

TYPES OF WASTE WATER

There are two basic kinds of domestic wastewater:

Greywater

Domestic wastewater from bathrooms and laundries. In a few cases greywater also includes wastewater from kitchens (If greywater contains any amount of sewage then it is called blackwater).

Greywater water quality can be highly variable. It can contain up to 70% of the total phosphorous in a home's wastewater; and up to 63% of Biological Oxygen Demand (BOD). If a little care is taken, greywater can be reused for watering gardens and lawns. Methods range from manual bucketing, to direct diversion of untreated greywater for sub-surface outdoor watering, to more sophisticated storage and grey-water treatment systems. The latter deliver better quality water - allowing for a wider range of re-use options.

Blackwater

Blackwater is wastewater (sewage) from toilets. Blackwater can contain up to 80% of all Nitrogen in a home's wastewater; about 60% of the total amount of Suspended Solids; and up to about 35% of BOD. Blackwater or sewage, is traditionally disposed of into the sewerage system via pipes to a sewerage treatment plant and outfall. If no sewer system is available the most common method of treating and disposing of sewage is on-site septic tanks.

The pathogens in sewage require adequate on-site treatment using systems such as septic tanks and newer, aerated systems (also called advanced wastewater treatment systems, AWTS).

TYPES OF WASTE WATER TREATMENT SYSTEMS

Septic tanks (sewage treatment)

Septic tanks are widely used throughout Australia in areas without a reticulated sewerage system. The traditional septic system consists of an underground concrete tank and an absorption trench (see **Figure 1**). Wastewater is partially treated in the tank by anaerobic processes that remove about 30% of phosphorus, 20% of nitrogen, 60% of suspended solids, 50% of BOD, and also reduce the concentration of biological contaminants. Final treatment occurs via an absorption trench. The effluent then percolates to the soil where soil organisms theoretically remove further contaminants before the effluent reaches surface or ground waters. Most absorption trenches are constructed below the biologically active topsoil zone, which limits the contaminant removal during this last step.

Guidance on the design and installation of septic tanks, and the disposal of effluent is provided in Australian Standards AS/NZS 1546.1:1998 and AS/NZS1547:2000. Only systems accredited by NSW Health can be installed. Landowners must also maintain and manage their on-site systems in accordance with health and environmental performance standards.

Studies have found that about 40% of septic systems do not operate correctly, causing odours and contributing contaminants and nutrients to waterways. Common reasons for the failure of septic tanks and absorption trench systems are:

- the volume of wastewater discharged to the septic tank is greater than its design volume
- failure to periodically remove sludge from the septic tank
- insufficient area of absorption trench to accept effluent from the septic tank
- inappropriate soil type for absorption of effluent (heavy clays, etc)

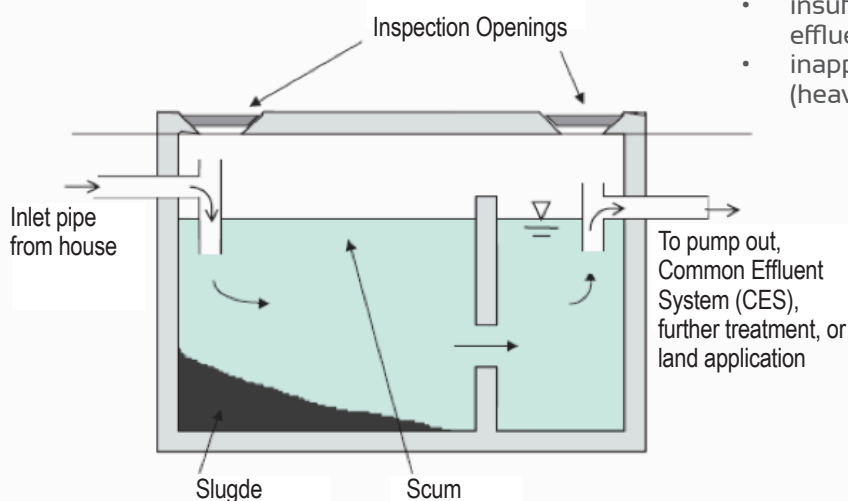


Figure 1: A typical septic tank
(Source: NSW Government, 1998)

AERATED SYSTEMS (SEWAGE TREATMENT)

Aerated Wastewater Treatment Systems (AWTS) use sensitive biological agents and mechanical systems to mix, aerate and pump sewage through accelerated aerobic and anaerobic decomposition to produce a higher quality effluent than standard septic tanks, (see **Figure 2**) making them more suited for use in urban and environmentally sensitive areas.

