

# Water recycling

What to consider before setting up a recycled water scheme



## Thinking of setting up a water recycling scheme?

We've developed this information as a starting point for business customers in the Sydney region who are considering water recycling projects as an alternative water source.

These customers include councils, businesses, sports clubs, urban irrigators, land/property developers and industry.

Residents who are interested in water efficiency might like to consider options like [rainwater tanks](#) and [greywater recycling](#).

It's important to look at the full range of water saving options right at the start of the planning process. Often, improving water efficiency is more cost effective than setting up a new water supply.

Start by reviewing current water use practices and checking [water efficiency](#) at your site. Fixing leaks and installing low flush toilets and efficient irrigation equipment can achieve major water savings at a relatively low cost.

If you think your site is already water efficient, consider whether [rainwater tanks](#) might be a practical alternative water supply.

If you've covered these options, then you may want to explore the possibilities of water recycling.

## Key questions

### You should ask:

- What do we want to achieve?
- How much water do we need?
- What are the recycled water supply options?
- Which of the options best suits our needs and budget?

## Recycled water schemes

### What is recycled water?

It's water that has been used before in bathrooms, laundries, kitchens and businesses. Recycled water is cleaned, treated and purified to a standard that is suitable and safe for its intended use.

Stormwater, when harvested and treated, is usually classed as a type of recycled water.

