



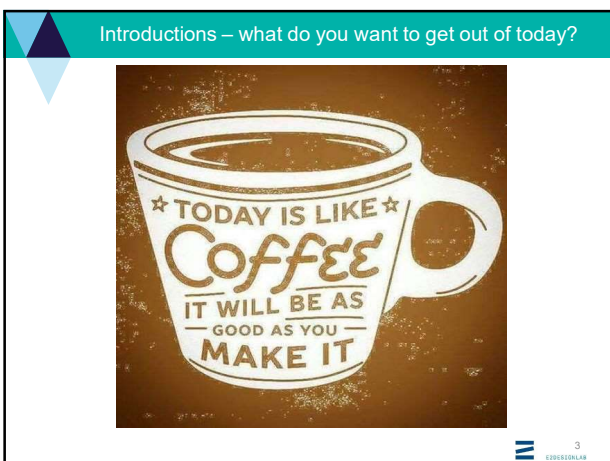
1

Today's activities

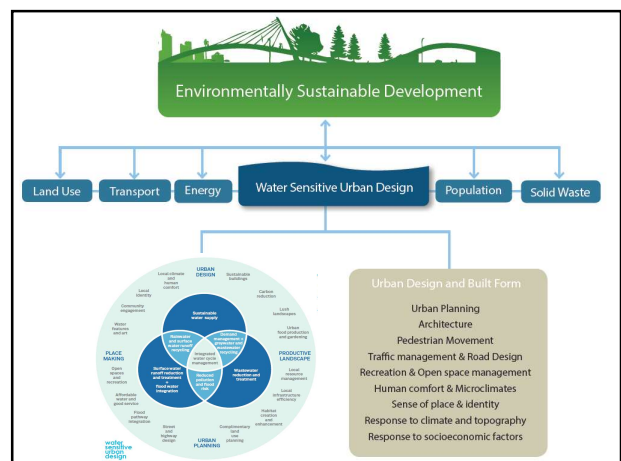
TIME	SESSION
10 am	Welcome and introductions
10:30 am	Why is stormwater management important?
11:05 am	Water Sensitive Urban Design 101
11:45 am	MINI BREAK (15 mins)
12pm	Overview of planning requirements and framework
	Planning requirements #1 - townhouses
1:15 pm	LUNCH (30 mins)
1:45 pm	Tools and resources
	Planning requirements #2 - commercial/industrial
	Pre- application discussion
3:00 pm	Wrap up
3:30 pm	Close



2



3





4

Defining urban stormwater

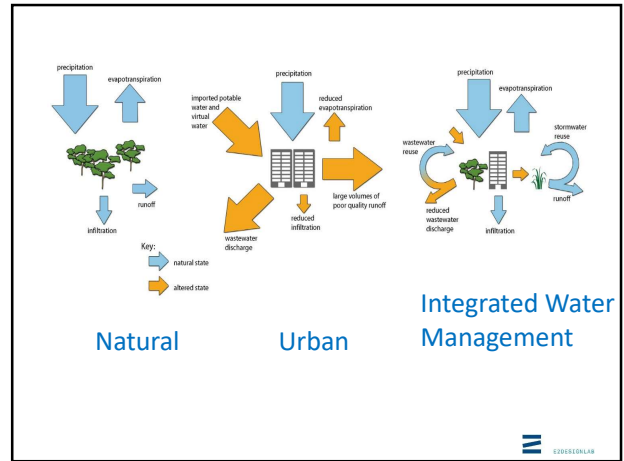
Clause 73.01 defines stormwater as:

The net increase in runoff from urban development due to water not being able to seep into the ground because of impervious surfaces, such as roofs and roads.



 5

5



6

Impacts of stormwater on receiving waters

Predeveloped Fully urbanised catchment

→


0% imperviousness (hard surfaces) 60% Imperviousness (hard surfaces)



 7

7

Impacts of stormwater on receiving waters

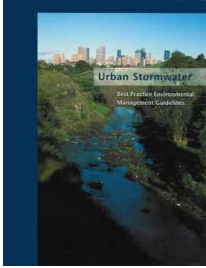


 8

8

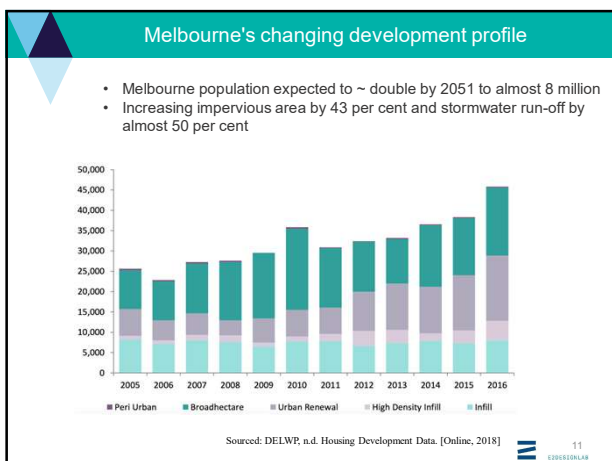
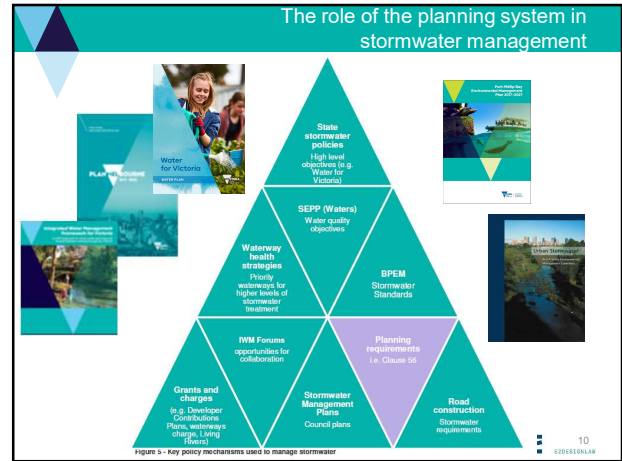
Urban Stormwater Best Practice Environmental Management Guidelines

