



Australian Government
National Water Commission

Requirements for installation of rainwater and greywater systems in Australia

**Master Plumber and Mechanical Services
Association of Australia**

Waterlines Report Series No 10, November 2008



Waterlines

A SERIES OF WORKS COMMISSIONED BY THE
NATIONAL WATER COMMISSION ON KEY WATER ISSUES

Waterlines

This paper is part of a series of works commissioned by the National Water Commission on key water issues. This work has been undertaken by the Master Plumber and Mechanical Services Association of Australia on behalf of the National Water Commission.

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Executive summary

The National Water Initiative (NWI) is the blueprint for improving Australia's water management and use. Under the NWI, the state, territory and Australian governments have committed to encouraging innovation in water supply, encouraging re-use and recycling and increasing the efficient use of water within domestic settings. Rainwater (rain collected from the roof) and greywater (wastewater not containing human excrement) are both important sources of water that can contribute to household water requirements.

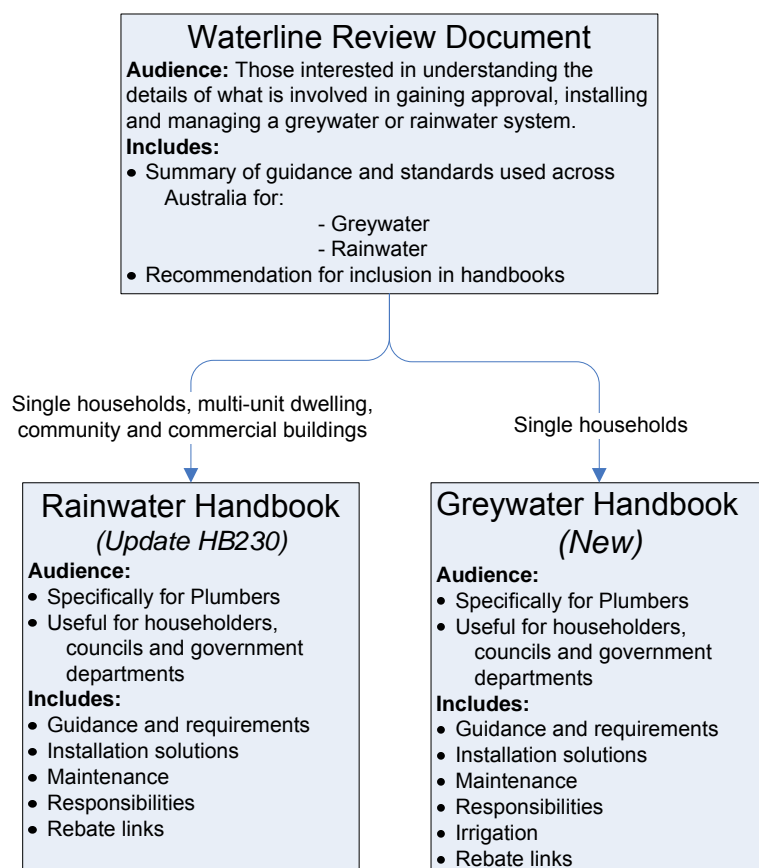
The increased use of rainwater and greywater in both domestic and commercial environments across Australia will improve water use efficiency and reduce pressures on drinking water supplies.

To help facilitate the safe and environmentally responsible use of rainwater and greywater, the National Water Commission (the Commission) funded the development of a rainwater and greywater package (Figure 1), comprising three parts:

- this National Water Commission Waterlines publication, which provides an overview of what communities need to know before pursuing the installation of greywater or rainwater re-use devices in a domestic setting. The publication sets out consent requirements, standards and codes for each state and territory. This publication was an outcome of the research undertaken in the development of the two handbooks described below
- a rainwater handbook, which provides practical and technical information for plumbers to gain approval, install and maintain rainwater systems for single households, multi-unit dwelling, community and commercial buildings (updating HB230 - Standards Australia et al. 2006)
- a greywater handbook, which provides practical and technical information for plumbers to gain approval, install and maintain greywater systems for single households.

This package aims to facilitate commitments under the NWI in progressing towards the 'Water Sensitive City'. The documents produced in this three-part package do not replace any national or state and territory codes of practice, guidelines or regulations. They have been designed to help householders and plumbers to understand in a practical sense the impact of these guidance documents with respect to gaining approval, installing, using and maintaining rainwater and greywater systems that are safe and environmentally sustainable. The information collated in this Waterline publication will also be valuable to government agencies to assess rainwater and greywater developments.

Figure 1: Overview of components of the NWC funded rainwater and greywater package



There are a number of issues and concerns with regard to consent arrangements for greywater installations.

For installation of both rainwater and greywater systems, the approvals required, reporting needed, and responsibilities of the householder, plumber and regulatory authority (for example, councils, health departments and environment departments) vary considerably across Australia. It appears that the installation and approval process is often complicated and difficult to understand. Initially this must discourage householders and have them turn to their own resources to install rainwater or greywater system. If not installed correctly (complying with the appropriate guidelines and standards), this could ultimately compromise human health or the local environment.

A number of guidelines currently available across Australia do not provide sufficient stand-alone approval process, design, installation and maintenance details at a technical and practical level for plumbers and householders to understand what is involved, and for plumbers to install rainwater and greywater systems. There is usually some referral to several other standards, codes or guidelines.

Some states and territories have produced documents to address this issue. For example, the *Rainwater plumbing guides for use and installation* (SA Water 2006b) and the *Sydney Water guidelines for rainwater tanks on residential properties. Plumbing requirements* (Sydney Water 2003 – Amendment) are a good step in the right direction. Many other states do not provide guidance, and the guidance that exists is limited technically (especially from a plumber's perspective of the practicalities of installing systems).

Many states or councils offer some type of government rebate to encourage use of rainwater and greywater systems, most require licensed plumbers to install them

(bucketing or direct diversion of washing machine greywater doesn't usually require a plumber). The plumber must supply evidence of installation and that it has been done to a specific standard (in many cases there is no auditing of this process). The plumbing code (AS/NZS 3500 (AS/NZS 2003b)) relates only to the diversion of septic tanks, but not to greywater systems. What specific standards should they be installed to?

Plumbers are generally identified as the interface between the user (householder) and the relevant standards, guidelines and regulations. Technical solutions for plumbers are dispersed through at least 10 Australian Standards, a number of codes, several state guidelines, two Australian guidelines and numerous acts of legislation and local government requirements.

Plumbers are a crucial link in the householders' understanding of rainwater and greywater systems. In many cases plumbers gain the final approval and install the rainwater or greywater system. This Waterlines publication provides a national overview, and aims to facilitate a greater overall understanding of the approval, installation, maintenance and use of both greywater and rainwater for interested householders, new home builders and plumbers. For practical technical solutions for gaining approval, installing and maintaining rainwater and greywater systems the reader is referred to the additional two handbooks produced as part of the MPMSAA project discussed above.

The Waterlines and handbook publications have been developed by the Master Plumbers and Mechanical Services Association of Australia with assistance from the Steering Committee developed for the project.

The Steering Committee members consist of:

- Master Plumbers and Mechanical Services Association of Australia
- Arris Pty Ltd (Dr Daryl Stevens)
- National Plumbing Regulators Forum
- Australian Local Government Association
- Urban Development Institute of Australia
- Housing Industry Association
- Australian Rainwater Industry Development Group
- National Water Commission
- RMIT University
- Standards Australia
- Netafirm Water re-use
- Griffith University
- Labmark.

1. Introduction

1.1 Background

The Master Plumbers and Mechanical Services Association of Australia (MPMSAA) was recently successful in obtaining funding through the Australian Government Water Fund Commonwealth Government of Australia's National Water Commission (NWC) to improve Australian plumbers' understanding of rainwater and greywater systems.

This project aims to develop best practice guidance for the approval, design, installation and maintenance of household rainwater and greywater systems. Existing codes, standards, technical solutions and reports at local, state and national level have been reviewed and used as the basis for the development of the publications. The project will also assist everyone interested in rainwater and greywater use to understand what is required to correctly install and maintain these systems.

1.2 Definitions

For this report, the definitions of rainwater and greywater defined in the *Australian guidelines for water recycling* (NRMMC and EPHC 2006; NRMMC and EPHC 2007 – Draft for Public Comment) have been adopted. Other relevant water sources have also been defined below but are not reviewed in this document. Definitions of water source include:

- rainwater (or roofwater) – water collected from the roofs of buildings
- greywater – wastewater from the hand basin, shower, bath, spa bath, washing machine, laundry tub, kitchen sink and dishwasher. Water from the kitchen is generally too high in grease and oil to be reused successfully without significant treatment (does not include black water – water containing human excrement)
- stormwater – rainfall that runs off all urban surfaces such as roofs, pavements, carparks, roads, gardens and vegetated open space
- mains water – potable water from a reticulated water supply, e.g. town water supply
- single household or dwelling – a Class 1a building as defined in the building code of Australia (ASCB 2007), is a detached house, or one of a group of two or more attached dwellings, each being a building separated by a fire resisting wall, including a row house, terrace house, town house or villa unit. This does not include a Class 1b building (boarding house, guest house hostel or the like).

This review focuses on greywater and roofwater but the use of these water sources has implications on the broader water supply system and as such greywater and roofwater are discussed in the context of mains water supply and stormwater where relevant.

1.3 Aim and audience

This review aimed to summarise the current information available relating to approval, installation and associated plumbing of two crucial components of the water cycle in Australia:

- rainwater systems for capturing and using rainwater (roofwater) within the boundary of the residential or commercial property
- greywater systems in single household sewer areas and within the boundary of the property which includes a single household.

This Waterlines publication and the two handbooks will be a single point of reference that provides a roadmap for rainwater and greywater use in Australia, helping householders and plumbers to understand the:

- responsibilities of the owner and user
- approval processes and related regulations and guidelines
- role of the plumber and builder
- role of the responsible regulatory authorities (for example, councils, health and environment-related government departments).

Information collated in this document will be valuable to regulators and environmental managers to assist these agencies assess greywater development applications and provide common platforms for all players to understand the process.

Technology and guidance in these areas have changed significantly over the past five years in this rapidly developing industry. The information in this review will also be used as a basis for updating the Rainwater Handbook (HB 230 – Standards Australia et al. 2006) and drafting a Greywater Installation Handbook for the plumbing industry across Australia.

There is currently no Australian Standard covering greywater and rainwater. The rainwater and greywater handbooks were initiated to fill this gap by publishing comprehensive and practical guidance to plumbers and householders. The handbooks may also serve the first step in the development of national standards in this area.

This Waterline document also includes information on rebates available for the installation of rainwater and greywater systems and current or known future building requirements relating to them for all states and territories of Australia (May 2008). This is useful information for householders, builders, local government and plumbers when considering rainwater or greywater systems.

2. Rainwater systems in Australia

2.1 Rainfall in the urban environment

This review has focused on rainwater in urban areas that has fallen on a roof and been captured before reaching other urban surfaces. The quality of this rainwater depends on the:

- location of the roof catchment in relation to a pollution emitting industry
- quality (material, design and installation) of the capture and storage infrastructure (for example, roof, gutters, pipes, tanks)
- maintenance (inspection, filtration, pest management) of infrastructure.

Possible applications for rainwater are:

- laundry washing machine connection – cold water use
- toilet flushing
- outdoor use
- pool, pond, and spa top-up
- garden irrigation
- hot water use
- fire fighting
- cooling towers
- drinking and food preparation.

If the water is to be used for drinking and food preparation, it must comply with the *Australian drinking water guidelines* (NHMRC and NRMMC 2004). The decision to use rainwater for drinking and food preparation, in an urban main water area, is made at the risk and responsibility of the property owner. Most health authorities recommend using mains water for drinking if it is available. Rainwater must be plumbed into separate plumbing fixtures and identified appropriately.

For rural non-town areas, where rainwater is the only source of water, it may be used for all plumbing fixtures and hose taps in accordance with local Health Department guidelines.

The amount of rainfall across Australia varies significantly and should be considered when investing in a rainwater system. Garden water requirements will also be governed by climatic conditions and pan evaporation (Table 2, Table 3), which can give an indication of the monthly or annual water requirements for householders gardens (based on a crop factor and garden size). Most guidelines also give an indication of water requirements for flushing toilets, showering and gardens (Table 9). If garden requirements are combined with other areas within the residence that are connected to the rainwater system (for example, for a washing machine or toilet flushing) an estimate of the total rainwater requirement can be made.

Table 1: Average pan evaporation and rainfall data for capital cities in Australia

City	Pan evaporation (Daily average for a month, mm)												Year Average
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Sydney	7.2	6.5	5.3	4.2	2.9	2.5	2.7	3.7	4.8	5.9	6.5	7.4	5.0
Melbourne	5.7	5.2	3.8	2.5	1.6	1.1	1.2	1.7	2.5	3.5	4.4	5.2	3.2
Brisbane	7.3	6.5	5.8	4.5	3.2	3.0	3.2	4.1	5.5	6.3	7.2	7.5	5.3
Perth	8.3	7.8	6.3	4.0	2.5	1.9	1.8	2.3	3.3	4.8	6.3	7.6	4.7
Adelaide	7.4	7.2	5.3	3.5	2.2	1.5	1.6	2.2	3.0	4.4	5.7	6.7	4.2
Hobart	4.2	3.8	2.9	1.9	1.3	0.8	0.8	1.2	1.9	2.6	3.4	3.9	2.4
Darwin	6.0	5.7	5.8	6.4	6.8	6.9	6.9	7.2	7.7	8.1	7.5	6.7	6.8
Canberra	8.3	7.5	5.6	3.7	2.2	1.6	1.7	2.6	3.7	5.2	6.5	8.0	4.7
	Rainfall (Monthly average, mm)												Year Average
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Sydney	103	117	130	126	122	131	98	82	69	77	84	78	1215
Melbourne	48	48	50	58	56	49	48	50	58	67	60	59	651
Brisbane	160	158	141	93	74	68	57	46	46	75	97	133	1149
Perth	19	7	21	31	92	134	151	135	90	43	20	6	753
Adelaide	24	24	24	52	77	77	88	75	64	52	37	30	622
Hobart	48	40	45	51	47	54	53	53	53	62	54	57	617
Darwin	419	358	325	102	21	2	1	5	15	69	140	246	1704
Canberra	60	56	51	46	45	41	41	47	52	63	64	53	619

Source: <http://www.bom.gov.au/climate/averages/tables/cw_070014_All.shtml> using all available data up to 2007

Table 2: Summary of average water requirements for gardens in capital cities of Australia

City	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
	Water required for 100 m ² of garden (KL/month)												
Sydney	3	0	0	0	0	0	0	0	2	3	3	5	16
Melbourne	5	3	2	0	0	0	0	0	0	0	2	3	16
Brisbane	0	0	0	0	0	0	0	3	5	4	3	1	15
Perth	11	10	8	4	0	0	0	0	0	4	8	11	56
Adelaide	10	8	6	1	0	0	0	0	0	3	6	8	41
Hobart	3	2	1	0	0	0	0	0	0	0	1	1	8
Darwin	0	0	0	1	9	10	11	11	10	7	0	0	59
Canberra	8	6	5	2	0	0	0	0	1	3	5	8	38

Calculated assuming rainfall 0.8 efficient, crop factor 0.5 and average pan evaporation data from cities.

2.2 Household use of rainwater

The Australian Bureau of Statistics (ABS) has recently released information (ABS 2007) which shows that:

- the majority of Australian households were actively participating in water saving activities
- rainwater tanks could be found in 21 per cent of all households
- 65 per cent of houses in Australia were still suitable for installation of rainwater tanks and 14 per cent were not suitable for rainwater tanks.

Rainwater tanks have become an important component of the urban water cycle and will continue to become crucial to urban and rural water management in the near future.

Opportunities for rainwater collection and use vary according to the location in Australia: urban households already have a connection to a centralised, or reticulated, water supply system, whereas rural households typically have to source their water on their property. Consequently, the regulations and guidelines concerning the collection and use of rainwater vary according to location. Householders and those responsible for the rainwater system should always check with their local council or state health authority for advice on the current regulations and guidelines in their particular area.

2.3 Volumes available

The volumes of water that could be collected in rainwater tanks vary considerably across Australia (Table 3). In some cases it may be necessary to augment rainwater in tanks with water from other sources such as bores, dams, rivers and creeks or with carted water. Only water that is suitable for the purpose intended should be used. If the water is to be used for drinking and food preparation, it should comply with the *Australian drinking water guidelines* (possibly after chlorination; NHMRC and NRMCC 2004). If there are any doubts about the suitability of a water source, the local or state water or environmental health agency should be consulted.

Table 3: Indicative volumes of water collected in rainwater tanks in Australian capital cities

Annual rainfall (mm)	Roof area (m ²)						
	100	150	200	250	300	400	500
	Maximum volumes of rainfall per year (KL/y)						
150	10	15	20	25	30	40	50
200	14	21	28	35	42	56	70
250	18	27	36	45	54	72	90
300	22	33	44	55	66	88	110
400	30	45	60	75	90	120	150
500	38	57	76	95	114	152	190
600	46	69	92	115	138	184	230
800	62	93	124	155	186	248	310
1000	78	117	156	195	234	312	390
1200	94	141	188	235	282	376	470

Source: enHealth (2004, p.62)

Water subject to contamination from human or livestock waste (surface water, other than roof water), such as dams, rivers and creeks, can contain a wide range of pathogenic organisms including chlorine-resistant *Cryptosporidium*. Water of this type may not be suitable for drinking even after disinfection.

Surface water that is protected from human and livestock waste can be used. Water should be added to the tank in one action, chlorinated and allowed to stand for at least one hour before use. Chlorination should be performed as described in enHealth (2004, s.5) using a test kit to measure chlorine residuals. If, 30 minutes after chlorination, there is not at least 0.5 milligrams per litre of free chlorine, a second equal dose should be added (enHealth 2004).¹

¹ <<http://portal.water.wa.gov.au/portal/page/portal/WaterManagement/Stormwater/StormwaterMgtManual>>

2.4 Australia – rainwater

In Australia, the installation of a rainwater tank may require approval from one or more of the following:

- the responsible regulatory authority (for example, a local council) – rainwater tanks are defined as a structure – Class 10b under the Building Code of Australia
- plumbing regulator
- network utility operator (mains water supply).

Pipes, outlets and fittings supplying rainwater should be clearly identified and be in accordance with AS/NZS 3500.1 and AS/NZS 3500.3 *Plumbing and drainage code* (AS/NZS 2003b).

Australian and New Zealand Standards that apply to tanks and their associated fixtures and fittings (enHealth 2004) are:

- AS 2070 *Plastic materials for food contact use*
- AS/NZS 2179 *Specifications for rainwater goods, accessories and fasteners*
- AS 2180 *Metal rainwater goods—selection and installation*
- AS/NZS 3500 *Plumbing and drainage code*
- AS/NZS 4020 *Testing of products for use in contact with drinking water*
- AS/NZS 4130 *Polyethylene (PE) pipes for pressure applications*

Pipes that may be in contact with rainwater for extended periods should comply with AS/NZS 4020. In general, this does not apply to guttering or downpipes that deliver directly into the top of rainwater tanks because contact with the water is transient. Underground pipework delivering water to the tank, between tanks, or from tanks to houses should comply with AS/NZS 4020. Polyethylene pipes used for pressure applications should comply with AS/NZS 4130. Irrigation piping should not be used as it can contain and release lead into water at concentrations exceeding those specified in the Australian drinking water guidelines (enHealth 2004).

Authorised materials and products

Materials and products used in a rainwater tank installation to connect to the water supply shall comply with the requirements of the national plumbing products certification scheme and be of an approved type as specified in the appropriate Standard listed in AS/NZS 5200.000, in accordance with the Plumbing Code of Australia. In general, all rainwater storage products shall be structurally sound and watertight.

Roofing material

Before installing a rainwater tank, the roof catchment area should be checked (enHealth 2004) for:

- overhanging vegetation – should be pruned
- a flue from a slow combustion heater – if possible this section of roof should be avoided; if not, ensure the flue is installed in accordance with Australian/New Zealand Standards
- overflows, discharges and bleed-off pipes from roof-mounted appliances, such as evaporative air-conditioners, hot water services, and solar heaters – should not discharge onto the rainwater catchment area

- uncoated lead flashing – should be painted
- exposed preservative-treated timber – should be sealed or the section of roof containing the timber should not be used for collection of rainwater
- gutters – should have sufficient and continuous fall to downpipes to prevent pooling of water that could increase accumulation of material, lead to algal growth and possibly provide a site for mosquito breeding; a fall of one in 100 should be sufficient; gutter shielding devices will substantially reduce the amount of larger debris (bark, larger leaves, etc.) but small particles will not be removed; periodic cleaning will still be needed but at a lower frequency than for gutters without shielding
- dangerous plants – some Australian plants can produce toxins, but most are low growing and would be unlikely to effect roof catchments or tanks
- paints and coatings – some paints may not be suitable for roofs to collect rainfall due to lead content or leaching of other hazardous substances.

The risk from asbestos is one that is commonly raised in relation to rainwater systems (DHS 2007). Asbestos is no longer used in new houses, but it may be present in some older roofs. Asbestos fibres are dangerous to health when inhaled in sufficient quantities, and harvesting water from asbestos roofing should be avoided. Where possible, asbestos roofing should be left undisturbed as fibres can be released into the air by actions such as cutting, grinding or drilling. High-pressure roof cleaning methods should also be avoided. Where the roof catchment area has deteriorated badly, it should be replaced with asbestos-free substitutes.

Additional information based on managing the quality of the rainwater catchment roof is available in the *Australian guideline for water recycling, Managing health and environmental risks*, Volume 2B Stormwater harvesting and reuse (NRMMC and EPHC 2007 – Draft). There have also been other recent publications on the quality of rainwater in Australia (Chapman et al. 2008a; Chapman et al. 2008b; Magyar et al. 2008) highlighting the importance of maintaining the collection and storage components of rainwater systems to maintain rainwater quality, especially if it is to be used for drinking.

Tank materials

Australian and Australian/New Zealand Standards that apply to tanks and their associated fixtures and fittings are:

- AS/NZS 1546 *On-site domestic wastewater treatment units—septic tanks*
- AS/NZS 2179 *Specifications for rainwater goods, accessories and fasteners*
- AS/NZS 3500 *Plumbing and drainage code*
- ATS 5200 Technical specification for plumbing and drainage products
- ATS 5200.026 Cold water storage tanks

Polyethylene tanks

- AS 2070 *Plastics materials for food contact use*
- AS/NZS 4130 *Polyethylene (PE) pipes for pressure applications*
- AS/NZS 4766 *Polyethylene storage tanks for water and chemicals*

Metal tanks

- AS 2180 *Metal rainwater goods—selection and installation*

Concrete tanks

Septic tanks have standards (On-site wastewater treatment AS/NZS: 1546, 1547) and these are being applied to other tanks (AS/NZS 1998; 2000; 2001a,b).

AS 3735: 2001 *Concrete structures retaining liquids* specifies requirements for concrete structures and members that include reinforcing steel or tendons, or both, used for retaining liquids at ambient temperature (see AS 2001).

Filters

If a filter is used for health reasons, then it should be certified against an appropriate standard (such as AS/NZS 4348 or ANSI/NSF 53).

Rainwater storage tanks

Methods of acceptable rainwater tank authorisation are as follows:

- above ground polyethylene rainwater tanks shall be designed and manufactured in accordance with AS/NZS 4766
- rainwater tanks made of materials other than those covered by AS/NZS 4766 shall have the minimum authorisation of WaterMark certification to ATS 5200.026
- rainwater tanks constructed of products and materials that would not be applicable to be certified under ATS 5200.026 (for example, *in situ* tanks, underground rainwater tanks, and flexible water storage tanks) shall be structurally sound and water tight
- *in situ* and underground rainwater tanks could be certified in accordance with the specified test method, performance requirements, pressure testing and objectives of AS/NZS 1546.1, AS/NZS 4766 and be designed, inspected and signed off by a qualified structural engineer
- rainwater tanks may be lined with approved coating in accordance with AS 5200.000.

Rainwater tank connection devices

Rainwater tank connection devices should comply with:

- ATS 5200.466—2004 *Rainwater tank connection devices*
- ATS 5200.467—2004 *Rainwater tank connection valve references*
- AS/NZS 3500:2003 *Plumbing and drainage code*
- AS/NZS4766(Int):2002 *Polyethylene storage tanks for water and chemicals*
- AS1397:2001 *Steel sheet and strip—hot-dipped zinc-coated or aluminium/zinc-coated*
- ASTM A240/A240M-05 *Standard specification for chromium and chromium-nickel stainless steel plate, sheet, and strip for pressure vessels and for general applications*
- AS 3735:2001 *Concrete structures retaining liquids*
- AS/NZS 1170.1:2002 *Structural design actions—permanent, imposed and other actions*
- AS/NZS 1170.2:2002 *Structural design actions—wind actions*

Rainwater outlets shall be identified as 'RAINWATER' with a label or a rainwater tap identified by a green coloured indicator. Rainwater warning signs shall comply with AS 1319 (Figure 2) as per the 2005 amendment to AS/NZS 3500.

Figure 2: Example of rainwater tank or outlet signage as per AS1319 (AS 1994; AS/NZS 1994)



The following sections outline the governance, installation, rebates and specific building requirements for rainwater systems in territories and states of Australia.

