

# Civil Design Requirements for Developers

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## Part A: Integrated Stormwater Management

Issue No.5    DATE: 26 March 2025



City of  
**KINGSTON**

*community inspired leadership*

## REVISIONS AND AMENDMENTS

ISSUE No.	REVISION No.	DETAILS	PREPARED BY	ENDORSED BY	APPROVED BY	DATE APPROVED
1	0		Colin Myers	Brian Trower	Warren Ashdown Manager Infrastructure	10/11/98
1	1	Amendment to Pit Lids.	Colin Myers	Brian Trower	Warren Ashdown Manager Infrastructure	15/12/99
2	0	Revision of all sections.	Colin Myers	Brian Trower	Warren Ashdown Manager Infrastructure	27/9/00
2	1	Insert: Kerb & Channel, p.12 Amdt: Bicycle Paths, p. 14 Amdt: Appdx 1 – General Notes, p. 23 Amdt: Appdx 1 – Sample Project Specific Notes, p. 24	Colin Myers	Brian Trower	Warren Ashdown Manager Infrastructure	19/7/01
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4	0	Reformatting and minor revisions	Roshan Khanal	Brian Trower	Peter Bain Manager Infrastructure	23/5/16
5	0	Revision of all sections	Alan West	Brian Trower	Kathy VanHeer Acting Manager Infrastructure	26/3/25

## List of Abbreviations

- Australian Rainfall and Runoff (ARR)
- Average Exceedance Probability (AEP)
- Environmentally Sustainable Design (ESD)
- Integrated Stormwater Management (ISWM)
- Model for Urban Stormwater Improvement Conceptualization (MUSIC)
- Site Environmental Management Plan (SEMP)
- Stormwater Treatment Objective Relative Measure (STORM) Calculator
- Sustainable Tools for Environmental Performance Strategy (STEPS)
- Water Sensitive Urban Design (WSUD)

### Planning Overlays

- Special Building Overlays (SBO)  
A planning scheme control that identify areas prone to overland flooding.
- Land Subject to Inundation Overlays (LSIO)  
A planning scheme controls that apply to land affected by flooding associated with waterways and open drainage systems. Such areas are commonly known as floodplains.
- Floodway Overlays (FO)  
Land which is identified as carrying active flood flows associated with waterways and open drainage systems. This overlay is categorised by depths in excess of one metre.

## TABLE OF CONTENTS

<b><i>List of Abbreviations .....</i></b>	<b><i>2</i></b>
<b><i>1. Introduction .....</i></b>	<b><i>6</i></b>
<b><i>2. Development Size .....</i></b>	<b><i>7</i></b>
<b><i>3. Documents to be Submitted.....</i></b>	<b><i>7</i></b>
<b>General Requirements .....</b>	<b>8</b>
<b><i>4. Flood Management .....</i></b>	<b><i>10</i></b>
<b>Floor Levels .....</b>	<b>10</b>
<b>Overland Flowpaths .....</b>	<b>10</b>
<b>Basement Garages .....</b>	<b>10</b>
<b>Additional requirements for Large Scale developments &amp; Road Designs .....</b>	<b>10</b>
<b><i>5. Pipe capacity and storage .....</i></b>	<b><i>12</i></b>
<b>5.1 Private Drainage Systems .....</b>	<b>12</b>
<b>5.2 Council Drainage Systems .....</b>	<b>15</b>
<b><i>6. Stormwater Treatment and Reuse .....</i></b>	<b><i>18</i></b>
<b>6.1 Small Scale Developments .....</b>	<b>19</b>
<b>6.3 Large Scale Developments .....</b>	<b>22</b>
<b>6.4 Safety in Design .....</b>	<b>25</b>
<b>6.5 Detail Design &amp; Construction of WSUD Assets .....</b>	<b>25</b>
<b><i>7. References .....</i></b>	<b><i>27</i></b>

## Background

The requirements in this document are in place to ensure that stormwater runoff from all urban development is managed in an integrated way, and thereby:

- improve the quality of stormwater that flows to our creeks and rivers.
- reduce the impact of increased stormwater run-off on the drainage system.
- facilitate on-site stormwater infiltration.
- encourage stormwater management that maximises the reuse of stormwater.
- support green infrastructure.

### Victorian State Government

Council's objectives are consistent with the Victorian State Government's overarching planning policies targeting stormwater or integrated water management. The Victorian Planning Provisions and relevant clauses for different development types are summarised in the following table. (source: Clearwater)

	Townhouse/units	Apartment buildings	Subdivisions – residential, commercial, industrial	Commercial/industrial development >50m2
Treatment of stormwater to BPEM objectives	<a href="#">55.03-4 B9</a>	<a href="#">55.07-5 B39</a> <a href="#">58.03-8 D13</a>	<a href="#">56.07-4 C25</a> <a href="#">53.18-4 W1</a>	<a href="#">53.18-5 W2</a>
Contribute to urban cooling, habitat and amenity	<a href="#">55.03-4 B9</a>		<a href="#">56.07-4 C25</a> <a href="#">53.18-4 W1</a>	<a href="#">53.18-5 W2</a>
Rainwater tanks (laundry/toilet)		<a href="#">55.07-5 B39</a> <a href="#">58.03-8 D13</a>		
Connect to dual pipe recycled water supply		<a href="#">55.07-5 B39</a> <a href="#">58.03-8 D13</a>	<a href="#">56.07-2 C23</a>	
Prevent chemicals/toxicants from entering stormwater system				<a href="#">53.18-5 W2</a>
Site management during construction	<a href="#">Clause 65 (Decision guidelines)</a>	<a href="#">Clause 65 (Decision guidelines)</a>	<a href="#">56.08-1 C26</a> <a href="#">53.18-6 W3</a>	<a href="#">53.18-6 W3</a>
Maximise infiltration of stormwater into tree pits and permeable areas		<a href="#">55.07-5 B39</a> <a href="#">58.03-8 D13</a>		

The state water plan, Water for Victoria (DELWP, 2016) is a framework to guide smarter water management, with five Integrated Water Management Forums (DELWP, 2017) across Melbourne's five major waterway catchments, comprised of Yarra, Maribyrnong, Werribee, Dandenong and Western Port.

### City of Kingston

The City of Kingston's strategic objectives and goals have been developed to align with the Dandenong Strategic Directions Statement to ensure that we are all working towards a consistent regional approach.

Our approach is documented within Council's Integrated Water Strategy that was first developed in 2012. This document was refreshed in 2022 to respond to climate changes and increased urbanization, which place immense pressure on every part of the water cycle.

