

# Water quality guidelines for recycled water schemes

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## 1. Introduction

The relevant recycled water provisions of the *Water Supply (Safety and Reliability) Act 2008* (the Act) commenced on 1 July 2008 and are administered by the Department of Energy and Water Supply (DEWS). The chief executive of DEWS is the regulator under the Act.

The Act includes provisions relating to recycled water. The primary aim of the recycled water provisions is to protect public health and, for certain schemes known as critical recycled water schemes, to ensure continuity of operation of the scheme to meet the essential water supply needs of the community or industry.

The Act requires that a recycled water provider must have either of the following before supplying recycled water unless they are covered by a transitional period:

- a recycled water management plan (RWMP) approved by the regulator; or
- an exemption from preparation of a RWMP granted by the regulator (refer to *Recycled water management plan exemption guidelines*).

Transitional periods about recycled water are specified in sections 631–634 of the Act<sup>1</sup>.

The Act can be viewed at <[www.legislation.qld.gov.au](http://www.legislation.qld.gov.au)>.

### 1.1 Scope of the *Water Supply (Safety and Reliability) Act 2008*

#### 1.1.1 What is recycled water?

The Act covers specific sources of recycled water that are intended to be reused. The term ‘reused’ includes being treated to improve the water’s quality, but does not include merely being discharged into, or disposed of in, the environment. For example, water being placed in a dam to augment drinking water supplies is covered, but water being discharged into a river for disposal under an approval issued by the Environmental Protection Agency is not covered.

The sources of recycled water covered by the legislation are:

1. **Sewage or effluent sourced from a service provider’s sewerage.** A service provider is defined in the Act as:

- a local government that owns infrastructure for supplying water or sewerage services
- a water authority that owns infrastructure for supplying water or sewerage services
- each person who is:
  - the owner of one or more elements of infrastructure for supplying water or sewerage services for which a charge is intended to be made; or
  - a person nominated in a regulation as a related entity of a person who is the owner of one or more elements of infrastructure for supplying water or sewerage services for which a charge is intended to be made.

Owning infrastructure for the production and supply of recycled water does not in itself qualify a person as a service provider unless the person also owns other infrastructure for the supply of a water or sewerage service. A service provider does not include a service supplied by infrastructure, if:

- the infrastructure is used solely for mining purposes; or
- the service is used only by:
  - the owner of the infrastructure or the owner’s guests or employees including, for example, guests at a resort; or

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<sup>1</sup> A summary of the transitional arrangements can be found in Table 1 of the *Recycled water management plan exemption guidelines* and the *Recycled water management plan and validation guidelines*

- if the owner of the infrastructure is a body corporate for a community titles scheme under the *Body Corporate and Community Management Act 1997*—the occupants of lots in the scheme.
2. **Greywater sourced from a large greywater treatment plant** as defined in the *Plumbing and Drainage Act 2002*. A large greywater treatment plant is a plant capable of treating at least 50 kilolitres of greywater a day. While greywater is defined in the *Plumbing and Drainage Act 2002* as wastewater from a bath, basin, kitchen, laundry or shower, whether or not the wastewater is contaminated with human waste, kitchen greywater is not allowed to be recycled<sup>2</sup>.
  3. **Wastewater**, other than water outlined in points 1 and 2 above. Wastewater means the spent or used water generated on premises from industrial, commercial or manufacturing activities, or animal husbandry activities prescribed under a regulation, other than spent or used water generated from an agricultural activity or a mining activity<sup>3</sup> or petroleum activity<sup>4</sup>. However, wastewater is not covered by the Act if:
    - it is not supplied to another entity, that is, if the wastewater is used by the entity generating the recycled water, it does not fall under the jurisdiction of the Act. The Department of Employment and Industrial Relations has jurisdiction under the Act in those circumstances
    - it is supplied to an entity prescribed under a regulation as a related entity to the entity that produces the recycled water. At the date of the approval of this guideline, there was no regulation for any entity to be prescribed. However it is envisaged that related entities prescribed in any future regulation would include certain familial relationships. For example, it is likely to include supply of wastewater by a husband to his wife.

Wastewater is only covered by the Act when it is supplied to another entity for reuse, where the other entity is not a related entity. Sewage, effluent or greywater is covered by the Act where it is reused by the entity that produces it, or supplied by that entity to another entity for reuse.

For the purposes of the Act, recycled water does not include for example stormwater, desalinated water or water extracted during coal seam methane gas extraction processes.

### 1.1.2 Who is a recycled water provider?

A recycled water provider means an entity that:

- owns infrastructure for the production and supply of recycled water; or
- another entity, prescribed under a regulation, that owns infrastructure for the supply of recycled water. This only applies to a single-entity scheme and enables other entities which supply, but do not produce, recycled water to be covered by the legislation. For instance, a pipeline supplying recycled water from one entity to another may be prescribed under a regulation as a recycled water provider.

In some cases, recycled water schemes may operate in sequence, that is, a recycled water provider may obtain their source water from another recycled water provider. For example, an advanced water treatment plant owner may treat and use effluent from a local government's sewerage treatment plant, where the owners are different, both would be considered as recycled water providers and both require their own RWMP or exemption.

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2 Under the Act greywater does not include wastewater from a kitchen.

3 Defined in the *Environmental Protection Act 1994* section 147.

4 Defined in the *Environmental Protection Act 1994* section 77(1).

A recycled water scheme can be declared a critical scheme by the regulator<sup>5</sup>. A critical recycled water scheme can involve either a single-entity or multiple-entities. For multiple-entity critical recycled water schemes<sup>6</sup>:

- there must also be a nominated scheme manager
- there may also be other declared entities, which are other entities other than the scheme manager or recycled water provider(s). Other declared entities are owners of infrastructure for the supply, rather than production and supply, of recycled water. These entities are specifically identified as other declared entities when a scheme is declared to be a critical recycled water scheme by the regulator. For example, in a scheme supplying recycled water to augment drinking water supplies where there is an entity who does not own infrastructure for the production of recycled water, but that entity does own infrastructure for the supply of recycled water (for example, a pipeline), that entity may be declared to be part of a recycled water scheme.

For the purpose of these guidelines, a reference to a recycled water provider also includes a declared entity under the Act.

## **1.2 Aim of the guidelines**

Under section 571(1)(h) of the Act, the regulator has the power to make guidelines for the purpose of providing guidance to recycled water providers on the quality of recycled water. The *Water quality guidelines for recycled water schemes* (these guidelines) have been prepared for that purpose.

These guidelines provide information on the minimum water quality criteria that apply to recycled water. The guidelines also include information on how control measures may impact on what is considered an acceptable water quality.

Water quality criteria are not prescribed for all sources and uses. Where they are not prescribed, the recycled water provider should contact the regulator so that water quality criteria can be determined on a case by case basis.

These guidelines do not specify how to demonstrate compliance with the water quality criteria. Other guidelines have been developed to explain how to demonstrate compliance and these are discussed in section 1.3.

It is anticipated that these guidelines will be reviewed.

In these guidelines, some of the regulator's requirements are mandatory as they are legislative requirements of the Act. Where the regulator's requirement is mandatory, the guideline will use the word 'must'. In this case, the recycled water provider must supply the information required and in the manner prescribed. It is the recycled water provider's responsibility to ensure that mandatory legislative requirements of the Act are met.

In other cases, the regulator's requirements are not mandatory. If the requirement is not mandatory the word 'should' is used in these guidelines and recycled water providers are able to follow the guideline suggestion if they choose, or alternatively choose their own methods or information for achieving requirements.

If a recycled water provider chooses to use their own method for satisfying the regulator's requirement, the regulator will assess that alternative approach against the regulator's policy objectives and the overarching aims of the Act. The explanatory material in this guideline is indicative of the regulator's policy objectives and the Act's aims, but the regulator may also choose to look at other information

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<sup>5</sup> The regulator may declare a recycled water scheme to be a critical recycled water scheme if the regulator reasonably believes the declaration is necessary to maintain continuity of operation of the scheme to meet the essential water supply needs of the community or industry or to ensure the appropriate management of risks to public health posed by the supply of recycled water under the scheme. Refer to sections 300–307 of the Act for additional information on the declaration of critical recycled water schemes. These sections also contain information about which of those schemes the regulator must declare critical.

<sup>6</sup> A multiple-entity recycled water scheme includes more than one recycled water provider or at least one recycled water provider and another entity.

which supports its policy objectives and the Act's aims such as best practice industry standards, information provided by technical experts or other health based information.

### 1.3 Relationships to other guidelines

#### 1.3.1 Are there any other regulatory guidelines?

These guidelines are part of a suite of guidelines prepared to assist recycled water providers in understanding the requirements that the Act places upon them. In addition to these guidelines, other regulatory guidelines in this suite include:

- *Recycled water management plan and validation guidelines*
- *Recycled water management plan exemption guidelines*
- *Audit and annual reporting guidelines*<sup>7</sup>.

There are other guidelines, outlined in section 1.3.2, which provide advice on water recycling.

#### 1.3.2 What other useful information is available?

Other sources of valuable information are available for potential recycled water providers considering or intending to establish a recycled water scheme.

The *Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 1) (2006)* (AGWR Phase 1) and the *Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 2) Augmentation of Drinking Water Supplies (2008)* (AGWR Phase 2) outline a risk management approach to the production and use of recycled water based on the framework developed for the *Australian Drinking Water Guidelines (2004)*.

AGWR Phase 1 focuses only on sewage and greywater as sources of recycled water. They provide specific guidance on the use of treated sewage and greywater for purposes other than augmentation of drinking water supplies and environmental flows. More information on the AGWR can be found on the Environment Protection and Heritage Council website at <[www.ephc.gov.au](http://www.ephc.gov.au)>.

The module of the AGWR Phase 2 addressing augmentation of drinking supplies, has already been published. Subsequent modules are being developed and will focus on other aspects of recycled water such as stormwater harvesting and end uses such as modified aquifer recharge. All modules are based on a risk management approach.

The *Manual for recycled water agreements in Queensland* published by the Queensland Government provides information and guidance on writing a contract for the supply and use of recycled water. The manual can be found on the DEWS website at <[www.dews.qld.gov.au](http://www.dews.qld.gov.au)>.

