

Civil Design Requirements for Developers

Part A: Integrated Stormwater Management

Version 5

September 2018



REVISIONS & AMENDMENTS

Version Number	DETAILS	PREPARED BY	ENDORSED BY	APPROVED BY	DATE APPROVED
1		Colin Myers	Brian Trower	Warren Ashdown	10/11/98
1	Amendment to Pit Lids.	Colin Myers	Brian Trower	Warren Ashdown	15/12/99
2	Revision of all sections.	Colin Myers	Brian Trower	Warren Ashdown	27/9/00
2	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	19/7/01
3	Division of Stormwater Management and Road Design into Part A and Part B, respectively. Revision of all sections. Addition of treatment, reuse and conservation sections.	Alan West	Brian Trower	Peter Bain	12/6/13
4	Reformatting and minor revisions	Roshan Khanal	Brian Trower	Peter Bain	23/5/16
5	Reformatting and minor revisions	Emily Boucher	Brian Trower	Rachelle Quattrocchi	11/09/2018

List of Abbreviations

BPEM - Best Practice Environmental Management

FO - Floodway Overlays

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.

IWM - Integrated Water Management

LSIO - Land Subject to Inundation Overlays

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.

MUSIC - Model for Urban Stormwater Improvement Conceptualization

SBO - Special Building Overlays

A planning scheme control that identify areas prone to overland flooding.

SEMP - Site Environmental Management Plan

STORM - Stormwater Treatment Objective Relative Measure

WSUD - Water Sensitive Urban Design

Table of Contents

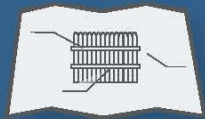
1. INTRODUCTION	6
2. DEVELOPMENT SIZE	7
2.1. General Requirements	9
2.2. Safety in Design	10
3. FLOOD MANAGEMENT	11
3.1. Overland Flowpaths	11
3.2. Floor Levels	11
3.3. Basement Garages	12
3.4. Additional requirements for Large Scale developments	12
4. DRAINAGE SYSTEMS	13
4.1. Permissible Site Discharge (PSD)	13
5. ONSITE DETENTION	15
5.1. Gravity Flow Systems	15
5.2. Infiltration Systems	15
5.3. Pumped Systems	16
6. COUNCIL DRAINAGE SYSTEMS	17
6.1. Minor Flow Objectives	17
6.2. Minimum Pipe Size	17
6.3. Pipe Flow Velocity	17
6.4. Pipe Depth	17
6.5. Pipe Material	17
6.6. Pipe Class	17
6.7. Reinstatement	18
6.8. Sub-soil Drains	18

6.9.	Property Drain connections to Council Drain	18
6.10.	Stormwater Pits	18
7.	STORMWATER TREATMENT AND REUSE	20
7.1.	Modelling treatment performance	21
7.2.	Rainwater Tanks	22
7.3.	Bioretention Systems / Raingardens	22
7.4.	Construction, maintenance and defect liability requirements	25
7.5.	Use of propriety products for stormwater quality treatment	25
8.	DOCUMENTS TO BE SUBMITTED	26
9.	REFERENCES	28

once I know my permit type...

PREPARE AN APPLICATION

1



DRAW UP A PLAN

It's a good idea to discuss this with your neighbours early.

2



DISCUSS WITH COUNCIL

A pre-application meeting will identify any issues early. Also check if you need a building permit or other type of council permit.

3



PREPARE YOUR APPLICATION

See our Planning Guides and Checklists to find out what information must be included in your plans and other documents.

4

LODGE YOUR APPLICATION

Mail or visit us to lodge your completed application

understanding

THE PLANNING PROCESS

how do I get a planning permit?

BUILDING A SHOP, COMMERCIAL OR INDUSTRIAL PREMISES

BUILDING OR RENOVATING A HOME

LANDSCAPING

ADVERTISING SIGNS

SELLING OR SERVING ALCOHOL

CHANGES TO CAR PARKING PROVISIONS

CHANGING THE USE OF A PREMISES

SUBDIVIDING



find out the...

RULES THAT APPLY TO YOU

Contact the Planning Team for advice or to organise a pre-application meeting:

go to
kingston.vic.gov.au/
planning

call
(03) 9581 4131

email
info@kingston.vic.gov.au

visit us
1230 Nepean Hwy
Cheltenham

post
PO Box 1000
Mentone VIC 3194

what happens

ONCE I HAVE LODGED AN APPLICATION

5



FURTHER INFORMATION MAY BE REQUESTED

Help skip this step by following the pre-application meeting process and using our Planning Guides and Checklists.

6



FEEDBACK IS SOUGHT FROM THOSE WHO MIGHT BE IMPACTED



ADVERTISING

Neighbours and community are notified and may lodge an objection. A meeting with objectors and Council Officers may be required to resolve any issues.