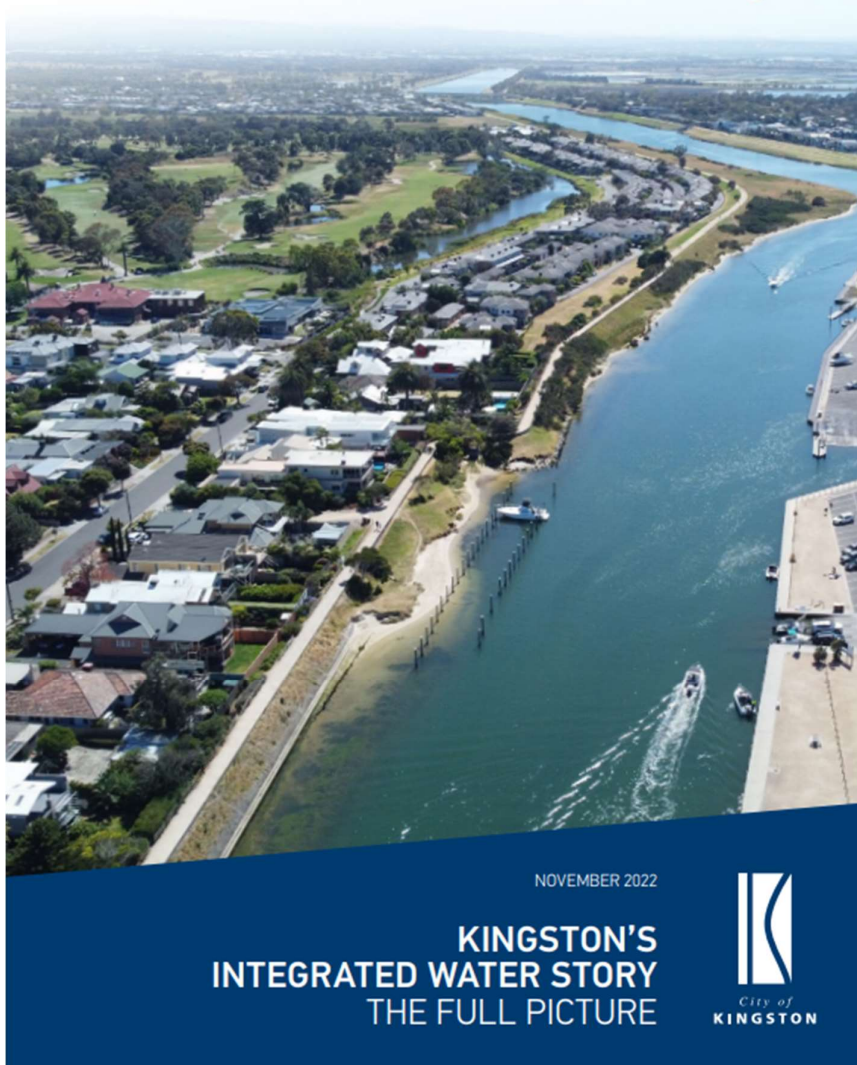
Council's Strategy sets objectives, goals and targets, for both 2030 and 2050 that focus on:

- Using water wisely, including less drinking water (potable water) and more use of alternative water such as rainwater tanks, harvested stormwater and recycled water.
- Protecting our waterways and Bay by reducing litter and all forms of pollution.
- Improving our flood management, including prevention and response.
- Enhancing education, engagement and partnerships with our community and regional partners.

*Kingston's Integrated Water Strategy* is supported by *Kingston's Integrated Water Story – The Full Picture* that provides additional information about our journey, challenges, modelling and opportunities.

Both the Strategy and the supporting Story can be found on the City of Kingston website at [www.kingston.vic.gov.au](http://www.kingston.vic.gov.au)

## Our Local Water Ways



NOVEMBER 2022

**KINGSTON'S  
INTEGRATED WATER STORY**  
THE FULL PICTURE



## 1. Introduction

The City of Kingston's 'Civil Design Requirements for Developers' consists of:

### Part A: Integrated Stormwater Management [this Document].

Explains the requirements for addressing all aspects of stormwater management including:

- Flood management by catering for extreme storm events – See section 4
- Pipe capacity and on-site detention systems – See section 5
- Water Sensitive Urban Design (WSUD) principles – See section 6
- Alternative water reuse for potable water conservation – See section 6

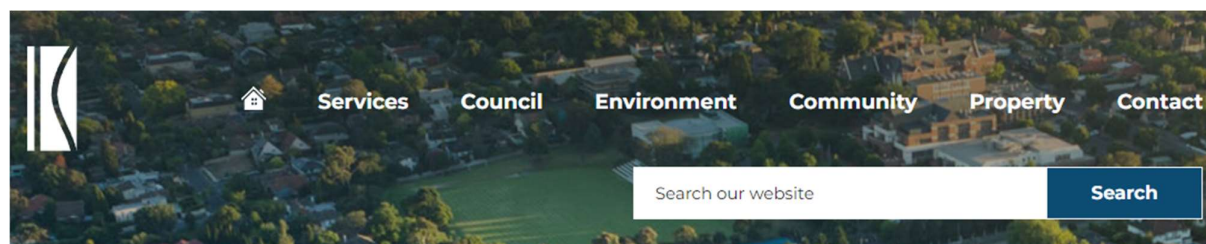
and

### Part B: Roads Design Standards and Presentation of Designs

Explains the presentation standards for submitting detailed drainage design plans and external roadworks plans for subdivisions and council assets.

This document forms one part of the broader 'Application for Planning Permit' process.

Applicants are encouraged to refer to the City of Kingston website [www.kingston.vic.gov.au](http://www.kingston.vic.gov.au) and search under [Drainage and civil works approvals](#) and [Stormwater requirements for developers](#).



For further information including planning application flowchart, checklist and facts sheets, contact the following Council areas on **1300 653 356** :

- City Development Department (Statutory Planners) to discuss planning applications.
- Infrastructure Department (Development Engineers) to discuss this document.

This document is intended for use by consultants with appropriate expertise and experience in the design, construction and maintenance of stormwater infrastructure.

Where required, the external references listed under Section 7 should be used for further information and guidance.



## 2. Development Size

Council recognises that the type and complexity of information required should be proportional to the type of development taking into consideration the risks and opportunities associated with each.

The level of documentation required is based on the following categories of planning applications:

### Small Scale

- Residential and/or mixed-use developments of 1 to 2 dwellings.
- Residential developments and/or mixed-use developments with a new building gross floor area less than 500 m<sup>2</sup>.
- Non-residential developments with a new gross floor area less than 500 m<sup>2</sup>.

### Medium Scale

- Residential and/or mixed developments of 3 to 9 dwellings.
- Non residential developments with a new building gross floor area between 500m<sup>2</sup> and 1,000 m<sup>2</sup>.
- Non residential developments with building alterations or additions between 500m<sup>2</sup> and 1,000 m<sup>2</sup>.
- Subdivision of land vacant land between 1,000m<sup>2</sup> and 4,999m<sup>2</sup>.

### Large Scale

- Residential and/or mixed-use developments of 10 or more dwellings.  
Non-residential developments with a new building gross floor area of greater than 1000 m<sup>2</sup>.
- Subdivision of vacant land greater than 5,000m<sup>2</sup>.
- Subdivision of land involving public road networks or public open space as determined by Council.

## 3. Documents to be Submitted

The applicant's proposed approach to Integrated Stormwater Management (ISWM) should be discussed with Council officer(s) during the preliminary consultant phase with the outcomes influencing the proposed development's site layout and configuration as appropriate.

The following **Integrated Stormwater Management** documentation shall be submitted as part of the Council approval process. Further information will be requested where this documentation is incomplete or at Council's sole discretion based on individual site or development characteristics.

### **Small Scale**

- A copy of Kingston's '**Development Engineer - On-site Drainage Declaration Form**' that has been signed by the drainage designer.
- A set of Civil design drawings that document drainage and construction details.
- Drainage computations confirming onsite detention storage requirement (where applicable - see section 5).
- The provision of minimum 2000 litre rainwater tank clearly nominated for each new dwelling with water re-use for toilet flushing and irrigation as a minimum. Additional reuse is preferred as detailed in section 6.
- Soil and percolation test report and computations (where applicable - see section 5.1).
- Please refer to sections 4.1, 4.2, 5.1 & 6.1 that are typically applicable to this type of development. Other sections may also apply.

**Medium Scale**

- A copy of Kingston's **'Development Engineer - On-site Drainage Declaration Form'** that has been signed by the drainage designer.
- A set of Civil design drawings that document construction details and cater for:
  - (i) Flood management requirements (see section 4).
  - (ii) Internal and external drainage requirements (see section 5).
  - (iii) Stormwater treatment & reuse requirements (see section 6).
- Drainage reports (e.g detention systems, pumps, soil and hydraulic conductivity tests & soakwell design) and computations confirming onsite detention storage requirement (see section 5).
- The provision of minimum 2000 litre rainwater tank clearly nominated for each new dwelling with water re-use for toilet flushing and irrigation as a minimum. Additional connection for laundry re-use is preferred.
- A copy of a STORM Tool, Blue Factor Tool <sup>1</sup> or MUSIC output demonstrating how the proposal achieves best practice stormwater management objectives or a 100% STORM or Blue Factor rating (see section 6).

