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National Water Commission

Recycled water use in Australia: regulations, guidelines and validation requirements for a national approach

Dr. Kaye Power

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Abbreviations and acronyms

| | |
|----------|---|
| ACT | Australian Capital Territory |
| ACTEW | Australian Capital Territory Electricity and Water |
| AGWR | <i>Australian Guidelines for Water Recycling: Managing Health and Environmental Risks</i> (Phase 1) |
| AMHC | Australian Human Ministers Conference |
| ANZECC | Australian and New Zealand Environment Conservation Council |
| APP | Aquifer Protection Permit |
| ARMCANZ | Agriculture and Resource Management Council of Australia and New Zealand |
| AS/NZS | Australian Standards/New Zealand Standards |
| ATUs | Aerobic Treatment Units |
| CRCWQT | Cooperative Research Centre for Water Quality & Treatment |
| DAF | Dissolved Air Filtration |
| DALY | Disability adjusted life years |
| DEC | Department of Environment and Conservation |
| DECCW | Department of Environment, Climate Change and Water |
| DEPHA | Department of Environment, Parks, Heritage and Arts |
| DERM | Department of Environment and Resource Management |
| DHCS | Department of Health and Community Services |
| DHS | Department of Human Services |
| DIP | Department of Infrastructure and Planning |
| DNRW | Department of Natural Resource and Water |
| DoH | Department of Health |
| DPEMP | Development Proposal and Environmental Management Plan |
| DPI | Department of Primary Industries |
| DPIBAS | Department of Planning and Infrastructure Building and Advisory Services |
| DWE | Department of Water and Energy |
| E.coli | Escherichia coli |
| EMPC Act | Environmental Management and Pollution Control Act |
| EP | Equivalent Persons |
| ETV | Environment Technology Verification |
| HACCP | Health Analysis and Critical Control Points |
| ISO | International Organization for Standardization |
| IAWG | Inter Agency Working Group |
| IPART | Independent Pricing and Regulatory Tribunal |
| JASANZ | Joint Accreditation System of Australia and New Zealand |
| JSC | Joint Steering Committee |
| L/day | Litres per day |
| LTESWTR | Long Term Enhanced Surface Water Treatment Rule |
| ML/day | Mega Litres per day |
| NH&MRC | National Health & Medical Research Council |
| NORF | National On-site Regulators Forum |
| NOW | New South Wales Office of Water |
| NRMMC | Natural Resource Management Ministerial Council |
| NRWRF | National Recycled Water Regulators Forum |
| NSF | National Science Foundation |
| NSW | New South Wales |
| NT | Northern Territory |
| NWQMS | National Water Quality Management Strategy |
| QLD | Queensland |
| SA | South Australia |

| | |
|--------|---|
| TAS | Tasmania |
| US EPA | United States Environmental Protection Agency |
| USA | United States of America |
| UV | Ultraviolet |
| VIC | Victoria |
| WA | Western Australia |
| WHO | World Health Organization |

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| | |
|--------------------|---|
| Nina Allen | SA Department of Health |
| Narelle Berry | NSW Independent Tribunal for Pricing and Regulation |
| Mark Biebrick | SA Water |
| Judy Blackbeard | Melbourne Water |
| Palenque Blair | WA Water Corporation |
| Tony Bles | NSW Department of Health |
| Melissa Bromly | WA Department of Water |
| Scott Burton | Tasmania Department of Health and Human Services |
| David Cunliffe | SA Department of Health |
| Kerrily Dickson | ACTEW |
| Peter Donnelly | ACT Environment Protection Authority |
| Adrian Farrant | ACT Health Protection Services |
| Jane Filmer | WA Department of Environment and Conservation |
| Steven Gallagher | Tasmanian Department of Tourism, Arts and the Environment |
| Robert Hogan | NSW Department of Environment and Climate Change |
| Alan Humphreys | Tasmanian Department of Justice |
| Leonie Huxedurp | NSW Department of Energy and Water |
| Greg Jackson | QLD Department of Health |
| Brian Jones | ACT Health Protection Services |
| Stephen Lansdell | Victorian Environment Protection Authority |
| Cliff Liston | SA Water |
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| Michael McGuinness | QLD Department of Infrastructure and Planning |
| Ian McNab | QLD Department of Natural Resources and Water |
| Darren Miller | WA Department of Environment and Conservation |
| Robert Mitchell | NSW Department of Energy and Water |
| Vanessa Moscovis | WA Water Corporation |
| Vanora Mulvenna | Victorian Department of Human Services |
| Anita Packwood | QLD Department of Environment and Resource Management |
| Scott Prenzler | QLD Department of Environment and Resource Management |
| Ona Rae | QLD Department of Infrastructure and Planning |
| Peter Rogers | NT Department of Health and Community Services |
| Suzie Sarkis | Victorian Department of Human Services |
| Amelia Savage | Victorian Department of Human Services |
| Lester Sickerdick | SA Water |
| Kandy Smith | Tasmanian Department of Tourism, Arts and the Environment |

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SA Environment Protection Agency
WA Department of Health
QLD Department of Natural Resources and Water
ACT Environment Protection Authority

Executive summary

A National Water Commission Fellowship was awarded in 2008 to 'Review individual jurisdictional requirements for the validation of recycled water treatment processes'. The initial aim of the project was to detail the processes being adopted by each jurisdiction for the validation of recycled water treatment processes and to compare this to other international requirements. The areas discussed included the current legislative requirements, guidelines (including specific validation requirements for treatment technologies), and the adoption and impact of the *Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 1)* (AGWR).

The report provides an overview of the regulation of on-site wastewater management. It covers single household effluent disposal in sewerred and unsewerred areas, including greywater recycling, and the regulation of effluent disposal and the associated recycled water from larger schemes. The guidelines, codes and standards used in each jurisdiction are also presented. Some jurisdictions have moved towards implementing the AGWR and have developed specific validation requirements for recycled water schemes, while others are still in the process of implementing them.

A review and comparison of the regulatory processes and guidelines in place for each jurisdiction, and discussions with regulators, indicated similarities and differences in how they managed recycled water. This showed the AGWR was not being applied consistently. In attempting to address these differences and develop a nationally consistent approach to recycled water regulation and the application of the AGWR, the following recommendations are made:

Recommendation One: Consideration be given by individual jurisdictions to implement a two-tiered regulatory system based on 'exposure scenario' rather than the current 'variable size' requirement.

Recommendation Two: A national approach to accreditation of treatment systems for single households for both disposal and water recycling be pursued through Standards Australia or through a mutual recognition of process testing and accreditation within other states. This could be pursued through the National Recycled Water Regulators Forum and the National On-site Regulators Forum with support from the National Water Commission.

Recommendation Three: The National Recycled Water Regulators Forum look at supplying advice to relevant Ministerial Councils(s) on simplifying and adapting the Australian Guidelines for Water Recycling Framework for easier implementation by single households.

Recommendation Four: Consideration be given to integrating the National Recycled Water Regulators Forum with the National On-site Regulators Forum to provide an opportunity to further enhance consistency in the approach to recycled water management.

Recommendation Five: Mechanisms be explored to facilitate the implementation of the Water Recycling Guidelines' framework within the water industry and the development of auditing frameworks and training.

Recommendation Six: The Australian Government and jurisdictions support the continuation of the National Recycled Water Regulators Forum to facilitate sharing of information, including training and the development of education programs for the industry.

Recommendation Seven: The jurisdictions agree that treatment systems for low-risk schemes be exempt from individual validation of treatment processes.

Recommendation Eight: A database be developed of log removal values obtained during testing of treatment systems and the corresponding operational parameters (e.g. turbidity and UV transmissivity) for use with low-risk schemes.

Recommendation Nine: The National Water Commissioner negotiate access rights to the ReQuality database for proponents and regulators who are not members of Water Services Association of Australia.

Recommendation Ten: A national approach to the validation of treatment processes for high-risk schemes be pursued by adopting the four-step strategy for the development of a national approach to the validation of treatment processes.

To aid the implementation of Recommendation Ten, a four-step process for the development of a national approach to the validation of treatment processes is suggested in this report.

Discussion with the regulators and proponents highlighted several issues, which are common to all jurisdictions, need further consideration. These include the long-term management of on-site systems, alternative disposal mechanisms, ownership of recycled water, cross-connections, decreased flow to sewers, long-term security of supplies through private service suppliers, laboratory capacities within states, and validation.

1. Introduction

Pressure from climate change, drought and urban development has resulted in a significant strain on fresh water supplies. In a worldwide context, the World Health Organization has recognised the principal driving forces for wastewater reuse as increasing water scarcity and stress, increasing populations, increasing environmental pollution from improper wastewater disposal, and an increasing recognition of the resource value of wastewater, excreta and greywater (WHO 2006). WHO has also recognised the need for clear direction and management of the reuse of wastewater. In Australia, the response to this has been an active push for water conservation and the development of alternative water sources. This has been embraced by individuals and local, state and federal governments, with the result that significant resources have been directed to encouraging and supporting the reuse of greywater and sewage and the development of recycled water schemes. To ensure the environment and public health are protected, there is a need for appropriate treatment of source water, use of recycled water, and the long-term management of recycled schemes. This can be achieved through appropriate legislation and guidelines, while still encouraging innovation and competition in the industry. As it is inevitable that the volume of water recycled and the number of schemes developed will increase, it is important that a nationally consistent approach to both regulation and guidelines and the application of the guidelines is embraced.

The National Water Quality Management Strategy *Australian Guidelines for Water Recycling: Managing Health and Environmental Risks* (Phase 1)(NR&MMC-EPHC-AHMMC 2006) (AGWR) was published in 2006 and advocate a risk management framework based on that previously detailed in the *Australian Drinking Water Guidelines* (NH&MRC-NRMMC 2004) and the *World Health Organization's Guidelines for Drinking-water Quality* (WHO 2004). This has resulted in a significant change in the approach to the management of recycled water schemes.

A National Water Commission Fellowship was awarded in 2008 to 'Review individual jurisdictional requirements for the validation of recycled water treatment processes'. The initial aim of the project was to detail the processes being adopted by each jurisdiction for the validation of recycled water treatment processes and compare this to other international requirements. The approach taken was to meet with the individual agencies involved in the regulation and management of recycled water. This included health, environmental and water resource management agencies, as well as some proponents of recycled water schemes. All jurisdictions except Northern Territory were visited in person. The areas discussed included the current legislative requirements, guidelines, including specific validation requirements for treatment technologies and the adoption and impact of the AGWR. This approach allowed each jurisdiction to describe how they managed recycled water schemes, problems and successes and to raise concerns they have about recycled water schemes and with the application of the AGWR based on their experiences. The outcomes of these discussions are detailed in this report. In addition, during discussions it became apparent there were several other issues of concern: these are listed in Appendix A to provide some direction for future research needs. The National Recycled Water Regulators Forum (NRWRF) was used to further discuss the issues (the development of group and minutes of the first meeting are presented in Appendix C).

The report provides an overview of the regulation of on-site wastewater management, covering single household effluent disposal in sewerred and unsewerred areas; the study included greywater recycling and the regulation of effluent disposal and the associated recycled water from larger schemes. The guidelines, codes and standards used in each jurisdiction are also presented. Some jurisdictions have moved towards to the AGWR and have developed specific validation requirements for recycled water schemes. These requirements are presented to help demonstrate the similarities and differences amongst the

jurisdictions. A brief description of the major international regulations and guidelines are included to provide a comparison with Australia. The conclusions and recommendations detail the future direction for addressing some of the concerns raised and increasing consistency between jurisdictions.

In the report, water recycling or reuse is limited to the use of greywater or blackwater as the source water. The source water may be defined in legislation as sewage, blackwater, greywater or wastewater; but all refer to source waters potentially containing human waste products. In this report, the words sewage and wastewater are used interchangeably, depending on the definition used in the legislation of the jurisdiction.

2. Jurisdictional arrangements

The legislation surrounding water recycling can be complex. Several different agencies can have responsibilities for approving the use of recycled water under a single Act and the associated regulations, while a single scheme may trigger several different Acts and regulations. Often there are formal roles and informal advisory roles for different agencies. This is due to the encompassing nature of public health and environmental protection legislation and the development of water recycling within existing legislation. Internal policy decisions also dictate the extent of an agency's role. Although existing legislation could be extended to cover all schemes, policy decisions are often made to limit the agency role because of resource constraints or a desire for less regulatory involvement.

There have traditionally been two main areas of legislation for wastewater management and associated reuse in relation to the disposal of treated effluent as a component of effluent management schemes:

- on-site systems (single households and small treatment plants) in unsewered areas, or
- centralised sewage treatment plants.

Disposal has traditionally been subsurface irrigation (single household) or irrigation to playing fields, woodlots and agriculture (larger schemes). This was driven by the need to dispose of the effluent safely for on-site systems, and a desire to reduce the environmental impact on receiving waters for centralised sewage treatment plants.

Single household (or on-site systems) usually involve specific plumbing and public health regulations due to the close proximity to the householder. The environmental impact of the effluent was also considered, but these systems were primarily in rural areas, which had a large disposal area and were not serviced with a reticulated sewerage system.

The development of recycled water schemes using the treated effluent as an alternative to potable water for approved uses required the interpretation of the existing legislation and development of guidelines to ensure the continued protection of public health and the environment. The early schemes—such as the residential reuse schemes of Rouse Hill in Sydney and irrigation of unprocessed food crops with the Virginia Pipeline scheme in South Australia—were developed by large water utilities and involved close consultation with the regulatory agencies. The protection of public health has been seen as one of the principal requirements because of the potential for high human exposure. Because of the success of these schemes and the active promotion of recycled water use, some states have produced new legislation to regulate recycled water, whereas others have continued to manage it within existing frameworks.

In attempting to compare between jurisdictions, the legislation was divided into (a) on-site wastewater management covering on-site systems (single households and small treatment plants) in unsewered areas, and (b) recycled water covering centralised sewage treatment plants.

2.1 Australian Capital Territory (ACT)

The management of wastewater and recycled water in the ACT differs from other jurisdictions due to the small size and population. There is only one level of government because there are no individual councils. The legislation for on-site wastewater management and water recycling is outlined in Table 1. The main bodies involved are the Environment Protection Authority and the Health Protection Service in ACT Health. There is also a small role for the ACT Planning and Land Authority in the determination of development applications.

2.1.1 On-site wastewater management

Under the *Public Health Act 1997*, on-site waste management systems are defined as a sewage system and require approval from ACT Health in unsewered areas. Provisions of the Building (General) Regulation 2008 ensure that development application for on-site waste management systems are passed to ACT Health. ACT Health looks at the overall design of the on-site system but has no specific procedure for accreditation and will accept accreditation from other states. There is an internal policy of not approving the use of on-site disposal system for block sizes smaller than a 4000 square metres. This does not preclude putting such a system in, but the accumulative effect of all blocks having a waste disposal system should be considered. The Environmental Protection Authority becomes involved in a single household when noise or odour is a factor.

Domestic greywater systems are not regulated in the ACT; however, the document titled *Greywater Use: Guidelines for Residential Properties in Canberra* (ACT Government 2007) provides guidance on the use of greywater in a domestic setting.

Table 1: Legislation and approval requirements for on-site wastewater management and recycled water schemes in the ACT

| Category | Size/type | Legislation | Approval authority or requirement |
|-------------------------------|-----------------|--|--|
| On-site wastewater management | | Building (General) Regulation 2008 | Development application approval required for all new developments Applications with treatment systems will be passed to ACT Health for approval ACT Planning and Land Authority |
| | | <i>Public Health Act 1997</i> | Activity Licence may be required ACT Health |
| | | Public Health Regulations 2000 (section 6.3) | In an unsewered area approval required from an authorised officer for the installation of septic tanks or chemical toilet ACT Health |
| Recycled water | | <i>Environment Protection Act 1997</i> | Minster for the Environment, Water and Climate Change |
| | < 3 ML per year | | Activities requiring environmental protection agreement |
| | > 3 ML per year | | Activities requiring environmental authorisation |
| | Overall | <i>Public Health Act 1997</i> | ACT Health has powers in relation to public health risk posed by sewage, the presence of unsanitary conditions and the protection of Canberra's water supply by utilities |

ML = megalitre

Commercial greywater systems are not specifically regulated in the ACT. However, under the Building (General) Regulation 2008, owners are required to lodge a development application for some buildings. The regulation outlines the requirements for plumbing installations and applications including treatment systems that may be sent to ACT Health for comment. It is possible for systems to be installed without the knowledge of ACT Health, particularly if a development application is not required.

2.1.2 Recycled water

Under the *Environmental Protection Act 1997*, a recycled water scheme will either require an environmental authorisation or a protection agreement, depending on the size of the scheme.

Recycled water schemes producing or supplying less than three megalitres per year require a protection agreement, while those producing or supplying greater than three megalitres per year of water require an environmental authorisation from the Environmental Protection Authority. The policy, *Wastewater Reuse for Irrigation: Environment Protection Policy* (Environment ACT 1999), was developed by both the Environmental Protection Authority and ACT Health. Most schemes developed in the ACT are small and therefore require a protection agreement, which is set up with the Environmental Protection Authority and the proponents. ACT Health is involved in the development of the agreement. ACT Health is not a signatory and does not approve schemes. Any alteration to the agreement, including different uses, requires a request for a variation to the Environmental Protection Authority. ACT Health provides comments on the variation.

There are no specific powers in the *Public Health Act 1997* to address recycled water schemes. However, there are powers in the Act for significant public health risks. The policy process under the *Environmental Protection Act 1997* is used to address risks if necessary.

2.2 New South Wales (NSW)

There are several key pieces of legislation covering the regulation of on-site wastewater management and recycled water in NSW. Agencies with key roles are the Department of Environment Climate Change and Water (DECCW), the NSW Office of Water (NOW) within DECCW, local councils, and NSW Health. The Department of Local Government has an indirect role through the oversight of local councils and the legislation that provides local councils with powers to regulate water supply, sewerage and stormwater drainage work. With the recent development of the *Water Industry Competition Act 2006*, the Independent Pricing and Regulatory Tribunal (IPART) also has an increased role. The legislation and management of recycled water in NSW is outlined in Table 2. The legislation in NSW can be seen as very complex. This results in some confusion between proponents and regulators regarding the approvals and process required for each scheme. Depending on the project, there may also be the need for a proponent to obtain approvals from up to three different government agencies—NOW, DECCW and NSW Health—as well as the local water utility and or the local council. There is a desire to have only one approval for each scheme, but discussions with all agencies is often needed to determine what approval is required.

2.2.1 On-site wastewater management

Most on-site wastewater management systems are regulated under section 68 of the *Local Government Act 1993*. A wastewater management system requires an approval to install and an approval to operate from the local council. If the system is designed to cater for fewer than 10 equivalent persons (EP) or 2000 litres per day then it is captured by the NSW Health accreditation requirements. NSW Health works directly with the manufacturers on accrediting treatment systems and maintains a register of accredited systems. This covers both greywater and blackwater treatment systems and any subsequent recycling. Proponents who wish to install an on-site wastewater management system to serve more than 10 EP are not required to install a system accredited by NSW Health. A system of this size would need to be designed specifically for the site. This regulatory setup allows for councils to approve the installation of quite a large system, which could service communities, with no input from state agencies.

In response to the desire for people to use greywater for irrigation, the regulations for greywater were streamlined in 2006 to allow an exemption from prior council approval for the installation of greywater diversion devices if certain practices are implemented and conditions met.

Table 2: Legislation and approval requirements for on-site wastewater management and recycled water schemes in NSW

| Category | Size/type | Legislation | Approval authority or requirement |
|--|---|--|--|
| On-site waste management system | < 10 EP | <i>Local Government Act 1993</i> (section 68) | Approval to install and operate given by the local council Systems installed need to have NSW Health Accreditation NSW Health maintains a register of accredited systems |
| | > 10 EP | | Approval to install and operate given by the Local Council |
| All sewerage schemes regardless of proponent | Operation of sewage treatment systems that involve the discharge or likely discharge of wastes or by-products to land or waters. | <i>Protection of the Environment Operations Act 1997</i> | DECCW Outlines the Scheduled Activities |
| | Scheduled Activity- capacity > 2500 EP or > 750 kL/day, which ever is the greater and involve discharge or likely discharge of wastes or by-products to land or waters. | Protection of the Environment Operations (General) Regulations 1998 | Requires a license from the Environment Protection Authority |
| | Local government water utility – sewage treatment works | <i>Local Government Act 1993</i> (section 60) | Approval from the Minister for Water via the NOW |
| Recycled Water | Water Utility | <i>Water Management Act 2000</i> <i>Local Government Act 1993</i> (section 60) <i>Hunter Water Act 1991</i> <i>Sydney Water Act 1994</i> | Approval from the Minister for Water via the NOW NSW Health advisory role Operating licence require Sydney and Hunter Water Corporations to supply recycled water according to relevant guidelines specified by NSW Health, DECCW, NOW and DPI IPART audits and maintains operating licence |
| | Private Sector Schemes | <i>Water Industry Competition Act, 2006</i> Water Industry Competition (General) Regulation 2008 <i>Local Government Act 1993</i> (section 68) | Network operator's or retail supply licence issued by the Minister for Water Initial license application is to IPART, who assesses application and passes to NSW Health and NOW for comment and potential conditions of approval Approvals to install and operate given by the local councils. Councils may seek advice from NOW and NSW Health |

2.2.2 Recycled Water

The regulation of recycled water schemes is spread across several different agencies. Schedule 1 of the *Protection of the Environment Operations Act 1997* lists activities that need to have an environmental protection licence; this includes sewage treatment plants. Sewage treatment plants that have an intended capacity of greater than 25,000 EP or 750 kilolitres per day and also involve the discharge or likely discharge of wastes or by-products to land or waters require a license from DECCW as a Scheduled Activity. This licence covers the land disposal of effluent for irrigation. DECCW will not generally license non-scheduled wastewater recycling systems because they can be designed and operated to avoid pollution.

