

Recycled water systems: information guide for applicants

This guide provides information on the application process and requirements for recycled water schemes, with particular focus on schemes proposing use of recycled water for high exposure applications, such as dual reticulation and unrestricted irrigation.

Introduction

When using recycled water it is essential to protect public and environment health at all times. This can be achieved through good design, installation and appropriate management of recycled water systems.

In South Australia, all recycled water schemes using treated wastewater require approval from the Department of Health (DH) prior to installation.

Collection, treatment, reticulation and reuse systems are individually assessed by DH. Approvals are granted pursuant to the Public and Environmental Health (Waste Control) Regulations 1995.

How to use this guide

This guide is intended to assist planners, designers, engineers, councils and other persons responsible for the planning, design, installation and operation of a recycled water system.

This guide provides an explanation of the requirements to obtain DH approval for a recycled water system. It explains the level of detail required for high exposure applications such as use of recycled water in a dual reticulation system for toilet flushing, but can also be applied to other recycled water systems.

Application Requirements

Applicants are encouraged to contact DH to arrange a preliminary meeting with Wastewater Management Section staff to discuss the proposal and subsequent application requirements. Specific design, installation and operation requirements to protect public and environmental health will be discussed which may impact on the overall design of the system.

Consultation with DH is therefore encouraged during the early planning and design stages of a scheme. Preliminary or concept information (e.g. preliminary plans and a concept report) should be provided to aid discussions.

Applications should provide sufficient detail relevant to the proposal for assessment by DH. The level of detail required depends on the type of system and the associated risk to health, which is based on the proposed end use and potential for human exposure. For example, limited detail would be required for systems proposing use of water for drip irrigation of a vineyard. Comprehensive design, installation and operation information would be required for use of recycled water in a dual reticulation system for toilet flushing.

The DH may require further information in support of an application at any time to ensure an adequate assessment can be conducted.



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Applicants are referred to *the Australian Guidelines for Water Recycling (AGWR)* for design and operation guidance for a recycled water system. The AGWR provide a risk management approach that must be applied to the design, operation and management of all recycled water systems. Development of a recycled water RMP is central to the AGWR and is a DH requirement. The AGWR also provide several case studies of existing systems which may assist in preparation of a RMP.

The AGWR can be found at: [Australian Guidelines for Water Recycling: Managing Health and Environmental Risks \(Phase 1\) – November 2006](#)

Applications for approval of a recycled water system must include:

- a design report; and
- a recycled water Risk Management Plan (RMP).

An explanation of these requirements is provided in the following sections.

Design Report

A final design report describing the overall design and operation of the scheme should be submitted for assessment by DH as part of the application. Detail is required as follows:

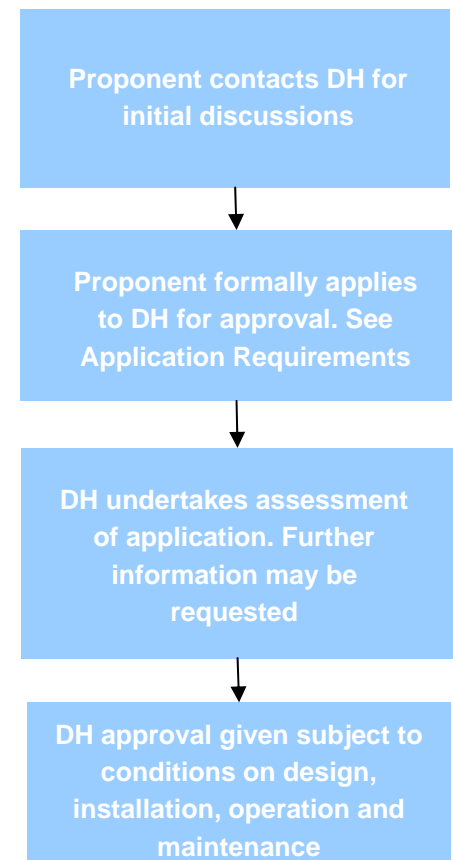
- A description of the system including key components, their design capacity (average and peak) and an overall schematic;
- Specifications and supporting engineering calculations, documentation and references for the design (which may include provision of independent engineering certifications);
- Scaled plans of all pipework, pump stations, treatment plant equipment, reuse or irrigation areas including site boundaries and buffer zones;
- Process and instrumentation diagrams.