**Large Scale**

- An 'Integrated Water Management Plan' in the form of a comprehensive Stormwater Management Strategy report that addresses all the requirements of section 6.3
- MUSIC model outputs demonstrating how the proposal achieves best practice objectives.
- Stormwater layout drawings demonstrating how the proposed treatment system and drainage assets will function.
- A signed copy of Kingston's **'Development Engineer - On-site Drainage Declaration Form'** will be required if the development includes private drainage assets.

In addition, if the property is deemed by Council officers to be prone to flooding, or the works are likely to have a drainage impact on downstream properties, detailed flood modelling and reports may be required. This requirement will be confirmed during the initial stages of the development process. Refer to Section 4.5 for further details.

All developments shall satisfy the following Council requirements (unless otherwise directed by Council) and the requirements of Melbourne Water (in situations where they are the responsible drainage authority).

**General Requirements**

Typical Conditions (that are subject to change)

1. Stormwater drainage must be provided to prevent any concentrated overflows onto adjacent properties and be directed to the nominated point of discharge and shall not exceed the maximum allowable discharge rate.
2. The development of the site must be provided with stormwater works which incorporates the use of water sensitive urban design principles to improve stormwater runoff quality and assists with infiltration and reducing runoff volumes from the approved development. The system must be maintained to the satisfaction of the Responsible Authority. Council's Development Engineer can advise on satisfactory options to achieve these outcomes, which may include the use of WSUD assets such as an infiltration or bioretention system, rainwater tanks connected for reuse and a detention system.

<sup>1</sup> The STORM Calculator is expected to be replaced with a revised tool called Blue Factor during 2025 (DEECA).



3. The provision of minimum 2000 litre rainwater tank clearly nominated for each new dwelling with water re-use for toilet flushing.
4. Road Opening permits and applicable fees apply to connections to Council assets.
5. Plan Checking and Construction Supervision fees apply to all works which will become Council assets.
6. Road occupation and works permit, including preparing a Traffic Management Plan (TMP) may apply for any road or construction work that disrupts access to Council roads or road reserve. For further information refer to Council's website at: [www.kingston.vic.gov.au](http://www.kingston.vic.gov.au) and search 'Road occupation and works permit'.

Typical notes requested on Plans (that are subject to change):

7. All internal drainage works must be in accordance with AS/NZS 3500.3: 20215 Stormwater Drainage.
8. All concrete works must comply with AS3600 - Concrete Structures Code.
9. Minimum allowable concrete compressive strength is 32 MPa" at 28 days.
10. All works within the road reserve and easement/laneway must comply with the City of Kingston Specification and Drawings current at the time of commencement of construction.
11. The Contractor must contact Council's Development Engineer on ☎1300 653 356 /9581 4131 seven (7) days prior to the commencement of any works within the road reserve/easement/laneway to arrange for an on-site inspection.
12. The Contractor must provide to the Council a copy of their Public Liability Policy (to the value of \$20 million) which nominates Council as the interested party, prior to the commencement of any works in road reserve/easement/laneway.
13. The Contractor must provide notice to all affected properties seven (7) days prior to the commencement of any works. The notice must include the Contractor's name and contact telephone number.
14. At the completion of construction works, all areas disturbed during the construction are to be reinstated by the Contractor at the Contractor's cost.
15. Builder Note: Any bioretention, rain garden or infiltration asset must be protected from silt during construction works to maintain the design absorption rate and prevent surface clogging". Any accumulated sediment on the surface must be removed, the surface made good, and the asset replanted as needed in accordance with design specifications prior to handover/completion.
16. The location of the existing trees to be retained and proposed trees as indicated on the endorsed landscaped plans must be verified prior to drainage works commencing, and any conflict must be reported to the designer for re-design.
17. Excavate all trenches by hand for the pipes/services within the tree protection zone/canopy drip line. This condition also applies to trees on neighbouring property where the tree protection zone/drip line occurs on the subject site. The Contractor must contact Council's Vegetation Management Officer to arrange for an on-site inspection.
18. Invert level of a private property connection to existing Council pit must be a minimum of 150mm above the base/invert of the pit.

## 4. Flood Management

All developments (small, medium & large scale) shall be designed to cater for 1% Annual Exceedance Probability (AEP) storm events, formerly known as 1 in 100 year ARI, and shall address the following requirements as a minimum:

### 4.1 Floor Levels

All developments within designated flood overlay areas shall cater for the following freeboard above designated flood levels:

<u>Land subject to</u>	<u>Building Type</u>	<u>Minimum freeboard</u>
Special Building Overlay (overland flow path)	Main buildings/ Extensions	300mm
Special Building Overlay (overland flow path)	Outbuilding/ garage	150mm

Refer to the Victorian Planning Scheme for relevant Melbourne Water and Kingston overlays impacting on your development site.

### 4.2 Overland Flowpaths

- The major storm drainage system may consist of overland flow along streets, through parks and through private property where floodways are constructed within easements.
- The drainage system shall be designed such that flooding from a 1% AEP storm event will not:
  - (i) Flow over private property other than through a designated floodway;
  - (ii) Build up within private property such that it floods the floor of a dwelling, or commercial or industrial premises.
- Site levels shall cater for a 1% AEP flowpath around all dwellings and garages to prevent inundation. Where this is not achievable, the design will need to include a storage system to detain the 1% AEP flows from the upstream catchment.

### 4.3 Basement Garages

- The pavement level at the entrance into basements shall be designed and constructed a minimum of 100mm above the 1% AEP flows along the adjacent roadway. This requires a calculation of the depth and width of flows along the kerb and channel based on the upstream catchment area. Contact Council for further information.
- Based on the above calculation, the 'apex' at the top of the ramp (before it starts grading down) will need to be set at the required level in situations where the footpath level is insufficient to provide 100mm freeboard.
- Council does not accept sub-surface water (groundwater including seepage and/or perched water) into the stormwater system. It is the responsibility of the developer to dispose of any groundwater either on site, off site through a private trade waste agreement or reach an agreement with the local sewer authority. This is particularly relevant for basement and subsurface structures.

Refer to Council's Policy on *Basements and Underground Structures: Management of groundwater, dewatering during construction and access (June 2024)*, available at [www.kingston.vic.gov.au](http://www.kingston.vic.gov.au)

### 4.4 Additional requirements for Large Scale developments & Road Designs

- Trapped low points in streets and reserves adjacent to private property shall only be permitted where an overland flow path that has been approved by Council can be provided which caters for the 1% AEP storm event.

- All building entrances and surrounds, outdoor access areas, ingress and egress routes, streets, driveways, footpaths and cycle paths that are subject to flooding meeting the following safety criteria:

Maximum depth:	0.35 metres
Maximum velocity:	1.5 metres per second
Maximum depth x velocity:	0.35 metres squared per second

#### **4.5 Flood Modelling Requirements**

Flood modelling is essential to assess the potential impacts of the development on flood levels, flow velocities, and flood extents, ensuring that the design does not exacerbate flooding risks for surrounding properties or infrastructure. The modelling must be conducted in accordance with the most current version of Australian Rainfall and Runoff (ARR) guidelines and Melbourne Water's flood modelling specifications, using approved software and methodologies to simulate the effects of both minor and major storm events, including the 1% AEP event.

The requirement for detailed flood modelling and reporting will be confirmed by Council officers during the initial stages of the development process (Stage 1) and applies regardless of the project scale.