Water Services Association of Australia (WSAA) *National Wastewater Source Management Guidelines* have been approved and are a useful reference for any scheme which requires sewage source control.

#### 1.3.3 Relationship to other legislation and regulations

Recycled water schemes may operate under different legislation which must be complied with, for example, *Workplace Health and Safety Act 1995*, *Plumbing and Drainage Act 2002* and the *Environmental Protection Act 1994*. The requirements of the Act do not negate the requirements of other legislation unless where expressly stated or by implication. It is the responsibility of the recycled water provider, or scheme manager where applicable, to determine and ensure compliance with relevant legislative obligations.

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<sup>7</sup> The *Audit and annual reporting guidelines* are being developed and will be made available when approved.



## **2. Recycled water provider and scheme manager obligations**

### **2.1 What water quality criteria obligations apply to recycled water providers and scheme managers?**

Water quality criteria relate primarily to the protection of public health. Recycled water providers and scheme managers are required to:

- meet the specified water quality criteria as outlined in this guideline, the *Public Health Regulation 2005* and any information notice
- meet the water quality criteria on a continuous basis. For example, water quality criteria must be consistently demonstrated (to the regulator's satisfaction) during the commissioning verification stage and then must be met continuously while the recycled water is provided to the end user
- meet water quality criteria as close as practicable to the point where the recycled water is supplied (note point of supply in relation to water quality criteria means, where possible, the physical point of transfer to the user). There are instances where this is not practical and will not accurately represent the water quality of the scheme. It is in these instances that the recycled water provider, or scheme manager where applicable, should discuss with the regulator options for monitoring points and the point of application of water quality criteria
- meet the water quality criteria appropriate to the intended use or supply, a quality that, when combined with appropriate control measures, will make the recycled water suitable for the intended use
- confirm that the control measures, where used, as outlined by the user in their RWMP or RWMP exemption application, are in place prior to supplying the recycled water.

Recycled water providers may choose, at their discretion, to go beyond these requirements and produce a higher quality of water for the intended use. However, they must meet the minimum water quality criteria.

It is highly recommended that recycled water providers, and scheme managers where applicable, develop a formal agreement with users specifying obligations and responsibilities for both the provider and the user. This agreement should also detail any control measures that have been agreed upon between the recycled water provider and user. Further information on preparing a recycled water agreement can be found in the *Manual for recycled water agreements in Queensland*.

### **2.2 What happens if I don't meet the relevant water quality criteria?**

Once a RWMP is approved, section 270 of the Act requires a recycled water provider, other declared entity or the scheme manager (where applicable), to undertake certain notifications to the regulator where they become aware of a non-compliance. The non-compliance refers to non-compliance with the RWMP, to the extent that the water's quality under the plan must be consistent with any water quality criteria for recycled water.

Notification must be given to the regulator which provides detail of the non-compliance, and the circumstances that give rise to the non-compliance.

The notification must be made to the regulator immediately unless there is a reasonable excuse. There is a significant penalty for non-compliance with this requirement of the Act. If the notice is given orally, the responsible entity must give the regulator written notice of the information in the approved form as soon as practicable. This form is available online at <[www.dews.qld.gov.au](http://www.dews.qld.gov.au)>.

The regulator will apply a specific condition on each exemption approval granted requiring the recycled water provider to immediately (unless they have a reasonable excuse) report non-compliance with any applicable water quality criteria for the scheme.

### **2.3 Does compliance with water quality criteria guarantee suitability of recycled water for an intended use?**

Recycled water that complies with public health water quality criteria may not necessarily be suitable for certain intended uses. For example, recycled water supplied to a farmer for irrigating a minimally processed food crop may meet the water quality criteria specified in the *Public Health Regulation 2005*, but the *Public Health Regulation 2005* does not specify a water quality criteria for salinity. It is possible that the water supplied could meet the *Public Health Regulation 2005* requirements, but still be unsuited to the irrigation of that crop due to high levels of salinity, for example.

### 3. Minimum water quality criteria

The Act defines water quality criteria for recycled water as follows:

- (i) the standards for the quality of recycled water, relating to the sources and uses of the water, prescribed in a regulation under the Public Health Act;
- (ii) the criteria for the quality of recycled water, relating to the sources and uses of the water—
  - (A) stated in a guideline, if any, made by the regulator about the quality of recycled water; or
  - (B) in relation to the quality of recycled water to which a recycled water management plan or an exemption relates—stated in a regulator condition for the plan or exemption.

#### 3.1 What are the minimum water quality criteria?

##### 3.1.1 Where the water quality criteria are found

Water quality criteria for recycled water are set out in this guideline, the *Public Health Regulation 2005* and any information notice given for a RWMP approval or a granted exemption. These criteria prescribe the minimum water quality that must be met by recycled water providers to ensure that the quality of the recycled water is protective of public health<sup>8</sup>. Recycled water providers can provide a higher quality of water if they choose.

Regardless of whether the water quality criteria come from this guideline, the *Public Health Regulation 2005*, or any information notice given for a RWMP approval or a granted exemption – if there is an applicable water quality criteria for any of the sources or uses applicable to the scheme – the provider must comply with all of the relevant water quality criteria. For example, schemes supplying recycled water for augmenting drinking water supplies<sup>9</sup> or class A+ recycled water will need to meet the water quality criteria prescribed both in these guidelines and in the *Public Health Regulation 2005*.

##### 3.1.2 What the water quality criteria prescribe

Water quality criteria may be set for a range of matters including:

- performance values (for example, values for re-sampling, values and/or annual values)
- requirements for sampling (for example, different factors which must be sampled and frequency of sampling)
- requirements for a follow up sample where a performance value is not met
- a requirement to undertake an analysis of the samples (for example, if the quality of water has been monitored for 12 months an analysis of compliance with annual values may be required)
- for recycled water that augments a supply of drinking water, there is a:
  - requirement to be supplied into a receiving water source
  - requirement to be stored under conditions that allow for sufficient management of any risk to the health of the public from the recycled water quality
  - requirement for an assessment of risk to public health where a value is not met.

Section 3.1.6 of these guidelines provides further information of how the various water quality criteria operate. However, because the criteria operate differently for different types of schemes (that is, water quality criteria for recycled water schemes producing class A+ to D recycled water have a number of performance values), this is first explained. Recycled water providers who do not produce class A+ to

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<sup>8</sup> Water quality criteria under the Act relate to the potential risk to human health as opposed to the health of animals or harm to the environment.

<sup>9</sup> Where the recycled water for augmenting drinking water is sourced from sewage or treated effluent which is sourced from a service provider's infrastructure.

D recycled water should disregard sections 3.1.3 to 3.1.5 of this guideline, and refer to section 3.1.6 of these guidelines.

### 3.1.3 Explaining water quality criteria for class A+ to D recycled water

Unlike performance values for other types of recycled water (such as those applying to schemes which augment drinking water), performance values for class A+ recycled water and class A to D recycled water are not a singular set of values, but instead, are three values which are set for a number of points in time (only some of which have to actually be met). This concept is explained further below, and is illustrated in diagram one.

The three relevant values are as follows:

1. **The short term value/sample** – is a value which itself does not have to be achieved by the scheme, but instead is used in the two following ways:
  - a) where the exceedance of the short term value acts as a trigger for a subsequent resample (see point 2 below); and
  - b) the result of the short term sample (rather than the short term value itself) is used to calculate the annual value in point 3 below).
- Diagram one illustrates how to find the short term value in *Public Health Regulation 2005* (using *E.coli* in a class A+ recycled water scheme as an example). The short term value is shown in Box No. 1 (yellow), in diagram one.
- Section 3.1.4 of these guidelines also explains how the sample taken to establish the short term value, is also used to calculate the annual value (regardless of whether or not the short term value was exceeded).
- Reporting the ‘failed’ short term value to the regulator is not required. That is, the exceedance of the short term value referred to in Box No. 1 (yellow) in diagram one does not need to be reported to the regulator under section 270.

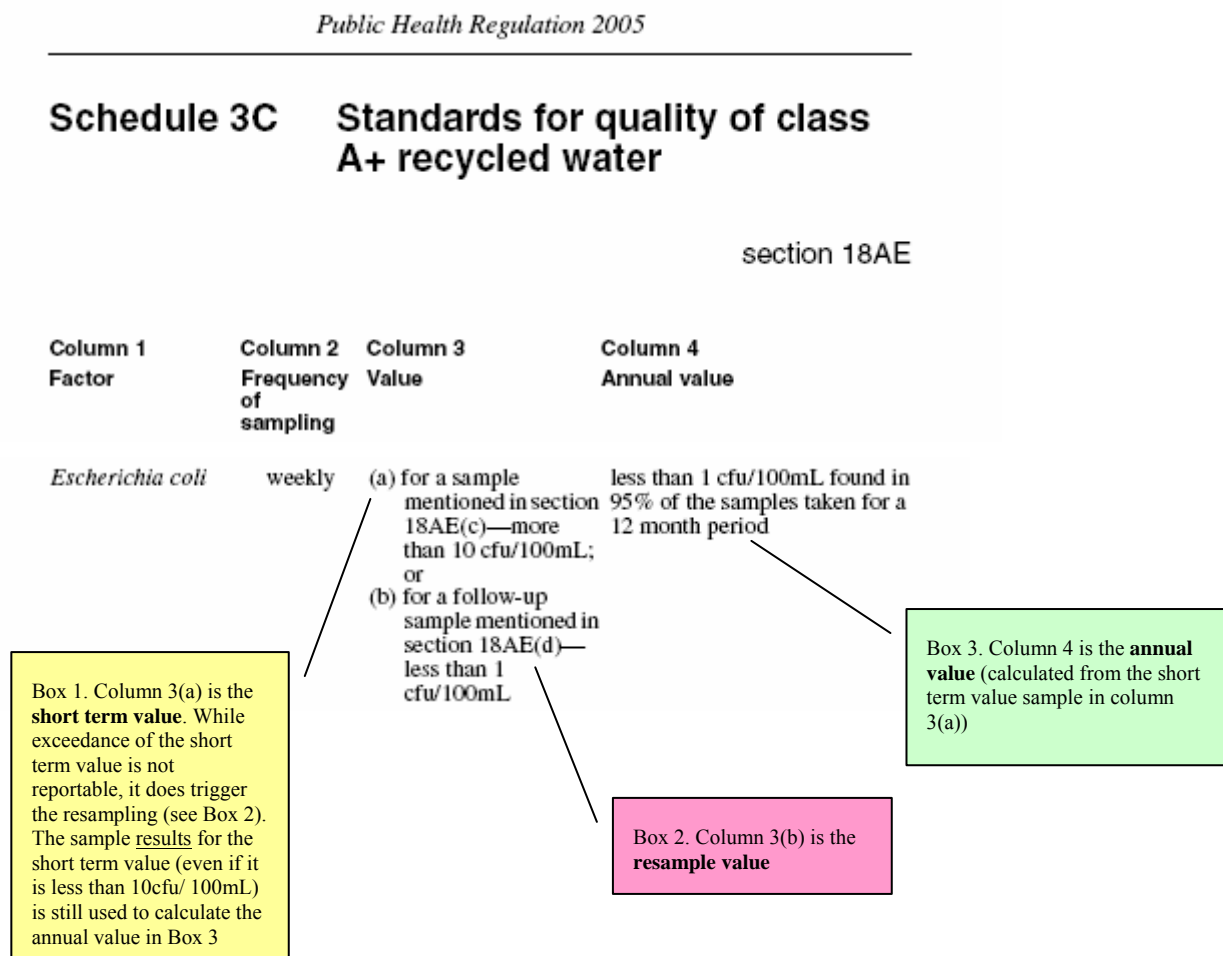
Note: While the short term value is often less conservative than the resample value, it is important to recognise that:

