

8 Human health

Human Health – the EA shall address the human health impacts arising from the application of recycled water and discharges of wastewater and recycled water. The assessment must be undertaken in accordance with the *Australian Guidelines for Water Recycling: Managing Health and Environmental Risks* (NRMMC, EPHC and AHMC, 2006).

The Project includes supply of recycled water to the proposed Googong township. The recycled water system would store treated water and allow for re-use for non-potable purposes such as irrigation, garden watering, toilet flushing and washing machines (refer to Appendix B).

CIC Australia is responsible for ensuring that the recycled water system would supply water to a standard fit for the intended uses in accordance with the *Australian Guidelines for Water Recycling: Managing Health and Environmental Risks* (henceforth referred to as AGWR) (NRMMC, EPHC and AHMC, 2006).

The AGWR is a set of national guidelines that can be applied to the management of both human and environmental risks. The application of these guidelines in relation to other State-based guidelines and licences is discussed in Section 8.1, as well as in Chapter 5.

This chapter outlines how the 12-element framework of the AGWR would be applied to the Project in relation to human health risks. This chapter primarily relates to the concept plan for the Project, with some detail relating to Stage 1.

8.1 Application of the AGWR framework

The AGWR set out the following 12-element, risk-based framework for the use of recycled water:

- Commitment to the responsible use and management of recycled water.
- Assessment of the recycled water system.
- Preventative measures for recycled water management.
- Operational procedures and process control.
- Verification of recycled water quality and environmental performance.
- Management of incidents and emergencies.
- Operator, contractor and end user awareness and training.
- Community involvement and awareness.
- Validation, research and development.
- Documentation and reporting.
- Evaluation and audit.
- Review and continuous improvement.

This framework is used to develop a management plan that describes the nature of a recycled water system and how it should be operated and managed. It is the most effective way to assure the appropriate management of recycled water by identifying and managing risks in a proactive way.

8.2 Outline of Recycled Water Risk Management Plan

The central principle of the AGWR is that all recycled water schemes require a risk management plan – referred to as a Recycled Water Risk Management Plan for this Project (RWRMP) – which is to be continuously evaluated and reviewed to assure safety and sustainability throughout the project lifecycle. Table 8.1 outlines the framework and content of a RWRMP and an assessment of the current status of development of a plan for the Project.

Table 8.1 Recycled water risk management plan framework

Content	AGRW framework	Status
Recycled water policy, consideration of regulatory requirements for the scheme and documentation of the stakeholder engagement process planned for the scheme.	Element 1	In progress
An assessment of the recycled water system for the scheme including identification of source water, intended uses, inadvertent or unauthorised uses, routes of exposure, receiving environments, endpoints and effects.	Element 2	In progress
Analysis of the recycled water system: this will involve collation of system information and documentation of key characteristics of the scheme.	Element 2	In progress
Assessment of the scheme water quality data.	Element 2	In progress
Documentation of the hazard identification and risk assessment workshop process including assessment of unmitigated, mitigated and residual risk.	Element 2	In progress
Identification of preventative measures and multiple barriers including those already in place and those that need to be developed to ensure risks are reduced to acceptable levels.	Element 3	In progress
Development of operational procedures and processes to control the system. This includes operational monitoring requirements for human health protection.	Element 4	To be commenced
Verification of quality and performance based on existing data only.	Element 5	To be commenced
Documentation and reliability procedures, non-compliance, incident and emergency management procedures, corrective responses.	Element 6	To be commenced
Supporting requirements (employee awareness and training, research and development, stakeholder consultation, communication and user satisfaction procedures).	Element 7 and 8	To be commenced
Broad identification of processes and activities for the validation of quantity and environmental performance during operation.	Element 9	To be commenced
Reporting and management of documentation and records	Element 10	To be commenced
Review procedures including evaluation, audit and continual improvement.	Element 11 and 12	To be commenced

The RWRMP would be continuously reviewed and updated through each phase of the project, including:

- Detailed design.
- Construction.
- Operation.
- Maintenance.
- Disposal.

Review of the RWRMP would include a review of the recycled water system analysis. The RWRMP would act as an effective management tool, containing a process for the ongoing review and maintenance of the documents.

8.3 Consideration of other relevant guidelines/regulatory requirements

While developing a RWRMP based on the national AGRW, it is important to note that there may be some overlap with State-based recycled water regulations. A RWRMP for the Project would need to demonstrate the sustainable management of supply, use and regulation of recycled water to regulators including the NSW Office of Water (part of DECCW). In this way, the RWRMP would enable CIC to demonstrate to customers and stakeholders that the system is appropriately managed to deliver a product that is 'fit for purpose'.

