5 MINUTE GUIDE

Rainwater Harvesting

This 5 Minute Guide provides the tools to evaluate how rainwater harvesting can save a company money and reduce their environmental impact.

What is rainwater harvesting?

Roof-collected rainwater is widely recognised as reasonably high quality water that can supplement mains water supplies. The quality depends on the roof and locality, and the cost depends on the equipment.

While it is often more expensive to install rainwater harvesting systems than people initially think, the cost may be offset by considerations such as:

1. It is not subject to water restrictions

2. There are no ongoing purchase costs for that water, and

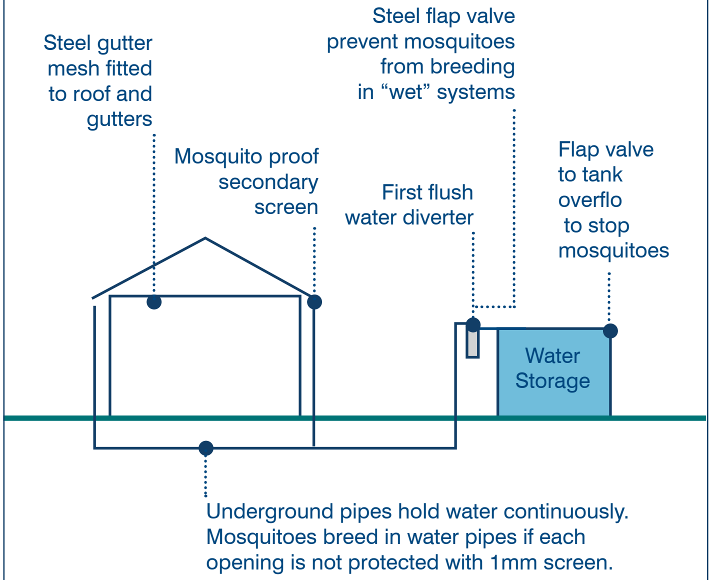
3. It generally results in good engagement with staff and community.

Rainwater is often confused with stormwater. Rainwater is collected from roofs and is comparatively clean, whereas stormwater drains from roofs, roadways and parking areas so it may to contain dirt, oils and litter.

Types of rainwater harvesting

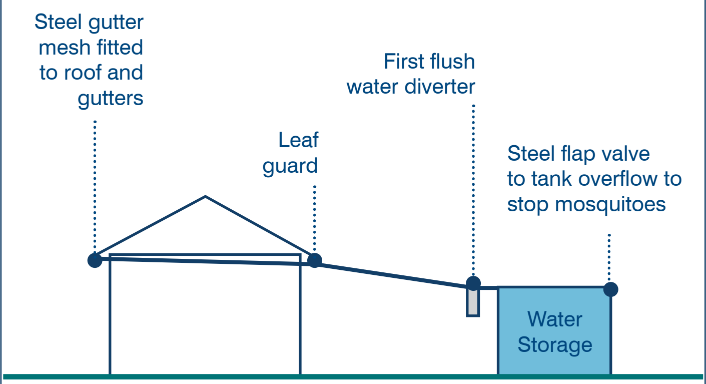
Rainwater harvesting can either be 'wet' or 'dry'. Wet systems use underground pipes and direct the water into a tank. They may require additional management and pumping as water can sit stagnant in pipes. Dry systems divert water direct from the roof area under gravity. The existing guttering system and the outlet/s points for roof water will determine which system is the easiest to implement at the site.

Wet System



(source: yourhome.gov.au)

Dry System



(source: yourhome.gov.au)

PACIA

Implementation

Implementing an effective water harvesting system is a simple process as long as appropriate guidelines are followed and key issues are addressed. Key factors to consider when developing any scheme include:

1. potential volume of water supply
2. the desired end use/s (volumes and quality)
3. existing roof water capture infrastructure
4. sizing an appropriate storage (balancing supply, demand and cost)
5. storage location and pumping requirements
6. water quality management – roof area management, treatment and end use
7. regulatory requirements and stakeholder management
8. ongoing operation and maintenance.

Balancing supply and demand for the optimum scheme

The following diagram (Fig.1) outlines the process for determining the potential supply of rainwater from the available roof area.

