Water Sensitive Urban Design (WSUD) Guidelines for City of Yarra Works

First Drafted October 2012, Revised February 2016

Contents

1. Background

At on 28 June, 2011 Council adopted a WSUD Policy for Council Infrastructure Assets and supported the proposed implementation strategy to better integrate WSUD across Council asset management.

The 2011 policy sought to:

- ensure Council's infrastructure asset management works complied with the best practice performance objectives for total suspended solids, total phosphorus and total nitrogen, as set out in the *Urban Stormwater Best Practice Environmental Management Guidelines*, Victoria Stormwater Committee 1999 as amended;
- require the use of stormwater treatment measures to improve the quality and reduce the flows discharged to waterways;
- ensure that water efficiency measures were included in new or upgraded infrastructure asset management works;
- prevent litter being carried off-site in stormwater flows;
- identify and investigate WSUD opportunities at project inception and their inclusion in Project Implementation Plans; and
- include WSUD principles in project briefs and tender documents.

The 2011 policy also sought to, wherever possible, incorporate WSUD into various Council works, especially those delivered by the then Infrastructure Services.

Due to a four year time limit, the 2011 policy expired on 28 June 2015.

The 2016 revised policy seeks to incorporate and retain without change the principles articulated in the 2011 policy. .

2. What Does The Policy Mean for Council Works?

The revised 2016 policy means that when any works are planned or undertaken across Council, consideration must be given to water issues and especially stormwater quality and volume reduction.

The policy makes particular mention of all road related and drainage works, new Open space and planted projects, new and upgraded buildings, as well as emphasising the need for commitment to WSUD innovation and stormwater and rainwater capture and re-use.

3. Objective of the Works Guidelines

The purpose of the Guidelines is to ensure that the 2016 Council Policy is translated into practice through the planning, design and construction of capital works. The Guidelines therefore serve as a prompt to officers that water management must be a key consideration in works planning as it is Council policy that WSUD considerations "will be integrated into renewal, upgrade, new and maintenance works." A key function of this document is to provide initial information that can help in that integration task.

4. Why is WSUD Important?

Water Sensitive Urban Design (WSUD) seeks to treat all forms of water (potable water, rainwater, stormwater, greywater and blackwater) as resources that should be managed.

WSUD seeks to change the way we create infrastructure on public lands and roads with WSUD being a vehicle to provide a more liveable urban environment with more green infrastructure and previous surfaces. In seeking to place value on all forms of water rather than defining many forms of water as waste and simply discharging them rapidly to a receiving water body, the WSUD philosophy seeks to retain water as locally as possible, ensuring that it can be put to a fit-for-purpose use with as much water as possible retained within catchments for infiltration, or until treatment has permitted it to be discharged to a receiving water body at a suitable time that does not provide detriment.

WSUD has merged with notions of integrated water management and become increasingly directed to the achievement of more liveable urban environments. Especially to support additional green infrastructure with more shaded and attractive urban environments that can mitigate heat, make physical activity more and add value and vibrancy to residential and commercial precincts.

5. Applying WSUD

In a City of Yarra context, the application of a WSUD philosophy means that when works are planned, it must be possible to demonstrate that for:

(i) Building Works

- rainwater harvesting and reuse has been considered where new, refurbished or extended roofs are installed.

    - possible internal uses such as toilet flushing, dishwashers, clothes washing machines, hot water for showers, evaporative air conditioning (especially where cooling via ceiling fans or building shading is deemed insufficient) and any other uses considered appropriate
    - any possible external uses for green walls, garden or open space irrigation, either in the immediate vicinity of the building or for open space in the local area.

- tank sizing has considered some over-sizing to limit overflows in more intensive rainfall events thereby improving reliability of supply. This would also contribute to reducing discharge to local waterways.

- any increased building footprint size has compensating WSUD offsets that maintain or reduce stormwater discharge compared with the previous building through: increased rainwater harvesting and re-use; increased pervious areas; increased on-site retention and infiltration of stormwater; or a combination of all of these or other measures.