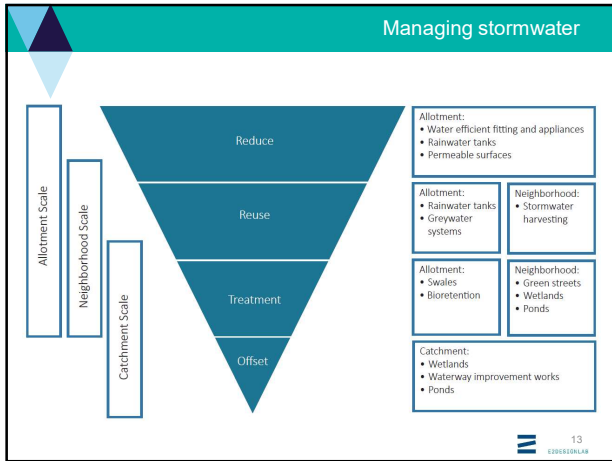
Pollutant type	Current best practice performance objective
Suspended solids (SS)	80% retention of the typical urban annual load
Total phosphorus (TP)	45% retention of the typical urban annual load
Total nitrogen (TN)	45% retention of the typical urban annual load
Litter	70% reduction of typical urban annual load (3)
Flows	Maintain discharges for the 1.5 year ARI at pre-development levels



The intent of the standards are relevant to all scales of development

9

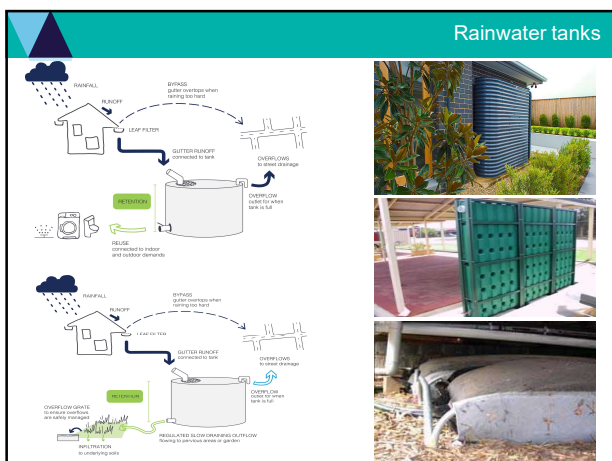




13



14



15



16

Raingardens



Soil and concrete work public domain water garden

Water spills into water garden when cars to too fast and over-saturated


Water runs down through soil gap for logging & flow surface and plants

Cloned concrete collection pipes and Run to the Day

Raingardens are a good fit for a child care centre, or office complex forecourt with a landscape/gardening contractor. Not a great choice for a warehouse forecourt due to the high chance of being run over by vehicles and general neglect.

17

Raingardens



18
EDGECOLLAB

18

Raingardens – the not so good




Poor interpretation of policy leading to poor urban design outcomes

- Increased maintenance problems
- Shorter life span of system working effectively


19
EDGECOLLAB

19


Porous pavements and infiltration systems




1. Open tree pit




2. Grated tree pit




3. Vegetated tree pit



4. Permeable pavement and structural soil to support trees



5. Proprietary structural soil systems (e.g. Chygreen Stratacull)



20
EDGECOLLAB

20

Increase site permeability

“Through the design process we realised how easy it was to improve our site’s permeability with readily available cost effective measures.”

How can I increase site permeability?
 The simplest way to increase your site permeability is to maximise areas where natural drainage can occur. These will include garden beds and lawn areas. However, where areas such as paving or driveways are required, the type of surface or sub-surface construction can greatly affect the overall permeability outcome. The diagram below lists the most permeable surfaces to the least. Keep in mind when selecting building materials for your project.

1 Garden Bed
Natural ground

2 Gravel
Removable sub-surface layer or permeable

3 Decking
Unmade ground below or with permeable treatment

21

21

Passively irrigated trees to enhance urban cooling and greening

22

22

Passively irrigated trees to enhance urban cooling and greening

1 tree in ideal conditions = 8 conventional urban trees

23

23

Passively irrigated trees to enhance urban cooling and greening

Control Tree

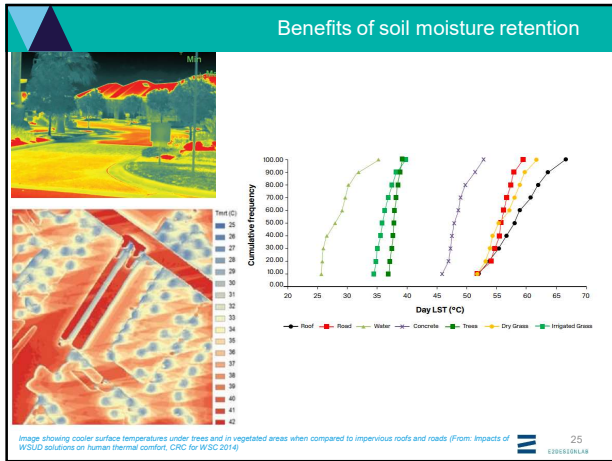
Water Wise Tree

February 2019

May 2019

Photo credits: Tim Davies, BCC
 24

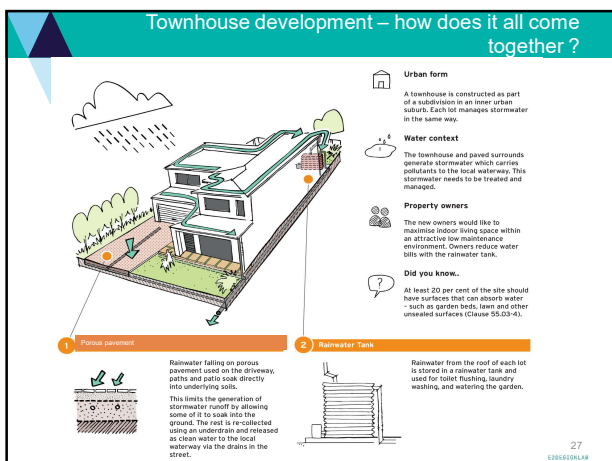
24



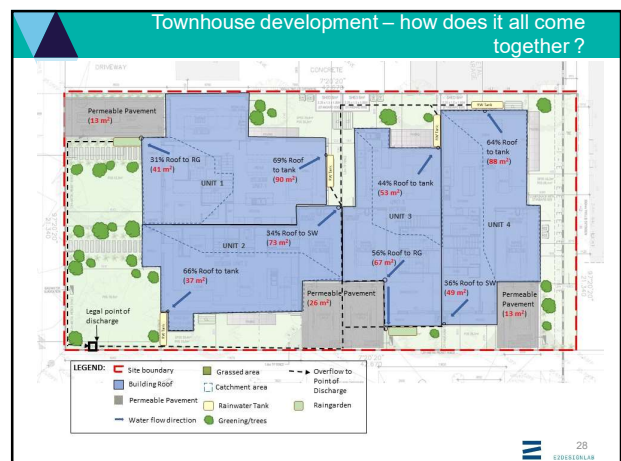
25



26



27



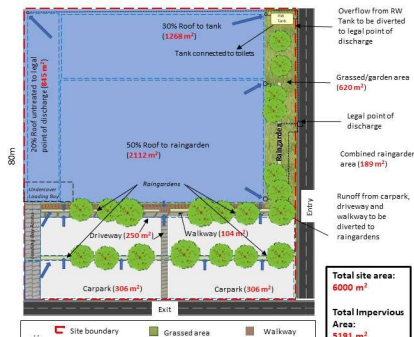
28

Townhouse development – how does it all come together ?