2.5 Australian Capital Territory – rainwater

Governance

In the ACT, installing a rainwater tank does not need planning or building approval if it is:

- less than 17 kilolitres in size
- no higher than 2.4 metres above natural ground level
- not built of reflective, white or off-white material
- installed to the side or rear of the house at least three metres from the rear boundary and 1.5 metres from the side boundary.

If a tank is outside any of these guidelines the householder will need planning approval from the ACT Planning and Land Authority (telephone 6207 1926) or building approval from a private certifier, or both. Tanks cross-connected to the ACT's drinking water supply network also require building approval from a private certifier.

The ACT Government's rainwater tank guidelines for residential properties in the ACT list details on the benefits of installing a rainwater tank, how to choose a suitably sized tank based on householders needs, how much rainwater different sized tanks can harvest, installation and approval requirements, and tank maintenance (ACT Government 2006). The installation section of the guidelines has some basic rainfall assembly options and some comments on AS/NZS 3500 *Plumbing and drainage code* Part Water services section 4 'Installation of Water Supply Systems from Rainwater Tanks' (Table 4), which sets out the minimum requirements for the installation of backflow prevention devices for zone protection for buried, partly buried and above-ground rainwater tanks in residential and commercial applications (2005 amendment to AS/NZS 3500 should also be checked).

The ACT rainwater tank guidelines also address plumbing approvals and requirements (ACT Government 2006).

Installation

Plumbing approvals

The installation of a rainwater tank in the ACT does not require plumbing approval if the tank:

- is free standing, and
- is to be used only for garden or lawn irrigation, and
- is not delivering rainwater to taps, fixtures or appliances in the house.

All other installations require plumbing approval and compliance with AS/NZS 3500 Section 4 Installation of water supply systems from rainwater tanks (AS/NZS 2003b).

Plumbing requirements

Below is a summary of AS/NZS 3500 Section 4 requirements for installing a rainwater tank on a residential property as applied in the ACT:

- All plumbed piping systems delivering rainwater to taps, fixtures or appliances in the house must be installed by a licensed plumber and meet the requirements of ACT plumbing legislation and AS/NZS 3500.
- As a general rule, there must be no direct connection between a rainwater tank plumbing system and potable water plumbing pipes served by ActewAGL's reticulated drinking water network (in special cases interconnection may be permitted if the risk is low and additional failsafe engineering controls are evaluated and approved by the ACT Planning and Land Authority and ActewAGL).
- Where a higher risk of contamination of the water supply is identified, the plumbing regulator, the ACT Planning and Land Authority, or ActewAGL may require the property owner to install a higher hazard backflow prevention device at the property owner's cost.
- Rainwater plumbing work serving internal taps, fixtures or appliances, must be notified to the ACT Planning and Land Authority using a 'Start of Work' notice before work is to commence.
- A top-up facility (drawing water from the ActewAGL network) requires a 'Start of Work' notice.
- The plumber must arrange for all drinking-water and rainwater plumbing work to be inspected by the ACT Planning and Land Authority.
- The plumber must submit a Certificate of Compliance to the ACT Planning and Land Authority and the customer at completion of the work.

Rainwater plumbing materials and labelling

Plumbing for a rainwater system must use approved materials and be labelled to distinguish it from plumbing used for drinking water. All pipes that could be in contact with rainwater should comply with AS/NZS 4020. Materials used in plumbing for a rainwater tank must comply with AS/NZS 3500 'Water supply—Acceptable Solutions', Section 2 'Materials and Products'. Complying products are marked with the 'Australian Standard Mark' '5 ticks', 'W' for the WaterMark or 'T' for type tested.

All above-ground rainwater service pipes must be clearly marked at intervals not exceeding one metre with the contrasting coloured wording 'RAINWATER'. Water outlets shall be identified as 'RAINWATER' with a label or a rainwater tap identified by a green coloured indicator with the letters 'RW'. This pipe labelling can be achieved for

above-ground pipes by using adhesive pipe markers (in accordance with AS/NZS 345). All below-ground rainwater service pipes must be clearly labelled 'rainwater' continuously along their length, 'RAINWATER' identification tape for below-ground pipes should be 75 millimetres wide and be installed on the top of the rainwater pipeline, running longitudinally and fastened to the pipe at intervals of not more than three metres. This can be done for below-ground pipes by using identification tape (made in accordance with AS/NZS 2648).

Proximity to other services

Rainwater pipes must not be installed inside the pipe protection envelope of any Actew water or sewerage main or ActewAGL electricity mains. All above-ground rainwater pipes must be located 100 millimetres from any drinking water service (this includes the pipe protection envelope, metres and any outlets). All below-ground rainwater pipes must be located 300 millimetres from any drinking water service.

Backflow prevention

Where there is the potential for the reverse flow of polluted water to contaminate a drinking water supply, an approved backflow prevention device must be installed.

Rebates

The ACT Government offers a rebate for the installation of an approved rainwater tank with an internal plumbing connection in domestic residences. To qualify, the householder must comply with regulatory standards and agree to the conditions of the rebate scheme.

The ACT Government offers a rebate for the installation of approved rainwater tanks with an internal plumbing connection on properties connected to Actew Corporation's water supply network. This program, which commenced 1 September 2006, replaces previous rainwater tank rebate programs.

The program recognises that maximum benefits from installing a rainwater tank, in terms of water saving and stormwater protection, are generated when the tank water is used for internal purposes, such as toilet flushing and clothes washing, as well as for garden watering. This provides a way for tank water to replace mains water all year round – internally during cooler months when the garden needs little water, and outside in the garden as well in warmer months – thereby increasing the amount of rainwater that can be harvested and used.

To be eligible for a rainwater tank rebate, the tank must have an internal plumbing connection, for example, to the laundry or toilet, and all rebate terms and conditions, as specified on the Rainwater Tank Rebate application form must be met.² Properties on blocks where rainwater tanks are mandatory are not eligible for rebates under the scheme. Mandatory requirements are identified in the block's lease and development conditions. The rebate amounts applicable to new tanks in ACT with an internal plumbing connection range from \$550 to \$4800 depending on the size of the tank (Table 4). There is a separate Internal Connection Rebate of \$400, which is available for internal plumbing connections for existing rainwater tanks (Table 4).

Table 4 Rebates available in ACT for new and existing tanks with internal plumbing connections

Total storage capacity	Rebate	
New tanks	From Feb 08	Before Feb 08
2000 to 3999 litres	\$750	\$550

² www.thinkwater.act.gov.au/tune-ups_rebates/documents/F00553-ORainwatertankrebate.pdf

4000 to 8999 litres	\$900	\$700
9000 litres or greater	\$1000	\$800
<u>Existing tanks</u>		
Internal Connection Rebate	\$600	\$400

For more information Ph 13 22 81³

Specific building requirements

Plumbing Note 24, *Greywater drainage separation and provision for rainwater plumbing (single residential buildings)* (ACTPLA 2004), indicates that Rainwater Supply Plumbing (Provisional points) must be installed in all single residential homes and extensions started on or after 1 January 2005 in the ACT, as detailed below:

- Toilet cistern: to supply homes with rainwater use facilities for the future, the home will incorporate provisional rainwater pipes, capped and sealed. These rainwater points must be installed to all toilet cisterns. If the toilet cistern will allow connection of a second inlet valve, the rainwater point is to finish below the second inlet entry to the cistern and be finished with a cap and flange of a chrome-plated type.
- Washing machine point: a third washing machine point for rainwater, capped and sealed, must be installed to allow the use of rainwater in the laundry facility for future use. This point must be left to allow for easy connection of a tap or cock and finished with a chrome-plated cap and flange.

The external rainwater provisional point must be left at an external position of the building to allow for easy connection of rainwater piping from a rainwater tank to serve the toilets and laundry facility. The rainwater piping for toilet flushing and laundry facilities must be combined and have one external connection point, this must be located no higher than one metre above finished ground level and to the rear or side of the house. This provisional point must be sealed with a chrome-plated cap and flange. Homes supplied with a commercial rainwater toilet flushing unit or units will not be required to comply with this plumbing note for the connection of the rainwater provisional point (toilet cistern only).

2.6 New South Wales – rainwater

Governance

New South Wales Health publishes guidelines for rainwater tanks in NSW (NSW Health 2007). Where a public water supply is available, this guideline acknowledges that a properly maintained rainwater tank can provide good quality drinking water. Occasionally, there are cases of illness from contaminated rainwater. The public water supply remains the most reliable source of drinking water for the community in urban areas. In these areas, NSW Health supports the use of rainwater tanks for non-drinking uses. NSW Health recommends that people use the public water supply for drinking and cooking because it is filtered, disinfected and generally fluoridated (NSW Health 2007).

The NSW State Environmental Planning Policy No 4 – Development Without Consent and Miscellaneous Exempt and Complying Development – Reg 16 summarises when rainwater tanks are exempt developments.⁴

³ www.thinkwater.act.gov.au/tune-ups_rebates/Current_rebate.shtml

⁴ http://www.austlii.edu.au/au/legis/nsw/consol_reg/seppn4wcameacd1170/s16.html

If there is any other type of connection between a rainwater tank and Sydney Water's water supply, a licensed plumber must complete the plumbing required.⁵ Plumbers should be aware of mandatory requirements, including having a visible air gap between the water supply and tank and an appropriate backflow prevention device fitted at the meter. For the vast majority of residential customers, Sydney Water will supply and install such a backflow prevention device for free. These requirements are needed to minimise any risk of water from the tank flowing into the public water supply.

If the tank has a capacity of 10,000 litres or more, the householder will also need to get Sydney Water's approval to ensure that it is not built over any Sydney Water structure or easement. In all cases, stormwater overflow from rainwater tanks must be directed to the stormwater drainage system and not the sewerage system.

Installation

Rainwater tanks with a capacity of 10,000 litres or less generally do not need council development approval but will still be subject to certain council requirements. For example, some councils have location, colour or noise control requirements for tanks. Householders should consult their local council before installing a rainwater tank. The Local Government and Shires Association⁶ of NSW refers back to NSW Health for guidance on maintenance of tanks and the NSW Department of Energy, Utilities and Sustainability for the advantages of rainwater tanks.

If the rainwater tank requires topping up, a flow restrictor should be installed on the piping. This will ensure the water pressure supplied to nearby residents is not affected when a householder is filling their tank. It is the role of the plumber to advise the householder of the requirements for topping up the tank. Sydney Water also has some good information for plumbers regarding the installation of rainwater tanks that collect roof water only.⁷

There are also guidelines for rainwater tanks on residential properties focused on plumbing requirements and information for rainwater tank suppliers and plumbers (Sydney Water 2003). These guidelines have some general installation drawings and several technical drawings to indicate connection, backflow devices and tank top-up systems (Figures 3 and 4). A more detailed diagram for connection of rainwater and mains water supplies to a toilet is a good example of the detail required by plumbers with a technical and practical focus (Figure 4). However, the diagram gives only a portion of the information required by a plumber. It does not discuss the water pressure required, pipe sizing and friction losses: one metre of fall is equivalent to 10 kilopascals of pressure (this is essential information for connection of rainwater systems because most standard valves need 30 kilopascals to work). There has been an amendment to this guideline (Sydney Water 2003 - Amendment), which is intended to provide plumbers with details of the new regulatory position and Sydney Water's requirements for on-site interconnection between the rainwater supply and the drinking water supply.

⁵ <<http://www.sydneywater.com.au/SavingWater/InYourGarden/RainwaterTanks/Installation.cfm>>

⁶ <<http://www.lgsa.org.au/www/html/256-stormwater.asp>>

⁷

<<http://www.sydneywater.com.au/Publications/download.cfm?DownloadFile=FactSheets/PlumbingInformationForRainwaterTanks.pdf>>

Figure 3: Plumbing for above-ground rainwater tanks with an air gap and pump by-pass interconnection to the drinking water supply and providing rainwater for all purposes (Sydney Water 2003 – Amendment)

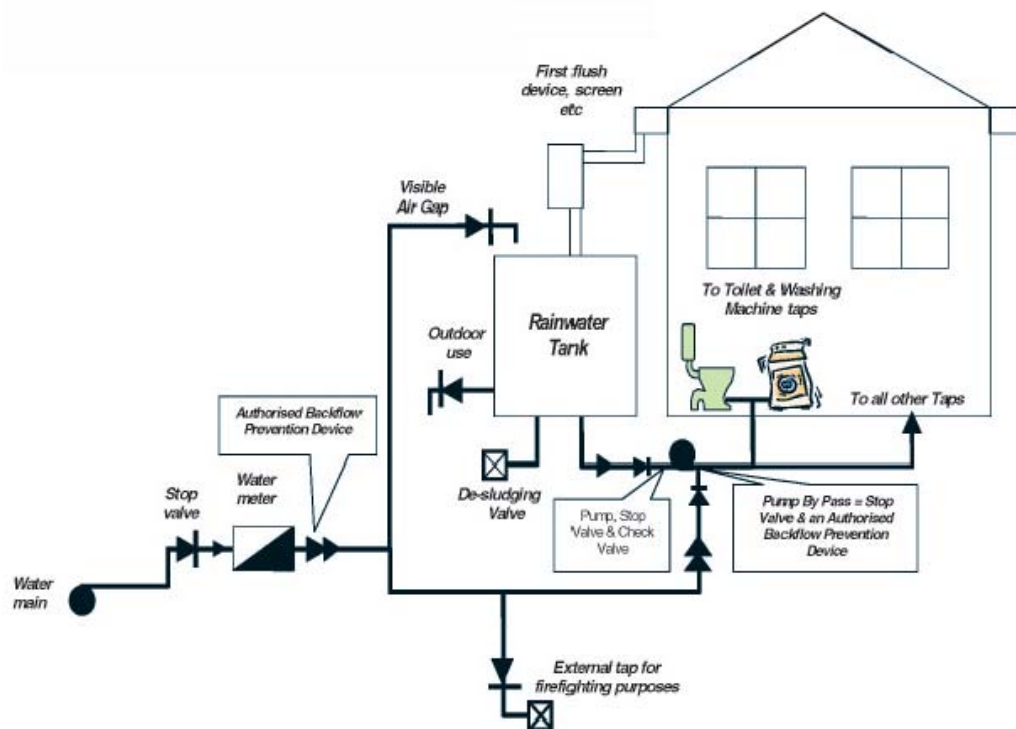
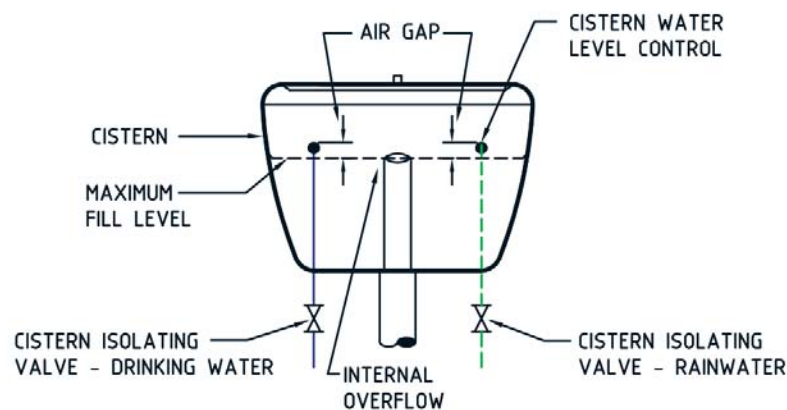


Figure 4: Detailed diagram for connection of toilet cistern with rainwater and mains water (Sydney Water 2003)



The amendment indicates that, although NSW Health does not recommend the use of rainwater tanks for drinking purposes where a reticulated drinking water supply is available to the customer, the customer can choose to have rainwater connected to their potable supply if they meet certain conditions explained in the amendment (Sydney Water 2003 - Amendment). The amendment contains diagrams explaining the plumbing requirements for connecting rainwater tanks to drinking water supplies. It is also important to ensure that the property owner or consumer is aware that the maintenance of a rainwater tank and the quality of the water supplied from a tank is the responsibility of the owner or consumer, not the local water utility.

Rebates

Sydney Water is offering a rebate to customers who install and connect a rainwater tank. The maximum value of the rebate has increased from \$800 to \$1500.

Householders can now get a rebate of up to \$1500 depending on:

- the date the tank was purchased
- the size of the tank
- whether a licensed plumber connects the rainwater tank to supply to the toilet and washing machine.

A special Rainwater Tanks in Schools Rebate program is available for schools⁸ (Table 5).

There are two parts to the rebate:

- tank capacity rebate – for the size of the rainwater tank
- internal connection rebate – for connecting the rainwater tank to a toilet(s) or washing machine.

The new rebate is for tanks bought and installed between 1 July 2007 and 30 June 2009.

Table 5: Rebates offered by Sydney Water for schools in NSW

Tank(s) capacity	Rebate*
2000 to 3999 litres	\$150
4000 to 6999 litres	\$400
7000 litres and above	\$500
Internal connections	Rebate*
Rainwater tank connected by a plumber to toilet	Additional \$500
Rainwater tank connected by a plumber to a washing machine	Additional \$500

The increased rebate is available until 30 June 2009⁹

If a rainwater tank was purchased and installed between 20 October 2002 and 30 June 2007, the previous rebate amount of up to \$800 is available. Provided the other terms and conditions of the rebate program are met,¹⁰ residents are eligible for the following rebate amounts in NSW:

- tank capacity rebate – for the size of the rainwater tank, up to \$500
- internal connection rebate – for connecting the rainwater tank to a toilet, washing machine or both, up to \$150 for connections made between 20 October 2002 and 18 October 2006; or \$300 for connections made between 19 October 2006 and 30 June 2007.

Other water authorities or councils in NSW may have similar rebates, and those considering installation of rainwater tanks should check with their local authority and councils.

Specific building requirements

In NSW, BASIX¹¹ (the Building Sustainability Index), ensures homes are designed to use less potable water and be responsible for fewer greenhouse gas emissions by setting

⁸ <<http://www.sydneywater.com.au/EnsuringtheFuture/WaterSchool/>>

⁹ <<http://www.sydneywater.com.au/EnsuringtheFuture/WaterSchool/>>

¹⁰ <<http://www.sydneywater.com.au/SavingWater/InYourGarden/RainwaterTanks/Rebates.cfm>>

¹¹ <<http://www.basix.nsw.gov.au>>

energy and water reduction targets for houses and units. Since 1 October 2006, BASIX applies to all new residential dwellings and any alterations or additions to residential dwellings throughout NSW.

Some of the features of BASIX are:

- rainwater tanks, plumbed to toilet, garden and/or laundry
- greywater systems where appropriate.

The target water savings range from zero to 40 per cent across NSW, depending on the location of the house or unit. Ninety per cent of new homes are covered by the target of a 40 per cent reduction, and no new home built in NSW will use more water than the current state average.

2.7 Northern Territory – rainwater

Governance

In the Northern Territory, the Department of Health and Community Services (DHCS) is the primary agency with responsibility for rainwater tanks (DHCS 2006). DHCS utilises the enHealth document entitled *Guidance on use of rainwater tanks* as the peak reference for issues associated with the collection of rainwater for potable purposes (enHealth 2004). There is no direct reference to plumbing installation in Northern Territory guidelines. However, the Building Advisory Services section of the Department of Planning and Infrastructure (now the Northern Territory Land Group) can provide information on plumbing and building matters relating to rainwater tanks.¹² The regulations and codes refer to the Building Code of Australia, National Plumbing Code (see AS/NZS 2003b; DCC 2007). The *Rainwater tank design and installation handbook* (Standards Australia et al. 2006) is also referred to in relation to a backflow device being required if town water is supplied by the Northern Territory's Power and Water Corporation.

Installation

No specific installation requirements were identified, other than the need to check with local government.

Rebates

There are no rebates for rainwater tanks in the Northern Territory.¹³

Specific building requirements

No specific building requirements were identified, other than the need to check with local government.

2.8 Queensland – rainwater

Governance

Queensland Health have policies that apply to all rainwater tanks where water is harvested or stored on-site for use on-site.¹⁴ They apply to the following scenarios:

¹² <<http://www.nt.gov.au/lands/building/regulations/>>

¹³ <<http://www.nt.gov.au/nreta/water/wise/>>

¹⁴ <<http://www.health.qld.gov.au/phs/Documents/ehu/30632.pdf>>

- the installation and maintenance of new rainwater tanks
- the maintenance of existing rainwater tanks
- areas where water stored in a rainwater tank is the sole water supply
- areas where water stored in a rainwater tank supplements a reticulated supply
- areas where water is supplied from other sources other than rain harvesting to the tank, such as trickle top-ups to rainwater tanks, tankered water, bore water, or water pumped from catchments or rivers.

Queensland Health indicate that the rainwater tank and rainwater collection and distribution system must be appropriately designed, installed and maintained and the quality of the water is appropriate for the intended use (Qld Health 2008 (accessed)). All rainwater tanks, regardless of their intended use, shall be designed, installed and maintained to prevent mosquito breeding. Potable reticulated water systems provide the safest form of supply for water for drinking and food preparation purposes, and therefore are preferred for these purposes. Queensland Health does not recommend the use of water from rainwater tanks for drinking and food preparation if a potable reticulated water supply is available. For other uses involving lower levels of oral exposure, such as bathing or tooth brushing, consideration must be given to the quality of the water and whether it is appropriate for the intended use.

Tank water may be used for supplying hot water systems where the water is heated to at least 60 °C. Tempering devices should be fitted to ensure the water temperature does not exceed 50 °C at the point of delivery to reduce the risk of scalding. In areas of Queensland where water stored in rainwater tanks is the sole water supply, Queensland Health recommends that all users of this water follow the advice contained in the enHealth document *Guidance on the use of rainwater tanks* (enHealth 2004) to optimise the quality of the water supplied from these tanks and manage risks to human health. This guideline should be considered in conjunction with Volume 2B of the *Australian guidelines for water recycling. Managing health and environmental risks* (NRMCC and EPHC 2007 – Draft).

Standard Plumbing and Drainage Regulation 2003 prohibits the connecting of a local government water service pipe to a water storage tank without approval from the local government. If approval is obtained, backflow devices must be fitted (Qld Health 2008 (accessed)).¹⁵

The Queensland Development Code includes:

- *Guidelines for Queensland development code* Part 25: Water Savings Targets (DLGSR 2007) has two diagrams for plumbing of tanks for trickle-top rainwater tanks with potable water and automatic switches to switch to town water supply if the tank is empty
- other components of the Queensland Development Code might also be relevant.¹⁶

The Queensland Development Code refers to several Australian Standards:

- AS/NZS 3500:2003 *Plumbing and drainage code*
- AS/NZS 4766(Int):2002 *Polyethylene storage tanks for water and chemicals*
- AS 1397:2001 *Steel sheet and strip—hot-dipped zinc-coated or aluminium/zinc-coated*

¹⁵ <<http://www.legislation.qld.gov.au/Legislation.htm>>

¹⁶ <<http://www.lgp.qld.gov.au/planning/?id=247> & www.lgp.qld.gov.au/planning/?id=2293>

- ASTM A240/A240M-05, *Standard specification for chromium and chromium-nickel stainless steel plate, sheet, and strip for pressure vessels and for general applications*
- AS 3735:2001 *Concrete structures retaining liquids*
- AS/NZS 1170.1:2002 *Structural design actions—permanent, imposed and other actions*
- AS/NZS 1170.2:2002 *Structural design actions—wind actions*
- *Australian drinking water guidelines* 2004 (NHMRC and NRMCC 2004); this document incorporates the 'Framework for the management of drinking water quality' and provides the Australian community and the water supply industry with guidance on what constitutes good quality drinking water
- Part 8 Mosquito prevention and destruction (Qld Health 2008 (accessed)), Health Regulation 1996 – this details provisions to prevent mosquito breeding in rainwater tanks. (Note: proposed amendments to the Public Health Regulation 2005 consistent with these provisions will replace the provisions of the Health Regulation 1996); available at: <<http://www.legislation.qld.gov.au/Legislation.htm>>.

For more information about rainwater tanks, residents are advised to contact their local council and/or Building Codes Queensland (telephone 07 3239 6369).¹⁷

Rebates

The Queensland Department of Natural Resources and Water offers rebates in Queensland for rainwater tanks.^{18,19}

From 1 February 2008, the rebate for rainwater tanks increased to \$1500 and will be available only for tanks that are 3000 litres or bigger and that are plumbed to at least one internal connection.²⁰ The previous \$1000 rebate will still apply to rainwater tanks that were ordered on or before 31 January 2008 and installed on or before 31 March 2008 whether they are plumbed in or not. Some councils in Queensland also offer rebates for rainwater tank installation (for example, Moreton Bay Regional Council²¹).