Aerated systems must be carefully managed and serviced to keep them working well and safely. Sewerage management facilities need to be accredited by NSW Health (see References section).

If maintenance regimes, as stipulated by accredited manufacturers, are followed (this includes periodic sludge removal) then effluent should be clear and odourless and meet NSW Department of Health guidelines. Effluent water quality standards have been set for accredited systems across; total suspended solids, BOD, residual chlorine and faecal coliforms. Effluent can then be disposed of by surface or underground irrigation - but a minimum irrigation area of 200 m² is usually required.

Approvals for onsite sewage systems

Under NSW law, the installation of any small scale onsite sewage system (septics, AWTS, composting toilets, incinerating toilets) requires local council approval. A local council must not approve the installation of certain sewage management facilities unless it has been accredited by the NSW Department of Health.

Ongoing operation also requires regular council inspections and approval (Clauses 40 and 41, Local Government (General) Regulation 2005).

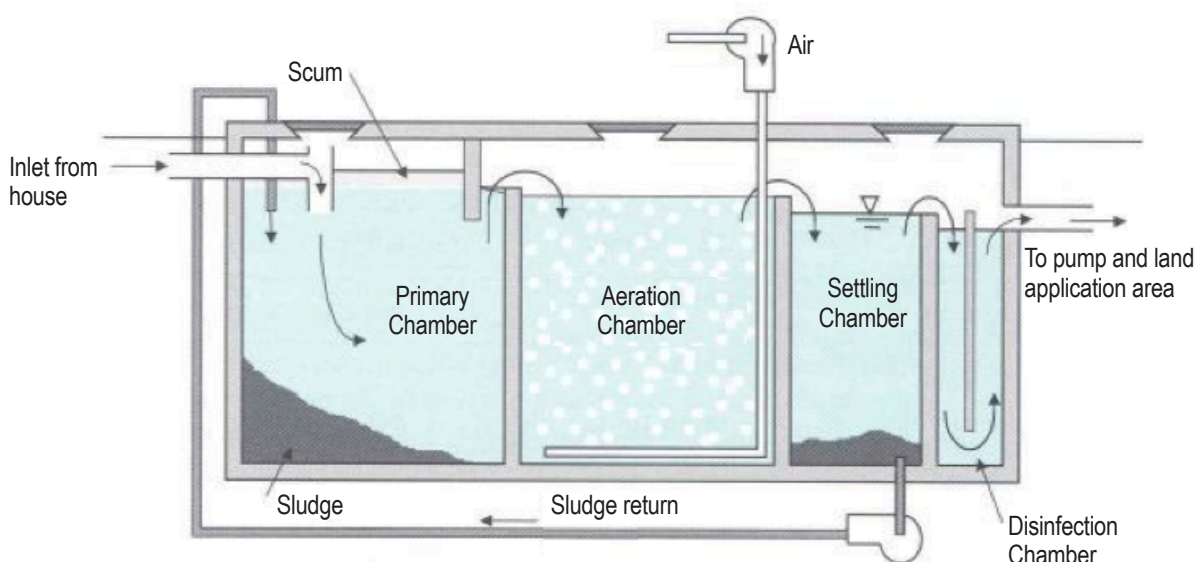


Figure 2: Aerated wastewater treatment system
(Source: NSW Government)

GREYWATER REUSE

NSW Guidance is now available for greywater reuse in single, sewerred domestic lots (see reference DEUS (2007)). Guidance covers three basic reuse methods:

1. Manual bucketing
2. Greywater diversion systems for immediate reuse
3. Greywater treatment systems

Further details on each are provided below. **Figure 3** illustrates a possible configuration for greywater treatment and re-use. The guidelines do not recommend the reuse of grey-water for homes with onsite sewage treatment systems.