- a range of water efficiency measures will be included in the fit out of the new or refurbished building including, but not limited to: tap aerators, flow restrictors; water efficient showerheads, toilet cisterns, dishwashers, washing machines and evaporative coolers (if applicable); waterless urinals; and re-circulators (or similar) for initial water from hot taps. Greywater diversion to garden may also be considered in some circumstances where garden is a significant element of the grounds and has appropriate soil percolation characteristics.

- the capacity of the local stormwater drainage system has been considered and that Council through its works will be setting an example, via its building works, for retention of stormwater in a manner that does not put additional stress on

the capacity of the local drainage system, or even seeks to relieve some of that capacity though the provision of additional storage capacity beyond the site requirements.

(ii) Road Related Works

- all opportunities for:
  - impervious surface reduction and replacement with vegetated areas;
  - pervious pavements especially in low traffic areas such as footpaths;
  - stormwater re-use via tree or garden bed irrigation within the works site;
  - reset of a reduced road area with increases in near source WSUD elements to assist in lowering sediment and leaf litter discharges to the drainage system;
  - a formal bio-filtration raingarden;

  have been explored during the planning phase.

- where major road re-construction is contemplated for wider streets (in excess of 22 metres property boundary to property boundary), all opportunities for development of centre vegetated swales are explored with drainage to that point. The road could be reconfigured to fall into the centre or in some cases perhaps cross-fall to one side.

- any drainage works have given consideration to the potential for direction of flows to any adjacent open space area, or the potential to link or direct flows to open space areas for subsequent harvesting and irrigation purposes.

(iii) Open Space or Various Garden Works

- address possible water repellence (hydrophobia) as part of construction to increase soil permeability.

- new works have been designed with The use of appropriate plants for soil condition and climate conditions.

- location of new works has sought to assess within project feasibility, the availability of irrigation for parks and gardens, including streetscapes, from alternative water sources.

- any increase in the number of open space areas under Council management and/or any increase in the total hectares of open space must not contribute to a rise in potable water demand incompatible with an overall, longer term downward trend in its use.

- there is recognition that open space (along with the Leisure Centres), are Council's largest water users by a significant margin and advances in reduction of potable water use must continue to be made from the open space area and should come about as a result of increasingly efficient application of irrigation water, as well as new alternative sources.

6. Staff Resourcing for the Application of WSUD

Specific staff training will need to be undertaken to ensure WSUD is embedded within everyday work practices and becomes part of the professional outlook of staff across Infrastructure Services.

Training courses that may need to be conducted could include:

- water sensitive road design
- water sensitive building design -
- water sensitive open space design and management -

7. Other WSUD Resources

Sections 7.1 through 7.4 provide an overview of documentation relating to WSUD

7.1 Guideline Documents

- *Water Sensitive Urban Design Engineering Procedures: Stormwater*, Melbourne Water, CSIRO Publishing 2005; and the earlier
- *Urban Stormwater Best Practice Environmental Management Guidelines*, Victorian Stormwater Committee, CSIRO Publishing, 1999.
- Streetscape WSUD Raingarden & Tree Pit Design Package, Moreland City council, GHD, 2013 (updated 2015)
- Water Sensitive Urban Design Guidelines, City of Yarra WSUD implementation Report November 2007, Melbourne Water, City of Yarra, 2007

7.2 Victorian Training Organisations & Industry Advice

Clearwater : http://www.clearwater.asn.au/resource_library

8. Measures for Achieving WSUD

8.1 Water Sensitive Road Design (WSRD)

Yarra's roads are responsible for generating 72% of all Total Suspended Solids (TSS) The road system is responsible for the generation of 488 tonnes of TSS each year. Total nitrogen load at 4.4 tonnes.

It is important that available opportunities for construction of street tree pits and on-street raingardens are taken up in conjunction with LTAM's road re-design, re-construction and re-sheeting, as per Council policy. . It is also critically important that the works phase of road re-construction observe sound environmental management practices to ensure that sediment is prevented from entering the stormwater system. Large scale WSUD opportunities should also be considered with road works.

