

# Issues Paper

DELWP

*for the  
Improving Stormwater Management  
Advisory Committee  
June 2018*



Front cover and website image courtesy of GHD. Rain-garden at Edinburgh Gardens. GHD completed the project on behalf of the City of Yarra and Melbourne Water

© The State of Victoria Department of Environment, Land, Water and Planning 2018



This work is licensed under a Creative Commons Attribution 4.0 International licence. You are free to re-use the work under that licence, on the condition that you credit the State of Victoria as author. The licence does not apply to any images, photographs or branding, including the Victorian Coat of Arms, the Victorian Government logo and the

Department of Environment, Land, Water and Planning (DELWP) logo. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>

Printed by DELWP

#### **Disclaimer**

This publication may be of assistance to you but the State of Victoria and its employees do not guarantee that the publication is without flaw of any kind or is wholly appropriate for your particular purposes and therefore disclaims all liability for any error, loss or other consequence which may arise from you relying on any information in this publication.

#### **Accessibility**

If you would like to receive this publication in an alternative format, please telephone the DELWP Customer Service Centre on 136186, email [customer.service@delwp.vic.gov.au](mailto:customer.service@delwp.vic.gov.au), or via the National Relay Service on 133 677 [www.relayservice.com.au](http://www.relayservice.com.au). This document is also available on the internet at [www.delwp.vic.gov.au](http://www.delwp.vic.gov.au).

# Issues Paper

DELWP

June 2018

*for the* Improving Stormwater Management Advisory Committee

# Contents

<b>1. Introduction .....</b>	<b>3</b>
1.1 Improving Stormwater Management Advisory Committee .....	3
1.2 The purpose of this paper .....	4
1.3 Policy context .....	5
1.4 Why we need to improve stormwater management.....	6
1.5 The role of the planning system .....	9
1.6 Links with other IWM policies and projects.....	11
<b>2. Key issues .....</b>	<b>13</b>
2.1 Opportunities to extend the coverage of stormwater planning requirements.....	14
2.2 Opportunities to provide broader benefits .....	18
2.3 Opportunities to deliver a ‘place based’ approach .....	18
2.4 Opportunities to link water management and urban planning .....	18
2.5 Opportunities to improve compliance and implementation .....	19
2.6 Opportunities to support stormwater management in the public realm .....	21
<b>References .....</b>	<b>23</b>
<b>Appendix A – Relevant projects .....</b>	<b>24</b>

# 1. Introduction

## 1.1 Improving Stormwater Management Advisory Committee

The Minister for Planning has established an Advisory Committee (the Committee) under Section 151 of the *Planning and Environment Act 1987* to provide advice to the Minister for Planning and the Minister for Water on how to improve stormwater management and strengthen the links between planning and urban water management.

The Committee is tasked with advising which types of development, of those not subject to the State's urban runoff management objectives, should be required to manage their stormwater impacts<sup>1</sup> and how this could be achieved. A conceptual planning control option to support Part A of the Committee's Terms of Reference (see Terms of Reference link on the Improving Stormwater Management website at <https://engage.vic.gov.au>) is included in section 2.1 for both consideration of the Committee and to invite feedback from stakeholders.

The Committee will also provide future policy directions on improving stormwater management or strengthening the links between urban water management and the planning and development system more broadly. As part of this, the Committee should consider:

- mechanisms in, or linked to, the planning system, that could be used to increase flexibility, e.g. offset schemes;
- provisions for delivering 'place based' outcomes to, for example, implement the Integrated Water Management Plans developed through Integrated Water Management (IWM) forums;
- protocols or guidance for improving compliance and implementation, e.g. guidance to encourage broader liveability (i.e. urban cooling) benefits (See Figure 1) or encourage Water Sensitive Urban Design (WSUD) outcomes in infill developments;
- information requirements to, for example, require WSUD and stormwater management to be reflected in design responses submitted with planning applications; and
- other potential mechanisms outside the planning system that could complement changes to planning provisions to improve stormwater management.

The Committee was established to integrate both planning and water expertise, seek input from stakeholders and experts using an open and transparent process and develop potential reforms.

Stakeholders will be able to contribute to the development of key stormwater-related planning reforms by presenting their specialist knowledge, experiences and perspectives to the Committee, through submissions on this paper. The Committee may seek to hear directly from key stakeholders on specific issues or opportunities raised in submissions or relevant to the Committee's Terms of Reference.

*In this paper the term 'stormwater' refers to runoff from urban areas. It refers to the net increase in runoff from urban development due to water not being able to seep into the ground because of impervious surfaces.*

---

<sup>1</sup> In order to achieve the outcomes in Figure 1, rather than merely more traditional drainage outcomes

Figure 1 How water contributes to liveable and resilient towns and cities (Figure 5.1, Water for Victoria)



## 1.2 The purpose of this paper

This paper provides a starting point for considering the issues the Committee has been asked to examine. It invites input from interested stakeholders on how to address the issues and the opportunities presented. The Committee is not limited to addressing the issues or opportunities discussed in this paper.

We welcome your input. If you or your organisation are interested in having a say please go to the Engage Victoria website (<https://engage.vic.gov.au/>) which has more information on the project and instructions on how to upload your submission to the Committee.

This paper focuses primarily on the types of stormwater management issues that the Victorian planning and development system currently has, or could have, a role in addressing (see Key issues). Many of the issues and opportunities are discussed in a Melbourne-centric context, as this is where the most urban stormwater is generated. However, there are similar urban stormwater management issues and opportunities in large regional centres. For this reason, reforms will be considered in terms of their applicability to all urban areas across Victoria, not just Melbourne.

The key questions raised in this paper are summarised below:

### 2 Key Issues

Are there any other key issues or opportunities (that are directly related to the Committee's Terms of Reference) that the Committee should consider?

#### 2.1 Opportunities to extend the coverage of stormwater planning requirements

What are your views on the conceptual planning control option?

What (complementary) changes to the building and plumbing regulations or guidance, or any other mechanisms, are needed?

#### 2.2 Opportunities to provide broader benefits

What stormwater planning provisions, or other mechanisms, would help to deliver the broader benefits listed in Section 2.2?

### **2.3 Opportunities to deliver a 'place based' approach**

Should stormwater standards vary spatially and, if so, on what basis and at what scale?

How can the planning system be used to guide and implement local IWM related standards?

### **2.4 Opportunities to link water management and urban planning**

How should IWM plans, and or frameworks (Section 1.6), be linked to the planning system?

What mechanisms should be used to strengthen the links between water management and public realm planning or the planning system more broadly?

What guidance material or tools are needed to help implement stormwater management through the planning system?

### **2.5 Opportunities to improve compliance and implementation**

Where are the weakest links in the chain of compliance and implementation of stormwater management requirements (including design, operation and people related issues)?

What actions are the most critical to improve compliance and implementation?

### **2.6 Opportunities to support stormwater management in the public realm**

What would help responsible authorities to determine and communicate the costs and benefits of public stormwater infrastructure?

What mechanisms should councils use to recover the construction and maintenance costs of public stormwater infrastructure?

Should offsets<sup>2</sup> be used to improve stormwater management? If so, how should they be used?

**Figure 2 Key questions (for response in submissions)**

## **1.3 Policy context**

The Victorian Government, in *Water for Victoria*, the *Yarra Action Plan*, the *Plan Melbourne Implementation Plan* and the *Port Phillip Bay Environmental Management Plan* commits to improving stormwater management for greener environments and healthier waterways. Many of these stormwater policies require changes to Victoria's planning controls (see Figure 3).

Work to implement these commitments has progressed through the *Integrated Water Management Framework for Victoria*, the *Better Apartments Design Standards* and through the development of options to extend the current stormwater standards (currently applicable to residential greenfield subdivisions and apartments) to commercial and industrial subdivisions (see section 2.1).

High level planning expertise and stakeholder input is now required to assist the Government develop appropriate and effective planning related reforms to support these stormwater policy commitments.

---

<sup>2</sup> A stormwater offset is a financial contribution paid by residential developers to Melbourne Water (or other agencies) for stormwater management works to be undertaken in another location. These works 'offset' stormwater impacts not treated within the development (Melbourne Water <https://www.melbournewater.com.au/planning-and-building/developer-guides-and-resources/drainage-schemes-and-contribution-rates-1-1>).