REFERRALS

Relevant Council experts and/or external agencies may be asked for advice on the proposal.

7



YOUR APPLICATION IS ASSESSED

A report is produced that assesses your proposal against the regulations in the Kingston Planning Scheme.

8



A DECISION IS MADE



APPROVAL

Council will decide either to 'approve' or 'refuse' the application, or issue a 'Notice of Decision to Grant a Permit' which means it will approve the application in 30 days time unless an appeal is lodged with VCAT.



REFUSAL



NOTICE OF DECISION

9



VCAT APPEAL

Applicants and objectors can appeal decisions at the Victorian Civil Administrative Tribunal. Set time frames apply.

10



LODGE FINAL PLANS WITH COUNCIL

If your permit has conditions which require changes to your plans, updated plans must be approved by Council before you can proceed.

call Customer Service on
1300 653 356

11



ENSURE YOU HAVE ANY OTHER PERMITS REQUIRED

Once you have planning approval you may need other permits or licenses, such as building or health permits, or a liquor license. Contact Customer Service on 1300 653 356 for more information.

1. Introduction

The City of Kingston recognizes that stormwater runoff from our streets, roofs and other impervious areas has a negative impact on downstream receiving waters including Mordialloc Creek, Patterson River and Port Phillip Bay.

Increased development can increase the amount of hard and impervious surfaces such as buildings, roads and car parks, this in turn changes the volume, velocity and quantity of stormwater draining into natural waterways. Traditional stormwater management practices direct stormwater untreated into urban waterways affecting the health and amenity of waterways. Large volumes of stormwater can cause flooding that damages both natural and built environments.

Integrating Water Sensitive Urban Design (WSUD) to capture, treat and reuse stormwater onsite can significantly improve the quality and quantity of water entering our waterways. Stormwater treatments can take various forms including wetlands, bio-retention systems, storage tanks and specialist paving.

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

Part A: Integrated Stormwater Management (this document)
which explains the requirements for addressing all aspects of stormwater management

AND

[Part B: Roads Design Standards and Presentation of Design](#)

which explains the presentation standards for submitting detailed drainage design plans and external roadwork plans for subdivision and council assets.

This Part A document is intended for use by consultants with appropriate expertise and experience in the design, construction and maintenance of stormwater infrastructure. Detailed drainage designs are required to be based on Council endorsed plans. Where required, the external references listed under [Section 9](#) 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 and scale of development; taking into consideration the risks and opportunities associated with each.

Drainage requirements are often outlined in planning permit conditions and the level of documentation required for scale of development is outlined here:

Type of Development	Application Requirements
Small Scale <ul style="list-style-type: none"> Residential and/or mixed use developments of 1 to 2 dwellings Residential developments and/or mixed use developments with new building gross floor area and /or an increase in impervious area less than 500m² 	<ul style="list-style-type: none"> A satisfactorily completed Application for Drainage/Civil Approval and Drainage Declaration Forms explaining: <ul style="list-style-type: none"> Compliance with conditions specified in planning permit Compliance of all private stormwater drainage with Plumbing and Drainage AS/NZS 3500.3:2015 How prevention of inundation of buildings, garages or carports from overland flow caused by 1 in 100 year storm events is achieved. How stormwater discharge onto adjoining properties is prevented. Compliance with City of Kingston permissible site discharge Compliance with required on site storage volumes Public drainage assets designed in compliance with Part B How best practice Water Sensitive Urban Design requirements are achieved Minimum 2,000L rainwater tank connected for toilet flushing for each new dwelling.
<ul style="list-style-type: none"> Non-residential developments with new gross floor area and / or an increase in impervious area less than 500m² 	<ul style="list-style-type: none"> Compliance with all conditions outlined in permit and as directed by the responsible authority
Medium Scale <ul style="list-style-type: none"> Residential and/or mixed use developments of 3 –to 9 dwellings Non-residential developments with new building gross floor areas and / or an increase in impervious areas that are between 500m² and 1,000m² Subdivisions of vacant land between 1,000m² and 4,999m² 	<ul style="list-style-type: none"> A satisfactorily completed Application for Drainage/Civil Approval and Drainage Declaration Forms explaining: <ul style="list-style-type: none"> Compliance with conditions specified in planning permit Compliance of all private stormwater drainage systems with Plumbing and Drainage AS/NZS 3500.3:2015 How prevention of inundation of buildings, garages or carports from overland flow caused by 1 in 100 year storm events is achieved. How stormwater discharge onto adjoining properties is prevented. Compliance with City of Kingston permissible site discharge Compliance with required on site storage volumes Public drainage assets designed in compliance with Part B How best practice Water Sensitive Urban Design requirements are achieved and /OR partial or full contribution to Stormwater Quality Offset scheme A STORM report demonstrating how the proposal achieves 100% rating.
Large Scale	<ul style="list-style-type: none"> A satisfactorily completed Application for Drainage/Civil Approval and Drainage Declaration Forms explaining: <ul style="list-style-type: none"> Compliance with conditions specified in planning permit