Appropriate councils should be checked for rebates. For example: Note that some of these councils no longer exist – you might want to ask the authors to check all qld links

- Brisbane City Council,
<http://www.brisbane.qld.gov.au/BCC:BRISWATER::pc=PC_1460>
- Gold Coast City Council, <http://www.goldcoast.qld.gov.au/t_gcw.asp?PID=2439>
- Ipswich City Council,
<<http://www.ipswich.qld.gov.au/division9/waterconservationrebatescheme.php>>
- Pine Rivers Shire,
<<http://www.prsc.qld.gov.au/c/prsc?a=da&did=1162798&pid=1128140783>>
- Logan City Council, <<http://www.logan.qld.gov.au/>>
- Redcliffe City Council, <<http://www.redcliffe.qld.gov.au/water5.htm>>, amalgamated
- Beaudesert Shire,
<http://www.bsc.qld.gov.au/council_information/Waterwise/Waterrebates.asp>

¹⁷ <<http://www.lgp.qld.gov.au/applications/lgdirectory/>>

¹⁸ <http://www.nrw.qld.gov.au/water/saverscheme/rebate_schemes.html>

¹⁹ <http://www.nrw.qld.gov.au/water/saverscheme/pdf/rainwater_tanks.pdf>

²⁰ <http://www.nrw.qld.gov.au/water/saverscheme/rebate_schemes.html>

²¹ <<http://www.redcliffe.qld.gov.au/Greywater%20Use%20Factfile.pdf>>

- Caboolture City Council, <<http://www.caboolture.qld.gov.au/living.aspx?id=870>>.

Note that this is not a complete list. It has been included to give the reader an idea of the complexities of the local and state government in Queensland.

Specific building requirements

Building requirements for Queensland are specified in the *Building Act 1975*. Building Codes Queensland introduced an amendment to the building code for water saving measures (including rainwater use, but it is not compulsory).²²

As part of new energy and water-saving laws introduced from 1 March 2006, councils have the option to amend their planning instruments to mandate rainwater tanks for new houses in their region. Councils will have the discretion to allow for local factors, such as rainfall and the demand for water in their area.

2.9 South Australia – rainwater

Governance

Before purchasing or installing a rainwater tank, it is important to establish whether there are any local health, building or planning regulations associated with rainwater tanks. The local council or regional authority with jurisdiction over these regulations should be consulted. The Environmental Health section of the South Australian Department of Health has a fact sheet on rainwater for the general public²³ outlining governance arrangements and then refers to two national documents for guidance (enHealth 2004; NHMRC and NRMCC 2004).

Installation

SA Water has a component of their website²⁴ dedicated to keeping plumbers informed in South Australia.²⁵ There is a *Rainwater plumbers guide* (SA Water 2006a) which describes diagrammatically the signage, labelling and installation of rainwater tanks and systems into houses (for example, see Figure 5 and Figure 6). Interestingly, the signage for rainwater taps is green rather than the yellow indicated in AS/NZS 1994; Figure 2). It is described as a guide to some of the key requirements of AS/NZS 2003b and South Australian variations that apply to installation and connection of rainwater tanks. These types of technical drawings for rainwater systems are ideal for assisting plumbers to install rainwater systems. However, the guideline has only three drawings, which may not represent all commonly connected rainwater systems across South Australia and Australia.

²² <<http://www.dip.qld.gov.au/sustainable-living/watertanks.html>>

²³ <<http://www.health.sa.gov.au/pehs/PDF-files/rainwater-tank-factsheet06.pdf>>

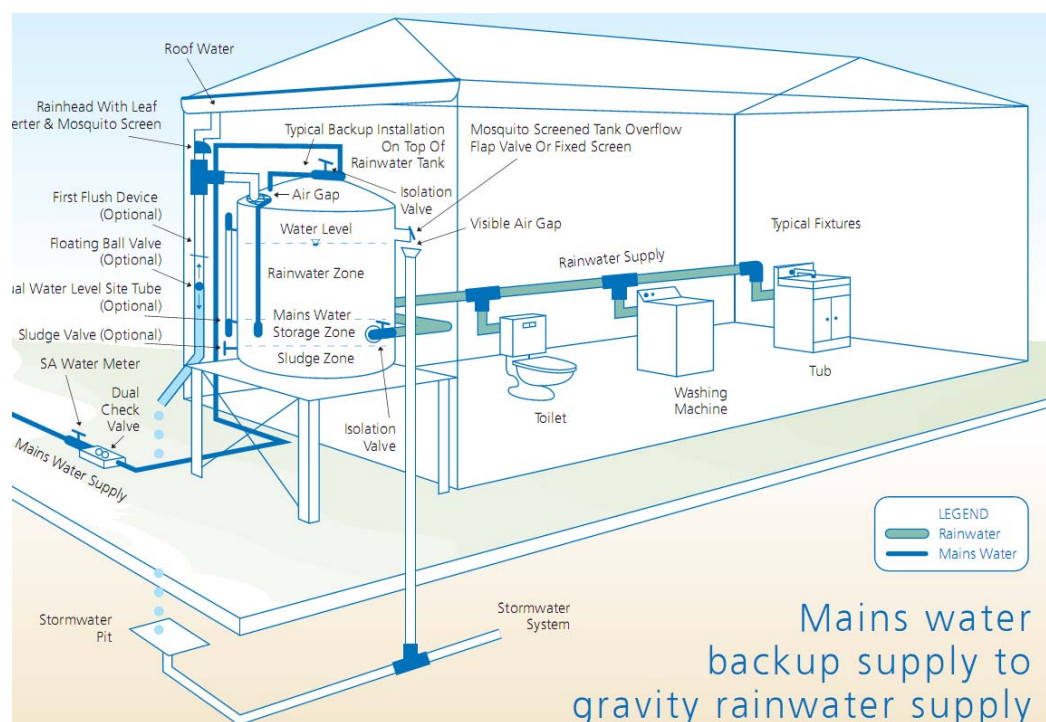
²⁴ <<http://www.sawater.com.au>>

²⁵ <<http://www.sawater.com.au/SAWater/DevelopersBuilders/ForPlumbers/>>

Figure 5: Pipe marking identified as typical for plumbing rainwater systems South Australia (SA Water 2006a) (not standard as per AS 1345 (identification of pipework), AS 1319 (warning signs).



Figure 6: Pressurised supply mains water and rainwater diversion valve. An example of Technical information for plumbers from the *Rainwater plumbing guide* (SA Water 2006a).



Rebates

In South Australia, SA Water offers a rebate of between \$200 and \$1000 for part of the cost of purchasing and plumbing a rainwater tank to retrofit into a residence for uses such as toilet flushing, clothes washing and hot water supply.²⁶

The rainwater tank rebate covers:

- up to \$800 to purchase a new rainwater tank and plumb it into an eligible home
- up to \$600 for plumbing into one eligible fixture type (to plumb an existing rainwater tank into an eligible home)
- \$200 to add an additional rainwater tank or replacement rainwater tank that is already plumbed to their existing system

²⁶ <http://www.sawater.com.au/SAWater/YourHome/SaveWaterInYourHome/rebates_rainwatertanks.htm>

- \$200 extra for new plumbing by a licensed plumber to supply rainwater to two or more different types of eligible fixtures or an eligible seamless automatic switching device.

General terms and conditions for rebates are as follows:

- all rainwater tanks need to be 1000 litres or more and plumbed into at least one eligible fixture type (toilet cistern, all laundry cold water outlets, or hot water service)
- eligible homes are generally homes for which an application for development approval was lodged before 1 July 2006
- a signed Certificate of Compliance from a licensed plumber must be obtained, indicating which eligible fixture types have been plumbed into
- the original receipts must be provided when claiming the rebate for the rainwater tank and switching device
- rainwater tanks and plumbing must comply with relevant Australian Standards and any local council requirements that apply
- tenants need to provide a letter of permission from their landlord to be eligible for the rebate.

Specific building requirements

Since 1 July 2006, South Australian building rules²⁷ have required new dwellings and extensions or alterations greater than 50 square metres to have an additional water supply to supplement the mains water. Rainwater tanks of more than 1000 litres capacity will be the most common way of acquiring the additional water supply, but there are other ways (such as a third pipe recycled water, bore). Rainwater tanks must have an overflow device fitted and a mosquito proof, non-degradable screen must be attached to protect the water quality. Some remote towns are exempt. The additional water supply has to be plumbed to a toilet, to a water heater or to all cold water outlets in the laundry of a new or altered home.

2.10 Tasmania – rainwater

Governance

Limited information could be located regarding the governance of rainwater tanks in Tasmania.

Installation

Rainwater tank installation will require a local council plumbing permit and must be installed by a registered plumber.

Rebates

The Hobart City Council is offering property owners a rates rebate for installing water-saving appliances, such as washing machines, showerheads and rainwater tanks. A rainwater tank of more than 1600 litres for garden watering receives a rates rebate of \$170. A tank of 600 litres or more for toilet flushing receives \$220. Further information

²⁷ <<http://www.planning.sa.gov.au/go/rainwater-tanks>>

can be obtained from Hobart City Council's Project Officer for Water Policy (SLT 2004b).²⁸

Specific building requirements

No specific building requirements were identified, consumers should check with their local government.

2.11 Victoria – rainwater

Governance

The 5-Star Standard for all new houses in Victoria came into full effect from 1 July 2005. This means it is compulsory for new houses to have a rainwater tank (VBC 2005).²⁹

Installation

Rainwater – single dwelling households

The quality and acceptable uses of rainwater are not subject to specific regulation in Victoria (DHS 2007). Despite this, individuals or organisations responsible for rainwater systems in urban communities should demonstrate due diligence by ensuring that rainwater is safe for its intended use. The quality of rainwater and the associated management controls need to be proportional to the level of exposure to rainwater – the more likely it is that rainwater will be ingested, the higher the water quality and more stringent the management controls need to be.

The Department of Human Services recommends that rainwater is not used for drinking and food preparation in areas where a water authority supplies reticulated (or 'mains') drinking water (DHS 2007). This is because the quality of rainwater is generally not as reliable as mains supplies, which have been treated to a level to ensure they are safe for human consumption.

In Victoria the Plumbing Regulations 1998 set the requirements and competencies for licensing and registering industry operatives and specify the minimum technical standards for all on-site plumbing work. These regulations are due for renewal in 2008 (DHS 2007).

Relevant guidelines and standards include:

- Plumbing Industry Commission technical information on the plumbing of rainwater systems
- the 'Rainwater tank design and installation handbook' HB 230-2006 published by the Australian Rainwater Industry
- Development Group, which can be purchased at www.arid.asn.au or through Standards Australia
- Australian Standards and Australian Technical Specifications, including (but not limited to):
 - AS/NZS 3500 *Plumbing and drainage code*
 - ATS 5200 *Technical specification for plumbing and drainage products*
 - AS/NZS 2179 *Specifications for rainwater goods, accessories and fasteners*

²⁸ <<http://www.hobartcity.com.au>>

²⁹ <<http://www.buildingcommission.com.au>>

- AS 1273 *Unplasticised PVC (UPVC) downpipe and fittings for rainwater*
- AS/NZS 4130 *Polyethylene (PE) pipes for pressure applications*
- AS/NZS 4766 *Polyethylene storage tanks for water and chemicals*.

No approval is required to use rainwater in and around a residence. However, local councils should be contacted before installing a rainwater tank to check if there is any building or planning regulation that must be met. If a rainwater tank is being installed to meet the 5 Star Standard for new homes, then specific requirements apply, for example, rainwater must be used for toilet flushing (EPA Victoria 2007).

Typical water use around the house (EPA Victoria 2007) is:

- bathroom 26 per cent
- kitchen five per cent
- garden 34 per cent
- laundry 15 per cent
- toilet 20 per cent

A licensed plumber should install rainwater tanks, fixtures, pipes and pumps to ensure that rainwater remains separate from the mains drinking water supply, and to make sure that any overflow from a tank is diverted to the stormwater drainage system (EPA Victoria 2007).

Customers connected to a mains water supply might be eligible for a rebate on the purchase and installation of a rainwater tank from the Department of Sustainability and Environment (EPA Victoria 2007).

Rainwater use in urban communities

The Department of Human Services in Victoria (DHS 2007) has developed a guideline for rainwater schemes in multi-residential (comprising two or more households), commercial and community facilities, where rainwater will be used for purposes other than drinking and food preparation.³⁰

Sites covered by this guideline include apartment blocks, community halls and amenities, sports centres, accommodation establishments, schools, community gardens and commercial or industrial sites.

Private drinking water supply

Many households in rural Victoria rely on a private drinking water supply as they don't have a mains drinking water supply. Error! Bookmark not defined. A private drinking water supply could be a rainwater tank connected to the roof, or a tank connected to a nearby stream, bore or well. This booklet provides simple information to help keep private domestic drinking water supplies safe and healthy. Error! Bookmark not defined.

Stormwater

Stormwater is rainwater that falls on a householder's property but is not captured by their roof. Stormwater can be captured at a property's lowest drainage point and pumped back for use. Stormwater should be used only:

- where it has been captured solely from an individual's property
- where this property is clean (no loose soil or chemical or petrol spills)

³⁰ <<http://www.health.vic.gov.au/environment/water/tanks.htm>>

- for low risk uses such as garden watering and toilet flushing.

Stormwater should NOT be used for drinking or food preparation. Where possible, stormwater should not be stored in a rainwater tank. If this does occur, the water should be used only for low risk uses such as garden watering and toilet flushing. A licensed plumber should install any plumbing carrying stormwater, especially if it is to be used in a house for toilet flushing, to ensure stormwater cannot contaminate the drinking water supply. Further information can be obtained from the Plumbing Industry Commission (EPA Victoria 2007).

Treatment of rainwater

Regular checking and maintenance of water treatment systems is important to ensure that the water supply continues to be safe (DHS 2007). DHS also recommends monitoring programs.

Rebates

The Victorian government offers rebates for rainwater tanks and diverters.³¹ There is a \$30 rebate when the purchase of one or more products with a combined value of \$100 or more is made. These include:

- rainwater diverters
- waterless car cleaning products
- shower timers
- toilet flush interrupter devices.

Since January 2003, there has been an overwhelming response to take part and help save water. More than 177,000 rebates have been approved, helping Victorians save more than 1.6 gigalitres of drinking water a year.

From 1 January 2007, Victorians on a reticulated water supply have been eligible for rebates of up to \$1000 on the purchase and installation of a large rainwater tank connected to their toilet or laundry and installed by a licensed plumber.

Products eligible for a rebate are:

- rainwater tank and rainwater tank to toilet connection – \$150 for a tank of 600 litres or greater, an additional \$150 for toilet connection
- large rainwater tank – \$1000 for a tank of more than 5000 litres connected to toilet and laundry, \$900 for a tank more than 4999 litres connected to toilet or laundry, \$500 for a tank of 2000–4999 litres connected to toilet or laundry.

Specific building requirements

The 5 Star standard for all new houses (VBC 2005) in Victoria came into full effect from 1 July 2005 after a 12-month transition period. This means it is compulsory for new houses to have:

- 5 Star energy rating for the building fabric, and
- a rainwater tank for toilet flushing or a solar hot water system.

Without these required elements, a building permit for a new house will not be issued.

Plumbers have an important part to play in implementing the 5 Star standard. The standard can be achieved only if, in addition to a 5 Star energy rating for the building

³¹ www.ourwater.vic.gov.au/ourwater/water_smart_rebates

fabric, a rainwater tank is connected for toilet flushing or a solar hot water system is installed. In these cases:

- the rainwater tank must have a minimum capacity of 2000 litres, and
- there must be a minimum roof catchment area of 50 square metres, and
- it must be connected to the sanitary flushing system.

2.12 Western Australia – rainwater

Governance

The Western Australian Department of Health provides two documents related to the day-to-day management of rainwater collection: both focus on the health aspects (DoH 2003, 2005).

Rainwater from the roof can be a valuable resource as it can contribute to the yearly water needs and help conserve drinking water reserves. However, a reticulated scheme for drinking water supply remains the most reliable source of drinking water in the urban environment. The Department of Health supports the use of rainwater tanks in urban areas for all non-potable uses, such as watering gardens, flushing toilets, in washing machines, and washing cars. Using rainwater in this way will not pose a health risk (DoH 2003).

Installation

If householders live in an urban area and would like to drink rainwater, they should be aware that there might be an increased risk of pollution by airborne chemical and microbiological contamination. Also, poorly maintained rainwater tanks can breed mosquitoes that can cause severe nuisance or carry human disease.

Rainwater can be collected from most types of roofs, including asbestos, Colourbond™ and galvanized metal (DoH 2003). It is important for householders to find out if roofing material or the paint used on their roof or in their gutters or other areas could contaminate rainwater. For example, tar based coatings can bind other harmful organic chemicals to the roof or gutter and be difficult to clean.

Rainwater should not be collected from parts of the roof that incorporate:

- a chimney from a wood burner
- discharge pipes from roof mounted appliances such as evaporative air conditioners or hot water systems
- chemically treated timbers
- lead-based paints or flashings.

It is important to protect the reticulated scheme drinking water supply from any risk of contamination through backflow from rainwater tanks. Rainwater tanks connected to the scheme must be fitted with an approved backflow prevention device installed by a licensed plumber. Before purchasing and installing a rainwater tank, the householder must check with their local government for local building regulations that apply in the area.

A rainwater system should incorporate:

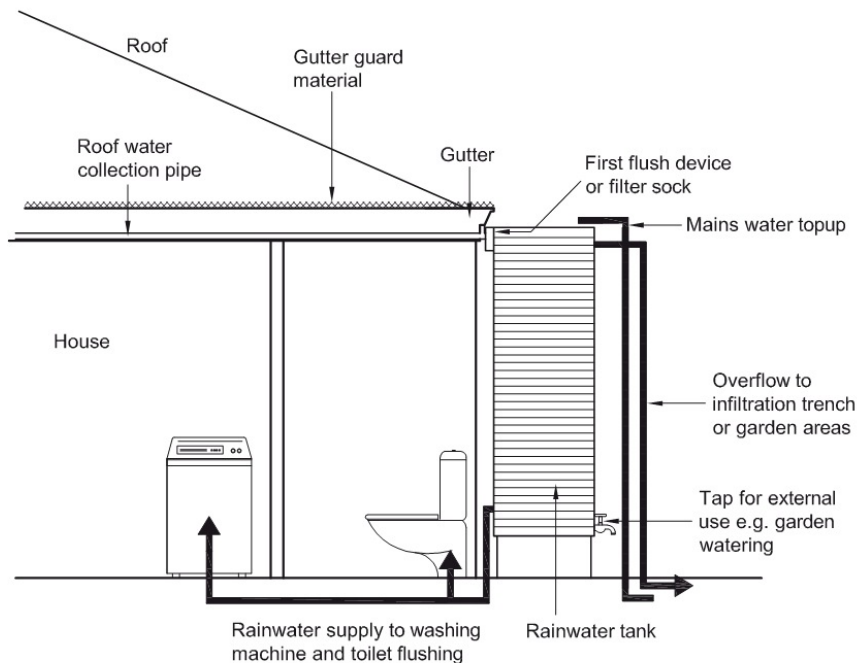
- a first flush device
- gutter guards or screen mesh to reduce the amount of debris entering the tank

- rainwater tank outlet points that reduce or eliminate the build up of sludge
- insect screens on overflow pipes and insect proof lids and inspection ports
- Australian Standards approval marks on materials that will come into contact with rainwater such as:
 - AS 2070 *Plastic materials for food contact use*
 - AS/NZS 2179—1994 *Specifications for rainwater goods, accessories and fasteners*
 - AS 2180—1986 *Metal rainwater goods—selection and installation*
 - AS 3500.1—1992 *Plumbing and drainage code—Part 1:Water supply*
 - AS 3855—1994 *Suitability of plumbing and water distribution systems products for contact with potable water*
 - AS 4020 *Products for use in contact with water intended for human consumption with regard to their effect on the quality of water*

Some PVC pipes may contain lead, so if the water is for drinking purposes use only high-grade (food) plastic pipes and fittings that meet AS/NZS 4020 and AS/NZS 1477 standards when installed (AS/NZS 2005, 2006).

To reflect the new approach to stormwater management, the Western Australian Department of Water has published its *Stormwater management manual for Western Australia* (DofW 2004). This document has very limited information in Chapter 9.2.1 relating to the storage of rainwater in tanks (see Figure 7 in this report). The main focus is water sensitive urban design.

Figure 7: Elements of a domestic rainfall system (DofW 2004)



Rebates

A rebate of \$300 or 50 per cent (whichever is the lesser amount) is available towards the cost of a Waterwise irrigation system installed by an approved Waterwise irrigation

installer. Householders can also claim a rebate for approved Waterwise products, such as subsurface irrigation and rain sensors, along with their claim for installation costs.³²

For rainwater tanks greater than 2000 litres (plumbed-in), one rebate per property is available up to \$600 or 50 per cent (whichever is the lesser amount). This rebate is for the purchase and installation of a rainwater tank, including plumbing to the toilet or the washing machine provided they are plumbed in by a licensed plumber for use in a householder's toilet or washing machine (or both) when installed.

Products still eligible for rebates under the revised 2007–08 Waterwise Rebate Program are listed below. For all purchases made between 1 July 2007 and 30 June 2008, householders have until 30 September 2008 to claim the applicable rebate.

A Waterwise rebate of up to \$600 is available for the purchase and installation of new tanks for domestic use. The rebate is available for one rainwater tank per household. Tanks with a capacity greater than 600 litres that are not plumbed in are eligible for a rebate of \$50.

The Department of Health can be contacted on 08 9222 4222 for guidelines on using rainwater tanks and a copy of its publication *Urban rainwater collection* before householders have a tank installed (http://www.health.wa.gov.au/envirohealth/water/docs/Urban_Rainwater_Collection.pdf).

A Waterwise rebate of \$20 is available for rain sensors endorsed under the Smart Approved WaterMark Scheme. The rebate is available for one rain sensor per household and householders can apply for this rebate as soon as they have bought a Waterwise rain sensor.³³

A Waterwise rebate of \$10 is available for 30-metre rolls of subsurface irrigation pipework endorsed under the Smart Approved WaterMark Scheme.³⁴

Specific building requirements

In May 2007, 5 Star Plus was launched in Western Australia; it is designed to make houses more energy and water efficient.³⁵ In addition to requiring a five-star energy rating for dwellings, these measures include requirements for solar or five-star gas hot water systems, water efficient showerheads, tap fittings in bathroom basins and vanities, efficient dual-flush toilets, and pool blankets for all new pools to reduce the rate of evaporation.

The second stage of the 5 Star Plus standards, due in 2008, will also require owners of new houses to install plumbing to toilets to allow for alternative water supply and easy recycling of greywater at a later date, and where single dwellings are located on larger lots, an alternative water supply (such as rainwater tanks) for flushing toilets and for washing machines.³⁶

The Water Use in Houses Code aims to reduce the consumption of water in residential homes by requiring water efficient fittings, minimising the wastage of water and facilitating the appropriate use of alternative sources of water such as greywater and

³² <<http://portal.water.wa.gov.au/portal/page/portal/WiseWaterUse/WaterwiseRebates>>

³³

http://portal.water.wa.gov.au/portal/page/portal/WiseWaterUse/WaterwiseRebates/WhatProductsCanIGetARebateFor/RainSensors/Content/Rain_Sensors_07_August_2007.pdf

³⁴

http://portal.water.wa.gov.au/portal/page/portal/WiseWaterUse/WaterwiseRebates/WhatProductsCanIGetARebateFor/SubsurfaceIrrigationSystems/Content/Subsurface_Irrigation_JUL07.pdf

³⁵ www.5starplus.wa.gov.au/builders/

³⁶ www.dpi.wa.gov.au/13871.asp

rainwater.³⁷ 5 Star Plus will be applicable to new homes approved for construction after 1 September 2007, but existing home owners can also use the code to improve energy and water efficiency in their homes. During 2008, the Western Australian Government will investigate measures to apply the 5 Star Plus provisions to existing homes.

The codes will be referenced under the Building Regulations 1989 to apply to all new residential Class 1 and 10 buildings from 1 September 2007. Measures to reduce the consumption of water in houses³⁸ will be implemented in two stages:

Stage 1 – applies to all new houses from 1 September 2007 and provides for:

- limiting water use through efficient three or four-star taps, shower and toilet fittings
- new swimming pools to be fitted with a pool blanket
- reducing energy waste by limiting the distance of taps from a hot water source.

Stage 2 – will be implemented during 2008 (DoHW 2006) and requires:

- new homes to be plumbed so that they can be connected to an approved alternative water supply at a later date (an alternative water supply may include water tanks, bore water and third pipes)
- new homes to be plumbed so that they can be connected to an approved greywater diversion system at a later date
- new homes on appropriately sized lots to be plumbed to enable connection at a later time to a greywater diversion system
- new homes with a high water demand for internal use to have an approved alternative water supply for appropriate non-potable use.

2.13 Summary – rainwater

Uses of rainwater specified across Australia guidelines are relatively consistent across the states and territories (Table 6), although some states and territories do not mention cooling towers specifically. In contrast, rebates and processes for installation approvals vary considerably across Australia (Table 7 and Table 8). This variability complicates the installation process, especially those working across state or territory borders. In generic terms, the approval, installation and maintenance of rainwater systems require several components to be addressed by the appropriate government authority, plumber, householder or resident (Figure 8). Requirements for new sustainable housing and the inclusion of rainwater tanks also vary considerable across Australia (Table 20, in the Appendix).

Some states have published guidelines specifically for plumbers; the guidelines identify state requirements and provide some installation diagrams (specifically, NSW and South Australia). These diagrams are displayed in fairly general terms and lack the technical information presented in *Rainwater tanks design and installation handbook* (Standards Australia et al. 2006). In some cases, they do not include some important technical diagrams (for example, rainwater filtration and cleaning options) and are qualified by the water authority who has written the guideline indicating they are not experts on the planning, health or building requirements and an appropriate expert should be consulted (for example, SA Water 2006a, p. 6). In most cases, only two or three examples of typical connections are given.