The AGRW framework has been adopted within a State set of guidelines called the *Interim NSW Guidelines for Management of Private Recycled Water Schemes 2007*. These State guidelines would also be considered in the Project RWRMP as it applies to applications for approval to install and operate under section 68 of the *Local Government Act 1993*. (Refer to Chapter 3 for a more detailed explanation of the relevant licences and approvals for recycled water.)

8.4 Construction impacts and mitigation measures

Construction of the Project would have no direct impact on human health. As such, no construction impact mitigation measures are required in relation to human health.

However, environmental mitigation measures that have an indirect benefit for human health are covered in various other sections in this EA. For instance, soil contamination issues in regard to human health are discussed in Section 9.4.2.

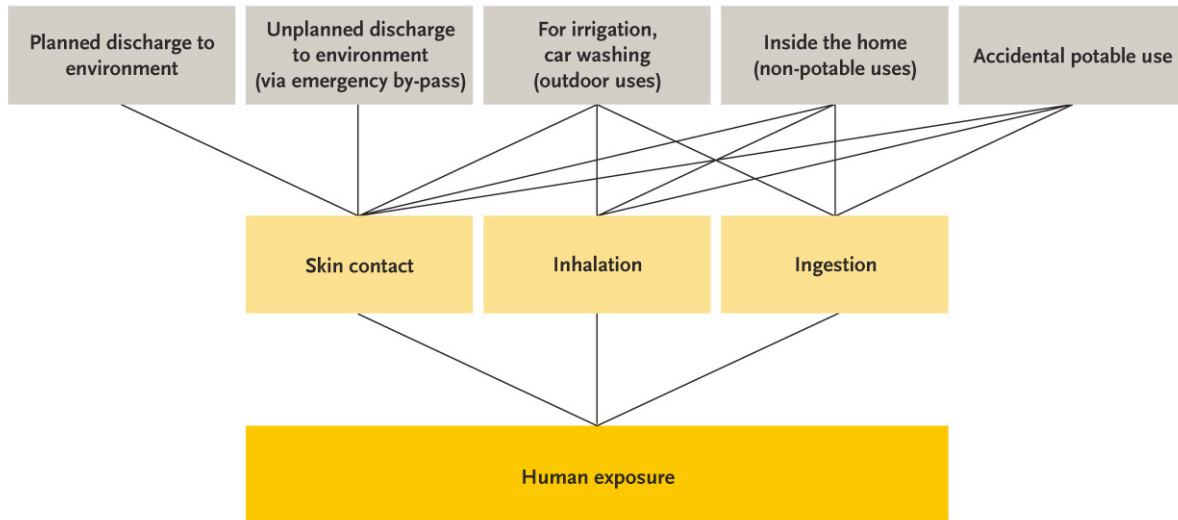
8.5 Operational impacts and mitigation measures

8.5.1 How humans could come in contact with recycled water

Using recycled water and discharging excess water to the environment would present a number of pathways through which the public could be exposed. The routes of exposure form part of Element 1 of the AGWR, and would be further defined and developed as a part of the RWRMP.

Figure 8.1 shows the complex pathways of exposure that would result from normal operation of the Project. These pathways would form a complex web of interactions and relationships between the system and the public.

Figure 8.1 Pathways of human exposure to recycled water



As shown in Figure 8.1, human exposure can occur inadvertently or accidentally through skin contact, inhalation and/or ingestion. This can occur from:

- Planned or controlled discharge to the environment.
- Use of recycled water for irrigation and car washing (eg inadvertent ingestion or inhalation of sprays).
- Use of recycled water inside the home (for non-potable uses).

In addition, failure of the system at any or multiple points can also result in accidental or unplanned exposure to raw waste water, treated wastewater or recycled water and, thus, potential contaminants to both the public and environment. This exposure could be caused by:

- Accidental spill or discharge to the environment.
- Accidental potable use of recycled water.
- Cross-connection of dual-reticulation systems with drinking water supplies, leading to accidental ingestion of recycled water

The main risk to human health is caused by the presence of residual pathogens in the recycled water after treatment. Ingestion of recycled water may cause gastrointestinal illness, and inhalation of recycled water sprays may cause respiratory illness.