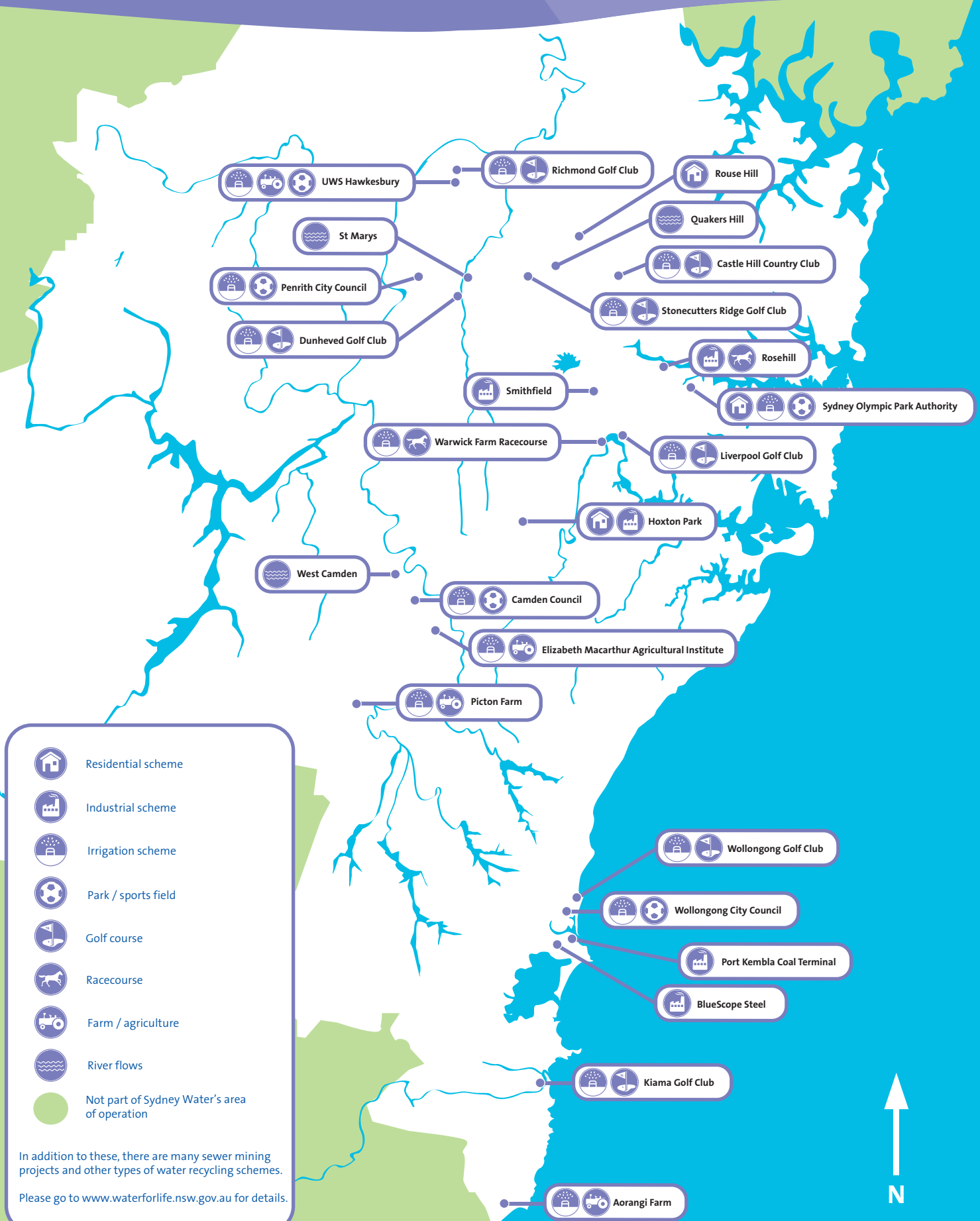
### Advantages of water recycling

- Conserves drinking water and contributes to a sustainable water supply.
- Can provide a drought-proof water supply.
- Can reduce the amount of treated wastewater going into local waterways.
- Uses an otherwise wasted resource.
- Generally has strong community support.

### Disadvantages of water recycling

- Can be expensive, especially if the project is small or very high quality recycled water is needed.
- Can take a relatively long time to set up small recycled water schemes, due to extensive planning and approval processes.
- Use of recycled water needs to be more closely managed compared to use of drinking water.
- The treatment and distribution system requires ongoing maintenance and management.
- May require large storage tanks.

# Water recycling in the Sydney region



In addition to these, there are many sewer mining projects and other types of water recycling schemes. Please go to [www.waterforlife.nsw.gov.au](http://www.waterforlife.nsw.gov.au) for details.

## Using recycled water

In Sydney and Wollongong, recycled water is used in many ways.

View the [map](#) on page 3 to see where Sydney Water's customers are using recycled water for:

- industrial processes and manufacturing
- irrigating parks, sports fields, golf courses and farms
- flushing toilets
- watering gardens and filling ornamental ponds
- dust suppression
- supporting river flows.

The number of water recycling projects is constantly growing. For an up-to-date list, visit [www.waterforlife.nsw.gov.au/recycling](http://www.waterforlife.nsw.gov.au/recycling).

**Recycled water is not used in NSW for drinking, however in some places such as Singapore, it's a key part of the drinking supply.**



Port Kembla Coal Terminal uses recycled water for dust suppression

## Producing recycled water

The NSW Government's [Water for Life](#) website provides a list and description of water recycling projects in NSW.

There are four main types of recycled water schemes in Sydney and the Illawarra. Recycled water can be produced and supplied from:

- water recycling plants
- sewer mining
- stormwater harvesting
- on-site systems.

### Water recycling plants

Recycled water is produced at large water recycling plants operated by Sydney Water or other providers.

Recycled water produced at treatment plants is used by [Port Kembla Coal Terminal](#) and [BlueScope Steel](#) for industrial processes, along with a group of industrial customers in the [Rosehill, Camellia and Smithfield](#) areas of Sydney. A number of Sydney councils and golf courses use this type of recycled water for irrigation.

#### This type of scheme works best for:

- large water users
- sites that are close to a water recycling plant (fewer pipes to build)
- sites where the type of recycled water produced at the plant matches the required end use.



## Sewer mining

Sewer mining is the process of tapping into a wastewater system, (either before or after the wastewater treatment plant), and extracting wastewater, which is then treated on-site and used as recycled water. Some sewer mining by-products may be acceptable for return to the wastewater system under a [Consent to Discharge Industrial Trade Wastewater](#).