Flood modelling and reporting is mandatory for Large Scale projects that have the potential to pose:

- A flood risk to the development site.
- An increased flood risk for downstream private and/or public land, including road reserves, due to both a 20% and 1% AEP event. The report must include afflux mapping illustrating that flooding is no worse than existing conditions.

The results of the flood modelling must demonstrate the adequacy of flood management strategies and ensure that the development meets Council's flood management objectives. Modelling should also identify appropriate mitigation measures to protect both the development site and downstream areas.

Flood modelling must address the following key areas:

- The impact of the proposed development on existing flood levels, flow velocities, and flood extents for a range of storm events.
- Compliance with the most current version of *Australian Rainfall and Runoff* (ARR) guidelines, ensuring that rainfall Intensity-Frequency-Duration (IFD) data and climate change factors are incorporated into hydrologic and hydraulic assessments.
- Mitigation measures such as on-site detention, drainage upgrades, or other flood protection measures to ensure no adverse effects on downstream properties.
- The capacity of both minor and major flow systems to manage stormwater during regular and extreme events, preventing overland flooding and maintaining the integrity of nearby infrastructure.
- The interaction between floodwaters and existing infrastructure, such as roads, buildings, and utilities, ensuring that flood events do not compromise public safety or property.
- The design and performance of proposed stormwater management infrastructure, including detention systems and overland flow paths, to ensure they function effectively during flood events.
- Compensatory flood storage calculations, if floodplain storage is lost due to development, ensuring that this loss does not increase flood risks downstream.
- Consideration of flood safety measures, such as appropriate access routes, flood depths, and flow velocities, to protect occupants and users of the development site during flood events.

By addressing these requirements, flood modelling will ensure that developments are resilient to flooding, protecting both the site and the wider catchment from increased flood risk.

## 5. Pipe capacity and storage

All drainage designs shall comply with the current version of Australian Rainfall and Runoff, published by the Institution of Engineers, Australia with computations based on the following criteria:

- A methodology that is deemed by Council to be appropriate for the scale and complexity of the project, such as the Rational method, an alternative hydraulic program, or flood modelling.
- Rainfall intensity to be based on the Bureau of Meteorology (BoM) data for the project's location within the City of Kingston. Refer to the most current BoM website.  
E.g [Rainfall IFD Data System: Water Information: Bureau of Meteorology](#)

### 5.1 Private Drainage Systems

The following requirements apply to the design and construction of privately owned and maintained drainage assets:

- Refer to section 5.2 where projects include public drainage assets such as easement drains or pipes within the road reserve.
- An application for a 'Legal point of Discharge' must be submitted (the application form is available on Council Website). Council will provide drainage information and applicable conditions. Only one nominated legal point of discharge can be used per site unless otherwise approved.
- The drainage designer must complete and submit the City of Kingston's '**Development Engineer – On-site Drainage Declaration Form**' (available on Council Website) and submit with the required drainage documents.
- An 'Opening Permit' is required for all connections into Council's assets and shall be constructed in accordance with the relevant City of Kingston standard drawing (e.g S501: Connection to kerb & channel, S503: Connection to Council drain, etc). Private drainage connection to existing Council pit must be minimum 150mm above the base/invert of the pit.
- All private drainage shall be designed in accordance with AS/NZS 3500.3: 2021 Plumbing and drainage, Part 3: Stormwater Drainage.
- Stormwater discharging from the site, shall not exceed the 'Permissible Site Discharge' as detailed below.
- Detention of stormwater on site using 'water sensitive urban design' principles (e.g rainwater tanks with water re-use for toilet flushing, vegetated swales, porous pavers, infiltration systems, etc) to reduce stormwater run-off and improve discharge quality is required prior to discharge.
- Stormwater discharge shall be prevented from flowing onto adjacent properties.
- Groundwater shall not be allowed to discharge into the drainage system (see also section 4.3 for further information on basement garages).
- For connections into Council pipes, the Council pipe must be 225mm diameter or larger.
- No private drainage works shall be located within easements unless specifically requested by Council.

#### Permissible Site Discharge

The maximum piped stormwater discharge from the site shall not exceed the following requirements. Council reserves the right to vary these requirements to cater for unusual sites and/or to address significant limitations with the capacity of the existing drainage system.

**(i) All residential developments shall be calculated based on:**

- A 20% AEP storm event (formerly known as a 1 in 5 year ARI storm event) using a 'Coefficient of Runoff' based on  $C=0.4$  regardless of the existing site imperviousness.
- 5 minute time of concentration for lots smaller than 1000 sqm and determined by the designer based on the critical storm duration for the lots greater than 1000sqm.  
Refer to the start of section 5 for BoM rainfall intensity data.
- The difference in discharge rates between  $C=0.4$  and post development (as a result of increased site imperviousness based on a 20% AEP storm event) shall be stored in accordance with the 'Onsite Detention' requirements detailed below.

**(ii) All Industrial and Commercial developments shall be calculated based on:**

- A 10% AEP storm event (formerly known as a 1 in 10 year ARI storm event) using a 'Coefficient of Runoff' based on the lower of; existing site imperviousness (where  $C < 0.7$ ) or  $C=0.7$  (maximum allowable upper limit due to a lack of capacity in the existing council drainage system).  
Alternatively, the designer may choose to investigate the capacity of Council's downstream pipe network (to point where the pipe is at least 600mm diameter) to review the proposed impact of the development for Council's consideration.
- 7 minute time of concentration for lots smaller than 1000 sqm and determined by the designer using a published calculation method for lots greater than 1,000sqm.  
Refer to the start of section 5 for BoM rainfall intensity data.
- Industrial developments shall store the difference between the 'permissible site discharge' rate (based on a 10% AEP storm event – formerly known as a 1 in 10 year ARI storm event) and the discharge rate for the proposed development based on a 10% AEP storm event.
- Commercial developments shall store the difference between the 'permissible site discharge' rate (based on a 10% AEP storm event) and the discharge rate for the proposed development based on a 10% AEP ARI storm event.
- Refer to 'Onsite Detention' requirements detailed below.

**Onsite Detention**

Onsite detention systems shall be designed in accordance with AS/NZS 3500.3 and the following requirements:

- All hard surfaces shall be included in calculations including all driveways, paved areas, garages and dwellings.
- Total site area must be taken into account for internal drainage design calculation with appropriate Mannings' run off coefficient. Stormwater overflows to neighbouring properties are not permitted.
- Designers are encouraged to achieve storage requirements via appropriately designed WSUD elements as described under Section 6.
- All rainwater tanks shall be a minimum of 2,000 litres for each dwelling and connected to a minimum roof area of 50m<sup>2</sup> unless otherwise approved. Refer to section 6 for further guidance. Rainwater tanks proposed for separate individual dwelling can contribute towards storage volumes on the following basis:
  - 500 litres of storage for each 2,000 litre tank or 1,000 litres of storage for tanks equal or greater than 2,500 litres. This is not applicable where combined Rainwater Tanks are proposed such as in apartment building development.

- Where soakwells or infiltration trenches are proposed, a soil permeability (Saturated hydraulic conductivity) test report by a qualified geotechnical engineer must be provided (no exceptions). Acceptance of soakwells and infiltration trenches are subject to Council approval.

As a minimum, soakwells must meet the following requirements:

- The base of the proposed soakwell system must be minimum 500mm above the groundwater table, confirmed by a groundwater level measurement; and
- The outside edge of the soakwell must be least 2m away from building foundations and property boundaries.

