The following case studies are a showcase of innovative urban water design in Australia.

FIGTREE PLACE

Source: Peter Coombes, University of Newcastle.

Water sensitive design saves money for a new development.

This case study is of interest for:

> **Minimising** development cost.

> **Collecting** rainwater.

> **Conserving** potable water.

> **Minimising** stormwater discharge.

Figtree Place is a 0.6 Ha development consisting of 27 townhouses in Hamilton, an inner suburb of Newcastle.

The project showed capital savings from using stormwater on-site rather than the building of traditional drainage.

Completed in 1998, the Figtree Place development incorporates rainwater harvesting and water sensitive design elements, including aquifer storage and retrieval. The site retains a connection to both mains water supplies and sewerage. All houses are supplied with a potable (drinking) and non-potable water supply.

Rainwater is collected from all roofs and passes through first-flush pits to storage in four communal in-ground (8 to 10kL) tanks. Pumps and a pressure vessel return this water to supply hot water systems and toilet flushing. Rainwater is therefore used in showering and dishwashing. The rain water tanks are backed up by the mains supply to the site.

Gravel infiltration trenches and a central recharge basin deal with the remaining stormwater.

The recharge basin in the middle of the development acts as temporary storage for stormwater, which is directed to the basin along the internal road.

The basin, which provides a grassed recreational area, overlays a 750 mm layer of gravel enclosed in goe-textile fabric.

Stormwater filters downward from the basin, is cleansed by the existing deep sand on the site, and enters an unconfined aquifer for retention.

A pump placed ten metres below ground then supplies water from the aquifer for all outdoor irrigation and for bus washing in the adjoining bus station.

Rainfall: Hamilton averages 930mm/a.

Grass covered infiltration basin

OUTCOMES OF THE PROJECT

> **All stormwater** is kept on-site for beneficial use.

> **Demands** on local infrastructure and waterways are reduced.

> **Indoor** potable water use is reduced by 45 percent.

> **Overall** potable water use is reduced by 60 percent.

> **Capital cost savings** prove all innovations cost 20 percent less than traditional stormwater infrastructure for the site.

> **Significant on-going net savings** from reduced water bills.

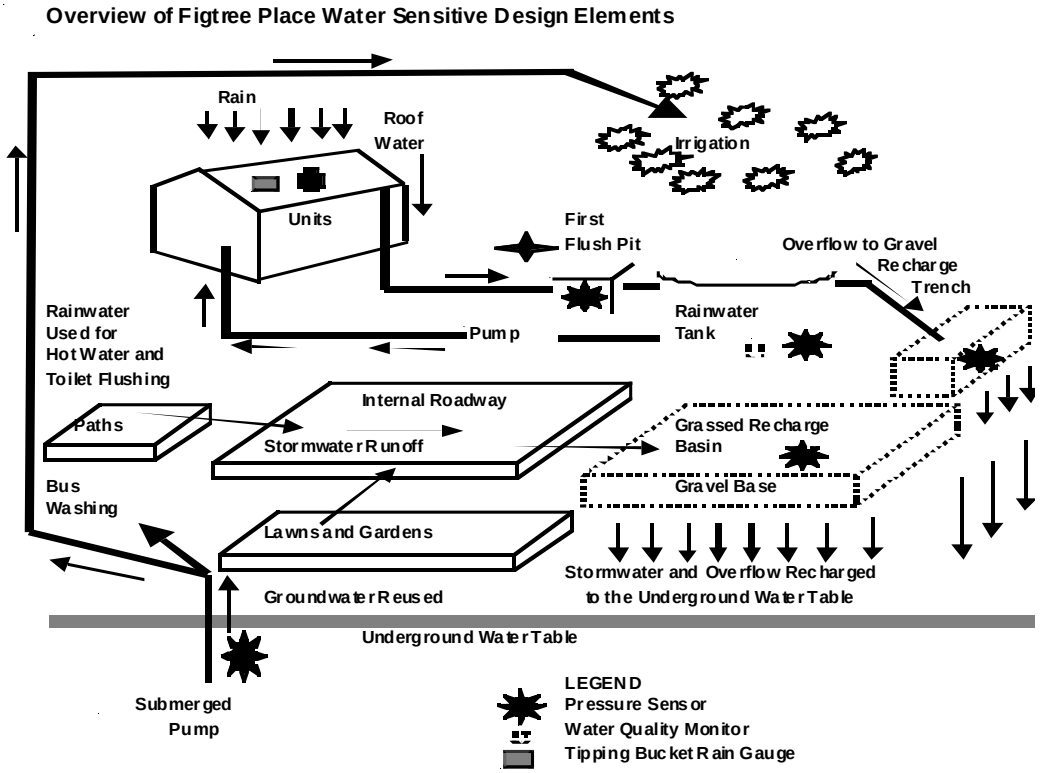
> **Reduced use** of materials such as concrete to provide stormwater management to site.