29

Commercial development



75m
80m

- 30% Roof to tank (1268 m²)
Tank connected to toilets
- 50% Roof to raingarden (2112 m²)
- 200% Roof untreated to legal point of discharge (845 m²)
- Grassed/garden area (620 m²)
- Legal point of discharge
- Combined raingarden area (189 m²)
- Runoff from carpark, driveway and walkway to be diverted to raingardens
- Carpark (306 m²)
- Carpark (306 m²)
- Walkway (104 m²)
- Driveway (250 m²)

Total site area: 6000 m²
Total Impervious Area: 5191 m²
Fraction Impervious: 87%

LEGEND:
 Site boundary, Building roof, Driveway, Carpark, Grassed area, Catchment area, Rainwater tank, Water flow direction, Walkway, Adjacent road, Raingarden, Tree

30

29

30

How can the standards be achieved?

Development type	WSUD assets required to achieve standards
Greenfield residential subdivision 10 ha catchment area	Surface area 3.4% of catchment area Wetland
Greenfield industrial subdivision 10 ha catchment area	Surface area 5.2% of catchment area Wetland
Infill townhouses (per townhouse) Site area per townhouse: 210 m ²	2kL Rainwater harvesting for non-potable uses, 1.5 m ² Raingarden
Commercial precinct 4.35 ha catchment area	100 111 ² Sediment basin, 400 m ² Raingarden
Office block Site area 1100 m ²	6kL Rainwater harvesting for non-potable uses, x1 Sediment trap, 2 m ² Raingarden