Calculations shall be based on the most current version of Australian Rainfall and Runoff (ARR), with Rational method, OSD4 or Boyds method being accepted as an alternative at Council's discretion, and designed to cater for the following criteria:

- 20% AEP storm event with a provision of piped overflow connected to the kerb and channel or Council drainage system, or
- 10% AEP storm event without a piped overflow but with an acceptable overland flow path.
- 1% AEP capacity at trapped low points.
- Soakwell and infiltration trench systems design calculation must comply with the requirements of "Water Sensitive Urban Design: Engineering Procedures, Melbourne Water, 2005T" with Council's requirements taking precedence where any contradictions occur.

#### **Design plans and drafting standards**

Plans of private drainage systems shall comply with the following minimum requirements:

- Plans to include the following information as a minimum:
  - North point
  - Layout Plan showing all dwellings, garages, and drainage alignments (existing as well as proposed).
  - Pit numbers and pit schedule.
  - Pavement makeup (typically concrete or asphalt).
    - Construction notes required by the City of Kingston.
    - Details of all detention systems, tanks, soakwell or pump systems.
    - Finished Floor levels of all dwellings and garages (consistent with endorsed development/architectural/landscape plans, if applicable).
    - All details shown on drainage plan such as general layout, finished floor levels of dwellings and garages, tree protection zone, Rainwater tank locations, other stormwater quality treatment measures such as raingardens must be consistent with the same shown on endorsed development (architectural and landscape) plans.

In cases where endorsed development plans are not consistent with the proposed drainage plans, they may need to be re-endorsed from the Planning Department at council's discretion.

- Percentage of impervious area on the development site, with impervious surface defined as:

All surfaces that are not vegetated soil; and

Grey surfaces (e.g gravel, Lilydale toppings or similar) and porous paving to be included in the impervious area calculation x 0.5 (allowing for an assumed 50% perviousness).



- Engineer's contact details.
- Easements and council assets.
- All other additional details as directed by Council.

## 5.2 Council Drainage Systems

This section applies to the design and construction of drainage assets that will become the responsibility of Council.

Developers must comply with the following Council requirement and liaise with Melbourne Water (when required) for applicable conditions.

### Design plans and drafting standards (for Council assets)

- Refer to 'Part B: Roads Design Standards and Presentation of Designs' for Council standards applicable to public drainage systems designed as part of subdivisions, external roadworks, outfall drains and easement drain.
- All works within the road reserve, public land and easements must be in accordance with the City of Kingston Standard Drawings and specification (the current version at the time of construction) which can be downloaded from Council's website: [www.kingston.vic.gov.au](http://www.kingston.vic.gov.au)

### Minor Flow Objectives

The underground drainage system designed to cater for minor flows shall:

- cater for the specified storm frequency.
- limit flow through intersections and past pram crossings.
- limit flow widths within the road reserve to a parking lane and/or back of path level.
- Storm Frequency and Coefficient of Runoff shall be based on the following, unless otherwise advised by Council:

<u>Land Use</u>	<u>Storm Frequency</u>	<u>Coeff. of Runoff</u>
Residential	20% AEP storm	0.6
Commercial	5% AEP storm	0.9
Industrial	10% AEP storm	0.9

### Minimum Pipe Size

- Pipes to be maintained by Council: 225 mm diameter.
- Pipes accepting flows from Side Entry Pits: 300 mm diameter unless otherwise approved.
- Pipe sizes shall not decrease downstream.

### Pipe Flow Velocity

- Minimum: 1 metre per second, running full.
- Maximum: 3 metres per second, running full.

### Pipe Depth

Desirable minimum cover to be in accordance with manufacturer's specification or 450 mm whichever is greater.

### Pipe Material

- Reinforced Concrete, rubber ring joints
- Fibre Reinforced Concrete, rubber ring joints

- UPVC, sewer quality, rubber ring or solvent joints (preferred material for easements) Approved pipes with recycled material content are encouraged for use in landscapes/non-trafficable, where appropriate.

#### **Pipe Class**

A pipe class shall be selected that will enable the pipe to withstand the working (service) loads resulting from overlying materials and superimposed loads for the particular installation.

#### **Reinstatement**

Reinstatement of any disturbed surfaces shall be undertaken in accordance with the City of Kingston's current Guidelines for Road Openings.

#### **Sub-soil Drains**

Sub-soil drains shall be laid behind all kerb and channel to adequately drain the road subgrade.

The sub-soil drains are to connect to the nearest downstream stormwater pit. Where a pit does not exist at the upstream end of the sub-soil drain, construct a 450 mm x 450 mm flushing pit with a 750 mm x 750 mm concrete frame and lid insert. Pit walls and base to be 150 mm thick.

Sub-soil drains may not be necessary in coarse sandy soils. Approval for their omission must be obtained from Council's Representative.

#### **Property Drain connections to Council Drain**

- The design shall provide drainage for each property.
- All pipes and fittings for property drains within the road reserve (from individual allotments < 750sqm) shall be 100 mm diameter. SN8 sewer quality UPVC, with an inspection opening placed at each change of direction.
- Property drains shall connect to a piped drain or pit where available or into the kerb and channel. Connections to the front of a property shall be located at least 6 metres from the side boundary to maintain clearance to future vehicle crossings.
- Where property drains connect to a Council drain, a junction pit shall be provided at the point of connection.
- For connections into Council pipes, the Council pipe must be 225mm diameter or larger.
- Grades to be no flatter than 1 in 100 unless otherwise approved.
- Property drains shall connect to the kerb and channel at right angles. Where a minimum grade of 1 in 100 cannot be achieved, the pipe can be redirected to improve the grade. This distance shall not exceed 10 metres or extend in front of a neighbouring property.
- Property drain connections are to be kept clear of vehicle crossing locations.
- The location of property (house) drains shall be marked on the face of kerb with a "H", 50 mm high.
- Property drain connection to existing Council pit must be minimum 150mm above the pit base/invert unless otherwise approved.
- If more than one property drain connections to kerb is allowed, they must be minimum 1m apart at the connection points on kerbs.
- The designated Legal Point of Discharge applies solely to clean, post-development flows. Construction site runoff and groundwater discharge are excluded and should be managed independently in accordance with construction-phase requirements.

### Stormwater Pits

Where practical, stormwater pits shall:

- be placed at all changes in direction, grade or pipe size.
- be spaced no more than 60 metres apart and spaced to reduce channel flow to the specified width.
- not be located within 1.0 metre of a vehicle crossing.
- be located at least 6 metres from side boundaries to maintain clearance to future vehicle crossings.
- have step irons where pit is deeper than 1.0 metre.
- be located at the upstream tangent point of kerb returns.
- in the case of an easement drain be positioned in the low corner of each property.

### Pit Lids

Location	New Subdivisions and Industrial Areas	Other Areas
Side entry pits	R&S Grating – Eco-Lite	Concrete surround and insert
Side entry pits where vehicle damage is evident or likely	R&S Grating – Eco-Lite	R&S Grating – Eco-Lite
Junction pits in nature strips	R&S Grating – Eco-Lite	Concrete surround and insert
Junction pits in easements (not subject to vehicle loads)	Residential - Concrete surround and insert  Industrial or Commercial - Concrete surround and insert	Concrete surround and insert
Junction pits in easements (subject to vehicle loads)	R&S Grating – Eco-Lite	R&S Grating – Eco-Lite
Junction pits in road pavements	Concrete filled cast iron complying with AS 3996	Concrete filled cast iron complying with AS 3996
Junction pits in vehicle crossings and footpaths	R&S Grating – Eco-Lite	R&S Grating – Eco-Lite

Refer to City of Kingston Standard Drawings for pit details which can be downloaded from Council's website at [www.kingston.vic.gov.au](http://www.kingston.vic.gov.au)

### Detention Tank Storage within the Road Reserve

- All pipe inlets to be treated by a gross pollutant trap (GPT) to reduce silt loads and litter entering detention tanks.
- All pipe outlets, designed with an orifice to limit discharge, to be no smaller than 150mm diameter to minimise blockages.
- Pit lids for access must comply with council's standards and be positioned to minimise traffic management safety risks.