Type of Development	Application Requirements
<ul style="list-style-type: none"> • Residential and/or mixed use developments of 10 or more dwellings • Non-residential developments with new building gross floor area and / or an increase in impervious area greater than 1,00m² • Subdivision of vacant land greater than 4,999m² • Subdivision of land involving public road networks or public open space as determined by Council 	<ul style="list-style-type: none"> ○ Compliance of all private stormwater drainage with Plumbing and Drainage AS/NZS 3500.3:2015 ○ How prevention of inundation of buildings, garages or carports from overland flow caused by 1 in 100 year storm events is achieved. ○ How stormwater discharge onto adjoining properties is prevented. ○ Compliance with City of Kingston permissible site discharge ○ Compliance with required on site storage volumes ○ Public drainage assets designed in compliance with Part B ○ How best practice Water Sensitive Urban Design requirements are achieved and /OR partial or full contribution to Stormwater Quality Offset scheme • An Integrated Water Management Plan (IWMP) including a Water Sensitive Urban Design Response • A MUSIC program output demonstrating how WSUD requirements have been achieved.

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

In determining an application, the Responsible Authority will consider the following, as appropriate:

2.1. General Requirements

1. Typical requirements that may be imposed on a planning permit or at the building permit stage may include:
2. Stormwater drainage of the site must be provided so as to prevent any overflows onto adjacent properties and be directed to the nominated point of discharge.
3. All internal drainage works must be in accordance with [AS/NZS 3500.3: 2015 Stormwater Drainage](#).
4. All drainage designs shall comply with [2016 Rainfall Intensity, Frequency and Duration \(IFD\) Data](#) available via the [Bureau of Meteorology](#).
5. All concrete works must comply with AS3600 - Concrete Structures Code. Minimum allowable concrete compressive strength is 32 MPa” at 28 days.
6. 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.
7. The Contractor must contact Council’s Development Engineer on 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.
8. Road Opening permits and applicable fees apply to connections to Council assets.
9. Plan Checking and Construction Supervision fees apply to all works which will become Council assets.
10. The provision of minimum 2000 litre rainwater tank clearly nominated for each new dwelling with water re-used for toilet flushing.
11. The location of the existing trees to be retained and proposed trees as indicated on the endorsed landscape plans must be verified prior to drainage works commencing, and any conflict must be reported to the designer for re-design. 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.
12. 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.
13. All construction must comply with City of Kingston [Getting it Right on Your Building Site](#) booklet.
14. 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.
15. At the completion of construction works, all areas disturbed during the construction are to be reinstated by the Contractor at the Contractor’s cost.

2.2. 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
<https://www.melbournewater.com.au/sites/default/files/Constructed-waterways-in-urban-developments-guidelines.pdf> (page 16)
<https://www.melbournewater.com.au/sites/default/files/2017-12/Wetland-Design-Manual-PartA2.pdf> (page 21))
- 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

All construction must comply with City of Kingston [Getting it Right on Your Building Site](#) booklet. Silt loads from construction activity is a primary cause of stormwater assets becoming prematurely clogged and ineffective. Works should be staged so that the construction of water sensitive urban design elements containing filter media is one of the last activities undertaken.

3. Flood Management

All developments regardless of scale must be designed to cater for 1 in 100 year storm events and shall address the following requirements as a minimum:

3.1. Overland Flowpaths

The drainage system shall be designed such that flooding from a 1 in 100 year storm will not:

- i. Flow over private property other than through a designated floodway (which may include streets, parks & easements);
- ii. (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 in 100 year average recurrence interval (ARI) 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 1 in 100 year flows from the upstream catchment.

3.2. Floor Levels

All developments within Special Building Overlay (overland flow path) shall cater for the following freeboard above designated flood levels:

Building Type	Minimum freeboard
Main buildings / Extensions	300mm
Outbuilding / garage	150mm

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

In areas close to the coast or subject to risk of inundation from sea-level rise, floor levels should also account for the following sea-level rise forecasts as per Clause 13.01-1 Kingston Planning Scheme:

In planning for possible sea level rise, an increase of 0.2 meter over current 1 in 100 year flood levels by 2040 may be used for new development in close proximity to existing development (urban infill).

Plan for possible sea level rise of 0.8 meter by 2100 and, and allow for the combined effects of tides, storm surges, coastal processes and local conditions such as topography and geology when assessing risks and coastal impacts associated with climate change.

3.3. Basement Garages

The pavement level at the entrance into basements shall be designed and constructed a minimum of 100mm above the 1 in 100 year 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.