31

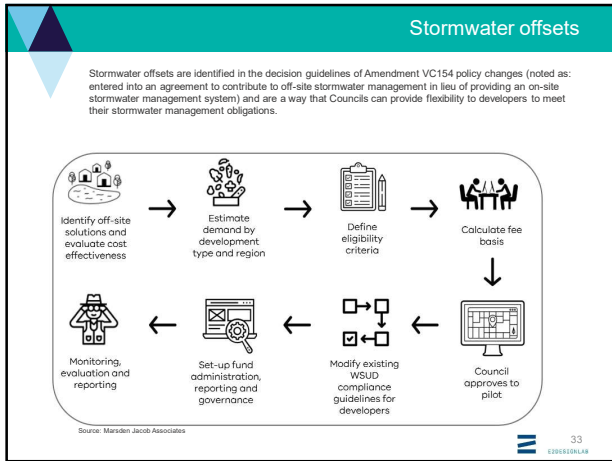
31

Water Sensitive City – Integrated Water Management



32

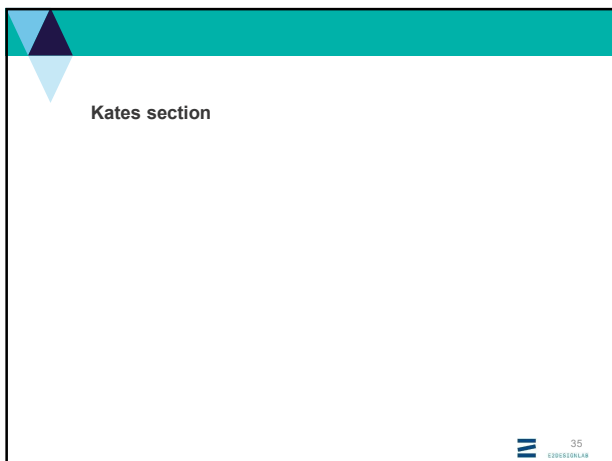
32



33



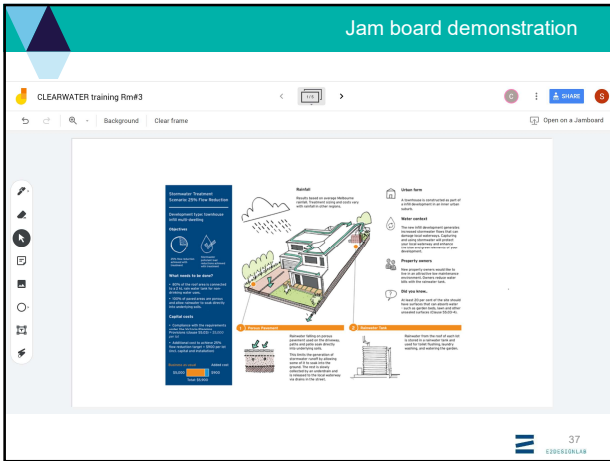
34



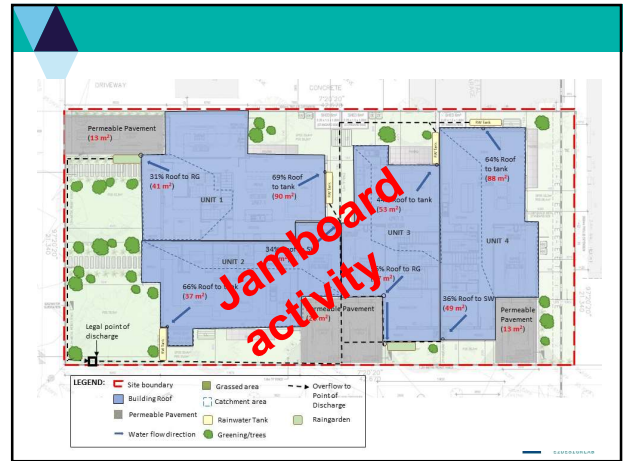
35



36



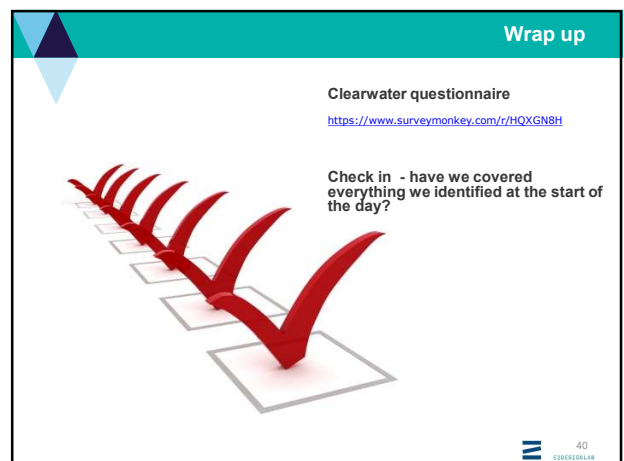
37



38



39



40



41

Assessment – what, why, how




1

State Planning Policies - summary

Clause 19.03-3S Integrated Water Management

- Integrate drainage/stormwater management with environmental, landscape and amenity outcomes

Clause 19.03-3S Integrated Water Management

- Facilitate integrated stormwater, wastewater, drainage, water supply, treatment and reuse
- Facilitate use of alternative water sources/supply (recycled water, use of runoff, stormwater, etc) where practical

Clause 14.02-01S Catchment Management

- Protect catchments and waterways (including drinking water) through controlling development and management of stormwater quality/quantity

3

Planning Control Framework

State Planning Policies

- Clause 14.02-01S (Catchment Management and Planning)
- Clause 14.02-2S (Water Quality)
- Clause 19.03-3S (Integrated Water Management)

Local Planning Policies


Particular Provisions

- Clause 55.03-4 (Rescode) - Standard B9
- Clause 55.07-5 (Rescode – Apartment Buildings) - Standard B39
- Clause 56.07-4 (Residential Subdivision) - Standard C24
- Clause 58.03-8 (Apartment Developments) - Standard D13
- Clause 53.18 (Stormwater Management in Urban Development) - Standards W1, W2, W3

2

Local Planning Policies - summary

- Pre-date Amendment VC154 and introduction of State-level stormwater requirements
- Usually apply to wider range of application types (single dwellings and extensions > 50m²)
- May have specific application requirements and policy guidance
- Sunset clause – continue to have effect where there are no particular provisions in place (ie dwellings and extensions)



4

Local Planning Policies

<p>Local Stormwater Policy</p> <ul style="list-style-type: none"> Bayside Kingston Casey Monash Melbourne Yarra Moonee Valley Port Phillip Stonnington Hume Campaspe Bass Coast 	<p>Local ESD Policy (with Stormwater regs)</p> <ul style="list-style-type: none"> Greater Bendigo Greater Dandenong Hobsons Bay Whittlesea Wyndham Whitehorse Manningham Moreland Darebin Banyule Knox <u>Brimbank</u>
--	---

5

5

Best Practice Environmental Management (BPEM) targets



7

7


Particular Provisions

	Townhouse/units	Apartment buildings	Subdivisions—residential, commercial, industrial	Commercial/industrial development >50m ² Public land
Treatment of stormwater to BPEM objectives	55.03-4B9	55.07-5B39 58.03-8D13	56.07-4C25 53.18 W1	53.18-2W2
Contribute to urban cooling, habitat and amenity	55.03-4B9		56.07-4 C25 53.18 W1	53.18-2 W2
Rainwater tanks (laundry/toilet)		55.07-5B39 58.03-8D13		
Connect to dual pipe recycled water supply		55.07-5B39 58.03-8D13	56.07-2 C23	
Prevent chemicals/toxicants from entering stormwater system				53.18-3W3
Site management during construction	Clause 65 (Decision guidelines)	Clause 65 (Decision guidelines)	56.08-1 C26 53.18-3 W3	53.18-3 W3
Maximise infiltration of stormwater into trees/plants and permeable areas		55.07-5B39 58.03-8D13		

6

6

“The Stormwater management system should be designed to meet the current best practice performance objectives for stormwater quality as contained in the Urban Stormwater - Best Practice Environmental Management Guidelines (Victorian Stormwater Committee, 1999).”




8

8

Assessment – the three step process

What do I need toknow?

1. What are they doing to meet BPEM?
2. Do they actually meet BPEM?
3. Is what they're doing shown on the plans?



9

Questions the application material needs to answer:

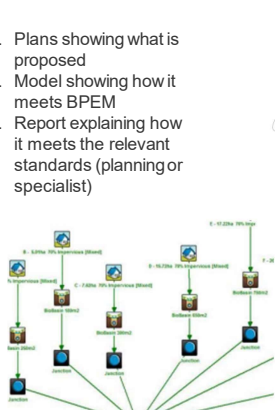
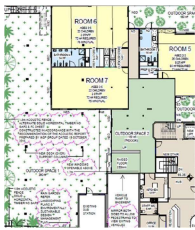
- What land uses are proposed?
- Permeable vs impermeablesurfaces (location and areas)
- What type of stormwater assets are being proposed?
- How big are the assets and where are they located?
- What level of treatment willthey achieve
- Where is the legal point of discharge
- Who's going to own/maintain the assets?



11

What are they doing to meetBPEM?

1. Plans showing what is proposed
2. Model showing how it meets BPEM
3. Report explaining how it meets the relevant standards (planning or specialist)

10

Do they actually meet BPEM?

STORM – Online tool

- Print out of STORM report
- Make sure meets 100% or more
- Make sure report inputs and results match plan

MUSIC – Proprietary software

- Provide a copy of the model file
- Print out the modelling results
- Provide summary of your model inputs for each treatment train (ie catchment size, % impervious, treatment area, etc)
- Provide a print out of the model schematic

Bonus points:

- Provide details of model parameters
- Provide results of MUSIC auditor run (if using Melbourne Water MUSIC Guidelines)

12

What to use when?

Development type	STORM	MUSIC
Subdivision (all)	✗	✓
Townhouses/units	✓	✓
Apartment buildings	✓	✓
Commercial/industrial – small scale	✗	✓
Commercial/industrial – new buildings/precincts	✗	✓

13

13

MUSIC models

15

15

STORM report

<https://storm.melbournewater.com.au/>

Storm rating $\geq 100\%$

14

14

What do I need to use?

