

WASTEWATER TREATMENT & REUSE

ENVIRONMENTALLY SUSTAINABLE DESIGN (ESD) FACT SHEET 6
VERSION 1/MARCH 2011



Waterless urinals at The Grove for yellow water collection prior to treatment and reuse (via irrigation dosing)

Photo - Michael Ward

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Photo - Michael Ward



Wastewater tank arrangement at The Grove

WHY IS WASTEWATER TREATMENT & REUSE IMPORTANT?

Australia is the driest inhabited continent, yet our per capita water consumption is one of the highest in the world. At present, rather than adopting a ‘fit-for-purpose’ approach (using different sources and varying quality of water for different applications), high-quality drinking water is used for practically everything – including watering the garden and flushing the toilet.

Changing weather patterns (reduced rainfall and extended periods of drought), increasing demand and inefficient water management means that less water must start going further. We need to face up to the reality that water is a scarce and valuable resource, and if we want to ensure a more secure supply into the future, we must both diversify our water sources plus use water more carefully.

Treating and reusing our wastewater for landscape irrigation (as well as certain non-potable indoor applications) is one of several smart ways of reducing pressure on high-quality water supplies. Studies around Australia have shown that there is strong public support for the reuse of wastewater and that it can lead to significant savings of water, energy and money. A decentralised onsite approach can be part of the solution – it often makes more sense as wastewater can be safely reused locally with much less pumping/energy consumption than remote end-of-pipe centralised systems.

WHAT HAS BEEN DONE AT THE GROVE TO SHOWCASE WASTEWATER TREATMENT & REUSE?

An innovative wastewater system has been incorporated into The Grove as part of achieving a key objective of the three Councils to provide a tangible real-life example of sustainability in action.

The integrated wastewater system at The Grove has been designed to supply a proportion of landscape water demand for irrigation (i.e. substitute bore water); effectively manage and utilise nutrients from the wastewater stream for landscape plant requirements; recharge the shallow aquifer to offset bore water use for seasonal landscape demands that exceed available wastewater volumes; and reduce volumetric and pollutant concentration loadings on the mains sewer.

The design of the system developed after water budget modelling was used to deliver an optimised outcome for this specific project. The modelling analysed the anticipated range for the volumes of different wastewater streams generated from the buildings (based on low and high occupancy rates and different water fixtures). Given the wastewater loads at The Grove can be fluctuating and highly variable (it is a public daytime facility), a key design parameter was to ensure that overflow and diversion to the mains sewer is provided at all critical points – thereby minimising the risk of overloading any of the treatment systems.

It is estimated that the wastewater system at The Grove will reduce the draw on groundwater that would be used for irrigation by approximately 700,000L each year. A major innovation is that the system provides for onsite separation, treatment and reuse of different wastewater streams, namely greywater (showers and hand basins), brown water (toilets as well as kitchen) and yellow water (urinals).

Greywater

The greywater system consists of a simple sedimentation tank followed by secondary treatment in a pump-out tank. Before the greywater is discharged it undergoes ozonation (a treatment process that destroys bacteria and other microorganisms through an infusion of ozone). Once treated, the greywater is then pumped to the onsite landscape (directly to the plants' rootzone) via substrata (under mulch) drip irrigation.

When viewed in conjunction with the brown water and yellow water system, the approach adopted for greywater at The Grove allows maximum utilisation of the available greywater with minimum operation and maintenance requirements.

Brown water

The brown water system consists of a pre-treatment Biolytix biogrinder (BG4000PAV) and two Biolytix filters (BF63000PAV). The Biolytix is a low energy, low maintenance aerobic treatment unit that uses biological, chemical-free processes to convert sewage and wastewater into high-quality irrigation water for onsite reuse. The system employs a number of staged filters and billions of micro-organisms to separate solids and liquids, break down organic material, nutrients and chemical compounds, and treat the residual water to a high standard that is suitable for irrigation.