[Pennant Hills Golf Club](#) and [Workplace 6](#) in Pyrmont also have successful sewer mining schemes.

### This type of scheme works best for:

- sites that are close to large wastewater pipes
- end uses that require a steady daily supply such as for toilet flushing and cooling towers.

## Stormwater harvesting

Recycled water is produced by capturing and treating stormwater from drains, channels and other stormwater sources.

[Willoughby Council](#) has a stormwater harvesting system that includes a five million litre storage tank. The council uses recycled water for toilet flushing, cooling towers and irrigation. [City of Sydney Council](#) re-uses stormwater to irrigate several of its parks. [Waverley Council](#) reuses stormwater to irrigate parklands, and for toilet flushing and ocean pool cleaning.

### This type of scheme works best for sites where:

- there is enough space for storage
- a constant daily supply of recycled water is not required, like irrigation
- there is a double benefit of managing flood issues and improving water quality for receiving waterways.

## On-site systems

Recycled water is produced by capturing, treating and re-using wastewater from a site's buildings or facilities.

Both [Sydney Airport](#) and [Sydney Water's head office](#) have successful on-site treatment plants. Wastewater from each site is treated to a very high level before being used for flushing toilets, in air conditioning systems and for watering gardens. Sydney Airport's international terminal saves up to 300 million litres of drinking water a year by producing its own recycled water.

The office complex at [1 Bligh Street](#) in Sydney also uses an on-site system combined with sewer mining.

### This type of scheme works best for:

- large developments of multi-storey building which incorporate sustainable design initiatives
- single customers or buildings, where there is no potential to be part of a large scheme with other customers.



Using recycled water helps to keep golf courses in good condition

## Will your recycled water scheme be viable?

You will need to work through the questions in this section to determine:

- whether water recycling could be a viable option
- the type of scheme that is likely to work best.

### Tips

- The closer you are to the source of recycled water, the better.
- Larger recycled water schemes are usually more economical than small ones.
- Higher levels of treatment cost more.
- Outdoor water use, such as irrigation, is weather dependant. Water requirements fluctuate a lot more over the year, and from year to year, compared to indoor use like toilet flushing and industrial processes.



Recycled water is used for irrigation by a number of nurseries in the Sydney region

## Why do you need recycled water?

### Set goals

What would your organisation like to achieve through this project? Are you trying to save drinking water, reduce costs, reduce stormwater discharge to waterways, promote green initiatives or achieve a high green star rating?

### Consider all the options

Have you looked at water efficiency measures like fixing leaks and installing water saving devices in toilets? Improving water efficiency is often cheaper than a water recycling project and can be just as effective. Regardless of whether you go forward with water recycling, you should make sure you aren't wasting your water resources.

## What kind of recycled water scheme would work best for you?

### Look for other potential users

Investigate whether there are others nearby who could be part of the recycled water project. This would allow you to share the costs and gain some economies of scale. You will also need to consider how long other users will be there and how they might use the recycled water. Will there continue to be a demand for recycled water and what type of legal responsibilities or agreements you'll need to put in place?

### Consider water quality levels

What standard of recycled water will you need? Is very high quality recycled water essential? Recycled water treated to a lesser extent contains more nutrients. It can be very effective for irrigation - however, extra safeguards need to be in place.

View the [diagram](#) on page 8 to learn more about the recycled water treatment process and the type of water quality suitable for different uses.

### Assess supply requirements

Estimate the average and peak volumes you are likely to need, and the water pressure. Will you need the water all day and every day? Can you compromise on this, if the project cost is too high?

### Identify potential water sources

Is there a Sydney Water treatment plant nearby? Are there any wastewater mains or stormwater channels close to the site? Is there already an on-site collection system for rainwater or wastewater? Can you get water from a local aquifer, waterways or existing suppliers?