There are also details in state and territory guidelines that could be useful to include in a revision of the *Rainwater tanks design and installation handbook* (HB 230) (Standards

³⁷ www.5starplus.wa.gov.au/builders/

³⁸ www.5starplus.wa.gov.au/home_owners

Australia et al. 2006). One such example is a diagram indicating the connection of dual water source cistern, as shown in Figure 4 in this document. Revision of HB 230 is required as some key uses for rainwater that are now possible in some states are not included; for example, it does not include guidelines for using rainwater for hot-water systems or cooling towers. In contrast, some guidelines specifically allow and provide guidance for the use of rainwater for the hot water system (for example, SA Water 2006a). New technology now exists and is in common use and should also be updated in HB 230 (such as flexible bladder storage).

The *Australian guidelines for water recycling. Managing health and environmental risks: Volume 2B Stormwater harvesting and reuse* (NRMMC and EPHC 2007 - Draft) will also add to the 'Minimising Contamination' chapter of HB 230 and should be integrated into in the next revision of HB 230.

Table 6: Uses of rainwater in single households as allowed in states and territories of Australia

State	Garden watering	Car washing	Hot water systems	Cooling towers	Toilets	Showering	Washing machine
ACT	√	√	√	?	√	√	√
NSW	√	√	√	?	√	√	√
NT	√	√	√	√	√	√	√
Qld	√	√	√	√	√	√	√
SA	√	√	√	?	√	√	√
Tas	√	√	?	?	?	?	?
Vic	√	√	√	√	√	√	√
WA	√	√	√	√	√	√	√

× - not allowed, √ - allowed, ? - not specifically mentioned

Note: It is also important to consider the filtration and treatment required for use of rainwater in hot water systems and potential impacts on warranty of water heaters.

Figure 8: Typical installation and approval process for rainwater systems in Australia

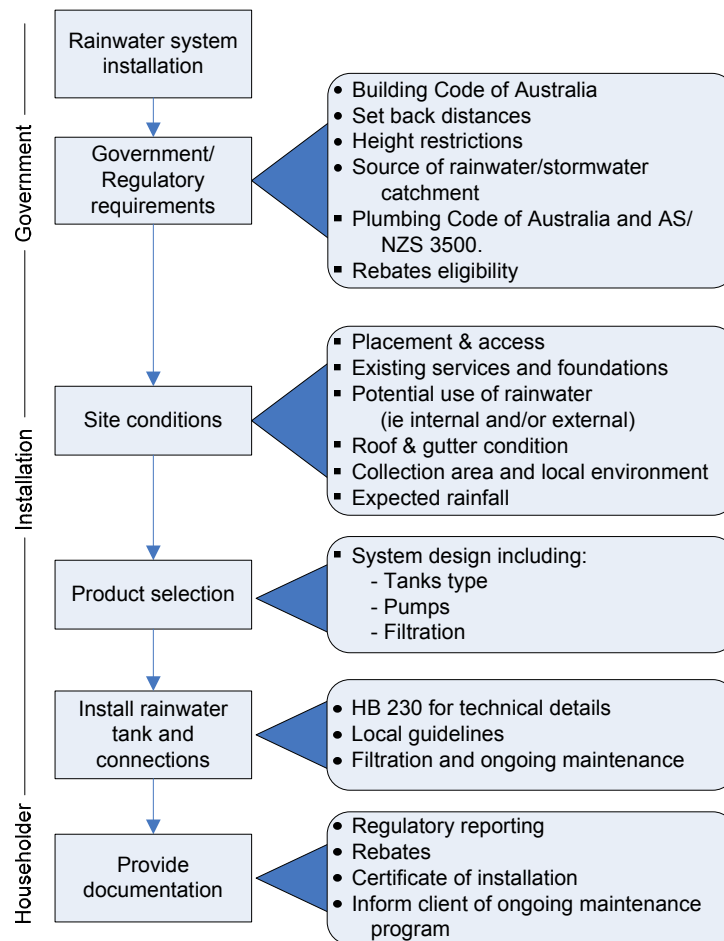


Table 7: Approvals required for installation of rainwater tanks and connection of rainwater to plumbing in single households in states/territories of Australia

State	Plumbing code	Limitations	Government department	Ref
ACT	AS/NZS 3500 Plumbing and Drainage Part Water services section 4 'Installation of water supply systems from rainwater tanks' (see Table 4)	Not needed if: less than 17kL in size, no higher than 2.4 m above natural ground level, not built of reflective, white or off-white material, installed to the side or rear of the house at least 3 m from the rear boundary and 1.5 m from the side boundary. Indicates tanks are Class 10 structures	ACT Planning and Land Authority. Heritage ACT (if heritage area)	1
NSW	NSW Code of Practice: Plumbing and Drainage 3rd Edition 2006	10,000 L or less does not need Sydney Water's approval, but will still be subject to certain council requirements for planning and building. Cannot be built over Sydney Water maintenance structure.	Sydney Water, Local council	2
NT	Not identified	Work must be carried out by Green Plumber	Does not require approval of NT department	3
Qld	AS/NZS 3500:2003 Plumbing and drainage	Household rainwater tanks installed to meet the requirements under Part 25 of the Qld development Control, must be approved by a building certifier during the building approval process. All rainwater tank plumbing work requires plumbing approval from Council. Must comply with QDIP 2007		4
SA	AS/NZS 3500:2003 Plumbing and Drainage with SA Modifications	Varied on council. Must have appropriate backflow if connected to mains. Must have appropriate mosquito control.	Planning and local government authorities, SA Water, Department of Health	5
Tas	Slight modification to AS/NZS 3500 in Tasmania Plumbing Code	Tank installation will require a Council Plumbing Permit and a registered plumber to carry out the work. Tanks larger than 35,000 L will need a Building Permit, as will tank stands over 1.2 m in height. Overflow (in heavy rain) must be connected to the stormwater system or a council-approved alternative system.	Local council	6
Vic	A licensed plumber should install tanks, fixtures, pipes and pumps to AS 3500—2003	No approval is required to use rainwater in and around households, but local council should be consulted before installing rainwater tank to check if there is any building or planning regulations that must be met.	Local council	7
WA	AS 3500.1—1992	Building Regulations 1989 and 5-star ratings	Local council	8

1 ACT Government (2006)

2 NSW Health (2007); Sydney Water (2003 - Amendment); CUPDR (2006)

3 DHCS (2006)

4 DLGSR (2007; QDIP (2007)

5 SA Water (2006a)

6 DoFJ (2006; SLT (2004b)

7 EPA Victoria (2007)

8 DoH (2003)

Note: Under the Building Code of Australia tanks may be considered a Class 10b building (ASCB 2007) and subject to the constraints in this code when being installed. It is also important to consider the filtration and treatment required for use of rainwater in hot water systems and potential impacts on warranty of water heaters.

Table 8 Rebates available for installation of rainwater tanks and connection to residential properties in states and territories of Australia

State	Rebates for tanks and connections	Amount	Internal connections	Approval required to obtain rebate
ACT	<ul style="list-style-type: none"> ▪ 2000–3999 L ▪ 4000–8999 L ▪ 9000L or greater ▪ Internal connection for existing tank 	\$750 \$900 \$1000 \$600	Yes	ACT Government ³⁹
NSW	<ul style="list-style-type: none"> ▪ Depends on: the date the tank was purchased, size and whether a licensed plumber connect. ▪ 2000–3999 L ▪ 4000–6999 L ▪ 7000 L and above ▪ Rainwater tank connected by a plumber to toilet and/or washing machine 	\$1,500 max \$150 \$400 \$500 + \$500 each	Yes	NSW Department of Environment and Climate Change ⁴⁰
NT	Min size of 1000 L rebate for plumbing service to connect rainwater tank with household water	\$500	Yes	Northern Territory Government ⁴¹
Qld	> 3000 L only from February 2008	\$1500	Min of one internal connection	Queensland Government, Dept. of Natural Resources and Water ⁴² .
SA	<ul style="list-style-type: none"> ▪ To purchase a new rainwater tank and plumb it into an eligible home ▪ For plumbing into one eligible fixture type (to plumb an existing rainwater tank into an eligible home) ▪ To add or replace an additional rainwater tank that is already plumbed to their existing system ▪ For new plumbing by a licensed plumber to supply rainwater to two or more different types of eligible fixtures or an eligible switching device 	up to \$800 up to \$600 \$200 + \$200	Yes Yes Yes Yes	SA Water ⁴³
Tas	<ul style="list-style-type: none"> ▪ A rainwater tank of more than 1600 L for garden watering ▪ A 600-litre or more tank for toilet flushing 	\$200 \$300	No Yes	Hobart City Council ⁴⁴
Vic	<ul style="list-style-type: none"> ▪ > 4999 L rainwater tank and installed by a licensed plumber ▪ 2000–4999 L ▪ > 600 L tank installed ▪ > 600 L additional rebate if connected to the toilet 	\$1000 \$900 \$500 \$150	Toilet & Ldry Toilet or Ldry Toilet or Ldry For each toilet	Department of Sustainability and Environment - Our Water Our Future ⁴⁵
WA	<ul style="list-style-type: none"> ▪ Rainwater tank greater than 2000 L including plumbing to the toilet or the washing machine ▪ Tanks with a capacity greater than 600 L that are not plumbed in 	50% up to \$600 \$50	Connection to a toilet and of washing machine	Water Corporation Waterwise Rebate ⁴⁶

Ldry = Laundry, (Current as of April 2008)

Detailed installation diagrams for plumbing of rainwater systems that are required to improve HB 230 include:

- first flush diverters
- uses of rainwater that are allowed

³⁹ <http://www.thinkwater.act.gov.au/tune-ups_rebates/rainwater_tank_rebate.shtml>

⁴⁰ <<http://www.environment.nsw.gov.au/rebates/ccfrtw.htm>>

⁴¹ <<http://www.nt.gov.au/nreta/water/wise/>>

⁴² <http://www.nrw.qld.gov.au/water/saverscheme/rebate_schemes.html>

⁴³ <http://www.sawater.com.au/SAWater/YourHome/SaveWaterInYourHome/rebates_rainwatertanks.htm>

⁴⁴ <http://www.hobartcity.com.au/HCC/STANDARD/PC_1041.html>

⁴⁵ <http://www.ourwater.vic.gov.au/ourwater/water_smart_rebates>

⁴⁶ <<http://portal.water.wa.gov.au/portal/page/portal/WiseWaterUse/WaterwiseRebates>>

- plumbing requirements for connection of rainwater within the household
- installation diagrams for all common uses of rainwater across Australia
- new house sustainable requirements (Table 20)
- new technology – bladder tanks, plastic cell structures, underground tanks, rainwater treatment, constant filtrations
- expanding the use of rainwater for additional uses (hot water, cooling towers)
- flow diagrams for approval processes.

2.14 Further considerations – rainwater

HB 230 was published in 2006 by Standards Australia et al., but due to the rapid changes in this industry there are sections of HB 230 that exclude important components of rainwater use now allowed in many residential houses in Australia. HB 230 has now been updated to include:

- additional information based on managing the quality of the rainwater catchment roof from the *Australian guideline for water recycling. Managing health and environmental risks*, Volume 2B (NRMMC and EPHC 2007 – Draft)
- flow diagrams for approval processes for installing and plumbing of rainwater tanks
- direct website links to state and regional requirements (or an industry website that is continually updated)
- summaries of the approval, installation and use requirements of each state and territory and relevant national components
- general awareness of Water Efficient Labelling (WELS) and legal responsibilities of plumbers⁴⁷
- simple drawings to translate plumbing codes into installation diagrams with the technical knowledge that indicates all requirements for rainwater systems commonly used across Australia
- new house requirements
- guidance on new technology – bladder tanks, plastic cell structures, underground tanks, rainwater treatment, constant filtrations
- incorporation of additional uses not accept in most states and territories for rainwater (for example, hot water and cooling towers).

⁴⁷ <<http://www.waterrating.gov.au/plumbers/index.html#responsibilities>>

3. Residential greywater systems in Australia

This chapter focuses primarily on greywater systems for single households in sewered areas. Larger systems have not been included because large or shared dwellings and public greywater reuse systems are usually installed and managed through companies specialising in this area. Larger systems also require specific government approvals that are in addition to those for single households. These larger systems are distinctly different to the single household.

In Australia, any work conducted on the water supply, sanitary plumbing or drainage system is to be carried out by a licensed plumber, including the installation of greywater treatment systems (GTS). This is regulated by the specific state plumbing code or Australia Standard (AS/NZS 2003b). Generally, householders require a licensed plumber to install greywater diversion devices (GDD) or GTS to recycling any water that goes down the plughole. This applies to any black water also. Any plumbing material used must also comply with Australian Standards (SAI Global 2003).

The use of greywater is regulated by a variety of state and territory government environmental, health and water authorities. Local councils may also have special requirements for the installation of greywater systems on sites within their jurisdiction. The discussion below provides an overview of permitted greywater use in each state and territory of Australia, the rebates on offer (where available), and the regulatory and approval process required in each state to install, modify or remove a greywater system.

3.1 Use of greywater in Australia

The Australian Bureau of Statistics (ABS) has recently released information (ABS 2007) which shows that:

- greywater was being used by 55% of all Australian households (buckets, washing machines or GTS)
- the majority of Australian households was actively participating in water saving activities.

Greywater reuse has become an important component of the urban water cycle and will continue to become crucial to urban and rural water management in the near future.

Estimates of the volumes of greywater available vary between Australia states and territories, with Australian government average estimates listed in Table 9. Direct comparisons are difficult because volumes are described differently in many guidelines and reports. For example, in some cases the water from the bathroom is recorded and in others greywater from taps in the house (which included bathroom, kitchen and laundry) is reported.

Table 9: Summary of greywater volumes estimated to be available

Wastewater source	Volume (L/person/day)
Blackwater	
Toilet	22
Greywater	
Shower	56
Hand basin	6
Kitchen tap	12

Dishwasher	5
Laundry tap	7
Washing machine	27
Total – Greywater	113
Total – Overall	135

Source: <<http://www.greenhouse.gov.au/yourhome/technical/fs23.htm>> (Accessed 2008, site constructed 2005)

3.2 Australia – greywater

There are several codes, standards and guidelines in Australia (Figure 9) that relate to the installation of greywater diversion devices (GDD), greywater irrigation systems (GIS) and greywater treatment systems (GTS). These devices can be temporary (such as a bucket) or permanent (GTS with subsurface GIS). Relevant national guidance includes:

Building codes

- ABCB (2007) *Building Code of Australia 2007*

Australian Standards

- AS/NZS (2003b) AS/NZS 3500 Plumbing and drainage code
- SAI Global (2003) Product Certification. Product Compliance Program WATERMARK Level 1.
- AS/NZS (1998) AS/NZS 1546.1:1998 *On-site domestic wastewater treatment units—Septic tanks*
- AS/NZS (2001a) AS/NZS 1546.2:2001 *On-site domestic wastewater treatment units—waterless composting toilets*
- AS/NZS (2001b) AS/NZS 1546.3:2001 *On-site domestic wastewater treatment units—Aerated wastewater treatment systems*
- AS/NZS (2003a) (2008 draft released for public comment: AS/NZS 2008 Draft) – AS/NZS 1547:2000 or 2008 *On-site domestic-wastewater management*
- AS/NZS (1994) AS 1319—1994 *Safety signs for the occupational environment*
- AS/NZS (1996) AS 2700—1996 *Colour standards for general purposes*
- AS/NZS (1995) AS 1345—1995 *Identification of the contents of pipes, conduits and ducts*

State plumbing codes

- NSW – Payne (2004; 2006)
- Tasmania – TG (2007 (accessed))
- Western Australia – Water Services Coordination (Plumbers Licensing) Regulations 2000⁴⁸
- Queensland – DIP Qld (2007), Qld LGPSR (2006a)
- Northern Territory – DHCS NT (1996)
- Victoria – EPA Victoria (In press, release expected July 2008)

Guidelines for water recycling (protection of human health and the environment)

- National

⁴⁸ www.austlii.edu.au/au/legis/wa/consol_reg/wslcr2000590/

- NRMCC and EPHC (2006)
- State
 - Western Australia – DoH WA (2001; 2005)
 - Victoria – DoH Vic (2007), EPA Victoria (2003; 2006)
 - Northern Territory – DHCS N (2004), DNREA NT (2007) (accessed)
 - NSW – DEUS (2007)
 - South Australia – DoH SA (2006a,b,c; 2007)
 - Tasmania – non-specific for greywater (SLT 2004a)
 - Queensland – EPA Q (2005), Qld LGPSR (2006b,c)
 - ACT – ACT Health (2007)

Most states and territories in Australia use AS/NZS 3500 as a plumbing standard and have additions to this code; but NSW has developed its own codes based on modifications from AS/NZS 3500 (see Table 10). Different states and territories also use different versions of AS/NZS 3500 (also shown in Table 10). Many local government councils have fact sheets pertaining to use of greywater for individuals, and these are generally based on the relevant state or territory guidelines. State and territory differences are summarised below and relevant sources/departments summarised in Appendix 2.

How these guidelines, standards and codes relate and their relevance for greywater is summarised in Figure 9. It is interesting to note that a watertight structure (a rainwater tank) is usually interpreted by the Building Code of Australia as a Class 10b building (ABCB 2007). Therefore, if rainwater tanks are a building, then greywater systems and storage devices should also be considered a building and must be installed as specified by the Building Code of Australia.

The complexity of the governmental systems in Australia and the related guidelines, standards and codes of practice make the interpretation for technical installation of greywater systems difficult. Others have identified that one of the main issues impeding a consistent approach to water efficiency and reuse regulations is that each state and territory in Australia has its own regulatory structure in place for plumbing (Workman and Herbert 2004).

The process and specifics for approvals, installation and maintenance for GDDs and systems varies across Australia. Even so, the overall process usually follows similar components (Figure 11 and Figure 10), depending on the complexity of the system (treated or untreated). There is also a range of products approved for greywater diversion and greywater treatments across Australia.

Table 10: Versions of plumbing and drainage code used in each state and territory of Australia and other plumbing related Acts, codes and regulations related to greywater use.

State	Version of AS/NZ 3500 ^A	Building regulation that applies to plumbing	State modification to 3500 that apply	Other relevant regulations
ACT	2003	<i>Construction Occupations (Licensing) Act 2004 (COLA)</i>	Water and Sewerage Regulation 2001, <i>Water and Sewage Act 2000</i>	Land (Planning and Environment) Act 1991
NSW	Not applicable	<i>Building Services Corporation Act 1989</i>	NSW Code of Practice: Plumbing and Drainage 3rd Edition 2006	NSW Code of Practice, <i>Water Management Act 2004</i> , Domestic Greywater Diversion Regulation 2006 <i>Sydney Water Act date</i> , <i>Hunter Water Act date</i> , Code of Practice for Plumbing and Drainage (CUPDR), Local water authorities variations
NT	2002	Building Act and Regulation	Code of practice for small on-site sewage and sullage treatment systems and the disposal or reuse of sewage effluent 1996	<i>Water Supply and Sewerage Act 1983</i>
Qld	2003	<i>Building Act 1975</i>	<i>Plumbing and Drainage Act 2002</i> Standard Plumbing and Drainage Regulations 2003	Building Code Queensland oversees the <i>Plumbing and Drainage Act 2002</i> and provides plumbing information for onsite sewerage facilities, water saving measures (including greywater use), sub-meters and more
SA	2003	Building Code of Australia 2007. South Australian <i>Development Act 1993</i> and Development Regulations 1993	None located	<i>Waterworks Act date</i> Waterworks Regulation 1996
Tas	2003	<i>Building Act 2000</i>	Plumbing Regulations 2004, Tasmanian Plumbing Code 2006; <i>Sewers and Drains Act 1954</i>	Approved Form No 33
Vic	2003	<i>Building Act 1993</i> , Building Regulations 2006 (the Regulations), and the Building Code of Australia 2006 ⁴⁹	Amendment and technical solutions – currently being review and available in March 2008, aim to ensure that the latest version will always be referred to.	'Septic tank systems' in the <i>Environment Protection Act 1970</i> , <i>Water Act 1989</i> , <i>Water Industry Act 1994</i>
WA	2002	<i>Building Act 1939</i>	Water Services Licensing (Plumbing Licensing and Plumbing Standards) 2000	Section 4A of the Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974

^A e.g. AS/NZS (2003b)

Note: Data in this table is related to plumbing, for water quality and use, other guidelines are relevant. See relevant government departments (e.g. Environment or human health related).

⁴⁹ <<http://www.buildingcommission.com.au/www/html/1343-victorias-building-regulatory-system.asp>>

Figure 9: Relationship between various codes, standards and guidelines overseeing installation of greywater systems in Australia and the major relevant components

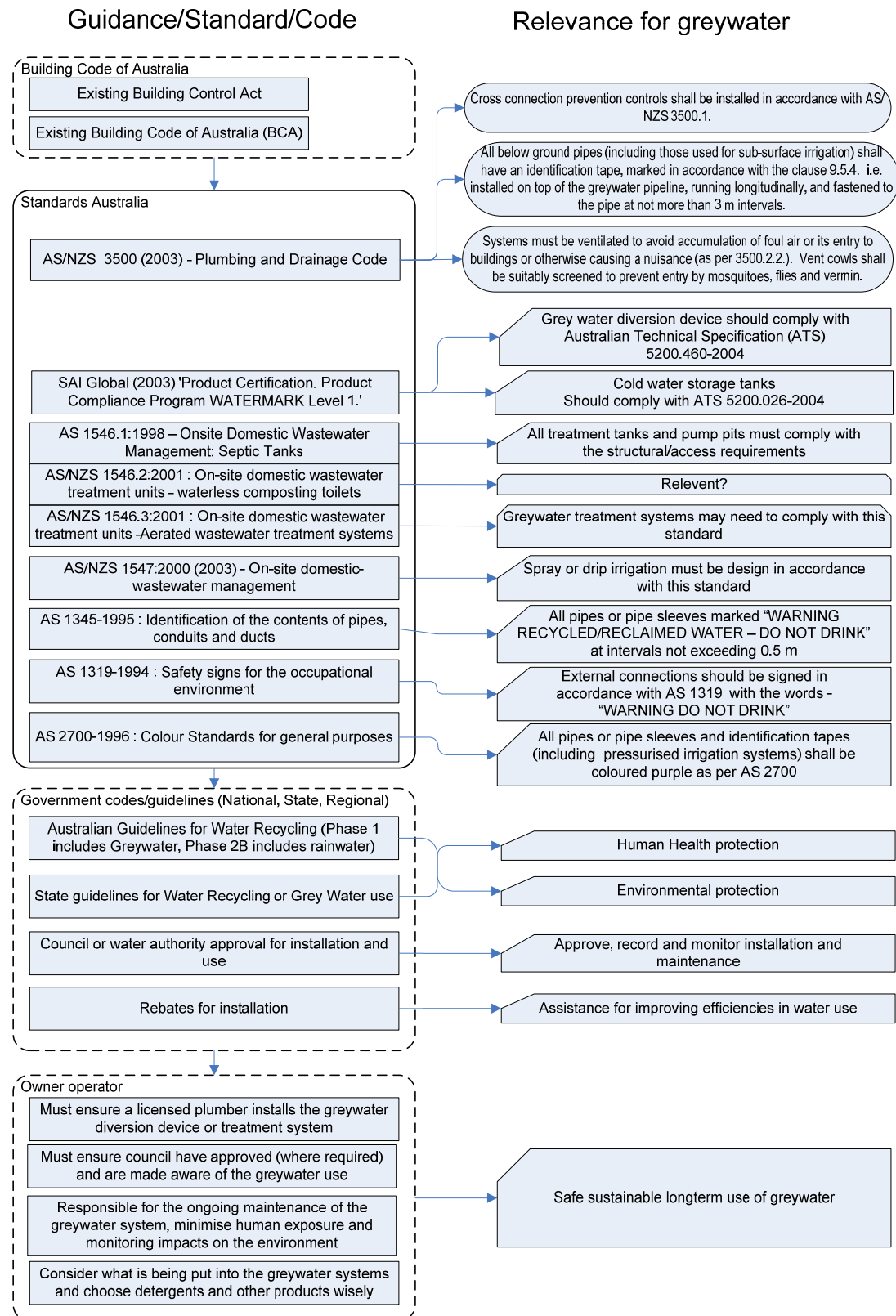


Figure 10: The approvals, installation and documentation required for installation of greywater treatment systems (GTS) in Australia. *Approved WaterMark products and systems approved by the responsible regulatory authority (Table 11).