The report should provide detail on the technical and engineering aspects of the design, however it is likely to reference the RMP in some areas.

Information on relevant legislation, guidelines, codes and standards for design of a recycled water system is provided in Attachment 1.

Recycled Water Risk Management Plan (RMP)

A recycled water RMP developed in accordance with the AGWR must be provided in support of the application to DH.



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Section 2 of the AGWR describes the 12 elements of the recycled water quality management framework, which forms the basis for a RMP.

The RMP must be produced as a stand-alone document to be used by all parties in the day to day operation and management of the scheme. The applicant must ensure that the recycled water RMP addresses all elements of the AGWR, using the headings and sequence described below.

Note: the highlighted boxes list the minimum requirements for assessment and approval from the DH. They do not cover all aspects of the AGWR risk management framework and should be read in conjunction with the relevant section of the AGWR. A comprehensive RMP which covers all aspects of the AGWR should be developed for safe and effective design, operation and management of the scheme.

1. Commitment to Responsible Use and Management of Recycled Water Quality

This section includes identifying the regulatory and formal requirements for the system, formation of partnerships, engagement of stakeholders, determination and communication of responsibilities and development of a recycled water policy.

- Identify all stakeholders and their specific responsibilities, including the supplier, scheme manager and users
- Describe how responsibilities will be understood and communicated to all stakeholders

For further assistance refer to AGWR Section 2.1

2. Assessment of the Recycled Water System.

This element requires an assessment of the system before strategies are planned and implemented to prevent and control hazards. The aim of the assessment is to:

- Provide a detailed understanding of the recycled water system from source to end use.
- Assess the hazards and events that can compromise recycled water quality and safety.
- Identify the preventive measures needed to control hazards and prevent adverse impacts on human health and the environment.

Collection and distribution systems associated with a recycled water system will also be assessed as part of the overall risk management strategy. This will include measures such as suitable vertical and horizontal separation of services in streets and premises, backflow prevention/ cross contamination strategies, and appropriate colour coding and marking of pipes.

- Provide a brief description of the recycled water scheme. Include the location of the scheme, the size of the scheme (design capacity, expected minimum and maximum flows), a description of the catchment, source of water and system inputs, the proposed end-uses of recycled water, a site plan showing the general arrangement of the treatment facility, a process flow diagram, and process instrumentation diagram and a schematic of the scheme including location of treatment processes, storages, pipelines and end-uses.
- Describe routes of exposure, receiving environments, endpoints and effects.

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- Include a flow diagram of the recycled water system.
- Identify potential sources of risk (based on a risk assessment) that will require control. Include risks associated with unintended uses such as cross connections.

For further assistance refer to AGWR Section 2.2 and 2.3

3 **Preventive Measures for Recycled Water Management**

This section deals with the measures required to prevent significant hazards or reduce hazards present in recycled water to acceptable levels. This includes the identification of critical control points (CCPs) and the “multiple barrier” approach to reduce risks from pathogens.

Table 3.8 of the AGWR describes the required water quality for various uses and describes indicative treatment processes. For example, to treat domestic sewage to a quality which can be used in a dual reticulation system, the ability of the treatment plant to achieve a 6.5 log removal of viruses and a 5 log removal of protozoa and bacteria must be demonstrated. This may require validation of certain treatment processes, described in Section 9.

CCPs are defined as activities, procedures or processes where control can be applied to prevent high risk hazards or reduce them to an acceptable level. CCPs must have operational parameters that are measurable, and for which critical limits can be set to define effectiveness.