The guidelines do not cover greywater reuse for sites larger than a single home - readers should refer to the Interim Guidelines for private recycled water schemes (DWE, 2008) - for further information.

Five easy to follow fact sheets have been prepared by NSW State Government to accompany the Guidelines and these cover topics such as; selection of an appropriate system, using greywater for irrigation and maintenance of greywater systems.

Manual Bucketing

Manual bucketing refers to the manual irrigation of lawns and gardens with greywater using a bucket (e.g. collecting shower and laundry water for reuse). Due to the collection method, the volumes of grey water used are low, and therefore this type of reuse is considered low risk, as limited contaminants will be present.

There are no formal approvals required for the reuse of greywater through manual bucketing. Guidelines and a set of recommendations for safe and effective reuse practices are available.

Untreated Greywater Reuse

Untreated greywater is diverted from the home (via a valve or switch) for immediate reuse, without storage. Diversion is either via a gravity fed system or pump, with surge protection. Greywater is re-used onsite to water lawns and gardens via a subsurface irrigation system that is 10cm deep. (Pictured below, source:Wattworks).

There are no formal approvals required for the reuse of untreated greywater if:

- A licensed plumber is used (and the work complies with Australian Standards and Plumbing Codes)
- The device is 'WaterMark' certified (confirms it meets plumbing and drainage code requirements). NSW Health provides a register of WaterMark approved devices
- All pre-conditions of Section 75A of the Local Government (General) Regulation 2005 are met (as set out in the NSW Guidelines (DEUS, 2007)).

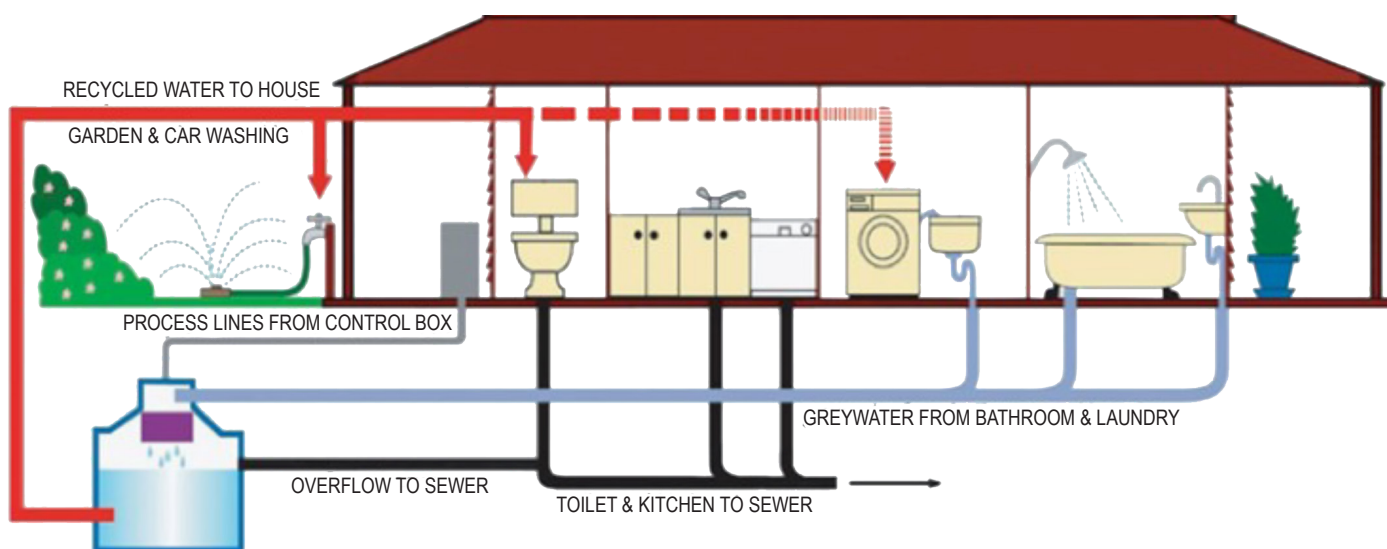


Figure 3: Key parts of a typical domestic rainwater system.