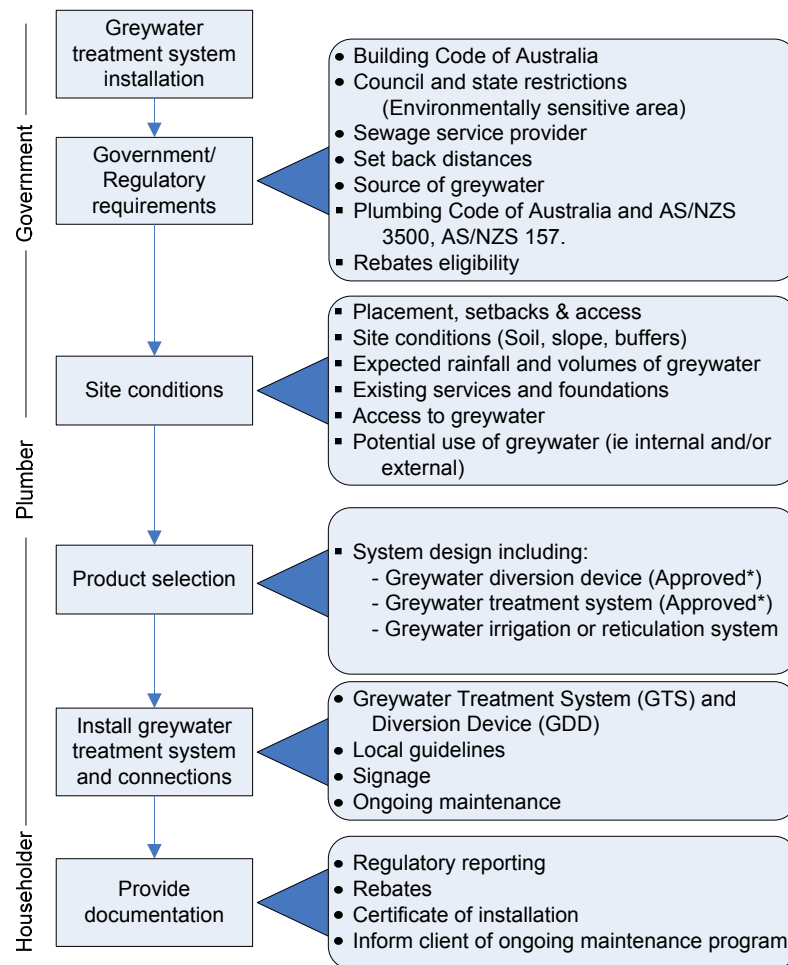


Table 11 Websites for approved greywater treatment systems and greywater diversion devices in Australia

State or Territory	System/device	Websites for approved greywater treatment systems
Australian Capital Territory	GTS GDD	The ACT Government does not provide a list of approved greywater system products, it provides links from its <i>Think water act water</i> website to information about greywater systems approved or accredited in other states and territories www.thinkwater.act.gov.au/water%20savingtips/Greywater_faqs.shtml#approvals
Northern Territory	GTS GDD	www.nt.gov.au/health/healthdev/enviro_health/wastewater.shtml www.nt.gov.au/health/docs/cdc_envhealth_register_Greywater_Treatment%20Systems.pdf www.nt.gov.au/health/docs/cdc_envhealth_register_greywaterdiverters.pdf
New South Wales	GTS GDD	www.health.nsw.gov.au/public-health/ehb/general/wastewater/gts/index.html www.health.nsw.gov.au/public-health/ehb/general/wastewater/diversion_devices.html
Queensland	GTS GDD	www.localgovernment.qld.gov.au/?id=4016 www.localgovernment.qld.gov.au/?id=4077
South Australia	GTS GDD	www.health.sa.gov.au/PEHS/branches/wastewater/080402-wwproducts-greywater.pdf Included in above
Tasmania	GTS GDD	www.tasmanianenvironmentcentre.org.au/documents/greywater_treatment_systems.pdf Not available – contact local councils
Victoria	GTS GDD	www.epa.vic.gov.au/water/wastewater/onsite.asp http://epanote2.epa.vic.gov.au/epa/septic.nsf/920b236424bf4a7bca256dcc001fb5bd?OpenView www.ourwater.vic.gov.au/_data/assets/pdf_file/0011/740/List20of20Greywater20Systems201020Oct2007.pdf
Western Australia	GTS GDD	www.health.wa.gov.au/envirohealth/water/greywater.cfm www.health.wa.gov.au/envirohealth/water/docs/Approved_Greywater_Systems.pdf www.health.wa.gov.au/envirohealth/water/greywater.cfm (included in greywater systems)

GTS = greywater treatment system, GDD = greywater diversion systems

3.3 Australian Capital Territory – Greywater

Governance

Residents of the ACT must operate their greywater according to the territory's guidelines (ACT Health 2007). Greywater treatment systems do not require formal approval, but normal plumbing approvals are required by the ACT Planning and Land Authority.

The Public Health Regulations 2000 outlines provisions for the protection of Canberra's water supply. Under these regulations, it is an offence for a person to put anything into the water supply that is detrimental to the quality of the water. This includes the backflow of contaminated water, such as greywater, into the drinking water supply (ACT Health 2007).

Materials used in plumbing and greywater treatment systems (GTS) and GDDs must comply with the Plumbing Code of Australia product certification scheme and AS/NZS 3500 Parts 1 and 2 (Section 2 Materials and Products) (AS/NZS 2003b). The requirements of the ACT plumbing legislation and AS/NZS 3500 must be met.

Plumbing work on greywater systems must be carried out by licensed plumbers (SAI Global 2003). This work can involve changing or modifying existing plumbing and drainage associated with the installation of a greywater diversion valve or a treatment system. The licensed plumber must notify ACT Planning and Land Authority of their activities and lodge a 'Start of Work Notice'.

The ACT Planning and Land Authority regulates plumbing in the ACT. The legislation governing the plumbing industry is called the *Construction Occupations (Licensing) Act 2004* (COLA). A number of operational Acts that relate to building, electrical, plumbing, gas, and utilities sit under COLA. The *Water and Sewerage Act 2000* and the Water and Sewerage Regulations 2001 are operational legislation within the COLA. The plumbing legislation (Water and Sewerage Act and Regulations) requires that any work conducted on the water supply, sanitary plumbing or drainage system is to be carried out by a licensed plumber. All plumbing work installed in the ACT must comply with the *Water and Sewerage Act 2000* and AS/NZS 3500 (AS/NZS 2003b). All plumbing products installed must meet the requirements of the Plumbing Code of Australia and the plumbing product approval scheme (SAI Global 2003),

In the ACT, the *Environment Protection Act 1997* regulates the environmental impacts of human activities. The capture and use of greywater must not lead to environmental damage. Greywater sludge, untreated greywater stored for more than 24 hours, and other treatment by-products can be discharged to the sewer only with written approval from Actew. The discharge of unapproved substances into the utility sewerage system could be in contravention of the *Utilities Act 2000*.

Installation

Appendix A to the ACT guidelines for Residential Properties in Canberra (ACT Health 2007) gives some advice to plumbers regarding administration requirements, drainage systems, internal use of greywater, signage, materials used and backflow prevention. There is limited detailed information for installation of greywater systems other than referring to the appropriate territory and national standards.

Rebates

No rebates were identified for greywater systems in ACT.

Specific building requirements

The greywater drainage separation and provision for rainwater plumbing 'Plumbing Note' (ACTPLA 2004) states that '... the sewerage drainage system of single residential homes must be installed to allow the wastewater fixture or fixtures (listed in the definitions except a kitchen sink) to drain to the outside of the building line separate to the black or soil drainage system. This waste pipe must be installed to allow crossover of the main sewer line to allow the greywater piping to gravitate to a below-ground holding vessel for reuse of greywater in the future. The drainage system to the house or building must be protected from sewerage surcharge by the means of a complying overflow relief gully (ORG).'

3.4 New South Wales – greywater

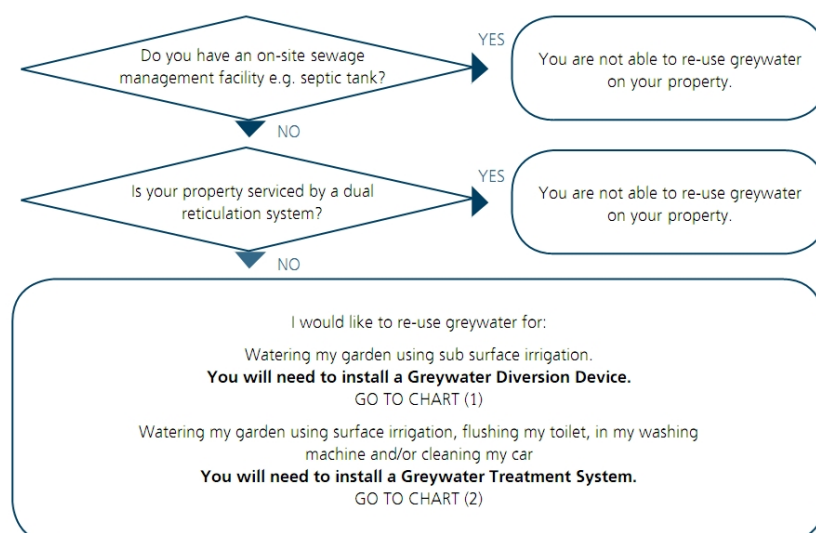
Governance

In NSW, greywater can be:

- diverted to householders gardens only through subsurface irrigation using a licensed GDD or irrigated above ground
- used for toilet flushing and in the washing machine through a NSW Health accredited domestic greywater treatment system (DEUS 2007).

This guideline has some good process flow diagrams to help residents (as in Figure 11) and plumbers (Figure 11 and Figure 12) to determine what type of greywater system is allowed for a specific household. The local council is the approval authority.

Figure 11: Greywater decision flow chart to determine whether greywater can be recycled on residential property (DEUS 2007)



The use of GDDs at residential premises in sewerred areas of NSW must comply with *NSW guidelines for greywater reuse in sewerred, single household residential premises* (DEUS 2007, Chapter 3) to satisfy the conditions for an exemption from prior approval for the operation of GDDs.

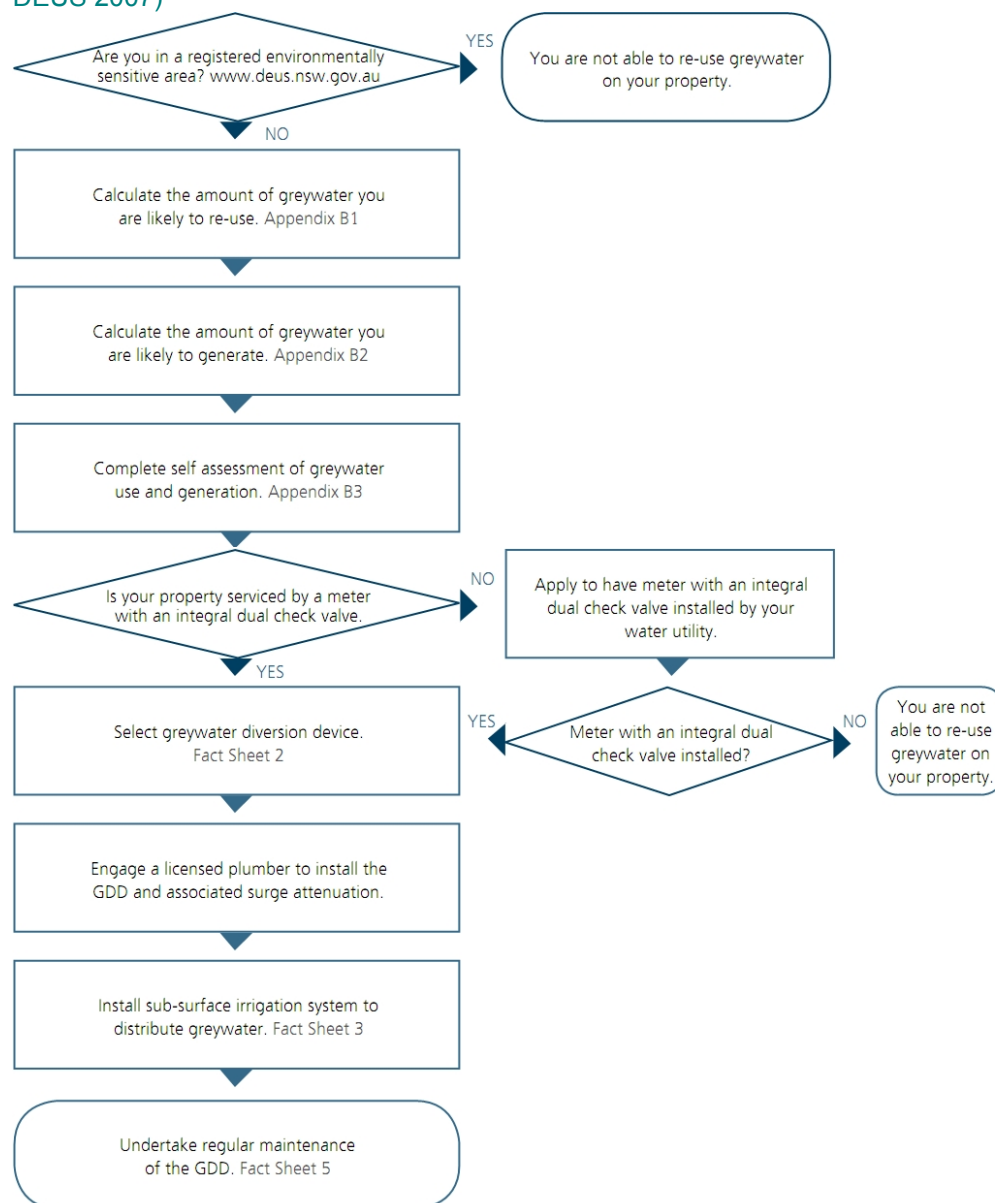
The Local Government (General) Regulation 2005 under the *Local Government Act 1993* requires prior council approval of greywater diversion. Under clause 75A of the regulation, greywater diversion at residential premises may be carried out without the prior approval of the council if the requirements of the *New South Wales Code of Practice: plumbing and drainage* (CUPDR 2006) for the reuse of greywater by a GDD are met (DEUS 2007).

Installation

It is the responsibility of the installing licensed plumber to install a GDD and non-storage surge attenuation to meet the requirements of CUPDR (2006). The plumber must ensure that controls to prevent the incidence of cross-connection are implemented and that the local water utility is notified in writing that a GDD is in place at the household. Written confirmation shall be in the form of a certificate of compliance and 'as completed plans' (for example, an amended sewer service diagram) or other documentation as required by the local water utility.

Where a GDD is to be installed at a single household, the property owner (householder) should check with the local water utility, prior to installation, that the property is serviced by a meter with an integral dual check valve to ensure backflow protection of the water supply. The subsurface irrigation system connected to the GDD does not require installation by a licensed plumber, but must meet the requirements of Section 5.6 and 5.7 and the performance standards in clause 75A of the Regulation (reproduced in Appendix C). Also, where relevant, the installation of the subsurface irrigation system must follow the manufacturer's recommendations or design. A GDD, unlike a GTS, does not require approval to operate the system (DEUS 2007).

Figure 12: Decision flow chart for installing greywater diversion devices (GDD) (from DEUS 2007)



A greywater treatment system (GTS) collects, stores, treats, and may disinfect, greywater to the standards specified in the NSW Health Domestic Greywater Treatment Systems Accreditation Guidelines (February 2005). A GTS can be installed in residential premises in sewered areas to provide treated greywater for reuse for irrigation (including surface irrigation), toilet flushing and washing machine use. NSW Health is responsible for administering the requirements of clause 4 of the Local Government (General) Regulation 2005 in accrediting GTSs and circulating accreditation notices to Public Health Units and councils. GTSs are accredited by the Director-General of the Department of Health (NSW Health), following the process and standards specified in the Domestic Greywater Treatment Systems Accreditation Guidelines (February 2005).

A council must not approve the installation of a GTS, unless the GTS has been accredited by NSW Health. There are some instances where a GTS may be exempt from accreditation by the Director-General of the NSW Health Department. The criteria

for exemption are explained on the NSW Health website.⁵⁰ The irrigation system associated with the GTS does not require accreditation by NSW Health, but it does require prior approval of the council. The *NSW guidelines for greywater reuse in seweraged, single household residential premises* (DEUS 2007) summarises the responsibilities for the GTS in a table form that make responsibilities very clear (Table 12).

Table 12: Example of defining responsibilities for greywater treatment systems

Actions	Responsibility		
	Owner	Plumber	Other
Undertake a water balance to determine water demand requirements	√		
Ensure GTS meets the requirements of the <i>NSW Code of Practice: Plumbing and Drainage</i> (CUPDR 2006)		√	
Apply for and obtain approval to install and approval to operate the GTS and associated irrigation from the local council	√		
Install a subsoil, subsurface or surface irrigation system to distribute greywater		√	
Notify the local water utility that a GTS has been installed at the property	√		
Undertake regular maintenance of the GTS in accordance with the manufacturer's recommendations and these guidelines		√	
Undertake annual testing of backflow protection device	√		√

Source: DEUS (2007, p21.)

A GTS is defined as a waste treatment device and therefore the owner of the premises must obtain prior approval from the council for installation, and operation, under Item c6 of Section 68 of the *Local Government Act 1993* and Part 2, Division 4 of the *Local Government (General) Regulation 2005* (DEUS 2007). There are no exemptions to this requirement. A council must not approve the installation of a GTS unless it has been accredited by the NSW Department of Health (clause 4 (NSW Health May 2006; NSW Health Feb 2005) of the *Local Government (General) Regulation 2005*). Council may grant approval to construct and install a GTS at a particular site in accordance with Item c5, Section 68, *Local Government Act, 1993*. A GTS and the associated reuse distribution system/s (for example, irrigation system, or reticulation for toilet flushing) also require approval to operate from council. Approval to operate should ideally be obtained from the local council at the same time as approval for the installation of the GTS and associated distribution system.

It is the responsibility of the owner of the premises to engage a licensed plumber to install the GTS and any associated distribution system (for example, irrigation system, third pipe for toilet flushing). It is the responsibility of the installing licensed plumber to install the GTS to meet the requirements of the *NSW Code of Practice: Plumbing and Drainage* (CUPDR 2006). The plumber must ensure that controls to prevent the incidence of cross-connection in addition to overflow and backflow protection (in the form of a backflow containment device) are implemented and that the local water utility is notified in writing that a GTS is in place at the premises. Written notification shall be in the form of 'as completed plans' (such as an amended sewer service diagram) or other documentation as required by the local water utility. Where a GTS is connected to internal fixtures for toilet flushing and washing machine use, a backup water supply will be required to ensure a constant water supply to all fixtures should the GTS fail. A summary of the legislation for greywater use in NSW is given below (Table 13).

⁵⁰ <<http://www.health.nsw.gov.au/public-health/ehb/general/wastewater/adnote.pdf>>

Rebates

No rebates were identified for greywater systems in NSW.

Table 13: Legislative summary for New South Wales

Legislative Process	Relevant Authority	Greywater Diversion Device	Greywater Treatment System	Land Application System
Carry out sewerage works approval	Local Government	√	√	x
Installation approval	Local Government	x	√	x
Accreditation	NSW Health	x	√	x
Operation approval	Local Government	√	√	√
Materials authorisation	Department of Land Water and Conservation	√	x	x

Source: NSW Health April 2000, p13

Specific building requirements

Since 1 October 2006, BASIX⁵¹ applies to all new residential dwellings and any alterations or additions throughout NSW. BASIX, the Building Sustainability Index, ensures homes are designed to use less potable water and are responsible for fewer greenhouse gas emissions by setting energy and water reduction targets for houses and units.

Some of the features of BASIX are:

- rainwater tanks, plumbed to toilet, garden, or laundry
- greywater systems where appropriate.

The water savings target ranges from 0 to 40 per cent across NSW, depending on the location of the house or unit. Ninety percent of new homes are covered by the 40 per cent water target, and the intent is that no new home built in NSW will use more water than the current state average.

3.5 Northern Territory – greywater

Governance

All greywater reuse needs to be approved by the Department of Health and Community Services⁵² and comply with the *Code of practice for small on-site sewage and sullage treatment systems and the disposal or reuse of sewage effluent* (DHCS NT 1996) and the *Australian guidelines for water recycling. Managing health and environmental risks* (NRMCC and EPHC 2006) where appropriate.

Installation

Installation of greywater systems should comply with the *Code of practice for small on-site sewage and sullage treatment systems and the disposal or reuse of sewage effluent* (DHCS NT 1996).

⁵¹ <<http://www.basix.nsw.gov.au>>

⁵² <http://www.nt.gov.au/health/healthdev/enviro_health/factsheets/Greywater.pdf>

Rebates

The Northern Territory Government is offering a Plumbing Rebate of up to \$500 (including GST) to households in Alice Springs and Tennant Creek for eligible services associated with installing a greywater diversion device that is approved by the Northern Territory Government. Refer to the Waterwise website for more information.⁵³

Specific building requirements

No specific building requirements for the Northern Territory could be identified⁵⁴.

3.6 Queensland – greywater

Governance

New laws were introduced in March 2006 to broaden the use of greywater in Queensland. The following is a summary of legislation in the Plumbing and Drainage Act 2002 and 2006.

The Queensland Government currently allows residents to manually bucket greywater from the laundry and bathroom only. They may also connect a flexible hose to divert greywater from the washing machine outlet hose to their garden. Permanently installed diversion devices and greywater treatment systems must be accredited by Standards Australia or the Department of Local Government, Planning Sport and Recreation, respectively.⁵⁵ Residents must obtain approval from their local council before installation. GDDs and GTS must be installed by a licensed plumber (EPA 2005; Qld LGPSR 2006c).

Installation

Householders cannot legally install below-ground systems or change existing above-ground plumbing to divert water from clothes washing machines, baths, showers and hand basins. In these cases, if householders do not use a plumber licensed in Queensland, they are ineligible for the rebate. Plumbers licensed in Queensland must be able to provide the householder with a License Number, Registration Number, and be registered with the Building Services Authority (BSA) to carry out the installation.

It is advisable to investigate local council requirements before making any decisions about installing a greywater system, as most do require council approval (except for the flexible hose connection to a washing machine) (Qld NRW 2007).

In addition to the *Queensland water recycling guidelines* (EPA Q 2005), the Queensland Government has published two documents: one for plumbers (Qld LGPSR 2006c) and one for councils (Qld LGPSR 2006b).

The scope of the councils' guidelines (Qld LGPSR 2006b) is to help councils manage applications for the use of greywater in sewered areas. The guidelines include suggestions for:

- compliance assessment
- assessing suitability of land for greywater
- irrigation

⁵³ <<http://www.nt.gov.au/waterwise>>

⁵⁴ <<http://www.nt.gov.au/infrastructure/bss/strategies/buildingcode.shtml>>

⁵⁵ see <<http://www.lgp.qld.gov.au/?id=1415>> for a list of approved devices and systems>

- options to simplify approvals and manage risks.

The council guidelines have been produced to assist councils with processing applications, communicating with homeowners, and meeting the requirements for management of greywater use.

The scope for the use of greywater in sewerage areas is limited by legislation to greywater, excluding kitchen greywater, generated by single dwellings that produce a volume of greywater less than 3000 litres per day. Refer to the *Plumbing and Drainage Act 2002*, Part 6A, Division 5, Sections 128L and 128M.

The Queensland *Greywater. Guidelines for plumbers* (Qld LGPSR 2006c) excludes kitchen greywater and specifies that storage of greywater is prohibited. It covers:

- types of greywater systems
- diversion of greywater
- distribution of greywater
- maintenance of greywater systems
- planning a greywater system
- legislation
- information about subsurface land application areas
- planning a compliant greywater use facility
- technical matters about greywater use facilities in sewerage areas.

The plumbing guidelines (Qld LGPSR 2006c) contains limited information regarding the practical installation of a GTS or a GDD, but provides good information for calculating volumes of greywater and areas of land required for a GIS relative to site conditions (referring to AS/NZS 2003a).

Many councils in Queensland also have greywater information and local guidelines⁵⁶ and some innovative methods for assessing systems (Figure 13). They have also included important components from Queensland's plumbing code (Qld LGPSR 2006a) (Table 14).

