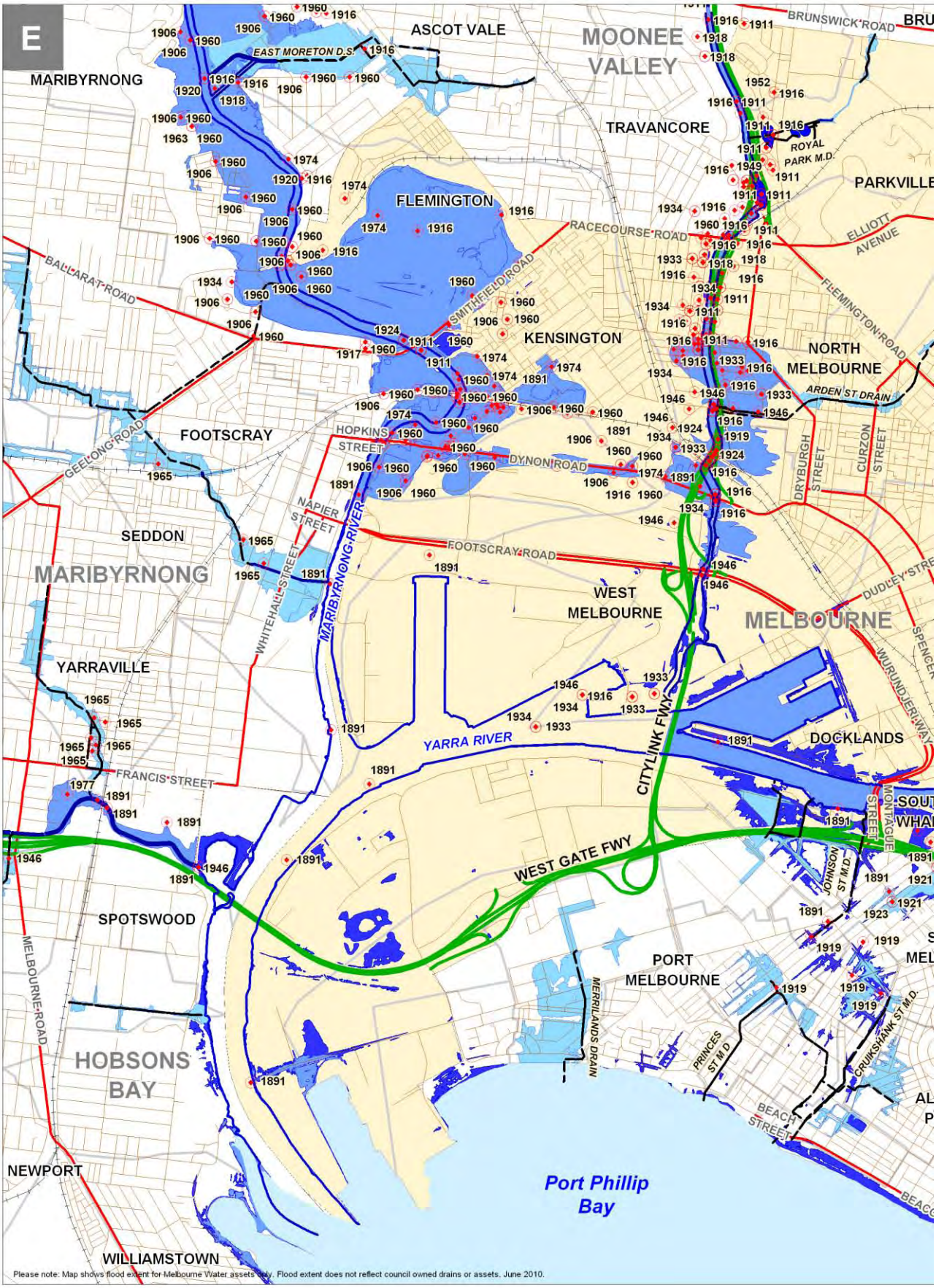


CITY OF MELBOURNE

C - Catchments

SES

Melbourne Water


E
MARIBYRNONG
ASCOT VALE
EAST MORETON D.S.
MOONEE VALLEY
TRAVANCORE
ROYAL PARK M.D.
PARKVILLE
BRUNSWICK ROAD
FLEMINGTON
RACECOURSE ROAD
ELLIOTT AVENUE
FLEMINGTON ROAD
BALLARAT ROAD
SMITHFIELD ROAD
KENSINGTON
NORTH MELBOURNE
ARDEN ST DRAIN
GEELONG ROAD
FOOTSCRAY
HOPKINS STREET
DYNON ROAD
DRYBURGH STREET
CURZON STREET
NAPIER STREET
SEDDON
MARIBYRNONG RIVER
FOOTSCRAY ROAD
WHITEHALL STREET
MARIBYRNONG
WEST MELBOURNE
MELBOURNE
DUDLEY STREET
YARRAVILLE
YARRA RIVER
CITYLINK FWY
DOCKLANDS
FRANCIS STREET
WEST GATE FWY
SPOTSWOOD
MELBOURNE ROAD
PORT MELBOURNE
MERRILANDS DRAIN
PRINCES ST M.D.
CRUIKSHANK ST M.D.
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Port Phillip Bay
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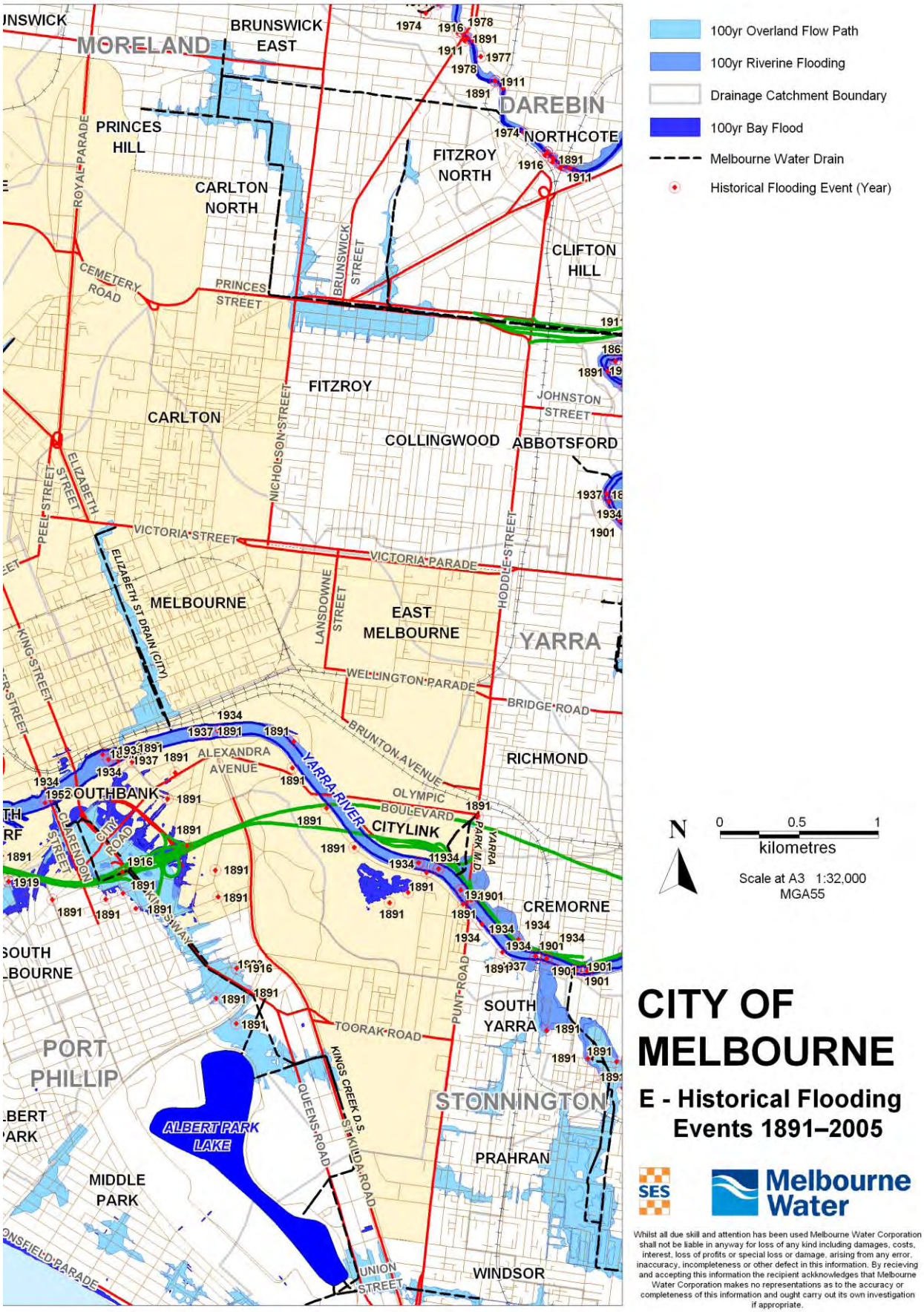