**Figure 3 Government stormwater policies that require changes to the planning system**

Extending the coverage of the best practice stormwater management standards for residential subdivisions (under clause 56 of the Victoria Planning Provisions) to apply to all subdivisions (*Yarra Action Plan*, Action 19).

Preparing and consulting widely on additional proposals to amend the Victoria Planning Provisions (VPP) and related building regulations aimed at improving stormwater management and associated outcomes (*Water for Victoria*, Action 5.5).

Strengthening links across portfolios to better align land use and water management planning by making sure that, among other outcomes, urban land use planning instruments are progressively aligned with the water-related benefits that support resilient and liveable cities and towns (*Water for Victoria*, Action 5.6).

Reviewing the Victoria Planning Provisions to improve stormwater management and related outcomes for all urban development (*Plan Melbourne Implementation Plan*, Action 94).

Review of planning and building systems to support environmentally sustainable development outcomes (*Plan Melbourne Implementation Plan*, Action 80).

Ensuring all urban and rural land use effectively controls impacts from stormwater and runoff, and that controls are in place to manage increases in loads (*Port Phillip Environmental Management Plan*, Action 3.3).

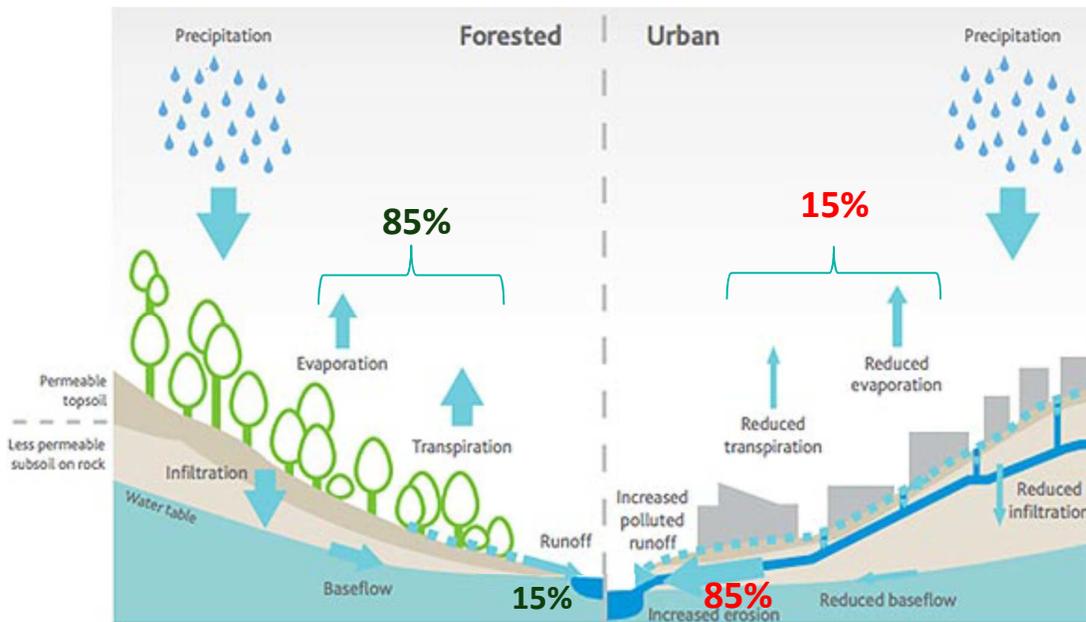
## 1.4 Why we need to improve stormwater management

As Melbourne develops, the extent of impervious (sealed) surfaces increases. The population of Melbourne, at 4.7 million in 2016, is expected to exceed 8 million by 2051. Modelling undertaken for the Department of Environment, Land, Water and Planning (DELWP) suggests that if this urban growth is accommodated in the same way it has been until now, by 2051 the total area of impervious surfaces in Melbourne will increase by around 43% and stormwater runoff will increase by almost 50%.

Work being undertaken to review Melbourne Water's Healthy Waterways Strategy suggests that by 2051, because of urban growth, an additional 80GL/year (equivalent to 32,000 Olympic swimming pools) of stormwater will be generated.

The impacts of development on stormwater runoff volumes are illustrated in Figure 4. Figure 4 compares the urban water cycle in a natural catchment (left) and an urbanized catchment (right), showing the relative changes in volumes of evaporation, transpiration and surface runoff (the relative volume is indicated by the size of the arrow).

Urban runoff carries a range of pollutants that degrade waterways, wetlands, beaches and bays. Changes to the flow regime of waterways due to stormwater degrades river ecology and reduces amenity; for example through erosion and litter transport.



**Figure 4 Impact of development on the urban water cycle (adapted from Walsh et al. 2004)**

In highly urbanised areas, this increased stormwater has been shown to cause the following consequences:

- Degradation of urban waterways, resulting in the loss of ecological function, amenity and recreational use. Stormwater impacts are more dominant and limiting than any other forms of ecological waterway degradation (Fletcher, et al., 2011). Modelling by the University of Melbourne, suggests that very high volumes of retention or reuse of stormwater is needed if we are to maintain the ecological values of many relatively healthy streams in the growth areas of Melbourne particularly in the northern and western growth corridors. Excess stormwater draining into urban catchments is a well-known cause of damage and degradation of the ecology of urban waterways and streams (Walsh et al., 2005). An increase of only 2 to 5% of impervious surfaces that are connected to urban streams by pipes can result in degradation. Vietz et al. (2014) estimate that following development of Melbourne to its urban growth boundary, an additional 900km plus of stream length will be degraded if the city is developed using conventional drainage practices.
- Degradation of downstream bays, lakes and coasts. The *Port Phillip Bay Environment Management Plan 2017-2027* found that, in terms of overall nutrient input, managing catchment inputs is as important as managing discharges from the Western Treatment Plant. Further, the efficiency of nitrogen processing within Port Phillip Bay (which reduces the likelihood of algal blooms) is impacted more by changes in Yarra/Maribyrnong flows than discharges from Western Treatment Plant<sup>3</sup>. Heavy storms can flush stormwater and other forms of pollution into the Bay making it less safe for swimming.
- Significantly increased drainage infrastructure costs to maintain current levels of drainage services or, without additional drainage investment, increased stormwater related flooding and damage to community infrastructure, private property and public safety.

Significant augmentation of Melbourne's water supply and sewage infrastructure is also anticipated to be needed to cope with an increasing population and climate change. Augmenting the mains water supply network is expected to become costly into the future, partly due to missed opportunities to use alternative water supplies, including re-use of rainwater and stormwater to offset potable needs.

Using stormwater as a source of water supply (e.g. for toilet flushing and irrigation) diversifies the supply portfolio, making water supplies more resilient to drought and other pressures. This in turn reduces the need for water restrictions which can have negative social impacts. There are situations where alternative water

<sup>3</sup> Port Phillip Bay Environmental Management Plan 2017–2027, Supporting Document

supplies, such as stormwater, are more cost effective than more traditional water sources, such as desalinated water and surface water supplies, with significantly lower carbon or other environmental impacts.

Stormwater networks may also inadvertently transport sewerage, due to cross connections or leaky pipes or sewage overflows. This increases the likelihood of beaches and waterways becoming unsuitable for recreation.

Climate change is expected to increase extreme storm intensity, increasing flooding and sea level rise, further exacerbating flooding in low lying areas. If more land is zoned as land subject to inundation, this will impact on land value and buildings in these areas as they will incur higher development costs to respond to the greater inherent risks.

Over the past 15 years, the water industry has moved away from draining stormwater away as quickly as possible towards WSUD. WSUD seeks to manage stormwater as a valuable resource, reduce flooding, erosion, waterway pollution and provide amenity and urban cooling benefits to the community. WSUD and, more broadly, IWM, are now accepted to be the best way to manage potable, wastewater and drainage systems holistically. These approaches to water cycle planning are based on the idea that all parts of the water cycle, including stormwater and the community are interconnected. Managing stormwater through a more integrated approach will require significant collaboration between all stakeholders as well as effective planning and development controls.

