
Purified Recycled Water Investigations Report and Update

Responsible Officer: Group Manager Planning and Delivery (Andrew Logan)

Recommendation:

That Council:

1. Receive and note the *Purified Recycled Water (PRW) Investigations Report (Attachment 1)*.
2. Defer further investigations into a Purified Recycled Water pilot / demonstration plant until Purified Recycled Water becomes a viable Stage 3 source option.

Background

Purified Recycled Water (PRW) involves taking treated wastewater and using advanced treatment to produce drinking water. There are two main types of PRW implementation - Indirect Potable Reuse (IPR) and Direct Potable Reuse (DPR).

IPR schemes involve the use of an environmental buffer such as a surface water reservoir (surface water augmentation) or aquifer (groundwater augmentation). In these schemes, the purified water is sent into the environment and then re-extracted and treated at a traditional water treatment plant.

DPR schemes do not involve an environmental buffer. The purified water is sent either directly to the network (Treated Water Augmentation (TWA)) or to the intake of a water treatment plant (Raw Water Augmentation (RWA)).

The regulatory situation varies for the different types of scheme implementations. However, in all instances the schemes will need to demonstrate that safe drinking water can be produced.

Future Water Project 2060

The Future Water Project 2060¹ considered several potential Stage 3 water source options as part of its development. These sources include surface water, groundwater, desalination, water efficiency and PRW. Stage 3 options are considered as medium to longer term water sources with potential implementation between 2030 and 2060.

The Future Water Project incorporated information from a preliminary feasibility investigation by City Water Technology (CWT) in 2020². Resulting in the following actions being recommended:

- *Development and implementation of a direct potable reuse pilot scheme.*
- *Additional investigations into the feasibility of indirect potable reuse as part of the regional water supply.*

Council Resolution – Future Water Project Actions

Following these recommendations Council resolved in 2020 [61/20] to undertake the following innovative actions:

6. iii) a) Progress Perradenya Estate pilot purified recycled water scheme and work with relevant stakeholders to design a long-term public education campaign to increase awareness and acceptance of indirect potable reuse (IPR) and direct potable reuse (DPR).

¹ Rous Regional Supply: Future Water Project 2060 – Integrated Water Cycle Management – **Hydrosphere** - April 2022

² Preliminary Feasibility Report – Investigation of Water Reuse as an Additional Water Source – **City Water Technology | Tonkin** – May 2020

6. iii) b) Investigate concurrently IPR and DPR schemes utilising effluent from Ballina, Lennox, south and east Lismore wastewater treatment plants (preferred options for water reuse identified in the CWT report).

Subsequent Council Resolution 2022 - Demonstration or Pilot Plant

Based on regulatory feedback, industry consultation and internal research, Council resolved in 2022 [82/22] to:

- a) Take no further action to progress a pilot purified recycled water scheme at the Perradenya Estate as part of the Future Water Project 2060.
- b) Continue to investigate the possibility of implementing a Purified Recycled Water pilot at the most advantageous location to meet strategic objectives of the Future Water Project 2060.
- c) Delay any significant investigations into a Purified Recycled Water pilot until such time as the Purified Recycled Water for Drinking Investigations – Option Assessment of Indirect and Direct Potable Reuse Schemes has been completed.
- d) Consider the comparative viability of Purified Recycled Water as a potential Stage 3 option when assessing whether to proceed with additional pilot investigations.

Purified Recycled Water Investigations – Scoping, Procurement and Timeline

The PRW Investigation scope was expanded to include all the wastewater treatment plants in the region, rather than just those shortlisted in the 2020 CWT investigation. The previous investigations only considered IPR options, and thus reassessment of all treatment plants would be beneficial to understand the viability of DPR schemes in the region.

The scope was discussed with numerous stakeholders including staff from the NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW, formerly DPIE/DPE). A stakeholder workshop was held in September 2022 to facilitate this engagement.

