Australian Water Recycling
Centre of Excellence

Project Report

National Validation Framework for Water Treatment Technologies—Business Case

A report of a study funded by the
Australian Water Recycling Centre of Excellence

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National Validation Framework for Water Treatment Technologies—Business Case

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About the Australian Water Recycling Centre of Excellence

The mission of the Australian Water Recycling Centre of Excellence is to enhance management and use of water recycling through industry partnerships, build capacity and capability within the recycled water industry, and promote water recycling as a socially, environmentally and economically sustainable option for future water security.

The Australian Government has provided $20 million to the Centre through its National Urban Water and Desalination Plan to support applied research and development projects which meet water recycling challenges for Australia's irrigation, urban development, food processing, heavy industry and water utility sectors. This funding has levered an additional $40 million investment from more than 80 private and public organisations, in Australia and overseas.

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NATIONAL VALIDATION FRAMEWORK FOR WATER TREATMENT TECHNOLOGIES

Business Case

A report prepared for the Australian Water Recycling Centre of Excellence

December 2012

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Abbreviations

Abbreviation	Full name
ADWG	Australian Drinking Water Guidelines
AGWR	Australian Guidelines for Water Recycling
NWQMS	National Water Quality Management Strategy
COAG	Council of Australian Governments
CRC	Cooperative Research Centre
IWCM	Integrated water cycle management
NHMRC	National Health and Medical Research Council
DSEWPaC	Department of Sustainability Environment Water Population and Communities
NWI	National Water Initiative
IPR	Indirect potable reuse
DPR	Direct potable reuse
JAS-ANZ	Joint Accreditation System of Australia & New Zealand
NATA	National Association of Testing Authorities

Glossary

Term	Definition
Technologies	Technologies and/or unit processes used to treat water in water recycling or other water treatment systems

Executive summary

Validation of water treatment technology is necessary if a range of important public health, water management and environmental outcomes are to be delivered. Advances in water treatment technology and processes over the past century have helped to ensure public health and safety, and the quality of our environment. However, rapidly evolving technology and demand for new and alternative sources of water have challenged the ability of regulatory systems to keep pace. This includes processes for validating water treatment technologies, which are currently inefficient and create difficulties in addressing water security and environmental challenges.

Drivers, investment and challenges

Contemporary challenges such as climatic variability, climate change, severe and prolonged drought, and rapid population growth have contributed to the need for new and less climate dependent sources of water supply. This has focused much policy and investment effort on new and alternative sources such as water recycling.

The water sector across Australia has invested heavily in recycling schemes. These schemes harness new and innovative technologies to treat hazards present in alternative water sources such as wastewater, stormwater and grey-water. A key element of managing risks associated with these sources is to ensure the performance claims of water treatment technologies. This is achieved through the process of validation.

Validation substantiates a technology (or process') ability to control hazards. It involves scientific testing of technologies before they are installed, and crediting their level of performance. Validation provides assurance that technologies can sufficiently protect public health and the environment, and regulation plays a critical role in providing this assurance. However, regulation needs to be efficient so it does not suppress development of technologies that help Australia meet its water management objectives.

The Australian Water Recycling Centre of Excellence (the Centre) has been tasked with addressing a range of challenges and opportunities associated with water recycling through targeted investment and research. This includes improving how water treatment technologies are validated in Australia.

Need for the Framework

General problems with the current validation arrangements that create more specific problems for stakeholders include:

- The absence of guidelines, protocols or minimum standards for the conduct of validations in Australia
- Inconsistencies in the approach to validation between jurisdictions
- The absence of default performance credits for the same type or similar groups of technologies
- The lack of consistent or transparent process for recognising validations undertaken interstate or overseas

- Insufficient information or sharing of information in relation to validation.

The current arrangements create confusion and uncertainty, and are duplicative and inefficient. As a result, governments, regulators, and scheme and technology proponents are all paying higher than necessary costs and enduring longer than necessary timeframes to validate technologies, leading to sub optimal public health, water management, environmental and economic outcomes for the Australian community.

Regulators and governments are spending greater than necessary public resources on validation, detracting from their ability to meet the needs of competing public policy issues. The lack of coordination and consolidated effort means knowledge and capacity is spread too thinly and has contributed to inconsistent requirements faced by industry.

Consultations have confirmed that the current arrangements create unnecessary red tape and regulatory burden, which reduces innovation and competition and hampers efforts to improve productivity. The current arrangements also reduce market participation and willingness to invest, and reduce government and community confidence. All of these factors contribute to water security, environmental, and amenity benefits being foregone and mean that Australia fails to benefit from a broader range of technologies or maximise the potential for economic benefits associated with domestic technology development.

A national validation framework (the Framework) will help address inefficiencies in current approaches to validation. The Framework presents a simple way to achieve important outcomes more efficiently and effectively. It gives all stakeholders increased confidence and assurance that technologies will perform as required; removes duplication of effort and reduces costs for government and industry, and provides a 'one-stop-shop' of validated technologies for use by regulators and proponents. Importantly, the Framework achieves this without encroaching on State government prerogatives and responsibilities.

The Framework

The Framework includes a number of new entities at the national level as well as existing entities that deliver new or modified functions. Its key elements include:

- A **Rule Setting Group** made up of state and territory regulator and industry representatives whose role is to determine and publish national validation requirements for treatment technologies. The Rule Setting Group will provide consistency and certainty in validation requirements.
- **Independent Assessors** who review validation studies and testing undertaken by proponents. Independent Assessors provide scientific rigour and assurance that validation has been undertaken in accordance with requirements.
- A **Framework Administrator** that provides governance and administrative support for the Framework, including the Rule Setting Group, Certification Body and Database Manager.
- A **certification step** where the Framework Administrator and proponent are notified by independent assessors that a technology has been validated in accordance with national requirements.

- A National **Database of Validated Technology** maintained by the Framework Administrator, that holds information on validated technologies for use by regulators and scheme and technology proponents. It provides a 'one-stop-shop' for validated technologies.

The following table compares the current process for validation with the process proposed under the Framework.

Table ES 1. Comparison of current process and process under the Framework

Step	Current process	Process under the Framework
Develop technologies	Technology or scheme proponents develop	Same process
Undertake validation testing/studies	Technology or scheme proponents undertake or outsource, but without consistent guidance, and potentially multiple times with variations to meet different regulatory requirements	Proponents continue to undertake or outsource, but under nationally agreed protocols and only once
Submit for approval	Potentially different studies submitted to different state or territory based regulators	Studies submitted once to the Framework administrator only
Confirm validation	Validation may or may not be confirmed independently of overall scheme approval, and validation is approved separately by each jurisdiction	Validations is confirmed once nationally by the Framework administrator, technology goes on database
Design scheme or system	Designed by proponents	Still designed by proponent, but designers draw on pre-validated technologies
Install technology	Proponent undertakes installation. Jurisdiction approves scheme as a whole.	Jurisdictions still approve scheme as a whole, but refer to national database to confirm validated technologies used in the scheme
Verify scheme or system	Jurisdictions and proponents undertake once installed	Same process

Source: Aither

Support for the Framework

Consultations undertaken for this business case indicate that the Framework concept has widespread support across government, regulatory, utility and technology stakeholders.

A broad range of water sector stakeholders, including state, territory and local government agencies, utilities and manufacturers have indicated support for the Framework in recognition of the benefits from pooling knowledge; having greater confidence in technology and the achievement of public health outcomes; removing the need to manage validation processes and proponents; reductions in costs, timeframes and over engineering; and from freeing up resources in a challenging budgetary environment. States are also supportive because the

Framework contributes to their objectives for removing red tape while allowing them to continue to grant or withhold approval of recycled water schemes and treatment systems within their jurisdictions.

Scheme and technology proponents including water utilities and technology providers support the Framework because it provides them with clarity and consistency in regulatory requirements; reduces their costs and approval times; makes it easier to design and implement schemes; provides certainty for investment, and contributes to improved economic viability of a wider range of recycling and treatment options.

The benefits of the Framework concept have also been recognised by Australian Government agencies because it supports Australian Government objectives to reduce regulatory burden and contributes to COAG's seamless national economy agenda. It also supports over $650m of Australian Government investment in stormwater recycling and improves implementation of the Australian Government's Australian Guidelines for Water Recycling. The Framework also increases the potential for competition, innovation and economic activity, and interstate trade; reduces the need for subsidisation of recycling infrastructure, and improves conditions for local investment and attracting more technologies to Australia.

Quantified benefits of the Framework

The widespread support among stakeholders is underpinned by the cost-benefit analysis of the Framework undertaken by The Centre for International Economics. Based on an initial scope that includes wastewater recycling for particular end uses, implementation is expected to deliver a net benefit of between $11m and $84m[1], depending on the capacity of future schemes. Undertaking validation at the national level is expected to deliver a net benefit to regulators of $2.28m[1] . Scheme and technology proponents (developers, water utilities, and manufacturers) are expected to benefit from reduced costs through removal of duplication and through nationally consistent requirements, which will result in net benefits of $0.97m[1].

The pooling of knowledge at the national level is expected to improve the accuracy of technology performance assessment, leading to lower capital and operating costs of treatment technology and reduced costs of recycled water schemes. For example, in Victoria, capital cost savings of between $32,000 for small schemes and $180,000 for large schemes, and operating cost savings of between $5,000 and $55,000, are expected to be possible under the Framework. These types of savings are expected to be more modest in other jurisdictions due to differences in current validation approaches.

Expanding the scope of the Framework

Discussions with stakeholders indicated support for the quantitative analysis, including its assumptions and results, but stakeholders suggested the results were unduly conservative due to the narrow scope considered[2]. Consultation revealed universal support for the widening of scope to include stormwater, grey-water, groundwater, and decentralised recycling systems in the Framework.

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[1] In Net present value terms over a 30 year time horizon

[2] The headline results focused on high exposure waste water recycling

These areas are identified by jurisdictions as being where current and future growth and investment is occurring and where the greatest regulatory challenge lies. As a result these were suggested as being areas where the Framework would add significant value. Further benefits may be possible from including these areas within scope, and potentially also from future expansion to all forms of recycling and water treatment (such as industrial reuse and potable supply).

Broadening the scope of the Framework is primarily limited by the Rule Setting Group's capacity to agree and publish validation requirements for different types of water treatment technologies, and the resourcing required to administer the Framework under an expanded scope. It has been recommended that the Rule Setting Group give immediate consideration to the priorities for protocol development, including stormwater, grey-water, groundwater and decentralised systems.

Implementation

The approach to implementing the Framework agreed through consultation is flexible and scalable and can be tailored to accommodate changes in scope and fluctuations in demand for validation.

The approach includes delivery of the framework administration, certification, and database functions through an existing Australian Government agency, and delivery of the Rule Setting Group through in-kind contributions of participants. The quantitative analysis suggested, and consultations confirmed an ongoing minimum commitment of approximately 1.5 full time equivalent staff would be required at the outset to deliver administrative functions, and consultations confirmed the Rule Setting Group could be resourced in-kind by participants.

It has been recommended that the Framework Administrator be established in advance to manage implementation of different aspects of the Framework before it becomes operational, including terms of reference and governance for the Rule Setting Group, operation of the certification process, and establishment of the database. These and other matters, including development of a cost-sharing or cost-recovery model, are recommended to be addressed through development of a detailed implementation plan.

Next steps

There is widespread support among state and federal government stakeholders consulted, for the further development and implementation of the Framework, along with backing from the regulatory, utility, private enterprise and research sectors.

Their interest is now in obtaining further detail on implementation, including a more detailed implementation plan, development of options for cost-sharing or cost-recovery, and business and marketing plans.