8.2 Common WSRD Treatments

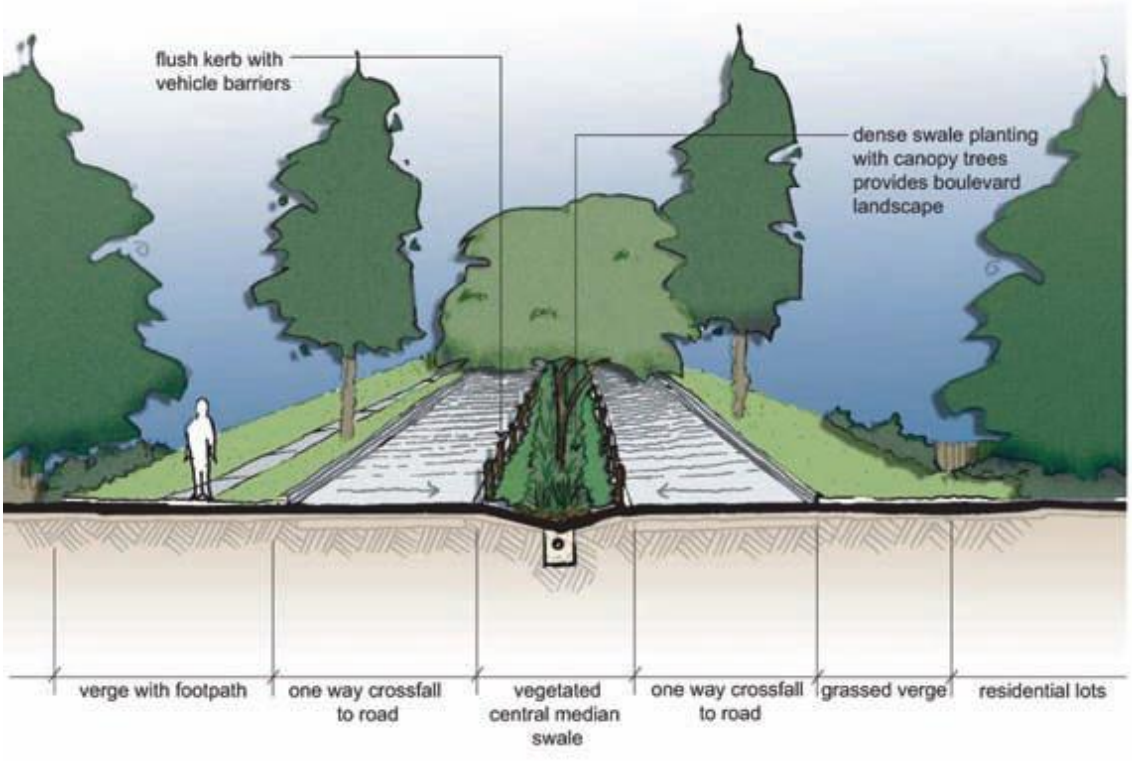
8.2.1 Swales, including Vegetated Swales and Bioretention Swales

A Vegetative Swale is a planted stormwater conveyance channel.
Bioretention Swale is a vegetative swale with bioretetion element.

General information about swales can be found at the following link to the Melbourne Water website:
http://wsud.melbournewater.com.au/content/treatment_measures/swales/overview.asp

Examples of Swales

Centre median vegetated swale – landscape feature, stormwater treatment and some local detention.



Schematic of centre median vegetated swale

The design procedure for swales is set out in Section 5.3 of the Engineering Procedures

Planning for maintenance is an important element of vegetated swale design. Sections 5.5 and 8.5 of the WSUD Engineering Procedures outline various maintenance considerations that need to be accounted for. Maintenance that addresses sediment accumulation and debris removal is especially important.

8.2.2 Buffer Strips

Buffer strips are areas of vegetation through which runoff passes while travelling to a vegetated swale, or a bioretention area, prior to going to a discharge point. Like swales, buffer strips are useful in reducing sediment loads and rely on well-distributed shallow flows passing across them. Buffers can be used as an edge to swales, especially where flows are distributed and enter along the edge of the swale or at discrete points along a swale. Buffer strips can also take the form of primary sediment capture zones or indeed leaf litter capture zones.