### Consult with the owner and regulator of the water source

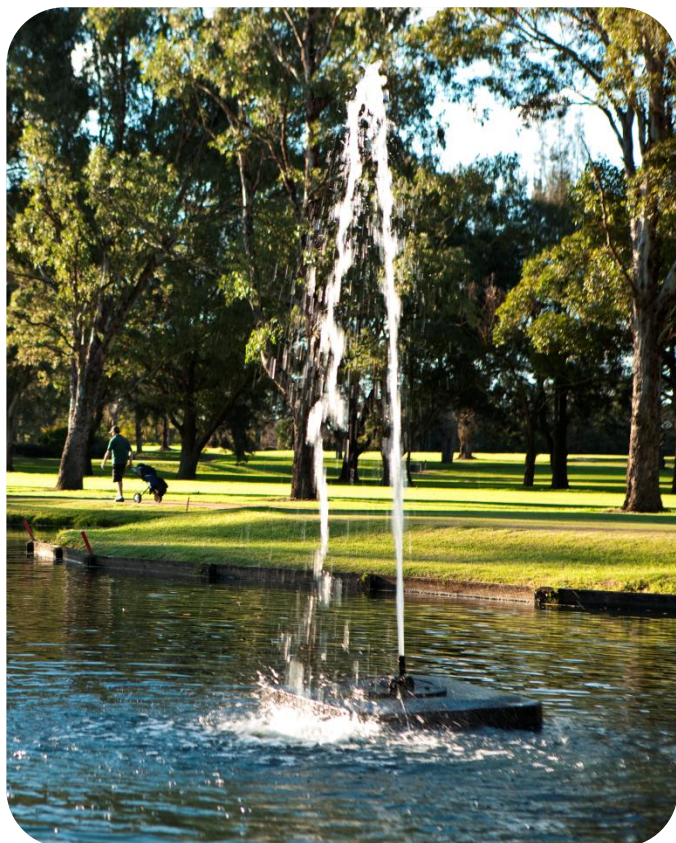
Can you get access to this water? How much is available? What approvals will you need?

### Investigate waste and energy issues

If you are thinking of building your own plant, where will the waste go? How much energy will you need for treatment processes and pumping?

### Carry out a land suitability and risk assessment

If you are thinking of irrigating, is the land suitable? Is the water quality suited to the site and proposed end use? What could go wrong with the project and how would you manage risks to the environment and community?



Some sites may need to build a dam to store recycled water

### How would you do it?

#### Work out what you'll need to build

Will you need a storage tank or dam? What type of pipe network will be needed? What approvals are required?

#### Work out where you'll build

If you need to build a treatment plant, where will it be located? Will this be acceptable to the community? Will you need to buy or lease land? Will there be any obstacles to construction?

#### Assess what on-site works you'll need

Will you need to re-plumb your existing water system to take recycled water?

#### Estimate costs and how to meet them

Producing recycled water can be expensive. Could your project qualify for a grant? Could you recover costs through charges or levies on your customer base? What is the estimated return on investment?

In addition to construction costs, consider the costs to run the scheme.

#### Tip

As a rough guide, schemes costing over \$5 per kilolitre for recycled water are unlikely to be viable without funding assistance.

The cost of drinking water in Sydney in 2013-2014 is \$2.16 per kilolitre.



# Recycled water treatment processes

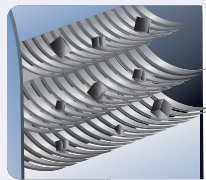
## Untreated wastewater

Wastewater going to treatment plants is more than 99% water. It comes from bathrooms, kitchens, laundries and businesses.



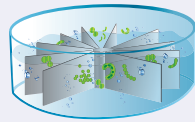
## Primary treatment

This step removes large solid particles from wastewater using screening, grit removal and sedimentation.