As a result, the Centre should now seek formal endorsement of the Framework concept and next steps under the Council of Australia Governments process. The Senior Officials Committee and Water Thematic Oversight Group under COAG is the appropriate pathway for approval, and it is recommended that, through the Australian Government Department of Sustainability Environment Water Population and Communities, the Centre:

- Seek in-principle support for implementation of the Framework from the Water Thematic Oversight Group (WTOG) and/or its water quality sub-group, subject to development of a detailed implementation plan.
- Seek WTOG endorsement of the Centre's implementation plan for the Framework, including indicating endorsement of a preferred model for cost-sharing or cost-recovery.

1 Introduction

1.1 About this project

In support of a more efficient and effective urban water sector, the Australian Water Recycling Centre of Excellence (the Centre) has invested in the development of a national validation framework for water treatment technologies (the Framework) and is now undertaking further work to enable its adoption.

The Framework supports the objective of providing secure, safe, healthy and reliable water-related services in an economically efficient and sustainable manner. It does this by reducing regulatory burdens and stimulating competition and innovation through improvements to the process of validating water treatment technologies.

Validation of water treatment technologies involves the use of scientific evidence to substantiate how effectively the technologies or processes used to treat water can control hazards. Validation is used to help ensure that potential risks to human and environmental health are effectively managed, and is often required for treatment technologies used in water recycling.

The process for developing the Centre's research and investment priorities revealed inconsistencies and inefficiencies in the way water treatment technologies are currently validated across Australia. Further consultation by the Centre with the regulatory, scientific, and industry sectors reinforced the existence of these problems.

The Framework aims to address these problems by providing a coordinated and nationally consistent process for validating the performance of water recycling technologies. It provides an opportunity to reduce duplication of effort for both regulators and industry, reduce the regulatory burden on industry, promote innovation and competition, and drive faster approvals for and lower costs of technology development and water recycling scheme implementation. These improvements will contribute to the urban water sector achieving important water security and environmental sustainability objectives.

While the draft Framework has been developed in the context of wastewater recycling projects it is sufficiently flexible to also validate technologies used in a much wider variety of water treatment systems. It could provide important benefits if applied to emerging technologies used in areas such as grey-water and stormwater recycling, and could also readily be applied to industrial and potable reuse and drinking water treatment systems.

Phase 1 of the Centre's national validation framework project produced a draft framework[3]. Phase 2 of the project is working towards adoption of the Framework in two parts, first (Phase 2.1) by confirming the need for it and assessing its feasibility through an independent cost-benefit analysis (See Appendix B) and this Business Case, and secondly (Phase 2.2) the progression of priority research activities identified in Phase 1.

This Business Case makes the case for implementation of the Framework nationally. It does this by:

- describing current validation arrangements and their deficiencies
- reviewing the concept and elements of the Framework developed in Phase 1

[3] Contained in the NatVal Road Map Report, Muston and Halliwell 2011 – See Appendix A

- documenting stakeholder feedback on the Phase 1 concept and making modifications in light of input
- establishing options for implementation of the Framework
- documenting the costs and benefits of the Framework and different implementation options
- indicating a preferred option and making a case for its implementation, and
- outlining pathways for implementation of the preferred option.

1.2 The Australian Water Recycling Centre of Excellence

The Australian Water Recycling Centre of Excellence was established in December 2009 following a $20 million grant from the Australian Government's *Water for the Future* initiative. The Centre is a not for profit company limited by guarantee and is governed by a Board of Directors.

The Centre's mission is to enhance the management and use of water recycling through industry and research partnerships, to build capacity and competency within the recycled water industry, and to promote water recycling as a socially, environmentally and economically sustainable option for future water security. It invests in industry-relevant research projects across all aspects of water recycling and these investments are guided by its Research Advisory Committee and its Strategic Research Plan, which is based around four goals:

1. Demonstrating the social, economic, and environmental value of water recycling.
2. Establishing a National Validation Framework for water recycling.
3. Demonstrating and communicating that reclaimed water is acceptable 'alternative water' for augmenting drinking water supplies.
4. Establishing a national knowledge, training and education program for water recycling.

This Business Case contributes to the second of the Centre's strategic goals: to establish a national validation framework for water recycling. This goal was informed by responses to discussion papers released by the Centre soon after it was established. Responses to the Centre's discussion paper on risk management and validation suggested improved processes for technology validation was an important need and indicated there was industry demand for a validation framework to ensure compliance with the Australian Guidelines for Water Recycling.

1.3 The project team and participants

The Centre engaged Aither to develop this Business Case and The Centre for International Economics (The CIE) to develop the cost-benefit analysis. Development of both reports was guided by a project steering committee established by the Centre, which included regulator, utility and private sector representatives.

The business case and cost-benefit analysis were also informed by consultation and engagement with a range of stakeholders involved in water recycling, public health and water management. The outcomes of consultation are reflected throughout the report, including confirmation of the problems with current arrangements (Section 2.4), confirmation of the

Framework concept (Section 3.8) consideration of options (Section 4.2) and implementation approaches (Section 5).

The steering committee membership and a full list of stakeholders consulted are provided at Appendix C.

1.4 Structure of this Business Case

The remainder of this Business Case is structured as follows:

- **Current situation and assessment of need for reform**: provides background and context for water recycling policy and regulation and documents current validation arrangements and their deficiencies
- **Overview of proposed solution:** outlines the Framework including its key elements and benefits, and compares it with current arrangements
- **Analysis of Framework options:** assesses the options, outlines the results of stakeholder consultation, discusses further qualitative benefits of implementing the Framework, and recommends a preferred option for implementation
- **Implementation strategy:** describes the possible institutional arrangements for implementation, identifies and discusses risks, and outlines possible resourcing arrangements, timing, and next steps

2 Current situation and assessment of need

2.1 Project and policy context

2.1.1 The urban water sector

The urban water sector provides water, wastewater, recycled water and stormwater-related services to cities, towns, and communities across Australia. Participants in the urban water sector are involved in policy, regulation, and service delivery, and include governments, regulators and water service providers. The sector is increasingly involved in integrated urban water cycle management such as stormwater and drainage management, harvesting and use and is increasingly contributing to broader sustainability and liveability outcomes through urban planning and water-sensitive urban design (NWC, 2011).

While the sector generally supplies high quality services this has not been achieved without significant reforms, and a number of recent reviews have suggested further reforms are required. The National Water Commission (2011) suggests the most pressing challenges facing the sector are:

- securing supply efficiently in the context of significant uncertainty about inflows to catchments and continuing growth in urban population
- meeting customer and community expectations in an effective and efficient manner
- maintaining effective wastewater services and maximising opportunities for efficient integrated water management (IWM) solutions without compromising public health and the environment.

It also identified a challenge specifically relevant to this project:

- *Continuing to protect public health in the context of increased recycling*: managing the actual and perceived risks of greater interconnection between the water, wastewater and stormwater sides of the urban water sector and managing community concerns about the use of recycled water for drinking purposes.

The Commission's review suggested that current regulation of water quality, public health and environmental outcomes is not cost-effective and creates barriers to integrated water management. The Productivity Commission's 2011 review (Productivity Commission 2011), also recommended institutional and regulatory reform in the sector, and its 2011 report on urban water quality regulation in Australia suggested that future reform effort should "focus on creating new cross-jurisdictional arrangements that facilitate more consistent, coordinated and timely regulation" (PwC 2011).

In addition, a 2010 report on recycled water use in Australia (Power 2010) identified a range of inconsistencies and other problems in the way water recycling treatment technologies are validated across Australia. The report recommended a national approach to the validation of treatment processes to address these problems.

2.1.2 Water treatment and recycling

Australia has high standards for water treatment and generally provides safe and very high quality drinking water. High quality water and wastewater service provision has contributed to the achievement of a range of public health and environmental outcomes. Concerns over the environmental sustainability of wastewater disposal drove increasingly comprehensive standards for effluent treatment in the late 1980's and early 1990's which contributed to early development of wastewater recycling.

Environmental sustainability continues to be a major driver of water recycling, along with the more recent imperative to secure sufficient water supplies against a background of drought, population growth and climate change. Water recycling is also increasingly important as a contributor to urban amenity, liveability and contemporary urban design objectives.

However, water recycling adds complexity in treatment and distribution systems and can present new or increased risks to public and environmental health. It is important to manage these risks effectively, and in a way that doesn't prevent water recycling from contributing to water security, sustainability and amenity outcomes.

Water recycling is now common in most centralised wastewater treatment plants. Over 19% of major urban utilities' wastewater was recycled in 2010-11, supplying recycled water to agricultural and non-potable urban and industrial end uses[4]. Decentralised recycling schemes are a new focus of attention, and investment is increasingly focusing on localised stormwater and grey-water recycling and managed aquifer recharge opportunities.

2.1.3 Institutional and regulatory arrangements

While it doesn't directly manage water resources or public health, the Australian Government helps to improve consistency through coordination and development of national guidelines, and is also a major investor in water and public health related activities such as research and infrastructure. The Australian Government has for many years played a leading role in setting the reform agenda for urban water.

State and territory governments manage public health and water related policy, legislation and regulation, which includes drinking water treatment and recycled water schemes. Several different state agencies or regulators can be involved in approving recycled water schemes, but validation and accreditation of water treatment technologies is usually run by a public health regulator.

For larger recycled water schemes a state based regulator is usually responsible for approvals, with other agencies providing advice. For smaller on-site recycling schemes, local government may be the approving agency. Local government approval of development applications by may also be required for recycled water schemes, and local government may act as a scheme proponent as well as being involved in validation of treatment technologies as a scheme project partner. In New South Wales and Queensland regional areas local governments own and operate water utilities so have greater involvement than in other areas.

Public and private water and wastewater utilities are usually the proponents of water treatment systems and recycling schemes, and are often involved in compiling and submitting applications for validation of technologies and overall schemes. Technology manufacturers

[4] Aither analysis based on National Water Commission National Performance Report dataset.

develop individual treatment technologies, and are usually responsible for providing the data to validate the performance of their own technologies.

Validation testing or studies on the same or similar technologies may have to take place in multiple jurisdictions before system design can be completed or approvals can be granted.

2.1.4 Trends in policy, regulation and investment

Water sensitive and liveable cities, water recycling and stormwater

The impacts of drought have been a major focus of urban water policy over the last decade, with major investments in water recycling and supply augmentation. Governments have made substantial investments to develop recycled water schemes to address these water security concerns as well as contribute other environmental and benefits, such as urban amenity and quality of life.

Urban amenity and recycling are key components of the water sensitive cities agenda, which continues to be a focus of policy development, research and investment. The recent round of Cooperative Research Centre grants awarded $30 million to the CRC for Water Sensitive Cities, which is focused on urban water management solutions that make Australian towns and cities more water sensitive. The CRC will be working on a range of urban water solutions, such as recycled water and stormwater that contribute to liveability, productivity and sustainability[5].

The Australian Government has committed to stormwater harvesting and recycling through its National Urban Water and Desalination Plan which provides funding for urban water infrastructure and research that contributes water security. To date approximately $650m has been invested in over 50 stormwater harvesting and reuse projects across Australia[6].

The New South Wales Government implemented the Building Sustainability Index (BASIX), in 2004 to reduce drinking water and energy use in new residential buildings. BASIX requirements have contributed to the implementation of third pipe recycled water projects, as well as decentralised water recycling, grey-water and stormwater options.

The Victorian Government has made commitments to liveable cities through its *Living Melbourne, Living Victoria - Plan for Water* which commits to establishing Victoria as a world leader in liveable cities and integrated water cycle management, including driving projects and developments that use stormwater and recycled water to provide major augmentation[7].