- Model file (.sqz)
- Stormwater Strategy (or similar) including:
 - Model schematic
 - Summary of results
 - Details of size and location of internal catchments (what's being treated)
 - Details size and location of treatment assets (what's doing the treatment)
- Model parameters

16

16

What am I looking for?

- Does the % reduction meet BPEM targets?

	Sources	Residual Load	% Reduction
Flow (ML/yr)	67.9	38.2	43.8
Total Suspended Solids (kg/yr)	9270	1830	80.3
Total Phosphorus (kg/yr)	20.2	6.79	66.4
Total Nitrogen (kg/yr)	154	74.3	51.7
Gross Pollutants (kg/yr)	2570	5.97	99.8

Flows	Engineers to advise (1.5 ARI pre development levels)
Total Suspended Solids (TSS)	≥80%
Total Phosphorus(P)	≥45%
Total Nitrogen(N)	≥45%
Gross Pollutants(Litter)	≥70%

17

17

Is what they're doing shown on their plans?

Site layout plan

19

19

How do I know it's right?

www.musicauditor.com.au

- Checks for potential issues with a model
- Identifies where standard parameters (inputs) have been varied
- Requires applicants to provide a .mrt file (Summary Report) of their model

Parameter	User Input	Check	Override	Message/Notes
Urban Node 4) Music Help				
Field Capacity (mm)	80	not equal	20	Use of 20 mm (suitable for clay soils with low infiltration) required. Variations need to be explained.
Soil Storage Capacity (mm)	120	not equal	30	Use of 30 mm (suitable for clay soils with low infiltration) required. Variations need to be explained. EAQ
Initial storage (% of Capacity)	30	not equal	25	Default expected, variations need to be explained.
Urban Node 5) Music Help				
Field Capacity (mm)	80	not equal	20	Use of 20 mm (suitable for clay soils with low infiltration) required. Variations need to be explained.
Soil Storage Capacity (mm)	120	not equal	30	Use of 30 mm (suitable for clay soils with low infiltration) required. Variations need to be explained. EAQ
Initial storage (% of Capacity)	30	not equal	25	Default expected, variations need to be explained.
Agricultural Node 6) Music Help				
Node Type	Agricultural	not equal	Urban	Only urban source nodes generally accepted. Urban source nodes should be used for pervious areas within urban areas. Forest nodes only appropriate for well established forested areas. Agricultural nodes are only appropriate to represent existing farming areas prior to development. EAQ
Field Capacity (mm)	80	not equal	20	Use of 20 mm (suitable for clay soils with low infiltration) required by MFC guidelines. Variations need to be explained.
Soil Storage Capacity (mm)	120	not equal	30	Use of 30 mm (suitable for clay soils with low infiltration) required by MFC guidelines. Variations need to be explained. EAQ
Initial storage (% of Capacity)	30	not equal	25	Default expected, variations need to be explained.
Urban Node 7) Music Help				

ENGINEERS ONLY!

18

18

- Water flows downhill – the stormwater asset needs to be downslope of what it's treating
- Make sure sizing on plans matches what's in the modelling (ie STORM report/Stormwater Management Strategy)
- Does it fit? Wetlands/large bioretention basins need access paths, batters, etc – are they shown?

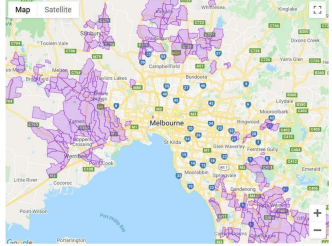
- Where's the legal point of discharge?
- Who's land is it on?
- Is what's being proposed practical given the future use of the site, and who's likely to maintain it.
- Council WSUD/asset management guidelines – preferences and requirements

20

20

When is it OK NOT to meet BPEMonsite?

- Existing regional scale WSUD asset strategy (Melbourne Water drainage scheme) or ICP/DCP which includes SWQ infrastructure (regional)
- Amendments to permit (depending on scale)
- If cost of full compliance with BPEM is significant non-compliance with other standards OR strategic justification (ie higher densities/site coverage actively sought by policy)




Remember – these are standards.
Should not must!

21

21

When is it OK NOT to meet BPEMonsite?


“The stormwater management system should be designed to contribute to cooling, improving local habitat and providing attractive and enjoyable spaces”



23

23

Urban cooling, habitat and landscape



22

22

Urban Cooling

- Decrease hard surfacing or dark walls/roofs which retain and reflect heat
- Shade out hard surfaces with canopy trees
- Increase cooling through evapotranspiration by vegetation cover, particularly trees

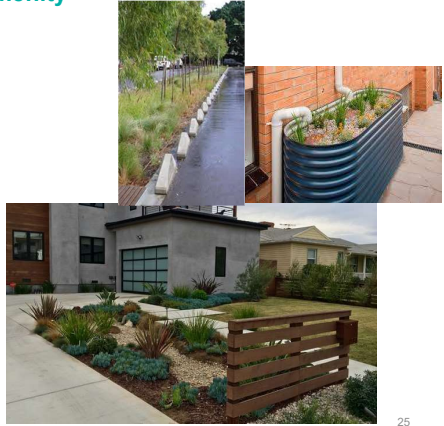


24

24

Habitat and Amenity

- Integrate landscape into drainage design and viceversa
- Passive irrigation
- Water management as landscape/design feature.



25

25

Site Management



27

Not an extra requirement, but a complimentary requirement



Urban cooling, habitat and landscape

- Apartment Buildings D7 – Communal Open Space
D10 – Landscape (including deep soil objectives)
- Townhouses and units (CL 55)
B1 – Neighbourhood character
B13 – Landscaping
B11 – Open Space (communal)
- Subdivisions
C6 – Neighbourhood character
C12 – Integrated Urban Landscape
C13- Public Open Space

26

26

Site Management

An application should describe how the site will be managed prior to and during the construction period and may set out requirements for managing:

- Erosion and sediment.
- Stormwater.
- Litter, concrete and other construction wastes.
- Chemical contamination



28

28

KM1

Site Management Plan
Site Environmental Management Plan
Construction Environmental Management Plan

29

Who assesses what?