Improved stormwater management is critical to increasing resilience and enhancing liveability, in both public and private spaces, because:

- Stormwater can be stored for use in dryer periods, such as in above or below ground tanks, and can provide a low-cost irrigation supply for maintaining private or public green spaces. Under current approaches to development, increased urbanisation, combined with more severe heat waves under climate change, is also expected to reduce the liveability of our towns and cities due to urban heat island (UHI) effects<sup>4</sup>. Economic modelling undertaken for the City of Melbourne (AECOM, 2012) suggests that increased UHI effects, among other negative impacts, result in heat-related deaths and illness. The strategic use of vegetation in the urban landscape and as part of built form, can help to address these risks to our cities and towns. At the same time, private gardens are getting smaller and there is increasing pressure to allow new development to build closer to or replace public green spaces to accommodate our expanding population. Green spaces are shown to help mitigate the urban heat island effect and provide a range of mental and physical health benefits (Ulrich, 1984, Kaplan, 1995) and WSUD can provide alternative water supplies to help maintain green spaces in dry periods.
- Distributed stormwater measures, such as rainwater tanks, can reduce flooding risks in urban cities and towns across Victoria<sup>5</sup>.
- Improved stormwater management reduces the impacts to waterways and bays, as mentioned above.
- WSUD infrastructure can have dual benefits in terms of managing stormwater while improving the function and amenity of passive and active space (when extreme storms are not taking place), and providing more water for landscapes.

While most urban development increases the proportion of impervious surface area and therefore increases the amount of stormwater discharged to the environment, it is possible to manage these impacts through increasing stormwater management (infiltration, capture and reuse) to effectively 'disconnect' those impervious surfaces from waterways.

Many waterways in urban areas are already significantly impacted by many decades of stormwater pollution. However, some waterways in less densely urbanised outer urban areas have much higher ecological values and, in some of these areas, stormwater can be managed in more cost-effective ways. Melbourne Water, in its work towards revising its Healthy Waterways Strategy (see Section 1.6), is seeking to identify which waterways, within greater Melbourne, may warrant higher levels of stormwater treatment.

---

<sup>4</sup> The term "heat island" describes built up areas that are hotter than nearby rural areas. Heat islands can affect communities by increasing summertime peak energy demand, air conditioning costs, air pollution and greenhouse gas emissions, heat-related illness and mortality, and water quality (US EPA)

<sup>5</sup> Distributed Storages Project, led by Kristina Sestokas, MW, with input from Brigid Adams and Emma Stewart, DELWP, AECOM and a number of other catchment modelling consultants. Culminating in a final report by Moroka, titled *A review of the effectiveness of distributed storage to decrease flooding, December 2017*.

While very high levels of stormwater management may not be justified for all waterways, nearly all stormwater which may contain contaminants enters waterways and ends up in a receiving waterbody, such as a bay, lake or the ocean at some point. In Melbourne, stormwater culminates, and mixes with pollution from other sources, in Port Phillip Bay, resulting in environmental degradation and (safety) advisories being issued. It's worth noting that more localised actions such as installing litter traps and enhancing river-side vegetation and landscaping can also provide important benefits, such as recreation and health benefits, in highly urbanised streams.

## 1.5 The role of the planning system

The objectives of planning in Victoria, stated under the *Planning and Environment Act 1987* Act, include:

- a) to provide for the fair, orderly, economic and sustainable use and development of land;*
- b) to provide for the protection of natural and man-made resources and the maintenance of ecological processes and genetic diversity;*
- c) to secure a pleasant, efficient and safe working, living and recreational environment for all Victorians and visitors to Victoria;*
- d) to conserve and enhance those buildings, areas or other places which are of scientific, aesthetic, architectural or historical interest, or otherwise of special cultural value;*
- e) to protect public utilities and other assets and enable the orderly provision and coordination of public utilities and other facilities for the benefit of the community;*
- f) to facilitate development in accordance with the objectives set out above; and to*
- g) to balance the present and future interests of all Victorians.*

To summarise, the planning system aims to support sustainable outcomes for people and the environment into the future.

It is much more effective to build stormwater management opportunities into new developments than to retrofit stormwater management measures into established buildings, due to the associated disruption and expense. Work undertaken for Melbourne Water's Healthy Waterways Strategy indicates that retrofitting a high level of stormwater management into existing buildings costs \$700,000/Ha compared to building it into new development which is estimated to cost approximately \$400,000/Ha. If new urban developments do not incorporate WSUD when they are constructed, there is an opportunity cost as it reduces the future number of water servicing options (drainage, supply, irrigation). For these reasons, this project is focused on changing how we design and construct new developments (both green and brownfield) to improve stormwater management, and the planning and development system is the most direct and immediate means to facilitate this.

Planning requirements are only one means to address stormwater. For this reason, the Committee has been asked, under part B of its Terms of Reference, to also examine potential mechanisms outside, but complementary to, the planning system to improve stormwater management. The broader range of key policy mechanisms used to manage stormwater are illustrated in Figure 5 (and are further described in Section 1.6).

Where planning requirements do not specify the need to incorporate WSUD measures, the opportunity to utilise water management to support wider community and liveability benefits is lost. Providing design responses to support WSUD measures also assists at the public/private interface, improving how water resources can be managed across a whole area.

The unprecedented volume of development required to service Melbourne's growing population provides us with a unique window of opportunity to construct new buildings and precincts in a way that makes better use of stormwater, and other alternative water supplies, through an IWM approach.

Stormwater management is also generated by existing developments and roads, which make up a significant proportion of total impervious surfaces in urban areas. Figure 6 illustrates the breakdown of impervious surfaces for the City of Moreland, which is expected to be representative of many other areas of Melbourne.

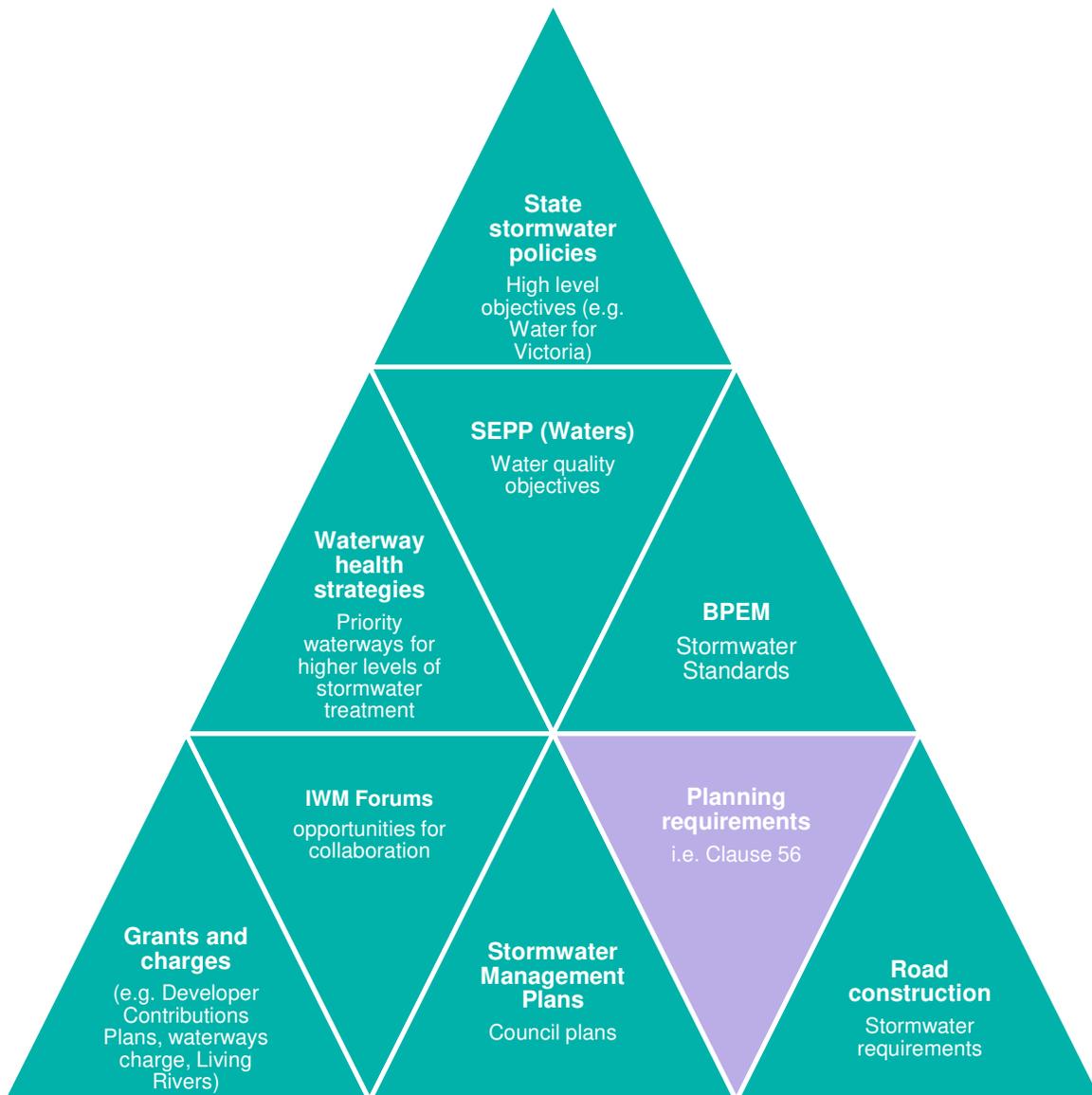
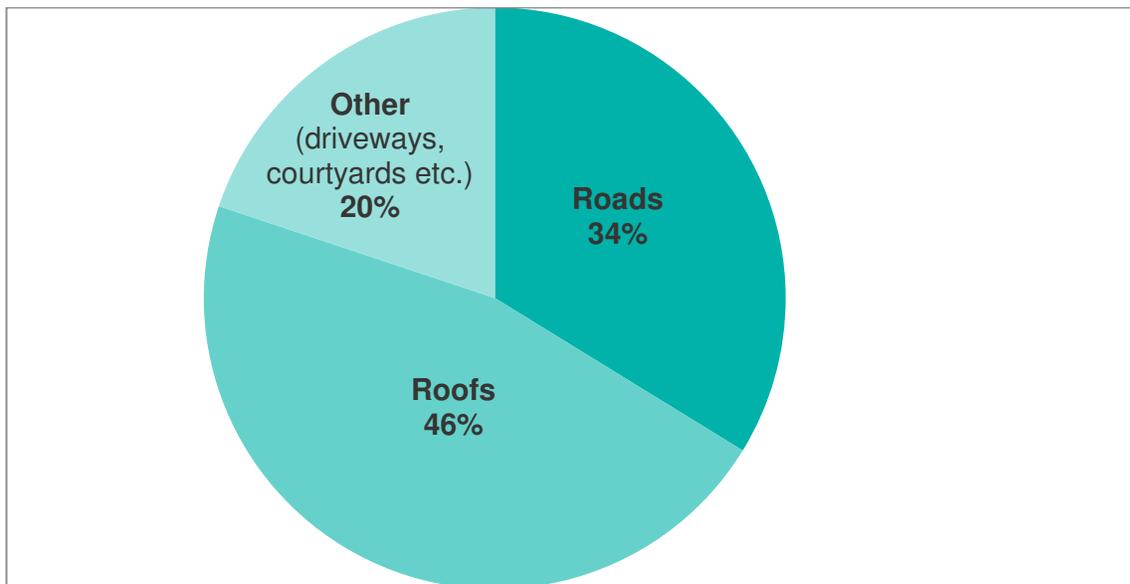