Potential supply volume

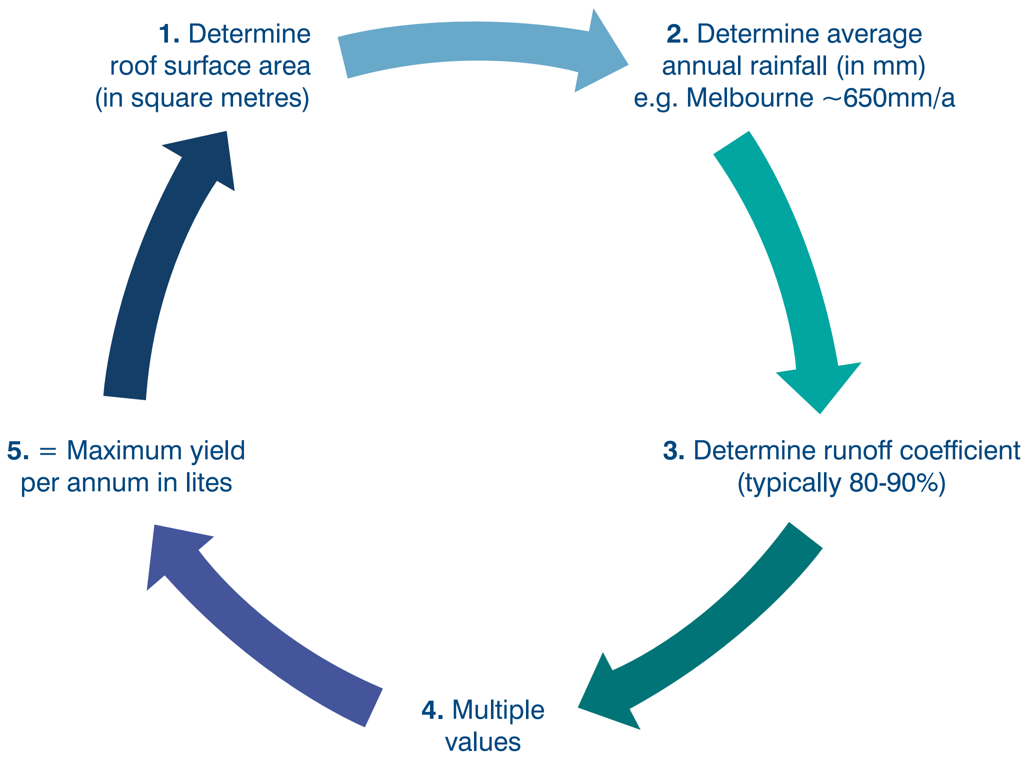
See Fig.1 Design Cycle

Potential demand

It is important when developing a scheme to remember that harvested rainwater can be used for a very wide range of purposes, including:

- toilet flushing
- laundry use ➲

Fig.1 Design Cycle



Example: 1000sqm roof area x 90% capture x 650mm = 585,000 litres potential yield per annum. It may be important to factor in the impacts of climate change on the volume, frequency and intensity of rainfall. The Bureau of Meteorology (http://www.bom.gov.au/jsp/awap/rain/index.jsp) website provides rainfall data from the nearest weather station and information on climate change impacts.

- surface and equipment washing
- irrigation
- cooling and heating
- several industrial processes including:
  - » cooling tower usage
  - » wash down
  - » boilers
  - » substitution into the production process as an additive in certain products.

Determining the required volume of water and when this water is needed is important in correctly sizing a scheme, for example demand may oscillate with seasons or different product manufacture. This can be done through observation, using existing benchmarks, consulting operating manuals (e.g. cooling tower) or through the installation of sub-meters.

Balancing *supply* and *demand*

With an understanding of potential supply and demand an appropriately sized storage can be determined. The University of South Australia has developed a helpful sizing spreadsheet which can assist in this task and ensure the tank is not too small causing inadequate supply and not too big which is a waste of resources.

See: *www.unisa.edu.au/water/UWRG/publication/raintankanalyser.asp*

Typical components

The typical components of a rainwater harvesting system are detailed in Fig.2 below, with key components discussed in further detail.

Storage Tanks

Storage tanks come in a variety of sizes, shapes (round, square, modular) and materials including concrete, steel and plastic. Plastic tanks are typically the cheapest, are easy to transport and have good longevity. A variety of storage solutions are available depending on the site needs and constraints. Storage should be placed as close as possible to the end use to minimise electricity consumption. Pumping is generally the major ongoing operating cost.