- All storage systems to be precast concrete, unless otherwise approved by Council, and must be designed and constructed to include the following requirements:
  - A flat solid base that can be pressure jetted. The base shall be shaped to direct silt towards a sump in the downstream corner (minimum of 900 x 900 x 400mm deep).
  - The base to have a minimum floor grade of: 1 in 40 crossfall and 1 in 100 longitudinal fall.
  - Manhole access to be provided at both ends for maintenance purposes and accessible using step irons as per pit requirements.
  - Trafficable to suit truck loads, equivalent to a Class C pit lid.

## **6. Stormwater Treatment and Reuse**

### **Water Sensitive Urban Design**

Implementing Water Sensitive Urban Design (WSUD) principles are strongly encouraged for all development projects to ensure a sustainable approach to managing rain water and stormwater run-off.

The benefits of WSUD include:

- improvement to stormwater quality;
- water conservation;
- reduce local inundation; and
- outcomes that closely mimic the pre-developed natural system.

The City of Kingston's Integrated Water Strategy (2022) is available at [www.kingston.vic.gov.au](http://www.kingston.vic.gov.au)

This strategy explains Council's aspirations and targets around pollution reduction and the provision of alternative water source for uses where potable water is not required.

These include toilet flushing, washing clothes, and outdoors for uses such as garden watering, car washing, filling swimming pools, spas and ornamental ponds, and firefighting. Rainwater from roofs may also potentially be used for hot water with appropriate treatment.

### **Best Practice stormwater treatment objectives**

The Best practice Environmental Management Guidelines (BPEMG) were developed and published by the Victorian Stormwater Committee to establish specific stormwater quality objectives to meet the State Environmental Protection Policy (SEPP) requirements. The Victorian best practice performance objectives for removing target pollutants are:

- 80% of suspended solids
- 45% of total Nitrogen
- 45% of total Phosphorous
- 70% of litter

The City of Kingston offers flexible options for developers to meet stormwater quality management obligations. For residential developments with three or more dwellings, as well as all commercial and industrial developments, developers can either:

- Provide stormwater treatment measures on-site, or
- Pay a fixed contribution towards Council managed stormwater projects.

For more information on estimating in-lieu contribution costs, refer to council's website under 'Stormwater Quality Management' at: [www.kingston.vic.gov.au](http://www.kingston.vic.gov.au)

## Onsite Treatment Requirements

Refer to the following sections for further information that applies to all scales of development:

- Section 6.1: Construction Site Management
- Section 6.1: Rainwater Tanks
- Section 6.2: Rain Gardens
- Section 6.3: Water Sensitive Urban Design on public land
- Section 6.3: Integrated Water Management Plan

## 6.1 Small Scale Developments

The recommended tools for modeling stormwater treatment for basic systems are the Melbourne Water STORM Calculator and the revised STORM Tool referred to as Blue Factor that is scheduled to be released during 2025.

Applicants will need to achieve a 100% storm rating or Blue Factor rating. The calculators assess whether best practice water quality objectives (specifically for Total nitrogen) have been achieved for the site, and are available online at: [Melbourne Water : STORM Rating Calculator](#) and [Blue Factor](#) respectively.

The STORM Calculator is a user-friendly and free online tool developed by Melbourne Water. You can access this tool on the Storm Melbourne Water website. It is designed to be suitable for applicants without any formal training in designing stormwater treatment systems.

The STORM Calculator inputs include the total development area and all impervious areas (including impervious areas where no treatment will be provided for stormwater runoff). The calculator enables users to select from a range of WSUD treatment types.

An overall STORM or Blue Factor score of at least 100% is required to demonstrate that the site is deemed to comply with the best practice stormwater management objectives.

## Water Sensitive Urban Design and Water Efficiency

Integrated Water Management places water security, liveability and the health of waterways and landscapes at the heart of servicing our urban communities. New developments, we can conserve Victoria's precious water resources and the health of local waterways. New developments are required to be designed to:

- Use water efficiently.
- Use water sources that are fit for purpose, such as rainwater re-use for toilet flushing.
- Reduce the amount of stormwater that leaves the site.
- Reduce pollutant levels in stormwater run-off.

For the latest information, see *Sustainable Design Fact Sheets - Integrated Water Management* prepared by the *Council Alliance for a Sustainable Built Environment* (CASBE). [Sustainable design assessment - City of Kingston](#)

## Rainwater Tanks

To meet council best practice standards for stormwater management, rainwater tanks should be sized to capture the majority of the roof catchment and corresponding rainwater, and plumbed primarily for consistent year round water use (such as toilet flushing and laundry).

If the year-round consistent reuse of rainwater is not feasible on site, then the water reuse can be considered for secondary objectives such as irrigation of gardens/landscapes etc. Developments which do not meet this requirement must demonstrate how water efficiency can be satisfactorily achieved within the development.

The following standards for rainwater tanks apply:

- All tanks shall be a minimum of 2,000 litres for each dwelling and connected to a minimum roof area of 50m<sup>2</sup> unless otherwise approved.
- 'Charged' pipelines that remain full of water are not permitted unless otherwise approved.
- The overflow pipe from the rainwater tank shall have a cross-sectional area that is equal or greater than the cross-sectional area of the inflow pipe(s).
- Tanks must be plumbed for toilet reuse and may be plumbed for other uses such as gardening and washing machine. With additional treatment (e.g. UV), they may potentially also be connected to the hot water service.
- The selection of pump size must consider system end use flow demand for optimal pump energy efficiency.
- Rainwater tanks proposed for separate individual dwellings can contribute towards on-site detention storage volumes on the following basis:
  - 500 litres of storage for each 2,000 litre tank or
  - 1,000 litres of storage for tanks equal or greater than 2,500 litres. T

The above volumes apply to separate dwellings. Combined storage volume requirements for apartment building developments will require further discussion with Council based on specific project details.

- Refer to the following publications for further guidance:
  - [Rainwater \(health.vic.gov.au\)](http://health.vic.gov.au)
  - [Alternative water sources and their use | Environment Protection Authority Victoria \(epa.vic.gov.au\)](http://epa.vic.gov.au)

### **Construction Site Management**

Construction sites should apply Australian Best Practice to manage stormwater runoff, sediment and erosion during construction. Additional site management objectives include, but not limited to chemical contamination, dust, litter, concrete and other construction wastes.

Refer to the following information on the City of Kingston website:

- Stormwater requirements for developers
- Construction management plan guidelines

Developers should adopt stormwater management systems and practices to protect Water Sensitive Urban Design Assets (WSUD) assets prior to and during construction.

WSUD assets shall be designed and constructed in accordance with the requirements of section 6.



## **6.2 Medium Scale Developments**

The criteria are the same as for small scale developments (see section 6.1) however, Council has an expectation that applications relating to Medium Scale developments will be more comprehensive and investigate the opportunities to maximise best practice outcomes in more detail.

### **Proprietary Products for Stormwater Treatment**

Unless otherwise approved, Council will regard WSUD proprietary products as suitable to function as primary treatment systems for removal of gross pollutants and total suspended solids (such as gross pollutant traps), but not for satisfying Total Phosphorus (TP) and Total Nitrogen (TN) removal requirements.

Council may consider approving a proprietary system that primarily consists of a landscaped area containing filter media, on a case-by-case basis where they are proven to remove pollutants to best practice standards.