- exceeding the short term value may eventually result in a failure to meet the annual value. For example:
  - to meet the short term value for *E. coli* for a class A+ recycled water scheme under the *Public Health Regulation 2005* the result must be 10 cfu (colony forming units)/100mL (millilitres) or less, and
  - the result of the short term value test is 11 cfu/100mL (where a resample is then required),
  - then the 11 cfu/100mL short term value sample result will contribute towards the annual value (which has a value of less than 1 cfu/100mL found in 95% of the samples taken for a 12 month period), and
  - continued short term value sample results of 1 cfu/100mL or more may mean a failure to comply with the annual value.
- compliance with the short term value could still eventually result in a failure to meet the annual value. For example:
  - to meet the short term value for *E. coli* for a class A+ recycled water scheme under the *Public Health Regulation 2005* the result must be 10 cfu/100mL or less, and
  - the result of the short term value sample is 9 cfu/100mL (where a resample is not required),
  - the result will still contribute towards the annual value which has a value of less than 1 cfu/100mL found in 95% of samples taken for a 12 month period, because the 9 cfu/100mL short term value sample result is higher than the annual value of less than 1 cfu/100mL, and
  - continued short term value sample results of 1 cfu/100mL or more may mean a failure to comply with the annual value.

In effect, recycled water providers should be aiming to avoid exceeding both the short term value and the resample value at all times to avoid non-compliance with the annual value.

2. **The resample value** – this value is the value which must be achieved on the resample (that is, the sample that occurs after the short term value was exceeded).
  - Diagram one illustrates how to find the resample value in the *Public Health Regulation 2005* (using *E. coli* in class A+ recycled water scheme as an example). The resample value is shown in Box No. 2 (pink) in diagram one.
  - This value must be achieved, and if not, the exceedance must be reported to the regulator under section 270 of the Act, unless there is a reasonable excuse.
3. **The annual value** – this value is the value which must be achieved: (a) once 12 months of monitoring under an approved RWMP or exemption approval has taken place; and (b) at each subsequent month after that.
  - Diagram one illustrates how to find the annual value in the *Public Health Regulation 2005* (using *E. coli* in class A+ recycled water scheme as an example). The annual value is shown in Box No. 3 (green) in diagram one.
  - Further information showing how the annual value is calculated (at both the 12 month interval and each subsequent month) from the short term value tests taken, is given in sections 3.1.4 and 3.1.5 of these guidelines.
  - This value must be achieved, and if not, the exceedance must be reported to the regulator under section 270 of the Act, unless there is a reasonable excuse.

**Diagram One**



Note: The above extract shows schedule 3C of the *Public Health Regulation 2005* as at the time of approval of these guidelines.

### 3.1.4 Calculating the annual value in the inaugural year (for class A+ to D recycled water)

As explained in section 3.1.3 of these guidelines:

- the short term value, while a performance value in the sense that it triggers resampling, it is not a value which the scheme actually has to achieve (only the resample value and the annual value are values which the scheme actually needs to achieve).
- the other use of the results of the short term sample (whether or not they comply with the short term value) is to calculate the annual value. This calculation is performed for the first time when there is 12 months of operational monitoring data for the approved RWMP or exemption, and every month thereafter. That is, the annual value is not required to be calculated until a scheme has 12 months of short term value sample results. Once 12 months of short term value sample results have been collected, the calculation of the annual value must be updated each month.

This subsection of the guideline aims to show how the annual value is calculated for the first 12 months, from the test results of the short term value samples (regardless of whether the short term value was exceeded or not). The next section of these guidelines (3.1.5) outlines how 'rolling 12 month' annual values are calculated and updated monthly.

#### **Summary example – annual value exceedance for class A+ recycled water for *E. coli* (as per diagram one)**

For class A+ recycled water, the *Public Health Regulation 2005* requires:

- that short term value sample result for *E. coli* must be 10 cfu/100mL or less (otherwise a resample must be taken and be less than 1 cfu/100mL) and that testing be undertaken on a weekly basis; and
- that 95% of the short term value sample results for the twelve month period must be less than 1 cfu/100mL (annual value).

To work out how many tests over the 12 months must comply with the annual value of less than 1cfu/100mL requirement:

Take the total number of short term value sample results for the twelve months (that is, 52 tests as the tests must be done weekly) x 95% = 49.4 which is then rounded up to a whole figure of 50. This means to comply with the annual value, you must have 50 short term value sample results which have less than 1 cfu/ 100mL (that is, not more than two short term value sample results which have 1 cfu/ 100mL or more).

*Summary:*

In a 52 week period, if three or more short term value sample results are equal to or exceed 1 cfu/100mL, then the annual value has been exceeded and is not compliant.

#### **Expanded example for calculating compliance with the annual value for class A+ recycled water under the *Public Health Regulation 2005*:**

1. Collect data on all short term results for the relevant period of time. Identify those results that exceed the annual value (that is, those which are 1 cfu/100mL and above). Determine the total number of exceedances.
2. Then calculate the number of times the annual value is allowed to be exceeded. For *E. coli* for class A+ recycled water, the annual value of 1 cfu/100mL must be met in 95% of the short term value sample results (that is, 95% x 52 tests = 49.4 rounded up to 50 tests). Therefore 50 short term value sample results must be compliant and two short term value sample results may be non-compliant.

If in this example there were three short term value sample results which were 1 cfu/100mL or above in a 52 week period, then the annual value for *E. coli* for class A+ recycled water has been exceeded and is not compliant. In this case, there is only 94% compliance (49 compliant short term value sample results divided by 52 weeks) when there should be 95% compliance.

In that case, the relevant entity must report the breach of the RWMP or RWMP exemption approval to the regulator immediately unless they have a reasonable excuse (the breach of the RWMP or RWMP exemption arises because of the exceedance of the annual value).

Had the recycled water provider only had two short term value sample results which were 1 cfu/100mL or more in a 52 week period, instead of three, in a 52 week period, the recycled water provider would have complied with the annual value of 95% and no report to the regulator would have been necessary (that is, 50 compliant short term value sample results divided by 52 weeks = 96% compliance).

**Note:**

**The resample values are not used in the calculation of compliance with the annual value.**

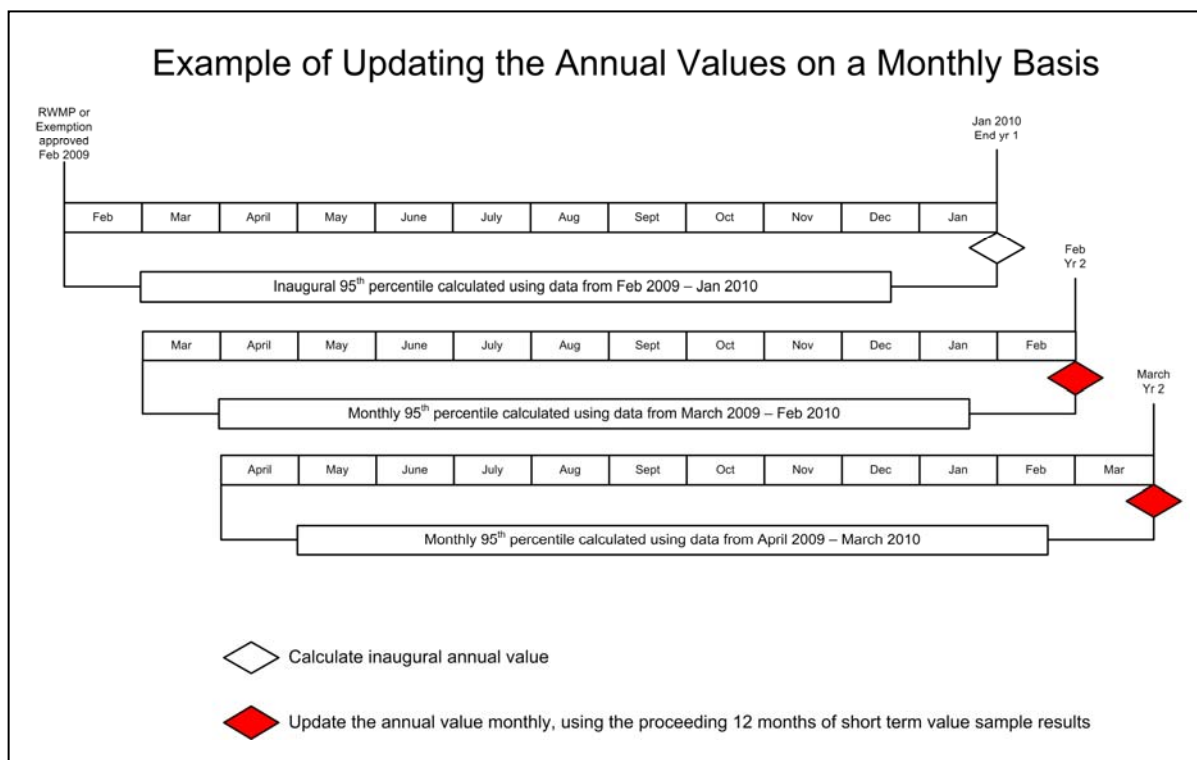
**In addition to reporting of exceedances of annual values, the recycled water provider might also have exceeded resample values during the year and would also have been required to report those resample value exceedances.**

**3.1.5 Updating the annual value on a monthly basis (for class A+ to D recycled water)**

As previously mentioned, the annual value must be recalculated on the collection of each subsequent month's short term value sample results. The updated annual value must use the preceding 12 months short term value sample results.