8.5.2 Reducing pathogens in recycled water

The AGWR states that management of human health includes defining tolerable risk and setting targets against use (pathogens, protozoa, viruses); and identifies how targets can be met. The AGWR calculates health-based performance targets, and identifies acceptable levels for index pathogens, representing viruses, bacteria and protozoa, so that risks to human health are reduced to acceptable levels.

The necessary removal requirements are defined as ‘log reduction’ of the index pathogens in the recycled water. Log reduction is used to define the ability of a treatment process to remove, kill or inactivate pathogens. The higher the log reduction, the higher the percentage reduction and the better the water quality. Log reduction requirements for use of recycled water provided by the Project are listed in Table 8.2 (extracted from Table 3.8 of the NRMMC, EPHC and AHMC, 2006).

Table 8.2 Log reduction requirements of pathogens (viruses, protozoa, bacteria) for recycled water use for the Project

Uses	Log reduction required for pathogens*		
	Viruses	Protozoa	Bacteria
Dual reticulation, toilet flushing, washing machines, garden uses	6.0	5.0	5.0

*Note: Higher log reduction values indicate higher removal rates of pathogens.

The recommended treatment process for dual reticulation is advanced treatment, such as secondary treatment, coagulation, filtration and disinfection (NRMMC, EPHC and AHMC, 2006). The treatment process that would be used at the Project WRP is consistent with this approach and is demonstrated in Figure 5.11 (refer to Chapter 5). The indicative log reduction for each stage of the treatment process and the total overall is provided in Table 8.3. As the design is currently in concept stage, ranges are generally provided. These indicative log reductions would be refined as detailed design progresses.

Table 8.3 WRP treatment process with indicative log reductions

Treatment process unit	Indicative log reduction for pathogens		
	Viruses	Protozoa	Bacteria
Secondary treatment	0.5–2.0	0.5–1.5	1.0–3.0
Filtration	2.5–6.0	>6.0	3.5–6.0
UV radiation	>1.0	2.0–6.0	1.0–4.0
Chlorination	1.0–3.0	0–1.5	2.0–6.0
Range	>5.0–11.0	>8.5–15.0	7.5–19.0

Table 8.3 indicates that log reductions for protozoa and bacteria would meet the requirements for dual reticulation purposes. However, the indicative log reduction for viruses ranges from >5.0 to 11.0, which indicates that it is theoretically possible that the process may not meet the relevant requirements (as a log reduction of 6.0 or above is required). The RWRMP that is being developed for the Project would update and refine this data as detailed design progresses. The final design of the WRP treatment process would ensure that a log reduction for viruses would meet the requirements, as well as continuing to meet the requirements for other pathogens.

8.5.3 Specific management measures

To limit exposures to recycled water, CIC would apply the following risk management practices:

- Installation regulations and codes of practice that include systematic processes to reduce the probability of cross-connections.
- Materials codes and regulations that easily discriminate plumbing for drinking and recycled water.

- Regulations that require only licensed tradesmen to legally install or modify plumbing systems.
- Education on recycled water use and the need to avoid the creation of cross-connections.
- Opportunities to apply pressure differentials in certain situations to ensure that, if cross-connections occur, they are from higher to lower water quality.
- Installation of backflow prevention.
- Operational checking (ie testing of recycled effluent quality following treatment) and connection auditing.
- Discrimination of drinking and recycled water by using materials codes and regulations for plumbing. These would be undertaken by licensed tradesmen only.

This is only a preliminary set of practices, which would be further developed as part of the RWRMP process.

8.5.4 Stakeholder consultation

Details of consultation with local residents (Wickerslack Lane residents) and the Greater Southern Area Health Service regarding issues of human health are provided in Chapter 16.

The needs of the local residents with access to the Queanbeyan River have been taken into account, and consultation would occur throughout both construction and operation phases of the Project to ensure continued awareness and understanding and to address issues as they arise.

In addition, a community education strategy would be implemented as part of the development approval process for the first subdivision – Neighbourhood 1A (NH1A) – to limit human exposure to recycled water (refer to Chapter 16).

8.6 Conclusion

CIC Australia would manage human health risks by:

- Developing a risk management plan (RWRMP) that complies with the 12-element framework under the national guidelines for recycled water (AGRW). This would assure safety and sustainability throughout the life of the scheme.
- Ensuring that the recycled water scheme recognises and complements other relevant State licences and guidelines.
- Building on lessons learned from existing recycled water schemes in Australia, such as the Rouse Hill region in Sydney.
- Committing to mitigation and management measures as listed in the statement of commitments HH1–HH3 in Chapter 18.