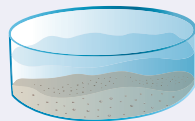
## Secondary treatment

Smaller particles and dissolved pollutants remain after primary treatment. 'Good' bacteria feed on and clean up organic particles and nutrients. Other typical treatment processes may include aeration, settling, clarification and chemical treatment.



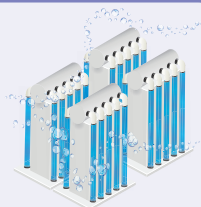
## Tertiary treatment

Deep sand beds are used to filter out nearly all remaining organic particles and suspended material.



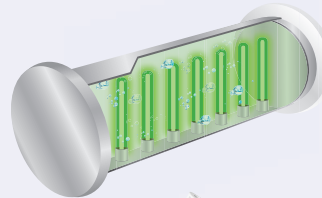
## Advanced treatment

This step may include microfiltration, ultrafiltration and reverse osmosis. These filters are so fine they can trap particles smaller than a millionth of a metre.



## Disinfection

This is the last step for all types of recycled water. The water is disinfected by chlorination and/or ultra violet light, depending on the end use.



The recycled water is now ready for its intended use.

## Secondary treatment

This type of recycled water can be used for timed irrigation.



## Tertiary treatment

This type of highly treated recycled water is suitable for many uses including irrigation, in industry and for watering gardens and flushing toilets.



## Advanced treatment

This type of highly treated recycled water is for specialised uses such as some manufacturing processes and for river flows.





# Is your recycled water scheme viable?

When you have an outline of your potential recycled water project, use our matrix to see whether it's viable.

Assessment	Unlikely	Possible	Promising
How much recycled water will you need?	< 100,000 litres/day	100,000 - 500,000 litres/day	> 500,000 litres/day
What will you use it for?	<ul style="list-style-type: none"> <li>Industrial processes</li> <li>Cooling towers</li> </ul>	<ul style="list-style-type: none"> <li>Flushing toilets</li> <li>In washing machines</li> <li>Watering gardens</li> <li>Washing cars</li> </ul>	<ul style="list-style-type: none"> <li>Irrigating open spaces, sports fields and golf courses</li> <li>Agriculture</li> <li>Suppressing dust</li> </ul>
How consistent is your water use?	Very inconsistent - highly variable or unpredictable.	Consistent - fairly predictable through the year.	Very consistent - used around the clock.
How similar is your source water to the water quality you need?	Much lower quality - will need a lot of treatment.	Slightly lower quality - needs some treatment.	Exactly the same or better - needs little or no further treatment.
How far away is the water source?	Long distance - five kilometres or more.	Medium distance - a few kilometres.	Very close - less than one kilometre.
What's between your site and your water source?	Major obstacles - freeways, rivers, railway lines.	A few obstacles - but we can easily get around them.	No major obstacles
Will you need storage tanks?	Yes - we'll need storage for weeks or months worth of water.	Yes - we'll need storage for a few days' worth of water.	No - we already have sufficient storage on site.
What plumbing and other work will you need to do on site?	We'll need major plumbing work on our site.	We'll need some retrofitting to the existing water system. Or - for dual reticulation in new buildings - we can install pipes during construction.	Minimal plumbing changes - we just need to connect to the recycled water supply pipe.

## Matrix outcomes

After assessing your proposed recycled water project, if your outcome results are mainly:

- **Orange** - This project will probably be unviable due to the very high cost per kilolitre of recycled water. The project should not proceed unless other significant drivers exist.
- **Blue** - This project will possibly succeed if some of the features can be improved. For example, by finding other customers or using a better source of recycled water.
- **Green** - This is a potentially viable project, worth going ahead and developing a proposal.

## Detailed water recycling information

If water recycling looks like a potentially viable option for your site and you've worked out which type of recycling is likely to be most feasible, please refer to these detailed guides for more information.