The project scope for the consultant included two separable portions:

- Separable Portion 1 – Scheme review and option identification, information collection, scheme information assessment and scope development.
- Separable Portion 2 - Treatment train investigations, costings, and option assessment.

An open tender process occurred, leading to the award of the contract to Tyr Group in March 2023, with the initial work focused on Separable Portion 1. Separable Portion 2 was awarded in October 2023, with practical completion in June 2024, and a final report issued in July 2024. A Council workshop providing a summary of the report contents was held in July 2024.

Summary of Report – PRW Schemes

This work has been completed by a range of water, wastewater and water recycling professionals/experts with considerable experience across PRW, both nationally and internationally. This includes experience in regulatory development, research, project design, implementation, and operation in projects across many locations including Singapore, the United States, Australia and South Africa.

The *Purified Recycled Water Investigations Report* (the Report) compared four different implementations of PRW in Rous's region. The implementation of PRW to date is understood to be more expensive than conventional sources (i.e. surface water and groundwater) and based on the findings in the Report, our region is no exception.

For the bulk of the PRW schemes considered, the capital costs are similar if not more expensive than desalination. However, this comparison will be further informed when updated secure yield modelling is completed later in 2024.

The most cost-effective option identified in the investigations (Lismore Raw Water Augmentation Scheme to Nightcap Water Treatment Plant) has significant regulatory challenges. RWA is a type of DPR or “direct augmentation.” In RWA, treated wastewater is purified via advanced treatment, and then blended with raw water source and fed to an existing water treatment plant (WTP). In this case, the purified wastewater would be blended with raw water from Wilsons River, and/or Rocky Creek Dam, and fed to Nightcap WTP. The key advantage of this scheme is that it can utilise existing transfer infrastructure (i.e. the pipeline and high-pressure pump stations that transfer Wilsons River water to Nightcap WTP). This results in a lower estimated cost than the alternative shortlisted options, and it also has the benefit of distributing the treated water widely across the network.

This produced water would need to comply with both the Australian Drinking Water Guidelines (ADWG) and the Australian Guidelines for Water Recycling (AGWR). At present, the AGWR primarily focuses on IPR rather than DPR. Whilst there is some mention of DPR in the AGWR, it does not provide the same level of guidance as to how these schemes should be assessed. This means that there is not a straightforward approval pathway for such a scheme under the current national guidelines.

However, it should be noted that the equivalent World Health Organisation guidance documents do provide a more in-depth consideration of how DPR schemes may be considered, and that this document adopts an approach that is consistent with Australian guidelines. Furthermore, there is growing consensus in the Australian water sector that an updated AGWR is required to be inclusive of DPR schemes, and potentially be integrated into the ADWG. This position has been advocated by staff from NSW regulators and Australian experts. Staff note that such an outcome would require coordination between state and federal governments, and such an endeavour is outside of Rous’s direct sphere of influence.

At this stage of the Future Water Project, moderately prospective conventional schemes (i.e. surface and groundwater) offer better value and lower risk than even the most cost effective PRW schemes identified in the *Purified Recycled Water Investigations Report*. For example, saline groundwater schemes (i.e. saline groundwater being more costly and difficult to treat than non-saline groundwater schemes) may be more preferred than a PRW option. For saline groundwater schemes, the potential avenues for concentrate disposal are expected to be a key limitation. If a suitable concentrate discharge location could be identified, it would be reasonable to expect that this type of scheme would require less costly treatment and lower transfer infrastructure costs than the shortlisted PRW schemes in the Report.

One of the main limitations identified in the Report is the availability of wastewater and resultant limitations on the scale of the scheme’s infrastructure. The identified schemes are limited to ~10 million litres (ML)/day or less. This is not sufficient to reach economies of scale that are normally seen in other installations around the world (typically ~40 ML/day or larger). The fixed cost associated with compliance, testing, process monitoring, instrumentation, auditing, operational staff, and control systems are significant and at this small scale, the result is higher water charges than would not otherwise occur in larger schemes, where these fixed costs are a lower percentage of the total capital expenditure.