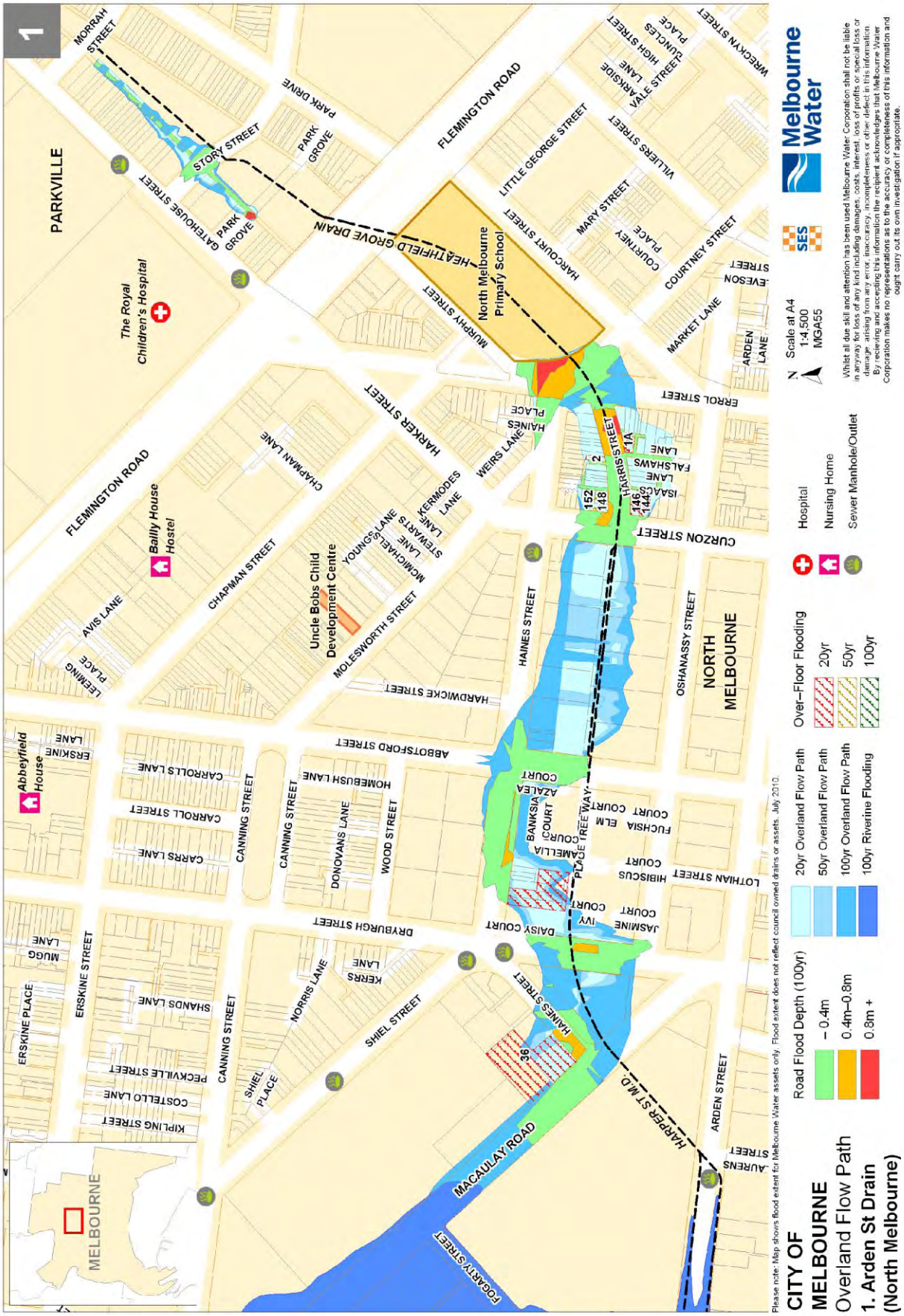
1
PARKVILLE
NORTH MELBOURNE
FLEMINGTON ROAD
MORRAH STREET
STORY STREET
PARK GROVE
PARK DRIVE
GATEHOUSE STREET
HEATHFIELD GROVE DRAIN
North Melbourne Primary School
The Royal Children's Hospital
Bailly House Hostel
Uncle Bobs Child Development Centre
Abbeyfield House
MURPHY STREET
HARKER STREET
CHAPMAN LANE
CHAPMAN STREET
AVIS LANE
LEEMING PLACE
MOLESWORTH STREET
HAINES PLACE
WEIRS LANE
HARRIS STREET
FALSHAWS LANE
ISAACS LANE
KERMODES LANE
STEWARTS LANE
MCMICHAEL LANE
YOUNGS LANE
CURZON STREET
HAINES STREET
OSHANASSY STREET
HARDWICKE STREET
ABBOTSFORD STREET
ERSKINE LANE
CARROLL LANES
CARROLL STREET
CARRS LANE
CANNING STREET
HOMEBUSH LANE
DONOVANS LANE
WOOD STREET
DRYBURGH STREET
DAISY COURT
AZALEA COURT
BANKSIA COURT
AMELLIA COURT
PLANE TREE WAY
FUCHSIA COURT
ELM COURT
HIBISCUS COURT
IVY COURT
JASMINE COURT
LOTHIAN STREET
MUGG LANE
ERSKINE STREET
ERSKINE PLACE
SHANDS LANE
PECKVILLE STREET
COSTELLO LANE
KIPLING STREET
NORRIS LANE
KERRS LANE
SHIEL STREET
SHIEL PLACE
HAINES STREET
HARPER ST M.D.
ARDEN STREET
AURENS STREET
MACAULAY ROAD
FOGARTY STREET
LITTLE GEORGE STREET
HARCOURT STREET
MARY STREET
COURTNEY PLACE
COURTNEY STREET
VILLIERS STREET
HIGH STREET
ARKSIDE LANE
VALE STREET
DUNCLES PLACE
WRIGHTON STREET
EVESON STREET
MARKET LANE
ARDEN LANE
ERROL STREET
MELBOURNE
Melbourne Water
SES
Scale at A4
1:4,500
MGA55
Hospital
Nursing Home
Sewer Manhole/Outlet
Over–Floor Flooding
20yr
50yr
100yr
Road Flood Depth (100yr)
– 0.4m
0.4m–0.8m
0.8m +
20yr Overland Flow Path
50yr Overland Flow Path
100yr Overland Flow Path
100yr Riverine Flooding
Please note: Map shows flood extent for Melbourne Water assets only. Flood extent does not reflect council owned drains or assets. July 2010.
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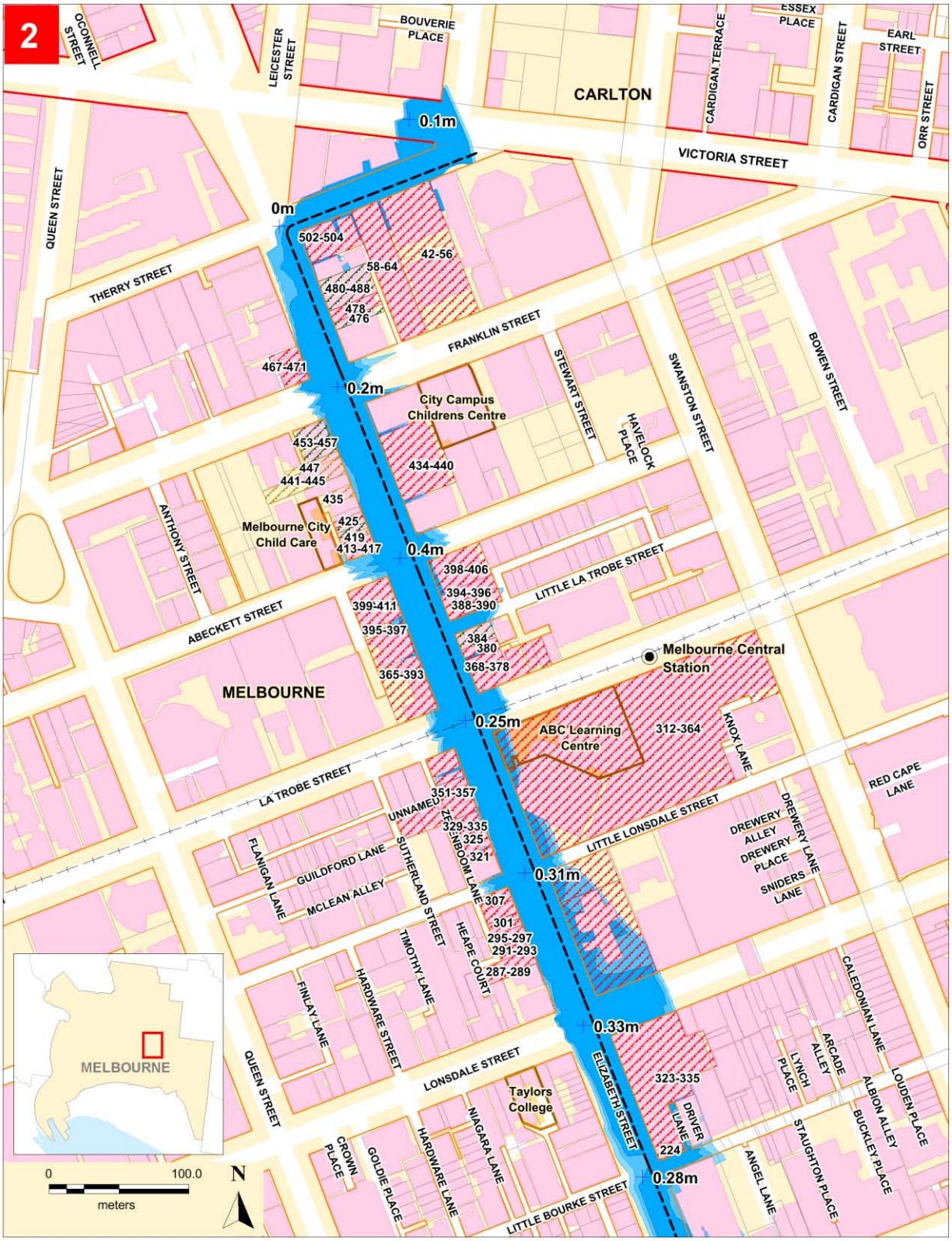
CITY OF MELBOURNE
Overland Flow Path
1. Arden St Drain
(North Melbourne)



