Water360
Resources for Reuse

Recycled water for drinking: Replenishing Perth's underground storages with purified wastewater

First mooted in 1995, the concept of purifying wastewater to drinking-water standards and using it to replenish Perth's underground water storages has been successfully trialled. Construction is now underway of Australia's first full-scale groundwater replenishment scheme to use potable water, with commissioning planned for late 2016.

The drivers

Underneath the city of Perth lies a vast groundwater system which provides more than half of the city's drinking water supply, the remainder being sourced from dams and desalination plants.

Since the mid-1970s, the south-west of Western Australia has experienced sustained reductions in rainfall, with the result that dams no longer offer a reliable supply and the underground storages ('aquifers') are not being replenished.

The drying climate coupled with continued growth in population has highlighted that Perth needs water sources that are independent of the climate.

Western Australia has large volumes of wastewater which, once treated, is largely discharged into the Indian Ocean. This wastewater has been assessed by the Government of Western Australia as a valuable resource, part of which could be pumped underground to replenish deep aquifers, augmenting Perth's water supply.

The scheme at a glance

- Treated wastewater will be further purified to drinking-water quality before being pumped deep underground to replenish, or 'recharge', the aquifers.
- When fully commissioned, the scheme will pump 14 billion litres a year underground, increasing to 28 billion litres some time in the future.
- The new supply will be available to the Integrated Water Supply System that serves more than 1.7 million people in the Perth metropolitan area and other areas.
- The Water Corporation, a corporatised entity owned by the Government of Western Australia and accountable to the Minister for Water, owns and operates the scheme at Craigie, one of Perth's northern suburbs.
- The scheme is being regulated and approved by the state government departments of Health, Water and Environment.

The path taken

Investigation

As far back as 1995, the state government saw the concept of using wastewater to replenish Perth's aquifers as a promising way to manage climate variability. The Water Corporation investigated a highly successful groundwater replenishment scheme that has been operating in Orange County, California, since the 1970s. By 2003, a sustained trend of declining rainfall in WA's south-west was evident and, given the climate projections and population growth trends, the government recognised that Perth's traditional water supply sources were inadequate for the future.

Large volumes of treated wastewater were being piped out to sea at the time, and the Water Corporation sought advice from the EPA and the Department of Health on using this wastewater to replenish Perth's aquifers, in particular the implications and risks to the health of people and the environment. The EPA recommended trials be carried out and highlighted that no clear and established regulatory decision process existed for such a scheme.

Pilot

In 2008, the state government committed to conducting a groundwater replenishment trial to:

- demonstrate that the purification process was technically feasible and that the water in the aquifer, having been recharged, reliably met the guidelines for drinking-water quality

- provide a context for regulators to develop health and environmental regulations and policies for groundwater replenishment
- raise awareness in the community and encourage people to discuss groundwater replenishment and its potential as a water source.

The trial had three stages:

1. Pre-operations (March 2007 – December 2009)
2. Carry out and monitor the trial (January 2010 – December 2012)
3. Post-operation (December 2012 – December 2013)

During stage 1, the Department of Health identified 253 water quality guidelines that the recycled wastewater would have to meet at the point of recharge.

In stage 2, treated wastewater from the Beenyup Wastewater Treatment Plant in Perth's northern suburbs was transferred to the nearby advanced water recycling plant for further treatment. It was then pumped into the Leederville Aquifer, between 120 and 220 metres deep and away from the shallower groundwater system that is used to supply residential and other private bores. At this point, the recycled water was of drinking water quality. Over the course of the trial, 2.5 gigalitres (GL) of water was pumped into the aquifer.

The trial achieved its objectives and was deemed a resounding success by the state Water Minister who, in August 2013, gave the go-ahead for Australia's first full-scale implementation of a groundwater replenishment scheme using wastewater treated to drinking-water quality standards.

Construction

Construction of the full-scale scheme began in August 2014. The scheme is being built alongside the trial's advanced water recycling plant.

Originally the plan was to increase capacity in three stages over several years, starting at 7 GL per year, increasing to 14 GL and finally to 28 GL. However, in July 2014 the government announced that, as a result of competitive tendering, the capacity for stage 1 would double, taking it to 14 GL, with significant cost savings.

Commissioning

Operational commissioning of the completed full-scale scheme is expected to start by October 2016.

Engaging the community

The Water Corporation developed a communication strategy and a stakeholder management plan specifically for the trial. To build trust, the engagement strategy was based primarily on a face-to-face approach rather than on mass communication methods, though advertising, media relations and traditional public relations tools were used to support the face-to-face events.

Engaging decision-makers, regulators and politicians

The central objective was sustained and open engagement with decision-makers, regulators, key thought leaders and politicians to mitigate the risk of adverse media reports about the project and to make sure that all parties were well informed to be able to assess and approve a full-scale scheme.