- Identify and tabulate preventative measures for each significant hazard or hazardous event to ensure residual risks are reduced to acceptable levels
- Describe water quality objectives and why they are appropriate for intended uses, expressed in log reduction values (LRV) attributed to each particular end use.
- Tabulate treatment plant performance objectives, expressed in LRV attributed to specific treatment process units and/or onsite controls. Provide references to demonstrate validation of the performance claims (see Section 9).
- Identify Critical Control Points (CCPs), critical limits and target criteria.

For further assistance refer to AGWR Sections 2.3 and 3

4. **Operational Procedures and Process Control**

A key component of ensuring safe recycled water is to ensure all components of the recycled water system function effectively at all times. This is achieved by establishing operational procedures and processes to monitor the performance of the system, and to provide advance warning that water quality may be deviating outside the target limits and not meeting specified requirements for health. The identification of corrective actions when key processes fail is also important.

The effectiveness of operational monitoring will depend on equipment capabilities, maintenance and calibration. It should also be noted that for all validated systems, log reduction claims may be limited by the sensitivity of operational monitoring (see Section 9 on validation).

- Identify operational procedures required for all key processes and activities applying to the recycled water system.
- Describe how operational performance of the recycled water system will be

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ensured. Provide specific reference to CCPs and their mechanisms for operational control. Include statements on the capability and reliability of this equipment.

- Provide copies of preliminary operating procedures relating to all key processes and activities (including all CCPs) in a preliminary operations manual. These must include the critical limits, corrective actions described in the RMP and detail when the system can be brought back online after a shut-down.
- Provide a table of all key operational monitoring equipment, operational monitoring parameters (referencing CCP critical limits and target criteria, as discussed in Section 3), and monitoring frequency. Describe use of alarm systems where applicable. Provide links to monitoring protocols, including sampling, testing, auditing and equipment calibration.
- Provide a table listing corrective actions for non-compliance of all key operational parameters (specifically CCPs), e.g. disposal of non-compliant water if key processes fail.

For further assistance refer to AGWR Section 2.4 and Section 5.2.4

5. **Verification of Recycled Water Quality and Environmental Performance**

This element discusses the overall performance of the treatment system, the ultimate quality of the recycled water being supplied and the quality of the receiving environment. Verification provides confidence that all water quality targets are being achieved through sampling and testing of final water quality.

Development of a sampling and monitoring plan will be required. The specific parameters to be monitored should relate to the water quality objectives for the system, and should be developed in consultation with DH.

- Tabulate the water quality characteristics to be monitored, including what, where, when, how and who.
- Identify any customer feedback programs.
- Identify and document the procedures for review of monitoring data to ensure that the quality of water meets targets and complies with approval conditions.
- List corrective responses to non-conformance or feedback from users of recycled water.

For further assistance refer to AGWR Sections 2.5 and 5

6. **Management of Incidents and Emergencies**

This section sets out the requirement to develop protocols and communication strategies to manage incidents and emergencies in order to protect public and environmental health.

- Detail incident and emergency protocols specific to the production and supply of recycled water including response actions, roles and responsibilities and communication arrangements. These can include internal and external reporting.

Refer to AGWR Section 2.6

7. **Operator, Contractor and End User Awareness and Training**

Awareness and training for all operators, contractors and end-users is an essential part of the management framework. It includes ensuring that operators

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and contractors are appropriately trained and qualified in their required areas of expertise and includes identification of training needs for various individuals and groups. Employees need to be aware of the potential consequences of system failures, and of how their decisions can affect the safety of the scheme.

- Provide details on the suitability of the operators' and contractors' qualifications, training and experience.

Refer to AGWR Section 2.7

8. **Community Involvement and Awareness**

This element describes the process of consultation with users of recycled water and the community as well as information on developing a comprehensive strategy for consultation.

- Provide copies of the information to be given to recycled water users to promote awareness of recycled water quality issues, allowable uses, responsibilities and the impacts of unauthorised uses.