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CITY OF MELBOURNE

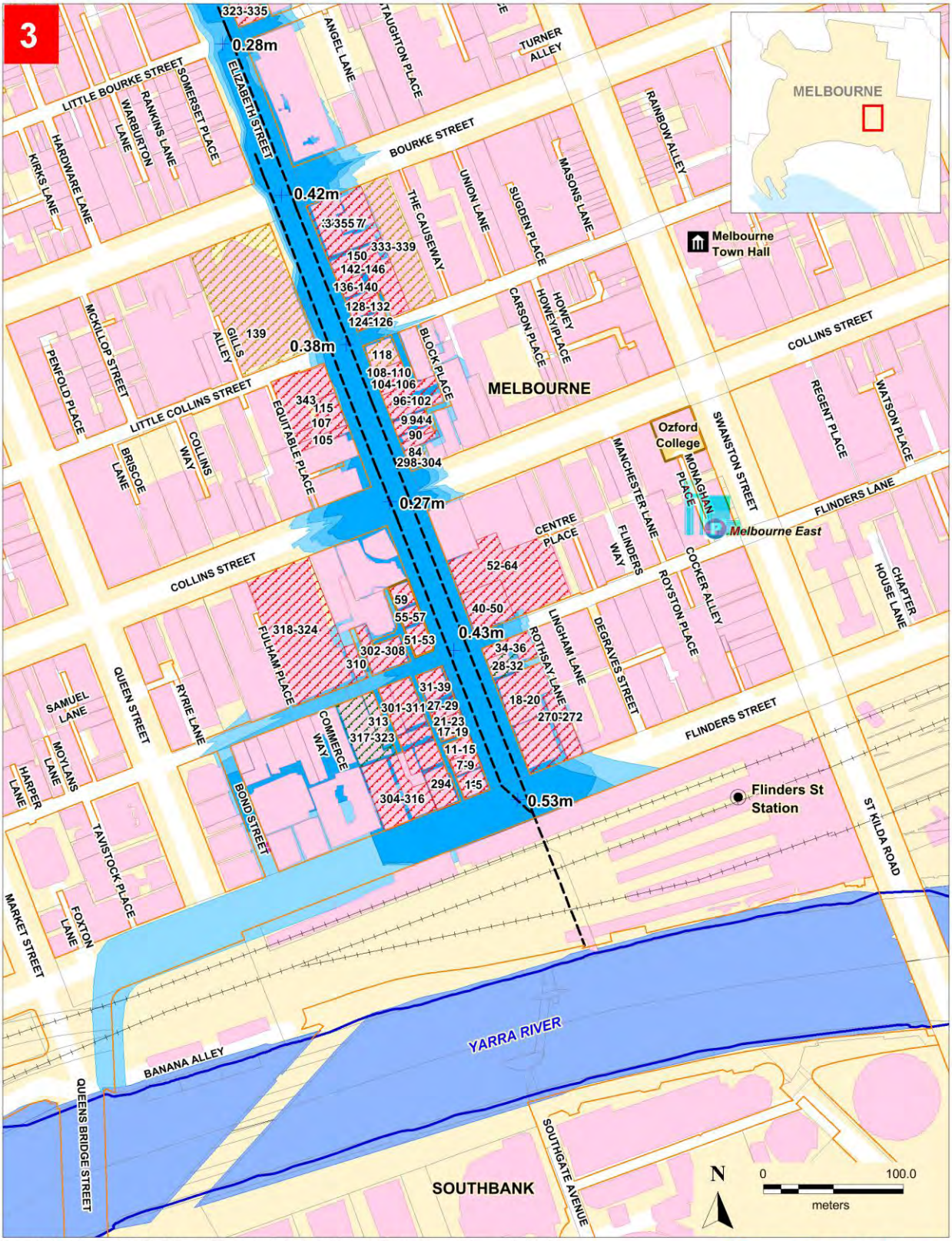
Flash Flooding

2. Elizabeth St Drain (North) (Melbourne CBD)

20yr Flash Flooding
50yr Flash Flooding
100yr Flash Flooding
Building
Flood Depth (100yr)

Over–Floor Flooding
20yr
50yr
100yr

SES Victoria Melbourne Water



Please note: Map shows flood extent for Melbourne Water assets only. Flood extent does not reflect council owned drains or assets. July 2010.

CITY OF MELBOURNE

Flash Flooding

3. Elizabeth St Drain (South) (Melbourne CBD)

- 20yr Flash Flooding
- 50yr Flash Flooding
- 100yr Flash Flooding
- 100yr Riverine Flooding
- Building

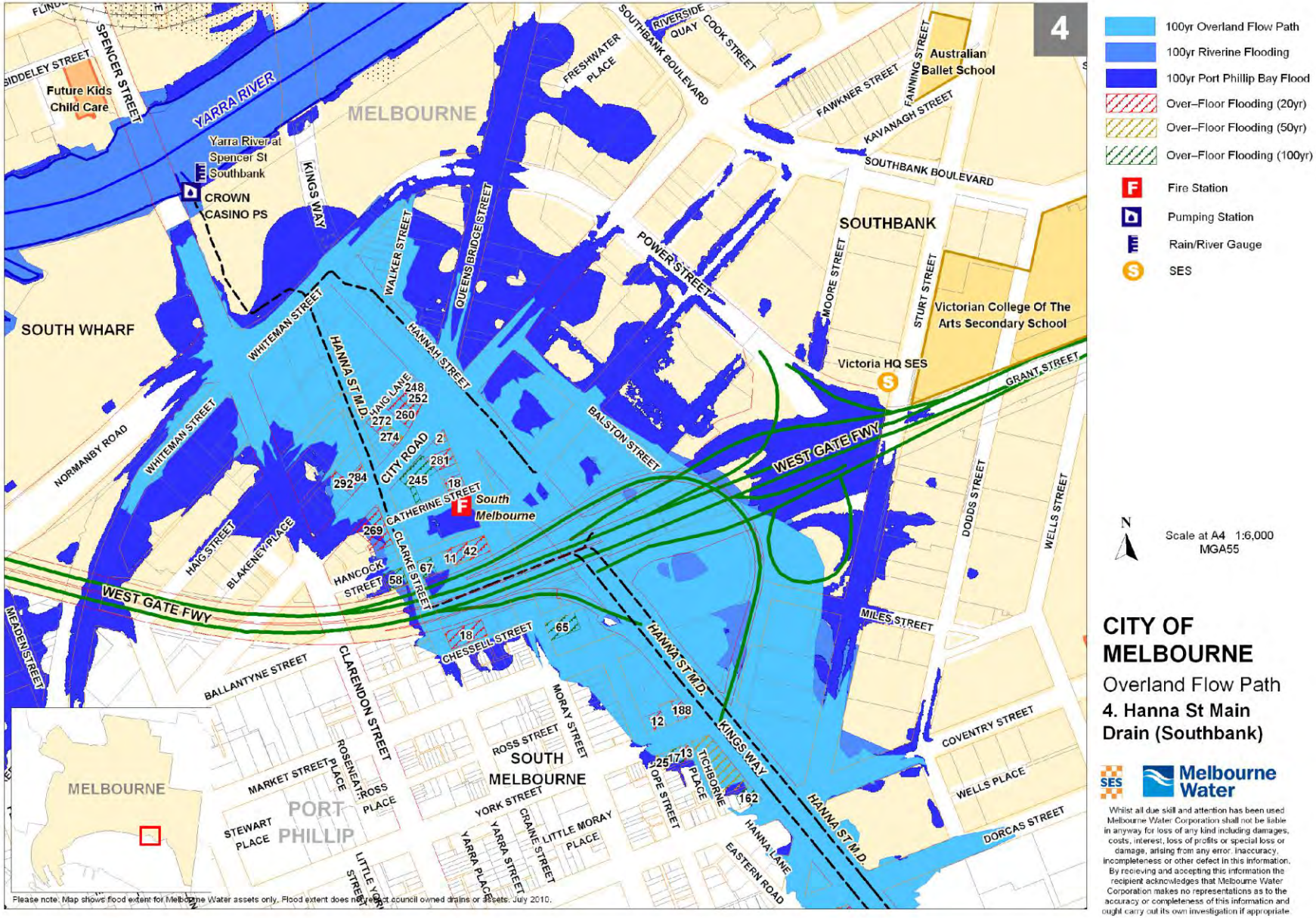
Over–Floor Flooding
- 20yr
- 100yr
- 50yr