There are different approval processes for recycled water schemes. Schemes run by local councils defined as water utilities are approved by the Minister for Water under section 60 of the *Local Government Act 1993*. Gosford City Council, Wyong Council and the Sydney Olympic Park Authority are defined under the *Water Management Act 2000* as water utilities, and they also require approval by the Minister for Water. NSW Health has an advisory role in these schemes in relation to potential public health risk and the final use of the water. Schemes run by the two major water utilities, Sydney Water and Hunter Water, are covered by specific legislation, the *Sydney Water Act 1994* and *Hunter Water Act 1991* respectively. Both organisations have an operating license, which requires them to supply recycled water according to relevant guidelines specified by NSW Health, DECCW, NOW, and the Department Primary Industries.

In addition to this, private operators are required under the *Water Industry Competition Act 2006* and the Water Industry Competition (General) Regulation 2008 to obtain a network operator's licence to construct, operate and maintain water industry infrastructure. They are also required to obtain a retail supply licence to supply water or provide sewerage services. Both licences are issued by the Minister for Water. The initial license application is to IPART, who assesses the application and passes it on to NSW Health and NOW for comment and potential conditions of approval. This is then passed to the Minister for Water for final approval of the licence. While private operators require a license, the Exemption Clause 19 does allow water or sewerage infrastructure that is owned and operated on one site to not require a licence if it is owned and operated by the owner of the site. These schemes would be covered under section 68 of the *Local Government Act 1993* as they are situated on a single premise or require a discharge license from DECCW.

2.3 Northern Territory (NT)

The management of sewerage in the NT is substantially affected by the large areas of unpopulated land, the large distances between towns, and the remoteness of many small communities. There are fewer opportunities and, in fact, less need for large centralised recycled water schemes than there are in the other jurisdictions.

The legislation covering water recycling in the NT and the administration of the legislation are presented in Table 3. The primary legislation for the management of wastewater in the NT is the *Public Health Act 2005* and the associated regulations: Public Health (General Sanitation, Mosquito Prevention, Rat Exclusion and Prevention) Regulations 2007. The legislation was written using the definition of septic tank to cover all systems of wastewater management. The approval of wastewater management systems sits with the Department of Health and Community Services (DHCS). The DHCS approve the wastewater treatment system and the installation of the systems regardless of the size of the scheme. There is a small role for the Department of Planning and Infrastructure Building and Advisory Services (DPIBAS) through its administration of the *Building Act 1993*: this requires a certificate of plumbing compliance for works in Controlled Areas (the larger towns, approximately 5 per cent of the territory). This certificate is given by DPIBAS through a private certification system and covers systems with approval from the DHCS. Any scheme that is outside the Controlled Areas or that is unusual will require approval from the DHCS. The process of approval for all types of treatment and recycled water schemes is outlined in the *Northern Territory Guidelines for Management of Recycled Water Schemes* (DHCS 2009) and is neatly summarised in that document in 'Table 1: Approval summary'. There are three scheme definitions that affect the approvals process: a conventional on-site wastewater system (less than 150 EP), an alternative on-site wastewater management system (less than 150 EP); and a recycled water scheme, which is anything above 150 EP. Any potential environmental impact of the schemes will need to be addressed, and some schemes under the *Waste Management and Pollution Control Act 1998* may require a discharge licence. As for the ACT, local councils are not involved in the approval of schemes.

Table 3: Legislation and approval requirements for on-site wastewater management and recycled water schemes in the NT

| Category | Size/type | Legislation | Approval authority or requirement |
|-------------------------------|---|---|---|
| On-site wastewater management | Conventional on-site wastewater system | <i>Public Health Act 2005</i> Public Health (General Sanitation, Mosquito Prevention, Rat Exclusion and Prevention) Regulations 2007 <i>Building Act 1993</i> | DHCS approval for the system required DHCS may chose to approve the installation of theses systems for a schedules fee The Chief Health Officer has delegated the installation approval to certain staff in the DHCS operational regions and <u>type approval</u> ¹ DPIBAS Plumbing Compliance Certification Plumbing requirements within Building Controlled Areas |
| | Alternative on-site wastewater management systems | <i>Public Health Act 2005</i> Public Health (General Sanitation, Mosquito Prevention, Rat Exclusion and Prevention) Regulations 2007 <i>Building Act 1993</i> <i>Waste Management and Pollution Control Act 1998</i> | DHCS approval for the site specific system required DPIBAS Plumbing Compliance Certification Plumbing requirements within Building Controlled Areas Environment Protection Agency licence may be required |
| Recycled water | > 150 EP | <i>Public Health Act 2005</i> <i>Waste Management and Pollution Control Act 1998</i> | DHCS approval required Environment Protection Agency licence may be required Connection to power and water corporation sewerage system requires approval |

¹Based on 'Table 1 Approval summary', *Northern Territory Guidelines for Management of Recycled Water Schemes* (DHCS 2009)

2.4 Queensland (QLD)

Queensland's Climate Smart 2050 strategy is one of the driving forces for changes in recycled water use in that state. It was developed to help the state address climate change. A large component of the strategy is adapting to water shortages and securing the future water supply. In response to these drivers, there has been a significant change in the regulation of water and wastewater supply and management. This has resulted in changes to the *Plumbing and Drainage Act 2002*, the Public Health Regulation 2005 Part 6A and the development of the *Water Supply (Safety and Reliability) Act 2008*. The government's plan to augment drinking water supplies with recycled water and the need for a level of confidence in the supply of the water was also a catalyst in the development of the Act.

Legislation impacting on recycled water use in QLD is outlined in Table 4. It is divided into two areas: on-site wastewater management systems covered by the *Plumbing and Drainage Act 2002*; and the second group of larger schemes covered by the *Water Supply (Safety and Reliability) Act 2008*.

2.4.1 On-site wastewater management

On-site wastewater management or household systems are regulated under the *Plumbing and Drainage Act 2002* and the Standard Plumbing and Drainage Regulations 2003. On-site sewage treatment plants defined as fewer than 21 EP require council approval for installation. The system also requires approval from the Chief Executive of the Department of Infrastructure and Planning and it must meet the performance criteria of the *Queensland Plumbing and Wastewater Code* (DIP 2009) for water quality and system monitoring and maintenance requirements. Currently all blackwater in unsewered areas must go to the on-site disposal system and to the sewer in sewered areas. Blackwater cannot be collected and recycled on-site.

The reuse of treated and untreated greywater is allowed in both sewered and unsewered areas. The *Queensland Plumbing and Wastewater Code* (DIP 2009) sets the water quality requirements depending on the intended end use of the water. The level of treatment will determine whether the water can be reused for internal use, such as toilet flushing and in washing machines, or for garden irrigation only.

Households that intend to reuse greywater and generate more than three kilolitres per day of greywater must install a greywater treatment system.

All single greywater treatment systems with a capacity of less than 50 kiloliters per day must be approved by the Chief Executive of the Department of Infrastructure and Planning. The system must also meet the performance criteria of the *Queensland Plumbing and Wastewater Code* (DIP 2009) for water quality and system monitoring and maintenance requirements.

Before supplying recycled water, any single greywater treatment system with a capacity of greater than 50 kilolitres per day must obtain approval from the Office of the Water Supply Regulator, which is part of the Department of Environment and Resource Management (DERM).

Currently, QLD is preparing to undertake blackwater reuse trials in sewered areas. The trials will be carried out over a period of up to three years in a restricted class of buildings (class 5, 6 and 9b as defined in the *Building Code of Australia* (Australian Building Codes Board 2009). They include high-rise apartments and multiunit developments, shopping centres, and tertiary educational institutions); and they are only in South East QLD. These classes of buildings were chosen as they generally have a property manager who would be responsible for managing or maintaining the system.

A multi-agency committee—chaired by the Department of Infrastructure and Planning and including representatives from QLD Health and DERM—has been convened to review the proposed schemes and outcomes of the trials. The objectives of the treated blackwater reuse trials are: to gather relevant scientific information and social data to enable the QLD Government to make an informed recommendation on whether on-site blackwater treatment and reuse should be permitted in sewered areas in QLD; and to provide the QLD Government with relevant data to assess the feasibility of a regulatory framework for treated blackwater reuse in sewered areas. The aim of this framework would be to meet the needs of the community and protect the environment and public health.

2.4.2 Recycled water schemes

Sewage treatment plants in QLD are regulated for releases to the environment under the *Environment Protection Act 1994* and the Environment Protection Regulation 1998, and they are regulated by the Environment Protection Authority (now part of DERM). Sewage treatment is an environmentally relevant activity, and most plants require a development approval. Many inland wastewater treatment plants in QLD have some reuse of treated

effluent. Most treated effluent is used for irrigation, and historically most treatment plants are required to have a user agreement and an irrigation management plan as part of the environmentally relevant activity approval. It should be noted that, since the commencement of the new regulatory framework (see below), DERM (formally the Environment Protection Authority) has withdrawn from placing the requirements for user agreements on environmentally relevant activity approvals and this is now under the jurisdiction of the *Water Supply (Safety and Reliability) Act 2008*.

Table 4: Legislation and approval requirements for on-site wastewater management and recycled water schemes in QLD

| <i>Category</i> | <i>Size/type</i> | <i>Legislation</i> | <i>Approval authority or requirement</i> |
|--|--|--|---|
| On-site wastewater management | On-site sewage treatment plant: < 21 EP in areas not served by a sewerage system—no recycling allowed must all go to disposal system. Greywater treatment plant: < 50 kL of greywater generated on the premises per day Sites generating > 3 kL of greywater must install a greywater treatment system | <i>Plumbing and Drainage Act 2002 (Section 91)</i> Standard Plumbing and Drainage Regulation 2003 | Council for approval for the installation of the system Chief Executive of the DIP approval under section 91 for accreditation of the system |
| | On-site sewage treatment in sewered areas >21EP. Only treated blackwater reuse trials allowed through the <i>Queensland Plumbing and Wastewater Code 2009</i> | <i>Plumbing and Drainage Act 2002</i> Standard Plumbing and Drainage Regulation 2003 | Approval for participation in trials from Local Council and DIP |
| Recycled water | Sewage treatment plants considered an environmentally relevant activity. | <i>Environmental Protection Act 1994</i> Environmental Protection Regulation 1998 Schedule 1 | DERM development approval |
| Where water is being reused and is being supplied to a third party | Sewage or effluent sourced from a sewage service provider's infrastructure Greywater treatment plant > 50 kL of greywater generated on the premises per day. Process water | <i>Water Supply (Safety and Reliability) Act 2008</i> <i>Public Health Act 2005</i> Public Health Regulation 2005, Part 6A | Office of the Water Supply Regulator of the DERM (Chief Executive) |

The *Water Supply (Safety and Reliability) Act 2008* provides for the safety and reliability of water supply. The primary aims of the recycled water provisions are to protect public health and to provide for schemes known as 'critical' schemes to ensure continuity of operation of the scheme to meet the essential water supply needs of the community or industry. This was achieved by a regulatory framework for recycled water and drinking water.

Recycled water as defined under the *Water Supply (Safety and Reliability) Act 2008* covers three main water sources intended for reuse:

- sewage or effluent sourced from a service provider's infrastructure
- greywater from a large greywater treatment plant (greater than 50 kilolitres per day), as defined under the *Plumbing and Drainage Act 2002*, in both sewered and unsewered areas

- process water, which is wastewater that is produced on premises from industrial, commercial or manufacturing activities and the *Water Supply (Safety and Reliability) Act 2008* applies if water is provided to another entity.

A service provider includes local government, but it does not include resorts, ecovillages, bodies corporate and mining communities. It includes anyone who taps into any of the infrastructure of a service provider (e.g. sewer mining).

For example if someone were to extract sewage before it gets to a sewage treatment plant they fall under the jurisdiction of the *Water Supply (Safety and Reliability) Act 2008* and would be defined as a recycled water provider.

By way of further example, a tannery would have to onsell its process water for it to be captured under the *Water Supply (Safety and Reliability) Act 2008*. If the process water is used on-site only then it will not be captured. The *Water Supply (Safety and Reliability) Act 2008* covers suppliers of water, not the users; and it also can cover production, transport or supply. Thus, if someone produces recycled water but supplies it through infrastructure (e.g. a pipeline) owned by another party and there is a concern that there could be a degradation in water quality, then the owner of the infrastructure can also be covered as a recycled water provider. It is anticipated that phase two of the legislation will look at risks associated with the use of recycled water at ecovillages and related entities, desalination and stormwater.

Under the *Water Supply (Safety and Reliability) Act 2008*, recycled water providers are required to have an approved recycled water management plan for the supply of recycled water. The plan must be in compliance with the Recycled Water Management and Validation Guidelines, which are based on the AGWR. The *Water Supply (Safety and Reliability) Act 2008* requires audits and reviews to be conducted by the recycled water providers. The Office of the Water Supply Regulator may also carry out spot audits and require external audits to be conducted.

A proponent may apply for an exemption from having a recycled water management plan. It is still necessary for other requirements to be met, such as final water quality and appropriate uses (outlined in the Public Health Regulation). The recycled water management plan and exemption applies to the recycle water providers and not the end user, but there is an obligation on the providers to be aware of how the end user(s) of their scheme are using and managing the recycled water. If the end user(s) is not using the recycled water correctly, and the provider becomes aware of this, they must, under the *Water Supply (Safety and Reliability) Act 2008*, cease supply immediately to that end user(s). Controls put in place by the end user must be included in the recycled water provider's recycled water management plan or an exemption should be sought. Proponents are expected to have user agreements in place to ensure the safe use of the recycled water. The Public Health Regulation 2005 Part 6A details QLD Health's powers with respect to water related aspects of public health. QLD Health's powers are limited to those entities that are covered by the *Water Supply (Safety and Reliability) Act 2008*. Any entities or persons that produce or use recycled water that fall outside the scope of that Act are regulated by local government.

If an incident occurs with recycled water augmenting a drinking water supply, QLD Health is responsible for providing advice to the Office of the Water Supply Regulator with respect to any public health risk and assessment of the corrective actions by the recycled water provider. If there is an incident at a local level, the recycled water provider maintains responsibility but must notify the Office of the Water Supply Regulator. For example if a caravan park was supplying recycled water to a golf course then the caravan park (recycled water provider) must notify the regulator as soon as possible after an incident has occurred and must manage any associated public health risk. The Office of the Water Supply Regulator has a variety of powers it may enact if required.

QLD Health can set standards for recycled water quality under the Public Health Regulation 2005 Part 6A. To date, QLD Health has set standards for recycled water used to augment drinking water supplies, dual reticulation schemes, and for irrigation of minimally processed food crops. QLD Health also has powers to respond to public health incident under the *Public Health Act 2005*, and the power to prosecute if a drinking water supplier provides unsafe drinking water or if a recycled water supplier provides recycled water that is not fit for use. This was designed to cover the situation where a supplier knowingly supplied unfit water, but did not do anything about it.

2.5 South Australia (SA)

The management of recycled water in SA is relatively straight forward due to the encompassing nature of the *Public Health and Environment Act 1987* and the Public and Environmental Health (Waste Control) Regulation 1995. The legislation states that any waste that contains human waste and abattoir wastewater requires approval from the Department of Health if it is to be recycled. As a result, both on-site wastewater and large-scale waste water are handled in a similar manner.

The breakdown in requirements is outlined in Table 5. Local council is the approval authority for the installation of on-site wastewater treatment systems that service 50 EP. All systems must be approved by the Department of Health. The size limit of 50 EP is arbitrary. Under the legislation there is no size limit placed on the system approval, but the Department of Health has chosen to set a limit of 50 EP.

Township schemes and private schemes are approved by the Department of Health. Councils do not have the authority to approve the installation of any system that is not a department-approved system: anything larger than 50 EP or a 'one-off' must go to the department. The Department of Health is responsible for checking the entire system, including the collection system, treatment system technologies, and the recycled water distribution infrastructure. The Environment Protection Authority will become involved in newly developed schemes through advice under the *Development Act 1993* (and associated regulations) when the size is 50 EP or above in a sensitive area and greater than 250 EP in a non-sensitive area. The level of involvement of the Environment Protection Authority is even greater when the size is 100 EP or above and is in a sensitive area and greater than 1000 EP in non-sensitive area. In addition, when the size is 100 EP or above and is in a sensitive area and greater than 1000 EP in non-sensitive area, all scheme operators must have an approval in the form of an authorisation under the *Environment Protection Act 1993*. All installations for greywater treatment must go to the Department of Health for approval to install.

The Environment Protection Authority may seek operators of large recycled water schemes to enter into an environmental performance agreement, which may contain terms providing for any matter that considered to be appropriate for securing the objectives of the legislation.

SA Water is the water utility for SA. It is responsible for providing recycled water to most of the large recycled water schemes. The Department of Health and the Environment Protection Authority conduct regular meetings with SA Water and have worked very closely with them to develop schemes.

One area of concern within SA is the regulation of stormwater schemes as orphaned schemes. SA Water often finds out about stormwater schemes sooner than the Department of Health because they receive notice of connection to drinking water and sewage services. If the scheme was remote from all services, then SA Water would not receive notification. Currently stormwater is one area that is not covered in the *Public Health and Environment Act 1987*, and so it is currently unregulated. There are regulations in the *Public Health and Environment Act 1987* for a stormwater scheme to be shut down if it is causing a public health

or environmental health risk once it is in operation. The gap in regulation regarding the use of stormwater as alternative source water for recycled water schemes needs to be reviewed.

Table 5: Legislation and approval requirements for on-site wastewater management and recycled water schemes in SA

| <i>Category</i> | <i>Size and Type</i> | <i>Legislation</i> | <i>Approval Authority or Requirement</i> |
|----------------------------|----------------------|---|---|
| All waste control systems. | | <i>Public and Environmental Health Act 1987</i> | Ability of the Governor to make regulations in relation to waste control systems |
| | | Public and Environmental Health (Waste Control) Regulations 1995 | Department of Health for all township schemes and on-site systems that are not subject to prescribed codes |
| | | Environment Protection (water Quality) Policy 2003 | |
| | < 50 EP | | Council approval for installation (for on-site systems that are subject to Department of Health prescribed codes i.e. septic tanks, aerobic systems and sand filters) |
| | > 50 EP | <i>Development Act 1993</i> <i>Environment Protection Act 1993</i> | Department of Health for installation and treatment process Environment Protection Agency for advice on new schemes in sensitive areas |
| | > 100 EP | | Environment Protection Agency license required if > 100 EP in water protection areas Environment Protection Agency direction for new schemes in water protection areas |
| | > 10000 EP | | Environment Protection Agency license required if > 1000 EP in non-water protection area |

2.6 Tasmania (TAS)

The legislation that regulates recycled water use is outlined in Table 6. This is divided into two main areas: (a) on-site wastewater management systems and (b) larger systems that cover the recycling associated with disposal of treated wastewater.

2.6.1 On-site wastewater management

Tasmania's standard for plumbing work under the *Building Act 2000* is the Tasmanian Building Code (Tasmania Department of Justice 2006). The Code is a performance-based code that provides for performance-based solutions. This allows for innovation in design, provided the solution adopted to manage wastewater meets the relevant performance requirements of the code.

Under the *Building Act 2000*, on-site wastewater management systems that are designed with a hydraulic loading of up to 100 kilolitres per day require a Special Plumbing Permit from the Permit Authority (municipal council) for installation and maintenance. These systems are usually designed for use in unsewered areas and are required to have a certificate of accreditation granted by the by Minister for Justice and Workplace Relations under the Code.

Importantly, council-owned and operated systems and purpose-built systems do not require accreditation. However, they still require a Special Plumbing Permit and meet the same standard as for gaining accreditation to obtain the required permits.

Under the current *Sewers and Drains Act 1954*, in a sewerred area, the council has the power to require a household to be connected to the sewer. This does not prevent the installation of private packaged treatment plants in a sewerred area. The TAS regulator’s view is a connection is still warranted to allow for off-site discharge in the event of a failing system or the inability to use the wastewater generated on the property.

Table 6: Legislation and approval requirements for on-site wastewater management and recycled water schemes in TAS

| Category | Size and Type | Legislation | Approval Authority or Requirement |
|--------------------------------|---|---|---|
| On-site waste water management | Systems designed with a hydraulic loading of <100 kL/day of average dry-weather flow Permanent greywater diversion devises Greywater treatment systems | <i>Building Act 2000</i> Plumbing Regulations 2004 | Special Plumbing Permit from the Permit Authority (municipal council) for installation and maintenance of on-site wastewater management systems A Certificate of Accreditation issued by the Minister for Justice and Workplace Relations is required if not exempt. The Certificate details what the system can be used for and how it is to be used and maintained. Regulations provide for the information required to be supplied to the permit authority (council) before Special Plumbing Permit (permit to operate) can be granted. Council’s Environmental health Officer is to consent to the systems installation Exemption from accreditation requirement of on-site waste management systems possible if prototype for the purpose of testing or the system is specifically designed for that site and is not for sale |
| Recycled water | Systems designed with a hydraulic loading 100 kL/day or more where they are defined as <u>Level 2 Activities</u> ; some smaller systems are also capture, e.g. treating waste from specified processes. Level 1 activity—any activity that may cause environmental harm and in respect of which a permit is required | <i>Environmental Management and Pollution Control Act 1994</i> Schedule 2 <i>Land Use Planning and Approvals Act 1993</i> | Requires a Development Proposal and Environmental Management Plan (DPEMP) The Director of Public Health may require a health risk assessment The DPEMP goes through the Wastewater Re-Use Coordinating Group Approval for the scheme is by the Director EPA The user agreement is the responsibility of the council Municipal council for schemes |

The focus of the legislation and accreditation process for on-site wastewater management systems is on package plants or manufactured systems. Purpose built systems e.g. designed for a specific site and use need to demonstrate how they meet the performance requirements of the *Tasmania Plumbing Code* (Tasmania Department of Justice 2006). The accreditation process is able to use a variety of guidelines and expert judgement to do this. The Department of Justice draws on the knowledge and expertise of its Plumbing Advisory Committee in carrying out evaluations and setting conditions of use for accreditation of on-site wastewater management systems.