Regulation

An ongoing feature of national policy debate is the appropriate level and type of regulation. This theme is currently in particular focus at the national level, with many governments committing to reduce regulatory 'red tape' burdens on business.

At the federal level, the Australian Government has committed to targeting bureaucratic processes that interfere with business operations, and has suggested that less red tape and better regulatory frameworks are needed to make Australia one of the world's top five places for doing business by 2025. The Government has suggested that well designed regulation is

[5] https://www.crc.gov.au/HTMLDocuments/Documents/PDF/Factsheet%20-%20SR14.pdf

[6] http://www.environment.gov.au/water/policy-programs/urban-water-desalination/projects-table.html

[7] http://www.water.vic.gov.au/initiatives/livingvictoria

required to allow businesses to be flexible and innovative[8]. The Opposition has expressed its support for the removal of red tape, suggesting that doing so would be a top priority of a Coalition government[9].

State governments are also looking at improvements to regulation. For example the Queensland Government is implementing a regulatory simplification plan including reduced legislation and streamlined administrative and procurement processes. The aim is to give time and money back to business, the community and government to invest in pursuits that promote productivity, facilitate innovation and increase competitiveness[10]. The Victorian Government has committed to cutting bureaucratic regulation by 25 per cent by 2014 by streamlining compliance, legislation and other rules crimping business[11]. A recent report on efforts to improve regulation in South Australia suggested red tape had been cut by $320 million a year, with efforts continuing to achieve further improvements[12]. In New South Wales, an office in the Department of Premier and Cabinet delivers the government's reform agenda to reduce regulatory burden and cut red tape[13].

One of COAG's major current reform agendas is the pursuit of a seamless national economy to improve the environment for businesses operation and to enhance productivity in the national economy[14]. COAG has agreed that all governments will maximise the efficiency of new and amended regulation and avoid unnecessary compliance costs and restrictions on competition. COAG has also agreed to deliver more consistent regulation across jurisdictions and address unnecessary or poorly designed regulation[15], and recently agreed to address priority areas that lower costs for business, and address duplication of environmental assessment and approval processes[16].

Infrastructure

Infrastructure issues occupy much public policy discourse and are an area of focus for the Australian and state governments. The Australian Government has established Infrastructure Australia to advise it on infrastructure issues, including water, and invest in priority state and territory regional infrastructure projects through the Regional Infrastructure Fund[17]. Infrastructure Australia has suggested that security of water supplies is an urgent and

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[8] http://www.psnews.com.au/Page_psn337f5.html?utm_source=psn337f&utm_medium=email&utm_content=news5&utm_campaign=newsletter_friday

[9] http://www.businessspectator.com.au/bs.nsf/Article/Abbott-pledges-to-make-cutting-red-tape-a-priority-pd20121101-ZMQWU?OpenDocument&src=hp9

[10] http://www.getinvolved.qld.gov.au/regulation/simplification-plans.html

[11] http://www.theaustralian.com.au/national-affairs/state-politics/major-crackdown-by-baillieu-government-on-red-tape-to-help-business/story-e6frgczx-1226288841680

[12] http://www.adelaidenow.com.au/business/sa-business-journal/red-tape-razor-gang-hits-320m-in-targets-in-south-australia-government-says/story-e6fredel-1226515303247

[13] http://www.betterregulation.nsw.gov.au/

[14] http://www.coag.gov.au/a_seamless_national_economy

[15] http://www.coagreformcouncil.gov.au/reports/docs/sne-feb-2012/Seamless_National_Economy_2011_Part-C-Other-Regulatory-Reforms.pdf

[16] http://www.psnews.com.au/Page_psn337f5.html?utm_source=psn337f&utm_medium=email&utm_content=news5&utm_campaign=newsletter_friday

[17] http://www.infrastructureaustralia.gov.au/regional_infrastructure_fund/

nationally significant issue and that water quality in regional areas is also a pressing challenge[18].

States and territories have invested heavily in water infrastructure in recent years, with major desalination and recycling projects occurring in most capital cities. Future water infrastructure challenges have been suggested to relate to regional and rural water infrastructure and service delivery, and efforts to improve water and sewerage systems in regional areas may drive investments in regional water infrastructure in the future. As is discussed above, the water sensitive cities agenda is a focus for urban areas and is driving investment in recycled water infrastructure in cities and towns.

2.1.5 Future opportunities for water recycling and water treatment systems

Large scale supply augmentations have been made by most states and territories over the last decade, including major investments in desalination and continued investment in wastewater recycling systems. Future opportunities for water recycling may occur through:

- Stormwater, grey-water, managed aquifer recharge, industrial reuse and sewer mining
- Increased use of decentralised, rather than centralised, water treatment systems
- Water sensitive urban design including water-smart urban renewal projects and greenfield developments
- Water-smart construction standards and new 'green' buildings and precinct developments
- Application of recycling to a wider range of end uses, potentially including potable use
- Greater use of new membrane bioreactor technology (MBR) due to higher performance and lower footprint
- Regional areas with relatively fewer water supply options (such as desalination) than major metropolitan cities on the seaboard
- Advances in recycling technologies that contribute to lower costs and increased effectiveness of schemes.

Opportunities for recycling may also result from prospective or actual institutional changes in the way water services are delivered in regional New South Wales, Queensland and Tasmania, and in Victoria, where the Living Melbourne, Living Victoria reforms are likely to result in the promotion of IWCM projects, particularly in greenfield growth areas.

2.2 Validation of water treatment technologies

In Australia, validation of water treatment technologies is currently only required for the approval of certain types of water recycling schemes. Other water treatment systems (such as drinking water) generally do not require technology validation. However, there is growing interest in validating technologies used in drinking water systems and this is a feature of some validation frameworks overseas[19].

[18] http://www.infrastructureaustralia.gov.au/water/

[19] For example, in California, validation occurs for both drinking water and recycled water systems.

Validation is important for water recycling schemes because the water sources involved often present greater risks to public and environmental health than water sources used in other systems.

The Australian Guidelines for Water Recycling (EPHC 2006) advocate a risk management framework based on that previously detailed in the Australian Drinking Water Guidelines (NHMRC 2011) and the World Health Organization's Guidelines for Drinking Water Quality (WHO 2011). The AGWR require treatment technologies and processes to be validated prior to the operation of a water recycling scheme. The effectiveness of treatment technologies used in recycling needs to be confirmed ('validated') before installation to provide assurance that identified health and environmental risks can be managed. It ensures the accuracy of technology providers' claims and reduces the risk of installation of ineffective technologies.

Validation is the substantiation of a technology's (or process') ability to effectively control hazards. It is undertaken through scientific testing and studies in a laboratory or in-situ before a technology is installed. Different validation methods exist for validating different technologies. Validation can be undertaken for new or existing technologies, or can involve reviewing existing validation studies undertaken overseas or interstate[20]. Validation usually results in a technology being credited for its performance by confirming a log reduction value (LRV) that it can demonstrably achieve and can be operationally measured.

Validation differs from verification, which assesses the in-production performance of an overall treatment system (which may include multiple treatment technologies or barriers assembled in stages ('treatment trains').

Validation establishes how well a technology can improve the quality of the source water, but it doesn't specify water quality requirements of the water produced. These requirements are set separately by jurisdictions and are generally determined by the end use. Typical treatment systems are designed to include a series of different treatment technologies – based on the quality of the source water, the performance of each of the barriers (the technologies), and the required output water quality.

2.2.1 Validation in Australia

There are no specific jurisdiction requirements for validation of individual treatment technologies prior to their entry to the market. Rather, technologies are usually required to demonstrate validation of their performance when approval is sought for a complete recycled water scheme.

Table below indicates the validation requirements of each jurisdiction based on information from 2010 (see Appendix G for more detail).

Table 1. Current validation requirements for recycled water schemes

Jurisdiction	Treatment technology or process validation requirements
Australian Capital Territory	Yet to be specifically defined
New South Wales	High exposure schemes require validation

[20] For an extended discussion on validation see Appendix F

Jurisdiction	Treatment technology or process validation requirements
Northern Territory	Yet to be specifically defined
Queensland	Validation of manufacturer's specifications is required prior to commissioning
South Australia	All moderate to high-risk schemes must have validated equipment where log reduction credits are applied
Tasmania	Validation of treatment technologies is required as part of the permit process
Victoria	Individual processes within treatment trains for Class A schemes must be validated
Western Australia	Yet to be specifically defined

Source: Adapted from Power 2010

While states and territories do not have specific requirements for validation in isolation from overall recycled water scheme approvals, the general process for validation is typically as follows:

1. A technology or scheme proponent develops a new technology, or designs a new recycling scheme utilising an existing technology (such as one from overseas), to treat water.
2. The proponent either ensures the existence of a validation certificate for existing technology, or undertakes (or engages third parties to undertake) research, scientific testing and studies to demonstrate the treatment performance of a new technology.
3. The proponent presents the existing validation certificate, or the documented results of the validation study (including validation data), to the relevant regulators in each jurisdiction where the technology (or scheme) will operate.
4. The regulator(s) confirm validation of the technology, issuing it with a performance credit (log reduction value), and approve its use in an overall scheme.

Additional information on the process for validation is also provided in Section 3.7 below.

2.3 Problems with current validation arrangements

The following sections highlight a range of problems with the current validation processes for the various groups of stakeholders involved.

2.3.1 General problems with the current approach

General problems with the current approach that create problems for stakeholders include:

- Inconsistencies in the approach to validation between jurisdictions
  - This creates uncertainty and confusion for all stakeholders, and contributes to duplicated effort and slow or patchy uptake of otherwise-viable technologies across Australia.
- Absence of guidelines, protocols and minimum standards for the conduct of validations

  - This results in uncertainty for technology and scheme proponents about how technologies should be validated, and about the minimum regulatory requirements for approval.
  - It adds to regulators' workloads as proponents seek guidance or submit unsuitable documentation.
  - It risks the validation process varying between states and territories and depending on the regulatory personnel involved.

- Absence of default performance credits (LRV's) for the same type, or similar groups of technologies
  - This leads to difficulty in designing schemes due to uncertainty about the number of treatment barriers required to achieve a target log reduction, and results in different treatment trains in schemes in different states as well as over-engineering of schemes.
  - It suppresses development and/or adoption of new and innovative technologies. For example, MBR technology is currently given different log reduction credits in California, South Australia, New South Wales, and Victoria.
- Absence of transparent and consistent processes for recognising, or taking account of, validations undertaken interstate or overseas
  - This leads to Australia not benefiting, or benefiting later, from certain technologies developed overseas. It means that technology proponents have to duplicate validation effort for different Australian regulators, and regulators have to undertake additional reviews of the validation data submitted.
- Insufficient information or sharing of information
  - The lack of a centrally coordinated information base available to regulators contributes to duplication of validation effort.
  - Technical expertise is already spread thinly across the states. Validating technologies in isolation from colleagues in other jurisdictions adds unnecessarily to work pressures and delays in approvals.
  - Lack of data can hinder regulators' and proponents' ability to determine feasibility of a proposed validation approach, and possibly result in inadequate validation assessments.

2.3.2 The Australian Government

The problems with current arrangements for the Australian Government relate to foregone opportunities for improved economic outcomes for Australia and sub optimal public confidence and efficiency outcomes associated with its investments in national guidelines.

- Suppressed competition and innovation
  - Inefficient regulatory arrangements have the capacity to discourage competition and innovation by reducing market participation and investment due to the increased costs of business in dealing with those arrangements.