3.4. Council does not accept sub-surface water (groundwater) discharging into the stormwater system. It is the responsibility of the developer to dispose of any groundwater either on site or reach an agreement with the local sewer authority. This is particularly relevant for basement and subsurface structures. Refer to Council's [Basements and Deep Building Construction Policy 2014](#) and supporting [Basements and Deep Building Construction Guidelines 2014](#) for further details. Flood proof apex to protect the property from any overland flows may be also required for development sites where the land falls to rear from the street and when the 1 in 100 year flood cannot be safely contained within the road reserve. Refer to issued planning permit for any flood proof apex condition. Additional requirements for Large Scale developments

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 100 year ARI storm event.

All building entrances, outdoor access areas, ingress and egress routes, streets, driveways, footpaths and cycle paths that are subject to flooding must meet 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. Drainage Systems

The following requirements apply to the design and construction of privately owned and maintained drainage assets (also noting requirements of section 5.2 where assets will become the responsibility of Council):

- Stormwater is not permitted to flow onto adjacent properties.
- All private drainage shall be designed in accordance with [Plumbing and Drainage AS/NZS 3500.3:2015](#).
- 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 discharging from the site shall not exceed the 'Permissible Site Discharge' as detailed in the following section.
- No private drainage works shall be located within easements unless specifically requested by Council.
- An application for a '[Legal point of Discharge](#)' must be submitted. Council will provide drainage information and conditions. Only one nominated legal point of discharge can be used per site unless otherwise negotiated with Council. For connections into Council pipes, the Council pipe must be 225mm diameter or larger. All pipes located under structures (buildings and/or garages) are to be a minimum of 150mm diameter.
- The drainage designer must complete and submit the City of Kingston's: '[Application for Drainage / Civil Approval and On-site Drainage Declaration Form](#)' 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 available in [Part B](#).

4.1. Permissible Site Discharge (PSD)

The maximum piped stormwater discharge from the site shall not exceed the following requirements.*

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

- 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 1000m²
- For the lots greater than 1000m² as determined by the designer based on the critical storm duration ([see 2016 IFD data](#)).
- The difference in discharge rates between $C=0.4$ and post development (as a result of increased site imperviousness based on a 1 in 5 year ARI) shall be stored in accordance with the 'Onsite Detention' requirements detailed below.

* 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.

- For infiltration / soakwell system designs permissible site discharge shall be calculated on the basis of subject site's soil saturated hydraulic conductivity (permeability) and provided surface area for infiltration. More details are available in the following sections.

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

- 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 for lots greater than 1000sqm ([see 2016 IFD data](#)).
- Industrial developments shall store the difference between the 'permissible site discharge' rate (based on 1 in 10 year ARI) and the discharge rate for the proposed development based on a 1 in 10 year ARI storm event.
- Commercial developments shall store the difference between the 'permissible site discharge' rate (based on 1 in 10 year ARI) and the discharge rate for the proposed development based on a 1 in 10 year ARI storm event.
- For infiltration / soakwell system design permissible site drainage shall be calculated on the basis of subject site's soil saturated hydraulic conductivity (permeability) and provided surface area for infiltration.
- Refer to 'Onsite Detention' requirements detailed below.

5. Onsite Detention

5.1. Gravity Flow Systems

Onsite detention systems shall be designed in accordance with [Plumbing and Drainage AS/NZS 3500.3:2015](#) and the following requirements:

- All areas of the subject site including buildings, garages, driveways, paved areas and open space must be included with appropriate run-off coefficients in calculations of the onsite detention system design
- All rainwater tanks designed for water reuse shall be a minimum of 2,000 litres for each dwelling and connected to a minimum roof area of 50m² (unless otherwise approved). Refer to Rainwater Tank Section for further guidance.
Rainwater tanks designed for water reuse 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.
- Appropriate orifice / flow restriction devices must be provided to separate the storage volume of water from reused volume in tanks larger than 2,000L or other systems as approved.

5.2. Infiltration Systems

Acceptance of soakwells is subject to Council approval. Where infiltration/soakwell systems are proposed, an application must include:

- A soil report carried out by a geotechnical engineer. The soil test report must provide details of soil type, saturated hydraulic conductivity of the soil and groundwater table of the site;
- Only soils with a minimum saturated hydraulic conductivity of 100mm/hr (homogeneous sand and sandy clay) will be acceptable for infiltration system design.
- The design computation of infiltration system must be based on soil's saturated hydraulic conductivity / soil permeability in accordance with '[Australian Runoff Quality – A Guide to Water Sensitive Urban Design](#)'. Design computations based on percolation rate of the soil will not be acceptable to Council.
- The infiltration / soakwell system must be a minimum of 500mm above the groundwater table as demonstrated in the soil test report.
- The outside edge of the soakwell must be at least 2m away from building foundations and property boundaries.
- Calculations shall be based on the Rational Method, Swinburne Method (OSD4) or Boyd Method and designed to cater for the following criteria:
 - 1 in 5 year ARI with piped overflow connected to the Council drainage system, or
 - 1 in 10 year ARI without a piped overflow but with an acceptable overland flow path.
 - 1 in 100 year capacity at trapped low points.
- The total outflow discharge of the proposed / designed infiltration area (L/s) shall be considered as permissible site discharge for the site when infiltration system is proposed. Only 50% of all side walls of the proposed soakwell / infiltration system shall be taken into account for total design infiltration area calculation.
- Soakwell / infiltration system with Atlantis modules or equivalent must be installed with a minimum 300mm or 600mm cover depending on load.

- The infiltration system must be protected from silt during construction works to maintain the designed infiltration rate

5.3. Pumped Systems

Where a property falls to the rear and it is not possible for the stormwater to be discharged by gravity to a Council drain a pumped system may be used. It must be designed in accordance with [Plumbing and Drainage AS/NZS 3500.3:2015](#). The approval of a pumped system is subject to the following conditions:

- Design is to be for a 1 in 10 year ARI
- The pump discharge must be directed to a pit located at the front property boundary and then discharged by gravity to the kerb via a 100mm diameter house drain. This pit is to have a grated lid and positioned so as any overflow is directed to the street not to neighbouring properties.
- The pit containing the pumps must be in an accessible location and clear of any easements within the property.
- Overflow from the pit containing the pump may be directed to an above ground on-site stormwater detention system within the site (eg landscaped, driveway carpark areas) to prevent flooding or nuisance to adjacent property owners.
- Pump flow rate cannot exceed permissible site discharge.
- Pumps should be in duplicate (so that one is on standby should the primary pump fail)
- Rainwater tank storage is not to be included as part of volume contribution.

6. Council Drainage Systems

This section provides additional clarification on the design and construction of drainage assets that will become the responsibility of Council. Designs must be consistent with specifications outlined in [City of Kingston Standard Drawings](#) or liaise with Melbourne Water (when required).

6.1. Minor Flow Objectives

Councils 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:

Land Use	Storm Frequency	Coeff. of Runoff
Residential	1 in 5 year storm	0.6
Commercial	1 in 20 year storm	0.9
Industrial	1 in 10 year storm	0.9

6.2. Minimum Pipe Size

- Pipes to be maintained by Council: 225 mm diameter
- Pipe sizes shall not decrease downstream.

6.3. Pipe Flow Velocity

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

6.4. Pipe Depth

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

6.5. 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)

6.6. 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.

6.7. 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 450mm x 450mm flushing pit with a 750mm x 750mm concrete frame and lid insert. Pit walls and base to be 150mm thick.

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

6.8. 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 100mm dia. SN8 sewer quality UPVC, with an inspection opening placed at each change of direction.
- Property drains shall connect to Council drainage pipe 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 a property drain connects to a Council drain in an easement, 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

6.9. 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.

The following pit lids shall be specified unless otherwise approved:

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

7. Stormwater Treatment and Reuse

Integrating Water Sensitive Urban Design (WSUD) is now a requirement under the City of Kingston Planning Scheme (Section 22.20). Early consideration of WSUD ensures a sustainable approach to managing rain water and stormwater run-off and can include fit-for-purpose water use where potable water is not required (e.g. toilet flushing and garden irrigation).

City of Kingston has a strong focus on encouraging 'green' and 'blue' infrastructure which has multiple benefits to our community (including cooling, biodiversity and habitat). Vegetated infrastructure in the form of swales, infiltration pits, wetlands, bioretention systems and raingardens are Council preferred method of water quality treatment.

This Part A document follows the [Best Practice Environmental Management Guidelines \(BPEM\)](#) which have established stormwater quality objectives to help determine the level of stormwater management necessary to meet the [State Environment Protection Policy \(Waters of Victoria\)](#) objectives. This SEPP is a statutory policy under section 16 of the Environment Protection Act 1970 that identifies the beneficial uses of Victoria's waterways.