Diagram two outlines how the relevant 12 month (52 week) period is a rolling period, where the annual value (derived from the short term sample results in the rolling 52 week period) is recalculated monthly:

**Diagram Two**



The method of monthly calculation of the annual value is exactly the same as outlined in section 3.1.4, with the exception that the short term sample results used as the basis for the calculation are not those obtained in the first 52 weeks, but instead are those in the 'rolling' 52 weeks of short term sample results.

A more detailed example of calculating both the inaugural and monthly calculations of the annual value is shown in the attachment in section 7 of these guidelines.

Where the relevant entity for the scheme calculates the annual value at monthly intervals, and becomes aware that there has been a breach of RWMP or the exemption because the annual value has been exceeded at that point in time – the relevant entity must immediately report to the regulator unless they have a reasonable excuse (see section 270 of the Act).

### 3.1.6 Explaining the water quality criteria in general

#### Examples of water quality criteria from the Public Health Regulation:

Examples of the way in which water quality criteria may be set for a range of matters is outlined in the tables below.

Note: the following tabled examples contain summary information about non-compliance reporting and annual reporting obligations. This information is a summary only, and recycled water providers should refer to the Act (for non-compliances) and the *Audit and annual reporting guidelines*<sup>10</sup> (for audit and annual reporting obligations).

Example 1: For class A+ recycled water, in accordance with the *Public Health Regulation 2005*, using *E. coli* as an example, the water quality criteria are<sup>11</sup>:

General criteria	Specific criteria for <i>E. coli</i>	Notification to the regulator where value not met
Requirement for sampling which covers frequency of samples for factors to be tested	<i>E. coli</i> must be tested on a weekly basis	
Short term value sample	If in any sample taken for <i>E. coli</i> the value is more than 10 cfu/100mL, a follow up sample must be taken and tested for <i>E. coli</i>	
Resample value	The value of the follow up sample for <i>E. coli</i> must be less than 1 cfu/100mL	If the value of the sample is not less than 1 cfu/100mL, the responsible entity (the scheme manager, other declared entity or the recycled water provider) must notify the regulator. This matter must also be included in the annual report for the scheme
Annual value	95% of the samples taken over a 12 month period must have less than 1 cfu/100mL <i>E. coli</i> . Once the recycled water has been monitored for 12 months, the rolling 12 month average can be worked out at the end of each month. For example, January to December, then February to January, March to February, Refer to Diagram 1	If the annual value exceeds these criteria, then the responsible entity must notify the regulator. This matter must also be included in the annual report for the scheme

10 The *Audit and annual reporting guidelines* are being developed and will be made available when approved.

11 Note that the *Public Health Regulation 2005* requires testing of factors in addition to *E. coli* for class A+; the use of *E. coli* as a factor is to provide one example only. Note also that the regulator can set water quality criteria in addition to those set by the *Public Health Regulation 2005*.



Example 2: For class C recycled water, in accordance with the *Public Health Regulation 2005*, using *E. coli* as an example, the water quality criteria are <sup>12</sup>:

General criteria	Specific criteria for <i>E. coli</i>	Notification to the regulator where value not met
Requirement for sampling which covers frequency of samples for factors to be tested	<i>E. coli</i> must be tested on a weekly basis	
Short term value sample	If in any sample taken for <i>E. coli</i> the value is more than 10000 cfu/100mL, a follow up sample must be taken and tested for <i>E. coli</i>	
Resample value	The value of the follow up sample for <i>E. coli</i> must be less than 1000 cfu/100mL	If the value of the sample is not less than 1000 cfu/100mL, the recycled water provider must notify the regulator. This matter must also be included in the annual report for the scheme
Annual value	95% of the samples taken over a 12 month period must have less than 1000 cfu/100mL <i>E. coli</i> . Once the recycled water has been monitored for 12 months, the rolling 12 month average can be worked out at the end of each month. For example, January to December, then February to January, March to February. Refer to Diagram 1	If the annual value exceeds these criteria, then the recycled water provider must notify the regulator. This matter must also be included in the annual report for the scheme

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12 Note that the regulator can set water quality criteria in addition to those set by the *Public Health Regulation 2005*.

Example 3: For recycled water supplied to augment a supply of drinking water, in accordance with the *Public Health Regulation 2005*, using molybdenum as an example, the water quality criteria are <sup>13</sup>:

General criteria	Specific criteria for molybdenum	Notification to the regulator where value not met
Requirement for sampling, which covers factors to be tested (each factor must be tested unless under an approved RWMP a factor does not need to be monitored). For commissioning verification, each factor must be considered and a reason provided as part of the validation program if a factor is not to be monitored	Molybdenum must be tested at the frequency specified in the approved RWMP (unless under an approved RWMP that factor does not need to be monitored)	
Performance value	The value of the molybdenum in the sample must not be more than 50 micrograms per litre (µg/L)	The responsible entity (the scheme manager, other declared entity or the recycled water provider) must immediately notify the regulator if in any sample taken for molybdenum the value is more than 50 µg/L. This matter must also be included in the annual report for the scheme
Requirement for an assessment of the risk to public health from the quality of the recycled water	If in any sample taken for molybdenum the value is more than 50 µg/L, an assessment of the risks to the health of the public from the quality of the recycled water must be carried out	This assessment must be undertaken by the responsible entity. Advice should be sought from the regulator. This assessment should contain information on what actions are to be, or have been, taken, as a result of the exceedance

In addition to the above values for the augmentation of drinking water supplies there is a general requirement that the recycled water must be stored in one of the following:

- an aquifer
- a dam on a watercourse
- a lake
- a watercourse
- wetlands

The public health risk assessment should be commenced as soon as a test result indicates that a water quality criterion has not been met. However, where it is subsequently proven that the non-compliant test result was invalid, that is, the test result was in compliance (for example, due to laboratory error) it can be taken that there was no risk posed to public health. This evidence should be provided to the regulator as part of the completed public health risk assessment.

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<sup>13</sup> Note that the *Public Health Regulation 2005* requires testing of factors in addition to molybdenum for recycled water supplied to augment a drinking water supply; the use of molybdenum as a factor is to provide one example only. Other factors must also be tested. Note also that the regulator can set water quality criteria in addition to those set by the *Public Health Regulation 2005*.

Minimum water quality criteria apply to the production of recycled water from three particular types of source water and some specified uses of recycled water.

**1. Source water<sup>14</sup> covered by this guideline includes:**

- sewage or effluent sourced from a service provider's infrastructure
- greywater sourced from a large greywater treatment plant
- wastewater, when it is supplied to another entity, which is not a related entity.

Further details on minimum water quality criteria for sources of recycled water can be found in section 4 of this guideline.

**2. Uses of recycled water**

For some specific uses, recycled water must be supplied at a particular water quality regardless of any control measure the user may have in place. For example, for dual reticulation purposes recycled water sourced from sewage must be supplied at class A+ quality.

For other uses of recycled water, the recycled water provider may supply recycled water of a specified quality that, when combined with appropriate control measures, will make the recycled water suitable for the intended use. For example, different qualities of recycled water can be used for irrigation depending on the control measures implemented by the user. A lower quality of recycled water may be used for irrigation if it is being applied via subsurface irrigation, reducing the risk profile when compared to spray irrigation methods.

Details on minimum criteria for certain uses of recycled water can be found in section 5 of this guideline. In addition, a recycled water provider has a general obligation under the *Public Health Act 2005* (section 57F) to supply recycled water that is 'fit for use'. The chief executive of Queensland Health may issue an improvement notice to a provider who has contravened this obligation. Penalties may apply to a provider who does not comply with the improvement notice. Recycled water is fit for use if it would not be likely to cause physical harm to a person who might later be exposed to it, assuming it was not contaminated after supply and it was used for its intended use.

**3.2 Are minimum water quality criteria set for every source, parameter or use?**

Given the variable characteristics of source water, especially wastewater, used to produce recycled water and varied uses of recycled water, it is not feasible to specify all sources, parameters and uses that must be measured or achieved. Where microbiological, physical or chemical parameters associated with determining appropriate water quality criteria for recycled water are not specified, the recycled water provider will need to contact the regulator for approval of their proposed water quality criteria. The principal requirement is that the recycled water should protect public health.

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14 Refer to information in section 1.1 of this guideline, which outlines the scope of the recycled water legislation.

## 4. Water quality criteria for production of recycled water

### 4.1 Recycled water sourced from sewage<sup>15</sup> or effluent

The *Public Health Regulation 2005* sets some minimum water quality criteria for recycled water sourced from sewage or effluent sourced from a service provider's sewerage.

#### 4.1.1 Classes A+, A, B, C and D

Where a recycled water provider uses sewage or effluent, sourced from a service provider's sewerage, to produce recycled water of classes A+, A, B, C and D, they must comply with the water quality criteria stated in section 18AE, schedule 3C or section 18AF, schedule 3D, whichever is applicable, of the *Public Health Regulation 2005*.