Appropriate Australian Standards are used where applicable and are extended to cover the design and desired use. No specific guidance documents have been developed. However, the principles of existing on-site wastewater management standards and product standards are adopted. The Department of Justice has been encouraging manufacturers and suppliers to present to them what the system is designed for and then deciding if it is fit-for-purpose.

2.6.2 Recycling water scheme

Historically, the major use of recycled water has been for agricultural and golf course irrigation. The Tasmanian Government does not directly regulate water recycling, but regulates wastewater discharge to land or water under the *Environmental Management and Pollution Control Act 1994* (EMPC Act) framework. Under the EMPC Act, sewage treatment systems with a design capacity to treat an average dry-weather flow of 100 kilolitres per day or greater are defined as Schedule 2 Premises and require a discharge licence from the Department of Environment, Parks, Heritage and Arts (DEPHA). If there is going to be a discharge to the environment, such as an irrigation scheme, then a development proposal and environmental management plan (DPEMP) is required. The DPEMP should address all environmental and public health issues of the proposed scheme. A DPEMP that includes a recycled water component would be reviewed by the Wastewater Re-Use Coordinating Group, which will make recommendations on the plan. The approval for the scheme is given by the Director, Environment Protection Authority (located in the DEPHA). If the proposal is for an existing plant, then it would only require a change in the wastewater treatment plant's current licence once a satisfactory DPEMP has been provided. The principal ongoing requirements of the licence are to achieve a treated water quality suitable for use and to report regularly to the director of the Environment Protection Authority on the sustainable operation of the scheme. It is the responsibility of the local municipal council to develop supplier-users agreements with the recipients of the recycled water and to monitor requirements arising from these legal instruments. Currently there are about 80 plants licensed by the DEPHA, of which about one third include a component of effluent reuse. Systems that are not captured by the EMPC Act as Schedule 2 Activities may still be defined as a Level 1 Activity under the *Land Use Planning and Approvals Act 1993* and require a permit from the local municipal council.

TAS has recently undertaken a review of its water and sewerage industry and has developed the *Water and Sewerage Industry Act 2008*. The Act establishes the Office of the Water and Sewerage Regulator and commenced on the 9 July 2008, except for section 30 which commenced on the 1 July 2009. As a result of the reform, the water and wastewater supply systems of the 29 councils have been transferred to three regional authorities (still council owned) and all water and wastewater personnel and assets moved to these authorities. This regulation will cover the treatment process for recycled water schemes but not the delivery infrastructure. The role of council for the smaller schemes will still need to be addressed.

2.7 Victoria (VIC)

The original driver for water recycling in Victoria was the need to reduce the input of nutrients into the inland rivers and the input of *Escherichia coli* (*E.coli*) and nutrients to the ocean. All this was occurring about 15 years ago, prior to the present drought conditions, and was embodied in the *Environment Protection Act 1970*. In response to the drought a white paper *Our Water Our Future* was produced by Victorian Government. The papers looked at alternative water sources including recycled water and provided an action plan to better use and manage Victoria's water resources.

The legislation and therefore most of the regulation for wastewater management and recycling in VIC is the responsibility of the Environment Protection Authority Victoria (EPA)

Victoria) with an approval or support role from the Victorian Department of Health. The requirements are outlined in **Error! Reference source not found.**

2.7.1 On-site wastewater management

The *Environment Protection Act 1970* covers on-site systems. This is unusual as most other states have the approval of the treatment system carried out by the health department or plumbing regulator. Under the *Environment Protection Act 1970*, the on-site systems are defined by their size (less than 5000 litres per day design capacity) and cover the treatment and dispersal of domestic wastewater (either sewage or greywater). This regulatory framework covers both the disposal and recycling of wastewater. The approval to install a system is with the local government. EPA Victoria maintains a list of on-site systems that may be installed in VIC through a 'Certificate of Approval' system. There is also the active policy that on-site blackwater recycling is not encouraged where a reticulated sewerage system is available.

Table 7: Legislation and approval requirements for on-site wastewater management and recycled water schemes in VIC

| Category | Size and Type | Legislation | Approval authority or requirement |
|-------------------------------|--|--|--|
| On-site wastewater management | Wastewater treatment plant with <5000 L/day design capacity and associated waste disposal area—referred to as 'septic tank' systems | <i>Environment Protection Act 1970</i> | System must be an EPA Victoria approved system Permit to install required from the local council On-site blackwater recycling is not permitted where reticulated sewerage is available as outlined under the <i>Code of Practice: On-site Wastewater Management 2008</i> . There are a few exceptions under Section 5.1.1 |
| Recycled water | Systems treating > 5000 L/day design capacity where there is no discharge to the environment (e.g. through irrigation) are not regulated Wastewater treatment plants with a design capacity of > 5000 L/day and discharge to the environment Recycled water schemes having > 1 ML/day supply | <i>Environment Protection Act 1970</i> Environment Protection (Scheduled Premises and Exemptions) Regulation 2007 | Under these regulations, EPA Victoria provides an exemption from licensing provisions if scheme meets the guidelines All recycled water schemes require an environment improvement plan (risk management plan) Approval and in some cases a license required from EPA Victoria Class A schemes require EPA Victoria approval and Department of Health endorsement Require EPA Victoria approval Class A schemes require EPA approval and Department of Health endorsement |

2.7.2 Recycled water

Wastewater treatment plants that discharge to the environment and have a design capacity of greater than 5000 litres per day are required to be approved or licensed by EPA Victoria under the Environmental Protection (Scheduled Premises and Exemptions) Regulation 2007. However, water recycling schemes that meet the relevant EPA Victoria guidelines are eligible for an exemption from licensing.

Large schemes (greater than one megalitre per day) require approval from EPA Victoria and Class A schemes (where recycled water is used for purposes with a high likelihood of direct contact) require both EPA Victoria approval and endorsement from the Department of Health.

2.8 Western Australia (WA)

In WA the Economic Regulation Authority licenses service providers of water supply (potable and non-potable), sewerage, and irrigation and drainage services. The *Water Services Licensing Act 1995* requires anyone wishing to provide one of these water services in a controlled area to be either licensed by the Economic Regulation Authority or formally exempted by the Governor of WA. Prior to granting an operating licence, the Economic Regulation Authority must be satisfied that the applicant has ongoing financial and technical capability and that the granting of a licence is not contrary to the public interest. Water Corporation, Aqwest (Bunbury Water Board), and Busselton Water Board are examples of service providers licensed to provide potable water services. There are many local councils in WA licensed to provide wastewater services in controlled areas. In areas that are not classified as controlled areas under the *Water Services Licensing Act 1995*, the disposal of effluent is primarily managed through the Department of Health and the local councils. The legislation in place for WA is outlined in Table 8.

2.8.1 On-site wastewater management

The *Public Health Act 1911* is the main regulation for wastewater management—Part (IV) outlines sanitary provisions. The legislation is prescriptive in its definition of waste (anything that anyone does not want) and places the onus on local government to manage the waste. The *Public Health Act 1911* covers any waste management system that is not connected to a sewer. A system servicing a single dwelling on a single plot or producing less than 540 litres per day requires local government approval and the system installed must be approved by the WA Department of Health. The department maintains a register of approved systems. The requirements for approval are outlined in the Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974. The use of greywater, in sewered and unsewered areas, is covered by the same regulation and detailed in the *Code of Practice for the Reuse of Greywater in Western Australia* (Water Corporation, Department of Environment and Department of Health 2005).

Applications for large on-site recycling systems in unsewered areas come directly to the WA Department of Health. The health regulation states that an apparatus is to be approved by the Executive Director of Health if it is intended to serve a building that is not a single dwelling and produces more than 540 litres per day. Currently, there are approximately 10–12 private schemes that have applied for approval. The majority of the schemes are dual reticulation with internal use (toilet flushing only) and restricted outside use. The WA Department of Health is to release codes of practice for these schemes in 2009.

2.8.2 Recycled water schemes

The *Environmental Protection Act 1986* requires that wastewater treatment plants with an output of greater than 100 cubic metres per day need to obtain a works approval for the infrastructure and an operating license to discharge to the environment. The works approval process should note that it is a recycled water scheme and whether it can meet the requirements. It is then passed to the Department of Health for comment. Conditions for the discharge are attached to the licence, which covers the quality and quantity for each plant and the conditions and approval of any irrigation scheme. Under the *Environmental Protection Act 1986*, an applicant can register a scheme under a certain size (between 20 and 100 cubic metres per day). A register of sub threshold schemes is held by the Department of Environment and Conservation. The environmental protection legislation covers both

environment and public health and, for many schemes, consultation is required with the Department of Health regarding licence conditions.

Table 8: Legislation and approval requirements for on-site wastewater management and recycled water schemes in WA

| <i>Category</i> | <i>Size/type</i> | <i>Legislation</i> | <i>Approval authority or requirement</i> |
|--|--|--|--|
| Water services providers of water supply (potable and non-potable), sewerage, and irrigation and drainage services | Provision of water supply (potable or non-potable), sewerage, drainage or irrigation services within a 'controlled area' | <i>Water Services Licensing Act 1995</i> | Required to be licensed by the Economic Regulation Authority or exempted by the Governor The Economic Regulation Authority administers the licensing requirement Department of Water administers the exemption process |
| On-site wastewater management and greywater | Single dwelling on a single plot or produces < 540 L/day Greywater treatment system < 10 EP | <i>Health Act 1911</i> (section 107) Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974 Section 4 | Local government approve the installation of the system Executive Director, Public Health accredits the system and maintains a register of accredited systems Department of Health application form to be completed and sent to the local government |
| | Single dwelling and produces > 540 L/day Greywater treatment system > 10 EP | | Executive Director, Public Health approves the system and installation |
| Recycled water | Category 54: Sewage facility: premises – (a) on which sewage is treated, or (b) from which sewage is discharged onto land or into water >100 m ³ /day | <i>Environment Protection Act 1986</i> Part V - Environmental regulation Environmental Protection Regulations 1987 Schedule 1 (Part 1) - Prescribed premises | Department of Environment and Conservation with advice sought from the Department of Health. Requires a works approval for the construction of the waste water treatment plant or the construction of the recycled waste storage plant. |
| | Category 85: Sewage facility: premises (a) on which sewage is treated: or (b) from which sewage is discharged onto land or into water > 20 but < 100 m ³ /day | <i>Environment Protection Act 1986</i> Part V – Environmental regulation Environmental Protection Regulations 1987 Schedule 1 (Part 2) – Prescribed premises | A license is required to regulate the discharge of the wastewater to the environment (i.e. irrigation scheme) from the Department of Environment and Conservation. |

The Department of Environment and Conservation is currently engaged in discussions on what is disposal versus what is recycling and how this fits in a regulatory framework that perceives a discharge as something you don't want to occur and places financial burdens on it. There is the potential to have an exemption for harmless discharge to land, which a recycled water scheme could be classed as. These schemes require a nutrient irrigation management plan prior to gaining approval for this activity and also pay a lower discharge fee. At the moment, the wastewater treatment plant is licensed as the prescribed premises and they pay a licence fee depending on the discharge to the environment. If they are disposing of it by passing it to another user the wastewater treatment plant is still required to

hold a licence. Currently, the end user is not licensed this is to encourage the use of recycled water and it is often a community golf course or local government using the water to irrigate parks and ovals. However, the wastewater treatment plant operator may charge the end user for the water to recover the cost of the license fee.

2.9 International

2.9.1 Legislation

The regulation of recycled water outside Australia differs from country to country. Some countries have actively pursued water recycling and developed specific regulations to support and encourage it, while other countries have addressed recycled water use with policy and guidelines development in the established wastewater management legislations. Key examples are presented below.

2.9.2 United States of America (USA)

There are no federal regulations governing water recycling in the USA, so the regulations have been developed on a state-by-state basis. As of November 2002, 25 states have adopted regulations regarding recycled water use, 16 states had guidelines or design standards and nine states had no regulations or guidelines (US EPA 2004). Some states have developed them in response to water conservation needs and, therefore, strongly encourage the use of recycled water as a resource. Examples of this are seen in California, Arizona, Florida and Washington. Other states' guidelines are based more on providing an alternative to discharge to surface waters. Two of the states with extensive regulations are California and Arizona.

California

An example of regulation that has been developed to actively encourage and support recycled water use is in the *California Water Code*, which is managed by the Department of Water Resources. Because the California Water Code directs the sustainable use of water, it promotes the use of recycled water in place of potable water. Section 13512 of the Code states that:

It is the intention of the Legislature that the State undertake all possible steps to encourage development of water reuse facilities so that reclaimed water may be made available to help meet the growing water demands of the State.

The delegation of the responsibility for the public health of recycled water is detailed in Section 13521 of the Code:

The Department of Public Health shall establish uniform state-wide recycling criteria for varying type of use of recycled water where the use involves the protection of public health.

To fulfil this requirement, the *California Code of Regulations Title 22 (Title 22)* was produced. Recycled water is specifically addressed in *Division 4 Environmental Health Chapter 3 Water Recycling Criteria*. Title 22 outlines the requirements for recycled water schemes. It defines the recycled water quality, treatment train requirements, and sources for recycled water, uses for the recycled water, sampling and analysis criteria.

The Department of Water Resources regulates the production, conveyance, and use of recycled water through its nine regional water quality control boards. This is also outlined in the California Water Code, which requires that a reclamation permit be requested by a proponent and issued by one of the California regional water quality control boards. All

schemes must meet the requirements outlined in the California Water Code and the recycled water criteria detailed in Title 22. Permits are given by the Control Board using prescriptive requirements.

The California Water Code Section 14875 also deals with the construction, installation or alteration of greywater systems for subsurface irrigation and other safe uses. This requires the Department of Water Resources to consult with various agencies, including the Department of Public Health, to adopt standards for the installation of greywater systems. Section 14877 indicates that the authority of the Department of Water Resources to adopt standards for residential buildings shall terminate upon the approval and development of the California Building Standards, currently detailed in the *State Building Standards Code, Title 24*. Administration for the installation of the greywater system is the responsibility of the relevant city or county, which ensures the system complies with the appropriate Code. The city or county is able to adopt more stringent standards than in the Code and to prohibit the use of greywater.

California Code of Regulations Title 17 also details the protection of water supplies from contamination and addresses the requirements for cross connection control.

This process has resulted in the development of large reclaimed water schemes run by water utilities. The Orange County Water District Groundwater Replenishment Program has been developed to address salt intrusion and secure the water supply need for Orange County. This treatment process includes tertiary treatment with additional membrane filtration and advanced oxidation. The City of San Diego also undertakes extensive use of recycled water under Title 22 for irrigation, industrial use and cooling towers. The water is supplied through two treatment plants and undergoes tertiary treatment including disinfection with chlorine. With further advanced treatment, recycled water has been approved for groundwater recharge or reservoir augmentation. There has been significantly less drive for systems smaller than those used by the large utilities, or for greywater use by individual householders.

Arizona

Arizona also has extensive experience with recycled water. The Arizona Department of Environment and Quality is responsible for granting permits for the use of recycled water. Regulations apply to wastewater treatment facilities supplying reclaimed water and to the sites where water is applied or used. These are defined as a Reclaimed Water Individual Permit or a Reclaimed Water General Permit, and they cover the owner or operator of a sewage treatment facility that generates reclaimed water for direct use, an owner or operator of reclaimed water blending facility, a reclaimed water agent, the end user and someone who uses greywater. All wastewater treatment facilities providing recycled water for reuse must have an individual Aquifer Protection Permit (APP) The APP requires monitoring and reporting of reclaimed water quality to ensure that effluent limitations for reclaimed water quality classes are met. These are detailed in the *Arizona Administrative Code Title 18 Environmental Quality*. An organisation can hold a general permit as an agent, which means individuals receiving the recycled water do not need to have their own licence with the associated reporting requirements. Individuals wishing to install on-site systems still require a Construction Authorization and Discharge Authorization from the Department of Environment and Water Quality. All of this is driven by the need to protect the ground water supplies from pollution.

The Tucson Water Department operates several reclaimed water facilities under licence from the Arizona Department of Environment and Quality. They supply recycled water for irrigation of parks, golf courses and households for irrigation as well as irrigation at schools. This water meets the reclaimed water quality requirements outlined in the Arizona Administrative Code Title 18 Environmental Quality.

2.9.3 Canada

As in many other countries, there has been an increase in interest in the use of recycled water in Canada. There are no overall federal regulations covering recycled water use, and the individual jurisdiction have started to develop their own.

Alberta

The *Environmental Protection and Enhancement Act 2000* requires that an approval be obtained before any treated wastewater from a municipal wastewater treatment plant is used for irrigation or any other purpose. The *Wastewater and Storm Drainage Regulation 2003* administered by Alberta Environment allows the Ministry to issue site-specific approvals for systems that reuse treated municipal wastewater for irrigation on agricultural land and golf courses. The provisions do not apply to residential irrigation. The *Alberta Building Code (2006)* and *National Plumbing Code of Canada (NRC-ICR 2005)* requires all plumbing to be connected to a sewer or to an approved private sewage treatment systems. The state is currently reviewing the use of recycled water for household use and has established the Reclaimed Water Working Group to develop the appropriate regulations, standards and water quality criteria.

British Columbia

British Columbia has recently produced the Municipal Sewage Regulation 2007 that replaces the previous permit system. The regulation outlines the acceptable uses, water quality criteria and treatment systems. In addition to the regulation, a companion document—*Code of Practice for the Use of Reclaimed Water*—covers the specific requirements for the use of the reclaimed water. The aim of these documents has been to encourage the safe use of recycled water and the safe disposal of effluent that cannot be economically or practically reused.

2.9.4 World Health Organization (WHO)

The WHO *Guidelines for the Safe Use of Wastewater, Excreta and Greywater Volume 1 Policy and Regulatory Aspects (WHO 2006)* provides an overview of a regulatory framework that could be adopted for the safe use of recycled water. The WHO Guidelines (WHO 2006) are an integrated preventative management framework for maximising the public health benefits of wastewater, excreta and greywater use in agriculture and aquaculture. They are not a regulatory framework in themselves, but provide guidance on how to set one up. The document states that:

Ultimately, the regulatory framework should adopt the format of a safe reuse of wastewater plan, in line with the concept of water safety plans in other areas of water quality management and health protection and promotion.

This would include the identification of hazards, generating evidence for health risks and the effectiveness of possible health protection measures to manage them, establishing health-based targets to manage health risks, implementing health protection measures to achieve the health-based targets and system assessment and monitoring. The idea behind the document is that this can be applied to both on-site and large centralised schemes.

3. Discussion

3.1 On-site wastewater management

Much of the legislation currently used for recycled water schemes was developed to manage the potential public health and environmental impacts from the disposal of sewage. Most legislation for on-site wastewater systems was intended for single households or small treatment plants to minimise the exposure to sewage and for sustainable management of effluent disposal in unsewered areas. The regulation and management of on-site systems has developed as a prescriptive process and is supported by a treatment system accreditation or approval process run by a central agency, usually health or plumbing (Table 9). A central agency maintains a register for the management of on-site wastewater systems. The approval to install the system is placed with the local authority such as the council. The council is responsible for ensuring the treatment system installed is an accredited or approved system, the installation is carried out according to appropriate plumbing and building codes, to determine auditing and inspection requirements and that the area in which it is installed will not be adversely impacted.

Most jurisdictions also do not allow recycling of sewage back into the building for internal use in single household systems. Both the NT and the ACT have only one tier of government involved in the approval process and therefore there is not the potential for the delegation to council.

Table 9: Accreditation and approval process for on-site wastewater management

| State | Installation | Size* | | Accreditation of treatment system |
|-------|--|---------------------|------------------------|--|
| | | EP | kL/day | |
| ACT | ACT Planning and Land Authority | All on site systems | All on site systems | ACT Health for activity. Accept accreditation from other states |
| NSW | Local council | < 10 EP | < 2 kL | NSW Health accreditation of system |
| NT | Department of Planning and Infrastructure for Plumbing, DHCS | < 150 EP | < 30 kL | DHCS approval for system |
| QLD | Local council | < 21 EP | 4.2 kL | Chief Executive of the Department of Infrastructure and Planning |
| SA | Local government | < 50 EP | <10 kL | Department of Health under prescribed codes |
| TAS | Municipal council | < 500 EP | < 100 kL/day | Certificate of Accreditation from Minister for Justice and Workplace Relations |
| VIC | Local council | < 25 EP | <5 kL/day | EPA approved system |
| WA | Local government | < 2.7 EP | <0.54 kL/day | Executive Director, Public Health accredits system |

* The bold values represent those presented in the legislation. A value of 200 litres per person per day was used as the volume generated to convert equivalent persons to kilolitres for the purposes of comparison.

While the overall regulatory process for these schemes is similar, there are significant differences in the size of system that the process covers. Most jurisdictions have unique

guidance documents or codes of practice; and most require adherence to Australian Standards. NSW has its own accreditation guidelines, QLD has its own code of practice for wastewater treatment assessment, SA has its own code of practice for assessing on-site systems, and WA is looking at setting up a system. In addition, in some jurisdictions the regulation of on-site wastewater management includes a size limitation, either volume or EP, above which the system that is installed does not have a specific requirement to be accredited or approved by the central agency. This leaves a large amount of responsibility with local councils for approval of entire treatment processes. This was the result of the need to design larger systems for the specific site.

