

# Coliban Water

## On-site Storage of Recycled Water

### Discussion Paper

## 1 Introduction

The Epsom Spring Gully Recycled Water Project will enable recycled water to be supplied to a number of end users including rural customers (via rural channels downstream of Spring Gully Reservoir), public open spaces (direct from pipeline or via rural channels), standpipe users and industrial customers.

The recycled water to be supplied will be a mix of treated effluent from Coliban Water's Bendigo Water Reclamation Plant and treated groundwater from Bendigo Mining Limited. Both of these sources provide recycled water of very high quality.

However, concern has recently been expressed by EPA Victoria regarding the need to store the recycled water on customer properties. Points raised include the potential for growth of opportunistic pathogens and the need for another layer of monitoring if on-site storage is to occur.

This paper discusses the need to retain the use of on-site storages at customer properties along the channel system, the risks associated with storing recycled water and the management controls proposed for this element of the recycled water system.

## 2 Need for Storage

Recycled water is to be supplied to a number of customers via the rural channel system downstream of Spring Gully Reservoir. This includes the Ascot channel system (including White Hills, Huntly, Goornong and Ellesmere channels) and the Axe Creek channel system (including Kangaroo channel).

The channel system is a network of open earthen and concrete channels, which delivers water according to a roster system. Customers have storage dams on-site to receive the water. These storages are required because:

- Channel flows/runs are not constant, but are undertaken on a roster basis across the irrigation season. Therefore there is not a continuous supply of water and customers need to buffer demand requirements by storing water between supply times;
- The channel system is not designed to meet the peak instantaneous flow requirements of all the customers at once. The storages enable the customer to match the supply flow with their irrigation system requirements, eg. via pumping from their dam.

The distribution system is reliant on customer dams and would not be effective without them. To deliver recycled water to rural channel customers, it is necessary for them to store it.

### 3 Precedent

Recycled water used within the Werribee Irrigation District can be stored in farm dams and no additional controls are placed on the way it is stored. However, recommendations are provided regarding prevention of algae and reducing leakage to groundwater.

Other more local examples of recycled water being stored at customer sites are the Axedale Golf Course and Kyneton Racecourse.

### 4 Risk Assessment

Hazards relating to customer storage of recycled water are outlined in the tables below, along with a risk assessment for each.

#### Health hazards

Hazard	Assessment	Risk Level
Regrowth of pathogens	<p>Of the four types of microorganisms identified for control (bacteria, viruses, protozoa and helminths) only bacteria are capable of regrowing in a recycled water system.</p> <p>There is limited evidence to suggest that bacteria regrowth will occur, although there is some risk as a chlorine disinfection residual is not being maintained in the storages. However, the National Guidelines for Water Recycling state that “in general, enteric pathogens do not regrow in treated effluent or stormwater”. (Enteric pathogens are bacteria and parasites that do not normally reside in our gut and that can cause disease when they infest the gut.)</p> <p>The likelihood will be decreased by minimising the time spent in storage.</p> <p>Risk to human health is controlled by ensuring recycled water is not used for drinking or swimming.</p> <p>As limited regrowth is expected, the water will remain suitable for livestock drinking (stock can drink Class B recycled water).</p>	Low
Contamination by birds/animals	<p>Uncovered storages are subject to input of microorganisms from avian sources.</p> <p>Animals accessing the storage may also add faecal material and potentially die leaving a carcass. These aspects can be managed through fencing, provision of alternative livestock drinking facilities and visual inspection of the storage.</p> <p>Human waste can be prevented from entering the storages through appropriate design and management of septic tanks and sewer connections.</p> <p>The likelihood of contamination of water from birds/animals is almost unchanged from the present raw water supply. However, there may be some increase in the level of bird activity if the nutrients in the recycled water lead to increased fish production and algae growth.</p> <p>Risk to human health is controlled by ensuring recycled water is not used for drinking or swimming.</p> <p>Water will remain suitable for livestock drinking.</p>	Low.