> **Reduced energy** and chemical usage due to reduction in potable water use.

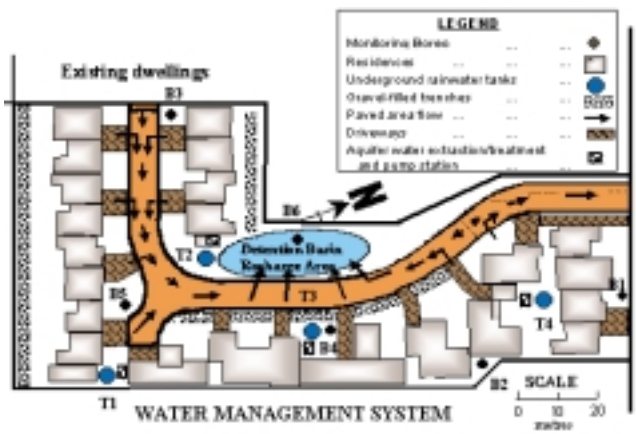
> **Water quality** monitoring showed effective pasteurization of rainwater in the hot water systems.

> **The rainwater supply** should increase the life of the hot water systems.

OVERVIEW OF FIGTREE PLACE WATER SENSITIVE DESIGN ELEMENTS



SITE STORMWATER MANAGEMENT PLAN



HEALTHY HOME

Source: Ted Gardener, QLD Dept. Natural Resources.

An advanced water system for a new house.

This case study is of interest for:

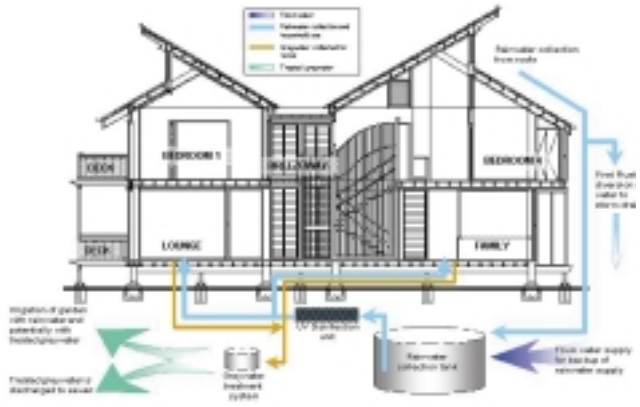
- **Collecting** rainwater.
- **Reusing** indoor greywater.
- **Conserving** potable water.
- **Minimising** wastewater discharge.

The healthy home is an innovative ecologically designed house on a 460m² urban site on the Gold Coast.

The advanced water system includes rainwater harvesting for potable use, greywater collection and treatment, and solar water heating.

A roof area of 150 m² supplies roof runoff via a first flush diverter to a 22KL concrete tank below the house. From this tank, a 0.7kW pump and pressure vessel supplies all water to the house. The tank is backed up by mains supply.

Greywater from the household is collected to a surge tank/treatment system also located under the house. Greywater from the bathroom and laundry entering the tank are circulated by pump through an Envirotech sand filter within the tank. The sand filter is dosed by programmed flow controller to maximise contact time and allow for biological treatment.



QLD Dept. of Natural Resources/University of QLD

A second pump discharges treated greywater to a storage tank. Under current Queensland law it is not possible to reuse greywater in a sewered area, so treated greywater is directed to the sewer with toilet and kitchen waters. When laws allow, the greywater system will supply the toilet and out door irrigation. Disinfection will be required before reuse is possible.

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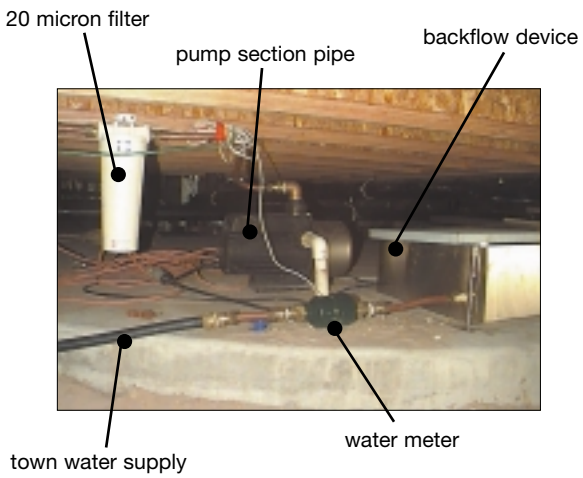
Greywater system



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Rainfall: the Gold coast averages 1460mm/a.