In NSW, non-scheduled sewage treatment systems (those less than 750 kilolitres per day but larger than a single household) fall into this category; in QLD the new regulatory system is limited to registered water service providers, leaving significant responsibilities with local government for approvals of larger than on-site schemes. In TAS, a system with greater than 100 kilolitres per day may require a permit from council but would not require a DPMP, and therefore it may not go through the Wastewater Re-Use Coordinating Group. This would leave the entire approval process to the council. From discussion with the various jurisdictions and the NRWRF, the amount of responsibility placed on councils for potentially large schemes was of particular concern.

SA has had a requirement for all on-site domestic systems to use the AGWR. System monitoring requirements are reduced in proportion to this public health risk that accompanies the different exposure profiles. Water for high-exposure uses such as toilet flushing must meet the final quality criteria, the technology needs to be proven, and the systems require online monitoring. In these scenarios, the cost has been seen as too expensive; therefore, people have opted to carry out bucketing of greywater rather than install a treatment system. The lack of accreditation processes for water recycling within on-site systems has, in this case, discouraged the uptake of wastewater recycling on a single household level.

Regulatory gaps

There are several scenarios where orphaned schemes with no regulatory oversight have occurred or could occur. Currently, in the ACT, a greywater system of less than three megalitres per year does not need an approval. Commonwealth land in the ACT and NSW is exempt from regulatory requirements. In VIC, schemes that do not discharge to the environment, regardless of size, are not regulated by EPA Victoria. These include closed-loop system such as toilet flushing. This gap is outlined in the discussion paper *A Framework for Alternative Urban Water Supplies* (DSE and DHS 2006). In NSW under s. 56 of the *Local Government Act 1993*, a recycled water scheme operated by the local council in the Sydney Water Corporation or Hunter Water Corporation areas of operation is exempt from ministerial approval. This is especially relevant to sewer mining schemes owned and operated by local councils. Some of these schemes may be covered under the Water Industry Competition (General) Regulation 2008 and will require a licence.

The concern for potential orphaned schemes is reflected in the recommendations made by the Victorian Department of Human Services in the EPA Victoria review of the *EPA Septic Tank Code of Practice*, which is now the *Code of Practice On Site Waste Water Management (2008)*. The two recommendations made by the Department of Human Services were that there was to be no blackwater recycling from on-site systems in seweraged areas and no multi-residential schemes (blackwater or greywater). There is currently no regulatory authority with the power to audit or manage these types of schemes. In the final document it was recommended that blackwater recycling from on-site systems not occur in seweraged areas and multi-residential schemes should be implemented with reference to AGWR. This is a barrier to such schemes, but it has not completely addressed the regulatory issues. These individual gaps in regulation need to be addressed by each jurisdiction directly as they are peculiar to

their own situations. An active process needs to be adopted by jurisdictions to identify area as regulatory gaps and address them.

3.2 Recycled water

Legislation covering centralised treatment plants was designed to manage discharge to sensitive environments rather than to specifically minimise exposure of the public to untreated sewage. In light of this, large schemes usually involve obtaining a licence to discharge to the environment from an environment agency (Table 10). In response to the development of recycled water schemes, some regulators have adapted their regulatory framework—such as those in TAS, VIC and WA—while others have developed new regulations for the licensing of recycled water suppliers, such as those in NSW and QLD.

Table 10: Approval process for recycled water

| <i>State</i> | <i>Approval Authority</i> |
|--------------|--|
| ACT | Environment Protection Authority—approval and licence for scheme ACT Health—reactive powers in relation to public health risk |
| NSW | Sydney Water and Hunter Water corporations—NSW Health, DECC, DWE and DPI approval Local government scheme: <ul style="list-style-type: none"> • Department of Water and Energy approval for construction and running the scheme • Department of Environmental and Climate Change—licence for discharge • NSW Health—advice Private sector scheme: <ul style="list-style-type: none"> • DWE—licence approval • IPART—licence application and assessment • NSW Health—for comment and potential conditions of approval • DWE—final licence |
| NT | DHCS Environment Protection Agency licence |
| QLD | Office of Water Supply Regulator of the DERM DERM Development Approval |
| SA | Environment Protection Agency—approval or licence for discharge Department of health—approval for Class A schemes |
| TAS | Approval from the Director, Environment Protection Authority—Wastewater treatment plant licence Wastewater Re-Use Coordinating Committee—interagency group which reviews the development proposal and environmental management plan Municipal council for schemes that do not require a licence |
| VIC | Environment Protection Agency—licence to discharge required for some larger schemes Class A schemes require Department of Human Services endorsement |
| WA | Department of Environment and Conservation (DEC)—approval for discharge with referral to Department of Health if water recycling a component Department of Health—Capacity to add conditions to DEC approval |

This report provides a few examples of regulatory frameworks developed in other countries. The examples of California and Arizona indicate the proactive nature of their regulations, with legislation designed to encourage the use of recycled water. In contrast, Canada is still in its infancy in the development and management of recycled water schemes. However, both Canada and Alberta have produced new regulations to cover recycled water use and management specifically. Although large recycled water schemes in the United States run by large water utilities are advanced, the on-site (single household) greywater reuse regulation is

not. They will be looking to Australia to see the direction taken, both in the uptake of greywater recycling and in the management of the potential impacts.

Legislation within Australia has been presented in two groups: on-site wastewater management and recycled water. The first group encompasses two subgroups: on-site wastewater management in single households and on-site wastewater management encompassing more than a single household, but still remaining on-site. The second group of recycled water schemes include those from large centralised wastewater treatment plants, which may or may not involve the transfer of water to other. To simplify and streamline recycled water regulation, it would be more appropriate to have a better defined two-tiered system.

Tier one would cover small on-site wastewater management systems that are designed to cover single households for effluent disposal and recycled water production and use. These systems would be defined by the exposure scenario experienced with single households. The transmission and exposure pathways for gastroenteritis illnesses are different to other schemes due to the constant nature of the occupants and the presence of other exposure pathways, for example direct person-to-person contact. These systems would have prescriptive guidelines and regulations with accreditation of treatment processes as currently detailed. Approval to install could remain with the local council, and the accreditation of the treatment system would be with a centralised body such as the health or plumbing agency.

Tier two would cover wastewater treatment systems designed for the production of recycled water. These would include those larger on-site systems, which are currently captured under the definition of an on-site waste management system but have a different exposure scenario, and those not captured under environment protection requirements. This would cover apartment blocks, shopping centres and small villages, many of which currently fall in regulatory gaps. The exposure pathways in these schemes are different to the single household schemes due to the more transient nature of the population and for the potential size of the population, which could contribute to the source water and be exposed to the recycled water. Tier two would also include those large schemes where the recycled water is produced from a centralised sewage treatment plant.

Recommendation One: Consideration be given by individual jurisdictions to implement a two-tiered regulatory system based on exposure scenario rather than the current variable size requirement.

The current process outlined for wastewater management—where a central agency accredits a system and council approves it for installation—would remain in place for tier one on-site single households. The simplification of the regulation to two tiers would allow the on-site approval process to be streamlined and the application of a national accreditation process for on-site system to be implemented.

The development of a two-tier system will also remove the additional burden that has been placed on local councils to approval installation of schemes where the size of the system installed is greater than the size for the requirement to install an accredited system. An alternative would be the removal of the approval to install processes from the local authority or council to a larger more centralised organisation with the appropriate technical expertise.

To facilitate Recommendation One, there needs to be a nationally consistent definition, or agreement, on the size of a single household. The current legislation has a range of definitions based on both volume and number of EP (Table 9).

A national approach to the accreditation of on-site treatment systems could be pursued independently of changes in regulations, as is outlined in Recommendation One. A national approval processes for on-site systems would benefit manufacturers and householders by

providing certainty around the product and consistency in requirements. This could be achieved with the further development of Australian Standards for package treatment plants for on-site single household application, including greywater recycling, or a process of mutual recognition between jurisdictions. This would be of great benefit to manufacturers who would need to undertake only one set of testing in place of the current need to carry out testing in each jurisdiction. The successful development of this will depend on a nationally consistent definition or agreement on the size of a single household.

Recommendation Two: A national approach to accreditation of treatment systems for single households for both disposal and water recycling be pursued through Standards Australia or as a mutual recognition of process testing and accreditation undertaken within other states. This could be pursued through the NRWRF, National On-site Regulators Forum (NORF) with support from the National Water Commission.

4. Guidelines and the uptake of the Australian Guidelines for Water Recycling

The National Water Quality Management Strategy (NWQMS) *Guidelines for Sewerage Systems: Use of Reclaimed Water* (ARMCANZ-ANZECC-NHMRC 2000) was published specifically to address the reuse of wastewater from municipal treatment plants. Prior to these guidelines, there were no national guidelines for recycled water. In response to the need to provide direction for the disposal of effluent and to manage the specific environmental impacts of effluent disposal from irrigation systems, some jurisdictions had produced their own guidelines. The NSW Recycled Water Coordinating Committee produced the *NSW Guidelines for Urban and Residential Use of Reclaimed Water* in 1993, which were designed specifically for large urban reuse schemes with high human exposure. With the increased interest in water recycling and each jurisdiction producing its own guidelines, a situation developed where there were inconsistencies between jurisdictions and a lack of uniformity of guidelines.

The emphasis in the earlier guidelines was on end-point or post-treatment testing as the basis of ensuring that the scheme did not pose a public health or environmental risk. In addition, there was a lack of a holistic approach to the management of the recycled water scheme. With the movement towards the risk-based management of drinking and recreational water and the use of multiple barriers for the management of public health, there was a need to update or develop more comprehensive national guidelines. The AGWR was published in 2006 and it advocates a risk management framework based on that previously detailed in the *Australian Drinking Water Guidelines* (NH&MRC-NRMMC 2004) and the *World Health Organization's Guidelines for Drinking-water Quality* (WHO 2004). The AGWR was developed:

to provide guidance on best practice for water recycling' and are intended to be used by anyone involved in the supply, use and regulation of recycled water schemes, including government and local government agencies, regulatory agencies, health and environmental agencies, operators of water and wastewater schemes, water suppliers, consultants, industry, private developers, body corporate and property managers. [NRMMC-EPHC-AMHC 2006]

The AGWR details a generic risk management framework that can be applied to any recycled water scheme, from small on-site systems to large utility run schemes, and both to sewage and greywater. The framework consists of 12 elements in four general areas: Commitment to Responsible Use and Management of Recycled Water, System Analysis and Management, Supporting Requirements and Review. The 12 elements provide a risk management plan' for the scheme. While this is different from previous guidelines, most of the current schemes will find that have already addressed a significant number of the 12 elements.

The AGWR presents the management of health risks from recycled water through the use of tolerable risk. This is achieved by determining the disability adjusted life years (DALYs) and establishing the tolerable risk at 10^{-6} DALYs per person per year. The risk associated with the scheme is calculated using quantitative microbial risk assessment. The quantitative microbial risk assessment process involves four main steps: hazard identification, dose-response, exposure assessment, and risk characterisation. Determination of this allows performance targets to be set for treatment processes. It also gives a log reduction requirement for each pathogen group and overall treatment process for the exposure scenario of the schemes. The AGWR provides default exposure, reference pathogen concentrations, and log removal values for certain treatment processes, including on-site controls such as withholding periods.

The use of quantitative microbial risk assessment and DALYs to determine the log removal requirement for the treatment process moves the emphasis of control onto treatment and the validation of the treatment processes used. The methods for validating every treatment process are not detailed in the AGWR. The general concept involves the determining the number of target microorganisms in the source water (effluent) entering the treatment process and the concentration of target microorganisms leaving the treatment process and linking this with the operational parameters of the system, which is ideally done in real time. This is a significant change in monitoring requirements from end-point monitoring only to the need to test each of the system components and linking this to real time operational monitoring. As there are several approaches to validation and there is a lack of specific direction in the AGWR, each jurisdiction has adopted a range of processes for validation.

This section of the report outlines the guidelines that have been developed by each jurisdiction for recycled water with specific reference to the validation requirements and the classification criteria used. The impact and implementation of the AGWR has also been included.

4.1 Australian Capital Territory (ACT)

The guidelines and validation requirements for ACT are outlined in Table 11 and Table 12. In the ACT the key document for recycled water is the *Wastewater Reuse for Irrigation - Environment Protection Policy* (Environment ACT 1999). The document sets out the health and planning requirements for wastewater reuse. It was developed with advice from the Health Protection Service, ACT Department of Health and Community Care, and it refers to the *Guidelines for Sewerage Systems – Use of Reclaimed Water* (ARMCANZ-ANZECC-NHMRC 2000). The policy sets final water quality requirements for end uses and lists the treatment processes that should achieve the final quality. The higher the risk associated with the scheme, the higher the final water quality and the monitoring frequency required. The only microbiological parameter to be tested is thermotolerant coliforms. Alternative treatment processes are acceptable as long as the proponent can demonstrate that the treatment process can satisfactorily achieve the desired water outcomes.

Uptake of the AGWR

When the AGWR was published, the ACT Environment Protection Authority (ACT EPA) reviewed its guidelines against these and felt that they were adequate and, in fact, more stringent. The ACT EPA also felt that its policy remained appropriate for the area and recycled uses in the ACT. If at some point a parameter were believed to be important for the ACT and was not covered in the policy, then the ACT EPA would refer to the AGWR. The ACT EPA does not anticipate changing to the AGWR directly. It is felt that the schemes in the ACT are too small, and many still require potable top up to meet demand.

The use of the AGWR has been discussed with reference to the future sources of water, including indirect potable reuse being reviewed. Australian Capital Territory Electricity and Water (ACTEW) is considering a 25 megalitre demonstration plant for the treatment of effluent and return to the lower Molonglo River.

Table 11: Guidelines wastewater management and recycled water schemes in the ACT

| Category | Size and Type | Guidelines | Standard/code |
|-------------------------------|---------------|--|---|
| On-site wastewater management | | <i>ACT Greywater Use: Guidelines for Residential Properties in Canberra</i> 2007 <i>NSW Environmental and Health Protection Guidelines On-site Sewage Management for Single Households</i> 1998 | AS/NZS 3500:2003 Part 2 Sanitary Plumbing and Drainage AS/NZS 1547:2000 On-site domestic-wastewater management |
| Recycled water | Overall | <i>ACT Wastewater Reuse for Irrigation – Environment Protection Policy</i> 1999 | |

Table 12: Recycled water quality classification and validation requirements for ACT

| Classification System | Guideline Document | Validation Requirements |
|--------------------------------|--------------------|--------------------------------|
| No class, based on risk levels | AGWR 2006 | Yet to be specifically defined |

4.2 New South Wales (NSW)

NSW Guidelines and the validation requirements for recycled water schemes are outlined in Table 13 and Table 14. There are several guidelines in use in NSW. The *Environmental Guidelines – Use of Effluent for Irrigation* (DEC 2003) was developed to provide guidance on the use of treated effluent sourced from sewerage works, processing industries (livestock, wood, paper or food), intensive livestock, aquaculture or agricultural industries, for irrigation in non-domestic situations. The focus of the document is on the management of the environmental impact of the water and the requirements for sustainable irrigation. The final water quality and conditions under which recycled water can be used for irrigation to protect public health are outlined in the document and are based on the *Guidelines for Sewerage Systems: Use of Reclaimed Water* (ARMCANZ-ANZECC-NHMRC 2000). Risk management considerations are incorporated throughout the guidelines, in particular, the section on Operation and management.

The *Interim NSW Guidelines for Management of Private Recycled Water Schemes* (DWE 2008) were developed to provide guidance to councils and proponents of those schemes that require a Section 68 approval under the *Local Government Act 1993* but were greater than 10 EP in size. The guidelines outline the process of approval for a scheme and the type of information that needs to be supplied to a council to assist in the approval process. The guidelines adopt the principles of hazard analysis and risk assessment to manage the use of recycled water as outlined in the AGWR. The process of conducting a risk assessment is detailed, along with the need to determine critical control points as well as the monitoring requirements including the validation, verification and ongoing monitoring needs for the different scheme types. The requirements for a scheme are based on a risk profile of high to low, rather than using a class system as is used in other jurisdictions. Schemes that would be defined as high exposure include those with unrestricted irrigation and dual reticulation. These are required to undertake more frequent monitoring of surrogate organisms—*Clostridium perfringens* and bacteriophage—to ensure adequate removal of pathogens. The high exposure schemes would also require a demonstration of the log removal capacity of their treatment process.

Uptake of the AGWR

NSW Health has requested that the AGWR are followed for all new Sydney Water Corporation and Hunter Water Corporation schemes as well as schemes run by local councils. The requirement to address all elements of the framework of the AGWR is embedded in the Water Industry Competition Regulation and is therefore a condition of licence approval for these schemes. The process of moving established schemes such as Rouse Hill to the AGWR is slowly being addressed by the Sydney Water Corporation . The *Interim NSW Guidelines for Management of Private Recycled Water Schemes* were developed to apply the AGWR to the regulatory framework required for Section 68 approvals and to supply a supporting document to councils for the approval of these schemes

Table 13: Guidelines and standards in NSW

| Category | Size/type | Guidelines | Standard/code |
|--|--|---|---|
| On-site waste management system | < 10 EP | <p><i>Greywater Reuse in Sewered Single Domestic Premises</i> (NSW Health 2000)</p> <p><i>Sewage Management Facility, Sewage Treatment Accreditation Guideline (incorporating AWTS and Sand Filters)</i> (NSW Health 2005b)</p> <p><i>Septic Tank and Collection Well Accreditation Guideline</i> (NSW Health 2001)</p> <p><i>Waterless Composting Toilet Accreditation Guideline</i> (NSW Health 2005c)</p> <p><i>Domestic Greywater Treatment Systems Accreditation Guidelines</i> (NSW Health 2005a)</p> <p><i>NSW Environmental and Health Protection Guidelines On-site Sewage Management for Single Households</i> 1998</p> | <p><i>NSW Code of Practice for Plumbing and Drainage</i> CUPDR 2006)</p> <p>National Plumbing and Drainage Code AS3500:2003</p> |
| | > 10 EP | <p><i>DWE Interim NSW Guidelines for Management of Private Recycled Water Schemes</i> (DWE 2008)</p> | |
| All sewerage schemes regardless of proponent | Operation of sewage treatment systems that involve the discharge or likely discharge of wastes or by-products to land or waters. | <p><i>Environmental Guidelines – Use of Effluent for Irrigation</i> 2003</p> <p>AGWR (2006)</p> | <p><i>NSW Code of Practice for Plumbing and Drainage</i> (CUPDR 2006)</p> |
| | Scheduled Activity–capacity > 2500 EP or > 750 kL/day, which ever is the greater and involve discharge or likely discharge of wastes or by-products to land or waters. | | <p><i>National Plumbing and Drainage Code</i> AS3500:2003</p> |
| Recycled Water | Water Utility Private Sector Schemes | | |

Table 14: Recycled water quality classification and validation requirements for NSW

| Classification System | Guideline Document | Validation Requirements |
|------------------------------------|---|---|
| Exposure Risk Level High to low | <i>DWE Interim NSW Guidelines for Management of Private Recycled Water Schemes</i> (DWE 2008) | High exposure minimum validation requirement <ul style="list-style-type: none"> • 12 weeks • influent and effluent • <i>E.coli</i>, <i>Coliphage</i> and <i>Clostridia</i> Medium and low exposure frequency lower than high exposure <ul style="list-style-type: none"> • 12 weeks • influent and effluent • <i>E.coli</i> |
| | AGWR 2006 | High exposure schemes require validation of treatment processes Each treatment train that will be relied upon should be addressed separately. To determine how to do this consult with NSW Health directly |

4.2 Northern Territory (NT)

The guidelines and validation requirements for recycled water schemes in the NT are outlined in Table 15 and Table 16. The DHCS released its *Guidelines for the Management of Recycled Water Schemes* in 2009. This document outlines the requirement for wastewater treatment and recycled water schemes. The guidelines describe a conventional on-site waste management system smaller than 150 EP. The NT interim guidelines were developed to provide support to proponents and regulators on developing recycled water schemes and incorporated the processes detailed in the *Interim NSW Guidelines for Management of Private Recycled Water Schemes* (DWE 2008), which includes the recommended sampling frequencies and the end water quality.

Uptake of the AGWR

One of the major concerns in the NT has been how to interpret and implement the AGWR. The components in the guidelines are, in some sections, quite complicated, and there needs to be additional support to implement them.

Due to the complexity of the AGWR, the DHCS felt it needed to develop its own guidelines rather than simply require the application of the AGWR.

Table 15: Guidelines and standards in the NT

| Category | Size/type | Guidelines | Standard/code |
|-------------------------------|---|---|---|
| On-site wastewater management | Conventional on-site wastewater system Alternative on-site wastewater management systems | | <i>Code of Practice for Small On-site Sewage and Sullage Treatment Systems and the Disposal or Reuse of Sewage Effluent November (NT DHCS 1996)</i> |
| Recycled water | > 150 EP | AGWR 2006 <i>Northern Territory Guidelines for Management of Recycled Water Schemes 2009</i> | |

Table 16: Recycled water quality classification and validation requirements for NT

| Classification System | Guideline Document | Validation Requirements |
|--------------------------------|---|---|
| No class, based on risk levels | <i>Northern Territory Guidelines for Management of Recycled Water Schemes 2009</i> AGWR 2006 | High exposure minimum validation requirement <ul style="list-style-type: none"> • 12 weeks • influent and effluent • <i>E.coli, Coliphage and Clostridia</i> |

4.3 Queensland (QLD)

QLD guidelines are outlined in Table 17; the validation requirements are outlined in Table 18. The *Queensland Water Recycling Guidelines* (EPA 2005) were developed before the introduction of the *Water Supply (Safety and Reliability) Act 2008*. Parts 4, 5 and 6 of these guidelines have been replaced by the Public Health Regulation and the regulatory guidelines under the *Water Supply (Safety and Reliability) Act 2008*. However, there is still valuable advisory information in Part 3 of the guidelines, in relation to planning for a scheme, and in Part 7, for use of recycled water. It is anticipated that that these sections of the guidelines will be replaced by new guidelines being developed by the Office of the Water Supply Regulator.