  - Current costs of validation are a barrier to entry of new and innovative technologies – many technologies currently being adopted are those that have already been validated in that jurisdiction.
  - As a consequence, public health and water management outcomes may be less positive or cost-effective than otherwise.

- Investment in water recycling infrastructure
  - Inconsistent and duplicative validation requirements lead to higher than necessary recycled water scheme costs. While the contribution of validation to overall scheme costs may be modest, the Australian Government has invested in a range of water recycling projects and the extent of this investment could be reduced if the cost of schemes was reduced.
- Foregone economic opportunities for Australia associated with developing water treatment technologies domestically
  - Validation efforts are often undertaken overseas by larger manufacturers due to clearer approval processes and lower costs. The costs of validation in Australia are higher than necessary due to the lack of clarity, national inconsistency in validation processes, and the need to replicate validation applications in each jurisdiction.
  - These problems particularly disadvantage small and medium sized Australian based enterprises seeking to compete with larger international firms in the Australian utilities market as well as the export market.
  - This contributes to Australia importing technologies rather than enjoying the national economic benefits from producing and exporting them.
- Suppressed interstate trade
  - Inconsistent regulatory requirements between states create unnecessary obstacles to interstate trade. Some technology proponents find it difficult and costly to sell their products into interstate markets due to artificial differences in requirements.
- Inconsistent application of the Australian Guidelines for Water Recycling
  - The Australian Guidelines for Water Recycling suggest that validation be undertaken for recycled water schemes. Where validation is required it is inconsistent, which is a sub-optimal outcome because the full public confidence and efficiency benefits of a national approach are not realised.
- Inconsistency with the regulatory reform agenda
  - As indicated in Section 2.1.4, reduction of regulatory burden and red tape is a priority of the Australian Government and COAG. Current regulatory arrangements for validation of water recycling technologies are confusing, inconsistent, duplicative, and costly and do not support achievements of the outcomes sought under COAG's seamless national economy agenda and other regulatory reform policies or processes.

2.3.3 State and territory governments and regulators

The problems for state and territory governments and regulators largely relate to the inefficiency of current processes and duplication of effort, but also increased costs and challenges to regulators and other state government agencies in delivering water management and public health outcomes.

- Confusion and uncertainty about treatment technology performance
  - Uncertainty about performance can lead to over-engineering of schemes and higher than necessary scheme costs. Some schemes are achieving much higher performance than validation suggested and regulators required.
  - Uncertainty about performance can contribute to a lack of confidence in public health outcomes in both governments and the community, creating additional constraints to greater uptake of recycling.
  - Differences in validation approvals, especially different log reduction credits for the same technology in different jurisdictions, can result in stakeholders raising public disquiet about the quality of those very approvals.
- Confusion and inconsistency about acceptable validation methods or studies
  - The lack of consensus about how to approach validation can lead to delays in technology development and approval and implementation of schemes.
  - It can lead to wasted agency resources in assisting proponents to lodge acceptable documentation or reviewing validation studies that may not be accepted for validation.
  - State and territory regulators may have to rely on professional judgement in the absence of agreed protocols for validation, which creates uncertainty and confusion for technology and scheme proponents and imposes risk on the regulator and the government.
- Insufficient knowledge and skills (agency capacity) to do validation work effectively
  - Capacity constraints can contribute to uncertainty and can lead to delays in approving technologies and/or schemes.
  - Agencies have sought to develop informal channels of liaison among state counterparts to respond to capacity constraints but the informality of such channels impose liability risk on decision makers if decisions are subsequently found to be defective.
- Duplicated effort in administrative arrangements, validation reviews and approvals
  - States and territories are required to run individual processes to achieve the same outcome for technologies that have national application.
  - Because there is no agreed process or method for recognising or accepting technologies validated interstate, regulators may undertake more validation reviews than necessary. State and territory regulators separately review and approve the same validation studies.

  - Some validations have been undertaken domestically for technology that has already been validated in respected overseas jurisdictions such as the US or Europe. In other cases where overseas validations have been taken into account in local validation decisions, the agreed process in Australia for relying on such overseas input is unclear.

2.3.4 Local government

Where local governments are involved in water recycling schemes as a proponent, they face challenges similar to that of other scheme proponents, including:

- Higher than necessary costs and time delays associated with validating and approving technology and approving overall schemes
  - The increased cost and longer time frames reduce the economic viability of schemes. For local government this can create a barrier for securing climate independent water sources and delivering integrated water management outcomes.
- Confusion and uncertainty about treatment performance of technologies
  - Lack of clarity about performance leads to uncertainty regarding the number or types of treatment barriers to incorporate in a recycling system. This contributes to uncertainty in scheme design, leading to over engineering and higher than necessary scheme costs.
  - Lack of clarity can also present increased risks to human or environmental health if schemes are under engineered because the performance of a treatment technology is over estimated.
- Lack of guidance on what constitutes acceptable validation methods and studies
  - The lack of guidance means that local governments may invest in the wrong type of validation studies, which may lead to repeating studies or doing extra work to satisfy regulators. This contributes to higher than necessary scheme costs, and time delays in approvals.

Where local governments are involved in water recycling schemes as an approval agency (such as through development applications) they may face problems such as:

- Confusion and uncertainty regarding validation requirements and treatment technology performance.
- Reliance on professional judgement rather that clear rules.

2.3.5 Technology proponents

Problems for technology proponents largely relate to increased costs, time delays, and barriers to market participation.

- The requirement to meet different regulatory requirements in different states, including variance in acceptable validation methods and the amount and/or type of evidence required by different regulators

  - Technology proponents seeking to operate across Australia have to prepare validation studies or undertake validation work multiple times to different state requirements for the same or similar technologies.
  - This contributes to duplication of validation effort, leading to increased costs and disincentives to compete.

- Lack of guidance on what constitutes acceptable validation methods and studies
  - This leads to confusion and uncertainty, resulting in some proponents not participating in the Australian market or participating to a lesser extent.
- Fracturing of the national water treatment technology market due to the different state based requirements
  - Such barriers to entry leads to technology proponents not participating in the market, not developing technologies locally, or not bringing technologies to Australia from overseas.
- Lack of Australian regulatory 'endorsement' for Australian exporters seeking to penetrate overseas markets
  - An official national validation endorsement by collective Australian regulators would be a powerful market advantage in some overseas markets. Conversely, the absence of such certification can be a serious impediment to market success overseas, especially for small and medium sized enterprises.

2.3.6 Scheme proponents

Scheme proponents include public and private water utilities in major cities or regional areas and developers of commercial buildings or residential developments. Problems for these stakeholders largely relate to increased uncertainty and costs.

- Confusion and uncertainty about treatment performance of technologies
  - Lack of clarity about performance leads to uncertainty regarding the number or types of treatment barriers to incorporate in a recycling system. This contributes to uncertainty in scheme design, leading to over engineering and higher than necessary scheme costs.
  - Lack of clarity can also present increased risks to human or environmental health if schemes are under engineered because the performance of a treatment technology is over estimated.
- Lack of guidance on what constitutes acceptable validation methods and studies
  - The lack of guidance means that proponents may invest in the wrong type of validation studies, which may lead to repeating studies or doing extra work to satisfy regulators. This contributes to higher than necessary scheme costs, and time delays in approvals.
- Having to meet different regulatory requirements and standards in different locations

  - Different requirements mean designing different studies for different locations, or modifying or repeating existing validation work. This leads to higher than necessary scheme costs and delays in approvals.

- Generally higher cost and longer time delays in scheme development or implementation
  - The increased cost and longer time frames reduce the economic viability of schemes. This reduces the willingness of scheme proponents to continue to invest in developing and implementing recycled water schemes.

- Reduced number of available validated technologies
  - Having fewer validated technologies reduces the choices available to scheme proponents in designing schemes. This constrains their ability to innovate and design more effective and/or lower cost schemes.

- Higher than necessary costs for private developers
  - In some cases the viability of decentralised recycling schemes are already challenged by cost, and this reduces the incentive for private developers to install them. Increased technology cost due to inefficient validation requirements further increases scheme cost and further reduces the incentive to install schemes.

2.3.7 The Australian community

Validation of water treatment technologies is necessary to protect the public health interests of the Australian community, and water recycling can contribute to important water security and environmental sustainability outcomes. Current validation arrangements have the potential to impact on the Australian community by preventing outcomes from being achieved in both these areas, or by achieving them in an inefficient manner.

- Uncertainty regarding treatment performance of technologies
  - Government uncertainty or concerns about the effectiveness or safety of recycling technologies has contributed to the imposition of policy bans or restrictions on particular types of recycling or for particular end uses. This constrains the choices available to the community.
  - Uncertainty about treatment performance and the public health outcomes of recycling may also contribute to a lack of public acceptance of recycling, which may reduce the availability of different water supply or treatment options.

- Increased cost and time delays associated with water recycling schemes
  - Where schemes are installed, increased costs and time delays are passed on to and impact consumers, such as through increased costs of water service provision.
  - Time delays in approvals reduce the water supply options available and further increases the risk to the community of not being able to secure sufficient sources of supply.
  - Where costs and delays prevent schemes from being implemented, the potential environmental and amenity benefits to the community are foregone.

  - Increased costs and delays mean that the potential for recycling schemes to contribute to a range of outcomes is not being maximised.
  - Time delays can result in delays to development approval for Greenfield residential developments.

- Reduced competition and innovation
  - If the costs of schemes are artificially inflated this reduces the number of choices and options that available to the community, such as through the different service offerings that local utilities may be willing or able to provide.

- Inefficient public process such as regulation and administration of validation
  - There are a range of public policy issues competing for public resources at any given time. Inefficient public investment reduces the opportunity to meet the needs of other areas of public policy that benefit the Australian community.

2.4 Consultation

Consultation with a range of stakeholders involved in validation provided confirmation of the problems listed above.

Government and regulatory stakeholders confirmed that red tape reduction and regulatory burden is a priority policy area, and also confirmed that stormwater recycling and decentralised systems are a significant growth area and where most future regulatory and operational challenges lie. It was also confirmed that over engineering of schemes has not been uncommon in some jurisdictions and that regulators have faced challenges in keeping pace with developments in recycling and validation.

For stakeholders participating in validation processes, including scheme and technology proponents, consultations suggested there has been confusion about roles and responsibility for validation. In addition regulators not keeping pace with technology developments has resulted in significant costs and time delays for proponents. Some proponents were also frustrated at unpredictable outcomes due to inconsistent professional judgement being applied.

Proponents gave examples of long project delays, with confusion about requirements, inconsistent application of regulations, confusion about ultimate decision making bodies, and insufficient capacity or capability in approving agencies all contributing factors. Proponents also gave examples of significant financial costs as a consequence of delays.

Proponents suggested that validation processes need to be much clearer and more transparent, with much greater certainty regarding outcomes, and that improved arrangements would be required to allow the market for water treatment technologies to grow and prosper in the future.

Both government stakeholders and proponents suggest that current recycled water regulations are inconsistent and burdensome and are generally discouraging the uptake of recycling.

2.5 Summary of need

The current arrangements for validation of water treatment technologies in Australia are inconsistent and confusing. Duplicative processes and requirements are contributing to higher

than necessary treatment technology and recycled water scheme costs, and long approval times, which negatively impact on governments, regulators, and scheme and technology proponents. Current arrangements contribute to a lack of confidence in recycled water and result in wasted public resources and foregone benefits for the Australian community.

The problems with the current arrangements indicate there is a clear and pressing need to clarify and harmonise scientific and regulatory approaches and requirements, to improve institutional arrangements and the efficiency of delivering outcomes, and to reduce financial and other costs to government, industry and the community.