⁵⁶ <http://www.goldcoast.qld.gov.au/t_standard.aspx?pid=7417>

Figure 13: A graphical method to determine land area required for the number of occupants of the property for the different types of greywater⁵⁷

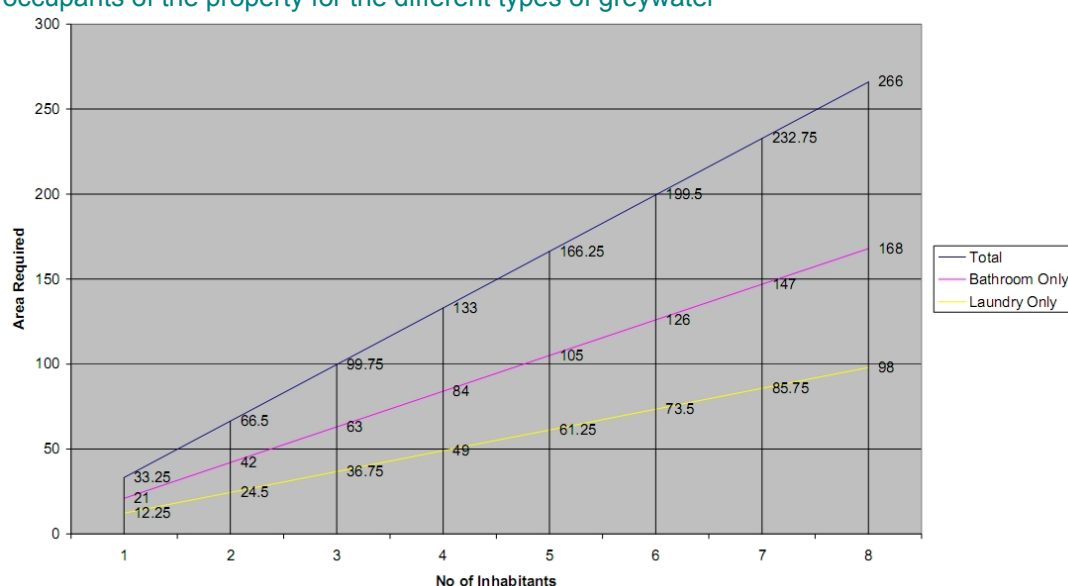


Table 14: Setback distances for greywater irrigation and systems in Queensland

Feature	Setback Distance (m)	
	Surface	Subsurface
From greywater irrigation area		
Property boundaries, pedestrian paths and walkways	2	2 (4 upslope)
Water edge of a swimming pool	6	6 (in-ground only)
Dwellings, recreation areas	10	2 (4 upslope)
In-ground potable water tank (not primary effluent)		6
In-ground potable water tank (primary effluent)	15	6
From greywater dispersion area		
Building footings and retaining wall footings		1
Property boundaries, public pedestrian or cycle paths or recreational areas		1
Swimming pools – in-ground		1
Potable water tanks – in-ground		6
Bores intended for human consumption		30
From surface and groundwater		
Top of bank of permanent water course; or Top of bank of intermittent water course; or Top of bank of a lake, bay or estuary; or Top water level of a surface water source used for agriculture, aquaculture or stock purposes; or Easement boundary of unlined open stormwater drainage channel or drain. Bore or a dam used or likely to be used for human and or domestic consumption		10 to 30*
Unsaturated soil depth to a permanent water table		0.3 to 1.2* (vertical)

Source: DIP Qld 2007

*.Varies depending on level of treatment

None of these guidelines provides sufficient details for installation of GTSSs, GDDs and GISs in the one document; they have instead extracted what they consider the most important information from state guidelines and Australian Standards.

⁵⁷ <http://www.goldcoast.qld.gov.au/attachment/building/land_area_required.pdf>

Rebates

The Queensland Government offers rebates on greywater installations through the Home Garden Waterwise Rebate Scheme. Rebates available include 50 per cent of purchase cost and installation up to a maximum of \$200 for an above-ground greywater system; or a maximum of \$500 towards the purchase and installation of a below-ground system.

For greywater guidelines and rebate details see:

- <<http://www.nrw.qld.gov.au/water>>
- <http://www.nrw.qld.gov.au/water/saverscheme/rebate_schemes.html>
- <http://www.nrw.qld.gov.au/water/saverscheme/pdf/grey_water_use.pdf>.

Some local government bodies (councils) in Queensland may also offer rebates for greywater systems. This should be checked with the appropriate local government body.

Specific building requirements

Building requirements for Queensland are specified in the *Building Act 1975*. Building Codes Queensland introduced an amendment to the building code for water saving measures (including rainwater and greywater use, but it is not compulsory⁵⁸).

3.7 South Australia – greywater

Governance

Manual bucketing onto the lawn and garden using water from the laundry or bathroom, or temporary use of a hose manually fitted to the washing machine outlet hose is permitted, subject to advice from the South Australian Government.⁵⁹ Permanent greywater systems need to be approved by the Department of Health.⁶⁰

Installation

The Department of Health in South Australia has published several guidance documents regarding the installation and use of greywater systems (DoH SA 2006a,b,c; 2007; 2007 accessed) and SA Water have published some guides for plumbers (SA Water 2006a,b). None of these guidelines gives specific installation information for plumbers installing greywater systems other than referring to state or Australian codes (e.g. AS/NZS 2003a) for detailed installation information.

Rebates

There are currently no rebates for greywater systems in South Australia.⁶¹

Specific building requirements

South Australia adopts the Building Code of Australia 2007. No specific comment regarding greywater installation requirements were identified. Consumers should check with local government.

⁵⁸ <<http://www.dip.qld.gov.au/sustainable-living/greywater.html>>

⁵⁹ <<http://www.dh.sa.gov.au/pehs/branches/wastewater/greywater-manual-bucketingjan07.pdf>>

⁶⁰ <<http://www.dh.sa.gov.au/pehs/branches/wastewater/greywater-general-nov06.pdf>>

⁶¹ <<http://www.sawater.com.au/NR/rdonlyres/57223FE3-4152-4472-9250-CA3029C40C34/0/HomeRebateBookletNov07.pdf>>

3.8 Tasmania – greywater

Governance

Generally, greywater reuse is not permitted in Tasmania's sewerage areas. In unsewered areas, greywater systems must be accredited by the Department of Justice and need approval from local council.

The Tasmanian Guidelines for Water Recycling do not cover greywater specifically (Dettrick and Gallagher 2002). There is some guidance from Sustainable Living Tasmania for the householder.⁶²

Installation

There is a number of regulations that must be met for any greywater treatment system (Plumbing Regulations 2004; Tasmanian Plumbing Code 1994; *Sewers and Drains Act 1954*; *Building Act 2000*). There is limited guidance for plumbers for the installation and setup of greywater irrigation systems. They are not mentioned in the Tasmanian Plumbing Code (DofJ 2006).

Rebates

There are currently no rebates for greywater systems in Tasmania.

Specific building requirements

No specific building requirements were identified. Consumers should check with local government.

3.9 Victoria – greywater

Governance

No permit is needed to divert greywater for immediate use on the garden, but there is a number of guidelines that should be considered (DoH Vic 2007; EPA Victoria 2003; 2006). Systems that collect, treat and reuse greywater (GTS) must be approved by the Environmental Protection Authority and be issued with a council permit.

Systems that collect, treat and reuse household wastewater from individual households must be approved by the Environmental Protection Authority for use in Victoria (following application by the system manufacturer) and be issued with a council 'septic tank permit' for each installation, as described in Section 3 (DoH Vic 2007; EPA Victoria 2003; 2006). A simple household GDD that does not treat the greywater is not subject to these approvals.

Installation

Greywater has to be diverted from the wastewater source before it can be reused. A diversion valve is normally used to direct the wastewater away from the sewerage system to an irrigation system. People intending to do this should consult the relevant water authority before commencing the works. They should also consult their municipal council before installing a diversion system. Work to install a GDD system must be carried out by a licensed or registered plumber (EPA Victoria 2006).

⁶² <http://www.tasmanianenvironmentcentre.org.au/documents/greywater_treatment_systems.pdf>

A GTS is required for greywater treatment in sewerred areas in Victoria. The approvals (EPA Victoria 2006) needed for this type of system would be in relation to:

- the treatment unit – must be a type approved by the Environmental Protection Authority; obtaining this approval is the treatment unit manufacturer's responsibility and should not concern individual householders (approved types of treatment units are listed on the Environmental Protection Authority's website)⁶³
- the irrigation scheme – must comply with the requirements in this information bulletin (EPA Victoria 2006)
- the entire scheme (this includes the wastewater collection, treatment and reuse components) – must be approved by the local council and issued with a 'septic tank permit' before it is installed. If a reuse scheme is proposed that differs from the above model, the Environmental Protection Authority and the local council should be contacted to discuss approval requirements.

The guidelines discussed above provide information on the plumbing codes that need to be complied with for installation of GTSSs, GDDs and GISs, but no practical advice is given for their actual installation by plumbers.

Many councils have produced their own greywater information,⁶⁴ which is generally summarised from state guidelines (DoH Vic 2007; EPA Victoria 2003; 2006).

Rebates

The Victorian Government offers a rebate of \$500 for the purchase and installation of approved permanent greywater tank systems that recycle wastewater from laundries and bathrooms for use on the garden or in the toilet through the Water Smart Gardens and Homes Rebate Scheme.⁶⁵

Specific building requirements

There are no specific building requirements for greywater in Victoria (VBC 2005).

3.10 Western Australia – greywater

Governance

Greywater can be reused in Western Australia by bucketing without a permit. Installation of a greywater system must be approved by the Department of Health and local council (DoH WA 2005). The following greywater systems are approved by the Department of Health (DoH WA 2005) for use in Western Australia:

- any 'Executive Director, Public Health approved system' (approved on an individual basis)
- systems that utilise a sedimentation tank and subsoil trench irrigation system constructed as prescribed in Part 3, Section 3.1.2 and Appendix 3 and sized as detailed in Part 3, Sections 3.4.2 and 3.4.3 of DoH WA (2005)
- systems that convert disused septic tank systems to greywater systems as detailed in Appendix 3 of DoH WA (2005)
- systems that convert Aerobic Treatment Units (ATUs) to greywater systems as detailed in Appendix 4 of DoH WA (2005).

⁶³ <<http://www.epa.vic.gov.au>>

⁶⁴ <http://www.bendigo.vic.gov.au/Page/Page.asp?Page_Id=1678>

⁶⁵ <http://www.ourwater.vic.gov.au/ourwater/water_smart_rebates>

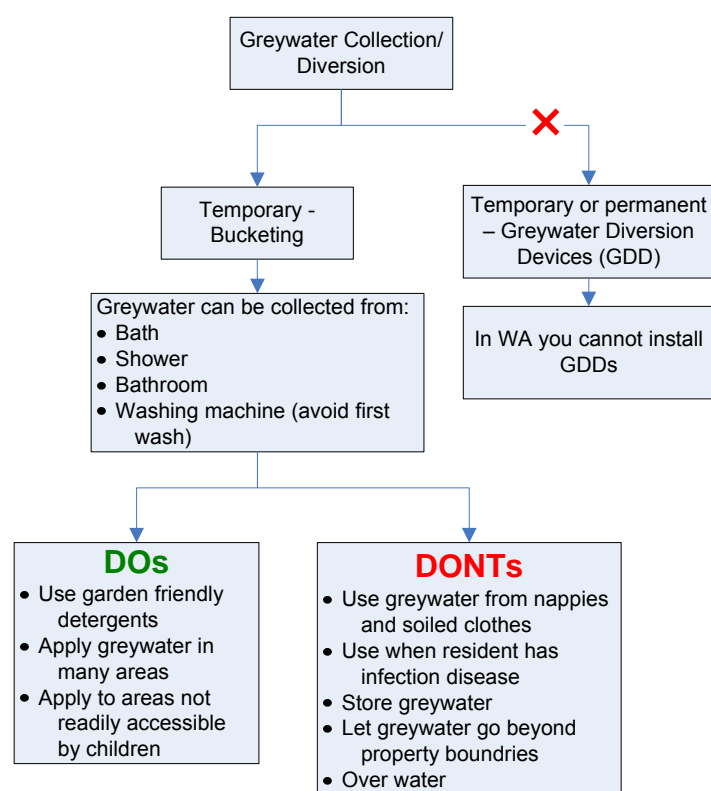
All plumbing work in sewerred areas must be undertaken by a plumber licensed under the Water Services Coordination (Plumbers Licensing) Regulations 2000⁶⁶ and must comply with AS/NZS 2003b.

Installation

There are no detailed instructions or guidance for plumbers regarding the installation of greywater systems in Western Australia. There are some details regarding irrigation systems in the WA Code (DoH WA 2005) and for Aerobic Treatment Units (ATU) (DoH WA 2001). For example, detailed guidance for plumbers could include:

- flow diagrams for communicating with the public or prospective greywater users (Figure 14 of this report)
- flow diagrams indicating the approvals and licensing required to install GTs (Figure 15 of this report))
- detailed installation diagrams for plumbers to retrofit greywater systems into existing houses, install greywater systems in new houses or make new homes greywater ready.

Figure 14: Example of flow diagram for communicating with the public or prospective greywater users



Rebates

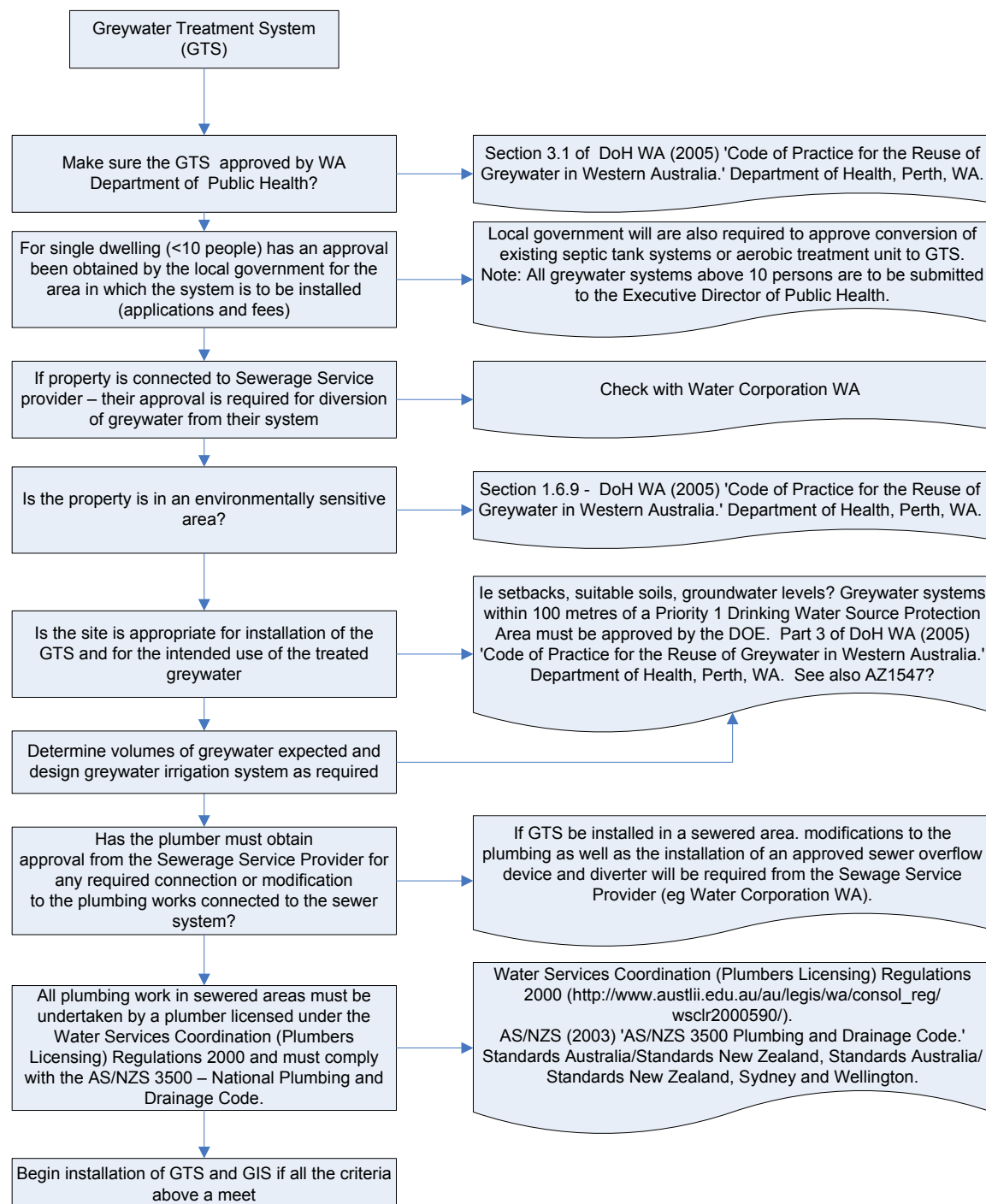
A Waterwise rebate of up to \$500 or 50 per cent of the purchase or installation cost (whichever is the lesser amount) is available for an approved greywater reuse system or aerobic treatment unit. For more information and a list of approved greywater systems see: <<http://portal.water.wa.gov.au/portal/page/portal/WiseWaterUse>>.

⁶⁶ <http://www.austlii.edu.au/au/legis/wa/consol_reg/wsclr2000590/>

Eligible greywater products are listed at:

<http://portal.water.wa.gov.au/portal/page/portal/WiseWaterUse/WaterwiseRebates/WhatProductsCanIGetAREbateFor/GreywaterReuseSystems/Content/Greywater_Systems_September_2007.pdf>.

Figure 15: Example of a detailed flow diagram for plumbers indicating the approvals and licenses required for installation of greywater treatment systems (GTS) in Western Australia



Specific building requirements

Measures to reduce the consumption of water in houses⁶⁷ will be implemented in two stages. Stage 1 focused on energy and water efficiencies and applies to all new houses built as of 1 September 2007, with little relevance to GTS. Stage 2 will be implemented during 2008 (DoHW 2006) and requires that:

- new homes be plumbed so they can be connected to an approved alternative water supply at a later date (an alternative water supply may include water tanks, bore water and third pipes)
- new homes be plumbed so they can be connected to an approved greywater diversion system at a later date
- new homes on appropriately sized lots be plumbed to enable connection at a later time to a greywater diversion system
- new homes with a high water demand for internal use have an approved alternative water supply for appropriate non-potable use.

3.11 Best practice for greywater use for single households across Australia

From the individual state and national guidelines above, a summary of best practice for GDD, GTS and GIS systems has been collated in the following sections.

Greywater diversion devices (GDD) – permanent and temporary

When using only GDD:

DO

Plumber

- ✓ Ensure that the greywater diversion system has a valve to allow untreated greywater to be diverted back to the sewer when it is too wet to go onto the garden
- ✓ Ensure there is no cross-connection of greywater with the drinking water supply
- ✓ Install a diversion device that has a WaterMark license⁶⁸
- ✓ Indicate where untreated greywater is being used by signage



Householder

- ✓ Use a licensed plumber to install the diversion system
- ✓ Use low risk sources for water diversion systems such as bath, shower and laundry rinse water (laundry wash water is much higher in detergent concentrations than rinse water)
- ✓ Be aware of biodegradable labelled products (such as soaps and detergents); liquid-based products are generally better (check the ingredients on the packaging)
- ✓ Only divert greywater in dry conditions in quantities that can be taken up by plants and soil (avoid over irrigation and runoff)
- ✓ Apply with buckets onto garden or use subsurface garden irrigation only (to council setback requirements)

DON'T

Plumber

⁶⁷ www.5starplus.wa.gov.au/home_owners

⁶⁸ <http://www.saiglobal.com/assuranceservices/certification/Productcertification/>

- Use greywater diversion devices if the property is connected to a municipal effluent reuse system and the sewerage service provider does not allow diversion of wastewater from the effluent reuse scheme
- Discharge untreated greywater near agricultural drainage pipes as the greywater could flow into the stormwater drainage system.
- Discharge untreated greywater in an environmentally sensitive area
- Use spray irrigation as the human health risks are unacceptable

Householder

- Use greywater from the washing of nappies or soiled clothing
- Use greywater when a resident has diarrhoea or is sick
- Use greywater generated by cleaning in the laundry or bathroom, or when using hair dye or other chemicals
- Use greywater generated by washing rags used for painting or for maintaining machinery
- Store untreated greywater for later use in a tank, as it is illegal in most states
- Use kitchen water as it is heavily contaminated with fats, greases and solids
- Apply greywater to vegetable gardens
- Overwater with greywater as it can raise the local water table

Greywater treatment systems (GTS)

When installing a greywater treatment system and using treated greywater:

DO

Plumber

- ✓ Install a greywater treatment system that has been accredited by local or state authorities
- ✓ Undertake a water audit before installing a greywater treatment system to calculate the amount of greywater that can be generated and used on-site
- ✓ Mark and label all pipes and use signs to indicate treated greywater use
- ✓ Ensure the greywater irrigation systems complies with state guidelines and plumbing codes (see AS/NZS 2003a)
- ✓ Use treated greywater for irrigation (including surface irrigation if appropriate), toilet flushing and washing machines only

Householder

- ✓ Select garden-friendly detergents that are biodegradable and low in phosphorus, sodium, boron and chloride (select liquid washing detergents, as they are comparatively low in salts)
- ✓ Monitor plant and soil response to treated greywater irrigation
- ✓ Ensure that regular maintenance of the treated greywater system is undertaken

DON'T

Plumber

- Install any component of an irrigation system within one metre of site boundary and buildings and other hard surfaces and swimming pools – refer to local council irrigation setback requirements

Householder

- Irrigate with greywater during rain
- Use greywater to top-up rainwater tanks or swimming pools
- Irrigate if the premise is located on an aquifer that is used for drinking water
- Use greywater on plants that will be eaten raw or where fruit has fallen to the ground
- Use greywater to wash paths, driveways or cars
- Use greywater so that it flows into the streets or down stormwater drains
- Let greywater go beyond the premise and cause a nuisance to neighbours

Greywater irrigation systems (GIS)

All greywater irrigation systems shall be designed to ensure that greywater is not applied at rates that exceed the absorption capacity of the soil and the plants grown on it (see AS/NZS 2008, p. 122). Care shall be taken to ensure that the application rate does not lead to:

- excess salt accumulation in the root zone during extended dry periods
- harmful long-term environmental effects to the soil of the land-application system or the adjacent surface water and groundwater
- increased risk to public health from surface ponding within the land-application area or channeling or seepage beyond the land-application area.

Considerations are:

- greywater volume potentially available (litres per person per day × number of people in the household)
- site conditions:
 - slope
 - climate (including local rainfall)
 - land fill
 - groundwater
 - erosion potential
 - site shading
- soil conditions:
 - soil type and texture
 - soil pH
 - slope
- design irrigation rate
- setback distances from:
 - dwelling
 - paths and other hard surfaces
 - swimming pools
 - natural waterways
- land area available for greywater irrigation.

For most states and territories of Australia, the guidelines are similar to the Australian Standard (AS/NZS 2003a; AS/NZS 2008) with some small differences in environmentally sensitive areas and specific regions of the state (for example, Swan Plains Sands in Western Australia) based on soil types and proximity of sensitive water sources. Soil types can have a significant impact on design irrigation rates of septic tanks and greywater systems (Table 16). The design irrigation rates and setback are not based on beneficial irrigation for establishment and maintenance of turf, ornamental gardens and other amenity horticulture uses. For example, water application is based on drainage from soil, rather than plant requirements (Table 4.2A4, AS/NZS 2000), which should be considered on a climate (pan evaporation or reference evaporation) basis.

This is mentioned in Appendix 4.2C (Water-balance and land-application systems, p 137), however, does not provide information on regional evaporation, allowing it to be considered in application rates.

The proposed handbook for greywater could add additional information in this area to assist plumbers to make better informed decisions on design irrigation rates based on irrigation of amenity horticulture. Soils data is adequate for these calculations in AS/NZS (2003a).

Table 15: Setback distances, soils types and Australian Standard used for assessing installation of a greywater irrigation system

Installation of a greywater irrigation system					AS/NZS 1547 – Onsite domestic-wastewater management referred to	Ref	
State	Setback distances				Soil types		
ACT	100 mm of any parallel drinking water service				Not mentioned	No, refers to AS/NZS (2003b)	1
NSW	1 m from boundary, in-ground pool, in-ground potable water tank				Not specifically mentioned	No, refers to AS/NZS 3500	2
NT	1.5 m setback from buildings and a 1 m setback from property boundaries				AS/NZS (2003a)	Yes	3
Qld	2–15 m depend on irrigation method (see Table 14)				Table 1.3.3 (p.7) site assessment checklist. Table 1.3.4 (p.8) soil assessment checklist	Refers to DIP Qld (2007) and AS/NZS (2003a) for estimation of greywater generated	4
SA	Sub-surface irrigation systems are to be designed in accordance with AS/NZS 1547				As per AS/NZS (2003a)	Sub-surface disposal and surface irrigation systems are be designed in accordance to AHC Code Waste Control Systems -	5
Tas	None located						
Vic	Mentioned in Septic Tank Code applies to greywater as well as EPA Victoria 2006. Supply pipe, 3.0 m; Potable supply channel (wastewater field upslope), 300 m; Potable supply channel (wastewater field downslope), 20 m; Gas, 3.0 m; Underground water tank, 15 m; Storm water drain, 6 m; Swimming pool, 6 m; Cutting/escarpment, 15 m; Building and allotment, 6 m upslope, 3 m downslope. Note: can be decreased by 50% if water quality is 20/30/10 BOD/SS/E.coli (EPA Victoria 2003, p28)				As per AS/NZS (2003a)	Yes, mentioned as relevant	6
WA		Drip (m)	Spray (m)	Trench (m)	Irrigation area size should be calculated on the basis of 10 litres/m2/day in sand and gravel/loam or for other soils in accordance with AS/NZS (2008)	Schedule B of the Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974	7
	Closed Fence Boundaries	0.3	0.5	0.5			
	Open Boundaries (i.e. open fence or no fence)	0.5	1.2	1.2			
	Buildings*	0.5	0.5	1.2			
	Sub-soil Drains	3	3	6			
	Bores (private)** intended for human for human consumption	30	30	30			
	Paths, drives, carports etc.	0.3	1.8	0.5			
	Public Water Supply Production Bores located in Public Drinking Water Source Areas***	100	100	100			
	Wetlands and water dependent ecosvstems where the PRI is <5***	100	100	100			

1 ACT Health (2007)

2 DEUS (2007)

3 DHCS NT (1996); DNREA NT (2007 (accessed))

4 Qld LGPSR (2006b), DIP Qld (2007)

5 DoH SA (2006b)

6 EPA Victoria (2003)

7 DoH WA (2005)

Note: refer to water greywater quality (Table 17) for allowed uses and check relevant standards for updates.