Where class A+ recycled water is produced, a recycled water provider should also demonstrate through validation that they comply with Table 1 below.

**Table 1 Minimum log reductions of pathogens and indicator organisms required for validation of class A+ recycled water schemes**

Pathogens	Examples	Indicator	Class A+
Bacteria	<i>Salmonella, Campylobacter, Pathogenic Escherichia coli, Atypical Mycobacteria, Shigella, Yersinia, Legionella, Vibrio cholerae, Staphylococcus aureus, Pseudomonas aeruginosa, Helicobacter pylori</i>	<i>E. coli</i>	5 log
Viruses	Enterovirus, Adenovirus, Rotavirus, Norovirus, <i>Hepatitis A</i> , Calicivirus, Astrovirus, Coronavirus	F–RNA bacteriophages, Somatic coliphages	6.5 log
Protozoa	<i>Cryptosporidium, Giardia, Naegleria fowleri, Entamoeba histolytica</i>	<i>Clostridium perfringens</i>	5 log
Helminths	Taenia, Ascaris, Trichuris	<i>Clostridium perfringens</i>	5 log

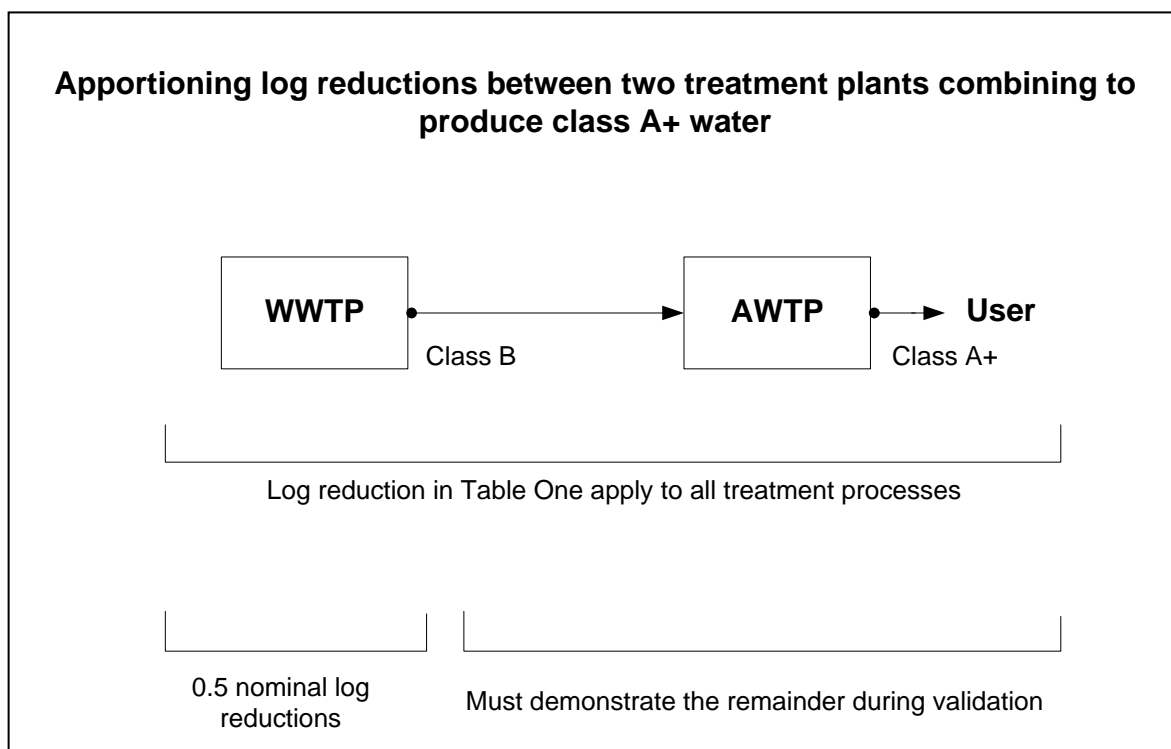
The log reductions specified in Table 1 apply to the entire treatment process (from sewage to class A+).

In some cases, advanced wastewater treatment plants (AWTP) are built which are designed to 'polish' water from existing wastewater treatment plants (WWTP). In these instances, the AWTP takes water of a lower quality from the WWTP and treats it to class A+ or higher recycled water. In this instance, the WWTP supplying the lower class water does not have to demonstrate log reduction requirements. The AWTP should still meet log reductions. The AWTP is able to nominally claim 0.5 log reduction for the portion of the treatment undertaken in the WWTP. The AWTP should then meet the balance of the log reduction requirements. For example, with a 0.5 nominal log reduction for protozoa, the AWTP would need to meet the residual 4.5 reduction requirements.

Note that the 0.5 nominal value is a minimal score that can be automatically claimed for the treatment occurring in the WWTP. If the AWTP is able to provide evidence from the WWTP of log reductions

<sup>15</sup> 'Sewage' is defined in the Act as 'household and commercial wastewater that contains, or may contain, faecal, urinary or other human waste.'

higher than 0.5 (for example, by challenge testing or monitoring results, etc.), the log reduction claimed for this component may be higher than 0.5. For example, if the WWTP validates the wastewater component, obtaining a log reduction of 3 for protozoa for the WWTP, then the AWTP will have a log reduction of 2 to achieve from the AWTP.



Further information on log reductions can be found in the AGWR Phase 1.

## 4.2 Recycled water sourced from greywater (greater than or equal to 50 kilolitres/day)

As there is no predetermined water quality criteria for greywater, the recycled water provider should first undertake an analysis of the source water characteristics to determine what an appropriate recycled water quality is, depending on the intended use. It is recommended that the recycled water provider contact the regulator to discuss the water quality criteria the regulator is likely to apply to the scheme at the time of granting the RWMP or RWMP exemption approval. This is best done before undertaking validation and submitting a RWMP or RWMP exemption application for assessment. As part of the assessment, the regulator will decide if the proposed recycled water quality is appropriate for the intended use, taking into account any onsite control measures to be implemented by the user.

## 4.3 Recycled water sourced from wastewater

As there is no predetermined water quality criteria for wastewater, the recycled water provider should first undertake an analysis of the source water characteristics to determine what an appropriate recycled water quality is, depending on the intended use. It is recommended that the recycled water provider contact the regulator to discuss the water quality criteria the regulator is likely to apply to the scheme at the time of granting the RWMP or RWMP exemption approval. This is best done before undertaking validation and submitting a RWMP or RWMP exemption application for assessment. As part of the assessment, the regulator will decide if the proposed recycled water quality is appropriate for the intended use, taking into account any onsite control measures to be implemented by the user.

Note: Wastewater is only covered by the Act, for certain activities and when it is supplied to another entity and the other entity is not a related entity.

## 5. Water quality criteria for the use of recycled water

### 5.1 Augmentation of drinking water supplies

Recycled water sourced from sewage or effluent sourced from a service provider's sewerage and supplied, or proposed to be supplied, to augment a drinking water supply must comply with the water quality criteria in section 18AD, schedule 3B of the *Public Health Regulation 2005*.

The design of the verification monitoring program for schemes augmenting drinking water supplies should be risk based. The scheme must comply with all factors stated in section 18AD, schedule 3B of the *Public Health Regulation 2005*, however not all factors need to be routinely tested or tested at the same frequency. This may apply if the scheme can demonstrate, through the validation program that a factor is of low risk to the scheme. To determine an appropriate verification monitoring program, recycled water providers should refer to the *Recycled water management plan and validation guidelines*.

Where recycled water is produced for augmentation of drinking water supplies, recycled water providers should also demonstrate, through validation, that they comply with Table 2 below.

**Table 2 Minimum log reductions of pathogens and indicator organisms required for validation of schemes for augmentation of drinking water supplies**

Pathogens	Examples	Indicator	Augmentation of drinking water supplies
Bacteria	<i>Salmonella, Campylobacter, Pathogenic Escherichia coli, Atypical Mycobacteria, Shigella, Yersinia, Legionella, Vibrio cholerae, Staphylococcus aureus, Pseudomonas aeruginosa, Helicobacter pylori</i>	<i>E. coli</i>	8 log
Viruses	Enterovirus, Adenovirus, Rotavirus, Norovirus, <i>Hepatitis A</i> , Calicivirus, Astrovirus, Coronavirus	F–RNA bacteriophages, Somatic coliphages	9.5 log
Protozoa	<i>Cryptosporidium, Giardia, Naegleria fowleri, Entamoeba histolytica</i>	<i>Clostridium perfringens</i>	8 log
Helminths	Taenia, Ascaris, Trichuris	<i>Clostridium perfringens</i>	8 log

Log reductions specified in Table 2 apply to the scheme as a whole. Information on log reductions can be found in the AGWR Phase 2.

### 5.2 Dual reticulation

Recycled water sourced from sewage or effluent sourced from a service provider's sewerage and supplied, or proposed to be supplied, for dual reticulation must comply with the water quality criteria for class A+ recycled water in section 18AE, schedule 3C of the *Public Health Regulation 2005*.

### 5.3 Irrigation (minimally processed food crops)

Recycled water produced to irrigate minimally processed food crops where the recycled water is sourced from sewage or effluent sourced from a service provider's sewerage, must comply with the water quality criteria as stated in section 18AG, schedule 3E of the *Public Health Regulation 2005*. This schedule also includes the control measures that are mandatory for the user, given the class of water supplied by the recycled water provider.

Minimally processed food crops<sup>16</sup> may include:

- crops grown in the ground such as carrots, beetroot, potatoes and onions
- crops with produce on or near the ground surface that have the skin removed before consumption such as pumpkins and melons
- crops with produce on or near the ground surface such as broccoli, cabbage, cauliflower, celery, lettuce, cucumber, zucchini, capsicums, tomatoes, beans, herbs, strawberries and mushrooms
- crops with produce that do not have ground contact and have a skin which is normally removed before consumption such as citrus, nuts, bananas, avocados, kiwi fruit, mangoes, lychees and pawpaw
- crops with produce that do not have ground contact whose edible skins are not normally removed prior to consumption such as apples, pears, apricots, cherries, olives, peaches and grapes (table and wine)
- all crops grown in hydroponic conditions or similar such as lettuce, herbs and seed sprouts.