### **Rain Garden design**

Unless otherwise approved by council, rain gardens (also known as bioretention systems and bio-swales) shall be designed and constructed in accordance with the following criteria:

- a) For multi-unit development sites, rain gardens must be located in a common area where their long-term functionality can be inspected by others.
- b) Where possible, rain gardens should be located where they are visible from the street or a public area.
- c) Where raingardens are proposed for the treatment of paved areas (e.g driveways, carpark and hardscapes, civil drainage design information is required before the condition stage of the planning process to demonstrate their feasibility and functionality. This information includes: the overland flow path and site grading, runoff collection system, surface level (RL) at the top of the raingarden, depth of the raingarden (detention depth and infiltration layers), the invert level of the outlet which connects to the stormwater system, and the level and details of the overflow pit.
- d) The minimum dimensions of a rain garden's filter area (excluding batters) must be no less than 3 square metres in area and no less than 1 metre wide to ensure healthy plants, unless other approved. Consideration may be given to supporting planter boxes servicing downpipes, on an individual project basis.
- e) Raingardens must have an overflow pit that is connect to the stormwater system.
- f) Flow from raingarden outlet pipe to receiving stormwater drain/pit must be by gravity. Flow by surcharge system is not permitted.
- g) The raingarden location and design must ensure that it will not create an unreasonable impact on building structures and adjoining properties during a flooding or storm event.
- h) For pipe inlets:
  - o The landscaped area shall incorporate the following gap between the pipe and the filter media to minimum scouring and ensure healthy plants: 1m for 100mm pipes, 2m for 150mm pipes, with larger pipes subject to further review.
- i) For paved surface inlets:
  - o The top of filter media must be at least 200mm lower than the pavement at the point where overland flow is directed into the rain garden to ensure free inflows.
- j) For rain garden cross sections and requirements:
  - o Batter slopes shall be no steeper than 1 in 4.
  - o The profile to consist of at least: 150mm detention depth, 400mm of suitable filter media (500 mm preferred), 150mm of transition sand, and 150mm of screening around subsurface drainage.

- Filter media shall have a hydraulic conductivity of between 200mm/hr and 300mm/hr.
- k) Planting: Refer to section 6.5 for suitable robust plant species. Planting density needs to be appropriate to ensure the entire area is covered within 2 years.
- l) A maintenance plan shall be prepared and provide to all new property owners. Maintenance of any WSUD/Raingarden component shall be the asset owner's responsibility and be carried out diligently as per industry standards and in accordance with: [Environmentally Sustainable Design \(merri-bek.vic.gov.au\)](http://www.merri-bek.vic.gov.au)

The following documents may be used as a reference for installation guideline, unless criteria conflict with the above requirements:

- <https://www.clearwatervic.com.au/user-data/resource-files/Aurora-Raingarden-Installation-Guide-for-Verification-manual-180607.PDF>
- <https://www.thehills.nsw.gov.au/Building/Development-Approvals/Subdivision/Rain-Gardens>

### **6.3 Large Scale Developments**

The criteria are the same as for medium scale developments (see section 6.2) plus the additional criteria specified below.

However, Council has an expectation that applications relating to Large Scale developments will be more comprehensive and investigate the opportunities to maximise best practice outcomes in more detail.

#### **Water Sensitive Urban Design on Public Land**

The applicant is encouraged to discuss preliminary WSUD opportunities and constraints with Council officers prior to formalizing a submission. The planning, design and maintenance of WSUD infrastructure should be in accordance with City of Kingston's requirements and the following publications which can be found on Melbourne Water's website:

- Stormwater management > Introduction to WSUD (and associated webpages)
- Wetland Design Manual (December 2020)
- Stormwater management during construction > Sediment management measures

Plus the following documents:

- WSUD Guidelines for Southeastern Councils, Melbourne Water (2012) – refer to <https://www.melbournewater.com.au/sites/default/files/South-Eastern-councils-WSUD-guidelines.pdf>
- [Adoption guidelines for stormwater biofiltration systems: CRC for Water sensitive cities](https://watersensitivecities.org.au/content/stormwater-biofilter-design/) (2015) – refer to <https://watersensitivecities.org.au/content/stormwater-biofilter-design/>

### **Preliminary Approval Phase**

#### **Integrated Water Management Plan (IWMP)/Comprehensive Stormwater Management Strategy**

An IWMP/Comprehensive stormwater management strategy shall be submitted for Council approval prior to proceeding with the detailed stormwater design drawings. The IWMP shall take the form of a comprehensive report with associated functional drawings that demonstrate how the development meets best practice and satisfies Council's requirements.

The IWMP / Comprehensive stormwater management strategy shall address the following:

- Flood management including allowance for overland flow (see section 4)
- A MUSIC program report or approved equivalent demonstrating how best practice WSUD requirements are to be achieved. A copy of all stormwater models (\*.msf, \*.sqz or similar) and summary reports (\*.mrt) must be provided.
- Stormwater network capacity, allowable discharge and onsite detention requirements.

- Integration Between existing and proposed drainage systems.
- Proposed stormwater treatment system details.
- Stormwater quality modelling results (comparison against best practice pollution reduction targets via MUSIC results or approved alternative).
- Comparison of water use demands vs proposed stormwater and rainwater reuse systems.
- Stormwater layout drawings demonstrating how the proposed treatment system and drainage assets will function. Drawings to be based on sufficient preliminary design and investigation of site constraints and levels to confirm the overall feasibility of the recommended solutions.
- Constructability and maintenance considerations including:
  - Silt and erosion control management during and after construction.
  - Strategy for protecting of filter media from construction activity.
  - Maintenance regime including costs, frequency, practicality and access arrangements.
  - Minimising energy use and greenhouse gas emissions
- Conclusions and recommendations

Sustainable Neighbourhoods provisions (Clause 56) introduced by the Department of Sustainability and Environment require all new residential subdivisions to meet the targets within each subdivision.

Refer to Council for further details regarding the applicability of Melbourne Water's *Stormwater Quality Offsets Scheme*.

[http://library.melbournewater.com.au/content/wsud/Stormwater\\_Quality\\_Offset\\_Scheme.pdf](http://library.melbournewater.com.au/content/wsud/Stormwater_Quality_Offset_Scheme.pdf)

## **Detail Design Phase**

WSUD assets that will become the responsibility of Council shall be designed and constructed in accordance with the requirements of section 6.5.

### **Modelling treatment performance**

The Model for Urban Stormwater Improvement Conceptualisation (MUSIC) is a modelling tool that uses historic rainfall data to estimate catchment runoff and predict the performance of WSUD infrastructure. Further information and details on licensing can be found from the [eWater](#) website. It enables a significantly higher degree of modelling complexity and flexibility compared to the STORM calculator.

The MUSIC model should only be used by those with appropriate expertise in the planning, design and modelling of WSUD assets.

WSUD treatment performance should be modelled using MUSIC software or an approved alternative. Modelling can be completed for individual assets or for a collection of WSUD measures.

Refer to the 'Guidelines' webpage at:

<https://www.melbournewater.com.au/building-and-works/developer-guides-and-resources/guidelines-drawings-and-checklists/guidelines> for information on:

- 'Biofiltration system guidelines'
- 'WSUD guidelines'
- 'Tool guidelines', for 'MUSIC Tool Guidelines' (2024) for input parameters and modelling approaches for MUSIC users.
- Rainfall templates and region maps

Stormwater harvesting performance should be determined using a water balance model. Most commonly MUSIC is used for this purpose. STORM and Blue Factor style tools are generally not well suited as they do not support the desired treatment trains and diversions.

Demand profiles in the water balance model are typically estimated as a monthly percentage of an annual demand, however can also be input as seasonal annual demands with variation (according to rainfall or rainfall – PET) or constant daily demands.

The system performance can be measured as a percentage of time that the water supply meets the demand. This can be calculated as a percentage for each time step in the model.