SEPP (Waters of Victoria) requires measures to be implemented to control the environmental impact of stormwater pollution. The BPEMG sets best-practice performance objectives for urban stormwater to help meet the policy's requirements. It is compulsory under the [Sustainable Neighbourhoods Clause 56 of the Victoria Planning Provisions](#) to design and manage urban stormwater management systems for all new residential subdivisions to meet current BPEM objectives. These objectives are:

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

Type of Development	Mandatory Requirements
Small Scale <ul style="list-style-type: none"> • Residential and/or mixed use developments of 1 to 2 dwellings • Residential developments and/or mixed use developments with new building gross floor area and/or an increase in impervious area less than 500m² 	<ul style="list-style-type: none"> • Compliance with all planning permit conditions • At least a 2,000 liter rainwater tank must be provided to <u>each</u> new dwelling (connected to a minimum 50m² roof catchment) with water reused for toilet flushing.
<ul style="list-style-type: none"> • Non-residential developments with new gross floor area and/or an increase in impervious area less than 500m² 	<ul style="list-style-type: none"> • Compliance with all conditions outlined in permit and as directed by responsible authority
Medium Scale <ul style="list-style-type: none"> • Residential and/or mixed use developments of 3 –to 9 dwellings • Non-residential developments with new building gross floor area and/or an increase in impervious area between 500m² and 1,000m² • Subdivisions of vacant land between 1,000m² and 4,999m² 	<ul style="list-style-type: none"> • Compliance with all planning permit conditions • A STORM report achieving 100% rating And /OR partial or full • Contribution to Stormwater Quality Offset scheme
Large Scale <ul style="list-style-type: none"> • Residential and/or mixed use developments of 10 or more dwellings 	<ul style="list-style-type: none"> • A MUSIC program output with input data demonstrating how WSUD requirements have been achieved And /OR partial or full

<ul style="list-style-type: none"> Non-residential developments with new building gross floor area and/or an increase in impervious area greater than 1,000m² 	<ul style="list-style-type: none"> Contribution to Stormwater Quality Offset scheme
<ul style="list-style-type: none"> Subdivision of vacant land greater than 4,999m² Subdivision of land involving public road networks or public open space as determined by Council 	<ul style="list-style-type: none"> Sustainable Neighbourhood provisions (Clause 56) introduced by the Department of Sustainability and Environment require all new residential subdivisions to meet the targets within each subdivision.

7.1. Modelling treatment performance

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

Refer to the MUSIC Guidelines (Melbourne Water, 2010) for more information on treatment nodes and associated input parameters.

Stormwater harvesting performance should be determined using a water balance model. MUSIC can provide a basic water balance model, however in some cases this may not be accurate enough and a more detailed model may need to be used. Demand profiles in the water balance model are typically estimated as a monthly percentage of an annual demand, however can also be input as an annual demand or daily demand. 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 MUSIC input parameters:

Parameter	Council requirements			
Fraction impervious	Based on land use type. Refer MUSIC Guidelines (Melbourne Water, 2010) for typical values.			
Rainfall data to be used	The Rainfall Distribution Plan in the MUSIC Guidelines (Melbourne Water, 2010) shows Kingston City Council sits within the following rainfall bands:			
	Model type	Rainfall reference station	Reference year	Time step
	Stormwater treatment	Melbourne City (MAR 650-750mm) Koo Wee Rup (MAR 750-850mm)	1966 2004	6 minute
	Stormwater harvesting	Melbourne City (MAR 650-750mm) Koo Wee Rup (MAR 750-850mm)	Up to 10 years of data	1 day
Modelling for stormwater treatment	<ul style="list-style-type: none">▪ Achieve Victorian best practice performance objectives.▪ Rainfall data and time step should be based table above.▪ 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">○ Wetlands,○ Rain gardens, swales & WSUD Tree Pits,○ Rainwater tanks, porous pavers & GPTs.			
Modelling for reuse	<ul style="list-style-type: none">▪ Rainfall data and time step should be based on the table above.			

- | | |
|--|--|
| | ▪ The input demand profile should be determined for each site. |
|--|--|

7.2. Rainwater Tanks

Tanks should be installed following [Guidance on use of Rainwater Tanks \(March 2011\)](#).

The following standards for rainwater tanks apply:

- The recommended tool for sizing tanks is the *Alternative Technology Association's Tankulator*. Details are available at www.tankulator.ata.org.au
- All tanks shall be a minimum of 2,000 litres for each dwelling and connected to a minimum roof area of 50m² 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 or laundry. See [SDAPP facts sheet 3.0 – Water Efficiency](#) for further information.
- Pump size to be selected considering system end use flow demand for optimal pump energy efficiency.
- Rainwater tanks can contribute towards onsite detention 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.
- Appropriate flow restriction device (orifice) must be provided to separate the storage volume of water from the reused volume on tanks larger than 2,000 litres or other systems as approved.

7.3. Bioretention Systems / Raingardens

Raingardens or bioretention systems are soil based systems that remove pollutants from runoff via infiltration through soil media. Successful implementation of raingardens require careful design & planning with consideration of the soils hydraulic and horticultural properties. Effective raingardens require planting as the plant roots promote porosity and assist in pollutant removal.