The benefits of addressing the problems identified include regulatory simplification and removal of red tape, confidence and assurance, reduced costs to government and industry, and improved water, public health and environmental outcomes.

3 Overview of proposed solution

The Framework has been developed by the Australian Water Recycling Centre of Excellence (the Centre) as a proposed solution to the problems with current validation arrangements in Australia. This section outlines how the Framework was arrived at as the proposed solution, including alternative options. It then outlines the Framework, including its different elements and functions, and compares the current approach to validation with the approach proposed under the Framework.

3.1 Development of the Framework and consideration of alternative solutions

Soon after the Centre was established it released a series of discussion papers to inform its future research and investment activities. One of those papers reviewed risk management and validation arrangements in Australia (AWRCOE 2010). Responses to the paper suggested that validation was a key issue needing to be addressed. Further consultations by the Centre, including a national tour by the Centre's CEO and Chair of its Research Advisory Committee (RAC), confirmed that validation was an area where industry believed the Centre's investment could leverage significant improvements in water recycling practice in Australia (AWRCOE 2012). Consultations also indicated there was a strong demand from industry for improved validation arrangements to demonstrate compliance with the Australian Guidelines for Water Recycling (Muston and Halliwell 2011).

As a result, improving Australia's validation processes became a major component of the Centre's work program, with goal two of its Strategic Research Plan specifically addressing the need for improved validation:

- **Goal 2.** *A national validation framework for water recycling is established* – this would include projects to support a national validation framework for water recycling schemes and the research to support regulator and industry confidence in regional and metropolitan implementation.

The Centre is delivering on this goal through a two-phase project. Phase 1 developed the draft Framework that was eventually agreed as being the optimal approach for validating technology. This position was reached following consideration of various alternatives before further developing and recommending the draft Framework. The process involved consultation with industry, urban and regional utilities, state and territory regulators, technical experts from a range of fields and institutions, and technology suppliers, including a major two day workshop involving nearly 40 participants from these sectors. The process determined that a national validation framework would be the best way to address the needs of industry and regulators. The following table summarises options that were considered during Phase 1 as well as advice from the Steering Committee in Phase 2.1.

Table 2. Possible solutions

Possible solution	Comment
Mutual recognition systems	Mutual recognition systems were considered but were not supported due to insufficient confidence and certainty being provided, especially in the context of public health outcomes. Many mutual recognition frameworks have been created for the sale of goods or registration of workers and do not include services. Problems identified with mutual recognition included knowledge gaps on how to validate some types of systems, the need to establish agreement on how validation should be performed, the need to establish agreement on which international validation methods to recognise when alternatives are available and a need to establish a certification process to verify validation testing conducted in one jurisdiction that would provide confidence to other jurisdictions. One potential solution explored was for a body such as WQAC to develop guidelines for validation. However, this is outside of the current scope and technical knowledge of this committee. It also doesn't deal with the issue of verification and WQAC doesn't commission research on filling knowledge gaps.
National Recycled Water Regulators Forum	The National Recycled Water Regulators Forum shares information between jurisdiction representatives to improve recycled water regulation. However, the Framework is proposing to deliver procedures that are well beyond the scope and resourcing of this group. Drawing on the NRWRF was also unlikely to deliver the stability and certainty required by industry as the NRWRF is a self-sustaining interest group that has no guarantee of long term survival. The NRWRF also has some of the shortcomings of the WQAC described above.
Environmental technology verification	Validation of water treatment technology takes place through broader Environmental Technology Verification (ETV) programs in some overseas jurisdictions. However, these models were assessed as not meeting the objectives for what is required for recycled water in Australia. ETV was suggested as often being designed to help accelerate the introduction of new environmental technologies to a commercial stage rather than necessarily to protect public health or the environment. A broader ETV program was also beyond the Centre's remit and did not meet stakeholders' needs.
New national regulation	The development of new Australian Government legislation and regulation was considered to have the benefit of national consistency, but costs were suggested to be too high and the approach was not supported by states and territories. A recent assessment of broader water quality regulation suggested that new national regulation in this area does not have the support of stakeholders (see PwC 2011). This approach would have significant challenges including determining or creating an appropriate regulator, and implementation challenges due to the area already being regulated by states and territories.

Possible solution	Comment
Validation programs or frameworks	Overseas validation programs (including ETV programs) were investigated and it was determined that there was no ready-made model that could be applied. While features of these models were relevant it was noted that the Framework would need to move ahead of existing models in dealing with recycled water. This led to development of the Framework.

Source: NatVal Phase 1 project workshop outcomes, NatVal Phase 2.1 project steering committee workshops, Halliwell and Roeszler 2012.

Phase 1 of the Centre's project also determined necessary requirements to progress the Framework beyond the draft stage, including the need for a cost-benefit analysis and Business Case. The results of Phase 1 are documented in the NatVal Road Map Report (Muston & Halliwell 2011).

Phase 2 of the project is focused on progressing implementation of the Framework. It includes two components. The first component aims to secure support for the Framework through further consultation with decision makers in government and regulation and is supported by the cost-benefit analysis and this Business Case. The second component aims to progress priority research activities identified in Phase 1 and includes development of some of the validation protocols that will be required for operation of the Framework.

3.2 Framework overview

The proposed Framework is a national-level process for validating water treatment technologies. It was developed to deal with wastewater recycling projects but, importantly, has the flexibility and scope to be applied to technologies used in all forms of water treatment.

The Framework is not a new, additional layer of national regulation. Under the Framework, states and territories would retain their full regulatory responsibility for water recycling scheme or treatment system risk assessments and approvals. However the Framework provides a process by which jurisdictions can develop and agree on consistent approaches to and requirements for validation of technologies used in those schemes or systems. States and territories can then implement the agreed approaches and requirements through their own legislation and regulations. This is analogous to the process used to develop and implement the Australian Drinking Water Guidelines and Australian Guidelines for Water Recycling.

The Framework aims to remove duplication and inconsistency by validating technologies once at the national level according to nationally agreed protocols. It also enables a consistent and transparent process for recognition of validation efforts already undertaken interstate or overseas.

Validation requires a high level of technical expertise and pooling this knowledge from around Australia in a single consistent process is expected to reduce costs and improve outcomes from the validation process for governments, regulators, industry and the community.

3.3 Framework objectives

The Framework is driven by an overarching objective to protect public health and the environment in an effective and efficient manner. It supports the objective of the Australian urban water sector to provide secure, safe, healthy and reliable water-related services to urban

communities in an economically efficient and sustainable manner (National Water Commission 2011). Specifically, the Framework aims to:

- Protect public health and the environment
- Support Element 9 of the AGWR (Validation, research and development)
- Provide independent endorsement of water treatment technologies
- Ensure consistency between jurisdictions within Australia
- Ensure a transparent and independent process
- Provide a mechanism for the consideration of international validation or technology certification programs.

3.4 Framework scope

The Framework guides the validation of technologies and processes used in water treatment. While it has been developed in the context of water recycling, it is flexible enough to validate technologies used in a variety of different water treatment systems (e.g., from wastewater recycling to potable water supply), and may also provide a useful model for validation of broader environmental technologies.

Importantly, the Framework does not create new or change existing requirements that schemes of treatment systems must use validated technology – this will continue to be determined by jurisdictions.

For example, some jurisdictions may currently require all wastewater recycling schemes to use validated technologies, but do not impose the same requirement on stormwater or grey-water systems. The Framework does not force jurisdictions to change these requirements, but provides a range of benefits when jurisdictions do increase requirements for the use of validated technologies, as is expected to occur progressively to ensure compliance with the AGWR.

Section 4 further explores options for the initial scope of the Framework including the costs and benefits of the different options.

3.5 Benefits of a national validation Framework

The benefits of the national validation Framework as articulated in the NatVal Road Map Report (Muston and Halliwell 2011) include:

- providing national consistency for validation requirements for proponents, regulators and technology providers
- provision of a national process for consideration of overseas testing within Australia's requirements
- reduction in the cost of validation for specific treatment technologies as once certified, validation would not require repeating unless significant changes in the process occurred
- collation of validation data for in-situ treatment technologies would provide data to support the updating of the AGWR

- streamlining of the process of recycled water scheme design in that proponents could choose a validated treatment technology and know the confirmed LRV to be used in design
- development of a framework which could be applied to drinking water technologies in the future
- development of a framework which could be extended to environmental treatment technologies

Further benefits of the Framework, including benefits to the different stakeholders involved are discussed in Section 4.5.

3.6 Key elements of the Framework

The Framework includes proposed new functions, and draws on existing entities with proposed new or modified functions. The functions of the different entities are designed to address different problems with the current approach for validation.

Figure 1 below indicates the general process of the Framework while the following tables indicate the roles and functions of both the new and existing entities, and the problems they seek to address.

Figure 1. The Framework process

Source: Aither

Table 3. The Framework – New functions

Function	Proposed role or function	Problems addressed
Framework administrator	Administers the Framework Develops validation protocols Chair and coordinates the Rule Setting Group Maintains register of Independent	Thinly spread knowledge and capacity Lack of coordination and consistency in validation approaches Absence of agreed protocols for validation Sharing of information

Function	Proposed role or function	Problems addressed
	Assessors	
Rule setting group	Approves validation protocols Appoints technical or sub committees to assist in developing protocols	Inconsistent methods and approaches to validation Insufficiently rigorous or unacceptable validation science Thinly spread knowledge and capacity
Independent assessors[21]	Review and/or prepare validation study designs Prepare validation reports Endorse completed validation studies on behalf of Framework administrator	Quality, rigour and scientific merit of validation studies Cost and time of regulator effort in reviewing studies
Certification body	Assesses validation reports Prepares and provides validation certification statements if validation consistent with protocol Advises the Framework administrator and database manager regarding certified technologies	Duplication of effort including costs of repeated validations Uncertainty regarding validated technologies Lack of interstate recognition of existing validations
Database manager	Maintains record of validated technologies including reports and data	Lack of consolidated information on validated technologies Duplication of effort

Source: Aither

Table 4. The Framework – Existing entities with new or modified functions

Entity	Proposed role or function	Problems addressed
Analytical facilities	Conduct analytical tests Prepare analytical and validation reports	Scientific rigour of testing and consistency with protocols
Research and specialists	Assist with protocol development and undertake relevant research	Scientific rigour Knowledge and capacity constraints
Scheme proponents	Design schemes and select treatment trains drawing on technologies in the national database	Uncertainty regarding treatment barrier performance Cost of schemes and time delays