Figure 5 - Key policy mechanisms used to manage stormwater



**Figure 6 Breakdown of impervious surfaces in Moreland Council area (Source: AECOM and Melbourne Water, cited in *Stormwater quality targets for the City of Moreland, City of Moreland 2012*).**

The planning and building system is unable to drive stormwater management in existing developments or inner-city roads, other than during redevelopment. Therefore, these land-use types are not the core focus of this paper.

Existing studies present a range of ideas for improving the capacity of the planning and development system, and associated guidance and processes, to support more sustainable water management. Specialist knowledge and analysis, and stakeholder input, is now required to determine which changes will be most appropriate for improving stormwater management in Victoria now and over the longer term.

## 1.6 Links with other IWM policies and projects

While the planning and development system provides essential mechanisms for improving stormwater management in Victoria, many other policies and projects also play an important role.

The *draft State Environment Protection Policy (SEPP) – Waters* provides a framework to protect and improve the quality of Victoria’s waters. It outlines the beneficial uses to be protected and the water quality objectives that will enable these uses to be protected. SEPPs ensure Victoria sets standards, rules and obligations to protect and improve the health of the natural environment. It also sets out roles and responsibilities to manage stormwater, including the requirement for councils to continue to prepare and implement Stormwater Management Plans. The draft SEPP - Waters is currently subject to public consultation.

The Best Practice Environmental Management (BPEM) Guidelines for Urban Stormwater were prepared by the Victorian Stormwater Committee in 1999. The implementation of the BPEM established Victoria as a leader in stormwater management. The BPEM is an incorporated document of (current) *SEPP - Waters of Victoria*. It was designed to implement the SEPP - Waters of Victoria by setting out best practice guidance and objectives for urban stormwater management. The Environment Protection Authority (EPA) is reviewing the BPEM and this review is likely to recommend an expanded range of stormwater management standards by mid-2019. The current standards focus on water quality (nitrogen, phosphorus and suspended sediment).

Melbourne Water’s Healthy Waterways Strategy, which is currently being updated, provides a strategy for prioritising Melbourne Water actions and investment into waterway health. It outlines priority waterways and reaches, based on factors such as social and environmental values and the current condition of the waterways. The revised strategy will combine Melbourne Water’s stormwater strategy with the previous Healthy Waterways Strategy. It is also a strategy for all stakeholders involved in protecting waterways, not just Melbourne Water. This approach, and especially the strategy’s approach to addressing stormwater, presents a step change in terms of implementing IWM.

Melbourne Water currently operates a development services scheme and offsets system, mainly in growth areas, and some councils have expressed interest in developing their own local stormwater offset schemes

(see section 2.5). The principles of the drainage schemes and what they can and cannot fund are documented in Melbourne Water's *Principles for Provision of Waterway and Drainage Services for Urban Growth*.

The Government has recently established IWM forums for the major river catchments in Melbourne. These forums, which are the first of their kind, provide a platform for identifying 'hot spot' areas or projects for which collaboration between councils, water corporations, catchment management authorities and other important stakeholders is likely to deliver greater community benefits.

Melbourne Water, as part of the Melbourne Flood Strategy, is developing flood management prioritisation tools to help categorise catchments and identify priority catchments with flood mitigation and water quality improvement measures.

Melbourne Water also runs the Living Rivers program, which provides funding to councils within Melbourne Water's service area to implement stormwater quality improvement works. The funding is used to support projects such as on-ground works, community education projects and the development of strategies and master plans. This provides capacity building and seeks to embed the principles of IWM and WSUD into standard practice.

There are also many IWM initiatives in regional Victoria which are shaping how we manage stormwater, such as the Eastbank Lake project in Shepparton, which aims to transform an underutilised anabranch of the Goulburn River into an environmentally sustainable urban waterfront precinct.

The Ballarat City Integrated Water Management Plan showcases how project partners can facilitate planning and collaborate with stakeholders to outline a pathway to becoming a water-sensitive city.

Other current or recent initiatives and mechanisms that influence stormwater management in new developments are summarised in Appendix A.

## 2. Key issues

The following issues relate to either the stormwater management requirements (in clauses 56.07-4 and 58.03-8 of the VPP) or the links between IWM and the planning and development system more broadly. They have been raised in previous studies or discussions with stakeholders. While by no means exhaustive or conclusive, these issues, and corresponding opportunities presented in the following sections, are presented to initiate discussion and generate ideas.

Key issues:

- a large proportion of urban developments are not required to manage stormwater to achieve BPEM objectives under state planning requirements<sup>6</sup>;
- many stormwater solutions, built in response to the current stormwater management requirements, are not designed to provide broader benefits, such as improved amenity;
- there is a lack of, or lack of awareness of, planning mechanisms that can be used to deliver 'place based' IWM outcomes;
- compliance and implementation of the stormwater management requirements is often poor (Kay & Hussey, 2013);
- urban water and flood management infrastructure and town planning processes are not well integrated, particularly for redevelopments and urban consolidation in existing urban areas;
- urban landscape and recreation space planning are often independent of stormwater and flood management planning and therefore synergistic opportunities are often overlooked;
- councils are often discouraged from implementing small scale WSUD infrastructure, due to uncertainty and difficulty associated with recovering their capital and maintenance costs; and
- the current BPEM standards were largely designed to protect Port Phillip Bay and, based on what we now know are, on their own, unlikely to maintain the ecological condition of relatively natural waterways on the edges of the city, or protect Westernport Bay and Gippsland Lakes into the future.