WHEN USING UNTREATED GREYWATER

- **DO** be careful lifting and carrying buckets of greywater, particularly over slippery surfaces and on stairs or steps.
- **DO** select garden-friendly detergents that are biodegradable and low in phosphorus, sodium, boron and chloride.
- **DO** select washing detergents that are low in salt – consider using a powder concentrate, or a liquid washing detergent.
- **DO** reuse greywater in the garden in several locations.
- **DO** monitor plant and soil response to greywater irrigation.
- **DO** consider applying a soil rewetting agent every six months.
- **DO** wash your hands after reusing greywater.

WHEN USING UNTREATED GREYWATER

- **DON'T** reuse toilet or kitchen wastewater.
- **DON'T** reuse greywater for irrigation during rain.
- **DON'T** apply greywater in areas that are readily accessible to children, people with a low immune system or pets.
- **DON'T** reuse greywater generated from the washing of nappies or soiled clothing.
- **DON'T** reuse greywater when a resident is sick, e.g. has diarrhoea.
- **DON'T** reuse greywater generated by cleaning in the laundry or bathroom, or when using hair dye or other chemicals.
- **DON'T** reuse greywater generated by washing rags used for painting or for maintaining machinery and vehicles.
- **DON'T** reuse greywater to top up rainwater tanks or swimming pools.
- **DON'T** store untreated greywater.
- **DON'T** over-water.
- **DON'T** reuse greywater on plants that will be eaten raw or where fruit has fallen to the ground and could be eaten.
- **DON'T** use greywater to wash paths, driveways or cars.
- **DON'T** reuse greywater so that it flows into the streets or down stormwater drains.
- **DON'T** let greywater go beyond the property boundary and cause a nuisance to neighbours.

Greywater treatment systems

Greywater from the bathroom, laundry and kitchen is collected (via valve or switch), stored and treated for a greater range of reuses: in toilets, washing machines and surface outdoor irrigation. (See **Figure 4**).



Figure 4: Greywater treatment systems.
(Source: Ecological Design)

Council approvals are required for the installation of greywater treatment systems. It is a requirement that:

- A licensed plumber must install the system and guarantee the installation complies with Australian Standards and Plumbing Codes)
- A NSW Health accredited treatment system is to be used (Further information section provides links to NSW Health certified devices).
- Ongoing monitoring and inspection is required—see approvals section

Unsuitable Applications of Greywater

Greywater re-use is not recommended in the following instances:

- If created by systems that do not contain the “Water Mark” accreditation
- To top-up rain tanks or swimming pools
- To irrigate edible plants that are eaten raw
- When people in the household are unwell e.g. diarrhoea
- When it is raining
- If there is a chance that greywater will runoff to other properties or public stormwater drains.

Care should also be taken when installing greywater re-use systems in high density urban areas where there are generally small buffers to neighbouring properties and soil conditions maybe unsuitable (e.g. heavy clays). This and other information is provided in the Greywater fact sheets which are listed below and can be downloaded from NSW Governments Water for Life website (see references at end).

- Greywater Fact Sheet 1: Greywater diversion devices - Do's and Don'ts
- Greywater Fact Sheet 2: Choosing the right greywater system for your needs
- Greywater Fact Sheet 3: Irrigating with greywater
- Greywater Fact Sheet 4: Keeping your plants and soil healthy with greywater
- Greywater Fact Sheet 5: Maintenance of greywater diversion devices and treatment systems

THE "DO'S & DON'T'S" OF TREATED GREYwater REUSE

It is important that greywater treatment is undertaken sensibly to ensure that public health and the environment are protected. The control measures, listed below are supplied by the NSW Department of Water and Energy (2008) to assist with the effective management of treated greywater and ensuring the reuse of greywater achieves the performance standards required by the approval granted by council.