Planners

- Ensure all required information is provided with the application.
- STORM reports
- Ensure the layout provides sufficient space for stormwater management.
- Undertake a holistic assessment of how the proposed stormwater management **integrates with the remainder of the applicable planning policy framework.**
- Ensure permit includes appropriate conditions which ensure planning scheme requirements flow through to final construction and can be enforced

31

Decision making and permit conditions

30

Engineering/Assets


- Technical assessment of designs and MUSIC modelling
- Final design review and approval (including landscape)
- Does it work (ie functional assessment)?
- Review and approvals of site management plans

32

Conditions

Prior to commencement of works

- Approved final layout (Condition 1)
- Functional/detailed engineering design approval (incl. asset design)
- Final landscape plan approval
- Site Management Plan approval



33

33

Development Specific Examples and Provisions




35

35

Prior to commencement of use/completion of development

- Stormwater assets are completed and connected to legal point of discharge
- Final asset inspections and sign off (usually public assets only).
- Completion of landscaping works (sign off/inspection/bond as relevant)




Remember - building/plumbing approvals have to follow the planning permit

34


34

Townhouse/Unit Development – Clause 55



36

36



Key requirements (B9)
20% site permeability (or as varied by the zone schedule)

Likely to see


- Water tanks
- Permeable paving (driveways, paths)
- 'Planter box' raingardens
- Small rain gardens

Information required

- STORM report (standalone or as part of ESD report)
- Written response to Standard, either by drainage engineer or project planner
- Site plans and upfront landscape plan
- 'Standard drawing' of stormwater asset (**raingarden only**)

37

37



Requirements - Standard B39/D13

- Rainwater reuse tanks (grey water systems)
- Maximise infiltration and minimise hard surfaces
- Connection to piped recycled water system, if available

Information required

- **As per Clause 55 applications**

What to expect

- Water tanks
- Permeable paving and tree pits (car parks)

39

39




Apartment Buildings




38

38



Exercise #1 – Townhouse Assessment



40

40

Stormwater planning for greener, cooler environments and healthier waterways

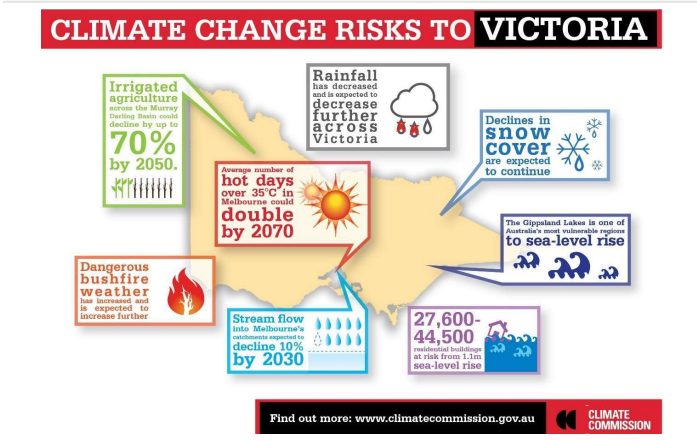


Mandy Bolton



 Environment, Land, Water and Planning

41

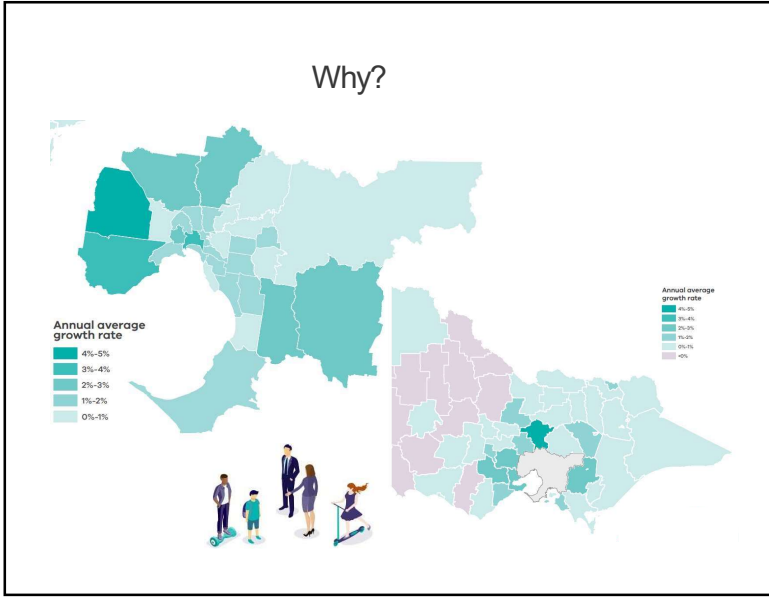
CLIMATE CHANGE RISKS TO VICTORIA



- Irrigated agriculture** across the Murray Darling Basin could decline by up to **70% by 2050**.
- Rainfall** has decreased and is expected to **decrease further** across Victoria.
- Declines in snow cover** are expected to continue.
- The Gippsland Lakes is one of Australia's most vulnerable systems to **sea-level rise**.
- 27,600-44,500** residential buildings at risk from 1.1m sea-level rise.
- Stream flow** into Melbourne's catchments expected to **decline 10% by 2030**.
- Average number of hot days** over 35°C in Melbourne could **double by 2070**.
- Dangerous bushfire weather** has increased and is expected to increase further.

Find out more: www.climatecommission.gov.au 

43



42

State policy context for greener, cooler environments and healthier waterways

- Water for Victoria
- Plan Melbourne
- Yarra Action Plan
- Port Phillip Bay Environmental Management Plan



44

IWM Framework for Victoria

IWM Forums established for:

- Each of the major waterway catchments of Greater Metro Melbourne (5)
- Regional areas defined by water corporation boundaries (10)

Key partners:

- Local Government, Catchment Management, Authorities, Traditional Owners, Water Corporations, others as relevant e.g. Victorian Planning Authority



45

Victoria's stormwater planning requirements

Since 2006

- Residential subdivision

Since 2017

- Apartments

Since 2018

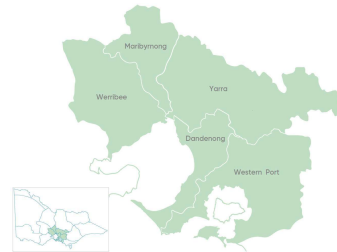
- Residential multi-dwellings (e.g. townhouses)
- Commercial subdivisions and developments
- Industrial subdivisions and developments
- Public use developments

7

47

Catchment scale IWM Plans

- Will identify catchment scale targets to drive catchment scale investments
- Will inform local scale targets to drive local scale investments
- Deliver evidence to guide whole-of-cycle water planning policy reform
- Align water management and land use planning for improved resilience and liveability



