

# Water Quality Issues for Household Water Reuse

## Purpose

This Policy Position Statement (PPS) considers the issues of the applicability of water reuse in the home from a water quality perspective, and sets out the position of the Chartered Institution of Water and Environmental Management on how best to progress this sensitive issue.

For the purpose of this PPS, greywater is a term used to describe the used water coming from washbasins, baths, showers and clothes washing machines. CIWEM does not advise that toilet, kitchen sink, or dish-washing machine effluent be included in this definition of grey water – these effluents are not suitable for the recycling applications referred to in this PPS due to their composition.

This PPS does not consider the quantitative impact of water reuse relating to conservation of potable water supplies or water reuse as a tool for demand management, (i.e. reducing per capita consumption).

## CIWEM's position

1. CIWEM supports the principle of wider application of household water reuse and welcomes the increasing debate surrounding the potential benefits of water reuse and the growth in research on the issue, in terms of both the water quality aspects and practical designs for installation, especially retrofitting. However, CIWEM notes that significant risks to public health remain to be adequately addressed.
2. Water that is reused within the household will not have been tested and proved to be of as high a quality standard as potable water supplies. CIWEM considers it essential that this is thoroughly understood by householders, housebuilders, developers, lawyers and architects so that water is reused safely in the home and garden and public health is not put at risk.
3. CIWEM considers there to be three distinct types of water reuse common in the home. Each of these three types of water reuse has separate water quality implications that need to be discussed independently.
  - a. Rainwater Harvesting and use: The collection of rainwater (normally from a roof or land surface catchment) into a storage container for use at a later time
  - b. Greywater Reuse – without storage: The collection of water from washing activities in the home for reuse in a different area of the household immediately with no storage tank or treatment – typically by bucket, watering can, or siphoning device.

- c. Greywater Reuse – stored greywater tank plumbing system: The collection of water via a non-potable internal plumbing system to be held in a greywater storage tank for use elsewhere in the household at a later time - this may include some form of water treatment or disinfection.
4. Generally, the water quality from rainwater harvested on a well maintained roof catchment is of superior quality to rainwater collected from a catchment on the ground. Rainwater is often of superior quality to domestic grey water. It is, however a mistake to assume that greywater is relatively unpolluted. It is not recommended that untreated greywater or rainwater is used for drinking, cooking, food preparation or washing water.
5. When reusing water in the household it is important to consider the storage time & storage container, along with the way the water was used the first time. The water quality can vary daily even between the reused water from the same source. The diagram below is intended as a guide but cannot be definitive as the quality of one type of reused water can differ in each specific situation. There should be no usage other than those listed.

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## Key issues

Water Reuse in the home is promoted for many reasons, including regard for the conservation of potable water supplies against the wider context of demand management and the supply and demand of water resources. Water that is reused in the home is not bound by the same stringent water quality standards as potable water supplied by a regulated water supplier. When water is being reused there is most likely to have been a deterioration in water quality and this in turn affects the way in which this water can be reused safely in the household. Whilst CIWEM recognises that the reuse of water in the home is increasingly popular, it is essential that the significant public health and water quality implications associated with this are understood and addressed.

Drivers for increased greywater and rainwater reuse include:

- ◆ Code for Sustainable Homes
- ◆ Water Savings Group (Defra)
- ◆ Restricting increases in abstraction and in some cases withdrawing licences to minimize environmental impacts, to comply with the legislation such as the Habitats regulations and the Water Framework Directive.
- ◆ Growing need for water conservation – increased population, climate change, lower occupancy, increased social bathing / washing norms.

## Summary of household water reuse - appropriate sources and uses

Source	Use					
	Toilet flushing	Car washing	Clothes washing	Garden watering	Outside cleaning / sluicing	Ornamental pond fill/top-up
Bath water	✓	✓		✓	✓	
Shower water	✓	✓		✓	✓	
Washing machine water				✓*		
Paddling / swimming pool		✓		✓	✓	
Rainwater ground catchment				✓	✓	
Rainwater roof catchment	✓	✓	✓	✓	✓	✓
Softener regen water	✓				✓	

\*Washing machine water should not be used on crops that will be eaten.