8.2.3 Porous Pavements

Porous pavements are permeable surfaces that allow water to seep through the surface. They often have an underlying storage reservoir filled with aggregate material that provides temporary storage prior to infiltration into the underlying soils - should those soils permit. The heavy basalt clays of Yarra are likely to offer limited infiltration investigation on a case by case basis is needed.

Since the reservoir area underneath porous pavement stores and infiltrates surface runoff, using porous pavement can significantly reduce the amount of land needed for traditional stormwater management measures. Where infiltration is effective, porous pavement can increase groundwater recharge, reduce pollutants in stormwater runoff, and help alleviate flooding and contamination to streams.

Porous pavements take on many forms from permeable pavers to pebble material loosely bound together with resins that allow penetration of water. A number of porous paving products are commercially available and include:

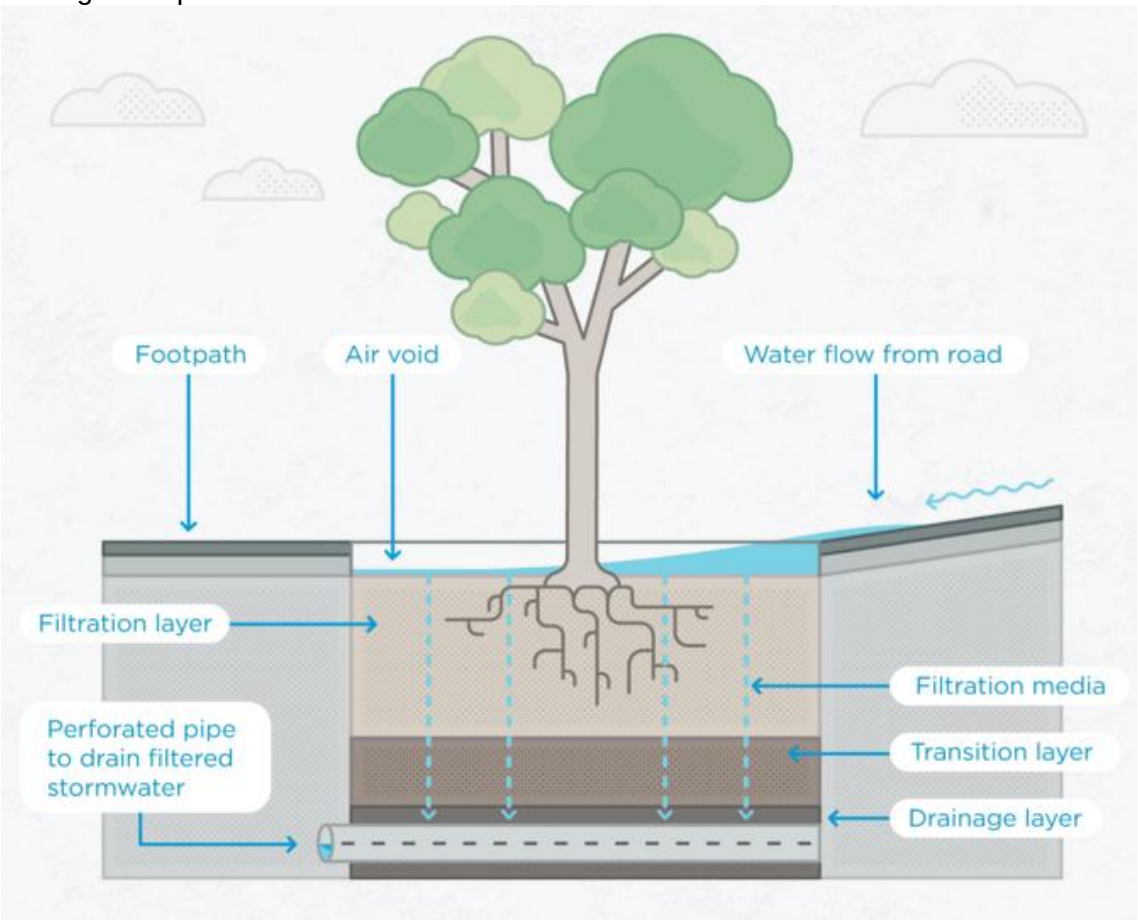
- concrete grid pavements that allow stormwater to filter through voids in the concrete –
- plastic modular block pavements that allow stormwater to filter through voids in the plastic matrix -
- resin bonded stone and shredded rubber materials
- Permeable Bluestone, concrete and Asphalt
- Porous grates

Eastern end of car park for Fitzroy Swimming Pool in the median of Alexander Parade, Fitzroy. These works were undertaken approximately 10 years ago.