The last issue relates to the stormwater standards, written into the BPEM. While these guidelines sit outside of the planning system they are called up through the VPP. The BPEM stormwater standards are the responsibility of the Environment Protection Authority (EPA), which is reviewing these standards. For this reason, the Committee has not been asked to recommend a new set of BPEM standards and therefore the issues and opportunities relating to these standards are not discussed further in this paper.

It should be assumed that the BPEM standards will continue to apply, but be amended to reflect changes in stormwater science and technology advances over time and associated impacts. Under Part A of its Terms of Reference, the Committee is tasked with advising which types of development, of those currently not subject to the State's urban runoff management objectives, should be required to manage their stormwater impacts and how this could be achieved. In addition, under Part B of its Terms of Reference, there is scope for the Committee to provide direction on how the standards and clause 56 of the VPP can better facilitate place based outcomes and enhance public open spaces, to achieve greater community benefits.

These BPEM standards will continue to be revised to reflect advances in science and technology.

The issues, and some potential opportunities for addressing them, are discussed in the following sections.

Are there any other key issues or opportunities (directly related to the Committee's Terms of Reference) that the Committee should consider?

---

<sup>6</sup> Other than permeability and standard drainage requirements

## 2.1 Opportunities to extend the coverage of stormwater planning requirements

### Current stormwater planning requirements

The urban stormwater runoff requirements (further referred to as stormwater requirements) for (undeveloped) residential subdivision are contained in Clause 56.07-4 of the VPP, which calls up the BPEM standards. The BPEM objectives include percentage reductions (from typical load) for nitrogen, phosphorus and total suspended solids and litter. The intent of the clause is to remove pollutants in urban stormwater and minimise flash flooding, for which the requirement to maintain 1.5 year ARI<sup>7</sup> flows (at pre-development levels) is a proxy.

Clause 56.07- 4 of the VPP requires only new residential subdivisions, excluding subdivision into lots containing an existing carpark or dwelling (thereby excluding a range of existing infill developments), to meet the BPEM stormwater objectives. This does not capture residential developments that do not involve subdivisions and redevelopments into lots each containing an existing dwelling or car park. This has resulted in a loophole, where any development approved prior to subdivision qualifies for an exemption from stormwater management requirements (Kay & Hussey, 2013). Multiple dwelling developments, other than apartments, are not captured either (i.e. townhouses and super lot developments<sup>8</sup>).

The BPEM and the VPP also have stormwater management requirements for the construction phase of development. Construction activities have been identified by council stormwater management plans to be a major source of sediment and erosion to waterways (EPA Victoria 2007). Councils often require Site Environmental (or Construction) Management Plans to be submitted to explain how the site will be managed prior to and during the construction period, in terms of sediment and erosion, dust, litter and runoff and the EPA provides best practice guidance to help address this issue. However, given the difficulties associated with supervising and monitoring all construction activity across the state, compliance is likely to be patchy.

In March 2017, DELWP implemented the *Better Apartments Design Standards* through clauses 55.07 and 58.03-8 of the VPP. One of the impacts of these changes is that all apartments must now also comply with BPEM standards.

### Developments not required to manage stormwater

There remain no equivalent provisions for industrial and commercial development, major redevelopments and smaller scale infill (such as townhouses and semi-detached dwellings) and public land. As such, the state's stormwater provisions do not capture large areas of land to be developed to support the future growth of Melbourne.

Figure 7 illustrates the different approvals streams for the major forms of development and associated stormwater (BPEM) requirements.

Through Action 19 of the *Yarra Action Plan*, the Government has committed to *Extending the coverage of the best practice stormwater management standards for residential subdivisions (under clause 56 of the Victoria Planning Provisions) to apply to all subdivisions*. DELWP is currently examining options to deliver this commitment to extend the current stormwater requirements to industrial and commercial subdivisions. However, this work has revealed that many industrial and commercial developments do not involve subdivision and that the current standards do not target the toxicants likely to reside in industrial and commercial stormwater.

The 'current' stormwater management requirements address a limited range of pollutants (nutrients, litter and sediment) whereas stormwater from industrial or commercial sites often contain very different pollutants (such as toxicants). Stormwater drain monitoring data indicates that the most serious industrial and commercial toxicants continue to enter the stormwater system even when it's not raining. This tells us that these chemicals are coming from activities, such as washing down of work areas, that release harmful chemicals to the stormwater system. There is potential to divert the harmful runoff to the sewerage system (which can treat these toxicants) or treating it in situ. As these actions go beyond the current BPEM standards, there are likely to be some associated costs for industry.

Therefore, the Committee is asked to consider what else, beyond Action 19 of the *Yarra Action Plan*, is required to improve stormwater management in Victoria.

---

<sup>7</sup> Average Recurrence Interval

<sup>8</sup> An area of land that is intended to be subdivided into further Lots, also known as a stage lot.

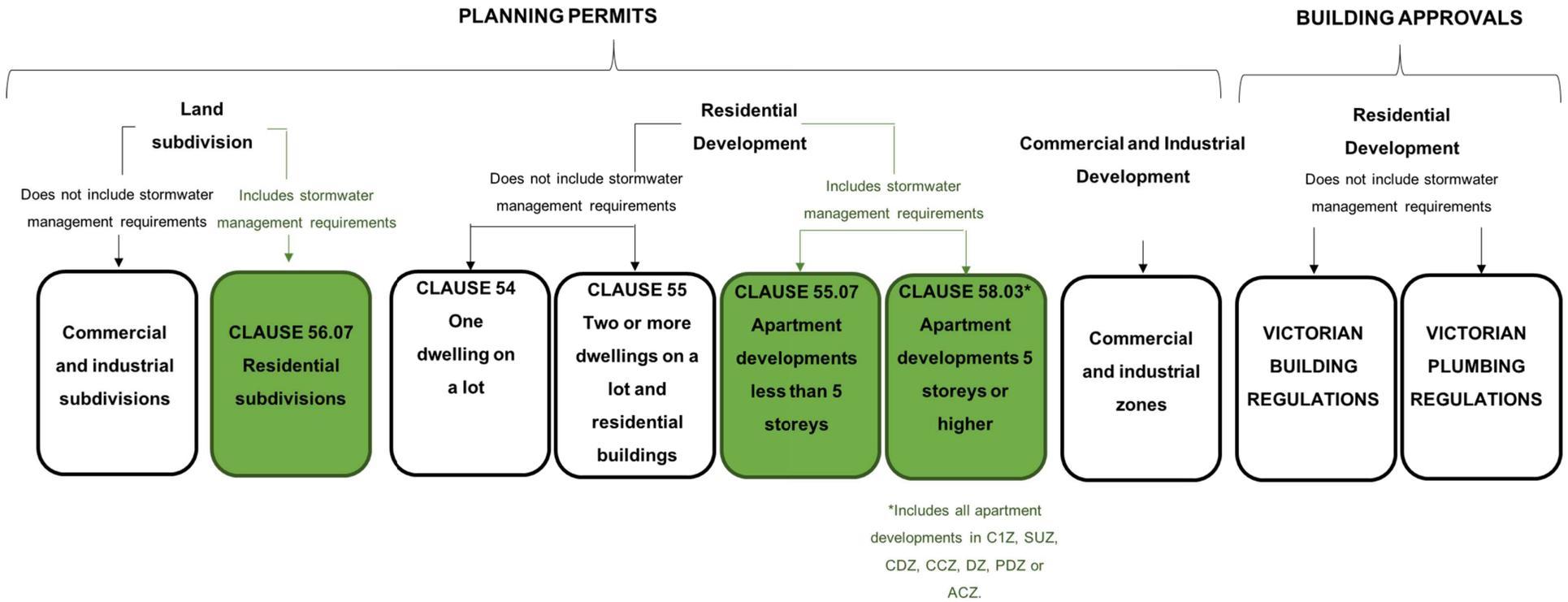


Figure 7 Coverage of BPEM stormwater requirements across different types of development approvals

### Building requirements

Developments that only require a building permit (and not a planning permit) have no specific requirement to manage stormwater for environmental purposes<sup>9</sup>. A planning permit is often not required for the construction or alteration of a single dwelling, particularly where the lot exceeds 500 m<sup>2</sup>.

Where a development needs only a building permit, the stormwater requirements in the planning system do not apply. The Victorian building regulations require either rainwater tanks or solar hot water systems in all new single dwellings. Less than 30% of new homes in Victoria currently choose a rainwater tank compared to NSW where over 90% of new homes, outside of recycled water schemes, install tanks. Where tanks are selected, the Victorian mandatory requirements include a minimum tank size of 2KL and internal connection to toilet only, from at least 50m<sup>2</sup> of the roof area. While this can provide an important contribution to managing stormwater, further capture and reuse is required to achieve the levels of stormwater management needed to maintain waterway health.