Raingardens typically consist of the following layers:

- Mulch – to suppress weeds and retain moisture within the underlying filter media;
- Filter – soil layer which acts as a pollutant filter and supports plant growth
- Transition layer – layer to separate filter layer from the drainage layer to avoid clogging of drainage pipe
- Drainage layer – free draining layer containing perforated drainage pipe

Minimum Requirements

- All bioretention system or raingardens must be designed to comply with the following Council requirements, unless otherwise approved by Council, irrespective of whether they will become private or Council assets:

- The filter media footprint shall be a minimum of 2m² regardless of the calculated size. This is required to promote healthy plant growth and minimise the risk of partial silting of the surface.
- The filter media footprint shall be located a distance away from a pipe discharging water (e.g a downpipe) to minimise the risk of scouring. The minimum distance shall be 10 x the pipe diameter (e.g 1m for a 100mm dia pipe) and shall typically consist of the rock lined swale.
- The filter media depth shall not be less than 400mm unless otherwise approved by Council.
- The raingarden shall be designed with a 150mm detention depth (measured from the top of the finished mulch layer) before water overtops into a grate pit or via a bypass arrangement.
- The invert of a pipe discharging water (e.g a downpipe) shall be set at a minimum of 150mm above the top of the finished mulch layer.
- Slope batters within 3m of trafficable or pedestrian areas shall not exceed 1 in 5 or alternatively shall be terraced with landscaped steps not exceeding 200mm in height.
- The filter media shall be covered with a suitable aesthetic mulch layer that does not float. E.g 75mm depth of crushed sandstone with 20mm nominal size.
- In some cases it may be necessary to install an impervious liner to contain the raingarden to prevent infiltration into the surrounding soil.

The following guidelines apply to the design and construction of Raingardens:

Mulch

Stone mulch should be applied in a 75mm layer across the surface of the filter prior to planting. Mulch should be even, neat in appearance and kept clear of plant stems to avoid collar rot. The finish level of the mulch is to be equivalent to the finish grade of the top of the filter to preserve the extended detention storage volume. Stone aggregate should be screened and contain no fine material. 100% of the particles should be in the size range 13 – 20mm.

Filter Media

The filter media shall preferably be a 'washed sand' i.e. one that has been mined and processed. Natural soils or topsoils are not appropriate due to their variable physical characteristics and potential to contain weed seeds. However because the filter media is required to support plant growth testing is required to determine its horticultural properties and if remediation is required. The filter media should be in a pH range of 5.5 – 7.5; have electrical conductivity less than <0.17mS/cm and have total salts less than 500ppm.

Filter media shall have a saturated hydraulic conductivity in the range of 250 – 350mm/h. This is a critical element for a bioretention system. Hydraulic conductivities higher than this will not allow adequate time in the filter for pollutant uptake and hydraulic conductivities below this range are more susceptible to clogging over time.

Filter materials which comply with the particle size grading outlined below will generally meet saturated hydraulic conductivity specifications of 180mm/h to 250mm/h.

Description	Proportion	Grading
Clay	2 – 4 %	< 0.002 mm
Silt	4 – 8 %	0.002 – 0.05 mm
Very Fine Sand	5 – 10%	0.05 – 0.15 mm
Fine Sand	10 – 25%	0.15 – 0.25 mm
Medium to Coarse Sand	60 – 70%	0.25 – 1.0 mm
Coarse Sand	7 – 10 %	1.0 – 2.0 mm
Fine Gravel	<3%	2.0 – 3.4 mm

Testing Requirements

To determine whether a filter media is suitable, the following test are to be undertaken prior to its delivery:

- Saturated hydraulic conductivity – AS4419 (the soil conductivity must be in the range of 180 – 250 mm/h)
- Particle size distribution – AS1141.11

Please note: saturated hydraulic conductivity is the critical performance factor and materials which fall outside the desired grading envelope should not be used.

Transition Layer

A transition layer is required when the drainage layer is fine gravel. The transition layer should be a sand/coarse sand material, generally applied in a 100mm layer. A suitable product is washed A2 filter sand (as per VicRoads Specification) with 90% of particles retained above 0.25mm.

Drainage Layer

The drainage layer should be a minimum of 100mm thick. Suitable materials include coarse sand (coarser than the transition layer) or fine gravel in the range of 4mm – 7mm (scoria is not considered a suitable material for this application).

The agricultural pipe is to be placed on an even bed of 20mm depth of aggregate over the base and be surrounded and covered with a minimum 20mm depth of aggregate over the pipe.

Landscaping and Planting

Landscape and planting is an important component of WSUD not only for aesthetics but also for functionality. Landscape and planting plans are to be submitted with the detailed design.

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

Plants	Ground Cover
Lomandra longifolia (Spiny-head Mat-rush)	Carpobrotus glaucescens (coastal pigface)
Ficinia Nodosa (Knobby Club Rush)	Myoporum parvifolium (Creeping Boobialla)
Gaura lindheimeri (Butterfly Bush)	

7.4. 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.
- 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.
- 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.
- 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. Council may require a longer defects liability period where the circumstances are warranted, or where required by a relevant authority.