Side entry pit using porous material in grate

8.2.4 Street Tree Pits

A tree pit is are mini raingardens that comprise of a tree or large shrub planted with an underground pit.



Tree Pit schematic (Image from http://urbanwater.melbourne.vic.gov.au/industry/treatment-types/raingarden-tree-pits/)

Bioretention tree pits are designed with the primary intent of removing pollutants from stormwater before the water is discharged to the local waterway. Commonly, stormwater runoff enters the bioretention tree pit through a break in a standard road kerb and is filtered through the soil media as it infiltrates. Treated stormwater is then collected at the base of the bioretention tree pit via perforated pipes located within a gravel drainage layer before being discharged into conventional stormwater pipes. In most designs the conventional stormwater pipes also act as an overflow, taking flows that exceed the design capacity of the bioretention tree pits. Bioretention tree pits provide stormwater treatment as well as landscape amenity. An additional benefit is that the passive irrigation from stormwater reduces the demand for irrigation from other sources such as potable water.

Examples of street tree pit plantings. Above at left, Little Collins St., Melbourne. At right, Batmans Hill Drive, Docklands.

8.2.5 Stormwater or Passive Irrigation of Street Trees

Passive irrigation is important at all available opportunities to achieve infiltration to local soils that can support tree growth thereby assisting evapotranspiration. Work to retrofit street trees should be accompanied by kerb and channel amendments to enable such passive irrigation where possible

8.2.6 OnStreet Raingardens

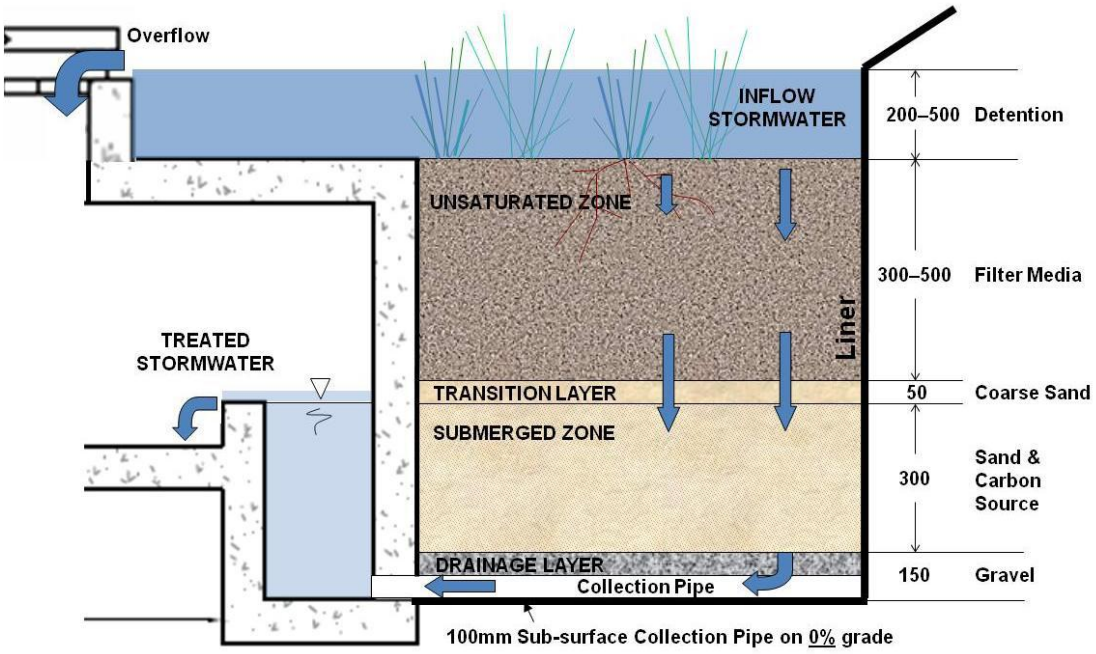
8.2.6.2 – Operation and Design of Raingardens