Table 16: Capacities of soil to absorb water

Soil Texture and Structure	Design Irrigation Rate (DIR) (mm/week)	Indicative drainage class
Gravel and sands – structureless	35	Rapidly drained
Sandy loams – weak structure	35	Well drained
Loams – weak to moderately structured	28	Moderately well drained
Clay loams – moderate to high structure	25	Moderately well drained
Light clays – weak to strong structure	20	Poorly drained
Medium to heavy clays – weak to strong structure	15	Very poor draining

Source: Modified from AS/NZS (2003a, Table 4.2A4, p 125)

Note these DIRs do not reflect plant water requirements but are based primarily on dispersal and disposal while minimise environmental impacts (see text for relevant discussion)

Many local governments have restrictions on irrigation using greywater. Restrictions could be based on specific local sensitivities, such as proximity to:

- environmentally sensitive areas
- waterbodies
- flood prone areas
- recreational waters
- filled areas
- natural heritage areas
- acid sulphate soils
- aquifers.

For example, Manly Council policy indicates that some environmentally sensitive areas will prevent greywater from being used for irrigation.^{69, 70} Residents should check with their local council for sensitive areas and overlays that might prevent the use of greywater.

Some regional restrictions may also apply and should be checked with Water Catchment Authorities, water saving plans and state zonings. This type of integrated assessment process allows assessment of the region/area.

3.12 Summary – greywater

There are already two major incentives for residents to use greywater:

- rebates are offered in many regions for residential use of greywater (Table 19)
- in some states of Australia, new houses must be built so they are rainwater and greywater-ready (that is, they can be easily connected to rainwater (toilet) or greywater (irrigation or toilet)) if the homeowner wishes. This is shown in Appendix 1 (Table 20). See also ACTPLA (2004).

69 <<http://www.manly.nsw.gov.au/DownloadDocument.aspx?DocumentID=979>>

70 <<http://www.manly.nsw.gov.au/sp/PlanningDocs.aspx?PageID=518>>

Installation and safe use of greywater systems remain difficult tasks. State and national guidelines for greywater use in Australia focus predominantly on the protection of human health and the environment. Communication with the public and greywater user is also well covered with fact sheets available from most councils, water authorities, and state, territory and federal governments. This information varies across Australia.

From these guidelines and plumbing codes, some states have put together guidance for plumbers regarding the approvals required for installation and the greywater systems that can be installed (for example, Qld LGPSR 2006c); however, most do not provide sufficient stand-alone design, installation and maintenance details at a technical, practical level for plumbers for installation of greywater systems. There is usually some referral to several other standards, codes or guidelines.

Given the referral to additional documents and the complexity in many of these standards and guidelines (Table 17), installation of greywater systems has become an onerous task for most plumbers. The approvals required, reporting needed, and responsibilities of householder, plumber and regulatory authority (for example, council, health department and environmental department) varies across Australia. Some consistent guidance for the plumbing industry for implementing greywater systems should aid plumbers to install greywater systems that are safe for humans and the environment. Section 1.1 of the proposed 'National installation handbook for greywater systems' will provide this.

Table 17: Greywater treatment systems – greywater quality and uses acceptable in states and territories of Australia (current as of May 2008)

State	Bio-chemical Oxygen Demand (BOD5) (mg/L)	Suspended solids (SS) (mg/L)	Thermo-tolerant Coliform* (CFU/100ml)	Turbidity (NTU)	Acceptable Irrigation methods for treated greywater					Non-irrigation uses of treated greywater			Ref
					Above ground drip/broadcasting	Above ground spray	Manual Bucket surface	Sub-surface irrigation	Sub-surface trench	Toilet	Laundry washing machine (cold)	Wash (Vehicle)	
ACT	20	30	10	N/A	√	√	×	√	√	√	√	√	1
	20	30	N/A	N/A	×	×	×	√	√	×	×	×	
NSW	10	10	10	N/A	√	√	×	√	√	√	√	×	2
	<20	<30	<30	N/A	√	√	×	√	√	×	×	×	
	<20	<30	N/A	N/A	×	×	×	√	√	×	×	×	
NT	20	30	10	N/A	√	√ ^A	×	√	√	×	×	×	3
	N/A	N/A	<1000	N/A	√ ^B	×	×	√	√	×	×	×	
Qld	240	180	N/A	N/A	√	×	√	√	√	×	×	×	4
	20	30	30	<5 ^D	√	√	×	√	√	×	×	×	
	10	10	10	<2 ^D	√	√	×	√	√	√	√	√ ^F	
SA	<20	<30	<10	N/A	√	√ ^C	×	√	√	×	×	×	5
	20	N/A	1	<2	√	√		√	√	√	×	×	
Tas ^E	N/A	N/A	N/A	N/A	×	×	×	√	√	×	×	×	6
Vic	20	30	10	N/A	√	√	×	√	√	√	√	×	7
	20	30	N/A	N/A	×	×	×	√	√	×	×	×	
	N/A	N/A	N/A	N/A	×	×	×	×	√	×	×	×	
WA	20	30	10	N/A	√	√	×	√	√	×	×	×	8

√ allowed, × not allowed, **E coli*, for NSW and Vic, 'or *E coli*' for SA, N/A = not applicable. CFU = Colony Forming Units.

Note: Updated guidance should be checked for water quality parameters and uses. See relevant state and territory guidelines.

References

- 1 - ACT Health (2007)
- 2 - NSW Health April (2000; Feb 2005)
- 3 - DHCS N (2004; 2007); DHCS NT (1996); DNREA NT (2007 (accessed))
- 4 - DIP Qld (2007); DLGPSR (2003); LGP (2003), <<http://www.lgp.qld.gov.au/planning/?id=7036>>
- 5 - DoH SA (2006b,c; 2007)
- 6 - DIER (2005)
- 7 - DoH Vic (2007); EPA Victoria (2003, refers to EPA Victoria (2006))
- 8 - DoH WA (2005)

^A Chlorine residual 0.5 to 2.0 after 30 min detention. Vegetables or food plants, including fruit and nut trees, must not be grown in the surface irrigation disposal area. If drip irrigation is used, fruit and nut uses may be allowed with a covering of at least 50 mm of hay, mulch or other absorbent organic material.

^B Access to area restricted

^C Dedicated irrigation area required

^D 95th percentile

^E Not allowed in sewerage areas, diversion must be to an approved on-site wastewater management systems

^F Allows washing of paving and fences also

Table 18: Untreated greywater – acceptable uses in states and territories of Australia

State	Acceptable Irrigation method					Comment and Storage requirements	Ref
	Above ground spray	Above ground drip or broadcasting	Manual Bucket surface broadcasting	Sub-surface dripper	Sub-surface trench		
ACT	×	√ ^A	√	√	√	< 24 hours of storage	1
NSW	×	×	√	√	√	Does not allow storage and must have a non-storage surge attenuation device Allows the temporary containment of greywater to be released to an irrigation system at a constant rate by gravity or pump	2
NT	×	×	×	√	√	Storage not allowed	3
Qld	√	√	√	√	√	Must have a surge tank designed on household fixture ratings of AS/NZX 3500.2, with a max discharge 500 L. Surge tank must not operate has a storage tank	4
SA	×	×	√	√	√	< 24 hours of storage	5
Tas	×	×	×	√	√	Not allowed in sewerred areas, diversion must be to an approved on-site wastewater management systems.	6
Vic	×	×	√	√	√	< 24 hours of storage	7
WA	×	×	√	√	√	Includes primary treated (sedimentation or diversion device)	8

√ allowed, × not allowed. For all untreated greywater systems kitchen greywater shall not be used and edible food plants should not be watered

References

- 1 - ACT Health (2007))
- 2 - NSW Health (April 2000; Feb 2005)
- 3 - DHCS (2004; 2007); DHCS NT (1996); DNREA NT (2007 (accessed))
- 4 - DIP Qld (2007); DLGPSR(2003); LGP (2003), <<http://www.lgp.qld.gov.au/planning/?id=7036>>
- 5 - DoH SA (2006b,c; 2007)
- 6 - DIER (2005)
- 7 - DoH Vic (2007); EPA Victoria (2003, refers to EPA Victoria (2006))
- 8 - DoH WA (2005)

^ARecommends restricted access

Table 19: Rebates available for greywater reuse in states and territories of Australia

State	Diversion	\$	Treatment systems	\$
ACT	none	none	none	none
NSW	none	none	none	none
NT	Govt. approved	\$500	none	none
Qld	max \$200 for above-ground, \$500 for below-ground system	50% total	none	none
SA	none	none	none	none
Tas	none	none	none	none
Vic	to garden and toilets	\$500	none	none
WA	greywater reuse	50% of total costs, up to \$500	Aerobic treatment	50% of total costs, up to \$500

Current as of May 2008

3.13 Further considerations – greywater

Information for design, installation and maintenance of greywater systems focused at a technical and practical level for plumbers is required to fill the current lack of sufficient stand-alone information. Section 1.1 of the proposed 'National installation handbook for greywater systems' should include the procedures for gaining appropriate approvals, technical installation and maintenance of greywater systems. More specifically this includes:

- a table, linked to diagrams, that identifies the common components of greywater systems that the plumber, EPA, Department of Health and local government are responsible for in each state. For GTS, plumbers are usually responsible up to the greywater diversion valve, EPA and the Department of Health usually responsible for the surge-tank/treatment system (GTS) and householder (post-GDD) and local government for the irrigation system (GTS)
- flow diagrams of approval process for installing a GDS, GTS and GIS
- a note that reed beds (natural process) is not a mechanical perspective and plumbers generally do not have training in this area. Reed beds are outside of the scope from a plumbing installation perspective, but they are possible in some states and require specialised expertise as defined in guidelines
- detailed installation diagrams for plumbing of greywater systems are required to cover the most common technical solutions for installing greywater systems. This includes combinations and all major types of:
 - diversions devices
 - treatment systems
 - new houses (greywater-ready – allow easy installation of diversion or treatment systems)
 - retrofitting of existing houses (concrete slab and stumped house types)
 - promotion of consistent signage for greywater use across Australia
 - comparative tables to easily identify differences in greywater guidance between state guidelines
 - requirements for new sustainable housing and the inclusion of greywater (Table 20)
 - a maintenance checklist for plumbers to give owners of the greywater system.

The proposed 'National installation handbook for greywater systems' (specifically Section 1.1) would provide the ideal medium to deliver these further considerations to the plumbing industry. Such a handbook would be used extensively through the Australian Plumbing industry and by local and state and territory governments. The handbook could also filter through to a general public document to help inform residents and potential users of greywater about the options and requirements if they are interested in installing a greywater system.

4. Conclusion

Rainwater and greywater use has been widely promoted across Australia. Many state and territory governments and councils offer some type of householder incentives (rebates) to encourage use of rainwater tanks and greywater systems, all of which require licensed plumbers to install them.

There is a lot of information available through codes of practice, guidelines and householder's user guides. There is surprisingly little practical information available to help plumbers:

- understand and comply with the regulatory controls for rainwater and greywater collection, storage, treatment and use
- identify the full range of local government requirements
- obtain approval from installation and irrigation perspectives
- identify technical installation solutions
- recognise local conditions and requirements.

In addition, technical solutions for plumbers are dispersed through at least 10 Australian Standards, several state guidelines, an Australian guideline and numerous Acts of various parliaments. There are also hundreds of local governments across Australia putting state guidance into practice.

There is therefore a clear need for a single document, or series of documents, that incorporates all the variations and provides practical advice and technical solutions for plumbers installing rainwater and greywater systems.

A series of handbooks is proposed. Along with this Waterline publication, the series will provide a national navigation tool for the approval, installation, maintenance and use of both rainwater and greywater from a technical and practical on-site perspective. This would fill a knowledge gap for many; from the householder to national and multi-national companies seeking to understand an Australian wide process for greywater and rainwater use.

With the proposed focus on technical issues, it is expected that the series will help local government organisations supply plumbers with more consistent requirements. It should also improve compliance with state and territory guidances and legislation, so that greywater systems and rainwater systems are installed correctly and comply with requirements for human health and environmental quality (see Table 20, in Appendix 1). This should help streamline approvals and installation processes.

A recent survey in Queensland identified that homeowners' knowledge levels for managing home water tanks or dual supply are lacking and that there is a clear need to address their effective use and maintenance (Gardiner et al. 2008). Appropriately informed plumbers should be in a better position to advise households.

The proposed installation handbooks for rainwater and greywater contain:

- direct website links to state and regional requirements (or an industry website continually updated)
- summaries of the approval, installation and irrigation requirements of each state and territory and relevant national components
- alternative greywater treatment systems (i.e. reed beds can be used for secondary treatment in South Australia) – noting the need for specialised expertise

- general awareness of water efficient labelling (WELS) and legal responsibility of plumbers
- more flow diagrams for steps to follow through the approvals process
- simple drawings to translate plumbing codes into installation diagrams that indicate all requirements for rainwater and greywater systems across Australia.

5. References

- ABCB 2007, *Building code of Australia 2007* (Volume 2). Australian Building Codes Board, Canberra, ACT, Australia.
- ABS 2007, *Environmental issues: people's view and practices*. Australian Bureau of Statistics 4602.0, Canberra.
- ACT Government 2006, *Australian Capital Territory. Rainwater tanks guidelines for residential properties in Canberra*, Australian Capital Territory Government, Canberra, ACT, Australia.
- ACT Health 2007, *Greywater use. Guidelines for residential properties in Canberra*. Second Edition, published October 2007, ACT Health, Health Protection Service, Canberra, ACT.
- ACTPLA 2004, PLUMBING NOTE 24 October 2004 *Grey water drainage separation and provision for rainwater plumbing (single residential buildings)*. (Ed. APaL Authority). ACT Government, Canberra, Australia.
- AS 1994, AS 1319—1994 *Safety signs for the occupational environment*, Standards Australia, Standards Australia, Sydney.
- AS 2001, AS 3735—2001 *Concrete structures retaining liquids*, Standards Australia, Standards Australia, Sydney.
- AS/NZS 1994, AS 1319—1994 *Safety signs for the occupational environment*, Standards Australia/Standards New Zealand, Sydney and Wellington.
- AS/NZS 1995, AS 1345—1995 *Identification of the contents of pipes, conduits and ducts*, Standards Australia/Standards New Zealand, Sydney and Wellington.
- AS/NZS 1996, AS 2700—1996 *Colour standards for general purposes*, Standards Australia/Standards New Zealand, Sydney and Wellington.
- AS/NZS 1998, AS/NZS 1546.1:1998 *On-site domestic wastewater treatment units—Septic tanks*, Standards Australia/Standards New Zealand, Sydney and Wellington.
- AS/NZS 2000, AS/NZS 1547:2000 *On-site domestic wastewater management*, Standards Australia/Standards New Zealand, Sydney and Wellington.
- AS/NZS 2001a, AS/NZS 1546.2:2001 *On-site domestic wastewater treatment units—waterless composting toilets*, Standards Australia/Standards New Zealand, Sydney and Wellington.
- AS/NZS 2001b, AS/NZS 1546.3:2001 *On-site domestic wastewater treatment units—Aerated wastewater treatment systems*, Standards Australia/Standards New Zealand, Sydney and Wellington.
- AS/NZS 2003a, AS/NZS 1547:2000 *On-site domestic-wastewater management*, Standards Australia/Standards New Zealand, Sydney and Wellington.
- AS/NZS 2003b, AS/NZS 3500 *Plumbing and drainage code*, Standards Australia/Standards New Zealand, Sydney and Wellington.
- AS/NZS (2005) AS/NZS 4020:2005 *Testing of products for use in contact with drinking water*, Standards Australia/Standards New Zealand, Sydney and Wellington.
- AS/NZS (2006) AS/NZS 1477:2006 *PVC pipes and fittings for pressure applications*, Standards Australia/Standards New Zealand, Sydney and Wellington.
- AS/NZS (2008 Draft) AS/NZS 1547:2000 *On-site domestic-wastewater management*, Standards Australia/Standards New Zealand, Sydney and Wellington.

Chapman H, Cartwright T, Hutson R, O'Toole J 2008a, *Water quality and health risks from urban rainwater tanks*, Cooperative Research Centre for Water Quality and Treatment Salisbury, SA, Australia.

Chapman H, Cartwright T, Tripodi N 2008b, *Guidance manual for the design and installation of urban roofwater harvesting systems in Australia* (Edition 1), Cooperative Research Centre for Water Quality and Treatment Salisbury, SA, Australia.

CUPDR 2006, *New South Wales code of practice. Plumbing and drainage*, Committee on Uniformity of Plumbing and Drainage Regulations in NSW, Sydney, NSW, Australia.

DCC 2007, *Building code of Australia*. Australian Government, Department of Climate Change., Canberra, ACT, Australia.

Dettrick D, Gallagher S 2002, *Environmental guidelines for the use of recycled water in Tasmania*, Department of Primary Industries, Water and the Environment, Hobart, Tasmania.

DEUS 2007, *NSW guidelines for greywater reuse in sewerred, single household residential premises*, Department of Energy, Utilities and Sustainability, NSW Government, Sydney, NSW, Australia.

DHCS N 2004, Information bulletin. Greywater reuse in single domestic premises, Department of Health and Community Services, Darwin, NT, Australia.

DHCS N 2006, Information bulletin No. 7. Environmental health. Requirements for the use of rainwater tanks, Department of Health and Community Services, Northern Territory, Darwin, NT, Australia.

DHCS N 2007, Information Bulletin No. 2. Environmental health. Greywater reuse in single domestic premises, Department of Health and Community Services, Darwin, NT, Australia.

DHCS NT 1996, *Code of practice for small on-site sewage and sullage treatment systems and the disposal or reuse of sewage effluent*. Department of Health and Community Services Darwin, Northern Territory, Australia.

DHS 2007, *Rainwater use in urban communities. Guidelines for non-drinking applications in multi-residential, commercial and community facilities*. Victorian Government, Department of Human Services, Melbourne, Victoria, Australia.

DIER 2005, *Tasmanian plumbing code 1994*, Part C1—Product authorisation report and conditions No BSR0444/2005, Department of Infrastructure, Energy and Resources, Government of Tasmania, Hobart, Tasmania, Australia.

DIP Qld 2007, *Queensland plumbing and wastewater code. Amendment 23/11/2007*. Department of Infrastructure and Planning., Brisbane, Queensland, Australia.

DLCGSR 2007, *Guidelines for Queensland development code*, Part 25: Water savings targets for councils, plumbers, builders and developers, Department of Local Government, Planning, Sport and Recreation, Government of Queensland, Brisbane, Queensland, Australia.

DLGPSR 2003, *Queensland plumbing and wastewater code*, Department of Local Government, Planning, Sport and Recreation.

DNREA NT 2007 (accessed), Greywater reuse: Technical fact sheet, Department of Natural Resources, Environment and the Arts, Northern Territory Government, Darwin, Northern Territory, Australia.

DofJ 2006, *Tasmanian plumbing code*, Department of Justice (Building Standards and Regulation Section) and Workplace Relations, Rosny Park, Tasmania, 7018.

DofW 2004, *Stormwater management manual*, Chapter 9. Structural controls, Government of Western Australia, Perth, Western Australia, Australia, <<http://portal.water.wa.gov.au/portal/page/portal/WaterManagement/Stormwater/StormwaterMgtManual>>.

DoH 2003, *Urban rainwater collection*, Department of Health(Ed.), Government of Western Australia.

DoH 2005, *Country rainwater collection*. Department of Health(Ed.), Government of Western Australia.

DoH SA 2006a, *Application for alternative on-site wastewater / waste control system installation*, Department of Health, Wastewater Management Section, Government of South Australia, Adelaide.

DoH SA 2006b, *Draft guidelines for permanent onsite domestic greywater systems: greywater products and installation*, Department of Health, Wastewater Management Section, Government of South Australia, Adelaide.

DoH SA 2006c, *Installation of permanent onsite domestic greywater systems*, Department of Health, Wastewater Management Section, Government of South Australia, Adelaide.

DoH SA 2007, *Manual Bucketing & Temporary Diversion of Greywater*. Department of Health, Wastewater Management Section, Government of South Australia, Adelaide.

DoH SA 2007 (accessed), *Approved Wastewater Products for marketing, sale and installation in South Australia*, Department of Health, Wastewater Management Section, Government of South Australia, Adelaide, <<http://www.dh.sa.gov.au/pehs/branches/wastewater/wastewater-products.htm>>.

DoH Vic 2007, *Greywater recycling: appropriate uses*, Department of Human Services, Victoria, Australia, Melbourne.

DoH WA 2001, *Code of practice for the design, manufacture, installation and operation of Aerobic Treatment Units (ATUS) serving single dwellings*, November 2001. Department of Health, Perth, Western Australia.

DoH WA 2005, *Code of practice for the reuse of greywater in Western Australia*. Department of Health, Perth, Western Australia.

DoHW 2006, *5 Star Plus*. Energy Use in Houses Code. Water Use in Houses Code, DoHa Works (Ed.), Government of Western Australia.

enHealth 2004, *Guidance on use of rainwater tanks*. Australian Government, Canberra.

EPA Q 2005, *Queensland water recycling guidelines*, Queensland Government Environmental Protection Agency, Brisbane.

EPA Victoria 2003, 'Septic tank code of practice. Guidelines for environmental management', EPA Victoria Publication 891 (NOTE draft for 891.1 Dec 2007 currently released for review and included advanced onsite sewage treatment systems, ie treated greywater), Southbank, Victoria 3006, Australia.

EPA Victoria 2006, 'Information bulletin. Domestic wastewater management series. Reuse options for household wastewater'. Publication 812.2. Environmental Protection Authority Victoria, Melbourne.

EPA Victoria 2007, *Rainwater use in and around the home*, Vic EPA, Melbourne, Vic, Australia.

EPA Victoria In press (release expected July), 'Code of practice onsite wastewater management', EPA Victoria Publication 891.1, Southbank, Victoria 3006, Australia.

- Gardiner A, Skoien P, Gardner T 2008, 'Decentralised water supplies: South-East Queensland householders' experience and attitudes', *J. Aust. Water Assoc.* 35:53–58.
- LGP 2003, *Onsite sewage facilities. Guidelines for the use and disposal of greywater in unsewered areas*, Water Industry Compliance. Qld Dept of Natural Resources and Mines. Brisbane.
- Magyar MI, Mitchell VG, Ladson AR, Diaper C 2008, 'Lead and other heavy metals: common contaminants of rainwater tanks in Melbourne', In *Water Down Under 2008 Conference*, Adelaide, South Australia, Australia, <www.waterdownunder2008.com/>.
- NHMRC and NRMCC 2004, *Australian drinking water guidelines*, National Water Quality Management Strategy, National Health and Medical Research Council, Natural Resource Management Ministerial Council, Canberra.
- NRMCC and EPHC 2006, *Australian guidelines for water recycling. Managing health and environmental risks*, Phase 1. National Water Quality Management Strategy 21, Natural Resource Management Ministerial Council, Environment Protection and Heritage Council Australian Health Ministers' Conference, Canberra, Australia.
- NRMCC and EPHC 2007 – Draft, *Australian guidelines for water recycling. Managing health and environmental risks*, Volume 2B – Stormwater harvesting and reuse, Natural Resource Management Ministerial Council, Environment Protection and Heritage Council Australian Health Ministers' Conference, Canberra, Australia.
- NSW Health 2007, Guideline. 'Rainwater tanks where a public water supply is available – use of space'. New South Wales Health, North Sydney, NSW, Australia.
- NSW Health April 2000, *Greywater reuse in sewered single domestic premises*, New South Wales Health, Gladesville, NSW, Australia.
- NSW Health Feb 2005, *Domestic greywater treatment system accreditation guidelines*, Part 4, Clause 43(1), Local Government (Approvals) Regulation 1999, New South Wales Health, Gladesville, NSW, Australia.
- NSW Health (May 2006) 'Advisory Note 4 – May 2006 sewage management facility accreditation criteria based on the final application of treated effluent and risk of disease transmission', New South Wales Health, Gladesville, NSW, Australia.
- Payne G 2004, *Approvals for installation and operation of systems of sewage management (including greywater diversion devices)*, Department of Local Government, Nowra, NSW, Australia.
- Payne G 2006, *Code of practice for plumbing and drainage*, Revised edition, Department of Local Government, Nowra, NSW, Australia.
- QDIP 2007, *Queensland development code*, Part 25. MP 4.2 – Water saving targets, Queensland Government, Department of Infrastructure and Planning.
- Qld Health 2008 (accessed), Queensland health policy 'Managing the Use of Rainwater Tanks'.
- Qld LGPSR 2006a, *Department of Local Government, Planning, Sports and Recreation. Queensland Plumbing and Wastewater Code*, Department of Local Government, Planning, Sports and Recreation, Queensland Government, Brisbane, Queensland, Australia.
- Qld LGPSR 2006b, *Greywater. Guidelines for councils. Use of greywater for residential properties in Queensland sewered areas*, Department of Local Government, Planning, Sports and Recreation, Queensland Government, Brisbane, Queensland, Australia.

Qld LGPSR 2006c, *Greywater. Guidelines for plumbers, Use of greywater for residential properties in Queensland sewerage areas*, Department of Local Government, Planning, Sports and Recreation, Queensland Government, Brisbane, Queensland, Australia.

Qld NRW (2007) *Greywater. Home WaterWise Rebate Scheme*, DoNRa Water (Ed.), Queensland Government.