7.5. Use of propriety products for stormwater quality treatment

City of Kingston does not support the use of any propriety product for the purpose of stormwater quality treatment (other than gross pollutant removal).

Any proposal of such propriety products for Council approval must be provided with, as a minimum, the following documents and must be to Council satisfaction:

- Evidence that the proposed propriety product has been tested by an independent third party and that it meets BEPM objectives or better;
- A defect liability period – fully funded by the support for a minimum of 2 years;
- The life cycle costs of the proposed product;
- A comprehensive maintenance plan

Council needs to ensure that adequate lifecycle budget and technical expertise to manage and maintain the proposed system is available prior to considering the use of such propriety products for pollutant removal purposes.

8. Documents to be Submitted

The applicant's proposed approach to stormwater management 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 documentation must be submitted as part of the Council approval process. All stormwater management / drainage documentation must be submitted on line. Refer to Council website for details: <https://www.kingston.vic.gov.au/Property-and-Development/Engineering-Assessments>

Further information maybe be requested where documentation is incomplete or at Council's discretion based on individual site or development characteristics.

Small Scale

- A signed copy of Kingston's '[Application for Drainage / Civil Approval and 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 (must be at least A3)
- 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.
- Soil and percolation test report and computations (where applicable - see [section 5.2](#)).

Medium Scale

- A signed copy of Kingston's '[Application for Drainage / Civil Approval and 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 3](#)).
 - (ii) [on-site](#) and [council drainage requirements](#) (see [section 4](#) & [section 6](#)).
 - (iii) Stormwater treatment & reuse requirements (see [section 7](#)).
- Drainage reports (e.g detention systems, pumps, soil and percolation tests & soakwell design) and computations confirming onsite detention storage requirement (see [section 5](#)).
- A copy of a STORM program output demonstrating how the proposal achieves 100% storm rating OR a [request for quote](#) to pay a fixed contribution towards Council managed off-site stormwater quality projects

Large Scale

- An 'Integrated Water Management Plan' in the form of a comprehensive report that addresses all the Water Sensitive Urban Design requirements.
- MUSIC model outputs demonstrating how the proposal achieves best practice objectives (these must be calculated using the specified [input requirements](#)) OR a [request for quote](#) to pay a fixed contribution towards Council managed off-site stormwater quality projects
- Stormwater layout drawings demonstrating how the proposed treatment system and drainage assets will function.
- A signed copy of Kingston's '[Application for Drainage / Civil Approval and On-site Drainage Declaration Form](#)' will be required if the development includes private drainage assets

Drainage design plans and drafting standards

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

- Plan to be drawn to scale at 1:100, 1:200 or 1:250.
- Plans size shall be a minimum of A3 with all text legible.
- Plans to include the following information as a minimum:
 - North point
 - Layout Plan showing all dwelling and drainage alignments (existing as well as proposed) including grades and level of pipes
 - 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
 - Floor levels of all dwellings and garages (consistent with endorsed development / architectural plans, if applicable)
 - Percentage of impervious area on development site
 - Engineers contact details
 - Easements and council assets
 - Overland flow paths
 - Flood proof apexes as required
 - All other additional details as directed by Council.

9. References

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

- [Victorian Planning Provisions \(Clause 55 and 56\)](#)
- [State Environment Protection Policy \(Waters of Victoria\), Environment Protection Authority, 2003](#)
- [Urban Stormwater Best Practice Environmental Management Guidelines \(CSIRO Publishing 1999\)](#)
- [Australian Runoff Quality Guidelines \(Engineers Australia\)](#)
- [Australian Rainfall and Runoff \(Institute of Engineers Australia\)](#)
- [Bureau of Meteorology Rainfall Intensity, Duration and Frequency Data](#)
- [Design, construction and establishment of constructed wetlands: design manual](#)
- [Fibre Reinforced Concrete Pipes and fittings \(AS 4139-2003\)](#)
- [Design for Installation of buried concrete pipes \(AS 3725-2007\)](#)
- [Specification and Supply of Concrete \(AS 1379-2007\)](#)
- [Grey Water Use around the Home and Code of Practice – Onsite Wastewater Management EPA](#)
- [Melbourne Water MUSIC Guidelines \(2010\)](#)
- [Water Sensitive Urban Design - Engineering Procedures: Stormwater, Melbourne Water, 2005](#)
- [EPA Publication No. 275 Construction Techniques for Sediment Pollution Control, May 1991](#)
- [Water Sensitive Urban Design - Engineering Procedures: Stormwater, Melbourne Water, 2005](#)
- [Water Efficient Labeling and Standards Schemes \(WELS\), Australian Government](#)



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