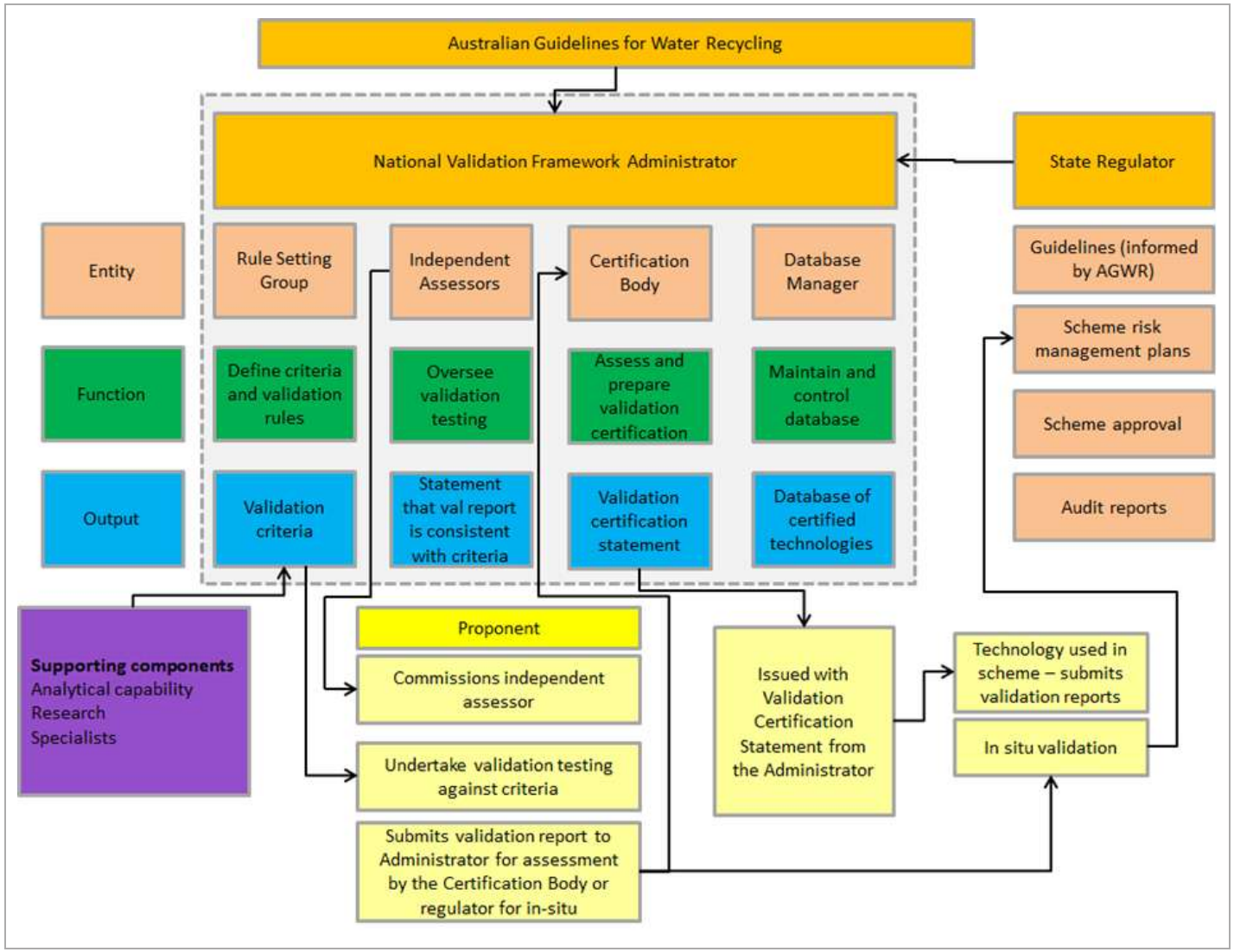
[21] While independent assessors do currently operate in some jurisdictions in a broadly similar role to what is described here, they have been presented as new functions as they play a major new role under the Framework

Entity	Proposed role or function	Problems addressed
Technology proponents	Commission validation studies Engage analytical facilities and independent assessors	Uncertainty regarding process and outcomes Duplication of effort Regulatory confusion or inconsistency
State and territory regulators	Provide final scheme or system approval Draw on Framework administrator to confirm validated technologies	Duplication of effort Cost and time of scheme development and implementation

Source: Aither

Figure 2 below further illustrates all of the entities under the Framework, including their functions, and outputs and how they interact with other aspects of the validation process.

Figure 2. The National Validation Framework



Source: Muston & Halliwell 2011

3.7 Comparison of the Framework and current arrangements

Key differences between the current arrangements and arrangements under the proposed Framework include:

- There would be a consistent and agreed set of protocols[22] to determine what validation studies are acceptable and how they should be undertaken
- New validation studies would be undertaken according to the developed protocols or previous studies being reviewed against them
- There would be consistent crediting across Australia of treatment performance for validated technologies
- Proponents would only have to undertake validation once at the national level, or for validations already undertaken interstate or overseas, not have to repeat them
- A single national database of technologies that have been validated would be maintained for use by regulators and proponents.

A comparison of the current validation process and the validation process under the Framework is provided in Table 5 below (note that some of these steps may occur in parallel rather than in sequence).

Table 5. Comparison of current process and process under the Framework

Step	Current process	Process under the Framework
Develop technologies	Technology or scheme proponents develop	Same process
Undertake validation testing/studies	Technology or scheme proponents undertake or outsource, but without consistent guidance, and potentially multiple times with variations to meet different regulatory requirements	Proponents continue to undertake or outsource, but under nationally agreed protocols and only once
Submit for approval	Potentially different studies submitted to different state or territory based regulators	Studies submitted once to the Framework administrator only
Confirm validation	Validation may or may not be confirmed independently of overall scheme approval, and validation is approved separately by each jurisdiction	Validations is confirmed once nationally by the Framework administrator, technology goes on database

[22] Protocols can be developed over time to apply to existing or new/emerging technologies, and some protocols have already been developed or are under development through Phase 2.2 of the Centre's national validation framework project

Step	Current process	Process under the Framework
Design scheme or system	Designed by proponents	Still designed by proponent, but designers draw on pre-validated technologies
Install technology	Proponent undertakes installation. Jurisdiction approves scheme as a whole.	Jurisdictions still approve scheme as a whole, but refer to national database to confirm validated technologies used in the scheme
Verify scheme or system	Jurisdictions and proponents undertake once installed	Same process

Source: Aither

3.8 Consultation

Consultations provided the opportunity to confirm stakeholders' understanding of the Framework concept, including the proposed functions of new and existing entities.

There was universal support for the concept of the Framework across the stakeholders consulted, comments included:

- "supportive of the idea"
- "proposal makes sense"
- "seems like a no-brainer"
- "can't see why it isn't a good idea"

Stakeholders consistently suggested re-branding the framework to describe it as a validation framework for water treatment technologies, rather than limit it to recycling. They also consistently suggested the Framework's value proposition would be increased if it applied more broadly, including to stormwater and grey-water, or potentially even broader to drinking water as is the case under the U.S. EPA validation guidelines.

Implementation arrangements were suggested as a critical area that would need to be well developed before jurisdictions could agree to the Framework, but states and territories recognised that the intent of the Framework is "not to replace current regulation, but to support it".

Stakeholders suggested that it would be critical that regulators have confidence in protocols, assessors, accreditors and the database, and feedback was provided on the need for protocols to address specific operational conditions. Technology proponents also sought clarification about how protocols would address specific issues such as extrapolation of validation to different sizes of the same technology type.

3.9 Summary

The Framework provides a more efficient and effective nationally based process for validating water treatment technologies[23]. It allows states and territories to maintain regulatory control over total scheme or treatment system approvals, but removes duplication of effort that results from separate validation approval processes. Drawing on a small number of new entities and slight modification of the roles of existing entities, it delivers a range of improvements for all stakeholders involved in the validation of water treatment technologies.

[23] See Section 4 and Appendix B for quantification of this.

4 Analysis of options

This section considers different options for addressing the identified need through implementation of the Framework, including consideration of continuing with the status quo and analysis of different scope options and organisational arrangements. It includes results from an independent cost-benefit analysis of the Framework and provides additional qualitative analysis.

4.1 Scope and institutional arrangements

There are two main elements to consider in implementing the Framework. The first is the scope of its application, and the second is the organisational arrangements to facilitate its operation.

Given the framework is flexible enough to validate most forms of water treatment technology, its scope of application could range from specific (e.g. wastewater recycling for urban non potable use) to broad (e.g. all forms of water treatment and recycling for all end uses).

The Framework could be delivered by new or existing organisations but a model that utilises existing organisation(s) may lower upfront and ongoing costs and be more responsive to the level of demand for validations in the future.

4.1.1 Scope of application

Current jurisdiction based validation requirements are outlined in Table 1 above and in Appendix G and indicate that primarily high exposure recycled water schemes in New South Wales, Queensland, South Australia and Victoria are required to demonstrate validation of their treatment technologies. These schemes generally supply water for non-potable urban and irrigated agricultural uses.

This provides a useful starting point for considering the application of the Framework. A major benefit of moving to a national approach includes mitigating the need for state based validation, so the Framework would at least need to apply where jurisdictions currently have validation requirements.

If the Framework's scope was broader than where jurisdictions currently require validation, there is potential to realise greater benefits. As jurisdictions implement the AGWR, more recycled water schemes will require the use of validated technologies. If the Framework's scope is sufficiently broad it can provide validated technologies for use in a broader range of schemes. A broader scope also reduces the potential for duplication of effort by ensuring that jurisdictions do not have to validate technologies that are outside the scope of the national Framework.

To provide a tangible starting point for assessing options, a potential scope was developed that corresponds with areas where jurisdictions currently have validation requirements (column two of Table 6). This scope was the basis of the cost-benefit analysis (Appendix B) and was also discussed during stakeholder consultations.

Given the potential for broader application of the Framework, different ways in which the Framework could be expanded were also identified (column three of Table 6).

Table 6. Potential scope of Framework application

	Narrow scope of application	Broader scope of application (additional)
Water type	Recycled water	All water types
Water sources	Wastewater	Stormwater, grey-water, surface water, groundwater, and other water sources (e.g. industrial)
End uses	High exposure (high level of human contact) including: residential dual reticulation; multi-unit dwellings internal reuse and external irrigation; agricultural irrigation unprocessed foods; urban irrigation with unrestricted access and application	Potable reuse, other irrigation uses, industrial use, medium and low exposure uses, drinking water
Hazards	Virus, protozoa	Bacteria, helminths, chemicals
End points	Human health	Animal health, environmental health
Application	Future water recycling schemes and existing schemes where future changes are made to the treatment train	Applied retrospectively to existing schemes
Process steps	Engineered treatment	Application to biological treatment and end-use controls (e.g. use of buffers)
Technology types	Technologies which are relatively easy to validate, package and replicate at many sites: e.g. UV, membrane filtration, oxidant disinfection Technologies which are relatively difficult to validate but easy to package and replicate at many sites: e.g. reverse osmosis (RO), membrane bioreactors (MBR).	Technologies which are difficult to validate and are also difficult (or impossible) to replicate and package and need to be validated in-situ: e.g. activated sludge, media filtration, lagoons

Source: Aither

4.1.2 Organisational approach

The Framework involves creating four new entities at the national level and drawing on a number of existing entities or institutions to provide new or modified functions (see Section 3.6). The Framework has been designed so that the new entities could be delivered by a single or multiple new or existing organisations.

A single organisation model may provide efficiency gains and better flows of information between entities, but could impact on the level of independence. Conversely a multiple organisation model may increase independence but increase costs. A new organisation may increase the brand value and recognition of the Framework, but is likely to result in higher setup and ongoing costs than a model that draws on existing organisations.

The demand for future validations and volume of technologies involved are important considerations as they drive the scale of operations behind the Framework. A relatively high

volume of validations and validated technologies is likely to be required to justify a new organisation.

4.2 Consultation

Consultations provided feedback that was considered in the development and analysis of options outlined below.

Stakeholders consistently expressed the view that there was a need to include stormwater, grey-water and on-site and decentralised systems in the Framework as future growth in these areas was more likely, and they suggested there would be greater benefits and value added from improving regulatory arrangements for these types of schemes now. Stakeholders also thought that only including high-exposure schemes was unduly limiting the Framework.

In relation to the cost-benefit analysis, some stakeholders suggested it could have adopted a broader scope given the emergence of stormwater recycling and the review of drinking water guidelines, and that as a result, the analysis seemed unduly conservative.

Stakeholders suggested that keeping costs of the Framework low would be essential to successful implementation and that it would need to be designed to an appropriate scale. Some stakeholders also saw merit in a staged roll out.