In addition, the uncertainty as to whether people will select tanks versus solar hot water systems makes it hard for water corporations to size the new infrastructure required to service new suburbs. Water corporations are also discouraged from implementing more innovative precinct scale alternative water schemes as there is no planning or building requirement for new dwellings to connect to these types of schemes, unless they are recycled water schemes.

Unlike large scale greenfield developments, dispersed infill has very few IWM related requirements but is expected to contribute at least half of new development over coming years.

### Local policies

Seven inner city councils have established local stormwater policies to address some of the above-mentioned inconsistencies, which extend the application of the existing Clause 56.07-4 of the VPP, to a broader range of developments (e.g. two or more dwelling residential developments and renovations over 50m<sup>2</sup>). Some of these policies also address commercial and industrial developments<sup>10</sup>.

The Cooperative Research Centre for Water Sensitive Cities (Choi L. & McIlrath B. 2017) argue that consistent and clear state-wide regulations are needed to guide future planning and reduce dependence on local policy responses. Its analysis suggests that there are inconsistencies in assessment processes within councils and that stakeholders would prefer a state-wide policy. A state-wide approach was also noted as being preferable to local planning policy responses by the planning panel considering Amendment C108 (WSUD) to the Moonee Valley Planning Scheme.

Choi L. & McIlrath B (2017) indicate that a state-wide policy can accommodate local variations, provided that the state policy framework articulates the mandatory requirements and offers decision tools that allow developers to find compliant, cost effective solutions.

### Conceptual planning control option to support Part A of the Committees' Terms of Reference

Part A of the Committee's Terms of Reference (ToR) task the Committee with advising which development types should be required to manage their stormwater effectively and the changes needed to achieve this.

To generate discussion on this, DELWP has outlined the following conceptual planning control option for the Committee's consideration and stakeholder feedback. It suggests, in high level terms, how the VPP should be revised to achieve Part A of the ToR.

Note that the policy assumes that:

- the development types currently required to meet BPEM stormwater requirements (in Clause 56.07-4, 55.07 and 58.03 of the VPP), including all subdivisions (Action 19, *Yarra Action Plan*), continue to meet the BPEM;
- adequate guidance and tools will be available to assist home owners and developers to determine what is needed to meet the BPEM requirements on their site.

---

<sup>9</sup> Other than existing planning and building permeability requirements

<sup>10</sup> See for example, Moonee Valley C108 2013, PPV 81; Environmentally Efficient Design Local Planning Policies Advisory Committee [2014] PPV 40

### ToR Part A - Conceptual planning control option for discussion purposes

- The following development types should be required, through planning controls, to comply with the BPEM stormwater objectives:
  - industrial and commercial developments (with or without prior subdivision);
  - inner city residential subdivision (i.e. including land that currently has a building or carpark) to two or more residential dwellings; and
  - residential development without subdivision;
  - one for one rebuilds; and
  - renovations and extensions over 50% of the existing volume\*
- The developments listed below should not be required, through planning controls, to comply with the BPEM requirements:
  - A subdivision of an existing building.
  - A rainwater tank.
  - A fence.
  - A domestic swimming pool or spa.
  - A pergola or veranda, including an open-sided pergola or veranda to a dwelling with a finished floor level not more than 800mm above ground level and a maximum building height of 3 metres above ground level.
  - A deck, including a deck to a dwelling with a finished floor level not more than 800mm above ground level.
  - Non-domestic disabled access.
  - Externally altering a building by structural work, rendering, sandblasting or in any other way that does not result in an increase in floor area.
  - Constructing or displaying a sign.
  - Externally painting a building.
  - Externally painting an unpainted surface.
  - Internally altering a building.
  - Carrying out repairs or routine maintenance which change the appearance of a heritage place.
  - The construction or extension of an outbuilding normal to a dwelling.
  - Removal, destruction or lopping of vegetation.
- Industrial and commercial developments must be designed to ensure that no contaminants, likely to be harmful to waterways and bays, drain into the stormwater system (through, for example, structural isolation of high risk work areas).
- Approval applications, for all developments required to meet the BPEM stormwater requirements, must provide information in the design response phase of the planning permit application, to illustrate how the BPEM and any other IWM requirements will be met.

\* This threshold has been selected to align with the current 6 star threshold for renovations / extensions. An alternative threshold for consideration is 'over 50m<sup>2</sup>'. 'Over 50m<sup>2</sup>' is the threshold used in the Melbourne, Moonee Valley, Stonnington, Yarra, Port Phillip and Bayside council stormwater policies.

What are your views on the conceptual planning control option?

What (complementary) changes to the building and plumbing regulations or guidance, or any other mechanisms, are needed?

## 2.2 Opportunities to provide broader benefits

The current stormwater management requirements (which are called up in Clause 56.07-4, 55.07 and 58.03 of the VPP) were written in 2006. Since then, science and technology relating to stormwater management have advanced. A number of studies (Planning Panels Victoria, 2013, 2014) suggest that the requirements could be improved to encourage other benefits, such as:

- litter and erosion management;
- mitigation of stormwater related flooding;
- liveability benefits associated with retaining rain/stormwater in the local environment, such as irrigation of green spaces, reduced urban heat island effects and improved urban amenity along waterways and drainage corridors;
- liveability benefits associated with complimenting or facilitating recreation through WSUD; and
- potable water substitution, thereby reducing pressure on the potable water system, leading to reduced costs and increased reliability / security of the current water supply system.

There may be ways that the planning system can be used to encourage stormwater management solutions that deliver these broader benefits.

What stormwater planning provisions, or other mechanisms, would help to deliver the broader benefits listed above?

## 2.3 Opportunities to deliver a ‘place based’ approach

There are also opportunities for aligning clause 56.07 of the VPP with broader IWM concepts and promoting a more ‘place based’ (localised) approach. As part of the University of Melbourne’s Stringy Bark Creek initiative, Yarra Ranges Council introduced an Environmental Significance Overlay, which varies the state’s stormwater requirements in a specific area to achieve a higher level of environmental protection. While the Committee is not tasked with recommending where stormwater standards should be more or less onerous, the Committee may consider how to set spatially varying stormwater standards through the planning system and the associated implications, to provide greater overall benefits to society now and in future.

As described above, the cumulative effect of increasing imperviousness will increase overall stormwater generation and reduce urban vegetation and soil moisture. The perviousness standards in clauses 54 and 55 of the VPP require that 20% of the area of a residential lot remain pervious, regardless of local flooding issues or downstream waterway sensitivity. It is possible for councils to amend this standard through the planning scheme amendment process, which is a rigorous and sometimes lengthy process.

The Fisherman’s Bend draft Framework Plan (2017) includes Water Sensitive Community provisions that go beyond the requirement to connect to recycled water schemes (where mandated). They require rainwater harvesting tanks for flood mitigation, connection to non-potable water supply and for all public spaces to integrate best practice WSUD.

The City of Greater Dandenong has introduced a 40% perviousness standard in its Neighbourhood Residential Zone with a 30% standard in its General Residential Zone.

Use of higher perviousness standards, or other mechanisms which encourage distributed storage and reuse of stormwater in areas prone to flood risk or coastal inundation could increase resilience in vulnerable areas.

Where justified, consideration could be given to providing councils with a simpler process for varying perviousness standards to respond to the local hydrology and other characteristics of their areas.

Should stormwater standards vary spatially and, if so, on what basis and at what scale? How can the planning system be used to guide and implement local IWM related standards?

## 2.4 Opportunities to link water management and urban planning

There may be opportunities to link the *Victorian IWM Framework (2018)*, sustainable water strategies and various IWM requirements with local planning schemes and other Environmentally Sustainable Development (ESD) planning policies, to inform structure planning and placed based outcomes.

The localised IWM plans and/ or frameworks, to be developed through the recently established IWM forums, may specify stormwater related requirements or outcomes for private development and redevelopments, and as such will need to be supported by strong links to and hooks within the planning system.

While there is much guidance for incorporating IWM into developments in growth areas (such as the Precinct Structure Guidelines and the requirement to develop IWM Plans), there is limited guidance for infill developments, both large and small. Local government therefore expends significant time and resources developing planning frameworks tailored to individual developments in inner Melbourne. It may be beneficial to provide guidance for strategic redevelopment areas in the established areas of Melbourne, noting that the Victorian Planning Authority and DELWP are currently reviewing the Precinct Structure Planning Guidelines.