Hazard	Assessment	Risk Level
<p>Growth of opportunistic pathogens</p>	<p>Opportunistic pathogens are microorganisms that cause infections and disease under optimal conditions, commonly in the very young, elderly and immuno-compromised. These include Pseudomonas, Streptococcus, Flavobacterium, Legionellae and Aeromonas species. Little is known of the virulence of opportunistic pathogens and their human health significance within any water distribution system. They can be commonly isolated from a wide range of environmental water samples, including wastewaters. However, this very rarely translates into the incidence or reported outbreak of illness.</p> <p>There is a wide range of factors that influence the extent of pathogen incidence, and the exact nature of this influence is largely unknown. Temperature, disinfectant residual, level of treatment and hydraulic conditions are considered important factors, and there is anecdotal evidence that elevated nutrient levels encourage pathogen growth.</p> <p>Treatment of the recycled water has removed opportunistic pathogens from this source. Treatment has also significantly reduced the nutrient levels in the recycled water, so that opportunistic pathogens in the receiving environment have less potential to grow. However, residual chlorine levels will be essentially zero. This means that some risk of growth remains, particularly as there will be some nutrients in the recycled water.</p> <p>There is potential for mixing of recycled water with raw water from Lake Eppalock, the Coliban Main Channel or the small catchment upstream of Spring Gully reservoir. This water will be of very high quality and is not expected to have sufficient nutrients to cause the growth of opportunistic pathogens. For example water from Lake Eppalock has mean total nitrogen of 1.3 mg/l and mean total phosphorus of 0.04 mg/l. This is less than the recycled water.</p> <p>The likelihood of opportunistic pathogen growth will be decreased by minimising the time spent in on-site storage.</p> <p>Risk to human health is controlled by ensuring recycled water is not used for drinking or swimming.</p> <p>As limited growth is expected the water will remain suitable for livestock drinking.</p>	<p>Low</p>
<p>Toxic algal blooms</p>	<p>Toxic algal blooms occur in conditions where there is high light exposure, high levels of nutrients (especially nitrogen and phosphorus) and warm water.</p> <p>Treatment has reduced the nutrient levels in the recycled water, but there remains some risk of algal blooms where water is stored during hot summer periods.</p> <p>Management practices available to customers for prevention of blue green algal blooms include:</p> <ul style="list-style-type: none"> <li>▪ Establishing or improving the growth of aquatic plants that will compete with the blue-green algae for nutrients;</li> <li>▪ Fencing out stock and establishing vegetated buffer strips around dams to intercept and trap nutrients and sediments;</li> <li>▪ Encouraging a quick turnover of water in the dams.</li> </ul> <p>Risk to human health is controlled by ensuring recycled water is not used for drinking or swimming.</p> <p>Where toxic algal blooms occur, recycled water should not be used for stock drinking.</p>	<p>Low</p>

### Environmental hazards

Hazard	Assessment	Risk Level
Leakage to surrounding environment	The recycled water is of high quality, with only minor increases in salinity and nutrients compared to the current channel supply. Leakage from the storages will continue to occur but the recycled water will not increase the impact on the surrounding environment. Coliban will upgrade the channel system to a piped system to reduce leakage over the next 2 - 5 years.	Low.  Unchanged from present channel supply.
Evaporative concentration resulting in increased salinity	The recycled water has a relatively low salinity and will be held in the storages for limited periods of time. There will be minimal impact on salinity levels due to evaporative concentration.	Low

### Aesthetic issues

Hazard	Assessment	Risk Level
Stagnation or stratification causing odour	The recycled water is of high quality and will be held in the storages for limited periods of time. Stagnation causing odour is unlikely to occur.  The storages are shallow and stratification is unlikely to occur.	Low
Airborne dust and algae increasing turbidity	Management practices for prevention of algal blooms are outlined in the health hazards table. Impact of airborne dust is unchanged from the current channel supply. Turbidity of water is more likely to be effected by delivery through earthen channels.	Low

## 5 Conclusions

Following the replacement of raw water with recycled water in the rural channel system downstream of Spring Gully reservoir, it is proposed that the use of customer storages continues, as:

- *The assessment of hazards relating to customer storage of recycled water indicates that the risk of human health, environmental or aesthetic impacts occurring is low;*
- *Precedent has been set elsewhere with storage of recycled water occurring within the Werribee Irrigation District recycled water scheme;*
- *The distribution system is reliant on customer dams to buffer demand requirements and match instantaneous flow delivered with irrigation system requirements.*

## 6 Proposed Management Controls

The following management controls are proposed for storage of recycled water on customer properties:

- Signs are to be installed at property access points and alongside dams in public recreation areas (eg. golf course, racecourse) to identify that recycled water is **NOT** suitable for drinking, swimming or fishing.
- Customers should be encouraged to limit detention times during hot summer periods to prevent algae growth.
- Regular visual inspection by customers to check for algae and other contamination.
- Where blue-green algae blooms occur do not use recycled water for stock drinking.
- Monitoring of Spring Gully Reservoir by Coliban Water to provide indication of how recycled water behaves in storage.

## 7 References

EPA Victoria (2005) *Health Risk Management in Urban Recycling Schemes: Technical Background Paper*

NRMMC, EPHC & AHMC (2006) *National Guidelines for Water Recycling: Managing Health and Environmental Risks*

Storey, M. et al (2007) *Microbial Regrowth and Water Quality in Potable and Recycled Water Distribution Systems in Australia*, Ozwater 2007 Conference Proceedings

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