### Sydney Water guides

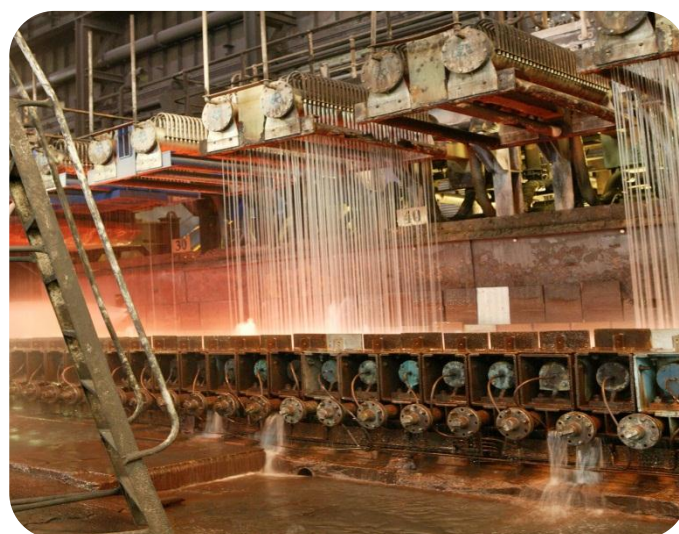
- [Sewer mining - How to set up a sewer mining scheme](#)
- [Stormwater Harvesting - How to collect and re-use stormwater from Sydney Water's stormwater system](#)

### Other resources

- [NSW Government Water Directorate – Water for Life](#)
- [Water Industry Competition Act](#)

### Recycled water regulations and guidelines

- [Australian Guidelines for Water Recycling: Managing Health and Environmental Risks \(Phase 1 - 2006\) \(AGWR\)](#)
- [Interim NSW Guidelines for Management of Private Recycled Water Schemes](#)
- [Plumbing Code of Australia](#)
- [Australian Standard AS/NZ 3500 and AS1319](#)



Recycled water is being used successfully to irrigate sports fields, in agriculture and for industrial processes

## Definitions

- **Recycled water** - in the broadest sense, all water on earth is recycled because it has been used, purified, and used again countless times. The term 'recycled water' is also used more specifically to describe water that has been used, (usually in human activities), and purified using a series of treatment steps so it can be used again. Stormwater is usually classed as a type of recycled water if it's reused.
- **Stormwater** - rain that hits the ground and runs off to drains or elsewhere. The term is often used in an urban context where rain runs off hard surfaces such as roads and car parks, often picking up contaminants.
- **Wastewater** - water that has been used, usually in human activities. This includes water from households (blackwater and greywater) as well as water from industrial and commercial uses. The wastewater going to Sydney Water's treatment plants is about 99.8% water.
- **Blackwater** - wastewater that includes water from toilets.
- **Greywater** - wastewater from any part of the home, except the toilet. Depending on the purpose, greywater may be used treated or untreated.
- **Stormwater harvesting** - involves collecting, storing and treating stormwater from urban areas, which can then be used as recycled water.
- **Sewer mining** - the process of tapping into a wastewater system, (either before or after the wastewater treatment plant), and extracting wastewater, which is then treated and used as recycled water.
- **On-site systems** - small treatment plants, usually privately owned and managed, that clean and treat wastewater so it can be used on-site or nearby.
- **Direct potable reuse** - where recycled water is added directly to the drinking water supply.
- **Indirect potable reuse** - where recycled water is added to an aquifer, river or other water source, which later joins the drinking water supply.
- **Biosolids** - when solids are separated from wastewater during the wastewater treatment process, which go through biological treatment. Biosolids are a rich source of phosphorus and nitrogen and can be used in agriculture, horticulture and site rehabilitation.



## To know more

For more information about water recycling, contact Sydney Water:

**Call:** 13 20 92

**Email:** [recycledwater@sydneywater.com.au](mailto:recycledwater@sydneywater.com.au)

**Visit:** [sydneywater.com.au](http://sydneywater.com.au)