On-street raingardens provide temporary ponding of stormwater within the confines of the raingarden so that inflows can percolate through the media providing capture of pollutants and take up of nutrients via plant material. Should inflows exceed the design capacity of the raingarden, ponded flows are released through the overflow pipe which sits above the mulched surface (see below). A slotted pipe at the base of the raingarden allows flows that have percolated through the media to be re-connected with the local drainage system – albeit in a cleaner form with reduced contaminant loads.

On-street raingardens in the City of Yarra have been designed in almost all cases as kerb outstands and in some cases existing outstands have been converted to raingardens.

Onstreet raingarden design considerations

- Street slope
- Catchment Size
- Media
- Maintenance
- Sediment catchment
- Plant Selection



Schematic representation of a raingarden (Source: FAWB, Stormwater and Biofiltration Systems – Adoption Guidelines, 2009 - Chapter 3, p. 32)

Bendigo St Raingarden Richmond

8.2.7 Sediment and Leaf Litter Traps

Sediment traps capture litter (vegetative and rubbish) and sediment.

Sediment and leaf litter traps can be employed in a variety of situations including within open space areas and in streets. Within the streetscape they could be potentially incorporated within existing kerb outstands, or built as new on-street structures.

These traps can in appearance look quite similar to raingardens, as they would often contain semi-aquatic plants. However, in terms of construction, they are simpler

structures than raingardens as they do not rely on filter media for treatment. They can also operate without necessarily being connected back to the sub-surface drainage system in the case of on-street systems.