Stakeholders confirmed the over conservative approach taken by some regulators means that assumptions regarding the potential to remove treatment barriers due to more accurate assessments of treatment performance is valid. They also confirmed the potential for both operational and capital cost savings associated with reducing treatment intensity or removing treatment barriers.

4.3 Options considered

Four different options have been considered, in addition to the base case 'do nothing' option. This includes three scope options (from narrow to broad) and two organisational options (integrated or standalone). These are summarised in Table 7 below, with further detail on key features and assumptions provided subsequently.

Table 7. Summary of options

Option	Description
Base Case	No national framework
1: Wastewater and existing organisation(s)	Narrow scope (wastewater recycling for non-potable urban and irrigation use (high exposure) and existing organisation (framework delivered by existing national organisation(s)
2: Wastewater and new organisation(s)	Narrow scope (wastewater recycling for non-potable urban and irrigation use (high exposure) and new organisation (framework delivered by new national organisation(s).
3: Wastewater plus storm/ground water and existing organisation(s)	Broader scope (wastewater plus stormwater, grey-water, and groundwater systems) and existing organisation (framework delivered by existing national organisation(s)

Option	Description
4: All water systems and new organisation(s)	Broadest scope (all forms of water recycling/end uses and other water treatment systems) and new organisation (framework delivered by new national organisation(s)

4.3.1 Base case

The base case option involves the continuation of current state and territory based validation requirements, and to the extent that jurisdictions maintain current processes, would be expected to mirror the current arrangements described in sections 2.2.1 and 3.7.

Key features

- Continuation of current jurisdiction based arrangements and requirements for validation
- Absence of nationally consistent and agreed approach to validation
- Continuation of problems with current arrangements including ongoing inefficiencies, and higher than necessary costs and regulatory burden (see Section 2.3)
- Opportunity to benefit from improved arrangements is foregone

Key assumptions

- Jurisdictions will maintain current arrangements
- No other national level process will be implemented nor improvements to jurisdiction based processes

4.3.2 Option 1 – High exposure wastewater recycling, Framework delivered by existing organisation(s)

This option involves the scope discussed in Section 4.1.1above (high exposure systems involving wastewater) with the Framework being delivered by existing organisation(s) to align costs with the narrow scope of application. This option aligns with headline findings in the independent cost-benefit analysis.

Key features

- Applies to recycling of wastewater for non-potable urban and irrigation use
- Applies to high exposure recycling schemes (high level of human contact)
- Applies to engineered treatment processes (rather than biological or end use controls)
- Is focused on and driven by human health concerns
- Validates technologies' ability to remove virus and protozoa
- Includes technologies that are relatively easy or difficult to validate, but that can be easily packaged and replicated at many sites

- Framework is delivered by existing organisation(s) at the national level
- Some aspects of the Framework would be downscaled to reduce costs but still deliver intended outcomes

Key assumptions

Key assumptions impacting on the results of the cost-benefit analysis of this option include:

- The number of existing, and projections for new recycling schemes
- The number of existing validated technologies and projections for future validations
- The rate of growth in new technologies
- The distribution of growth in schemes and technologies requiring validation across jurisdictions
- The extent of 'grandfathering' of already validated technologies to the national Framework
- The extent of upgrading of existing schemes
- The extent to which improved validation protocols can lead to removal of or reduced treatment intensity of treatment barriers in existing or future schemes
- Limited current recognition of validation between jurisdictions
- Validation protocols can readily be developed and agreed
- The upfront (setup) and ongoing (staff and administrative) costs of administering the Framework

Other assumptions include:

- Appropriate existing organisation(s) can be identified and are willing to deliver the Framework through their organisation(s)
- Funding and resourcing can be found for the setup and ongoing costs of administering the Framework, and/or an effective cost-recovery model can be developed

4.3.3 Option 2 – High exposure wastewater recycling, Framework delivered by new organisation(s)

This option maintains the same scope as option one, but involves creation of a new organisation(s) to deliver the Framework rather than an existing organisation(s).

Key features

The same as option one, with the exception that:

- The framework would be delivered by a new organisation at the national level
- All proposed aspects of the draft Framework would be implemented in full

Key assumptions

As per option one, with the exclusion of the need to identify an organisation, and:

- An appropriate scale and scope for the new organisation's operations (such as staffing levels) can be determined and agreed
- Appropriate governance arrangements already exist under which the new organisation could be created or new governance arrangements could be agreed and created

4.3.4 Option 3 – Wastewater plus stormwater, grey-water, and groundwater, Framework delivered by existing organisation(s)

This option increases the scope of the Framework in accordance with stakeholder feedback, and in recognition of potential future growth areas for water recycling. However, it maintains low costs by delivering the Framework through existing organisation(s).

Key features

As per option one, but in addition:

- Applies to recycling of stormwater, grey-water and groundwater
- Validates technologies' ability to remove hazards specifically associated with these additional sources and systems
- Increases the range of potential validation methods and technologies under the Framework
- Increases the potential number of validations occurring under the Framework

Key assumptions

As per option one, but in addition:

- Assumes protocols for a wider range of validation techniques or methods can be readily developed and agreed
- Assumes increase in scope does not result in a volume of validations that is beyond the capacity of an integrated organisational model

4.3.5 Option 4 – All water systems, Framework delivered by new organisation(s)

This option broadens the scope considerably to include all water systems, with the Framework delivered via a new organisation as the broader scope would likely result in greater throughput

of validated technologies. This is likely to require a level of resourcing and support consistent with a standalone organisation.

Key features

The same as option one, with the exception that:

- The Framework would be delivered by a new standalone organisation at the national level
- All aspects of Framework would be implemented in full rather than downscaled

And in addition:

- Applies to all water types and sources, and all forms of water treatment systems (recycled or non-recycled)
- Applies to all end uses, including potable reuse, different forms of industrial use, and to medium and low exposure uses
- Validates technologies' ability to remove bacteria, helminths, and chemicals
- Is focused on human health, animal health and environmental health
- Is applied retrospectively to existing schemes
- Includes biological treatment
- Include technologies that are difficult to validate and difficult to replicate or package

Key assumptions

As per option one, with the exclusion of the need to identify an organisation, and:

- Validation protocols can be readily developed and agreed for a much wider range of treatment technologies
- Difficult to validate technologies can actually be validated under the Framework
- Significantly more validations and technologies involved
- An appropriate scale and scope for the organisation's operations (such as staffing levels) can be determined and agreed
- Appropriate governance arrangements already exist under which the organisation could be created or new governance arrangements could be agreed and created

4.4 Assessment of options

All options, including the base case were considered but only assessments of options one (narrow scope and existing organisations) and three (broader scope and existing organisations) are described in further detail for the reasons outlined below.

The base case foregoes all benefits from moving to a national approach, both in quantitative and qualitative terms. The problems with the current arrangements are significant, and stakeholders have expressed strong support for the Framework.

Conservative quantification of Option one (high exposure wastewater recycling, Framework delivered by existing organisations) in the cost-benefit analysis suggests there are net benefits expected from implementing the Framework. In addition Section 4.5 illustrates a broader range of qualitative benefits from implementing the Framework.

Option two (high exposure wastewater recycling, Framework delivered by new organisations) is not discussed further as the results of the cost-benefit analysis, consultations, and further analysis suggest a narrow scope will not result in sufficient validation demand to justify establishing and running a new organisation.

Option three (wastewater plus stormwater, grey-water and groundwater, Framework delivered by existing organisations) is discussed further because it responds to stakeholder feedback to expand the scope of the Framework. This option still proposes to utilise existing organisations to deliver the Framework until such time as validation throughput justified establishment of a new organisation.

Option four (all water systems, Framework delivered by new organisation(s)) has not been analysed further due to a range of uncertainties (including costs and benefits) and potential implementation challenges associated with such a broad scope.

4.4.1 Assessment of Option 1 – High exposure wastewater recycling, Framework delivered by existing organisation(s)

Based on the independent cost benefit analysis, this option is expected to deliver net benefits to the Australian community. It is also likely to deliver a range of benefits not monetised in the cost-benefit analysis. These are discussed in Section 4.5.

Benefits

The benefits of this particular option include all of the benefits of implementing the Framework, such as those described in sections 3.5 and 4.5, and in addition:

- Potential to generate benefits sooner by focusing on areas where jurisdictions already have some validation requirements in place
- Reduces setup and ongoing costs by integrating Framework administration into an existing organisation,
- Allows the Framework administration to be responsive to validation demand and future growth
- Doesn't preclude a standalone organisation from being established in the future
- Draws on resources as required, improves functionality over time

Costs

- Setup and ongoing costs of managing the framework, including
  - Developing validation protocols
  - Framework administration and coordination
  - Rule Setting Group participant costs

  - Assessment of independent assessors
  - Assessment of validation studies (although this could be outsourced to independent assessors and paid for by industry)
  - Managing certification including issuing statements
  - Managing the database of technologies
- Costs to industry of undertaking validation studies and having them approved by regulators
  - These costs are not new, and are reduced due to the removal of duplication of effort

Quantified benefits and costs

As part of Phase 2 of its national validation framework project, the Centre commissioned an independent cost-benefit analysis of the draft Framework. The analysis used the same scope as that described under Option one in this report (high exposure wastewater recycling), and its headline results were based on the same organisational approach as that described under Option one (Framework delivered by existing organisations). Alternative organisational and resourcing options were investigated in the cost-benefit analysis through the use of sensitivity analysis. The cost-benefit analysis was based on information and data supplied by a range of stakeholders during consultation.

Removing duplication

The cost-benefit analysis suggests that cost savings will result from reduced duplication of effort. This is due to a lower total number of validations being required, which lowers costs to manufacturers and utilities. Regulators are expected to benefit due to fewer staff being required at the national than state level (1.5 full time equivalent nationally compared to 3 full time equivalents in total across jurisdictions currently). In aggregate, the cost-benefit analysis estimated that:

- the net benefit to industry would be approximately $0.97m in NPV terms from reducing the number of validation studies
- the net benefit to regulators would be approximately $2.28m in NPV terms due to lower resourcing requirements
- this results in a net benefit of $3.25m in NPV terms.

Pooling knowledge

The cost-benefit analysis suggests the national pooling of expertise under the Framework would deliver cost savings due to more rigorous and accurate assessment of technology performance, which is likely to lead to reductions in the number or intensity of treatment barriers required (resulting in reduced capital or operational expenditure). This is estimated to:

- reduce the capital and operating cost of future recycled water schemes
- deliver net benefits of between $8m and $80m in NPV terms, depending on the size of future schemes.

The cost-benefit analysis suggests the size of the cost savings will depend on the size of the schemes and will differ between jurisdictions depending on their current approach to

validation. For example, in Victoria capital savings of between $32,000 per scheme for small schemes and $180,000 for medium sized schemes are expected to be possible under the Framework. Operating costs savings are estimated to be between $5,000 per annum for smaller schemes and $55,000 per annum for larger schemes. For NSW and South Australia the cost savings are expected to be much smaller due to the fact that they currently adopt a less conservative approach to the validation of technology.

The cost-benefit analysis suggested that net benefits from pooling knowledge are likely to be conservative for a number of reasons:

- The savings only relate to more accurate assessment of performance of MBR technologies in reducing protozoa. There are also potential cost savings from improved assessment of virus reduction performance for MBR technology.
- The savings assume that there is no opportunity to completely remove a treatment barrier, such as the UV barrier, only a 'downscaling' of its capacity. In practice there are likely to be opportunities to completely remove one treatment barrier.
- There are other technologies (not just MBR) where the current assessments may not reflect the actual pathogen removal performance of the plants. For example, the performance of multiple barriers in combination may be greater than that of the sum of the individual components. The Centre has already commissioned a separate study to investigate this issue.