### Rainwater Harvesting and Use

Most commonly used are water butts, but also in attic and under-patio / drive storage tanks – rainwater may be better than tap water for many plants as it generally has lower dissolved solids and doesn't contain the chlorine of potable water.

A risk to the quality of rainwater is the surface catchment from which it is collected. A reasonably common cause of contamination comes from lead roofs, animal or bird defecation and grit from tiles, or from treatments to prevent moss growth.

### Greywater Reuse – without storage

This commonly consists of householders reusing their bath or shower waste to water their gardens or to flush their toilets directly with minimal storage times. People commonly use buckets to transport the water or create a siphon using a suitable length of hose.

This method of recycling water has few water quality implications as the greywater does not have the time to turn septic before it is used. The utensil that is used to transport the greywater must be regularly cleaned to ensure that a biofilm does not develop.

### Greywater Reuse – stored using greywater tank and plumbing system

Storage Tanks and storage times can significantly affect the quality of grey water. Dark warm places are ideal places for bacteria and fungi to thrive. As successive streams of greywater travel through the same tank, microorganisms and biofilm inevitably build up, making

treatment and disinfection necessary. Greywater can rapidly become septic and start to smell if not managed thoughtfully. Storage tanks should not be buried under driveways or in locations where they are awkward to clean.

When reusing washing machine water, it is advisable to use an “environmentally friendly” washing detergent. Even so, it is imperative that this water should not be used to irrigate plants grown to be eaten due to the risk of bacteriological contamination.

## Biofilm Control

There has been little research into the level of disinfection necessary or appropriate to control biofilm build-up. The appropriate disinfectant and its dose will be dependent on the source, the reuse and the anticipated storage time of the grey water. At the present time there is insufficient data available on appropriate methods of domestic-scale biofilm control. In practice the most commonly used methods are chlorine and/or ultra-violet disinfection. Regular manual cleaning of equipment is also important. There is a need for all parties with experience of reuse to collaborate to ensure that best safe practice can be determined at the earliest possible juncture.

## Planning and Installation

Correct planning, design and installation of a water reuse system is essential. During the planning stage it must be clear the purpose of the system and where the reused water will come from and what it will be used for. The design stage must consider ease of maintenance and mitigate any possible hygiene risks. There must always be a clear separation between recovered and potable water systems.

Pipes and taps used for reused water must at the minimum be clearly labelled as non-potable water (though this would not prevent accidental consumption by young children unable to read, for example and it may be preferable to have a unique tap design which included safety features). Tanks should be in dark cool places where possible and should always have a siphon and overflow pipe to a suitable drain or soakaway.

## Maintenance

CIWEM considers it essential for household occupants that have greywater recycling to fully understand the implications of these systems and the level of maintenance necessary to keep these water reuse systems functioning safely and effectively.

Maintenance is minimised when a greywater reuse system has been properly planned and installed. Tank maintenance must be considered during the design of the system.

Care should always be taken not to ingest greywater accidentally. Hands should be thoroughly cleansed after contact with greywater.

## Conclusion

CIWEM supports the Code for Sustainable Homes’ aim to increase the sustainability of homes and realises that this may well increase the number of households incorporating water reuse.

When implemented it is crucial that the full quality implications of reusing water in the home are fully understood and that water reuse is developed and implemented safely with any potential risks to public health assessed and mitigated.

This is a topical issue and one that is increasingly a focus of discussion and investigation. CIWEM encourages this growth in research and continued investigation.

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*Note: CIWEM Policy Position Statements (PPS) represents the Institution's views on issues at a particular point in time. It is accepted that situations change as research provides new evidence. It should be understood, therefore, that CIWEM PPS's are under constant review, that previously held views may alter and lead to revised PPS's. PPSs are produced as a consensus report and do not represent the view of individual members of CIWEM.*

## References / Further Reading

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An evaluation of single-house greywater recycling systems (2002) Hills, Birks, Diaper, Jeffrey

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