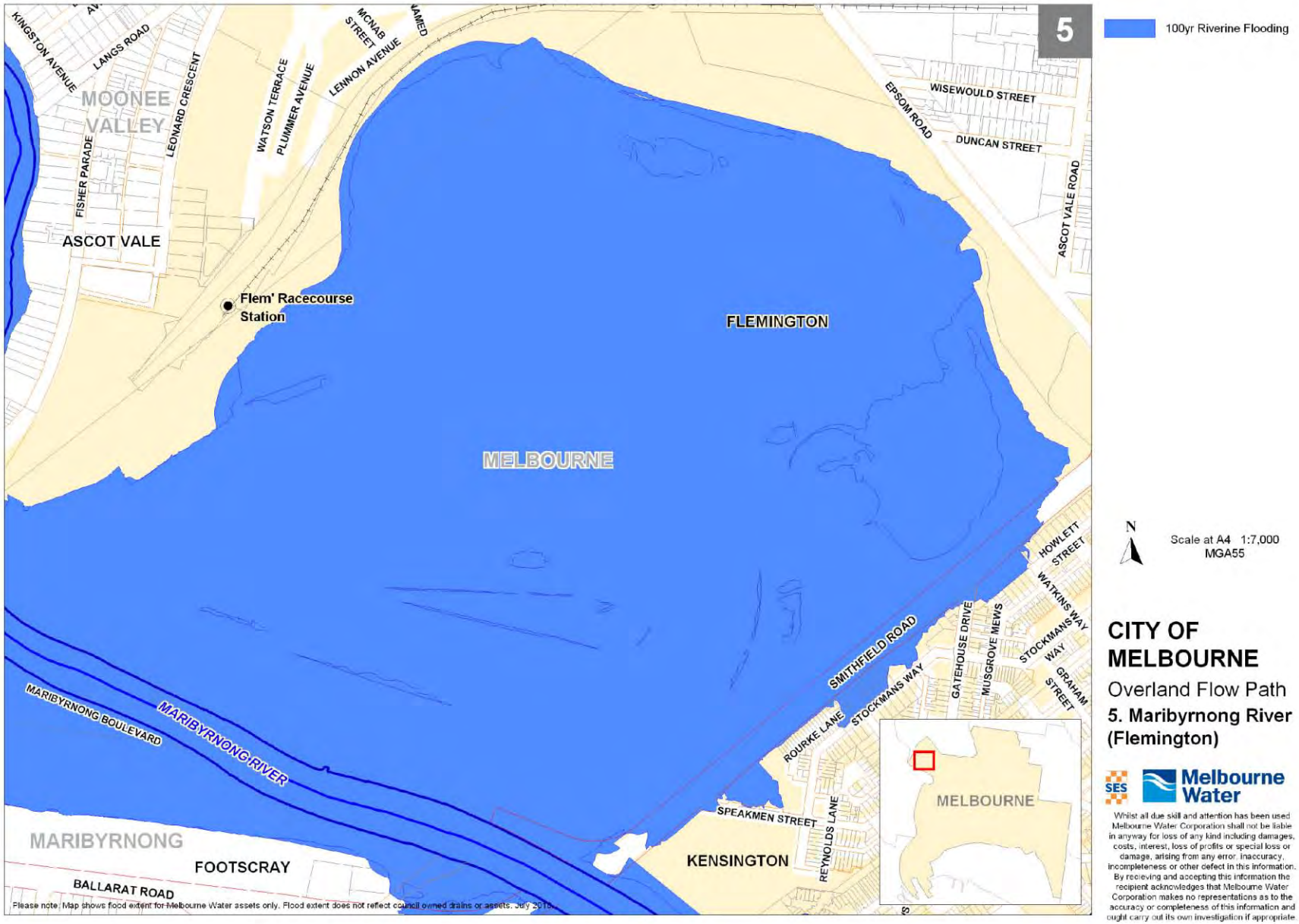
- Police Station
- Municipal Building
- Flood Depth (100yr)