The inclusion of a pre-treatment biogrinder ensures that the volume of incoming wastewater is matched to the treatment capacity of the system. The biogrinder receives all brown water and then distributes the incoming flows evenly between two Biolytix filters in parallel. In the event of flows greater than the peak daily allowable load these are automatically diverted to sewer. This design effectively means that the filters are only required to treat a maximum defined volume of wastewater with any excess or peak flows being diverted directly to sewer.

Yellow water

The yellow water system represents state-of-the-art source separation of wastewater by incorporating waterless urinals. These collect urine separately so that it can be stored for 6 months (for treatment purposes) prior to use. The intention is to also include urine diverting toilet pans for the female toilets in the future (pre-plumbing has been installed to allow this once the proposed overseas toilet systems have been granted the WaterMark certification required in Australia).

After collection, the urine is stored in 3 x 10kL in-ground concrete tanks and cycled in such a manner to ensure a minimum of 6 months storage before discharge to irrigation. The rich mix of nutrients in the treated (sterile) end product can then be dosed as required into the various subsurface and substrata irrigation lines as a fertiliser for plants.

WHAT CAN YOU DO AT HOME?

While a fully integrated wastewater system like what is being showcased at The Grove is not feasible at the household scale, you can however install a greywater system for your own home. On average each person in Australia produces about 100 litres of greywater per day. Instead of simply wasting this resource, you can divert the greywater for garden irrigation.

Reusing greywater to irrigate your garden will enable you to:

- Reduce your mains water consumption for garden irrigation
- Save money on your water bill
- Have an alternative source of irrigation during water restrictions
- Reduce the energy used in pumping wastewater from your house (hence lowering greenhouse gas emissions)
- Help in conserving Perth's scarce drinking water reserves, thereby reducing the costs and pressure on existing or new water infrastructure

It is important to note that you can only install a greywater system that has been approved by the **WA Department of Health**. The approved systems range from simple direct diversion models that provide basic filtration prior to irrigation, through to more elaborate systems that treat and disinfect the greywater.

As greywater can contain pathogens (disease causing organisms), it is important to follow some simple practices to eliminate any health risks. The greywater must be applied beneath the ground via a subsoil trench or purple coloured dripline covered with 100mm of mulch (unless the greywater is treated and disinfected). This reduces the scope for human contact and minimises the potential health risks associated with greywater systems.

You will need to lodge an application and receive approval from your Local Government before installing your greywater system, and a licensed plumber must undertake all changes to the house and sewer plumbing.



Greywater system and lilac dripline in a home garden

Greywater systems vary greatly in cost depending on the type of system you install. A simple gravity fed direct diversion system will cost around \$800, mid-range pumped systems range from \$2,000 - \$8,000, while a top-end treatment system (which allows the greywater to be safely stored in tanks for an extended period of time as well as used for above-ground irrigation) can cost in excess of \$10,000. The Federal Government greywater rebate of \$500 only applies to these more expensive treatment systems.

“a great place to grow”



The Grove, an environmental sustainability pioneer.

FIND OUT MORE ON **GREYWATER REUSE** FOR YOUR HOME

Further Information

Living Smart/Perth Solar City Program:
Greywater Reuse How to Guide

Department of Sustainability, Environment,
Water, Population & Communities: Greywater
Reuse Fact Sheet

Your Home Technical Manual: Wastewater
Reuse Fact Sheet

WA Department of Health: Greywater Reuse
Fact Sheet

WA Department of Health: List of Approved
Greywater Systems

Water Corporation: List of Waterwise Plumbers
for Metropolitan Perth

Save Water Alliance: Greywater Reuse
Information Resources

Living Greener: Household Greywater
Information

Please visit www.thegroveprecinct.com to download an electronic version of this fact sheet with hyperlinks to the above online resources.

Content - Josh Byrne & Associates

Relevant Organisations

WA Department of Health: (08) 9388 4999

WA Department of Water: (08) 6364 7600

Water Corporation: 13 10 39

Department of Sustainability, Environment,
Water, Population & Communities:
1800 218 478

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