### 5.4 Commercial/Industrial use

Commercial/industrial uses can include, but are not limited to, washdown, boiler feed and cooling towers in addition to a broad range of other commercial/industrial uses. As there is no predetermined water quality criteria for commercial/industrial wastewater, the recycled water provider should first undertake an analysis of the source water characteristics to determine what an appropriate recycled water quality is, depending on the intended use. It is recommended that the recycled water provider contact the regulator to discuss the water quality criteria the regulator is likely to apply to the scheme at the time of granting the RWMP or RWMP exemption approval. This is best done before undertaking validation and submitting a RWMP or RWMP exemption application for assessment. As part of the assessment, the regulator will decide if the proposed recycled water quality is appropriate for the intended use, taking into account any onsite control measures to be implemented by the user.

### 5.5 Irrigation for uses other than minimally processed food crops

These types of irrigation may include:

- irrigation of public open spaces such as, but not limited to, the irrigation of municipal parks and gardens, recreational sporting fields, racecourses, botanical gardens, school ovals and golf courses
- irrigation of non-food crops such as, but not limited to, the irrigation of turf, trees, woodlots, cotton and wholesale plant nurseries
- irrigation of heavily processed food crops such as, but not limited to, sugar cane, cocoa, cereal crops (wheat, rice and corn) grown for flour production and crops grown for oil production such as sunflower, canola and flax seed.

The regulator may use various national and industry guidelines as a benchmark for determining appropriate water quality criteria for the intended use, taking into account onsite control measures implemented by the user. These may include:

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<sup>16</sup> Minimally processed food crops are defined under the *Public Health Regulation 2005*. The water quality criteria in the *Public Health Regulation 2005* apply where the source of the recycled water is sewage or effluent sourced from a service provider's sewerage. Additionally, the Act does not cover irrigation of any type of crop with irrigation tailwater, although there may be requirements under the *Water Act 2000* in relation to overland flow (tailwater).

- The AGWR Phase 1 which generally covers sewage and greywater as a source of recycled water. Table 3.8 Treatment processes and onsite controls for designated uses of recycled water from treated sewage outlines a range of recycled water uses, indicative treatment processes, achievable log reductions, onsite control measures, exposure reductions and water quality criteria
- *Growing Crops with Reclaimed Wastewater*, developed by and available through Commonwealth Scientific and Industry Research Organisation (CSIRO), available online at <[www.publish.csiro.au](http://www.publish.csiro.au)>
- farm codes dealing with the appropriate use of recycled water, including:
  - *Queensland Dairy Farming Environmental Code of Practice* (Department of Primary Industries and Queensland Dairyfarmers' Organisation 2001), available online at <[www.dpi.qld.gov.au](http://www.dpi.qld.gov.au)>
  - *Environmental Code of Practice for Queensland Piggeries* (DPI 2000), available online at <[www.dpi.qld.gov.au](http://www.dpi.qld.gov.au)>
  - *National Beef Cattle Feedlot Environmental Code of Practice* (Australian Lot Feeders' Association 2000), available online at <[www.mla.com.au](http://www.mla.com.au)>
- industry codes of practice or similar documents.

## 5.6 Construction

The regulator may use various national and industry guidelines as a benchmark for determining appropriate water quality criteria for the intended use, taking into account onsite control measures implemented by the user. These include the following guides that have been issued by the Department of Employment and Industrial Relations:

- *Model Water Management Plan for the Queensland Civil Construction Industry*, available online at <[www.deir.qld.gov.au](http://www.deir.qld.gov.au)>
- *Guide to the Workplace Use of Non-Potable Water including Recycled Water*, available online at <[www.deir.qld.gov.au](http://www.deir.qld.gov.au)>.

These documents also indicate the types of control measures which can be implemented to allow the recycled water provider to supply, and the user to make use of, a lesser quality of recycled water.

## 5.7 Other uses—case by case assessment

It is very difficult to determine a set of water quality criteria for every specific use of recycled water. There may be instances where a recycled water provider is asked to supply recycled water for a use that has no specific water quality criteria prescribed in this guideline or the *Public Health Regulation 2005*.

As there is no predetermined water quality criteria for these uses, the recycled water provider should first undertake an analysis of the source water characteristics to determine what an appropriate recycled water quality is, depending on the intended use. It is recommended that the recycled water provider contact the regulator to discuss the water quality criteria the regulator is likely to apply to the scheme at the time of granting the RWMP or RWMP exemption approval. This is best done before undertaking validation and submitting a RWMP or RWMP exemption application for assessment. As part of the assessment, the regulator will decide if the proposed recycled water quality is appropriate for the intended use, taking into account any onsite control measures to be implemented by the user.

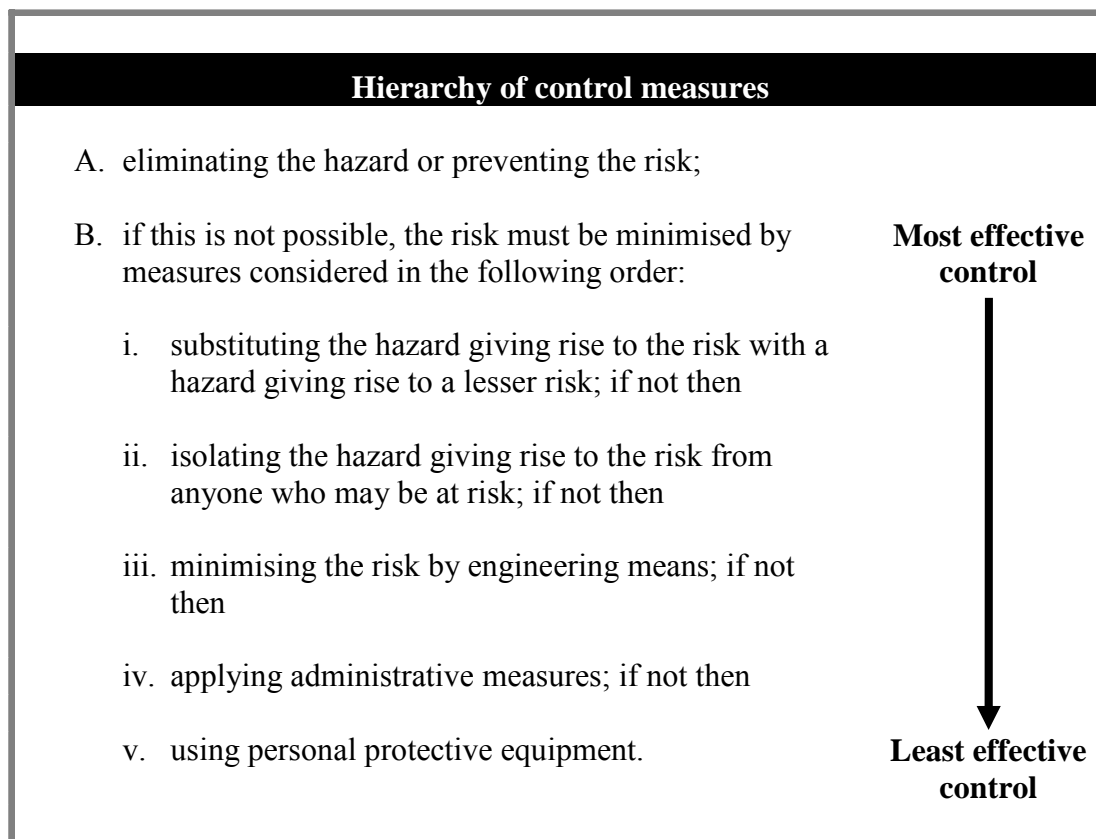


## 6. Control measures for recycled water users

A control measure is any action or activity that can be used to prevent, eliminate or reduce a hazard to an acceptable level. Control measures implemented by the user, in conjunction with the quality of the water supplied, are considered by the regulator when determining whether a RWMP or an exemption application should be approved.

### 6.1 Hierarchy of control measures

Control measures for hazards associated with recycled water, should be selected by preference guided by the following hierarchy<sup>17</sup>.



The control measures can be divided into three levels:

- the highest level includes measures that address the hazard at the source, or where it comes from, that is, elimination and substitution
- the second level measures intervene in the hazard’s course between the source and a worker, that is, isolation and engineering
- the third and lowest level measures are implemented at the point of the user, that is, administrative controls and personal protective equipment.

In many cases, it will be necessary to use a combination of measures to appropriately manage exposure to a hazard. For example, to minimise exposure to a microbiological hazard during irrigation for dust suppression on a construction site, the recycled water being used could be replaced with a higher quality recycled water, for example replace class B recycled water with class A recycled water (substitution), safer work procedures could be introduced (administrative measures) and personal protective equipment provided for users to use. See ‘Table 3 Control measures and examples’.

<sup>17</sup> Adapted from the *Workplace Health and Safety Act 1995*.

**Table 3 Control measures and examples**

Level	Control Measure	Comment	Example
1	Elimination	Control the hazard at the source. This is the most effective control measure and removes the risk by removing the hazard or changing the work processes.	Request recycled water provider to implement source control practices.
	Substitution	Replace the hazard with a suitable alternative that has a lower risk.	Source a higher quality of water (for example, use class A recycled water instead of class B).
2	Isolation	Remove or separate people from the source of the hazard.	Irrigation of areas with restricted access (for example, irrigation of fenced areas such as golf courses or sporting fields after hours).
	Minimise by engineering means	Change the physical characteristics of the way in which the recycled water is used to remove or reduce the risk.	Modify application of the recycled water from fine spray to heavy droplet to decrease risk of overspray, or use subsurface irrigation.
3	Administrative measures	Use policies, procedures, signs and training to control risk.	Review systems of work so that irrigation only occurs during times of low wind speed; use of signs advising recycled water is in use; train users in the safe use of recycled water.
	Personal protective equipment (PPE)	Provide equipment or clothing designed to protect workers using recycled water.	Provide eye protection and vapour masks to protect users against recycled water spray.