Refer to AGWR Section 2.8

9. **Validation, Research and Development**

Validation is a critical component of treatment process management and ensures that the required water quality objectives can be achieved. Validation involves demonstrating the performance of specific equipment through the evaluation of available scientific and technical information and/or undertaking investigations such as laboratory testing. Validation plays a key role in determining log reduction values attributable to a particular treatment process and the related operational monitoring requirements such as critical limits and target criteria.

For some processes (e.g. chlorination), published data recognised by DH can be used. Individual validation for other technologies (e.g. micro and ultra filtration, UV disinfection) will be required as these processes are known to produce variable results. Innovative processes will always require individual validation.

Validation must be undertaken through a DH endorsed process. For example, the *USEPA Protocol for Equipment Verification Testing for Physical Removal of Microbiological and Particulate Contaminants* is an accepted validation protocol for membrane filtration.

Validation techniques and protocols will depend on the technology used and should be discussed with DH in the early planning stages.

For all equipment which requires individual validation (e.g. micro filtration and UV disinfection), provide:

- A copy of the validation report for the particular model. The full report can be provided, but at the very minimum a summary report should be provided which includes sufficient information to enable performance claims to be assessed. For example, the summary report could include:
 - a) Summary of the process, test method and models tested

- b) The validated range of operating parameters and log reduction credits attributed to the model,
 - c) Operational monitoring
 - d) Justification for any deviation from the validation guidelines, and
 - e) Any pertinent information, caveats or qualifiers on the validation process, and design, operation and maintenance of the unit. DH may request further information as required.
- Endorsement of the validation report by an independent expert
 - Written comment from the design engineer, in conjunction with the manufacturer, that the validated model is suitable to be installed at the particular site, including:
 - a) Nomination of the design operational parameters and statement that these are within the validated range of operational parameters
 - b) Any caveats or qualifiers on the design, operation and maintenance specific to the site or to the validation (for example, velocity profiling, configuration of the units etc). *Reference should be made to Sections 3, 4 and 5 of the AGWR, where monitoring activities, critical limits and corrective actions are addressed.*

Note: Variations to the above will be considered, however, they will need to provide corresponding levels of confidence in the capability and suitability of the unit.

Refer to AGWR Section 2.9

10. **Documentation and Reporting**

This element sets out the requirements for effective documentation and reporting within the organisation, the community and various stakeholders (including DH).

- Detail documentation and records to be kept, including how, where and by whom.
- The recycled water RMP and all associated documentation and records must be the subject of a document control system.
- An annual report on the performance of the system must be prepared and provided to the Department of Health. Identify the person responsible for development and submission of this report.

Refer to AGWR Section 2.10

11. **Evaluation and Audit**

Long term evaluation of results and regular audits to assess the compliance of the recycled water management system with the RMP and DH approval conditions are required to determine whether preventive strategies are effective and are being implemented appropriately.

- Describe all internal and external audits (scope, frequency etc) to be undertaken on the recycled water system, specifically relating to auditing for compliance of the system with the recycled water RMP, DH conditions of approval and the AGWR.
- Describe the method of reporting and communication audit outcomes to stakeholders (including DH).

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Refer to AGWR Section 2.11

12. **Review**

Senior managers should review the effectiveness of the management system. If areas for improvement are identified, these should be addressed appropriately.

- Describe how the recycled water RMP will be reviewed and updated. Note that any changes to the RMP or operation of the treatment process will need to be approved by DH.