OUTCOMES OF THE PROJECT

> **Analysis** of water usage estimated that an 80 percent reduction in potable water use could be expected from the combined rain tank and greywater system if fully installed.

> **Chemical analysis** has shown that the recirculating sand filter effectively removes organic and suspended solids.

> **The pumps** on the rainwater and greywater systems were found to use 1.7kWhr per day. Energy use for small pumps is the Achilles heel of advanced water reuse systems and needs to be considered.

> **Significant reductions** in potable water usage and stormwater runoff from the site have been shown.

> **The rainwater and greywater systems** are not currently cost effective on the Gold Coast. Payback periods of 23 and 100 years respectively were calculated on the rain and greywater systems.

LISMORE RETROFIT

Source: Glen Marshall and Stuart White.

A single house retrofit for on-site wastewater management.

This case study is of interest for :

> **Reusing** outdoor greywater.

> **Composting** toilets.

> **Conserving** potable water.

> **Minimising** wastewater discharge.

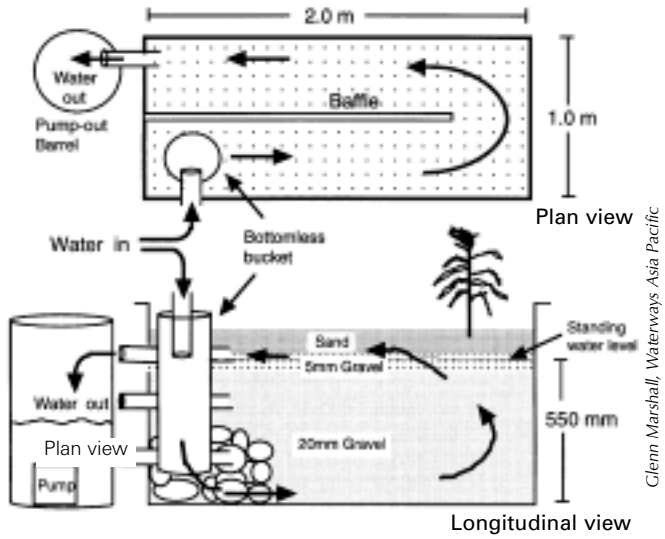
This Lismore NSW home was retrofitted over a four year period to demonstrate the potential for on-site wastewater management in the urban environment.

It incorporates dry sanitation and greywater treatment systems.

On the steep 0.125 Ha site, the owner-builder constructed a reed bed followed by an intermittent sand filter greywater treatment system that supplied subsurface irrigation for the garden. A 'Wheelibatch' dry toilet was installed with drained liquid (mostly urine) from the toilet directed to the reed bed. The home maintained its mains water supply.

Greywater from the home was diverted through a coarse gravel filter to the small sub-surface constructed wetland. The wetland was planted with *Phragmites australis,* with greywater passing through the lined basin filled with gravel and sand.

water case studies



Schematic of wetland

Effluent from the wetland drained to a 4500L storage tank from where it passed through an intermittent sand filter.

The filter was constructed with a 400mm depth of course washed sand above 100mm of gravel. Treated greywater drained to a pump out barrel and to sub-surface irrigation of a 100m^2 established garden.

The waterless toilet was designed as a batch system using two modified 240L mobile garbage bins. One bin sits under the pedestal while the second lies fallow. The ventilation system covers both bins. Liquid (urine) from the bins is drained to the greywater system.

Planted wetland

Glenn Marshall, Waterways Asia Pacific

OUTCOMES OF THE PROJECT

> **With two people** living in the house, the system avoided an estimated 150kL of sewage and associated treatment and pumping per year.

> **Chemical analysis** showed that with the addition of disinfection, the greywater system should meet NSW greywater guidelines for both indoor and outdoor reuse.

ADDITIONAL KEY REFERENCES

Gardener T., H. Gibson, G. Carlin & A. Vieritz, 2000, Water Sensitive Design to reduce the ecological footprint of urban development, Proceedings of the Water Recycling Australia conference, Adelaide. Web:http://jarrod.binke.com.au/uq/projects/prototype.html

Coombes P. J., Kuczera G; Argue J. J. and Argue J. R. (1998). Water Sensitive Redevelopment: The "Figtree Place" Experiment, Proc. Hydrastorm 98 Symposium, Adelaide, The Institution of Engineers, Australia.

Coombes P.J; Kuczera G; Argue J.R; Cosgrove F; Arthur D; Bridgeman H.A; and Enright K. (1999). Design, monitoring and performance of the water sensitive urban redevelopment at Figtree Place in Newcastle. Proc. Eighth international conference on Urban Storm Drainage, Sydney, The Institution of Engineers, Australia. Web:http://www.eng.newcastle.edu.au/ce/staff/pcoombes