## 6.2 Consultation on control measures

It is recommended that recycled water providers and scheme managers undertake consultation with users on water quality requirements and control measures. Consultation is important as users may be able to suggest ways to effectively manage risks for their specific use. Similarly, this consultation may establish that the recycled water is not suitable for the intended use.

## 6.3 Selecting the most appropriate control measures

When selecting a control measure, it is important for users to consider why a particular control measure is chosen. For example, there should be a reason why administrative measures are chosen to control a risk instead of using elimination, substitution, isolation or engineering.

When control measures are selected, they should:

- adequately control exposure to the risk and continue to do so over time
- not create another hazard
- be proportionate to the degree and nature of the risk, that is, high likelihood and severe consequences would need to have substantial permanent controls.

## 7. Attachment

### CALCULATION OF COMPLIANCE WITH ANNUAL VALUES FOR RECYCLED WATER CLASS A+ USING *E. Coli* AS AN EXAMPLE

Week of scheme operation	Short term values		Resample values (if required)		Annual values		
	Short term value sample result (cfu/100mL)	Is short term value sample result less than 10 cfu/100mL?	Resample testing result (cfu/100mL)	Is resample value less than 1 cfu/100mL?	Is the short term value sample result less than 1 cfu/100mL ?	% of short term value sample results taken in 12 month period prior to and including this date which are less than 1 cfu/100mL	Compliant with annual value? (equal to or more than 95%)
1	0	Yes	-	-	Yes	-	-
2	0	Yes	-	-	Yes	-	-
3	0	Yes	-	-	Yes	-	-
4	1	Yes	-	-	No	-	-
5	0	Yes	-	-	Yes	-	-
6	0	Yes	-	-	Yes	-	-
7	0	Yes	-	-	Yes	-	-
8	0	Yes	-	-	Yes	-	-
9	0	Yes	-	-	Yes	-	-
10	0	Yes	-	-	Yes	-	-
11	0	Yes	-	-	Yes	-	-
12	0	Yes	-	-	Yes	-	-
13	0	Yes	-	-	Yes	-	-
14	25	No	20	No	No	-	-
15	0	Yes	-	-	Yes	-	-
16	0	Yes	-	-	Yes	-	-
17	0	Yes	-	-	Yes	-	-
18	0	Yes	-	-	Yes	-	-
19	0	Yes	-	-	Yes	-	-
20	0	Yes	-	-	Yes	-	-
21	0	Yes	-	-	Yes	-	-

Water quality guidelines for recycled water schemes

Week of scheme operation	Short term values		Resample values (if required)		Annual values		
	Short term value sample result (cfu/100mL)	Is short term value sample result less than 10 cfu/100mL?	Resample testing result (cfu/100mL)	Is resample value less than 1 cfu/100mL?	Is the short term value sample result less than 1 cfu/100mL ?	% of short term value sample results taken in 12 month period prior to and including this date which are less than 1 cfu/100mL	Compliant with annual value? (equal to or more than 95%)
22	0	Yes	-	-	Yes	-	-
23	0	Yes	-	-	Yes	-	-
24	0	Yes	-	-	Yes	-	-
25	0	Yes	-	-	Yes	-	-
26	0	Yes	-	-	Yes	-	-
27	0	Yes	-	-	Yes	-	-
28	0	Yes	-	-	Yes	-	-
29	0	Yes	-	-	Yes	-	-
30	21	No	0	Yes	No	-	-
31	0	Yes	-	-	Yes	-	-
32	0	Yes	-	-	Yes	-	-
33	0	Yes	-	-	Yes	-	-
34	0	Yes	-	-	Yes	-	-
35	0	Yes	-	-	Yes	-	-
36	0	Yes	-	-	Yes	-	-
37	0	Yes	-	-	Yes	-	-
38	0	Yes	-	-	Yes	-	-
39	0	Yes	-	-	Yes	-	-
40	0	Yes	-	-	Yes	-	-
41	0	Yes	-	-	Yes	-	-
42	0	Yes	-	-	Yes	-	-
43	0	Yes	-	-	Yes	-	-
44	0	Yes	-	-	Yes	-	-

Week of scheme operation	Short term values		Resample values (if required)		Annual values		
	Short term value sample result (cfu/100mL)	Is short term value sample result less than 10 cfu/100mL?	Resample testing result (cfu/100mL)	Is resample value less than 1 cfu/100mL?	Is the short term value sample result less than 1 cfu/100mL ?	% of short term value sample results taken in 12 month period prior to and including this date which are less than 1 cfu/100mL	Compliant with annual value? (equal to or more than 95%)
45	0	Yes	-	-	Yes	-	-
46	0	Yes	-	-	Yes	-	-
47	0	Yes	-	-	Yes	-	-
48	0	Yes	-	-	Yes	-	-
49	0	Yes	-	-	Yes	-	-
50	0	Yes	-	-	Yes	-	-
51	0	Yes	-	-	Yes	-	-
52	0	Yes	-	-	Yes	94.23%	No
53	0	Yes	-	-	Yes	*	*
54	0	Yes	-	-	Yes	*	*
55	0	Yes	-	-	Yes	*	*
56	0	Yes	-	-	Yes	96.15%	Yes
57	0	Yes	-	-	Yes	*	*
58	0	Yes	-	-	Yes	*	*
59	11	No	0	Yes	No	*	*
60	0	Yes	-	-	Yes	94.23%	No

### Calculating annual values

Scenario: weekly testing for *Escherichia coli* (*E. coli*) under schedule 3C of the *Public Health Regulation 2005* ('schedule 3C') for a recycled water scheme producing and supplying class A+ recycled water.

Under schedule 3C for *E. coli* testing, the annual value must be less than 1 cfu/100mL found in 95% of the samples taken for a 12 month period. The annual value (12 month period) cannot be calculated until the testing results for the short term value testing regime have been obtained for the 12 month period (which commences from the first relevant sample after the grant of the RWMP or exemption approval).

For calculation of the annual value, only the short term value sample results are used (even if they don't actually exceed the actual short term value). Any results from the resampling event are not used in calculation of the annual value.

In weeks 4, 14, 30 and 59, the *E. coli* test results for the short term value sample exceed the annual value of less than 1 cfu/100mL limit listed in schedule 3C for *E. coli*.

Note that for week 4, although the short-term value was not exceeded, when calculating the annual value the short term value sample result still contributed to a non-compliance with the annual value.

If short term value sample results exist for a 12 month period, an annual value can be calculated. In this example, week 52 (up to and including week 52) of operation is the first time the annual value can be calculated.

Following week 52, each month using the new four weeks data, a percentage of compliance with the annual value criteria can be calculated by determining the percentage of short term value sample results which gave results equal to or more than 1 cfu/100mL.

In this particular example, the annual values calculated in weeks 52 and 60 (shown in red in the table) are non-compliant with the annual value and must be reported to the regulator immediately (unless there is a reasonable excuse). The annual value in week 56 is compliant as it is 95% or above.

\*NOTE: Calculations of the annual value are only required on a monthly basis (not a weekly basis) – therefore calculations take place in weeks 52, 56 and 60 and continuously from then on at four-weekly intervals.

## 8. Glossary

Term	Meaning
AGWR	The <i>Australian Guidelines for Water Recycling: Managing Health and Environmental Risks: Phase 1</i> or the <i>Australian Guidelines for Water Recycling Phase 2: Augmentation of Drinking Water Supplies</i> .
Approved recycled water management plan	A recycled water management plan approved by the regulator and not suspended or cancelled, under chapter 3 of the <i>Water Supply (Safety and Reliability) Act 2008</i> .
AS/NZS	Australian Standards/New Zealand Standards.
<i>Audit and Annual Reporting Guidelines</i>	The guidelines issued by the regulator under section 571(1)(l) and (m) of the <i>Water Supply (Safety and Reliability) Act 2008</i> .
Commissioning verification	A type of validation, but is distinct from other validation methods, because it is done by testing the end product water. This is performed to prove that the expected water quality is being consistently produced.
Control measure (preventive measure)	Any action or activity that can be used to prevent, eliminate or reduce a hazard to an acceptable level.
Critical recycled water scheme	A recycled water scheme declared to be a critical recycled water scheme under chapter 3 of the <i>Water Supply (Safety and Reliability) Act 2008</i> .
Declared entity	For a multiple-entity critical scheme, means each recycled water provider and other entity, other than the scheme manager for the scheme, declared to be part of the scheme under chapter 3, part 8 of the <i>Water Supply (Safety and Reliability) Act 2008</i> .
Dual reticulation	As defined in the <i>Public Health Regulation 2005, s18AB</i> . Note this definition contains the term ‘domestic use’. It is the department’s policy that the interpretation of the words ‘domestic use’ as it applies to recycled water only includes non drinking and non bathing water purposes such as toilet flushing, cold water laundry tap and external use for wash down and irrigation of lawns and gardens. For clarity this interpretation means that each of these domestic uses of recycled water, even if they are applied in commercial premises, would be captured as dual reticulation. For example, toilet flushing (which is a domestic use) in a commercial premises. The department does not consider ‘domestic use’ of recycled water to include those uses that require drinking water quality such as cooking or bathing.
Exceedance	Water quality that goes outside identified limits. These limits may include alert levels, critical limits or water quality criteria.
Exemption	Means an exemption granted under Chapter 3, Part 5 of the <i>Water Supply (Safety and Reliability) Act 2008</i> .
Greywater	Wastewater from a bath, basin, laundry or shower, whether or not the wastewater is contaminated with human waste.
Hazard	A biological, chemical or physical agent in, or condition of, recycled water with the potential to cause an adverse health effect.
Heavily processed food crops	Includes but is not limited to those crops that are heavily processed before consumption, for example sugar cane, cocoa, cereal crops (wheat, rice and corn) grown for flour production and crops grown for oil production such as sunflower, canola and flax seed.