Refer to AGWR Section 2.12

Glossary

critical control point	A point, step or procedure at which control can be applied and that is essential for preventing or eliminating a hazard, or reducing it to an acceptable level
critical limit	A prescribed tolerance that must be met to ensure that a critical control point effectively controls a potential health hazard; a criterion that separated acceptability from unacceptability.
hazard	a biological, chemical, physical or radiological agent that has the potential to cause harm
log removal	used in reference to the physical-chemical treatment of water to remove, kill or inactivate microorganisms such as bacteria, protozoa and viruses (1-log removal = 90% reduction in density of the target organism, 2-log removal = 99% reduction, 3-log removal = 99.9% reduction, etc).
preventive measure	any planned action, activity or process that is used to prevent hazards from occurring or reduce them to acceptable levels.
recycled water	water generated from sewage, greywater or stormwater and treated to a standard that is appropriate for its intended use. <i>Note: this guide only refers to recycled water from sewage and greywater.</i>
residual risk	the risk remaining after consideration of existing preventive measures.
risk	the likelihood of a hazard causing harm in exposed populations in a specified time frame, including the magnitude of that harm.
risk management	the systematic evaluation of the water supply system, the identification of hazards and hazardous events, the assessment of risks, and the development and implementation of [preventive strategies to manage the risks.
validation of processes	the substantiation by scientific evidence (investigative or experimental) of existing or new processes and the operational criteria to ensure capability to effectively control hazards.

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Application Fee and Forms

- A fee of \$373.00 applies for all applications (to 30 July 2009).
- Recycled water scheme application forms are available at:
[Application for wastewater systems and reclaimed water reuse schemes for towns, subdivisions and communities](#)
- Recycled water product application forms are available at:
[Application for product approval for wastewater / waste control systems](#)
- Applications should be addressed to:
Wastewater Management Section
Department of Health
PO Box 6 Rundle Mall
Adelaide SA 5000

Contact

Wastewater Management
Public Health
SA Health

1st floor, Citi Centre Building
11 Hindmarsh Square
Adelaide SA 5000

Tel 08 8226 7100
Fax 08 8226 7102

ABN 97 643 356 590

Email: public.health@health.sa.gov.au

Web: www.health.sa.gov.au/pehs/environment-health-index.htm

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Based on the Victorian Department of Human Services
"Guide for the completion of a Recycled Water Quality Management Plan:
For Class A water recycling schemes", October 2008

Recycled water legislation and guidelines

A general list of the current legislation and guidelines relevant to the health aspects of recycled water schemes in SA is provided below. The applicability of the legislation and guidelines is dependent on factors such as the location, scale and type of recycled water system. Depending on the proposal, there may be additional requirements to consider.

Note that the list does not consider the requirements of other agencies or stakeholders and there may be additional legislation and guidelines which apply to the design, installation and operation of a recycled water system.

It is the responsibility of the proponent to confirm compliance with all regulatory requirements.

Current Legislation

Public and Environmental Health Act 1987

This Act provides for promotion of proper standards of public and environmental health in SA and is a key element in the administration of matters relating to water recycling and enforcement of standards. It can be accessed at:

<http://www.legislation.sa.gov.au/LZ/C/A/PUBLIC%20AND%20ENVIRONMENTAL%20HEALTH%20ACT%201987.aspx>

Public and Environmental Health (Waste Control) Regulations 1995

These regulations require approval of the sale, installation, operation and maintenance of all wastewater systems in the State (including recycled water systems). Local government administers approvals of wastewater systems covered by a prescribed code, while the regulations provide authority for the Department of Health to approve installation of all wastewater infrastructure and sale of wastewater products for use in SA.

The regulations can be accessed at:

[http://www.legislation.sa.gov.au/LZ/C/R/PUBLIC%20AND%20ENVIRONMENTAL%20HEALTH%20\(WASTE%20CONTROL\)%20REGULATIONS%201995.aspx](http://www.legislation.sa.gov.au/LZ/C/R/PUBLIC%20AND%20ENVIRONMENTAL%20HEALTH%20(WASTE%20CONTROL)%20REGULATIONS%201995.aspx)

SAHC Code- Waste Control Systems Standard for Construction, Installation and Operation of Septic Tank Systems in SA 1995

This code details the technical aspects to be considered in the planning and design stages of a wastewater system and sets out the requirements relating to the approval, installation and operation of these systems. The Standard and its supplements also provide information on the hydraulic flows and BOD loadings relating to commercial /community sites other than domestic dwellings. The standard can be accessed at:

<http://www.dh.sa.gov.au/pehs/publications/Septic-tank-book.pdf>

<http://www.dh.sa.gov.au/pehs/publications/Supplement-B.pdf>

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Environment Protection Act 1993

This Act ensures that measures are taken to protect, restore and enhance the quality of the environment. The Act can be found at:

<http://www.legislation.sa.gov.au/LZ/C/A/ENVIRONMENT%20PROTECTION%20ACT%201993.aspx>

Environment Protection (Water Quality) Policy 2003

This policy was developed to manage water quality throughout the state. It applies to all inland surface, ground water and marine waters and covers a range of issues including water quality objectives, management of diffuse and point source pollution, obligations with respect to various activities and discharge limits. The policy can be accessed at:

[http://www.legislation.sa.gov.au/LZ/C/POL/ENVIRONMENT%20PROTECTION%20\(WATER%20QUALITY\)%20POLICY%202003.aspx](http://www.legislation.sa.gov.au/LZ/C/POL/ENVIRONMENT%20PROTECTION%20(WATER%20QUALITY)%20POLICY%202003.aspx)

Guidelines and Standards

Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase1) 2006

The guidelines provide a risk assessment framework for the treatment and reuse of recycled water and provide information for all persons involved in the design of a recycled water system and preparation of a risk management plan. The guidelines can be accessed at:

http://www.ephc.gov.au/pdf/water/WaterRecyclingGuidelines-02_Nov06_.pdf

Water Services Association of Australia Codes:

The Water Services Association of Australia (WSAA) has developed a series of codes for construction, design, maintenance, condition assessment and rehabilitation of the industry's water and sewer network infrastructure, including:

- WSA 02-2002 Sewerage Code of Australia Version 2.3 (Note that there is also SA Water Supplementary Documentation to this Code)
- Dual Water Supply Systems Version 1.2, a Supplement to the Water Supply Code 2002 Version 2.3
- WSA 07-2007 Pressure Sewerage Code of Australia Version 1.1
- WSA 06-2008 Vacuum Sewerage Code 2008 Version 1.2

For more information on the purchase of these codes see:

<https://www.wsaa.asn.au/frameset2.html>

SA Water Supplementary Documentation to WSAA Codes

SA Water, in conjunction with WSAA has developed a suite of standards for the design and installation of water supply and sewerage infrastructure. SA Water has incorporated the WSAA Water Supply Code of Australia and Sewerage Code of Australia as part of its suite of standards.

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Due to regional differences it has not been possible for SA Water to implement all of the national code initiatives, therefore a small supplementary section has been included as part of SA Water's manuals to identify their individual requirements.

For further information, see:

<http://www.sawater.com.au/SAWater/DevelopersBuilders/NetworkInfrastructureStandards/>

Septic Tank Effluent Drainage Scheme Design Criteria

This prescribed code sets out the design requirements for septic tank effluent disposal schemes (now known as Community Wastewater Management Schemes, CWMS). The guidelines can be accessed at:

<http://www.dh.sa.gov.au/pehs/branches/wastewater/steds-criteria.pdf>

SA STEDS Construction Manual and Technical Specifications

This document covers the materials, testing and installation requirements for Community Wastewater Management Schemes. The manual can be accessed at:

<http://www.dh.sa.gov.au/pehs/branches/wastewater/steds-speci-form.pdf>

AS/NZS 3500:2003 Plumbing and Drainage

This code addresses the requirements for design and installation of plumbing and drainage from the property fixtures to the authority's drain. The code also covers backflow prevention requirements which are essential for all recycled water schemes.

Further information / purchase of the standard can be obtained from SAI Global and SA Water at:

<http://www.saiglobal.com/shop/script/Provider.asp?Db=AS>

<http://www.sawater.com.au/SAWater/DevelopersBuilders/ForPlumbers/>