Storages
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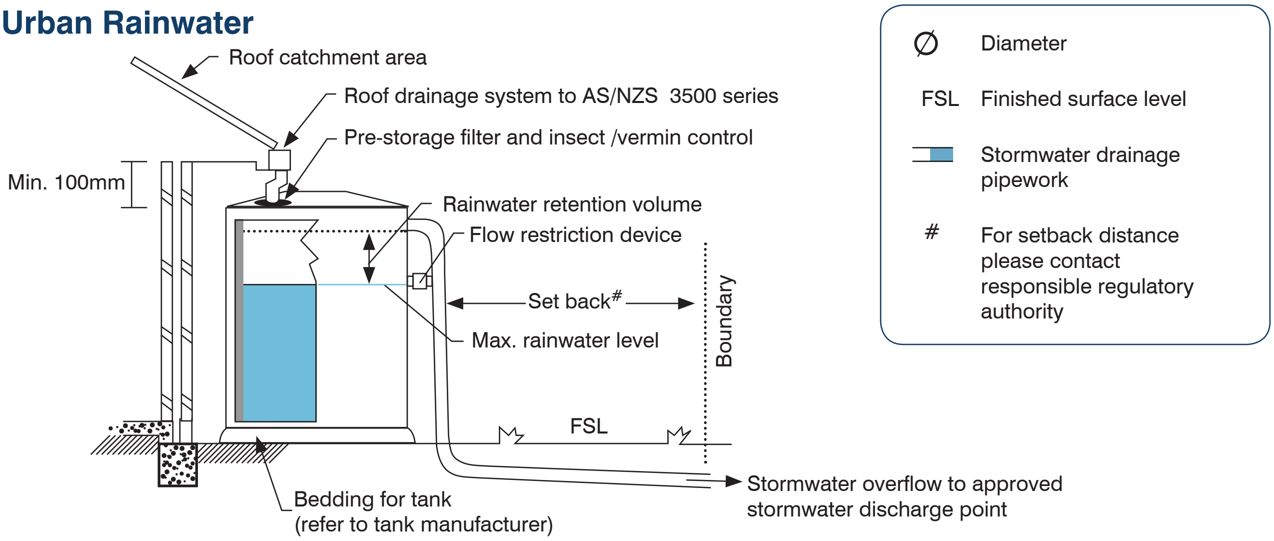
Fig.2 Urban Rainwater



(source: NWC, Arid and Master Plumbers Association (2008) Rainwater Tank Design and Installation Handbook)

Treatment

Typically roof water will require minimal treatment if directed to a non-sensitive end use where direct human contact is minimal. A first flush system should be considered. These passive systems capture the initial rainfall and divert it away, thereby preventing some debris and sediment entering the storage. Depending on the end use, additional treatment such as chlorination or UV disinfection may be required.

Distribution system

A distribution system to take water from the tank to the end use is required. This is typically a standard pump and purple pipe arrangement which, should be appropriately sign posted to make people aware that it is a rainwater supply.

What are the costs and benefits?

- ✓ Payback periods for an optimum sized rainwater harvesting in an industrial setting range from 5 to 10 years but can be longer depending on a range of factors
- ✓ As water prices continue to increase payback periods will continue to reduce
- ✓ Subsequent reduction in water bills from offset mains usage
- ✓ Good news sustainability story
- ✓ New capital asset for the company and an area of responsibility for staff
- ✓ Learning experience and talking point for staff and the wider community
- ✓ An alternative water source with a variety of potential uses that is not subject to water restrictions
- ✓ Rainwater capture infrastructure can be adapted to most site conditions
- ✓ Construction, operation and maintenance of systems is typically not labour intensive
- ✓ Reduction in regulatory and reporting burdens when roof water use reduces mains water usage below government reporting thresholds
- ✓ Opportunities to provide excess water to other users such as neighbouring properties and the community

Success Story

Viscount is a plastics manufacturer with three plants located in Victoria. Viscount's rotational moulding plant in Carrum Downs requires significant volumes of water for the cooling of the rotational moulds exiting the oven.

The team onsite were keen to improve their water conservation and efficiency, and installed a number of rainwater tanks around the site, diverting their downpipes into the tanks (e.g. a dry system). With a roof area of approximately 9000m^2, Viscount were able to reduce their water use by up to 50% from 2.5kL/day to 1.3kL/day and lower. The site is now almost water neutral with potable water required for drinking, and the staff kitchens.

5 MINUTE GUIDE SERIES

There are 9 titles in the 5 Minute Guide series. See also:

- How to improve boilers and steam efficiencies
- The new frontiers in water efficiency and conservation
- Establishing a water baseline and measuring success
- Matching water and purpose
- Top 10 water saving actions
- Reducing your trade waste impact
- How to reduce the water use of Cooling Towers and Chillers
- Understanding water, sewage and trade waste bills

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