6

46

Policy reform and supporting tools

BPBM review

- Strengthened standards for stormwater management

STORM upgrade

- User friendly tool to support small development applications

Offsets

- For equivalent stormwater treatment offsite

Building controls

- New single dwelling developments and extensions over 50m2

Melbourne Urban Stormwater Institutional Arrangements (MUSIA)

- Clarify stormwater and flood risk roles and responsibilities between Melbourne Water and greater Melbourne councils

ESD for new buildings in Victoria's planning system

8

48

Capacity building initiatives underway by DELWP

Training and information sessions

- 20 information sessions have been delivered statewide to an audience of over 900 people

Resources

- DELWP checklists and guidance
- Online Navigator Tool Resource Portal
- Online training modules

Developed in partnership between DELWP and Clearwater

9

49

Online Navigator Tool Resource Portal

- Assist planning system users identify stormwater management requirements set out in VPPs
- Non statutory guide, supported by checklists and context specific guidance
- Links to DELWP checklists and example development types
- Links to additional resources (e.g. EPA, Melbourne Water, local council)
- Outlines site management and asset maintenance requirements
- Final user testing completed. To go live soon.

11

51

DELWP resources: checklists and example development scenarios

Stormwater report checklists – handy compliance reference for applicants and assessors

1. Subdivision
2. Buildings and works

Example development scenarios - cross reference checklists and provide further detail and resources

1. Non residential building and works (such as commercial/retail)
2. Medium to high-density residential building and works (such as apartments)
3. Multi-dwelling building and works (such as townhouses)
4. Non-residential subdivision

10

50

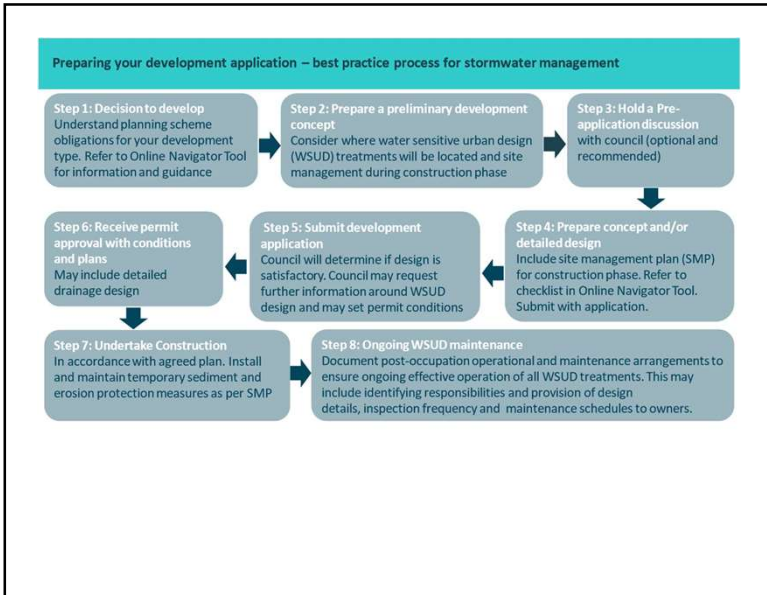
Zone	Development Type	IWM/Stormwater clause	Site Management clause
RESIDENTIAL	Subdivisions	56.07	56.08
	Apartments (buildings & works)	55.07-5 B39 58.03-8 D13*	At responsible authority's discretion (65.01)**
	Multi-dwelling (buildings & works)	55.03-4 B9	At responsible authority's discretion (65.01)**
NON-RESIDENTIAL	Subdivisions	53.18-4 W1	53.18-6 W3
	Buildings & Works	53.18-5 W2	53.18-6 W3

* The Permeability and Stormwater Management objectives in these clauses are identical – the applicable clause is dependent on the zoning and number of storeys in the development.

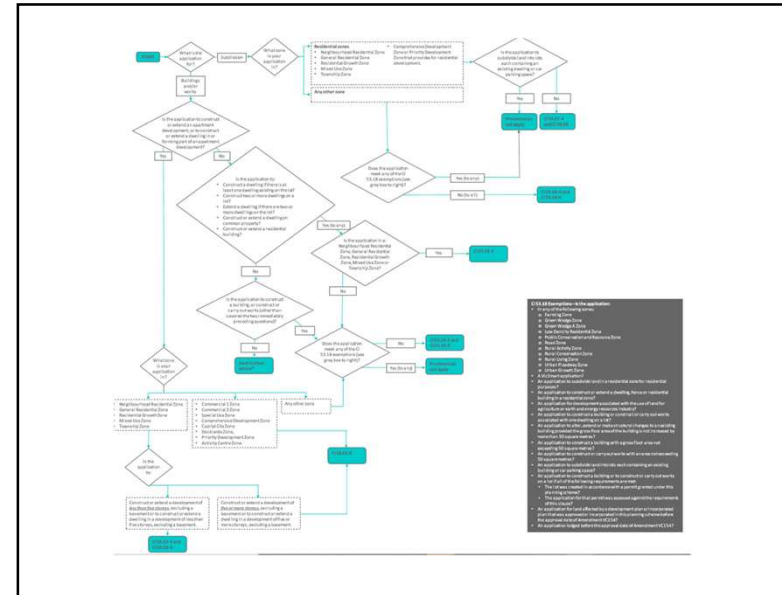
** Clause 65.01 specifies decision guidelines which list matters the responsible authority must consider, as appropriate, before deciding on an application or approval of a plan. This includes consideration of whether a proposed development is designed to maintain or improve the quality of stormwater within and exiting the site. They do not apply to VicSmart permits.

12

52



53



55

Online training modules

Incorporated into the Portal and also stand alone online resources

- 1: How use the Online Navigator Tool Resource Portal
- 2: How to assess small developments - e.g. townhouses

14

54

Relevant planning clauses and guidance material

Outlines stormwater and site management VPP clauses that apply to your development.