Target groups included members of parliament and local government; representatives of business, industry and government agencies; community groups; and schools.

Engaging customers

The Water Corporation knew that if its customers didn't accept the scheme, it would not receive the endorsement required to proceed. Research showed that trust and transparency are deciding factors in gaining public acceptance.

A comprehensive public engagement and education program was put in place.

A community advisory panel was established to advise the Water Corporation on technical, health, environmental and social aspects of groundwater replenishment. The panel met quarterly and played a pivotal role in commenting on all aspects of the trial.

A visitor centre was established at the trial site and more than 7400 adults and schoolchildren toured the trial's advanced water recycling plant and the visitor centre.

More than 70 health, environment and local government groups, including local councils, Aboriginal groups and other community groups, were briefed on the scheme.

A website dedicated to the trial was created, and water quality reports, using a colour-coded 'traffic light' system, were published regularly.

Social media was used extensively with excellent results. Facebook and Twitter were used for informal dialogue. Short updates, interviews and information clips were posted on YouTube. An online 'Have Your Say' forum was set up to allow informed discussion independently of the Water Corporation.

An electronic newsletter was distributed quarterly.

Success factors

A number of factors contributed to the success of the groundwater replenishment trial and the approval to build a full-scale scheme.

Long planning timeframe

Groundwater replenishment was on the state government's agenda for more than a decade before the trial. This extended planning timeframe meant that:

- the Water Corporation and state government regulators (health and environment) had time to carefully consider it
- bi-partisan political support was achieved, depoliticising the planning process
- regulators had time to consider regulatory decision pathways and identify gaps in those pathways
- the trial could be carefully designed and carried out in a measured way.

Transparent and stable institutional arrangements

Western Australia's institutional and regulatory arrangements for water management have been reasonably stable since the mid-1990s. Stable institutional and interagency arrangements meant that key decision-makers in the government (such as the Premier, Treasurer and Minister for Water) were always involved.

High levels of trust in water authority

The Water Corporation, formed in 1996, is responsible for supplying water to more than 90 per cent of the population of Western Australia. Trust in the Water Corporation is high because of its considerable expertise and its track record in providing high quality customer service. Their customers and the community know who to turn to with questions or concerns about water supply.

Mapping the decision process early

Before the trial, specific policy and regulations relating to groundwater replenishment did not exist in Western Australia. The trial provided a context for regulators to map the decision process well in advance of a full-scale implementation, identifying who is responsible for setting policy, establishing regulatory arrangements and ensuring the enabling legislation is in place.

In 2007, three years before the trial started, the Water Corporation and the three agencies responsible for developing the policy and regulation – the Departments of Health, Water and Environment – formed an interagency working group to develop the trial's regulatory framework. They defined the approvals framework and water quality guidelines, and monitored their effectiveness in protecting the health of people and the environment. By the end of the trial, the appropriate policy and regulatory framework to allow for a full-scale implementation had been established.

Water quality uncompromised

Independent technical reviews and audits confirmed that by using critical control points and extensive sampling and monitoring, water quality guidelines would be met. During the trial, the wastewater treatment process operated within critical control points 99.93% of the time. The three instances where they did not meet specifications during recharge did not pose a risk to the environment or to public health, and the regulators accepted Water Corporation's approach to enable recharge to continue on each occasion.

All of the 58,224 groundwater samples taken during the trial passed the water quality tests.

Sustained community support

Community support for groundwater replenishment was monitored regularly and remained steady at between 70 and 76 per cent.

The decision to call the trial a "Groundwater Replenishment Trial" was taken following extensive consultation and focus group research. Other terms such as recycled water, purified water and drinking water were considered; however, groundwater replenishment was ultimately selected as it was transparent and it built on local stakeholders' desire to maintain the health of Perth's aquifers.

Lessons learnt

After the trial, interviews were conducted with key players from the Water Corporation and the state government as part of a research project. From these interviews and a review of the literature, the following lessons have been identified.

- Understand and exploit your natural advantages. For Perth, there were clear and sustained signals that the climate was drying, and access to the large groundwater system could buffer supplies.
- Understand your institutional advantages. Perth's water supply is managed by a large, stable institution that has built trust over decades through providing quality services.
- Know your decision-makers. If decision-making processes are unclear, work with the relevant agencies and community groups to clarify them.
- Open and transparent (not closed and competitive) two-way dialogue between the water utility, decision-makers, regulators, thought leaders and politicians over the long term is critical and can help depoliticise the planning process.
- Don't depend on only one solution for augmenting your water supply. The Water Corporation's 50-year plan for Perth's water supply outlines more than 20 different water supply solutions which involve reducing water use, increasing water recycling and developing new water sources.

Further information: www.watercorporation.com.au

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