These are minimum NSW Government requirements for greywater treatment systems, Your local council may have other requirements and conditions.

When reusing greywater treated by a greywater treatment system:

- **DO** get council approval and install a Greywater Treatment System (GTS) that has been accredited by NSW Health.
- **DO** reuse treated greywater (from a GTS) only for irrigation (including surface irrigation), toilet flushing and washing machine use.
- **DO** undertake a water balance before installing a GTS to calculate the amount of water that can be reused by the household.
- **DO** select garden-friendly detergents that are biodegradable and low in phosphorus, sodium, boron and chloride.
- **DO** select washing detergents that are low in salt – consider using a powder concentrate, or a liquid washing detergent.
- **DO** monitor plant and soil response to greywater irrigation.
- **DO** occasionally irrigate with drinking water to disperse salts from the soil (only appropriate during extended periods of zero rainfall).
- **DO** consider applying a soil rewetting agent every six months.
- **DO** ensure that regular maintenance of the greywater system is undertaken.
- **DO** mark and label all pipes and use signs to indicate greywater reuse (see section 4.6).

When reusing greywater treated by a greywater treatment system:

- **DON'T** irrigate with greywater during rain.
- **DON'T** reuse greywater generated by cleaning in the laundry or bathroom, or when using hair dye or other chemicals.
- **DON'T** reuse greywater generated by washing rags used for painting or for maintaining machinery.

- **DON'T** reuse greywater to top up rainwater tanks or swimming pools.
- **DON'T** over-water.
- **DON'T** reuse greywater on plants that will be eaten raw or where fruit has fallen to the ground.
- **DON'T** use greywater to wash paths, driveways or cars.
- **DON'T** reuse greywater so that it flows into the streets or down stormwater drains.
- **DON'T** install drippers of an irrigation system within one metre of boundary lines, in-ground pools, and in-ground potable water tanks and buildings.
- **DON'T** let greywater go beyond the property boundary and cause a nuisance to neighbours.

Approvals for onsite greywater treatment systems

All greywater treatment systems in NSW must have prior council approval for installation and operation (Under Item C6 of Section 68 of the *Local Government Act 1993* and the *Local Government (Approvals) Regulation, 1999* (clause 43(1)). Councils are only able to approve the kinds systems that have been accredited by NSW Health (see 'Further information' for a web link to the online register of accredited greywater treatment systems).

Licensed plumbers must be used to install the system, and controls put in place to ensure any required mains backup supply is available and to prevent illegal cross-connections, overflows and backflows into mains water supply systems. The National Water Commission's Waterlines report outlines all relevant Australian Standards which must be complied with (see NWC, 2008). Your plumber must notify the local water authority that a GTS is in place. Any backflow prevention device must undergo annual testing according to the local water authority requirements.

FURTHER INFORMATION

Onsite Sewage Management

NSW Department of Local Government (2000) <http://www.dlg.nsw.gov.au> 'on-site sewage' topics page and The easy septic safe guide

NSW Department of Local Government (accessed 2011): Frequently Asked Questions on-site sewage management systems: <http://www.dlg.nsw.gov.au>

NSW Government (1998). On-site Sewage Management for Single Households. Has useful fact sheets as appendices. Prepared by the Dept. of Local Government, Environmental Protection Authority, Department of Health, Dept. of Urban Affairs & Planning & Dept. of Land & Water Conservation. Via <http://www.dlg.nsw.gov.au>

Onsite Greywater Reuse

www.waterforlife.nsw.gov.au : Access to (DEUS, 2007) NSW Guidelines for Greywater Reuse in Sewered, Single Household Residential Premises <http://www.waterforlife.nsw.gov.au/recycling/greywater>. (NSW Government – Water For Life program, May 2008)

www.waterforlife.nsw.gov.au/recycling/greywater/greywater_fact_sheets

NSW Government Greywater Fact Sheet Series:
Fact Sheet 1: Greywater diversion devices - Do's and Don'ts
Fact Sheet 2: Choosing the right greywater system for your needs
Fact Sheet 3: Irrigating with greywater
Fact Sheet 4: Keeping your plants and soil healthy with greywater
Fact Sheet 5: Maintenance of greywater diversion devices and treatment systems

DWE (2008): NSW Department of Water and Energy The Interim NSW Guidelines for Management of Private Recycled Water Schemes (To be used by anyone planning a private recycled water scheme that will serve more than a single dwelling).