SES

Victoria

Melbourne Water


4
MELBOURNE
SOUTH WHARF
SOUTHBANK
SOUTH MELBOURNE
PORT PHILLIP
YARRA RIVER
Future Kids Child Care
Yarra River at Spencer St Southbank
CROWN CASINO PS
Victoria HQ SES
South Melbourne
Australian Ballet School
Victorian College Of The Arts Secondary School
SPENCER STREET
SIDDELEY STREET
KINGS WAY
WALKER STREET
QUEENSBRIDGE STREET
FRESHWATER PLACE
SOUTHBANK BOULEVARD
RIVERSIDE QUAY
COOK STREET
FAWKNER STREET
FANNING STREET
KAVANAGH STREET
POWER STREET
MOORE STREET
STURT STREET
GRANT STREET
WHITEMAN STREET
NORMANBY ROAD
HANNAH STREET
HANNA ST M.D.
HAIG LANE
CITY ROAD
CATHERINE STREET
BALSTON STREET
WEST GATE FWY
DODDS STREET
WELLS STREET
HAIG STREET
BLAKENEY PLACE
HANCOCK STREET
CLARKE STREET
MILES STREET
MEADEN STREET
CHESSELL STREET
BALLANTYNE STREET
CLARENDON STREET
ROSS STREET
MORAY STREET
MARKET STREET
ROSENEATH PLACE
ROSS PLACE
STEWART PLACE
YORK STREET
YARRA STREET
CRANE STREET
LITTLE MORAY PLACE
YARRA PLACE
LITTLE YORK STREET
TICHBORNE PLACE
OPE STREET
KINGS WAY
HANNA ST M.D.
COVENTRY STREET
WELLS PLACE
DORCAS STREET
HANNA LANE
EASTERN ROAD
100yr Overland Flow Path
100yr Riverine Flooding
100yr Port Phillip Bay Flood
Over–Floor Flooding (20yr)
Over–Floor Flooding (50yr)
Over–Floor Flooding (100yr)
Fire Station
Pumping Station
Rain/River Gauge
SES
N
Scale at A4 1:6,000
MGA55
CITY OF MELBOURNE
Overland Flow Path
4. Hanna St Main Drain (Southbank)
Melbourne Water
Whilst all due skill and attention has been used Melbourne Water Corporation shall not be liable in anyway for loss of any kind including damages, costs, interest, loss of profits or special loss or damage, arising from any error, inaccuracy, incompleteness or other defect in this information. By receiving and accepting this information the recipient acknowledges that Melbourne Water Corporation makes no representations as to the accuracy or completeness of this information and ought carry out its own investigation if appropriate
Please note: Map shows flood extent for Melbourne Water assets only. Flood extent does not reflect council owned drains or assets. July 2010.