Roesner L, Qian Y, Criswell M, Stromberger M, Klein S 2006, *Long-term effects of landscape irrigation using household graywater – Literature review and synthesis*, Water Environment Research Foundation and Soap and Detergent Association, Alexandria, VA, USA and Washington DC, USA.

SA Water 2006a, *Rainwater plumbing guide*, SA Water, Adelaide, SA, Australia.

SA Water 2006b, *Recycled water plumbing guide. Guidelines for use and installation*, Adelaide.

SAI Global 2003, Product Certification. Product Compliance Program WaterMark Level 1. Standards Australia/Standards New Zealand, Standards Australia/Standards New Zealand, Sydney and Wellington.

SLT 2004a, *Greywater treatment systems*, Sustainable Living Tasmania, Hobart, Tasmania.

SLT 2004b, *Sustainable living tasmania – rainwater tanks*, Sustainable Living Tasmania, Hobart, Tasmania.

Standards Australia, MPMSAA, ARID 2006, *Rainwater tank design and installation handbook*, First Edition January 2006, Standards Australia, Master Plumbers and Mechanical Services Association of Australia, Australian Rainwater Industry Development Group. HB 230 – 2006, Sydney, NSW, Australia.

Sydney Water 2003, *Guidelines for rainwater tanks on residential properties. Plumbing requirements. Information for rainwater tank suppliers and plumbers*, Sydney Water, Sydney, NSW, Australia.

Sydney Water 2003 – Amendment, *Guidelines for rainwater tanks on residential properties. Plumbing requirements. Information for rainwater tank suppliers and plumbers*, Amendment 1, Sydney Water, Sydney, NSW, Australia.

TG 2007 (accessed) Plumbing Regulations 2004, Tasmanian Government, Tasmanian Legislation.

<http://www.thelaw.tas.gov.au/tocview/index.w3p;cond=ALL;doc_id=%2B44%2B2004%2BGS3%40EN%2B20071214150000;histon=;prompt=;rec=;term=greywater>.

VBC 2005, *5 Star – What to do now and for the future*, Building Commission, Victoria, Australia.

Workman G, Herbert R 2004, *Review of national & state plumbing codes to facilitate domestic water reuse*. CSIRO Land and Water, Water Conservation and Reuse Research Program, Adelaide.

Abbreviations and acronyms

DIR	Design irrigation rate
GDD	Greywater Diversion Device
GIS	Greywater Irrigation System
GL	Gigalitres (1GL = 1,000,000,000L)
GTS	Greywater Treatment System
GWS	Greywater System (GDD, GTS, GIS)
kL	kilolitres (1kL = 1000L)
MPMSAA	Master Plumbers and Mechanical Services Association of Australia
ORG	Overflow relief gully

Appendix 1 – Requirements for sustainable housing

Table 20: Requirements for sustainable housing rating systems in Australia

State/territory	Grey-water	Rain-water	Energy	System or code	Comments
Aust			√	Aust Building Code	<p>On 1 May 2008, the requirement for alterations to achieve 5 Star will come into effect in the Building Code of Australia 2008 <http://www.buildingcommission.com.au>. The new standard for renovations or relocations applies to the thermal performance of a home and does not require a solar hot water system or a rainwater tank for toilet flushing. New homes already should comply with 5 Star plus water savings.</p> <p><http://www.abcb.gov.au/go/thebca/aboutbca, www.nathers.gov.au></p> <p><http://www.nabers.com.au></p>
NSW	√	√	√	BASIX	<p>BASIX, the Building Sustainability Index, ensures homes are designed to use less potable water and be responsible for fewer greenhouse gas emissions by setting energy and water reduction targets for houses and units. Since 1 October 2006, BASIX applies to all new residential dwellings and any alteration/ addition throughout NSW.</p> <p>Some of the features of BASIX are:</p> <ul style="list-style-type: none"> ▪ rainwater tanks, plumbed to toilet, garden or laundry ▪ greywater systems where appropriate. <p>The water target savings ranges from 0 to 40 per cent across NSW, depending on the location of the house or unit. Ninety per cent of new homes are covered by the 40 per cent water target, and no new home built in NSW will use more water than the current state average.</p> <p><http://www.basix.nsw.gov.au></p>
Qld	×	×	√	BCQ	<p>Building Code of Queensland (BCQ) introduced an amendment to the building code for water saving measures (including rainwater and greywater use, but it is not compulsory)</p> <p><http://www.lgp.qld.gov.au/planning/?id=7036>.</p> <p>As part of new energy and water-saving laws introduced from 1 March 2006, councils have the option to amend their planning instruments to mandate rainwater tanks for new houses in their region. Councils will have the discretion to allow for local factors, such as rainfall and the demand for water in their area.</p> <p><http://www.dip.qld.gov.au/sustainable-living/watertanks.html></p> <p><http://www.dip.qld.gov.au/sustainable-living/greywater.html></p>
SA	×	√	√	Building sustainability and efficiency, Planning SA	<p>Since 1 July 2006, South Australian building rules have required new dwellings and extensions or alterations greater than 50 m² to have an additional water supply to supplement the mains water. Rainwater tanks larger than 1000 litres will be the most common way of acquiring the additional water supply, but there are other ways (e.g. 3rd pipe recycled water, bore). Rainwater tanks must have an overflow device fitted; and a mosquito proof, non-degradable screen must be attached to protect the water quality. Some remote towns are exempt. The additional water supply has to be plumbed to a toilet, to a water heater or to all cold water outlets in the laundry of a new or altered home. <http://www.planning.sa.gov.au/go/rainwater-tanks></p>
Vic	×	√	√	5 Star	<p>The 5 Star Standard for all new houses in Victoria comes into full effect from 1 July 2005. This means it is compulsory for new houses to have a rainwater tank (min. 2000 litres and min. roof catchment of 50 m²) for toilet flushing or a solar hot water system. This does not include greywater as compulsory, but comments that builders and consumers who wish to go further than 5 Star have plenty of choices. This can include using greywater for gardens, car washing and toilet flushing, and consideration is being given to the use of rainwater for hot water.</p>

State/territory	Grey-Water	Rain-water	Energy	System or code	Comments
					http://www.buildingcommission.com.au - (VBC 2005). http://www.pic.vic.gov.au – Click on ‘5 Star Plumbing’ and read ‘Stop Press’ and Click on ‘Technical Solutions’
WA	√	√	√	Five Star Plus	<p>For Stage 2 (due in 2008), owners of new houses will be required to install plumbing to toilets to allow for alternative water supply and easy recycling of greywater at a later date and, where single dwellings are located on larger lots, an alternative water supply (such as rainwater tanks) for flushing toilets and for washing machines.</p> <p>5 Star Plus is based around two new building codes, the Water Use in Houses Code and the Energy Use in Houses Code http://www.5starplus.wa.gov.au/ http://www.dpi.wa.gov.au/cityregionalplanning/13871.asp </p>
ACT	×	√	×	Requirements for sustainable water management	<p>From 31 March 2008, property owners who are building, redeveloping or significantly extending their properties will need to demonstrate how they meet a new 40 per cent water efficiency target. This applies to all residential, commercial and industrial developments. This includes an option of rainwater tanks being connected to at least toilet, laundry cold water, all external uses. http://www.actpla.act.gov.au/topics/design_build/siting/water_efficiency </p>
Tas					Check with local councils
NT					<p>Check with local councils http://www.nt.gov.au/infrastructure/bss/strategies/buildingcode.shtml </p>

Current as of April 2008, check for updates on relevant websites

Appendix 2 – Summary tables of Acts, codes and guidelines relevant to greywater use in states and territories of Australia

State Authorities	Department name	Websites	Direct link to guideline	Document
National	Environmental Protection and Heritage Council	< http://www.ephc.gov.au/ephc/water_recycling.html >	http://www.ephc.gov.au/pdf/water/WaterRecyclingGuidelines-02_Nov06_.pdf	NRMMC and EPHC (2006) <i>Australian Guidelines for Water Recycling. Managing Health and Environmental Risks</i> . Phase 1. National Water Quality Management Strategy 21, Natural Resource Management Ministerial Council. Environment Protection and Heritage Council Australian Health Ministers' Conference, Canberra, Australia.
	Department of Climate Change	< http://www.greenhouse.gov.au/ >	< http://www.greenhouse.gov.au/yourhome/technical/fs23.htm >	2.3 Wastewater re-use
	Standards Australia	< http://www.standards.com.au/ >		AS/NZS (2003) AS/NZS 3500 <i>Plumbing and drainage code</i> , Standards Australia/Standards New Zealand, Sydney and Wellington
				AS 1546 All treatment tanks and pump pits must comply with the structural and access requirements of AS 1546.1 <i>On-site domestic wastewater management: septic tanks</i> . (WA greywater code)
			< http://www.saiglobal.com/shop/Script/Details.asp?docn=stds000019912 >	AS/NZS 1546.1:1998 <i>On-site domestic wastewater treatment units—Septic tanks</i>

State Authorities	Department name	Websites	Direct link to guideline	Document
			http://www.saiglobal.com/shop/Script/Details.asp?DocN=AS900502987057	AS/NZS 1546.3:2001 <i>On-site domestic wastewater treatment units—Aerated wastewater treatment systems</i>
				AS/NZS 1546.2:2001 <i>On-site domestic wastewater treatment units—waterless composting toilets</i>
			http://www.saiglobal.com/shop/Script/Details.asp?docn=AS417924235393	AS/NZS (2003) AS/NZS 1547:2000 <i>On-site domestic wastewater management</i> , Standards Australia/Standards New Zealand, Sydney and Wellington
			Not available at this stage	AS/NZS (2008 Draft) AS/NZS 1547:2000 <i>On-site domestic wastewater management</i> , Standards Australia/Standards New Zealand, Sydney and Wellington
				AS 1319—1994 <i>Safety signs for the occupational environment</i>
				AS 2700—1996 <i>Colour standards for general purposes</i>
				AS 1345—1995 <i>Identification of the contents of pipes, conduits and ducts</i>
			http://www.saiglobal.com/assuranceservices/certification/Productcertification/SAI%20Global%20WMK%20PCP.pdf	SAI Global (2003) 'Product Certification. Product Compliance Program WATERMARK Level 1'. Standards Australia/Standards New Zealand, Sydney and Wellington

State Authorities	Department name	Websites	Direct link to guideline	Document
			<http://www.saiglobal.com/shop/Script/Details.asp?docn=AS539110849947>	Part of above. SAI Global Assurance Services. Australian Technical Specification ATS 5200.460—2005. Australian Technical Specification: Technical Specification for plumbing and drainage products – Part 460: Greywater diversion valve assembly
				All plumbing work in sewerred areas must be undertaken by a plumber licensed under the Water Services Coordination (Plumbers Licensing) Regulations 2000 (WA guideline states)
New South Wales	NSW Health	<www.health.nsw.gov.au/public-health>	<http://www.health.nsw.gov.au/public-health/ehb/general/wastewater/wastewater.html>	General website for wastewater
			<http://www.health.nsw.gov.au/public-health/ehb/general/wastewater/adnote4.pdf>	NSW Health (May 2006) 'Advisory Note 4 – May 2006 Sewage management facility accreditation criteria based on the final application of treated effluent and risk of disease transmission', New South Wales Health, Gladesville, NSW, Australia.
			<http://www.health.nsw.gov.au/public-health/ehb/general/wastewater/greywater.pdf>	NSW Health (Feb 2005) <i>Domestic greywater treatment system accreditation guidelines</i> . Part 4, Clause 43(1), Local Government (Approvals) Regulation 1999, New South Wales Health, Gladesville, NSW, Australia.
			<http://www.health.nsw.gov.au/public-health/ehb/general/wastewater/greywater.pdf>	NSW Health (April 2000) <i>Greywater reuse in sewerred single domestic premises</i> . New South Wales Health,

State Authorities	Department name	Websites	Direct link to guideline	Document
			ter_policy.pdf>	Gladesville, NSW, Australia
			< http://www.health.nsw.gov.au/public-health/ehb/general/wastewater/diversion_devices.html >	Greywater Diversion Devices. Register – Plumbing Safety Licenses (Greywater diversion devices are not accredited by NSW Health and this register is maintained only to assist consumers)
			< http://www.health.nsw.gov.au/public-health/ehb/general/wastewater/gts/index.html >	Greywater Treatment Systems. Register – Certificates Of Accreditation
	Department of Energy, Utilities and Sustainability	< http://www.deus.nsw.gov.au >	< http://www.deus.nsw.gov.au/Publications/NSW%20Guidelines%20for%20Greywater%20Reuse%20in%20Sewered,%20Single%20Household%20Residential%20Premises.pdf >	DEUS (2007) <i>NSW Guidelines for Greywater Reuse in Sewered, Single Household Residential Premises</i> . Department of Energy, Utilities and Sustainability. NSW Government, Sydney, NSW, Australia
			< http://www.deus.nsw.gov.au/water/Plumbing.asp >	CUPDR (2006) <i>New South Wales Code of Practice. Plumbing and Drainage</i> , Committee on Uniformity of Plumbing and Drainage Regulations in NSW, Sydney, NSW, Australia.
	Department of Urban Affairs and Planning		< http://www.dlg.nsw.gov.au/Files/Information/onsite.pdf#xml=http://www.dlg.nsw.gov.au/Scripts/dtSearch/dtisapi6.dll?cmd=getpdfhits&DocId=1294&Index=c%3a%5cdtsearch%5cuserdata%5cAllDocuments&HitCount=61&hits=397+678+5043+505f+50a9+511e+512b+51 >	DUAP (1998) <i>Environment & health protection guidelines. On-site sewage management for single households</i> , Department of Urban Affairs and Planning, Sydney.

State Authorities	Department name	Websites	Direct link to guideline	Document
			39+535e+5445+5448+5476+597d+5cad+5cf6+6b2b+6d5b+73f1+7657+7662+766a+7676+7687+7691+76b8+76c2+76d6+76dc+7714+7727+772e+7731+7745+7760+7774+7795+77c4+7800+7828+7c6a+7c7b+7c88+7c94+7c96+9901+9944+99b6+99ba+99c6+99d5+9a17+9a24+9abf+9ac5+9ad2+9add+9ae7+9e7b+9e8b+c24b+c5ec+&.pdf>	
	Shires/council			
	Sydney Water	< http://www.sydneywater.com.au >		General website for wastewater
Australia Capital Territory	ACT Health	< http://www.health.act.gov.au/hps >	< http://www.health.act.gov.au/c/health?a=da&did=10009573&pid=1103502499 >	ACT Health (2007) <i>Greywater use. guidelines for residential properties in Canberra</i> , Second Edition, published October 2007, ACT Health, Health Protection Service, Canberra, ACT.
				Public Health Regulations 2000
	no Department of Environmental Protection	< http://www.tams.act.gov.au/live/environment >	< http://www.tams.act.gov.au/live/environment >	<i>Environment Protection Act 1997</i>

State Authorities	Department name	Websites	Direct link to guideline	Document
	ACT Planning and Land Authority	< http://www.actpla.act.gov.au >	< http://www.actpla.act.gov.au/__data/assets/pdf_file/0011/2135/pn24.pdf >	<i>Water and Sewage Act 2000</i>
	Territory and Municipal Services	< http://www.tams.act.gov.au/live/environment >	< http://www.tams.act.gov.au/live/environment/think_water >	
	ACTEW	< http://www.actewagl.com.au >		<i>Utilities Act 2000</i>
Northern Territory	Department of Health and Community Services (DHCS)	< http://www.health.nt.gov.au >	< http://www.nt.gov.au/health/healthdev/envhealth/factsheets/Greywater.pdf >	DHCS N (2004) 'Information Bulletin. Greywater reuse in single domestic premises.' Department of Health and Community Services, Darwin, NT, Australia.
			< http://www.nt.gov.au/health/docs/cdc_envhealth_no2_greywaterinfobulletin.pdf >	DHCS N (2007) 'Information Bulletin No. 2. Environmental health. Greywater reuse in single domestic premises.' Department of Health and Community Services, Darwin, NT, Australia.
			http://www.nt.gov.au/health/docs/cdc_envhealth_register_greywaterdiverters.pdf	Register of product approvals. Public Health (General Sanitation, Mosquito Prevention, Rat Exclusion and Prevention) Regulations Regulation 26. – Approval of Septic Tanks. Greywater Diversion Devices (GDD)
			< http://www.nt.gov.au/health/docs/cdc_envhealth_no5_destructionseptic tanks.pdf >	'Information bulletin 5. Environmental health destruction, removal or reuse of septic tanks, collection wells, aerated wastewater treatment systems and other on-site wastewater systems' (July 2006)

State Authorities	Department name	Websites	Direct link to guideline	Document
	DHCS Environment Health Branch	< http://www.nt.gov.au/health >		
		< http://www.nt.gov.au/nreta/water/wise/pdf/greywaterreuse.pdf >		DNREA NT (2007 (accessed)) 'Greywater Reuse: Technical Fact Sheet.' Department of Natural Resources, Environment and the Arts, Northern Territory Government, Darwin, NT, Australia
	Waterwise rebates for greywater	< http://www.nt.gov.au/Waterwise >	< http://www.nt.gov.au/nreta/water/wise/pdf/terms_conditions.pdf >	NT DNEEA (2007 (Accessed Dec)) 'NT Waterwise Central Australia. Rebate Scheme. Terms and Conditions.' Department of Natural Resources, Environment and the Arts., Darwin, NT, Australia
	Power and Water	< http://www.powerwater.com.au >		
Victoria	Victorian Environmental Protection Agency	< http://www.epa.vic.gov.au >	< http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/2f1c2625731746aa4a256ce90001cbb5/f406263fd484e6f1ca2571ea0009bd3f/\$FILE/812.2.pdf >	EPA Victoria (2001) 'Information Bulletin. Domestic wastewater management series reuse options for household wastewater.' Environmental Protection Authority Victoria, Melbourne
			< http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/2f1c2625731746aa4a256ce90001cbb5/f406263fd484e6f1ca2571ea0009bd3f/\$FILE/812.2.pdf >	EPA Victoria (2006) 'Information Bulletin. Domestic wastewater management series reuse options for household wastewater.' Environmental Protection Authority Victoria, Melbourne
			< http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/2f1c2625731746aa4a256ce90001cbb5/64c2a15969d75e184 >	EPA Victoria (2003) <i>Use of reclaimed water. Guidelines for environmental management.</i> EPA Victoria, Publication

State Authorities	Department name	Websites	Direct link to guideline	Document
			a2569a00025de63/\$FILE/464.2.pdf	464.2, Southbank, Victoria 3006, Australia
			http://epanote2.epa.vic.gov.au/EPA%5CPublications.nsf/PubDocsLU/891?OpenDocument	EPA Victoria (2003) 'Septic tank code of practice. Guidelines for environmental management.' EPA Victoria, Publication 891 (Note draft for 891.1 Dec 2007 currently out for review and included advanced on-site sewage treatment systems, i.e. treated greywater), Southbank, Victoria 3006, Australia
			http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/PubDocsLU/1015?OpenDocument	EPA Vic (2005) <i>Guidelines for Environmental Management: Dual pipe water recycling schemes - health and environmental risk management</i> . EPA Victoria, Melbourne, Australia.
	Department of Human Services	http://www.health.vic.gov.au/environment/water/recycle.htm	http://www.health.vic.gov.au/environment/downloads/greywater_usage.pdf	
	Smart Water	http://www.ourwater.vic.gov.au/ourwater/water_smart_rebates	http://www.ourwater.vic.gov.au/ourwater/water_smart_rebates	
	Plumbing Industry Commission	http://www.pic.vic.gov.au	http://www.pic.vic.gov.au/www/html/146-risks-of-greywater.asp	Needs updating
Queensland	Queensland Environmental	http://www.epa.qld.gov.au		

State Authorities	Department name	Websites	Direct link to guideline	Document
	Protection Agency			
		< http://www.nrw.qld.gov.au/ >	< http://www.nrw.qld.gov.au/compliance/wic/guidelines_recycle.html >	EPA Q (2005) <i>Queensland water recycling guidelines</i> . Queensland Government Environmental Protection Agency, Brisbane
				DNRM (2003) <i>Guidelines for the use and disposal of greywater in unsewered areas</i>
	Department of Local Government, Planning, Sport and Recreation	< http://www.lgp.qld.gov.au > < http://www.lgp.qld.gov.au/sustainableliving > < http://www.lgp.qld.gov.au/?id=3044 >	< http://www.lgp.qld.gov.au/docs/building_codes/greywater/guidelines_plumbing.pdf >	Qld LGPSR (2006) <i>Greywater. Guidelines for plumbers. Use of greywater for residential properties in Queensland sewerage areas</i> . Department of Local Government, Planning, Sports and Recreation, Queensland Government, Brisbane, Qld, Australia.
			< http://www.lgp.qld.gov.au/docs/building_codes/greywater/guidelines_councils.pdf >	Qld LGPSR (2006) <i>Greywater. Guidelines for councils. Use of greywater for residential properties in Queensland sewerage areas</i> , Department of Local Government, Planning, Sports and Recreation, Queensland Government, Brisbane, Qld, Australia.
		< http://www.lgp.qld.gov.au/applications/lgDirectory/ >		Local Government directory to obtain approval from Council for installation of on-site sewerage, which includes GTF

State Authorities	Department name	Websites	Direct link to guideline	Document
				The Queensland Plumbing and Wastewater Code (Help with PDFs (304 kB)) and AS1546.3:2001 (Joint Australian/New Zealand Standard) document the performance requirements and criteria used to assess on-site sewage treatment facilities. Greywater treatment facilities are also assessed against the relevant components of these documents.
		< http://www.lgp.qld.gov.au/?id=1415# >	< http://www.lgp.qld.gov.au/?id=4077 >	On-site sewerage treatment plants – Approved treatment facilities – Greywater diversion devices
			< http://www.lgp.qld.gov.au/?id=4016 >	On-site sewerage treatment plants - Approved treatment facilities - Greywater treatment plants
			< http://www.lgp.qld.gov.au/docs/building_codes/New%20plumbing%20laws/plumbing_and_wastewater_code.pdf >	Qld LGPSR (2006) 'Department of Local Government, Planning, Sports and Recreation. Queensland Plumbing and Wastewater Code.' Department of Local Government, Planning, Sports and Recreation, Queensland Government, Brisbane, Qld, Australia
South Australia	Department of Health	< http://www.dh.sa.gov.au >	< http://www.dh.sa.gov.au/pehs/branches/wastewater/greywater-manual-bucketing-jan07.pdf >	
			< http://www.dh.sa.gov.au/pehs/branches/wastewater/greywater-general-nov06.pdf >	
			< http://www.dh.sa.gov.au/pehs/branches/wastewater/greywater-pr-install-draft-nov06.pdf >	Draft guidelines for permanent on-site domestic greywater systems: Greywater products and installation

State Authorities	Department name	Websites	Direct link to guideline	Document
			http://www.dh.sa.gov.au/pehs/branches/wastewater/alt-onsite-ww-appform.pdf	Application form for the installation of alternative on-site wastewater systems
			http://www.dh.sa.gov.au/pehs/branches/wastewater/wastewater-products.htm	Approved wastewater products list
			http://www.dh.sa.gov.au/pehs/branches/wastewater/onsite-systems.htm	Standard on-site wastewater systems
			http://www.dh.sa.gov.au/pehs/publications/Septic-tank-book.pdf	See Section 5 of the Standard for the Construction, Installation and Operation of Septic Tank Systems in South Australia (Supplement B)
	SA Water	http://www.sawater.com.au	http://www.sawater.com.au/NR/rdonlyres/04C0CB50-30AF-4A64-A902-020DBBD37F43/0/Recyledwaterplumbingguide.pdf	SA Water (2006) <i>Recycled Water Plumbing Guide. Guidelines for Use and Installation</i> , Adelaide
Western Australia	Department of Health	http://www.health.wa.gov.au	http://www.health.wa.gov.au/envirohealth/water/docs/code_of_practice_for_the_reuse_of_greywater_in_wa.pdf	DoH WA (2005) <i>Code of practice for the reuse of greywater in Western Australia</i> , Department of Health, Perth, WA.
			http://www.health.wa.gov.au/envirohealth/water/docs/ATUCOP.pdf	DoH WA (2001) <i>code of practice for the design, manufacture, installation and operation of aerobic treatment units (ATUs). serving single dwellings</i> , November 2001. Department of Health, Perth, WA

State Authorities	Department name	Websites	Direct link to guideline	Document
			< http://www.roebourne.wa.gov.au/pdf/health_info_sheets/approved%20greywater%20systems%20July%202006.pdf >	Greywater reuse systems approved by the Department of Health
				Treatment of Sewage and Disposal of Effluent and Liquid Waste Regulations 1974
	WA Water Corporation	< http://watercorporation.com.au >		
Tasmania				Plumbing Regulations 2004
				Tasmanian Plumbing Code 1994
				Sewers and Drains Act 1954
			< ">http://www.thelaw.tas.gov.au/tocview/index.w3p;cond=;doc_id=%2B44%2B2004%2BAT%40EN%2B20071214000000;histon=;prompt=;rec=-1;term=> >	<i>Building Act 2000</i>
International	WHO			WHO (2006) <i>Overview of greywater management health considerations</i> , World Health Organisation, regional office for the eastern Mediterranean, Amman, Jordan