Local Government (General) Regulation 2005 http://www.austlii.edu.au/au/legis/nsw/consol_reg/lgr2005328/s75a.html Section 75A sets out requirements for greywater diversion and treatment.

Lanfax Laboratories (for WQ and soil testing, and information on detergents to use with greywater systems): www.lanfaxlabs.com.au

Master Plumbers Association, 2008 Handbook on greywater design and installation www.nwc.gov.au/resources/documents/GREYWATER_handbook_nwc_lgr.pdf

General

NWC 2008: National Water Commission: WaterLines Report: Requirements for installation of rainwater and greywater systems in Australia (2008) http://www.nwc.gov.au/resources/documents/Final_Waterlines_full_version.pdf

Philip Geary, University of Newcastle: Phil.Geary@newcastle.edu.au

REFERENCES

DEUS (2007) NSW Guidelines for Greywater Reuse in Sewered, Single Household Residential Premises via www.waterforlife.nsw.gov.au

DWE (2008): NSW Department of Water and Energy The Interim NSW Guidelines for Management of Private Recycled Water Schemes.

Geary, P.M. (1994). Soil survey and the design of wastewater disposal systems', Australian Journal of Soil and Water Conservation 7(4), 16-23.

Geary P.M. (1998). Domestic wastewater: treatment and reuse', in Environment Design Guide. Royal Australian Institute of Architects.

McQuire, Stuart (1995). Not Just Down the Drain: a guide to re-using and treating your household water. Friends of the Earth, Collingwood Vic.

Local Government (Approvals) Regulation, 1999, Part 4, Clause 43(1), February 2005.

NWC (2008): National Water Commission: WaterLines Report: Requirements for installation of rainwater and greywater systems in Australia (2008) http://www.nwc.gov.au/resources/documents/Final_Waterlines_full_version.pdf

NSW Government (1998). On-site Sewage Management for Single Households. Prepared by the Dept. of Local Government, Environmental Protection Authority, Department of Health, Dept. of Urban Affairs & Planning & Dept. of Land & Water Conservation

National Health and Medical Research Council and Natural Resource Management Ministerial Council (2004). National Water Quality Management Strategy; Australian Drinking Water Guidelines. NHMRC & NRMCC, Australian Government.

Standards Australia (2003) AS/NZS 3500 Plumbing and drainage code Standards Australia (2003) Product Certification. Product Compliance Program WATERMARK Level 1.

Standards Australia: AS/NZS 1547: 2000 (2003) On-site domestic-wastewater management

Standards Australia (1998): AS/NZS 1546:1:1998 On-site Domestic Wastewater Treatment Units – Septic Tanks.

Standards Australia (2001): AS/NZS (2001a) AS/NZS 1546.2:2001 On-site domestic wastewater treatment units—waterless composting toilets

Standards Australia (2001): AS/NZS (2001b) AS/NZS 1546.3:2001 On-site domestic wastewater treatment units—Aerated wastewater treatment systems

DEVELOPED BY

A project delivered by the Hunter and Central Coast Regional Environmental Management Strategy (HCCREMS): a program of the Environment Division of Hunter Councils Inc.



This project has been assisted by the NSW Government through its Environmental Trust.



HCCREMS MEMBER COUNCILS



Address for Correspondence:
 Environment Division
 Hunter Councils Inc.
 PO Box 3137
 THORNTON NSW 2322
 Phone: (02) 4978 4020
 Fax: (02) 4966 0588
 Email: execassist@huntercouncils.com.au

© HCCREMS, 2013
 Waste Water Reuse
 Hunter Councils