As part of the development of the *Water Supply (Safety and Reliability) Act 2008*, the Office of the Water Supply Regulator has produced a range of guidelines for recycled water schemes. The *Water Quality Guidelines for Recycled Water Schemes* (DNRW 2008c) details the requirements in the *Water Supply (Safety and Reliability) Act 2008*, the Public Health Regulation requirements and the minimum water quality criteria that apply to recycled water schemes. It also includes information on control measures. The *Recycled Water Management Plan Exemption Guidelines* (DNRW 2008a) detail the circumstances under which a proponent can get an exemption from having a recycled water management plan. An exemption may apply for up to a maximum of five years. The Regulator may rescind an exemption and require a *recycled water management plan* from the proponent due to the associated risk of the scheme.

Table 17: Guidelines and standards in QLD

| Category | Size/type | Guidelines | Standards and codes |
|--|--|---|--|
| On-site wastewater management | <p>On-site sewage treatment plant < 21 EP in areas not served by a sewerage system—no recycling allowed must all go to disposal system</p> <p>Greywater treatment plant < 50 kL/day of greywater generated on the premises</p> <p>Sites generating > 3 kL of greywater must install a greywater treatment system</p> <p>On-site sewage treatment in sewerred areas > 21 EP; only treated blackwater reuse trials allowed through the <i>Queensland Plumbing and Wastewater Code 2007</i></p> | | <i>Queensland Plumbing and Wastewater Code 2007</i> Plus Australian Standards |
| Recycled water | Sewage treatment plants considered an environmentally relevant activity | <i>Manual for Recycled Water Agreements in Queensland</i> (Qld 2005a)—provides guidance on what should be in the agreements <i>Queensland Water Recycling Guidelines</i> (Qld 2005b)—provides information on planning and final uses | |
| Where water is being reused and is being supplied to a third party | <p>Sewage or effluent sourced from a sewage service provider's infrastructure</p> <p>Greywater treatment plant > 50 kL/day of greywater generated on the premises</p> <p>Process water supplied to another entity</p> | <p><i>Recycled Water management Plan and Validation Guidelines</i> (DNRW 2008b)</p> <p><i>Water Quality Guidelines for Recycled Water Schemes</i> (DNRW 2008c)</p> <p><i>Recycled Water Management Plan Exemption Guidelines</i> (DNRW 2008a)</p> | |

These guidelines also provide information to recycled water providers and scheme managers about preparing a recycled water management plan and validation program. Matters to be considered by the regulator in assessing a recycled water management plan and the responsibilities of recycled water providers are also discussed. The guidelines document the validation requirements and methodology in Section 3.8.7. The document does not detail specifically how to validate each component of a recycled water scheme, but details approved approaches and outlines appropriate guidance documents for validation such as *Development of Indicators and Surrogates for Chemical Contaminant Removal During Wastewater Treatment and Reclamation* (Drewes et al. 2008) and the *Membrane Filtration Guidance Manual* (US EPA 2005b). The guidelines also set log reduction targets required for Class A+ schemes and for schemes intended to augment drinking water supplies. A detailed explanation of the compliance monitoring required is also presented, as are appropriate control measures.

Uptake of the AGWR

The information in the AGWR has been instrumental in the formation of the *Water Supply (Safety and Reliability) Act 2008* and the Public Health Regulation.

Table 18: Recycled water quality classification and validation requirements for QLD

| <i>Classification System</i> | <i>Guideline Document</i> | <i>Validation Requirements</i> |
|---|--|--|
| Augmentation of drinking water supplies Class A+ to Class D and non-sewage | <i>Recycled Water Management Plan and Validation Guidelines</i> (DNRW 2008b) | <p>Minimum point requirements for all classes</p> <p>Pre-commissioning validation:</p> <ul style="list-style-type: none"> • historical data—all • scientific literature—all • manufacturers specifications—augmentation of drinking water and A+ only <p>Commissioning validation:</p> <ul style="list-style-type: none"> • pilot plant—augmentation of drinking water • specific challenge testing—augmentation of drinking water • on-site tracer studies—augmentation of drinking water • direct integrity testing—Augmentation of drinking water, A+ and non-sewage • continuous indirect integrity testing—augmentation of drinking water, A+ and non-sewage <p>Commissioning verification—all</p> <p>Existing schemes—12 months of weekly testing demonstrating that AWTP can meet Public Health Regulation 2005 water quality criteria.</p> |

4.4 South Australia (SA)

The guidelines and codes used in SA are detailed in Table 19 and Table 20, outlined the validation requirements for schemes. SA has usually applied the current national guideline. However, it was felt that the *NWQMS Guidelines for Sewerage Systems: Use of Reclaimed Water* (ARMCANZ-ANZECC-NHMRC 2000) were limited in detail. In response the SA Department of Health and The Environment Protection Agency published *South Australian Reclaimed Water Guidelines – Treated Effluent* (SA EPA 1999). With the development and publication of the AGWR, the SA Department of Health now applies these guidelines, and Department has changed its advice accordingly; greywater is also now included. The application of the AGWR to recycled water schemes has been a smooth transmission, especially for SA Water schemes because most of their schemes were developed using the principles outlined in the AGWR.

The SA Department of Health, due to its central role in approval of recycled water schemes, has made decisions on the appropriateness of validation procedures and will recognise any previous validation procedure undertaken by a reliable laboratory, provided an acceptable certification method is used. Examples of these are *Membrane Filtration Guidance Manual* (US EPA 2005b) and *Ultraviolet Disinfection Guidance Manual for the Final Long Term Enhanced Surface Water Treatment Rule* (US EPA 2006). The validation process needs to tie the log removal credits to operational monitoring.

Membrane validation carried out for California Title 22 requirements is not accepted as it does not always tie in the log removal credits with the operational monitoring. This results in the membranes being allocated relatively high log credits that cannot be matched to operational

parameters. The SA Department of Health requires third-party certification of the validation. The manufacturer is able to carry out the validation, but it needs a third party to evaluate the results. The SA Department of Health has carried out a third-party evaluation of results with one manufacturer, to provide a variation, but it does not necessarily see that being a permanent role for the department. Ultimately the responsibility for validation of the treatment process, including the limitation, is seen to be with the manufacturer. The better systems have definite restrictions or conditions on their validation results. The requirements placed on validation have not been a problem with the established manufacturers.

In SA, low-exposure, rural schemes have traditionally used lagoons with a long retention time (approximately 66 days), and they achieve good pathogen reduction. These rural schemes receive log reduction credits for end-use controls and, in general, have restrictions on final water use. In these cases there is little need to test for influent levels or to require the validation of the treatment systems for log removal.

Uptake of the AGWR

In response to the release of the AGWR, the SA Department of Health has developed an application guideline that deals with how to apply for an approval for a water recycling scheme. The emphasis of the of the guidelines is on the detail required for high-end use schemes such as dual reticulation schemes and the associated risk management plan. The final aim is to have a set of guidelines for the main uses and then treat anything unusual on a case-by-case basis. Once the Class A schemes are addressed, the smaller schemes such as Class B and other lower exposure schemes will still need to have the new AGWR rolled out into them.

The SA Department of Health and the Environment Protection Authority have a very good relationship with the Local Government Association—both departments have membership of the Community Wastewater Management Committee, which deals with funding for community schemes. There has also been some recent state and Commonwealth funding, which will continue for the next 10 years. The Local Government Association has a list of preferred tenders who come into the Department of Health to discuss water recycling schemes and plans. Proponents of schemes also contact both departments to discuss proposals with them. This provides the departments with a central point of contact to coordinate the adoption of the AGWR.

SA Water has done a lot of the work on the Virginia pipeline scheme, which was innovative, and therefore the requirement for the use of log removal requirements was easily taken on. SA Water was comfortable with the use of DALYs and they have adopted this approach in developing a *Giardia* and *Cryptosporidium* strategy for their drinking water plants. Due to their previous work, SA Water is also very comfortable with the concept of system validation.

SA has been concentrating on the big schemes, and these have been heavily scrutinised. The iterative work with the SA Department of Health has also meant that the principles of the AGWR have been applied since the schemes started.

Table 19: Guidelines and standards in SA

| Category | Size and Type | Guidelines | Standard or Code |
|---------------------------|---------------|--|--|
| All waste control systems | < 50EP | | Water Services Association Codes for all infrastructure work. SA Water Supplementary documentation to the Water Services Association of Australia Codes where required (for community wastewater management systems). AS/NZS 3500:2003 Part 2 Sanitary Plumbing and Drainage South Australian Health Commission (1995) Code Waste Control Systems: |
| | > 50 EP | SA Reclaimed Water Guidelines Treated Effluent 1999 AGWR 2006 | <ul style="list-style-type: none"> Standards for the Construction, Installation and Operation of Septic Tank systems in South Australia (1995a) Supplement A Aerobic sand filters (1995b) Supplement B Aerobic Wastewater treatment systems (1995c) |

Table 20: Recycled water quality classification and validation requirements for SA

| Classification System | Guideline Document | Validation Requirements |
|--------------------------------|--------------------|---|
| No class, based on risk levels | AGWR 2006 | All high-risk schemes must have validated equipment where log reduction credits are applied. The process of validation is dependent on the technology. The Department of Health accept existing endorsed validation protocols such as those of the US EPA. In-field validation processes must be discussed and agreed with the Department of Health on a case-by-case basis. To be designed by proponent for high-risk schemes—dual reticulation and unrestricted irrigation. Consult with Department of Health for acceptable methodology. |

4.5 Tasmania (TAS)

Tasmanian guidelines and codes or practice are outlined in Table 21. The TAS Department of Primary Industries, Water and Environment (now the Department of Environment, Parks, Heritage and Arts) developed the *Environmental Guidelines for the Use of Recycled Water in Tasmania* (Tasmanian Department of Primary Industries, Water and Environment 2002) to:

provide guidance on best practice environmental management for managers and operators of sewage or wastewater treatment plants for the planning, design, operation and monitoring of wastewater re-use systems involving land application in a manner that minimises risks to public health and the environment.

The guidelines present final water criteria based on three classes, with final effluent quality and treatment requirements for each of the classes. Most of the current recycled water schemes use these guidelines. The current Tasmanian guidelines include operational

requirements for wastewater re-use and incorporate environmental management plans, quality control systems, treatment reliability and supplier/user agreements. These are all components of different elements of the AGWR. The classification system used for recycled water in TAS and the validation requirements for both on-site and recycled water are presented in Table 21.

Uptake of the AGWR

The direct uptake of the AGWR has been minimal. There is no direct driver for the increased use of recycled water and to date most schemes have been Class B (as defined in *Environmental Guidelines for the Use of Recycled Water in Tasmania* (Tasmanian Department of Primary Industries, Water and Environment 2002)). These are mainly agricultural irrigation, golf course and public reserve schemes. There is the Wastewater Re-Use Coordinating Group, which assesses proposed schemes and provides advice and approval to the appropriate regulatory authority.

The question of validation requirements has not yet been discussed fully because the AGWR has not yet been implemented.

As the Minister for the Environment has signed-off on the AGWR, there is an expectation they will be implemented in TAS and used in the review of the *Environmental Guidelines for the Use of Recycled Water in Tasmania*. The rewrite of the state guidelines has been raised as a significant issue due to the disparity between the approaches taken by the different guidelines.

Table 21: Guidelines and standards in TAS

| Category | Size or type definition | Guidelines | Standard/code |
|-------------------------------|--|--|--|
| On-site wastewater management | Systems designed with a hydraulic loading of < 100 kL/day of average dry-weather flow | AGWR 2006 | Tasmanian Plumbing Code 2006 Plumbing Code Of Australia 2004 AS/NZ 1547 On-site domestic wastewater management AS/NZS 1546.1 Septic Tanks AS/NZS 1546.2 Water Composting Toilets AS/NZS 1546.3 AWTS <i>State Policy on Water Quality Management</i> (Tasmanian Government 1997) and supporting Emission Limit Guidelines |
| Recycled water | Systems designed with a hydraulic loading 100 kL/day or more where they are defined as Level 2 Activities. Some lesser capacity systems are also capture, e.g. treating waste from specified processes Level 1 activity—any activity that may cause environmental harm and in respect of which a permit is required | <i>Environmental Guidelines for the Use of Recycled Water in Tasmania</i> 2002 | <i>State Policy on Water Quality Management</i> 1997 and supporting Emission Limit Guidelines |

Table 22: Recycled water quality classification and validation requirements for TAS

| Classification System | Guideline Document | Validation Requirements |
|-----------------------|--|---|
| Class A to C | <i>Tasmanian Plumbing Code 2006</i> , Plumbing Code of Australia 2004 Environmental Guidelines for the Use of Recycled Water in Tasmania December 2002 AGWR 2006 | <p>For plants less than 100 kL/day capacity, the designer is required to provide detailed means of validation of treatment process as part of the permit process.</p> <p>Validation is achieved by satisfying the verification methods set out in the <i>Plumbing Code of Australia</i>, e.g. third-party certification.</p> <p>Permitted discharge limits must be met before reuse is allowed under the conditions of permit. This would take place during commissioning phase.</p> <p>The permit process would involve consultation with both Environment and Public Health agencies as other legislation may apply or overlap the process.</p> <p>For existing plants treating over 100 kL/day capacity, the facility must be able to provide records showing full compliance with the disinfection requirements for a proposed use for a trial period of not less than six consecutive months before the wastewater can be approved for reuse. Ongoing verification monitoring is then required.</p> <p>For new plants over 100 kL/day capacity, no detailed validation of treatment process is required prior to construction; however, licensed discharge limits must be met before reuse is allowed. Typically this takes place during commissioning period. Ongoing verification monitoring is then required.</p> <p>While there are plants designed to meet Class A reuse requirements, no Class A reuse schemes are currently in place. Validation would be as per the first dotpoint. Level of public risk would determine operational monitoring requirements and the frequency of verification monitoring.</p> <p>All water services including non-drinking water services must satisfy the relevant performance requirements of the <i>Tasmanian Plumbing Code</i>.</p> |

4.6 Victoria (VIC)

The Victorian guidelines and validation requirements for schemes are detailed in Table 23 and Table 24. EPA Victoria has published two guidance documents for large-scale recycled water schemes (greater than 5000 litres per day). The *Guidelines for Environmental Management: Use of Reclaimed Water* (EPA Victoria 2003) and *Guidelines for Environmental Management: Dual Pipe Water Recycling Schemes - Health and Environmental Risk Management* (EPA Victoria 2005). The *Guidelines for Environmental Management: Use of Reclaimed Water* was produced in response to the publication of the *NWQMS Guidelines for Sewerage Systems: Use of Reclaimed Water* (ARMCANZ-ANZECC-NHMRC 2000) and the increased use of recycled water. They are targeted to recycled water schemes from sewage treatment plants and outline the regulatory requirements for the scheme and importantly the basis under which an exemption from an EPA Victoria licence can be granted.

The treatment plant still requires an EPA Victoria works approval. It also identifies the need for risk assessment and management, with the identification of risks associated with a specific scheme. The recycled water quality requirements are placed into Classes A to D with the final water quality, treatment process required and the accepted uses listed. Under these guidelines, the Department of Health works with EPA Victoria on individually assessing and endorsing schemes that involve the use of Class A recycled water. *The Guidelines for Environmental Management: Dual Pipe Water Recycling Schemes – Health and Environmental Risk Management* (EPA Victoria 2005) were developed later to address those Class A schemes that require endorsement by the Department of Health. These guidelines:

- incorporated the preventative risk management framework presented in the Australian drinking water guidelines
- were supported by a range of technical documents detailed in the appendix
- present the regulatory requirements for a scheme and detail the need for a health and environmental management plan, which should contain a recycled water quality management plan that includes a risk assessment of the scheme with Hazard Analysis and Critical Control Points (HACCP) recommended as an appropriate framework. The microbial criteria for the scheme are defined in terms of the log removal requirements for protozoa and viruses and final end point quality for *E.coli*. The final end uses are listed which were used as the most likely exposures during the health risk assessment with the ability to look at other similar exposures.
- list the unacceptable uses such as filling swimming pools, cooking, bathing or drinking
- outline the validation requirements necessary for the treatment processes in the Appendix of the document. Exactly how to do validation for specific treatment systems or what would be accepted as validation results is not detailed.

EPA Victoria is reviewing the recycled water guidance framework (not the legislation or regulation, but the contents and the framework of the guidelines).

The Department of Health has since adopted the fit-for-purpose approach outlined in the AGWR for other (non-dual pipe) Class A water uses, and these replace those detailed in the *Guidelines for Environmental Management: Use of Reclaimed Water* (EPA Victoria 2003). The Department of Health is responsible for endorsing the recycled water quality management plans of all Class A scheme proponents. The endorsement focuses on the capability of the recycled water treatment system to achieve its water quality objectives.

The Department of Health has prepared a guidance document: *Guide for the Completion of a Recycled Water Quality Management Plan for Class A Water Recycling Schemes* (Victorian Department of Human Services 2009). This document details what is required in a recycled water quality management plan and covers the 12 elements of the AGWR framework. There is a requirement for the validation of individual components of the treatment process that will be relied on for pathogen removal and the operating parameters this relates to. Exactly how to carry out the validation and the type of information (such as literature or field sampling) that will be accepted is not detailed in the document, but the proponent is directed to the Department of Health for further information. The Department of Health requires the demonstration of the log removal of treatment processes on Class A schemes only. Class B and C schemes can use the literature-based evidence and guideline values to show that the proposed treatment processes will achieve the required log removal. With the lower class schemes, the controls are less reliant on treatment processes, and there is more focus on end point controls.

Validation guidelines are being developed by Department of Health. These will address the most common process units being used and will provide an approach to the validation for that system. They will detail how to validate and treatment process and what to test for along with the appropriate operational parameters.

This will hopefully result in a consistent approach to the process of validation for that treatment unit. Currently the Department of Health requires an HACCP analysis of the scheme and validation of each of the critical control points identified during the HACCP process. Class A schemes require ongoing microbial monitoring for final water quality. Weekly monitoring is required for *E. coli* and viruses and *Cryptosporidium* on a quarterly basis. The Department of Health will not be removing end-point microbial monitoring as it fits in the requirements for verification in the AGWR and because of the public relations benefits of a negative result.

Uptake of the AGWR

The development of the AGWR has had minimal impact on VIC other than strengthening the direction they were already heading towards. The ideas of preventative risk management framework, microbial risk assessment for the determination of log removal requirements, and the need for the validation of treatment processes were already present in state guidelines.

Table 23: Guidelines and standards in VIC

| <i>Category</i> | <i>Size and Type</i> | <i>Guidelines</i> | <i>Standard or Code</i> |
|-------------------------------|--|--|---|
| On-site wastewater management | Wastewater treatment plant with < 5000 L/day design capacity and associated waste disposal area—referred to as ‘septic tank systems’ | | <i>Guidelines for Environmental Management Code of Practice – on-site wastewater management</i> (EPA Victoria 2008) |
| Recycled water schemes | Systems treating > 5000 L/day design capacity where there is no discharge to the environment (e.g. through irrigation) are not regulated | <i>Guidelines for Environmental Management: Use of Reclaimed Water</i> 2003 <i>Guidelines for Environmental Management: Dual Pipe Water Recycling Schemes - Health and Environmental Risk Management</i> 2005 | |
| | Wastewater treatment plants with a design capacity of > 5000 L/day and discharge to the environment | <i>Guide for the Completion of a Recycled Water Quality Management Plan: For a Class A Scheme</i> 2008 AGWR 2006 | |
| | Recycled water schemes having > 1ML/day supply | | |

Table 24: Recycled water quality classification and validation requirements for VIC

| <i>Classification System</i> | <i>Guideline Document</i> | <i>Validation Requirements</i> |
|------------------------------|--|--|
| Class A to D | EPA Victoria has developed the following guidance for large-scale recycled water schemes (more than 5000 L/day with discharge to the environment): <ul style="list-style-type: none"> <i>Guidelines for Environmental Management: Use of Reclaimed Water</i> (publication 464.2) <i>Guidelines for</i> | Class A The Department of Human Services (DHS) is responsible for endorsing Class A scheme proponents’ recycled water quality management plans, which are required under EPA Victoria guidelines (publications 464.2 and 1015). DHS’s endorsement focuses on the capability of the recycled water treatment system to achieve its water quality objectives. Individual processes, within the treatment train that will be relied upon to provide pathogen reduction, must be validated for Class A schemes in VIC. Each |

| | |
|--|--|
| <p><i>Environmental Management: Dual Pipe Water Recycling Schemes – Health and Environmental Risk Management</i> (publication 1015).</p> <p>The Class A water quality objectives described in the publication 464.2 are not applied in VIC. Department of Human Services has adopted the fit-for-purpose approach outlined in AGWR</p> | <p>process unit should be addressed separately and validation studies should be undertaken according to best practice (consult the department for further information).</p> <p>DHS has prepared a guidance document to help Class A recycled water scheme proponents complete their recycled water quality management plans: <i>Guide for the Completion of a Recycled Water Quality Management Plan 2009</i>.</p> <p>DHS is also currently preparing draft <i>Guidelines for Validation of Treatment Processes for Class A Recycled Water Schemes</i>.</p> <p>Class B, C, and D</p> <p>Under the current management framework, treatment processes for Class B, C and D do not require validation. EPA Victoria approves environment improvement plans for these schemes.</p> <p>EPA Victoria and DHS are currently reviewing the GEM 464.2 to ensure consistency with the AGWR.</p> |
|--|--|

4.7 Western Australia (WA)

The WA Guidelines for schemes are presented in Table 25. The requirements for recycled water schemes in WA have been detailed on the scheme's licence. For active schemes these have been designed on a case-by-case basis. Previous to this, there has been no specific published guideline for use. The WA Department of Health has released *Guidelines for the Use of Recycled Water in Western Australia* (WA DoH 2009). The guideline is aligned with the AGWR and outlines the regulatory authorities and involvement of other jurisdictional agencies. The water quality classification system and validation conditions required are presented in Table 26. A recycled water management plan is required for all schemes, and the amount of validation required depends on the risk level of the scheme.