Another potential opportunity for linking water with urban planning processes is the use of strategic assessment processes to better integrate planning for high value wetlands and waterways that host ecological values protected under the *Environment Protection & Biodiversity Conservation Act 1999* (Cth) (EPBC Act) with the Victorian planning system. The Melbourne Strategic Assessment includes measures to protect Matters of National Environmental Significance in the expansion of Melbourne's growth corridors as part of the PSP (Precinct Structure Plan) planning process. However, future urban consolidation and redevelopment within the established parts of Melbourne, or catchments that drain into Ramsar wetlands, have not been strategically assessed under the EPBC Act. Strategic assessments can simultaneously assess major infrastructure project planning.

As described in Section 1.4, urban landscape and recreation space planning are often independent of stormwater and flood management planning and therefore synergistic opportunities are often overlooked. Flood management areas are often regarded as encumbered open space and active community recreation discouraged. There are opportunities to better link planning of public spaces and recreational planning with IWM planning to increase resilience to climate change and enhance the liveability of our urban environments.

How should IWM Forum plans, and/or frameworks (Section 1.6), be linked to the planning system?

What mechanisms should be used to strengthen the links between water management and public realm planning or the planning system more broadly?

What guidance material or tools are needed to help implement stormwater management through the planning system?

## 2.5 Opportunities to improve compliance and implementation

While Victoria's stormwater planning standards were written over ten years ago, they are relatively new compared to other planning requirements and, for this and other reasons, the levels of compliance and maintenance varies significantly across councils. While many councils are successfully implementing Clause 56.07-4 of the VPP, its continuing success needs active support (Kay and Hussey, 2013).

Compliance with all of the water quality requirements has historically been patchy and the requirement to contain the 1.5 year ARI flow storm event within the drainage system is not uniformly applied across Victoria (Kay and Hussey, 2013).

Poor implementation not only leads to poor outcomes but also discourages other stakeholders from complying or being innovative. Implementation has, in the past, been poorer in councils without high levels of internal support, and where some councils have lower levels of stormwater knowledge and experience.

Stakeholders report implementation barriers from the design stage through to longer term operation and maintenance. Kay and Hussey (2013) investigated the compliance and implementation issues associated with Clause 56.04-7 of the VPP and found that its effectiveness depends, to a very great extent, on the context in which it operates.

Some of the largest implementation issues they raise include:

- Limitations relating to the wording of the current provisions, for example the narrow application of clause 56.07-4 reduces the credibility of the requirements;
- Lack of protocols, guidance or other mechanisms to ensure effective asset handover and to address issues relating to resourcing operation and maintenance of stormwater measures, both private and public. At present, to comply with clause 56.07-4, developers often design and construct WSUD

assets that add value to new precincts but are not easy to maintain. Councils inherit the infrastructure, without the resources and sometimes the skills needed to maintain it; and

- Different levels of expertise and commitment within councils and the development industry.

Other factors that Kay and Hussey's 2013 study indicate aid successful compliance and implementation include high level strategic planning across water, land and built forms at the subdivision stage; technical experience; access to fit for purpose technical resources and integrated and inclusive approval processes. This could include improvements to stormwater compliance or assessment tools, or the articulation of deemed to comply solutions for situations where the appropriate solution does not necessitate a customised approach.

New planning implementation guidance could support the expanded role of IWM (including stormwater) standards, to assist infrastructure planners and council engineers. In other jurisdictions, the planning system provides clearer linkages with technical standards for stormwater infrastructure. The Infrastructure Design Manual used by many regional councils includes engineering drawings for some WSUD assets and a similar approach could be adopted for metropolitan councils. The IMAP<sup>11</sup> councils developed guidance to implement their ESD policies.

Tools currently available to help people determine how to comply with Clause 56 include the STORM tool on Melbourne Water's website (<https://storm.melbournewater.com.au>) (designed for small developments and for use by the general public and professionals alike) and eWater's<sup>12</sup> MUSIC tool (best suited to larger developments where a consultant is hired to determine the stormwater management solution, see <https://ewater.org.au/products/music>). The STORM tool is not able to model the range of stormwater treatment technologies currently in use and developments that are not residential. The need for clearer hosting and governance arrangements to underpin the tool has also been identified. There are also some concerns about how MUSIC is being applied and if developers implement what is reflected in their plans.

There may be ways the planning process could be used to help decision makers maximise overall IWM benefits. Wherever possible, IWM should be reflected in the design submission, rather than being addressed in response to permit conditions, after approval has been granted. To enhance public open spaces through stormwater management, it is necessary to consider the role of structure planning and planning policy to guide future redevelopment within the established areas of Melbourne. Since 2015, nine Melbourne councils have introduced ESD policies into their planning schemes which require developers to provide information regarding key elements of sustainability, including stormwater management, as part of their design responses.

To accommodate population growth, there are likely to be more design responses that need to trade off scale, site coverage and height to accommodate higher imperviousness standards. If so, guidance or policy mechanisms will be needed to enable this to occur in ways that maximises community benefits.

Drainage authorities can recover the costs of the additional drainage infrastructure needed to manage the increased stormwater generated by new or redeveloped sites through developer charges. However, there is no equivalent way of recovering the costs associated with legacy drainage issues in new developments or areas with existing development.

Where are the weakest links in the chain of compliance and implementation of stormwater management requirements (including design, operation and people related issues)?

What actions are the most critical to improve compliance and implementation?

---

<sup>11</sup> The Inner Melbourne Action Plan (IMAP) is a collaborative partnership between the Cities of Melbourne, Port Phillip, Stonnington, Yarra and Maribymong.

<sup>12</sup> An Australian Government owned not-for-profit organisation that offers capacity building, modelling tools, technical support services and a community of practice to support integrated water resource management, and water management governance.

## 2.6 Opportunities to support stormwater management in the public realm

### Decision Making

Many councils report difficulties justifying expenditure on public stormwater infrastructure, particularly where there are significant ongoing operating or maintenance costs. This could be due to:

- low understanding of the benefits of, stormwater management within the council and therefore difficulty justifying this to its community;
- high levels of uncertainty relating to upfront or ongoing costs and maintenance requirements;
- difficulty evaluating the merits of stormwater management versus other projects; and
- the lack of statutory mandate or defined responsibility to invest in or achieve specific stormwater management outcomes.

Councils may benefit from revised guidance or tools targeted to support decision making and efforts to bid for funding for stormwater infrastructure, which is likely to provide the community with greater overall benefits.

### Funding

Public stormwater management infrastructure is typically owned and maintained by either local government or the waterway manager (in Melbourne: Melbourne Water, across the rest of Victoria: catchment management authorities), depending on the size of the upstream catchment.

Melbourne Water's Development Services Schemes (DSS) are used, in tandem with planning processes, to fund regional drainage infrastructure in and around Melbourne's growth corridors, in conjunction with structure planning processes. These schemes promote a partnership approach between the water corporation and developers.

However, recovering the costs of stormwater infrastructure in redevelopments in established areas, including major renewals, is more difficult. Councils sometimes try to use Developer Contributions Plans<sup>13</sup> and Infrastructure Contributions Plans<sup>14</sup> to fund stormwater projects. However, this approach is not always appropriate or effective.

The difficulties associated with recovering costs linked to the planning system, in established suburbs, provide councils and developers with little incentive to pursue innovative stormwater and IWM solutions.

New planning guidance could be designed in such a way that provides councils and the water sector an opportunity to collaboratively develop and test stormwater projects, with tools to help them recover the costs. This would also strengthen the links between planning and water management.

Some states use council stormwater levies. However, having different levies in different council areas may create confusion for developers.

Some of the work carried out as part of the IWM Framework suggests that there are ways that the IWM Forums could be used to facilitate more equitable cost distribution and inform both strategic planning processes and financial planning by public authorities.

### Voluntary stormwater offsets

Several councils have expressed interest in the use of voluntary stormwater offsets in their areas, particularly councils that can construct relatively low cost public stormwater infrastructure.

Melbourne Water has an offsets framework for new subdivisions which enables developers to request approval from council and Melbourne Water to (partially or fully) opt out of compliance with on-site clause 56.07-4 of the VPP, by subsidising end of line solutions (such as large wetlands). Melbourne Water generally encourages solutions to be built on-site. End of line solutions require new land to be purchased, or use of existing public land, which can be difficult to obtain in suitable locations.