N

Scale at A4 1:7,000
MGA55

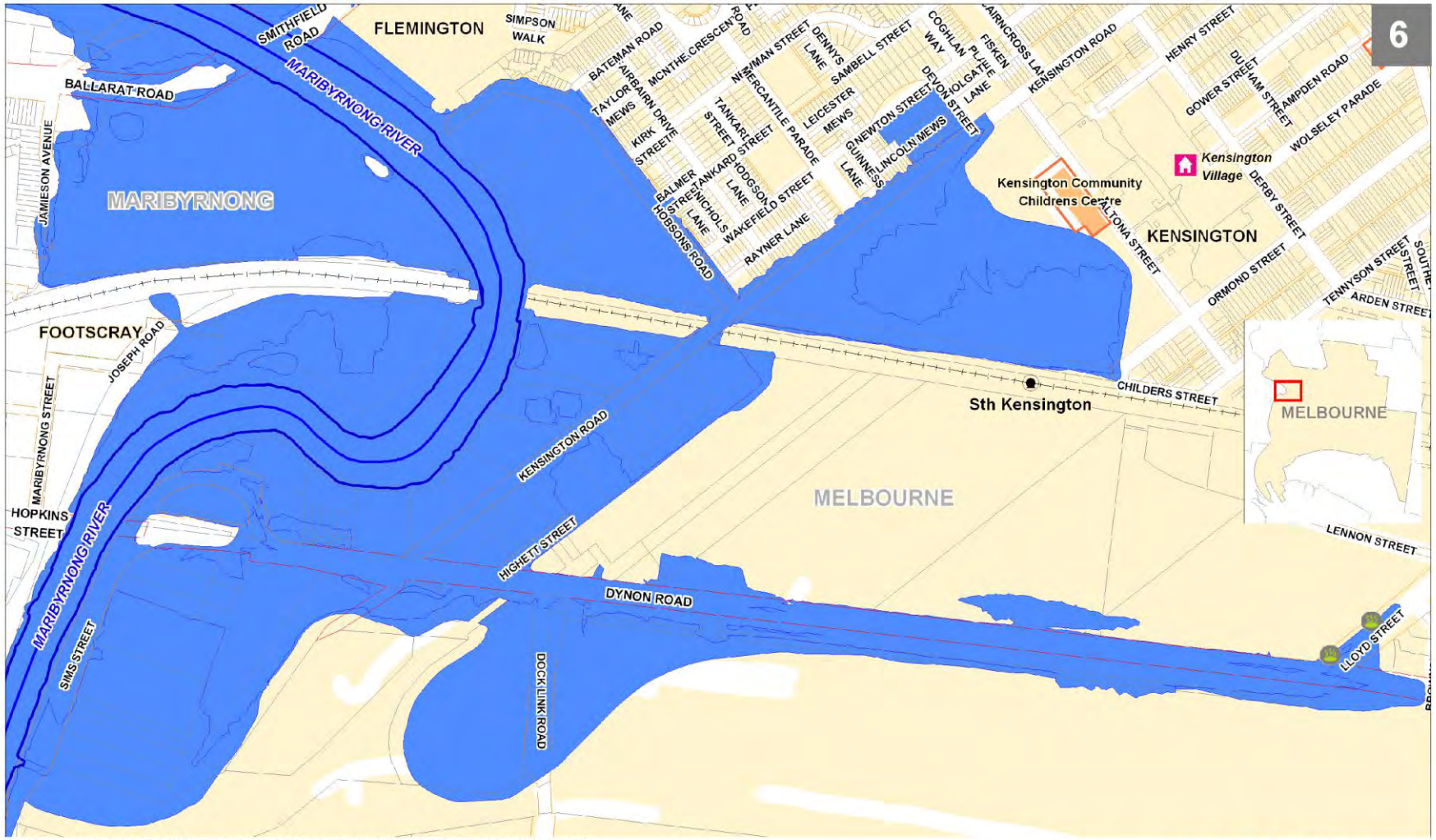
CITY OF MELBOURNE

Overland Flow Path

5. Maribyrnong River (Flemington)

SES

Melbourne Water



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CITY OF MELBOURNE

Overland Flow Path

6. Maribyrnong River (Kensington)

100yr Riverine Flooding