Uptake of the AGWR

The AGWR has not officially been adopted in Western Australia, except for indirect potable reuse schemes, and there is to be some lead-in time before full implementation of the guidelines. This is particularly relevant to the existing schemes. The Department of Environment and Conservation is adopting the AGWR and is writing a policy guide to reflect this.

The Department of Health is looking at reviewing all the current licensed and registered recycled water schemes and moving the monitoring requirements to the AGWR or at least the final WA guidelines. There will be an attempt to use the existing schemes' current data to address the validation requirements. Most schemes are not high exposure.

For on-site systems, the Department of Health is currently not accepting validation from other states and is requesting full validation for WA. This is due to the unique conditions, variations and uses in WA projects.

Table 25: Guidelines and standards in WA

| Category | Size/type | Guidelines | Standards and codes |
|--------------------------------|--|---|---|
| On-site wastewater management. | Single dwelling on a single plot or produces < 540 L/day more than a single dwelling and produces > 540 L/day | | Western Australia Department of Health. <i>Code of Practice for the Design, Manufacture, Installation and Operation Of Aerobic Treatment Units (ATUs) Serving Single Dwellings</i> 2001 |
| Greywater | Greywater treatment system < 10 EP Greywater treatment system > 10 EP | | Western Australia Department of Health. <i>Code of Practice for the Reuse of Greywater in Western Australia</i> 2005 |
| Recycled water | Category 54: Sewage facility: premises—(a) on which sewage is treated; or (b) from which sewage is discharged onto land or into water > 100 ML/day Category 85: Sewage facility: premises—(a) on which sewage is treated; or (b) from which sewage is discharged onto land or into water > 20 but < 100 m ³ /day | AGWR 2006 <i>Western Australia Department of Health Guidelines for the Use of Recycled Water in Western Australia</i> 2009 | WA Department of Water <i>Water Quality Protection Note 22 –Irrigation with Nutrient Rich Wastewater</i> 2008 WA Department of Water <i>Water Quality Protection Note – 33 Nutrient and Irrigation –Management Plan</i> 2006 |

Table 26: Recycled water quality classification and validation requirements for WA

| Classification System | Guideline Document | Validation Requirements |
|---------------------------------------|--|---|
| Exposure risk level high to extra low | AGWR 2006 Western Australia Department of Health <i>Guidelines for the Use of Recycled Water in Western Australia</i> 2009* | High exposure minimum validation requirement <ul style="list-style-type: none"> • six samples • influent and effluent • <i>E.coli</i>, <i>Coliphage</i> and <i>Clostridia</i> Medium and low exposure frequency lower than high exposure <ul style="list-style-type: none"> • six samples • influent and effluent • <i>E.coli</i> Approval authority may direct proponent where adequate log removal need to be demonstrated, e.g. novel configurations or high-risk applications |

* This is based on the guidelines released in April 2009

4.8 International

There are a significant number of countries in the world that still use untreated sewage or highly polluted source waters for agriculture. In these areas appropriate management of sewage for the protection of public health are yet to be developed. The *WHO Guidelines for the Safe Use of Wastewater, Excreta and Greywater* (WHO 2006) details a risk management framework based on the Stockholm framework, which involves the assessment of health risks prior to setting of health-based targets and the development of guidelines values. It is promoted for use with drinking water, wastewater use and recreational water supplies

(Bartram et al. 2001). The AGWR uses this framework with adaption to the Australian environment and the inclusion of higher exposure such as dual reticulation. With the publication of the WHO Guidelines (WHO 2006), it is anticipated that most new regulation for recycled water and for the development of specific guideline documents will look to use the framework presented in the guidelines. This is particularly relevant to developing countries. Bahri and Brissaud (2004) reviewed water reuse in Mediterranean countries and outlined microbiological guidelines based on the use of quantitative microbial risk assessment and the idea of acceptable annual risks.

The other main guidelines that have provided a basis for the development of further guidelines has been those required in California and detailed in Title 22. The *'Purple Book'*, which outlines the California health laws related to recycled water; Chapter 3 details the water recycling criteria. These Californian guidelines detail the use of the recycled water, the treatment process, and the final water quality criteria. The three main criteria are: *'Disinfected Secondary – 2.2 Recycled Water'*, *'Disinfected Secondary – 23 Recycled Water'* and *'Disinfected Tertiary Recycled Water'*. The first two groups are based on treatment train and final water quality criteria. The third criterion is a filtered wastewater that has been disinfected with chlorine under a defined contact time or a disinfection process that, when combined with a filtration process, can remove log 5 MS2 or polio virus. This requires the demonstration of the log removal capacity of the disinfection and filtration steps. The guidelines are prescriptive in nature and do not require a risk management plan to be developed.

The USA has also produced *Guidelines for Water Reuse* (US EPA 2004), which contains the current regulations and guideline requirements in the USA. This set of guidelines also includes suggested guidelines for water reuse (Table 4-13), which are presented by the type of reuse with required treatment and final water quality. The guideline states that *'historically, the microbiological quality of reclaimed water has been based on the presence of indicator organisms, which has been an effective practice that is likely to continue'*. There is a mention of the ability of regulators to consider the use of quantitative microbial risk assessment to set guidelines or limits for selected pathogens in the reclaimed water. The California Department of Public Health does have a defined procedure for accepting alternative treatment technologies and provides a treatment technology report for recycled water that lists those technologies that can be used to meet the filtration and disinfection requirements for the compliance with California's Title 22.

The WHO Guidelines (WHO 2006) are the only guidelines that, like the AGWR, describe the need for validation of treatment processes for log removal. There are a number of international validation documents for specific treatment processes, which are presented in Table 27. Some of these are standards and some are guidelines; but they have all been designed to address specific needs. The majority of these documents were designed for drinking water and many were developed by the US EPA to help with compliance to the *'long-term enhanced surface water treatment rule'* (LTESWTR). This will limit their applicability to recycled water due to potentially higher pathogen and organic matter loading. Only one document has been designed specifically for use with recycled water: the *Ultraviolet Disinfection Guidelines for Drinking Water and Water Reuse with Recycled Water* (NWR 2003).

Internationally, the AGWR is significantly advanced and matches that outlined in the WHO guidelines (WHO 2006). As this is the case, a large number of countries will be looking to Australia to lead the way in developing regulation that incorporate the concepts of risk assessment and allow the adoption of these concepts to different schemes sizes.

Table 27: International validation documents

| Document | Role | Criteria |
|---|--|---|
| <i>Ultraviolet (UV) disinfection</i> | | |
| <i>Ultraviolet Disinfection Guidance Manual for the Final Long Term Enhanced Surface Water Treatment Rule</i> (US EPA 2006) | Designed to help systems comply with the treatment requirements under the LTESWTR Chapter 5 summarises the requirements for validation testing Designed for drinking water | MS2 phage and <i>Bacillus subtilis</i> spores for challenge testing Accepts alternative protocols |
| Austrian Standards (ÖNORM 2001) M 5873-1 | Designed for drinking water | Those certified by this method for a <i>Bacillus subtilis</i> RED of 40 mJ/cm ² should be granted a 3-log <i>Cryptosporidium</i> and <i>Giardia</i> inactivation credit. |
| Austrian Standards (ÖNORM 2003) M 5873-2 | Designed for drinking water | Those certified by this method for a <i>Bacillus subtilis</i> RED of 40 mJ/cm ² should be granted a 3-log <i>Cryptosporidium</i> and <i>Giardia</i> inactivation credit. |
| German Guidelines (DVGW 2006) | Designed for drinking water | Those certified by this method for a <i>Bacillus subtilis</i> RED of 40 mJ/cm ² should be granted a 3-log <i>Cryptosporidium</i> and <i>Giardia</i> inactivation credit. |
| National Water Research Initiative <i>Ultraviolet Disinfection Guidelines for Drinking Water and Water Reuse</i> . Second Edition (NWRI 2003) | Used by the State of California for compliance to Title 22 requirements Designed for drinking water and recycled water | MS2 phage for validation |
| NSF/ANSI 55 <i>Ultraviolet Microbiological Water Treatment Systems</i> (NSF 2007) | Designed for drinking water | MS2 phage <i>Saccharomyces cerevisiae</i> for validation |
| <i>Water Conditioning Equipment Inside Building – Devices Using Low-pressure Ultraviolet Radiators</i> (Estonian Centre for Standardisation 2009) | Designed for drinking water | <i>Bacillus subtilis</i> |
| <i>Membranes</i> | | |
| <i>Membrane Filtration Guidance Manual</i> (US EPA 2005b) | Provides guidance on membrane compliance to the LTESWTR. Designed to address the development of alternative technologies such as membranes Designed for drinking water | <i>Cryptosporidium</i> used as challenge organisms. Methodology is suitable for use with any pathogen |
| <i>Chemical disinfection</i> | | |
| <i>Disinfection Profiling and Benchmarking Guidance Manual</i> (US EPA 1999b) | Provides guidance on disinfection profiling and for the application of the LTESWTR Designed for drinking water | Chlorine contact time values for <i>Giardia</i> and <i>Cryptosporidium</i> inactivation |
| <i>Alternative Disinfection and Oxidants Guidance Manual</i> (US EPA 1999a) | Provides technical data for other chemical disinfectants and oxidants not as widely used as chlorine Designed for drinking water | Covers ozone, chlorine dioxide, potassium permanganate, chloramines, peroxone, UV and combines disinfectants |

5. Discussion

Many jurisdictions have developed their own guidelines, and others have directly implemented the AGWR. Implementations of some of the components of the AGWR are easier than others. The risk management framework as a whole is easily implemented, and when proponents change to the AGWR, they often find they have already carried out most of the steps. The use of quantitative microbial risk assessment and the log reduction requirements are less easily implemented; and validation is the most difficult. Although validation is only one step in the process of developing a safe recycled water scheme, it is a significant step, and it is an area of confusion for regulators and proponents.

During discussion with other regulators, there were concerns raised around the implementation of the AGWR to smaller schemes, including commercial buildings and small community schemes that are not connected to large centralised treatment plants. The application of the AGWR for medium to low risk schemes may not be realistic with the resources and training level available in the regulatory agencies.

It was generally felt that the AGWR was not that useful for application to on-site single households due to its complexity. As detailed in the regulatory section of the report, most of these systems are currently covered by accreditation requirements as systems of effluent disposal, but not for recycling. The application of the AGWR Framework, especially the validation requirements, is seen as too onerous and potentially too expensive for single households. Easier implementation of the AGWR could be achieved by replacing the validation requirements with a national accreditation process, as outlined in Recommendation Two, and by simplifying the risk management framework.

Recommendation Three: The National Recycled Water Regulators Forum look at supplying advice to relevant Ministerial Council(s) on simplifying and adapting the Australian Guidelines for Water Recycling Framework for easier implementation by single households.

Regulators of larger recycled schemes are increasingly being asked to approve schemes that include treatment systems previously limited to use for on-site wastewater management, such as modular systems connected together to treat effluent from several households, or in an apartment block, or the up-scaling of household systems to treat larger amounts. The overlap between the two areas of recycled water regulation and guidelines is now increasing as a result, and the issues faced become increasingly similar.

Currently there are two national forums—the NRWRF and National On-site Regulators Forum (NORF)—both of which have similar terms of reference. The NRWRF was developed to support the regulators involved in managing water recycling from both on-site and centralised systems, while NORF was developed to look at on-site wastewater management, of which recycled water is becoming an increasing component. Currently several members of NORF are also members of NRWRF. There would be a benefit to integrating the two groups. This would reduce the strain on resources for agencies and increase dialogue between the two areas. There may be some concern with the size of the combined forum and a potential for issues important to smaller schemes to be lost. This can be overcome by developing subgroups within the forum to work on particular areas of concern and report back to the larger group, thereby remaining engaged with the larger group of regulators.

Recommendation Four: Consideration be given to integrating the NRWRF with the National On-site Regulators Forum (NORF) to provide an opportunity to further enhance consistency in the approach to recycled water management.

This review of the legislation and guidelines highlighted the areas where there is potential for inconsistency in the application of the guidelines. Where councils have responsibility for the approval of schemes, the potential for inconsistency arises from the high number of local councils involved and the experience of the councils. Councils vary in their size, location, capacity and expertise in relation to sewage and recycled water management. There is a large potential for differences in application processes (from fees to information requirements), the extent to which relevant guidelines are applied, conditions of approval, and ongoing operational requirements. There is the possibility of similar recycled water schemes being approved with few conditions in one council area, while another council may area require significantly greater approval conditions. The ability of a council to interpret the AGWR will affect how the AGWR is implemented.

In addition to the variability of interpretation of the guidelines by the councils, there is a large variability in the skills of proponents: some consultants and proponents are highly skilled and require little support in applying the AGWR, while others require a lot of assistance. State regulators often have to apply a significant amount of time and effort to ensure schemes address the requirements of the guidelines adequately.

The AGWR presents several new concepts, including (a) the application of risk assessment and management to recycled water schemes, and (b) the use of quantitative microbial risk assessment to determine the log removal reduction required to achieve an acceptable risk. There is still a significant way to go to achieve a good, consistent understanding of log reduction requirements. This has caused a number of delays in schemes due to a misunderstanding of what has to be done to get the log removal information, particularly that *E. coli* removal is not necessarily enough.

Long-term management of recycled water schemes requires ongoing monitoring and auditing for the adherence to licence or approval requirements. The increase in the number of schemes, particularly smaller schemes, requires ongoing resources. As more small schemes develop, the auditing responsibility will need to be addressed. Under the current system, this would often be the responsibility of councils, which may not have the resources to undertake frequent audits. Auditing could be outsourced to external consultants. There is currently no specific auditing program or training in place for recycled water schemes. There are approximately 65 recycled water schemes operating in regional WA alone. Currently all WA recycled schemes require Department of Health approval, which sets out conditions relating to quality and system controls. However, there is limited auditing of schemes by the end user as most do not have the required expertise or the resources.

Ongoing monitoring could be addressed through the education of councils, development of support material and training.

Consistency in application and interpretation will improve over time with the increased use of the guidelines. However, there would be significant benefit from industry training to ensure consistency and high quality. Specifically training courses in design and auditing of recycled water quality management plans and application of the AGWR Framework are needed.

Recommendation Five: Mechanisms be explored to facilitate the implementation of the AGWR's framework within the water industry and the development of auditing frameworks and training.

To enable mechanisms for the implementation of the framework to be explored, there needs to be a national group to provide technical input and direction on the needs of the industry and regulators. This can be addressed with the use of the NRWRF. As the section of this report on guidelines indicates, many of the jurisdictions have already produced guidelines and many have produced internal documents for the management of the approvals process. IPART in NSW has developed criteria for acceptance to their auditing panel. As these

currently exist, they could easily be used as a basis for national documents and training programs.

Recommendation Six: The Australian Government and jurisdictions support the continuation of the NRWRF to facilitate sharing of information, including training and the development of education programs for the industry.

The dilemma for regulators and proponents is that the AGWR provides an overview of the concept of validation, and the need to do it, but very limited information on how to validate. This is probably due to the lack of specific guidance documents available and the role of the AGWR as a guideline rather than a prescriptive document. The AGWR lists two validation documents: the *Draft Ultraviolet Disinfection Guidance Manual* (US EPA 2003) and the *Disinfection Profiling and Benchmarking Guidance Manual* (US EPA 1999b). It recommends that the regulator define what validation is needed and how it is to be carried out. The responsibility could be passed back to the proponent to demonstrate that the system is validated, but it will still require the regulator to provide some definition or direction on what will be accepted. The smaller the scheme and the smaller or less experienced the proponent, the more direction required from the regulator. The lack of tools in the AGWR to support the validation requirements is a significant issue. This lack is especially relevant to new or novel technologies, and it is one of the main concerns raised during discussions and during the NRWRF meeting (Appendix C).

The greatest challenge associated with running a successful recycled water scheme is demonstrating that it is working and that it is not an environmental or public health risk. Reliance on end-point monitoring is expensive, and the detection methods that are available make it difficult to test for the presence of pathogens in highly treated recycled water. Use of the AGWR will address many of these concerns. However, the challenge for the application of the AGWR is the process of validating treatment systems and to incorporate that into the ongoing operational monitoring of the system. Developing a risk management framework is straightforward and has been carried out in most schemes; determining the required controls on the treatment process is straightforward, but proving what the log reduction is under the operating conditions is difficult.

The application of validation requirements contained in the AGWR to low-risk schemes has been seen as excessive and proponents have complained about the cost.

The literature contains much evidence for the log removal of microorganisms achieved by standard treatment processes, which is presented in the AGWR and the WHO Guidelines (WHO 2006). Low-risk schemes with additional point of use barriers, such as restricted access or subsurface irrigation, require a lower log removal—the treatment process should easily be able to meet the theoretical value in these cases. These include most of the irrigation schemes such as golf courses, playing fields and crop irrigation. These are the schemes that have the least exposure to humans, provide a method of sustainable effluent disposal, and have established community support. These are schemes that need to be encouraged and supported. These schemes would benefit from the reduced costs of being able to use published log removal values (from the literature) or those presented in the AGWR.

This principle was discussed at the NRWRF (Appendix C), and it was agreed that this was the approach currently being undertaken in most jurisdictions. Consensus on what is low risk needs to be achieved because there is the potential for a range of definitions. For example, a low-exposure scheme that relies on a single treatment barrier for the removal of a class of pathogen (e.g. bacteria, viruses or protozoa), could still require the treatment process to be validated because the reliance on one barrier only makes it a high risk. In this cases, verification of all treatment processes regardless of the risk level would still be required.

Recommendation Seven: The jurisdictions agree that treatment systems for low-risk schemes be exempt from individual validation of treatment processes.

Once the agreement that low-risk schemes can use indicative log removal values for enteric pathogens for standard treatment processes has been established, reliable and consistent log removal values need to be produced. The indicative log removal or inactivation of pathogens by standard treatment processes presented in the AGWR (Table 3.4) and the WHO Guidelines (WHO 2006, Table 5.2) is limited in its usefulness by the large range of log removal values provided. The log removal tables in WHO Guidelines (2006) and the AGWR are based on data from full-scale plants, theoretical data, and values that were limited by the concentration of organisms present in the source water. In addition, to be useful, the information needs to have the log removal capability of the treatment processes linked to the operational parameters and the range for each treatment system more closely defined; for example, values of 0–6 log removal are not useful. This is especially relevant to biological systems that were not designed for pathogen removal, but for nutrient removal. Monitoring of the inflow and outflow of these treatment processes has indicated that there is some pathogen removal, but the monitoring systems have not been linked specifically to design or operational conditions to allow the log removal to be achieved consistently. A database of log removal values collected during testing of treatment processes that are linked to specific operational parameters therefore needs to be developed.

Recommendation Eight: A database be developed of log removal values obtained during testing of treatment systems and the corresponding operational parameters (e.g. turbidity and UV transmissivity) for use with low-risk schemes.

The National Water Commission and Water Services Association of Australia have jointly funded a project ‘Framework for the Management of Recycled Water: Development of a Methodology to Assess Implementation of the AGWR’. The objective of the project is to develop a method to assess the implementation of the AGWR. The tool (ReQuality) will be used to monitor the performance of recycling schemes to ensure they align with AGWR. The project includes web-based software that is a ‘user friendly guide’ to the application of AGWR Chapter three ‘Managing health risks in recycled water’, including a component on treatment technology and performance. This is to include a pathogen treatment technology database that identifies (a) the log reduction that can be achieved through treatment technology combinations, and (b) a treatment performance database that identifies the process monitoring and process performance requirements that need to be met to operationally demonstrate particular pathogen log reductions. This is currently being developed and will help with the design of recycled water schemes and implementation of the AGWR. This database could provide suitable information for low-risk or low-exposure schemes and also act as a storage place for log removal data from validated systems.

Recommendation Nine: The National Water Commission negotiate access rights to the ReQuality database for proponents and regulators who are not members of Water Services Association of Australia.

High exposure schemes require validation of individual treatment processes. This raises the issue of how to validate treatment systems and what information is necessary for a treatment process to be accepted as validated. The individual jurisdictions have put in place some requirements for validation, for which discussion with individual regulators is needed for high exposure schemes. Currently, information for the validation of treatment processes is reviewed by each jurisdiction on a case-by-case basis. Many of the processes are the same, as manufacturers or proponents are required to produce similar information for each jurisdiction. If the information supplied is not considered adequate, they are required to undertake additional validation. In some incidences, full validation of treatment systems is required at several sites.