Term	Meaning
Industry code or best practice management document	A published standard, by a body that the regulator considers to be a recognised industry body.
Minimally processed food crops	As defined in the <i>Public Health Regulation 2005</i> , includes carrot, onion, pumpkin, rockmelon, broccoli, cabbage, tomato, avocado, banana, mango, apple, olive, peach, herbs and lettuce.
Multiple–entity recycled water scheme	<p>A scheme involving the production and supply of recycled water by more than one recycled water provider, or at least one recycled water provider and another entity, and includes:</p> <ul style="list-style-type: none"> <li>• each recycled water provider and other entity declared to be part of the scheme under a declaration for the scheme made under chapter 3, part 8 of the <i>Water Supply (Safety and Reliability) Act 2008</i>; and</li> <li>• the infrastructure for the production and supply of the water stated to be part of the scheme under the declaration.</li> </ul>
DEWS	The Department of Energy and Water Supply.
Point of supply	In relation to water quality criteria means, where possible, the physical point of transfer to the user. There are instances where this is not practical and will not accurately represent the water quality of the scheme. It is in these instances that the recycled water provider, or scheme manager where relevant, should discuss with the regulator options for monitoring points and the point of application of water quality criteria.
Public open spaces	Any open space, such as parks, sporting fields, botanical gardens, racecourses, school ovals, municipal parks and gardens, golf courses, footpaths, car parks, road verges, where either members of the public, staff or employees may be exposed to recycled water. It does not include gardens in domestic residences nor agricultural farmland.
Recycled water	<p>Any of the following that are intended to be reused:</p> <ul style="list-style-type: none"> <li>• sewage or effluent sourced from a service provider’s sewerage</li> <li>• greywater sourced from a large greywater treatment plant within the meaning of the <i>Plumbing and Drainage Act 2002</i></li> <li>• wastewater, other than water mentioned in the previous two dot points.</li> </ul>
Recycled Water Management Plan (RWMP)	<p>For a single-entity recycled water scheme—a plan about the production and supply of recycled water under the scheme by the recycled water provider for the scheme.</p> <p>For a multiple-entity recycled water scheme—a plan about the production and supply of recycled water under the scheme consisting of a scheme manager plan and a scheme provider plan for each declared entity in the scheme.</p>
<i>Recycled Water Management Plan and Validation Guidelines</i>	The guidelines issued by the regulator under section 571(1)(i) & (j) of the <i>Water Supply (Safety and Reliability) Act 2008</i> .
<i>Recycled Water Management Plan Exemption Guidelines</i>	The guidelines issued by the regulator under section 571(1)(k) of the <i>Water Supply (Safety and Reliability) Act 2008</i> .
Recycled water provider	<p>An entity that:</p> <ul style="list-style-type: none"> <li>• owns infrastructure for the production and supply of recycled water; or</li> <li>• another entity, prescribed under a regulation, that owns infrastructure for the supply of recycled water.</li> </ul>



Term	Meaning
Recycled water scheme	A single-entity or a multiple-entity recycled water scheme.
Regulator	The chief executive of the Department of Energy and Water Supply (DEWS).
Reused	Includes being treated to improve the water's quality, but does not include merely being discharged into, or disposed of in, the environment.
Risk	The likelihood that identified hazards will cause harm in exposed populations including the magnitude of that harm (Risk = likelihood x impact).
Scheme manager	<p>The scheme manager for a multiple-entity recycled water scheme is the entity:</p> <p>(a) the recycled water providers and other entities declared to be part of the scheme agree is the scheme manager for the scheme</p> <p>(b) either—</p> <ul style="list-style-type: none"> <li>(i) stated in the declaration under chapter 3, part 8 of the <i>Water Supply (Safety and Reliability) Act 2008</i> for the scheme to be the scheme manager</li> <li>(ii) stated in the notice given under section 307(2) of the <i>Water Supply (Safety and Reliability) Act 2008</i>.</li> </ul>
Service provider	<ul style="list-style-type: none"> <li>• A local government that owns infrastructure for supplying water or sewerage services.</li> <li>• A water authority that owns infrastructure for supplying water or sewerage services.</li> <li>• Each person who is: <ul style="list-style-type: none"> <li>– the owner of one or more elements of infrastructure for supplying water or sewerage services for which a charge is intended to be made; or</li> <li>– a person nominated in a regulation as a related entity of a person who is the owner of one or more elements of infrastructure for supplying water or sewerage services for which a charge is intended to be made.</li> </ul> </li> <li>• A service provider does not include a service supplied by infrastructure, if: <ul style="list-style-type: none"> <li>– the infrastructure is used solely for mining purposes; or</li> <li>– the service is used only by: <ul style="list-style-type: none"> <li>○ the owner of the infrastructure or the owner's guests or employees including, for example, guests at a resort; or</li> <li>○ if the owner of the infrastructure is a body corporate for a community titles scheme under the <i>Body Corporate and Community Management Act 1997</i>—the occupants of lots in the scheme.</li> </ul> </li> </ul> </li> </ul>
Sewage	Household and commercial wastewater that contains, or may contain, faecal, urinary or other human waste.
Sewerage	A sewer, access chamber, vent, engine, pump, structure, machinery, outfall or other work used to receive, store, transport or treat sewage.
Single-entity recycled water scheme	A scheme involving the production and supply of recycled water by only one recycled water provider, and includes, if the provider owns infrastructure for the supply, or the production and supply, of the water—the infrastructure.
Source water	Any water destined for further use. This includes, but is not limited to sewage (for treatment at a wastewater treatment plant) and treated sewage (for further treatment at an advanced wastewater treatment plant).

Term	Meaning
Supply	<p>In relation to recycled water, means:</p> <p>(a) for greywater, sewage or effluent that is recycled water—</p> <p style="padding-left: 40px;">(i) reuse of the recycled water by the entity that produces it; or</p> <p style="padding-left: 40px;">(ii) supply of the recycled water, by the entity that produces it, to another entity for reuse</p> <p>(b) for other recycled water—supply of the recycled water, by the entity that produces it (the producer), to another entity for reuse, other than another entity prescribed under a regulation as a related entity of the producer.</p>
Transitional period	<p>The transitional periods stipulated under chapter 9, part 5 of the <i>Water Supply (Safety and Reliability) Act 2008</i>, by which the recycled water provider must comply with the Act, and either have an approved RWMP or an exemption granted by the regulator or cease supply.</p>
Treated effluent	<p>Sewage that has been treated.</p>
Validation program	<p>A documented program about how the plant or equipment used for the treatment of recycled water under the scheme are to be tested to show the quality of the recycled water consistently meets the water quality criteria for recycled water relevant to the scheme.</p>
Wastewater	<p>Wastewater as defined in the <i>Water Supply (Safety and Reliability) Act 2008</i> as the spent or used water generated on premises from industrial, commercial or manufacturing activities, or animal husbandry activities prescribed under a regulation, other than spent or used water generated from an agricultural activity or a mining activity or petroleum activity.</p>
Water quality criteria	<p>(i) the standards for the quality of recycled water, relating to the sources and uses of the water, prescribed in a regulation under the Public Health Act</p> <p>(ii) the criteria for the quality of recycled water, relating to the sources and uses of the water—</p> <p style="padding-left: 40px;">(A) stated in a guideline, if any, made by the regulator about the quality of recycled water, or</p> <p style="padding-left: 40px;">(B) in relation to the quality of recycled water to which a recycled water management plan or an exemption relates—stated in a regulator condition for the plan or exemption.</p>
<i>Water Quality Guidelines for Recycled Water Schemes</i>	<p>The guidelines prescribed by the regulator under section 571(1)(h) of the <i>Water Supply (Safety and Reliability) Act 2008</i>.</p>

## References

Australian Lot Feeders' Association (2000) *National Beef Cattle Feedlot Environmental Code of Practice, Meat and Livestock Authority*.

<http://www.mla.com.au/NR/rdonlyres/FABEF8B2-475C-4758-BAEF-9BD68D8FF74E/0/Nationalbeeffeedlotcodeofpractice.pdf>

Department of Employment and Industrial Relations (2007) *Model Water Management Plan for the Queensland Civil Construction Industry*, Department of Employment and Industrial Relations, Queensland. [http://www.deir.qld.gov.au/pdf/whs/model\\_watermgt.pdf](http://www.deir.qld.gov.au/pdf/whs/model_watermgt.pdf)

Department of Employment and Industrial Relations (2007) *Model Guide to the Workplace Use of Non-Potable Water including Recycled Water*, Department of Employment and Industrial Relations, Queensland. [http://www.deir.qld.gov.au/pdf/whs/non-potable\\_guide.pdf](http://www.deir.qld.gov.au/pdf/whs/non-potable_guide.pdf)

Department of Primary Industries (2001) *Queensland Dairy Farming Environmental Code of Practice*, Department of Primary Industries and Queensland Dairyfarmers' Organisation. <http://www2.dpi.qld.gov.au/environment/1235.html>

Department of Primary Industries (2000) *Environmental Code of Practice for Queensland Piggeries*, Department of Primary Industries and Queensland Dairyfarmers' Organisation. <http://www2.dpi.qld.gov.au/environment/1093.html>

NHMRC-NRMMC (National Health and Medical Research Council and Natural Resource Management Ministerial Council) (2004) *Australian Drinking Water Guidelines*, NHMRC and NRMMC, Canberra.

NRMMC–EPHC–AHMC (Natural Resources Ministerial Management Council; Environment Protection and Heritage Council; Australian Health Ministers' Conference) (2006) *Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 1)*, NRMMC, EPHC and AHMC, Canberra.

NRMMC–EPHC–NHMRC (Natural Resource Management Ministerial Council, Environment Protection and Heritage Council, National Health and Medical Research Council), *Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 2) Augmentation of Drinking Water Supplies*, (2008) NRMMC, Canberra.

Stevens D, Kelly J, McLaughlin M, Unkovich M. (2006) *Growing crops with reclaimed wastewater*, CSIRO PUBLISHING. Collingwood, Victoria, Australia.

The State of Queensland Environmental Protection Agency (2005) *Queensland Water Recycling Guidelines*, Brisbane, Queensland

The State of Queensland Environmental Protection Agency (2005) *Manual for recycled water agreements in Queensland*, Brisbane, Queensland

WSAA (Water Services Association of Australia) (2008) *National Wastewater Source Management Guideline*



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