Report Outcomes – Pilot or Demonstration Plant

One of the barriers to entry for PRW is obtaining approval from regulators in the absence of a prescriptive NSW regulatory framework whilst demonstrating social licence from the community.

The Report proposes a pathway to achieve this with a demonstration plant. The implementation of a pilot or demonstration plant is primarily a way to seek approval for a PRW scheme by addressing the 12 elements of the AGWR, which is a risk-based framework that is used to ensure that produced water is fit for purpose.

As such, without a clear intention to seek approval for a specific PRW scheme, the implementation of a pilot or demonstration plant does not represent good value for money for the community.

Staff have reviewed the outcomes of the Report and consider that a temporary re-deployable pilot plant would potentially be more cost effective, whilst still able to action the regulatory approval requirements and act as a focal point for community engagement to seek social license.

A pilot or demonstration plant may be considered in future if a specific PRW scheme was identified as a preferred Stage 3 option and Council was seeking to commence the approval process.

Governance

The *Purified Recycled Water Investigations Report* will be an input into a future review of the Integrated Water Cycle Management Strategy (IWCM). The updated IWCM will be presented to Council for consideration at that time. As such, no specific actions are necessary at this stage.

- **Finance**

The project received partial grant funding as part of the NSW Government's *Safe and Secure Water Program*. The project was completed within the approved budget amount.

Subject to Council's decision, budget allocations for further PRW investigations, and a pilot or demonstration PRW plant will be removed from the Long-Term Financial Plan.

Rous has one residual commitment relating to manufactured water research with a modest contribution of \$15,000 (excl. GST) in relation to administering the National Validation Framework (NatVal) for the next 3 years. The Australian Water Recycling Centre of Excellence (2009- 2016) lead the NatVal project. The aim of NatVal is to create a universally agreed validation framework for treatment technologies utilised in water recycling. Being part of this network provides a low-cost option for Rous to support the broader industry in working towards establishing a regulatory framework for manufactured water that will better support authentic options for water authorities into the future.

Consultation

The scope of the project was developed in consultation with a range of stakeholders including staff from NSW DCCEEW and staff from other NSW water utilities such as Sydney Water and Hunter Water.

The main consultants on the project, TYR Group, utilised specialist review from international and Australian experts.

Conclusion

The attached *Purified Recycled Water Investigations Report* provides detailed information about potential PRW schemes, which can be used to better understand the various aspects of PRW. The Report provides comprehensive information from which to compare other stage 3 options such as surface water, groundwater and desalination.

It is not anticipated that any additional short to medium term investigations or actions will be required at this time to progress PRW investigations as part of potential Stage 3 options or a pilot \ demonstration plant. The option of PRW is now well understood for comparison and decision-making as part of the Future Water Project. The role of the pilot/demonstration plant has been clarified, and it would only be prudent if Council decides to pursue approval of a PRW scheme.

At current, the most prospective PRW scheme does not have a clear pathway for regulatory approval due to a gap in national regulatory guidelines for DPR. This scheme, Raw Water

Augmentation Scheme from Lismore to Nightcap Treatment Plant via the Wilsons River pump station, should be considered as a watching brief, with potential reconsideration if the regulatory situation changes significantly. This scheme compares favourably in terms of cost per capacity to recently identified desalination schemes, and therefore has potential to be one of the most cost-effective rainfall independent options available as a potential stage 3 option.

Despite this, the estimated costs are still significantly higher than those for previously explored conventional options such as surface water and groundwater schemes. Error! Bookmark not defined.

The next element of work related to Purified Recycled Water is expected to be undertaken as part of the next review of the Integrated Water Cycle Management (IWCM) Strategy, which will incorporate the learnings from this Report.

Attachment:

1. *Purified Recycled Water for Drinking Investigations – Project Report – Tyr Group – July 2024*
<https://rous.nsw.gov.au/page.asp?f=RES-XTX-57-42-23>