---

<sup>13</sup> Mechanism used to levy new development for contributions to planned infrastructure needed by the future community. A council collects development contribution levies from new development through an approved DCP. An approved DCP is a DCP that forms part of a planning scheme.

<sup>14</sup> Standard levies that are pre-set for particular development settings and land uses, to fund the provision of essential infrastructure that will support new or growing communities.

The City of Kingston is trialling a similar offsets scheme for redevelopments in their area. The City of Kingston has access to more public land than many other urban councils and the local waterways here are already highly urbanised. The council anticipates that its stormwater management measures will deliver not only environmental but also significant social benefits by using WSUD to enhance their open spaces.

While offsets can provide flexibility, they must be carefully designed to deliver optimal place based outcomes. They should only be used where they can provide cost signals which encourage the optimal solutions, in terms of nature, scale and location. Having multiple offset schemes could create confusion, but if there is only one, there are considerations as to its scale and how it should operate. Developers have no incentive to design innovative on-site stormwater solutions when it is cheaper and easier to pay an offset charge. In the upper areas of catchments where waterways tend to be in a relatively natural state, large volumes of stormwater need to be managed to protect these waterways. In these situations, end of line management is unlikely to be effective, when used in isolation. If stormwater management is not incorporated on-site during development, this is a lost opportunity.

Planning principles or codes could be used to guide and encourage the use of stormwater offsets in areas where it can be shown that larger scale stormwater measures will achieve maximum community benefits. Offsets could be used in combination with some degree of stormwater management at the lot scale. Melbourne Water's offsets fund regional retarding infrastructure but don't exempt developers from providing local flood detention measures.

What would help responsible authorities to determine and communicate the costs and benefits of public stormwater infrastructure?

What mechanisms should councils use to recover the construction and maintenance costs of public stormwater infrastructure?

Should offsets be used to improve stormwater management? If so, how should they be used?

# References

1. AECOM, 2012, Economic Assessment of the Urban Heat Island Effect
2. Choi L. & McIlrath B, 2017, Policy Frameworks for Water Sensitive Urban Design in 5 Australian Cities, Monash University, Melbourne, Australia: Centre for Water Sensitive Cities.
3. City of Moreland, 2012, Stormwater quality targets for the City of Moreland
4. Environmentally Efficient Design Local Planning Policies Advisory Committee, 2014, PPV 40
5. Fletcher, T. D. et al., 2011. Stormwater management in a Water Sensitive City. Appendix 4: Stream Ecology (Literature Review) in Blueprint 2011, Melbourne, Australia: Centre for Water Sensitive Cities.
6. Kay E & Hussey K, 2013, Evaluation of Clause 56.07-4 of the Victorian Planning Provisions for DELWP, DELWP
7. Planning Panels Victoria, 2013, Moonee Valley C108 Planning Panels Report, PSA, PPV 81
8. Vietz, G, Rutherford, I, Walsh, C, Chee, Yung En, Belinda, Hatt, The unaccounted costs of conventional urban development: protecting stream systems in an age of urban sprawl
9. Walsh, C. J. & Kunapo, J., 2009. The importance of upland flow paths in determining urban stream ecosystems. *Journal of the North American Benthological Society*, Volume 28, pp. 977-990.
10. Walsh, C. J., Leonard, A. W., Ladson, A. R., & Fletcher, T. D. (2004). Urban stormwater and the ecology of streams. Melbourne, Australia: Monash University (CRC for Freshwater Ecology, Water Studies Centre, CRC for Catchment Hydrology and Institute for Sustainable Water Resources, Department of Civil Engineering).
11. Wenger, S. J. et al., 2009. Twenty-six key research questions in urban stream ecology: an assessment of the state of the science. *Journal of the North American Benthological Society*, Volume 28, pp. 1080-1098.
12. Williams Donald R, 2017, The Influence of Statutory Land Use Planning on Water Sensitive Urban Design Practices, Monash.

## Appendix A – Relevant projects

<b>Project</b>	<b>Description</b>	<b>Lead agency</b>	<b>Relevance to the TOR</b>	<b>Status</b>
Industrial and commercial stormwater standards	This project is seeking to extend the stormwater requirements currently applied to residential greenfield subdivisions to industrial and commercial subdivisions.	DELWP, Water and Catchments	Is expected to extend the current stormwater requirements to industrial and commercial subdivisions by end 2018.	In progress
BPEM Review	EPA has been tasked with revising the BPEM guidelines, which includes the stormwater standards (or objectives), called up through Clause 56.07-4 of the VPP.	EPA	Likely to recommend an expanded range of stormwater standards by mid-2019.	Recently commenced
Port Phillip Bay Environmental Management Plan 2017- 2027	A plan for action and investment on priority issues affecting Bay health.  Priorities were identified through background investigations, and community and agency consultation.	DELWP, Coasts and Marine	The plan aims, among other things, to ensure: <ul style="list-style-type: none"> <li>• nutrient and sediment loads do not exceed current levels and pollutant loads are reduced where practicable</li> <li>• all urban and rural land use effectively controls impacts from stormwater and runoff, and that controls are in place to manage increases in loads</li> </ul>	Completed and in implementation phase
Waters of Victoria - State Environment Protection Policy Review	The SEPP addresses impacts to water quality across Victoria. The SEPP is being revised to ensure that it has clear and relevant standards, legal rules and statutory obligations to protect and improve the health of water environments.	DELWP Water and Catchments	The (BPEM) Planning standards were designed to help implement this SEPP. There is a new urban segment for the growth areas of Melbourne, which has higher SEPP objectives than inner Melbourne. This sets a precedent and potential boundary for a more place based approach to stormwater standards.	Updated draft SEPP (Waters) released for public consultation Feb 2018.
Smart Planning	The Smart Planning program aims to 'make planning in Victoria more efficient, effective, accessible and collaborative' (Reforming the planning system brochure <sup>3</sup> , p.1).	DELWP Planning	This project needs to consider the principles that inform the Smart Planning initiative to ensure recommendations align where possible and relevant.	In progress
Review of the Victorian Building Regulations	Revision of the Victorian Building Regulations, which sunset in 2018	DELWP Planning	No changes to the Victorian variation (2005) 6 star provisions (tank versus solar hot water heater) to the National Construction Code, are proposed in this update.	In progress

Towards Zero Emissions Homes – Beyond 6 Star	Research, consultation and engagement to develop options for energy efficiency regulatory reform for new homes; including a 1. Review of the Victorian variation (2005) to the National Construction Code 2. Policy position for new home energy efficiency regulation	DELWP, Energy	Options for changing the Victorian variation (2005) (tank versus solar hot water heater) will be examined in this update.	Work due for completion June 2020.
Yarra Action Plan	The plan contains a number of actions aimed at improving the land-use and environmental quality of the Yarra River corridor.	DELWP, Water and Catchments	The Committee's ToR are designed to help deliver Action 19 of the Yarra Action Plan	In progress
Little Stringy Bark project	An on-going research program run between the University of Melbourne, Monash University, local government, water authorities and residents. The project is currently assessing whether stormwater management can restore the health of the Creek.	University of Melbourne	Preliminary results indicate that stormwater management can restore waterway health.	In progress
Melbourne Water's Healthy Waterways Strategy	A strategy for prioritising Melbourne Water actions and investment into waterway health.	Melbourne Water	It will outline priority waterways and reaches, based on factors such as social and environmental values and the current condition of the waterways	In progress. Key dates include: March - Key directions for the strategy (draft goals, targets, actions etc) - June - Draft - August - Final
The IWM forums	A platform for identifying 'hot spot' areas or projects for which collaboration between councils, water corporations, catchment management authorities and other important stakeholders is likely to deliver far greater community benefits than could be achieved if these agencies worked in isolation.	Facilitated by DELWP.	The Committee may call on the expertise of the Chapter 5 Water for Victoria Reference Group, which is a group of experts set up to provide oversight and expertise into the forums.	Recently commenced
Better Apartments Design Standards	A range of standards to improve the liveability and sustainability of apartments across Victoria	DELWP Planning	The Better Apartments Design Standards were implemented in the VPP and all planning schemes via Amendment VC136 on 13 April 2017. The provisions require new apartments to meet the BPEM standards.	Completed