The following table summarises the City of Kingston’s input parameters:

Parameter	Council requirements			
Fraction impervious	Based on land use type. Refer MUSIC Guidelines (Melbourne Water, 2023) as revised for typical values.			
Rainfall data to be used	The Rainfall Distribution Plan in the MUSIC Guidelines (Melbourne Water, 2023) shows Kingston City Council sits within the following rainfall bands:			
	Model type	Rainfall reference station	Reference period	Time step
	Stormwater treatment and harvesting	Melbourne City (MAR 650-750mm) Dandenong (MAR 750-850mm East)	1952-1961 1967-1976	6 minute
Modelling for stormwater treatment	<ul style="list-style-type: none"> <li>▪ Rainfall data and time step should be based table above.</li> <li>▪ Stormwater treatment assets should be chosen based on site characteristics and may include a combination of the following assets: <ul style="list-style-type: none"> <li>○ Wetlands</li> <li>○ Rain gardens, swales &amp; WSUD Tree Pits.</li> <li>○ Rainwater tanks, porous pavers &amp; GPTs.</li> </ul> </li> <li>▪ Achieve Victorian best practice performance objectives.</li> </ul>			
Soil parameters	<ul style="list-style-type: none"> <li>▪ Soil parameters as per Melbourne Water’s guidelines should generally be used.</li> </ul>			
Modelling for reuse	<ul style="list-style-type: none"> <li>▪ Rainfall data and time step should be based on the table above.</li> <li>▪ The input demand profile should be determined for each site.</li> </ul>			

## **6.4 Safety in Design**

The following safety issues should be considered in the detailed design of all private and public assets:

- site access (for construction and maintenance) – for staff and machinery/vehicles.
- safety considerations for construction.
- public access
- appropriate signage to identify risks (for example deep water, use of recycled water, confined spaces etc.).
- batters to open water (refer to Melbourne Water guidelines – wetlands and ponds).
- batters for maintenance – minimum of 1 in 5.
- risks of using recycled water, refer to NWQMS Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 2) – Stormwater Harvesting and Reuse (2009).
- flood depths and water velocities.

## **6.5 Detail Design & Construction of WSUD Assets**

This section applies to the design and construction of WSUD assets that will become the responsibility of Council and may be used as a guide for assets that are privately owned.

Detail design drawings and reports shall be consistent with the approved preliminary design unless otherwise approved by Council. Documentation shall address the following requirements:

### **Rain Garden design**

- Slope batters within 5m of trafficable or pedestrian areas shall not exceed 1 in 5 or alternatively shall be terraced with landscaped steps not exceeding 200mm in height.
- Filter media shall have a hydraulic conductivity of between 200mm/hr and 400mm/hr.
- Exposed landscaped surfaces to be covered with 75mm depth of crushed sandstone with 20mm nominal size.

### **Landscape and planting**

Landscape and planting is an important component of WSUD not only for aesthetics but also for functionality. Landscape and planting plans shall comply with the following requirements:

- Landscape and planting plans shall be submitted with the civil and IWM detailed design plans. All drawings and documents shall be coordinated to ensure the consistency of inter-related details prepared by different consultants.
- The staging of landscaping and planting shall be coordinated to minimise the risk of damage to filter media caused by other surrounding construction activity, including the runoff of silt.
- Refer to section 6.6 for additional requirements.

Species that have proven to perform well within rain gardens constructed within streetscapes around the City of Kingston include:

Native Grass	Ground Cover	Shrubs
Carex Appressa (Tall Sedge) 	Carpobrotus rossii (pigface) 	Goodenia ovata (Hop goodenia) 
Ficinia Nodosa (Knobby Club Rush) 	Myoporum parvifolium (Creeping Boobialla) 	
Lomandra longifolia (Spiny-head Mat-rush) 	Calocephalus lacteus (Milky beauty heads) 	

The following references provide further guidance on landscape and planting:

- Landscape Character Planting Guide (fact sheet)
- WSUD Engineering Procedures: Stormwater – Appendix A Suggested plant species for WSUD treatment elements (Melbourne Water, 2005)
- Constructed Wetlands Guidelines – Appendix 4 Suggested plant species for wetlands (Melbourne Water, 2010)
- CRC for Water Sensitive Cities' reports on vegetation selection for biofiltration systems  
<https://watersensitivecities.org.au/wp-content/uploads/2016/06/AGSBS-A5-Vegetation-selection-for-stormwater-biofilters.pdf> (2015)
- [Adoption Guidelines for Stormwater Biofiltration Systems \(Payne et. al., 2015\)](https://watersensitivecities.org.au/wp-content/uploads/2015/10/TMR_C1-1_AdoptionGuidelinesStormwaterBiofiltrationSystems_2.pdf) .  
[https://watersensitivecities.org.au/wp-content/uploads/2015/10/TMR\\_C1-1\\_AdoptionGuidelinesStormwaterBiofiltrationSystems\\_2.pdf](https://watersensitivecities.org.au/wp-content/uploads/2015/10/TMR_C1-1_AdoptionGuidelinesStormwaterBiofiltrationSystems_2.pdf)



## **6.6 Construction, maintenance and defect liability requirements**

The following construction and maintenance issues should be addressed and documented in the detailed design report:

- All items listed under section 6.1
- timing of construction of WSUD assets within site construction schedule and construction site management including measures to be implemented to protect assets during construction.
- proposed maintenance program including activity description, frequency and cost for plant establishment (first 2 years following construction) and ongoing maintenance and renewal activities.
- asset handover arrangements including education of private owner on maintenance and management responsibilities or checklist for handover to council.
- defect liability period and designation of maintenance and management responsibilities during plant establishment (first 12 months following construction). This is to be responsibility of developer for council owned assets.
- A Site Environmental Management Plan (SEMP) may also be requested following the initial permit application review at the Council's discretion depending on individual site conditions.

The defect liability period applicable to WSUD assets owned by Council will commence following practical completion and is to be a minimum of 12 months unless otherwise agreed at Councils sole discretion. Council may require a longer defects liability period where the circumstances are warranted, or where required by a relevant authority.

## **7. References**

Integrated stormwater management systems are to be designed in accordance with requirements of the latest version of the following documents:

- Victorian Planning Provisions (Clause 55 and 56)
- Urban Stormwater – Best Practice Environmental Management Guidelines (Victorian Stormwater Committee, 1999)
- 1739.1: Urban stormwater management guidance
- Australian Runoff Quality Guidelines (Engineers Australia)
- Australian Rainfall and Runoff (Institute of Engineers Australia)
- Land Development Manual (Melbourne Water)
- Fibre Reinforced Concrete Pipes and fittings (AS 4139-2003)
- Design for Installation of buried concrete pipes (AS 3725-2007)
- On-site domestic wastewater management (AS1547:2012)
- Specification and Supply of Concrete (AS 1379-2007)
- Water Efficient Labelling and Standards Scheme (WELS), Australian Government  
[www.waterrating.gov.au](http://www.waterrating.gov.au)
- Grey Water Use around the Home and Code of Practice – Onsite Wastewater Management EPA Vic, [www.epa.vic.gov.au](http://www.epa.vic.gov.au)
- SDAPP Brochures 3.0 and 4.0 (City of Kingston)
- Melbourne Water MUSIC Guidelines (2023)
- Water Sensitive Urban Design - Engineering Procedures: Stormwater, Melbourne Water, 2005
- Melbourne Water Wetland design manual

- SE WSUD Guidelines
- Kingston's Industry Stormwater Guidebook, 2007
- Builders Stormwater Code of Practice
- Sediment Control Fact Sheet
- Building Site Management Booklet
- State Environment Protection Policy (Waters of Victoria), Environment Protection Authority, 2003
- Urban Stormwater Best Practice Environmental Management Guidelines, CSIRO Publishing 1999
- EPA Publication No. 275 Construction Techniques for Sediment Pollution Control, May 1991
- Water Sensitive Urban Design - Engineering Procedures: Stormwater, Melbourne Water, 2005



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