Provides resources to support development of stormwater report:

- Site layout plan, catchment areas and WSUD treatments
- Modelling to demonstrate compliance
- Functional design consideration
- Site management plan
- Asset maintenance program

DELWP development checklists and example developments

Print PDF summary of requirements and resources

16

56

Online Navigator Tool Resource Portal

Online Navigator Tool Resource Portal

Choose your development scenario run throughs

<https://staging.clearwatervic.com.au/resource-library/toolkits/stormwater-planning/>

17

57

Requirements – W2/W3

- Design to prevent/limit potential for pollutants to wash into stormwater system and waterways.
- Manage site during construction to prevent/limit pollutants and soil washing into stormwater system and waterways
- Water tanks
- Tree pits, permeable paving
- Gross pollutant traps (GPTs)
- Small scale raingardens/bioretention basins
- Canopies/enclosures for areas used for chemical storage (including fuel tanks)
- Drain 'dirty' areas to sewer

42

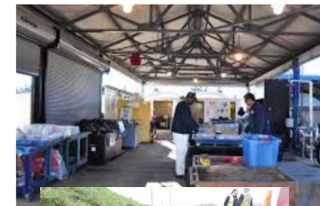
59

Commercial and Industrial Development



41

58




Design to stop polluted runoff reaching stormwater system:

- Roofed, designated storage area
- Internal drainage design – polluted run off directed to sewer/sump
- Bunding (physical barrier)



60



Information required


- MUSIC model
- Stormwater strategy
- Engineering design (unless water tanks only)
- Site plans and concept landscape plan
- Site management plan (can be conditioned)

What to expect

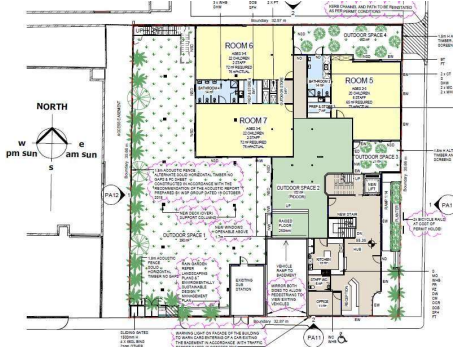
- Water tanks
- Tree pits, permeable paving
- Gross pollutant traps (GPTs) - **industrial**
- Small scale raingardens/bioretention basins
- Canopies/enclosures for areas used for chemical storage (including fuel tanks) - **industrial**
- Drain 'dirty' areas to sewer - **industrial**

44

61




The site is within the Commercial 1 Zone and is not affected by any overlay.




46


63



Worked example – Child care centre



62



Suggested components for Applicants

Item 1:	Drainage and WSUD Summary Report	<i>What is the best strategy to manage drainage and improve stormwater quality for the site? Are the best practice standards achieved?</i>
Item 2:	Site Layout Plan	<i>Are the drainage and WSUD layout shown on planning drawings?</i>
Item 3:	Design and engineering calculations	<i>What are the engineering details of proposed WSUD treatment system?</i>
Item 4:	Site Management Plan	<i>How will construction be managed so that stormwater is protected?</i>

47

64

Drainage and WSUD summary report

Assessor: SDC
 Development Type: Other
 Allotment Site (m2): 1,172.5
 STORM Rating %: 104

Does the STORM rating achieve 100% or more?

Description	Impervious Area (m2)	Treatment Type	Treatment Area/Volume (m2-dm3)	Occupants / Number Of	Treatment %	Tank Water Supply Reliability (%)
Rest of Site	392.00	None	0.00	0	0.00	0.00
Roof to Tank	485.00	Rainwater Tank	16,000.00	100	170.00	82.00
Connected to Raingarden	295.00	Raingarden 100mm	20.00	0	133.20	0.00

Are the locations of the WSUD assets shown on the site layout plan? Have engineering drawings been provided?

65

Item 2 Site layout plan

67

Suggested components for Applicants

Item 1:	Drainage and WSUD Summary Report	<i>What is the best strategy to manage drainage and improve stormwater quality for the site? Are the best practice standards achieved?</i>
Item 2:	Site Layout Plan	<i>Are the drainage and WSUD layout shown on planning drawings?</i>
Item 3:	Design and engineering calculations	<i>What are the engineering details of proposed WSUD treatment system?</i>
Item 4:	Site Management Plan	<i>How will construction be managed so that stormwater is protected?</i>

66

Suggested components for Applicants

Item 1:	Drainage and WSUD Summary Report	<i>What is the best strategy to manage drainage and improve stormwater quality for the site? Are the best practice standards achieved?</i>
Item 2:	Site Layout Plan	<i>Are the drainage and WSUD layout shown on planning drawings?</i>
Item 3:	Design and engineering calculations	<i>What are the engineering details of proposed WSUD treatment system?</i>
Item 4:	Site Management Plan	<i>How will construction be managed so that stormwater is protected?</i>

68

Item 3 Drainage and engineering calculations

52

69

Item 4 Site management plan

71

71

Suggested components for Applicants

Item 1:	Drainage and WSUD Summary Report	<i>What is the best strategy to manage drainage and improve stormwater quality for the site? Are the best practice standards achieved?</i>
Item 2:	Site Layout Plan	<i>Are the drainage and WSUD layout shown on planning drawings?</i>
Item 3:	Design and engineering calculations	<i>What are the engineering details of proposed WSUD treatment system?</i>
Item 4:	Site Management Plan	<i>How will construction be managed so that stormwater is protected?</i>

53

70

Key questions to consider

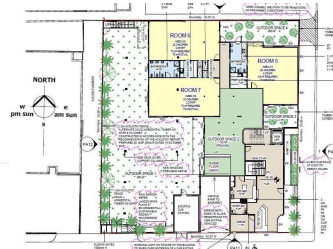
- What must occur to satisfy the requirements of Clause 53.18?
 - Standard W2
 - Standard W3
- Are all measures in the STORM report shown on the plans?
- Are the best practice stormwater requirements achieved?
- What suggestions could you make to the developer to improve the beneficial outcomes for the site?

55

72

Lets discuss: actual report for the site

- occupants/number of bedrooms
- treatment % in at 179%
- reliability of supply



Assessor: SDC
 Development Type: Other
 Allotment Site (m2): 1,172.00
 STORM Rating %: 104

Description	Impervious Area (m2)	Treatment Type	Treatment Area/Volume (m2 or L)	Occupants / Number Of Bedrooms	Treatment %	Tank Water Supply Reliability (%)
Rest of Site	392.00	None	0.00	0	0.00	0.00
Roof to Tank	485.00	Rainwater Tank	16,000.00	100	170.00	82.00
Connected to Raingarden	295.00	Raingarden 100mm	20.00	0	133.20	0.00

56