Nursing Home

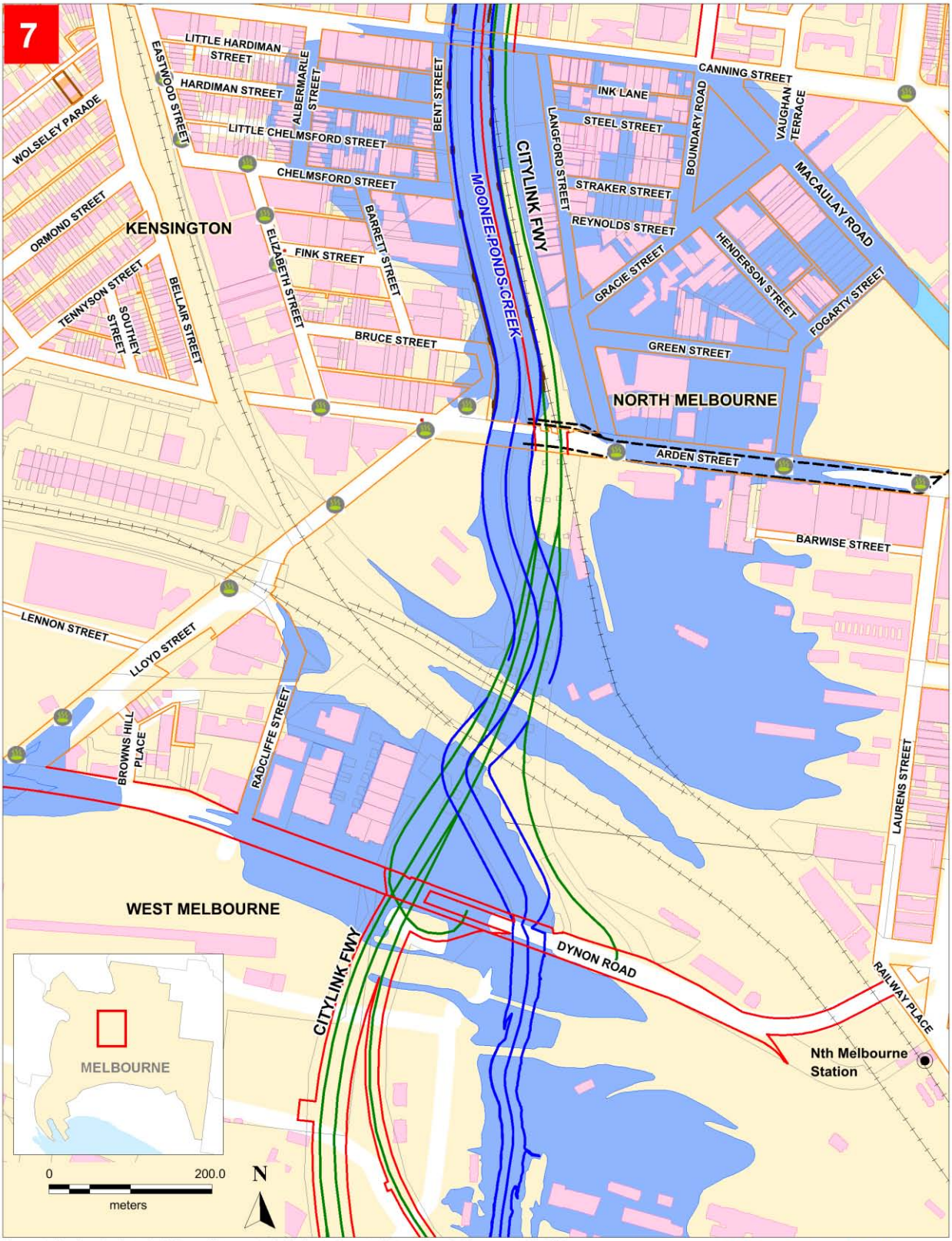
Sewer Manhole/Outlet

N

Scale at A4
1:7,000
MGA55

SES

Melbourne Water



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CITY OF MELBOURNE

Riverine Flooding

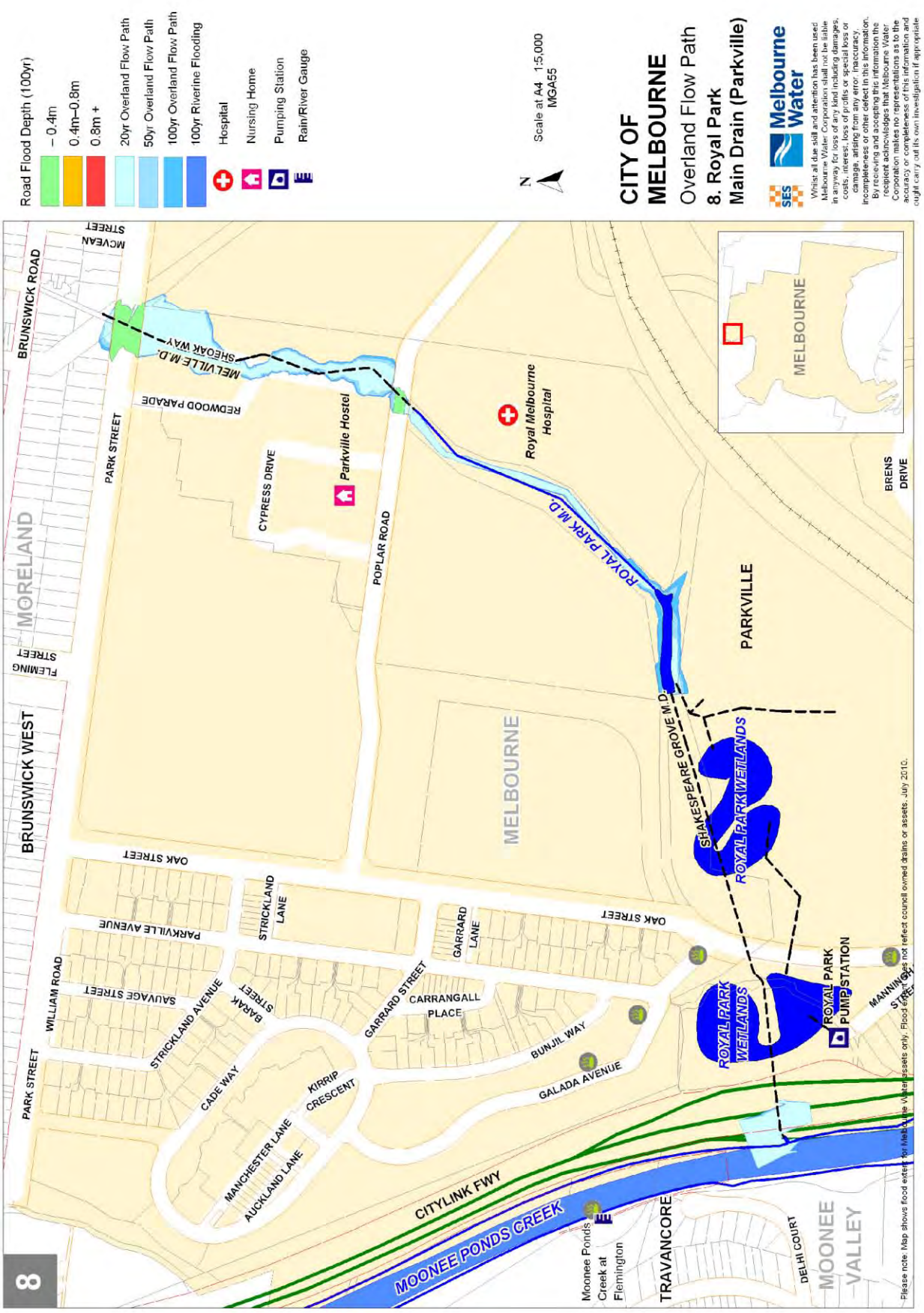
7. Moonee Ponds Creek (North Melbourne)