There is a need for uniformity in validation or log removal credits given to treatment technologies across the jurisdictions. Discussion among the regulators found that this was due to one state not requiring the log credit for a treatment process as the scheme already had the required number of log credits. Different states had given slightly different log removal credits for the same process. To encourage consistency in the validation of treatment processes, a national approach needs to be developed, this could be achieved with the following steps:

- **Step One:** Review of national and international guidelines and standards available for the validation of treatment processes. This would include determining the limitations or applicability of the available standards and guidelines to recycled water and to the role of validation in the AGWR framework. An example is the interpretation of the State of California Division of Drinking Water and Environmental Management's (2009) *Treatment Technology Report for Recycled Water* for log removal ability of membranes. The California State recognises treatment processes as being *'acceptable for compliance with treatment requirements of the California Recycled Water Criteria'*, but the results are not linked to operational parameters or log removal value as stand-alone units.
- **Step Two:** Conduct a gap analysis of areas where guidance documents for validation are missing and needed. The development of those documents should be prioritised to the most commonly used treatment processes and those that are being relied upon as critical control points, such as membrane bioreactors, media filters, UV, chlorination and lagoons.
- **Step Three:** Development of validation protocols for those treatment processes prioritised during the gap analysis. The Victorian Department of Health is involved in a Smart Water funded project to develop *Validation Guidelines for Treatment Processes*. It is anticipated that these will be used in Victoria for Class A schemes. While these are being developed to address Victoria's requirements, there maybe an ability to adopt all or part of these nationally.
- **Step Four:** Development of a centralised validation or approval of treatment processes. Once guideline documents for the validation of treatment processes have been defined and developed, a process for national acceptance of validated treatment processes should be established. This would involve determining whether validation that has been carried out previously, either as part of an Australian scheme or overseas, is acceptable; and it should include the applicability and limitations of the results. Many treatment processes where guidelines or standards are available have already undergone validation. This is especially relevant in the USA, where drinking water regulations are based on the log removal capability of the treatment process. For recycled water schemes in Australia, this information is supplied to many regulators as part of the development of the water quality management plan and as a requirement for final approval. This would need to be an ongoing group to ensure a process is available to address new technologies as they are developed.

The NRWRF could be used as a mechanism to achieve national consensus and act as a steering committee for work carried out by consultancies. The reporting pathways of the Environment Protection and Heritage Council could be used to inform environment ministers and the Joint Steering Committee for the ARWG for coordination with the NH&MRC. The NRWRF contains representation from the National Water Commission, the Environment Protection and Heritage Council, and members of the Joint Steering Committee of the AGWR. The review of national and international guidelines and standards could be carried out by a consultancy using the information collated in this report as the starting point. The consultancy would be required to have significant expertise in treatment technologies to determine the limitations of standards and guidelines and their applicability to Australian conditions. The gap analysis of validation guidelines could be carried out by the NRWRF using the information obtained from first step and each regulator's requirements and experience. The validation protocols for treatment processes would require input from people with technical expertise.

This could be a technical working group that would include industry members such as water utility operators and technology proponents. The extent of this work would be dependent on the outcomes of the work by the Victorian Department of Health and the results of the first two steps.

The development of a centralised validation or approval of treatment processes would involve an ongoing process that is recognised nationally and supported by regulators and proponents. There are several different processes of centralised validation or approval of treatment processes that could be used as a model for this process in Australia. These are detailed in Appendix B.

The US Environmental Technology Verification (ETV) process could be adopted in Australia, but it would require a central technical organisation or group capable of reviewing technologies and developing protocols on an ongoing basis along with the development of treatment testing facilities. An alternative would be a technical review group, which could work with proponents of schemes who wish to have their treatment technology validated. This validation would be carried out as part of the approval process from the recycled water scheme, but it may require more additional work than is required for approval in that jurisdiction. The technical review group would be responsible for determining the applicability of the validation process used and the limitations of the results. An example is the design of the membrane bioreactor scheme for irrigation, where the proponent may choose to work with the technical group to validate the system for log removal, therefore allowing it to be used for high exposure schemes, without repeating the work. The results of the validation work would have to be stored centrally, which would require input from a federal organisation to maintain a database of validated equipment.

In Australia, there is Standards Australia and the accreditation body Joint Accreditation System of Australia and New Zealand (JASANZ). JASANZ is the government-appointed accreditation body for Australia and New Zealand responsible for providing accreditation of conformity assessment bodies in the fields of certification and inspection. Accreditation by JASANZ demonstrates the competence and independence of these conformity assessment bodies. JASANZ accredits 63 conformity assessment bodies that certify some 50,000 organisations. JASANZ provides services in more than 20 countries and is a signatory to a number of bilateral, regional and international agreements. These agreements provide international recognition and acceptance of JASANZ-accredited certificates and inspection reports. JASANZ accredits organisations that provide certification and or inspection services. Common schemes that conformity assessment bodies certify are Quality Management Systems based on the ISO 9001 Standard, and Environmental Management Systems based on the ISO 14001 Standard.

The JASANZ process should provide a higher level accreditation for testing centres and a possible process to move towards once the initial steps are completed. If the development of Australian Standards for on-site single household treatment processes occurs, this could lead the way to a centralised accreditation process for these systems. JASANZ would provide accreditation of testing facilities for on-site systems.

The benefits of a national approach to treatment validation include greater clarity for manufacturers and proponents in what is required by regulators. In addition, there would be a reduction in costs for the proponent by using a validated treatment process. The validation would be tied to the operational parameters and would supply valuable information on this for incorporation into the recycled water quality management plan.

Having a validated system would give the manufacturer a marketing advantage through increased market competition for the technology developer. This would also provide incentive for the manufacturer to become involved in the validation process and contribute to the validation of the system. Under the USA and Canadian ETV processes, manufacturers of

technologies are one of the key instigators of the validation process, and they cover the costs of the testing (outlined in Appendix B). This is possible because of the centralised verification facilities.

The development of this process does not require changes in regulations. The process and protocols developed require endorsement by appropriate ministers for incorporation into individual jurisdiction requirements. This makes the adoption into current processes easy.

The development of a national approach to treatment system validation removes the responsibility for this from the smaller regulators or individual jurisdictions, such as councils. This will remove the duplication seen while jurisdictions produce their own guidelines for validation of individual treatment systems. Increased consistency between regulators both in and outside jurisdictions is also expected from a national approach. With the current regulations, there are several agencies involved in approval of recycled water schemes in each jurisdiction.

Recommendation Ten: A national approach to the validation of treatment processes for high-risk schemes be pursued through the adoption of the strategy identified.

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Appendix A—Issues for future consideration

The review and comparison of the regulatory system and discussion with the regulators and proponents highlighted several issues common to all jurisdictions that need further consideration.

Long-term management of on-site systems

All on-site wastewater treatment systems require long-term management and commitment. A system may be installed by an enthusiastic owner or property developer, but it will need to be serviced regularly, and this will continue past the sale of the property to the subsequent owners. This needs to be considered within the approvals process.

Alternative disposal mechanisms

On-site recycled water schemes in both sewerred and unsewerred areas need to have an alternative disposal mechanism for situations where the recycled water does not meet water quality requirements. All on-site treatment systems have the potential to fail and produce water of a lower quality. The ability to cease supply of water that is no longer fit for purpose is important for risk management. Schemes in sewerred areas that are not connected to sewer systems are reliant on the excess effluent being tankered to a central treatment plant. The tankering of treated effluent is not considered a viable option in many situations, particularly where the system is large or in a built-up area. This also leads to potential issues if the scheme is not maintained in the long term, and a supplier of last resort is required to step in. The development may need to be connected to the central system at a cost. In unsewerred areas, the schemes still need to be designed with sufficient holding capacity for water that is not fit for purpose or alternative disposal on-site. The use of recycling of water on unsewerred sites should not become a mechanism for reducing effluent disposal site requirements.

Cross-connections

Due to cross-connections, dual reticulation schemes that involve a different supplier for recycled water can present a risk to the potable water supply. This can be addressed by cross-connection controls in approvals; but if a scheme is an orphaned scheme then this ability is lost. This control is then dependent on requirements in plumbing and building codes to address it and appropriate auditing.

Discussions with water utilities raised the concern of the risk from private schemes to a utilities potable water supply from back flow contamination and cross connections. This is addressed in most jurisdictions by requiring that the water utility to be notified of any schemes before connection and by conducting cross connection checks. However, the cross-connection auditing requirement for dual reticulation schemes has the potential to cause capacity and workload problems as the number of dual reticulation schemes increases and due to difficulties accessing houses to carry out the cross-connections audits. The requirement on many large dual reticulation schemes is for cross-connection checks to be carried out every five years, or 20 per cent per year. Cross-connections were found at both Rouse Hill and Sydney Olympic Park, even though Olympic Park has extensive cross-connection checking programs, highlighting the difficulty of managing these occurrences.

Ownership of recycled water

The ownership of recycled water as a product and the management of the recycled water after passing from the producer to the end user are issues of concern. These issues become increasingly important as the product moves from the producer/provider to the user, and the more providers and users involved the more difficult the management of the end use becomes. This is covered by user agreements in some cases, but it is reliant on the recycled water producers ensuring the use is appropriate. This issue has been seen with dual reticulation schemes where the water is supplied to individual households and education is supplied to the householders; however, inappropriate use is known to occur (e.g. topping up or filling of swimming pools). This will result in regulators needing to assume the highest exposure use or providers not being able to guarantee on site controls.

Interaction with other regulations based on effluent management

The SA Environment Protection Authority and Department of Health have been trying to deal with the requirements for setback distances associated with the use of recycled water. The Department of Health Codes stipulate that irrigation can not occur within 100 metres of the River Murray, 100 metres from the high tide mark and 50 metres from other waterbodies. However, this has been challenged by users as the quality of water is higher than the codes were originally designed for. As a result, there has been a partial move towards a risk management approach. However, there is still the issue around what size schemes the restrictions apply to and whether the intent of the original code is being met.

Commercial in confidence

Access to company validation and treatment testing data and commercial-in-confidence issues with those data are problems. A proponent will often argue for an exemption from the need to do validation testing due to the extensive testing previously carried out for a similar project that uses their equipment, but the proponent is then reluctant to pass that information to the regulator for assessment, citing commercial-in-confidence and competition concerns.

Decreased flow in sewer systems

The increased uptake of greywater diversion and recycling has resulted in a decrease in the flows in the reticulated sewerage system. While not an immediate problem, it may affect future designs of sewer mains and the solid to liquid ratio going into current sewage treatment plants. It could also affect the operation both of the sewerage reticulation and of treatment plants. This is due to the impact of the quality and quantity of the residuals returned to the sewer from the on-site treatment system and the reduction in flow into the sewer with greywater capture and sewer mining. New or proposed schemes downstream of older schemes may not have access to reasonable quality sewage and will need to adjust treatment systems. Sewer mining may concentrate pollutants in the sewer by removing a proportion of the flow. Concentrating the flow may lead to solids depositing (increased chokes), increased detention times and odours. In addition many sewer-mining schemes return the residuals from the treatment plant to the sewer.

Impact of water conservation programs on source water for recycled water schemes

The future management of community conservation measures such as low-flow toilets and rainwater tanks could have an impact on the amount of water available to recycle schemes. This is particularly in areas with dual reticulation schemes. SA Water is still required to supply potable water for dual reticulation until there is enough recycled water to match demand. In

NSW, the Rouse Hill scheme and Sydney Olympic Park Authority scheme need to use additional potable water to meet demand for recycled water consumption in summer months. Inadequate pricing of recycled water could encourage inappropriate and overuse of recycled water.

Long-term security of recycled water supply through a private service provider

From a public health point of view, there is an issue with the long-term security of recycled water supply through a private service provider. Appropriate mechanisms need to be put in place to address failure of the business and therefore the need for a supplier of last resort. An area of concern for many regulatory authorities is the long-term survival and financial viability of the proponents. This has been addressed by many regulators requiring the proponents to show long-term management plans and financial viability as part of a management plan or as a requirement for licence application for a service provider.

Laboratory capacity

The isolation of many communities and the size of a jurisdiction hinder the ability of authorities or scheme managers to routinely send samples to laboratories for validation testing or for long-term monitoring of schemes. This is especially relevant for microbiological analysis. This will result in a continued emphasis on the use of *E.coli*. In addition, some jurisdictions do not have the laboratory capacity to do pathogen or surrogate monitoring.

Validation

Public health concerns were expressed; specifically in relation to reliance upon the validation approach in the AGWR in the absence of defined critical control points. It was felt that a defined critical control points should be required, regardless of relevant DALY assessment processes, in order to ensure adequate protection of public health during periods of treatment system failure. Operational parameters for treatment systems, which could be critical control points, were not included in the AGWR. The aim of the document was to provide a framework for proponents to develop schemes and encourage innovation. The AGWR is not prescriptive in treatment train requirements and operation parameters.

The ability to obtain log removal values for treatment processes *in situ* from plants when there is good quality water coming into the treatment plant is limited. This is especially relevant for advanced recycled water treatment plants. The influent usually contains very low numbers of microorganisms, which makes it difficult to determine the removal efficiency of the treatment processes, using indigenous microorganisms. This limits the ability to do validation *in situ* testing without requiring spiking to be carried out. While on a cost level, spiking maybe an option for a high-risk large scheme, it is not a realistic option for small or lower-risk schemes.

There is a limitation to the *in situ* validation of systems that are part of staged developments. Wastewater treatment systems will need to be used to manage wastewater from partially occupied buildings or for schemes that are not at full capacity. There is a need to determine at what level of occupancy the *in situ* validation of the process becomes acceptable.

The use of field data for the validation of the treatment processes also places too much onus on equipment that is already installed. There is a risk of installed equipment being unable to achieve the required log removal. In this case subsequent modifications would be required.

The validation requirements for different treatment processes are variable. Each treatment process requires an approach tailored to the technology. This should consider the mode of action of the process and the organisms that it is being designed to remove.

Within the development of validation guidelines or interpretation of requirements, there are questions on the appropriate choice of indicators or surrogates. The indicators and surrogates suggested in the AGWR may not be appropriate for all treatment processes.

The broadbrush approach to surrogates and indicators may not be appropriate.

The log removal values derived from chlorine contact time tables have generated some concern and debate. Most of the current chlorine contact time tables are based on clean water with minimal chlorine demand. This may not necessarily be the case with all recycled water. Depending on the effectiveness of the treatment processes the recycled water may have a high chlorine demand.

The log credit for combined UV and chlorine needs to be determined. Currently both of these are taken in isolation, but there may be a synergistic effect. Consideration of synergistic effects may give an extra half log credit for the combination of the two.

Dual media as a treatment process represents a challenge. The traditional view of a dual media plant is of a robust treatment system. However, in Australia there are a large number of examples of badly run dual media plants. The South Australian Department of Health and SA Water are currently conducting a program of field validation of dual media using surrogates (coliphage and bakers yeast) and comparing the removal against operational turbidity monitoring. *Bacillus subtilis* maybe used as an alternative as it is naturally occurring, easy to isolate, and should be in high enough numbers to not require the spiking of influent. Publication of this work would be of great benefit to the industry.

A membrane bioreactor is another treatment process that needs to have validation procedures developed. Membrane bioreactors are one of the largest growth areas in treatment technologies for recycled water production due to their small footprint. The main difficulty with this technology is linking online operational parameters such as turbidity and particle counts with log removal efficiency.

Validation requirements for treatment processes have been addressed quite thoroughly by SA. Validation of membrane systems raises questions around log removal capability and what can be demonstrated. With processes such as UV, there is a closer match between results from operational monitoring and the log removal, and this allows much higher operational log removal credits to be given. The log removal values around chlorine contact time have generated some concern and debate.

Appendix B—Overseas technology verification and validation programs

The State of California Division of Drinking Water and Environmental Management *Treatment Technology Report for Recycled Water* (State of California 2007) details those treatment technologies that meet the California Water Recycling Criteria. The acceptance of a technology is based on field testing and reports provided by the manufacturers showing the operational parameters that would achieve a 5-log virus removal/inactivation. Once the validation process has been completed, usually by a state utility as part of the development of a recycled water scheme, the California Department of Human Services considers the technology as *acceptable for compliance with treatment requirements of the California Recycled Water Criteria*.

The US EPA Environment Technology Verification (ETV) Program was established in 1995 to develop testing protocols and to verify the performance of innovative technologies (US EPA 2005a). The ETV Program is voluntary and includes regulators and industry partners. The program is open to any technology, but has specific categories of technologies that are prioritised by the ETV Program verification centres and the stakeholders. The criteria for verification and a protocol for verification of the technology are both determined or developed. This is carried out by a technical review panel that also develops the protocol. The full process is outlined at the US EPA website <http://www.epa.gov/mrmri/std/etv/verificationprocess>.

US EPA ETV Drinking Water System Center has a focus on small system technology needs. Testing is done in the field. There are four categories for verification: filtration technologies (microorganism reduction), UV and other water disinfection; pathogen reduction technologies – disinfection and filtration processes; UV and on-site chlorine generation and ozone generation; filtration microfiltration and ultrafiltration; alternative filtration systems including bag and cartridge filters, back-washable depth filter, chemical coagulation, flocculation and filtration and pre-coated or diatomaceous, earth filtration.

While the US EPA ETV program works with specific centres to carry out testing, it will use data generated from other sources as long as it meets the ETV's quality assurance requirements (detailed in Appendix C of the ETV Quality Management Plan).

In the presentation by Bruce Bartley at the ETV International Forum Meeting in 2005 (US EPA 2005a) he indicated that many state agencies in the US felt that the ETV data that had been produced help minimise pilot testing requirements and help expedite the approval and implementation of treatment processes in each state. ETV process and results also helped to provide technology providers with valuable information on product weaknesses, which can then be addressed before implementation in the field.

The EPA ETV program in partnership with National Science Foundation International has developed several Environmental Technology Verification Protocols. The protocols are listed in Table 28 and outline the field testing required by the organisation. The testing organisation then uses the requirements in the document to develop a product or treatment specific test protocol. Testing of the equipment under the specific testing protocol is carried out by an National Science Foundation–Qualified Field Test Organisation and a state or third party accredited analytical laboratory.

Table 28: EPA ETV Program protocols

| <i>Document</i> | <i>Covers</i> |
|---|--|
| Protocol for Equipment Verification testing for Inactivation of Microbiological Contaminants (NSF 2003) | Ozone-based and advanced Oxidation processes, On-site generation of Halogen Disinfectants |
| Protocol for Secondary Effluent and Water Reuse Disinfection Applications (NSF 2002) | UV disinfection |
| Protocol for the Verification of Wastewater Treatment Technologies (NSF 2001) | Commercially available prefabricated equipment for decentralised wastewater treatment Residential wastewater treatment technologies with a design flow of > 1,500 gallons per day |
| Protocol for Equipment Verification for Physical Removal of Microbiological and Particulate Contaminants (NSF 2005) | Membrane filtration Coagulation and filtration Bag filters and cartridge filters Precoat filtration Backwashable depth filtration |

The US EPA then issues an ETV Joint Verification Statement outlining the technology type, the application type, the name of the technology, the conditions under which the testing was carried out, and the results.

Canada also runs an ETV program that is similar to its approach as the US EPA ETV. Technology producers or developers apply to the ETV Program for verification of the claims made concerning the environmental performance of their technologies. If the claim is verified successfully, the company is issued three documents: a Verification Certificate, a Technology Fact Sheet and a Final Verification Report; the graduate is also entitled to use the ETV logo (on the specified documentation) to market their technology in Canada and abroad. ETV Canada provides buyers with an assurance that suppliers' claims regarding the environmental performance for a technology are valid, credible and supported by suitable demonstration test information. The ETV Program is recognized by Canadian Provinces as an important component of their respective Certificates of Approvals processes.

Several Asian countries such as Japan also have environmental technology verification programs. In addition, the European Commission has the European Union Environmental Technologies Action Plan (ETAP). The third ETAP Forum was held in Paris and discussed the role of ETV in supporting the market take-up of eco-technologies. ETV systems provide a prior verification of claimed performance and potential environmental impacts of new eco-technologies. The objective is to enhance the confidence of investors and potential buyers in promising innovative eco-technologies, thus facilitating their entrance into the European Union and international marketplace.

All of the ETV programs discussed above are able to use current standard methods such as National Science Foundation, American Society for Testing and Materials or International Organization for Standardization. However, these processes for the production of testing protocols to use for verification or validation of a new treatment technology for developing standards were felt to be too slow and prescriptive and therefore new processes were put into place.

Appendix C—National Recycled Water Regulators Forum

In 2006, NSW Health proposed the establishment of a forum consisting of those agencies and authorities responsible for the regulation of recycled water schemes and for the implementation of the AGWR. Following consultation with other agencies the terms of reference for the group were developed and accepted by EnHealth and the Environment Protection and Heritage Council.

During 2008, contact was made with each of the appropriate regulatory agencies and representatives identified for membership to the forum. NSW Health had received some feedback directly from these people regarding involvement and some initial comments on the potential role of the group. A significant number of people highlighted the need to meet to discuss issues confronting regulators and further develop the role and avenues of action for the forum. To help facilitate this NSW Health convened the first meeting of the National Recycled Water Regulators Forum (NRWRF) in Sydney on 24th March 2009. The minutes, including the terms of reference are presented in this appendix. From this meeting, the tables detailing the water quality classes and validation requirements for each jurisdiction were developed.

The meeting included a presentation of the initial findings of the National Water Commission Fellowship as well as a presentation on Guidelines for Validation of Treatment Processes by Suzie Sarkis from the Victorian Department of Health. A discussion of each jurisdiction's approach to regulating and approving schemes (related to both size and proponents) occurred. The overall finding was that there was reasonable cooperation from large utilities or organisations for large schemes but less cooperation from smaller schemes and those not owned or run by utilities or large organisations. In general, the smaller the scheme the more difficult it is to insist on the high level of validation necessary for high exposure schemes as outlined in the AGWR. The tools and projects, such as interpretive tools for AGWR, scientific research being carried out, and potential funding groups for additional work were also discussed.

There was a general agreement that the AGWR can be applied to all schemes, but the amount and type of information required from the proponent is dependent on the exposure risk. High-exposure schemes such as dual reticulation require full application of AGWR, including the validation of critical treatment processes. In contrast, low-risk schemes would need to meet water quality objectives with appropriate end-point controls only.

The meeting was attended by all representatives from all jurisdictions and included both environmental and health agencies. Many of the representatives present were also members of the National On-site Regulators Forum (NORF). There was consensus on the need for the group to continue and on the potential role of the group in supporting the uptake of recycled water use in Australia while protecting public health and the environment.