Apperly St Sediment trap

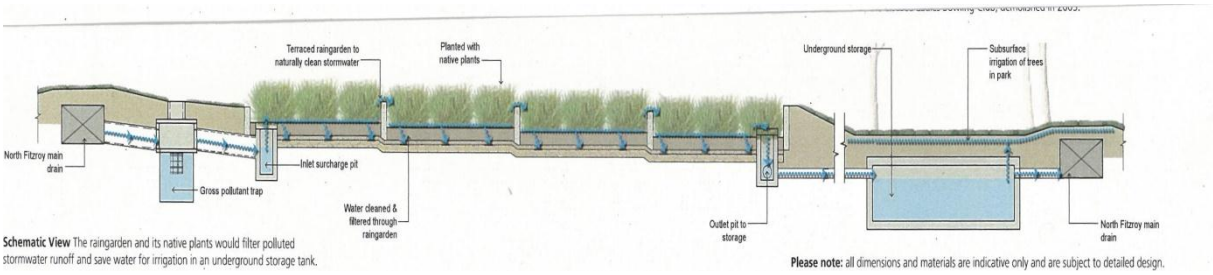
8.3 WSUD and Open Space

8.3.1 Open Space Raingardens

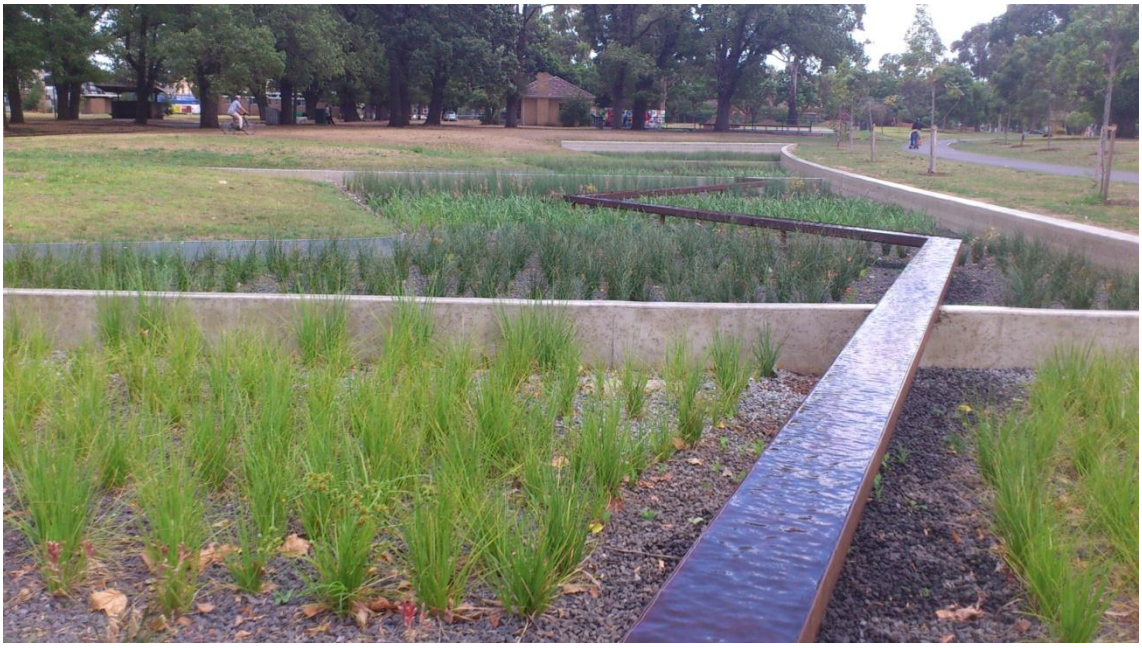
Open Space raingardens function the same as street scape raingardens.

8.3.1 Major Raingardens

Major rain gardens capture and treat large amounts of stormwater. An example of a rain major raingarden is Edinburgh Gardens Raingarden and stormwater harvesting system. Design of new Open Space should include investigation into opportunities for larger scale raingardens or swales. A key opportunity associated with open space raingardens is their potential to include stormwater harvesting for irrigation of playing fields, parklands and garden beds.



Schematic view of the Edinburgh Gardens raingarden in North Fitzroy showing treatment of stormwater across the four raingarden cells prior to the 200,000 litre storage and re-connection to the North Fitzroy Main Drain.



The 700 (approx.) square metre raingarden at Edinburgh Gardens in North Fitzroy

8.4 WSUD & Building Works

The City of Yarra should consistently also apply its WSUD policy to new buildings, existing buildings and their fittings and all refurbishments. Rainwater harvesting and re-use within buildings, for toilet flushing should be a key consideration. Replacement of roofs, gutters and downpipes is especially an opportune time to consider installation of rainwater tanks and reuse systems.

In addition, the adoption by Council of the ESD Buildings Policy in October 2011 further commits Council to water savings in relation to buildings

8.4.1 New Buildings

Where new buildings are planned, the conservation of all resources including water must be taken into account. A building water demand assessment should be undertaken as part of the planning and design process and rainwater harvesting linked to maximisation of re-use within buildings. Options for re-use include:

- toilet flushing
- all hot water uses including appliances such as dishwashers
- clothes washing machines (which should use cold water only)
- cold water for showers
- evaporative air conditioning (
- possible external uses for green walls, garden or open space irrigation, either in the immediate vicinity of the building or for open space in the local area.

New buildings should also give consideration to a range of other water efficiency measures including, but not limited to:

- tap aerators
- flow restrictors
- water efficient showerheads

- toilet cisterns
- waterless urinals
- re-circulators (or similar) for initial water from hot taps.

Greywater diversion to garden may also be considered in some circumstances where the garden is a significant element of the grounds. Care must be taken to exclude water from kitchen sinks if greywater is being considered.

It is also important to consider some over-sizing of the rainwater collection tank to limit overflows in prolonged rainfall events thereby improving reliability of supply, but also contributing to reduction of discharge to local waterways and even local flood
Should Council need to obtain a planning permit for works, it is possible that conditions may be applied from Melbourne Water requiring that stormwater be managed in line with Best Practice as set out in the Urban Stormwater Best Practice Environmental Management Guidelines (Victorian Stormwater Committee, 1999).

Overall, as suggested at the start of this document, Council should be seeking to be a leader in WSUD and to demonstrate that through its own building works.