100yr Riverine Flooding

Sewer Manhole/Outlet

Building

SES Victoria Melbourne Water


CITY OF MELBOURNE
Overland Flow Path
8. Royal Park Main Drain (Parkville)
Melbourne Water
SES
Road Flood Depth (100yr)
– 0.4m
0.4m–0.8m
0.8m +
20yr Overland Flow Path
50yr Overland Flow Path
100yr Overland Flow Path
100yr Riverine Flooding
Hospital
Nursing Home
Pumping Station
Rain/River Gauge
Scale at A4 1:5,000
MGA55
N
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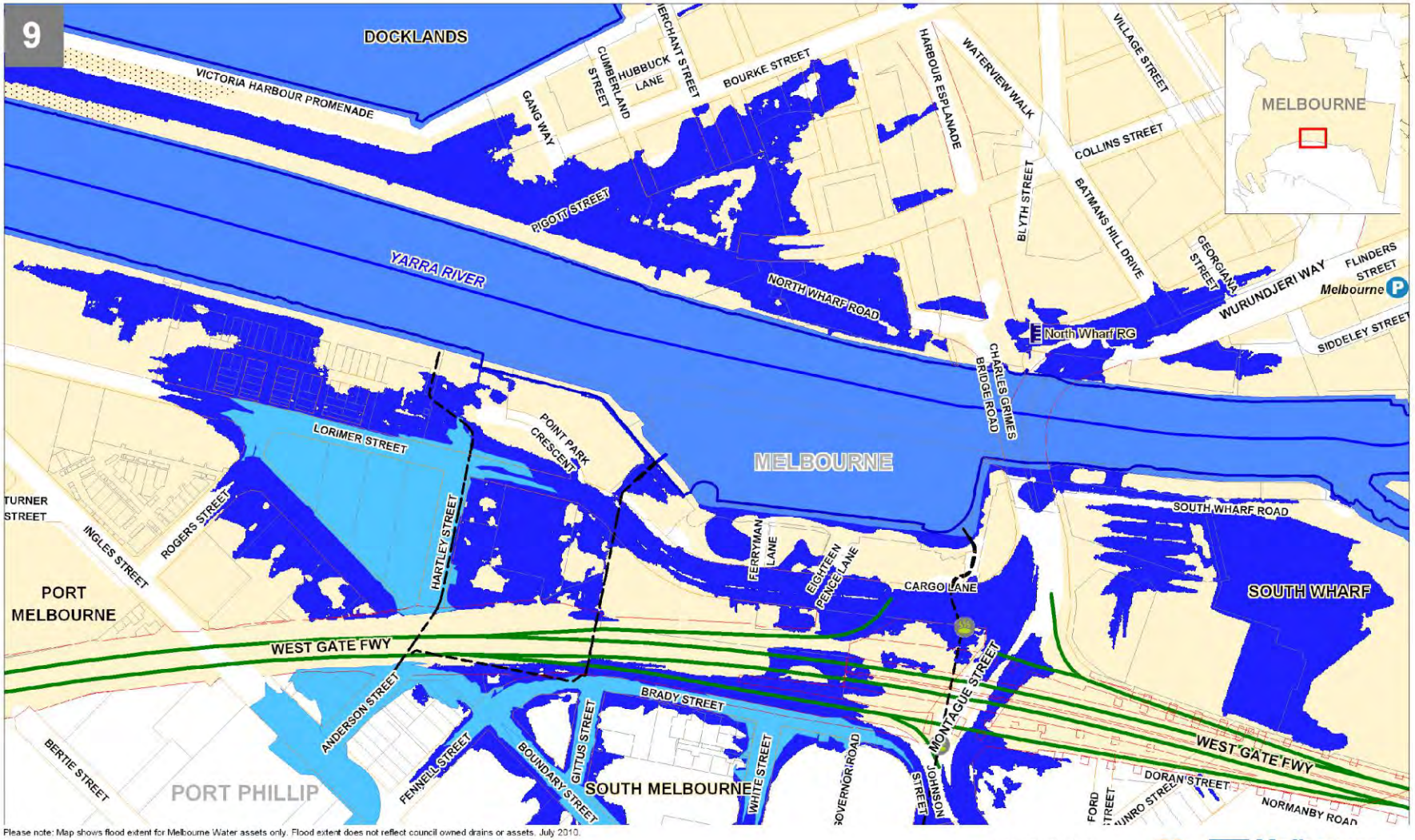
MELBOURNE
BRUNSWICK ROAD
MCVEAN STREET
REDWOOD PARADE
MELVILLE M.D.
SHEOAK WAY
PARK STREET
Parkville Hostel
Royal Melbourne Hospital
CYPRESS DRIVE
POPLAR ROAD
ROYAL PARK M.D.
BRENS DRIVE
MORELAND
FLEMING STREET
BRUNSWICK WEST
PARKVILLE
MELBOURNE
SHAKESPEARE GROVE M.D.
ROYAL PARK WETLANDS
OAK STREET
PARKVILLE AVENUE
STRICKLAND LANE
GARRARD LANE
WILLIAM ROAD
SAUVAGE STREET
STRICKLAND AVENUE
BARAK STREET
GARRARD STREET
CARRANGALL PLACE
ROYAL PARK PUMP STATION
MANNINGHAM STREET
PARK STREET
CADE WAY
KIRRIP CRESCENT
BUNJIL WAY
GALADA AVENUE
MANCHESTER LANE
AUCKLAND LANE
CITYLINK FWY
MOONEE PONDS CREEK
Moonee Ponds Creek at Flemington
TRAVANCORE
DELHI COURT
MOONEE VALLEY
8
Please note: Map shows flood extent for Melbourne Water assets only. Flood extent does not reflect council owned drains or assets. July 2010.



Please note: Map shows flood extent for Melbourne Water assets only. Flood extent does not reflect council owned drains or assets. July 2010.

CITY OF MELBOURNE
Overland Flow Path
9. South Wharf (South Wharf)

- 100yr Overland Flow Path
- 100yr Riverine Flooding
- 100yr Port Phillip Bay Flood
- Police Station
- Rain/River Gauge
- Sewer Manhole/Outlet

N
Scale at A4
1:6,000
MGA55

SES

Melbourne Water