NATIONAL RECYCLED WATER REGULATORS FORUM

1st Meeting 24th March 2009

Mary MacKillop Place, North Sydney

MINUTES

Welcome and introductions

Appendix 1: Attendees list.

| | | |
|---|-----|------------------------|
| ACTION Item 1: Update of membership information (Excel spread sheet) kaye.power@doh.health.nsw.gov.au | All | 17 th April |
|---|-----|------------------------|

Appendix 2: Presentation of background to the NRWRF and terms of reference (TOR)

TOR mainly covers health concerns. As the Forum and recycled water regulation involves both health and environmental regulators do we need to review TOR?

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|---|-----|------------------------|
| ACTION Item 2: Review TOR for inclusion of environmental concerns | All | 17 th April |
|---|-----|------------------------|

National On-site Regulators Forum (NORF) – management of small domestic installations – Tony Bles

NORF commenced in 2001 and meet on regular basis to exchange ideas and discuss issues surrounding domestic waste water treatment installations. Current chair is NSW Health (rotating chair) and they are intending to meet later this year. Teleconference in 3 months time.

Appendix 3: NORF Terms of Reference.

Have membership from each state but require update for QLD DIP plumbing group.

| | | |
|---|---------|------------------------|
| ACTION Item 3: Update of QLD membership contact to Tony Bles tony.bles@doh.health.nsw.gov.au | QLD DIP | 17 th April |
|---|---------|------------------------|

Areas of overlap between NORF and NRWRF:

NORF role is to try and develop uniformity in the criteria for final water quality and end use of effluent from domestic on-site wastewater treatment systems nationally.

Areas of cross concern:

The use of treated greywater internally moves the issue into recycled water rather than effluent disposal.

An issue is the development of an Australian Standard for the treatment of domestic greywater for internal household use. There have been several attempts over the last few years to progress this. The restructure of Standards Australia and New Zealand's lack of

interest in the area has resulted in it being neglected. The new business model for Standards Australia requires interested parties to develop a project scope for any work and a business plan. Standards Australia will project manage the development of the standard and publish it.

The testing protocols for on-site systems could be set up through Standards Australia to get away from individual testing of systems. Then rely only on the Standards published by Standards Australia.

Suzie Sarkis: To ensure the protection of public health, the risk management framework needs to be overseen by robust governance arrangements (i.e. approval, auditing and evaluation processes). Recognising that the regulatory arrangements in each state are beyond the scope of NRWRF and NORF, these groups should still work together to establish protocols to ensure a consistent approach to validating treatment processes.

David Cuncliffe: Treatment of greywater on site, which is then returned to the house for internal use, is a challenge. NORF has been dealing with single household on-site systems for garden irrigation only. SA applies Australian Guidelines for Water Recycling (AGWR) to greywater reuse; this is different from what NORF normally deals with. Therefore need validation of treatment systems for removal of pathogens and chemicals instead of a just the final water quality testing protocol.

Tony Bles: A draft Australian Standard for public comment has been developed for Greywater Treatment Systems for Vessels Operated on Inland Waters. The draft standard covers treatment for discharge to inland waters. NSW greywater treatment system testing protocol has been used since 2000.

Paul Byleveld: Due to staff reduction, Standards Australia is reducing the number of Standards published. This group needs to take it forward to Standards Australia to convince them of the need for the Greywater Standard.

Alan Humphreys: Claire Gunning from Standards Australia is looking at water initiative funding to see what is available to progress the development of greywater treatment standard.

Suzie Sarkis: Possible option: each department throw money in to get the work done!

The additional support from the NRWRF for a greywater standard would add weight to the argument that Standards Australia help develop a standard for on-site greywater treatment for internal use.

To encourage consistence between the two groups there should be a member of NORF on NRWRF.

There is the potential for crossover between NORF and NRWRF. The use of treated greywater for internal use has moved from disposal to recycling and therefore will result in some areas of mutual concern.

| | | |
|---|------------------------------|--|
| ACTION Item 3: Tony Bles to join NRWRF as NORF representative and keep NORF updated | Tony Bles | ongoing |
| ACTION item 4: Discuss with Standards Australia the development of a development of a standard for on-site greywater treatment systems for internal use | Alan Humphries and Tony Bles | 24 th March 2009 completed |

MORNING TEA

Appendix 4 *NWC Fellowship initial findings – common issues and concerns presentation* (Kaye Power)

Additional points arose:

QLD – The provider of recycled water needs to have agreement with users, therefore the users are unregulated.

WA - Jane Filmer: Recycled water is seen as a resource

VIC – Approve construction & licence of recycled water scheme, but if reusing 100%, no licence requirement (i.e. licence for recharge). Blackwater recycling in Victorian DHS building, because the wastewater is not discharge, it didn't need approval or licence to operate.

SA - Stormwater – unregulated, problem?

Appendix 5 *Guidelines for Validation of Treatment Processes* presentation by Suzie Sarkis

LUNCH

Regulator's activities:

Each state's approach to regulating and approving schemes (related to both size and proponents).

General comment: there was reasonable cooperation from large utilities or organisations for a large scheme, but less cooperation with smaller schemes and those not owned or run by utilities or large organisations. In general the smaller the scheme, the more difficult it is to insist on a high level of validation necessary with the high exposure schemes as outlined in the AGWR.

Application of the AGWR and definition of classes or risk profiles for schemes:

How is the guideline applied to different types of schemes by regulators? Is it schemes specific? Or apply all components to all schemes?

- Vic – Class A – QMRA and full validation as outlined in AGWR. Class B etc rely on on-site control for risk management therefore full validation not required
- WA – dropped classification system as it carries too much baggage. Different classes = different levels of risks
- NSW - avoided classification, use risk profile instead
- SA – trying to drop class system (e.g. old Class B). Terminology change, instead to changes in risk management
- ACT – no classification – AGWR
- NT - no classification – AGWR
- TAS – Class but currently have no Class A schemes so have not had to address the application of the validation requirements of the AGWR
- QLD – Class system embedded in the regulation with additional flexibility based on risk definition of low/high risk scheme varies for each state

On-site systems - how does each state define —~~high~~ risk”?

Size and risk association needs input from health and economic regulator

TOOLS, PROJECTS AND GRANTS

| | |
|---|---|
| <p>Interpretive tools for guidelines – how to implement 12 elements etc</p> | <p>AGWR Joint Steering Committee – community tool being developed</p> <p>WSSA and NWC – two tools within the one project – to provide guidance for proponent of recycled water scheme</p> <p>1. User Manual - Requality AGWR Continuous Improvement Tool which can be can also be used as auditing tool.</p> <p>2. User-friendly Guide – Implementation of the AGWR Health Risk Assessment (Ch3)</p> <p>Including - Exposure assessment and control and Treatment technology and Performance</p> <p>Both of which will be web based tools</p> |
| <p>Scientific research to provide supporting data</p> | <p>VIC DHS Smart Water Grant: microbial validation</p> <p>NWC Fellowship Stuart Khan – chemical validation handbook</p> <p>Old CRCWQT/ Water Quality Research Australia – In vitro testing for determining safety of recycled water quality (3 year project)</p> |
| <p>Funding groups</p> | <p>Water Quality Research Australia</p> <p>NH&MRC partnership grant</p> <p>NWC</p> |
| <p>Sharing of research and validation data</p> | <p>Confidentiality issues. Maybe addressed with selective sharing with forum.</p> |
| <p>Additional</p> | <p>QLD developing new guidelines – 3 year project to come up with new policy and guideline</p> <p>National Plumbing Regulator Forum – research on reduced flows and impact of these</p> |

IMPLEMENTATION OF AGWR

At what point does the need for the validation of the log removal capacity of treatment processes occur versus the ability to rely on default values presented for treatment systems in AGWR and end point control.

General agreement that the AGWR can be applied to all schemes but the amount and type of information required from the proponent is dependent on the exposure risk.

Default cut off for low risk scheme – proponent must meet water quality objectives with appropriate end point controls.

High exposure schemes such as dual reticulation schemes require full application of AGWR including validation of critical treatment processes.

- QLD – small schemes must provide a recycled water quality management plan and some validation, but might not be full suite. Some schemes can apply for exemption if they are simple schemes'. Have found that most schemes are simple'.
- VIC – All class A or high exposure schemes require treatment systems to be fully validated.
- SA – using the AGWR with the information required dependent on the exposure.
- SA DoH is looking at a gradual roll out over time of the AGWR to established schemes.

However, problem lies with retrospectively approving the new guidelines to schemes that have been up and running for some time. Where does the accountability lie? Have these schemes been properly audited?

E.coli as indicator for lower risk schemes – is it scientifically feasible? It is known not to be a reliable indicator for pathogens such as *Cryptosporidium* and *Giardia*.

The ongoing requirement for auditing of the schemes and the resources to do this is an area of concern.

Current fee structures for most regulatory agencies do not cover the real cost of reviewing an application or for ongoing auditing of scheme.

NSW IPART has developed an auditing panel and RABQSA is interested in developing an audit course, which maybe of benefit to others.

As we are all resource-stretched, there needs to create more combined tools to help each other.

Lessons learnt from new legislations (e.g. IPART & QLD).

Problem and knowledge sharing.

| | | |
|--|---------------|------|
| ACTION Item 5: Provide information on audit requirement and program to forum members | Narelle Berry | ASAP |
|--|---------------|------|

The conflict occurring between the health regulations and the sustainability regulations is creating issues.

This is seen with the need for a supplier of last resort and resource limitations. The use of alternative water sources to increase the amount of development occurring in an area needs

to include the assessment of the ability to supply critical needs when the greywater treatment plant or the recycled water plant fails. When this occurs an alternative water source will need to be found to ensure public health, e.g. ensure toilet flushing and cleaning can occur. This is often overlooked with larger sustainability assessment and planning.

Definition of a critical water supply – what goes back to the building i.e. toilet flushing is critical, anything else, not critical (e.g. garden and lawn watering)?

VALIDATION

How should validation of treatment process be carried out?

Collation of information from each state on how each state is assessing validation.

| | | |
|---|---|------------------------|
| ACTION Item 7: Inclusion of validation assessment for each state in NWC Fellowship report | All to complete spread sheet and return to KP | 17 th April |
|---|---|------------------------|

How to determine if a treatment system is validated?

Ideally on a national Level but how and who?

Possibilities

- 1) National Technical body for validation process
- 2) Not necessarily Standards Australia.
- 3) Use of people within this forum forming sub-group discussing treatment validations.
- 4) Build on Technical body for validation process?
- 5) Build on Victorian DHS and Smart Water Fund (draft Validation Guidelines of Treatment processes) (principals)
- 6) Availability of published list of accepted validated systems.

Step 1 – Review DHS/Smart Water Fund draft Validation Guidelines of Treatment processes (anticipate consultation draft end of June)

Step 2 – How much more do we need – gap analysis, research and funding

Step 3 – Develop or review a national process for implementation of AGWR

Step 4 – Determine Industry capacity for validating treatment systems
3rd party validation or qualified 3rd party auditing

Step 5 - What sort of industry do we wish to create?

| | | |
|---|-----------|---------------------------------------|
| ACTION Item 8: Review of VIC DHS/Smart Water Fund - draft Validation Guidelines for Treatment processes | Suzie/All | Once draft completed (end of June 09) |
| ACTION Item 9: Gap analysis for treatment systems to be covered and research needs required | All | Before next meeting |

Suggested alternative models

- JASANZ guideline product validation – process is in place already, may be able adapt to Recycled water
- Elevators
- Electrical

| | | |
|---|------------|----------|
| ACTION Item 10: Discussion with members of NRWRF of model for national validation scheme. Stage 2 of NWC Fellowship report. | Kaye Power | Ongoing |
| ACTION Item 11: Apply to NWC for funding for secretariat support for group. | NSW Health | May 2009 |

Next meeting:

6mthly face-to-face meeting

Option - around the 7th IWA Congress on Water Reclamation and Reuse 20-25th September 2009 www.reuse09.org Brisbane

QLD to organise the meeting

Teleconference as need rises.

Appendix 1: Attendees

| NAME | ORGANISATION |
|---------------------|--|
| Adrian Farrant | ACT Health |
| Peter Donnelly | ACT Department of the Environment, Climate Change, Energy and Water |
| Greg Jackson | QLD Health |
| Scott Prenzler | QLD NRW (now DERM) |
| Ona Rae | QLD Department of Infrastructure and Planning |
| Samantha Roberts | QLD Department of Infrastructure and Planning |
| Richard Theobald | WA Health Department |
| Jane Filmer | WA DEC |
| Suzie Sarkis | Vic DHS |
| Stephen Lansdell | Vic EPA |
| Alan Humphreys | Tasmania Department of Justice - member of NORF Tasmania Department of Environment, Parks, Heritage and Arts |
| Stephen Gallagher | SA Health |
| David Cunliffe | SA Health |
| Nina Allen | NT Health |
| Peter Rogers | NWC |
| Paul Smith | Department of the Environment, Water, Heritage and the Arts |
| Charles Edlington | Department of the Environment, Water, Heritage and the Arts |
| Terry Korodaj | NSW Health – Chair |
| Kaye Power | NSW Health – member of NORF |
| Tony Bles | NSW Health |
| Hopi Yip Richardson | NSW Health |
| Nanda Altavilla | NSW Health |
| Paul Byleveld | NSW Health |
| Robert Hogan | NSW DECC |
| Jenny Bailey | NSW DECC |
| Narelle Berry | IPART NSW |
| Gary Drysdale | IPART NSW |
| Leonie Huxedurp | NSW Department of Water and Energy |
| Gary Hamer | NSW Department of Water and Energy |
| <i>Apologies</i> | |
| Vaughan Macdonald | NSW Department of Local Government |
| Anita Packwood | QLD NRW (now DERM) |
| Leon English | WA Department of Water |
| Scott Burton | Tasmanian Department of Health |

Appendix 2: Presentation of background to the NRWRF and terms of reference (TOR)

History NRWRF

- The original idea promoted in late 2007
- Paper sent to EnHealth 7 Feb 2008 seeking support and nominations from Jurisdictional Environmental Health Group (JEHG) members for jurisdictional representatives
- Paper went to the Environment Protection and Heritage Council 17 April 2008 and accepted:
 - ...Not that the expert group established to provide advice on whether or not the uptake of water recycling has been impeded by any lack of product standards was of the view that:
 - a lack of product standards is not considered to have significantly impeded the uptake of water recycling
 - further work on improving the approval and verification process across the states and territories to facilitate streamlined nationwide approval of water recycling equipment and systems could usefully be undertaken.
 - Note that a National Recycled Water Regulators' Forum is being established to progress these and other issues....”
- NWC Fellowship project
- VIC DHS Smart Water Grant : Victorian Water Recycling Scheme Treatment Validation Guideline
- Face-to-face meeting

Terms of Reference of NRWRF

- To encourage the consistent application of the *Australian Guidelines for Water Recycling* to recycled water schemes, by:
 - Ensuring consistency in the implementation of the risk assessment approach.
 - Ensuring consistency in validation and verification requirements between states and territories.
 - Supporting mutual recognition of validation and verification processes for recycled water schemes, where appropriate, between states and territories.
 - Identifying tools, which will assist the consistent implementation of the guidelines.
- To improve communication processes between state/territory regulatory agencies regarding health-related regulatory requirements for approval of recycled water schemes.
- To facilitate an on-going national regulators dialogue on recycled water issues as appropriate from time to time, including email discussion group, conferences and workshops.
- To keep the Environment Protection and Heritage Standing Committee informed on relevant national policy issues.
- To provide a forum for officers of state/territory government agencies to
 - discuss the development, implementation and evaluation of strategies to ensure that recycling schemes protect public health.
 - discuss new and emerging issues relating to recycled water treatment and use.

Appendix 3: National On-site Regulators Forum (NORF)

A forum for state and territory agency officers working for safe and sustainable decentralised wastewater management throughout Australia

(formed 27 September 2001)

TERMS OF REFERENCE

- 1) To provide a Forum for officers of state/territory government agencies to:
 - a) exchange ideas and information on administrative arrangements for on-site wastewater management and regulation within jurisdictions,
 - b) discuss the development, evaluation and implementation of strategies and standards for on-site and decentralised sewage management,
 - c) discuss education and training requirements and competency standards for design, installation, maintenance and operation of on-site and decentralised sewage management systems.
- 2) To support mutual recognition of standards, qualifications, testing and administrative procedures relating to the safe and sustainable use of on-site and decentralized sewage management systems.
- 3) To facilitate integrated consideration of local, state and national issues in research and development of guidelines and technical notes relating to the safe and sustainable use of decentralized sewage management systems.
- 4) To improve communication on on-site wastewater management issues and needs between the States and Territories and to act as a "channel" for concerns to be raised with other appropriate forums and organizations.
- 5) To facilitate information sharing and mutual awareness of other jurisdictions' arrangements for on-site wastewater management.
- 6) To promote public education and an "on-site management awareness culture" within communities using on-site wastewater management.
- 7) To facilitate an on-going national regulators' dialogue on on-site sewage management issues as appropriate from time to time, including through e-mail discussion lists, conferences and workshops.

Appendix 4: NWC Fellowship Presentation

NWC Fellowship

- The aim of Stage 1 of the project is to detail the process being adopted by each state and territory for the validation of recycled water treatment processes.
 - Regulations and guidelines national and international.
- The aim of Stage 2 of the project will be to build consistency in the approach to validation across jurisdictions.
 - Investigation of the feasibility of a national approach to the validation of recycled water treatment systems.
 - Establishment of a technical review group to assess the validation of new and established technologies.

Recycled Water Regulations and The Australian Guidelines

- Visit people within each state and territory to discuss
 - Status of recycling in their area
 - Current regulations and guidelines
 - Process of adoption of the Australian Guidelines for Water Recycling (2006) – in particular the treatment validation Requirements
 - Specific issues they were having with water recycling schemes particularly in relation to validation of treatment processes

On-site – Single Household

| State | Installation | Accreditation of Treatment System |
|-------|---------------------------------|--|
| NSW | Local council | NSW Health |
| VIC | Local council | EPA approved system |
| ACT | ACT Planning and Land Authority | ACT Health for activity licence –no accreditation process |
| SA | Local government | Department of Health |
| TAS | Municipal council | Minister for Justice and Workplace Relations |
| WA | Local government | Executive Director, Public Health |
| QLD | Local council | Chief Executive of the Dept of Infrastructure and Planning |

Larger Scheme

STATE APPROVAL AUTHORITY

TAS

- Approval from the Director, EPA – Wastewater treatment plant licence
- Wastewater Re-use Coordinating Committee
- Municipal council for schemes not requiring a licence

WA

- DEC – approval for discharge with referral to Department of Health if water recycling a component
- DoH – capacity to add conditions to DEC approval
- Department of Natural Resources and Water for recycled water quality management plan
- EPA Development approval

QLD

- Environment Protection Agency – approval or licence
- Department of Human Services – endorsement for Class A schemes

VIC

- Environment Protection Authority – approval and licence for scheme
- ACT Health – reactive powers in relation to PH risk

ACT

- Department of Health – approval for Class A schemes
- Environment Protection Agency – licence to discharge required for some larger schemes

SA

- Department of Health – approval for Class A schemes
- Environmental Protection Agency – licence to discharge required for some larger schemes

NSW

- Sydney Water Corporation and Hunter Water Corporation
 - NSW Health, DECC, DWE and DPI approval
- Local Government scheme
 - DWE construction and running of scheme
 - DECC license to discharge
 - NSW Health advisory
- Private Sector Scheme
 - IPART licence application and assessment
 - NSW Health comments and potential conditions approval
 - DWE final licence approval

Guidelines

- States have developed guidelines, some are based around the AGWR
- Direct adoption or reference to AGWR
 - VIC
 - NSW
 - SA

Issues – General

- Dual reticulation schemes where the water utility is not the proponent. Risk is of cross-connections with potable water. This is especially relevant in areas where there are different regulators involved.
- Long-term survival and financial viability of proponents running small centralised schemes. Long-term management plans.
- Public health consequences or implications with the changing exposure between on-site systems and larger community schemes.
- Resources
 - Increase in scheme numbers and need for review on case by-case basis
 - Burden of expertise on council and other approval bodies
 - Ongoing monitoring and auditing of schemes
- Orphaned schemes
- Cross connection
 - Risk from private schemes to utilities
 - Cross connection checking burden

Issues –Guidelines and Validation

- Need for mutual recognition of process testing by other states and proponent in other states.
- There is a range in log removal capabilities of each treatment process given in the guidelines. Low- verses mid-point, which will have an impact on the treatment modules required.
- Absence of any information on the process for validating some established treatment technologies such as membrane bioreactors.
- Technologies being at a disadvantage when compared to technologies where a validation procedure exists.

Questions

- How can we make the validation component of the AGWR more accessible for proponents and regulators?
- How can we use the work already done by other proponents and regulators?
- How can the AGWR be applied to smaller systems such that they are easier to implement for proponents?

Potential Validation Program – Smaller Systems

- Setting up an accreditation of ‘off the shelf’ products using the AGWR framework rather than the current accreditation process that is in place for on-site systems.
- Reducing validation requirements in line with the risk of the schemes as set out in the QLD points system.

Potential Validation Program – Larger Systems

- Recognise any validation procedure undertaken by a reputable laboratory.
- Recognition of established accreditation guidelines
 - Membrane – US membrane guidance.
 - UV – US EPA Guidelines, National Water Research Institute, German UV
- Centralised agreement of validation processes and centralisation of information.
- At a minimum, principles of what is accepted.

What’s Next?

- Investigation of the feasibility of a national approach to the validation of recycled water treatment systems.
- Establishment of a technical review group to assess the validation of new and established technologies.
- The aim will be to build consistency in the approach to validation across jurisdictions.