Administration of the Framework

The cost benefit analysis estimated between 1.5 full time equivalent staff would be required under the Framework with remuneration costs equivalent to Australian Public Service EL1 level ($115 257pa). Setup costs such as the refurbishment of office space were estimated at approximately $22,500 based on space required for 1.5 permanent staff. This does not include an allocation of resources for the Rules Setting Group which based on administrative staffing costs of 1.5 FTE would need to be delivered in-kind.

Expected net benefits

Based on an estimated decrease in costs to regulators due to reduced approvals and administration effort, and reduced costs to industry and utilities from removing duplication of validation effort and reduced costs of total schemes, the cost-benefit analysis estimated total net benefits to be between $11m and $84m in NPV terms, depending on the capacity of future recycling schemes.

Summary

The cost-benefit analysis indicates positive net benefits from implementing this option. Costs of validation will be reduced for all stakeholders involved, technology costs and time taken to approve and implement future recycled water schemes will also be reduced. This option enables a scalable approach to administration of the Framework that is responsive to demand and minimises upfront and ongoing fixed costs, and will result in a range of other non-monetised benefits.

4.4.2 Option 3 – Wastewater plus stormwater, grey-water and groundwater, Framework delivered by existing organisation(s)

Option three increases the range of technologies and validation methods that fall under the scope of the Framework, but maintains an integrated institutional approach. This may result in additional benefits due to further reductions in duplication of effort for regulators and industry, should jurisdictions choose to require the use of validated technologies in a wider range of recycled water systems. Should this occur, the increased pooling of knowledge across a wider range of technologies and treatment types may also reduce costs through more accurate performance assessment of technology.

This option also has the potential benefit of increasing economies of scale. If a cost recovery model is pursued, the larger range of technologies involved spreads recovery of fixed costs across a larger number of validations and participants, thereby reducing per unit costs of validation.

Benefits

As with option one, the benefits of option three include all of the benefits of implementing the Framework, such as those described in sections 3.5 and 4.5, but in addition, option three:

- Is responsive to the needs and requirements of stakeholders
- Recognises where future growth in recycling may occur and facilitates that growth by putting efficient validation arrangements in place ahead of demand constraints
- May reduce the potential for duplication of effort across a wider range of technology and treatment types, leading to lower costs associated with developing and implementing a wider range of recycled water systems (for a range of stakeholders)
- May increase the benefits of pooling of knowledge at the national level by including more potential technologies, leading to more accurate assessments of treatment performance for a wider range of systems, and reduced total costs of those systems
- Provides increased economies of scale, including a larger base over which to recover framework administration costs if a cost recovery model is implemented
- Reduces costs of validation for industry due to larger base over which to recover fixed framework administration costs (assuming a cost recovery model is implemented), but also due to increasing the size of the market for validations

Costs

The same as those described under the assessment of option one, but with:

- Increased costs associated with developing and agreeing validation protocols for a wider range of treatment technologies
- Potentially increased administration costs if the volume of validations is significantly higher than under option one
- Higher variable costs associated with potentially higher number of validations

Summary

Option three is responsive to the needs of stakeholders and recognises the potential areas of future growth in recycling systems. This option may generate additional benefits due to inclusion of a wider range of treatment technologies and a wider base from which to recover the costs of operating the Framework. It maintains a flexible, scalable and responsive approach to implementation that does not preclude the creation of a new organisation to administer the Framework in the future if validation demand increases significantly.

4.5 Further benefits of a national validation Framework

Any implementation scenario will deliver the benefits of the Framework described in Section 3.5, with the extent of net benefits dependent on the scope of application and the organisational model. This section discusses a range of further benefits that result from the implementation of the Framework including as they accrue to the major stakeholders involved.

4.5.1 General benefits associated with the Framework

Key general benefits associated with implementation include:

- A process that meets the identified need, including:
  - Clarifying and harmonising scientific and regulatory approaches and requirements
  - Improving institutional arrangements and the efficiency of delivering public health, water and environment outcomes
  - Reducing financial and other costs to government, industry and the community
- A nationally consistent and agreed process that is transparent and independent
- Standardised protocols for validation methods and studies, default performance credits for technologies, and transparent recognition of existing validations
- Improved information and sharing of information
- confidence and assurance for governments, regulators and the community that water treatment systems can safely and effectively supply water fit for its intended purpose

4.5.2 The Australian Government

The Framework provides assurance and confidence to the Australian Government that public health, water and environmental objectives are being achieved, and are being achieved in a cost-effective, efficient and effective way.

The Framework increases the level of compliance with national guidelines invested in by the Australian Government, such as the Australian Guidelines for Water Recycling, and collects data and information that supports updating those guidelines.

The Framework also reduces regulatory burden and red tape, a key priority of the current Australian Government and of COAG.

The Framework would also ensure the effective and efficient validation of technology used in over 50 stormwater harvesting and reuse projects with approximately $650m worth of Australian Government investment.

The Framework also:

- Increases the potential for competition and innovation in the market for water treatment technologies
- Reduces the need for or level of subsidisation of recycling infrastructure
- Increases potential for economic activity and interstate trade
- Puts Australia on a more level footing with international counterparts, improving conditions for local investment and attracting more technologies to Australia

4.5.3 State and territory governments and regulators

The framework reduces duplication of effort amongst states and territories in managing validation processes and approvals of technologies and overall recycling schemes. It will free up resources within government departments and regulatory agencies that can be used to help deliver on other important public policy needs. It also helps facilitate improved health, water and environment outcomes by improving confidence in recycled water systems, reducing costs associated with implementing recycling schemes, and continuing to protect public health.

Specifically, the Framework will:

- Provide confidence to regulators about treatment technology and overall recycled water scheme performance
- Improving ability to deal with future challenges such as climate change and population growth
- Provide confidence and assurance that public health outcomes are being achieved
- Remove costs associated with assessing and approving validation studies
- Remove over engineering of recycled water schemes and reduce overall scheme costs
- Improve timeliness of scheme implementation
- Facilitate improved information sharing and coordination across jurisdictions, especially in relation to new technology, and benefit from wider range of skills and expertise through the national process
- Free up resources to apply to other policy areas
- Reduce expenditure in a challenging financial and budgetary environment
- Deliver on commitments to remove regulatory burden and red tape

4.5.4 Local government

Local governments will benefit primarily from reductions in the time and cost associated with technology development and scheme approval and implementation. The Framework will assist

local government in delivering integrated water management solutions as well as urban amenity, environmental, and water security outcomes by helping to ensure water recycling options do not face unnecessary barriers that prevent them from competing on equal economic footing to other solutions.

Specifically local governments benefit from:

- Improved ability to deal with future challenges such as climate change and population growth
- Clarity and consistency in regulatory requirements
- Reduced overall scheme cost and time taken to approve and implement schemes
- Improved timeliness of scheme implementation
- Having an 'off-the-shelf' listing of pre validated technologies with agreed performance to select from in designing schemes
- Making it easier and cheaper to design schemes with greater confidence in performance
- More innovative technologies being available
- Freeing up resources to apply to other public works areas

4.5.5 Technology proponents

The benefits for technology proponents mainly relate to decreased costs and time associated with developing new technologies and gaining approval for their use. This is achieved through:

- Clarity and consistency in regulatory requirements
- Reduced duplication of validation effort across multiple jurisdictions
- Removal of market fragmentation

The Framework also facilitates greater innovation by reducing costs of new technology development, which will benefit those proponents who successfully develop new technologies.

4.5.6 Scheme proponents

Scheme proponents will largely benefit from reductions in overall scheme costs and time taken to gain approval as well as greater confidence in approvals processes and use of wider range of pre-validated technology.

Specifically scheme proponents benefit from:

- Having an 'off-the-shelf' listing of validated technologies with agreed performance to select from in designing schemes
- Making it easier and cheaper to design schemes with greater confidence in performance
- More innovative technologies being available
- Reduced overall scheme cost and time taken to approve and implement schemes

- Increased confidence to develop scheme proposals and make investments in new schemes
- Greater government confidence in wider range of recycling options, leading to more opportunities for scheme proposals to be developed and implemented

4.5.7 The Australian community

The Australian community benefits from the assurance that the Validation framework provides to maintaining protection of public health, as well as improved water security and urban amenity and environmental outcomes associated with recycling.

Specifically, the Australian community benefits from:

- Wider range of water recycling options being available, and being more economically viable
- Increase competition and innovation
- Greater confidence in ability of wider range of water treatment technologies to supply fit for purpose water
- Greater service offerings from local water utilities
- Improved environmental outcomes
- More efficient and cost-effective use of public resources (or avoidance of public expenditure if cost-recovery model is implemented)

4.5.8 Consultation

Government and regulatory stakeholders confirmed the knowledge, skills and capacity benefits of the Framework, including it providing a knowledge hub for best practice management of water recycling, and that it would provide data and information to support the Australian Guidelines for Water Recycling. They also confirmed the cost-benefit analysis assumptions about the potential to remove treatment barriers due to pooling of knowledge at the national level.

Consultations confirmed that the Framework would help provide assurance and confidence to governments and regulators, including creating confidence in reclaimed water of all forms if its scope was extended. It was also suggested that an increased scope would be beneficial regardless of regulatory arrangements as it would assist in appropriate selection of technology.

Some jurisdictions with fewer resources available for validation confirmed the Framework's protocols would be very beneficial as they have previously relied on other states' guidelines or protocols.

Consultation confirmed the view of government stakeholders that the Framework is consistent with many governments' policies to reduce red tape and regulatory burden, and some states see their current reviews of regulatory arrangements for recycling as an opportune time to bring forward the Framework. Industry stakeholders also confirmed the proposal as helping to reduce regulatory burden by decreasing confusion and uncertainty and duplicative requirements.

Industry based stakeholders suggested the Framework would provide clarity and this should assist in reducing approval times, and also suggested that the Framework would provide credibility to Australian industry.

Scheme proponents suggested there would be significant benefit in having 'off-the-shelf' technologies, and that the Framework would enhance adoption of newer more efficient and effective technologies and avoid time and cost of validating new technologies when upgrading or replacing technology.

It was also suggested that there would be benefits to local government, regional utilities and smaller operators from information and guidance provided through the framework and database of technologies, and it would increase local governments' confidence when purchasing treatment technology.

Some technology proponents suggested the Framework would be of benefit to smaller operators for whom a confusing regulatory environment is a threshold barrier to participation.

Stakeholders also confirmed the broader benefits of the Framework to the Australian economy and community, including the benefits of increased competition and innovation. It was also suggested that the Framework would be valuable for remote communities in helping them understand what technologies are available and what they are capable of.

4.6 Conclusion and recommendations

Implementation of the Framework is expected to deliver a range of benefits for all stakeholders involved in validation of water treatment technologies, as well as the Australian community more broadly. The Framework will help address a range of problems and inefficiencies, such as inconsistency and confusion in requirements, duplication of effort, and higher than necessary costs. In doing so, the Framework will contribute to public health, environment and water management outcomes.

Four options for the implementation of the Framework have been presented. Option one limits the scope of the Framework to high exposure wastewater treatment schemes and uses existing organisations to support implementation. Option two uses the same scope but establishes new organisation(s). Option three expands the scope to include stormwater, grey-water, groundwater and decentralised systems while using existing organisation(s). Finally, Option four expands the scope to include all water treatment systems (including drinking water) and establishes new organisation(s).

The cost-benefit analysis undertaken independently of this business case identified net benefits from the implementation of Option one. These benefits are expected to be between $11m and $84m, resulting from reduced costs due to removal of duplication, and more accurate assessment of treatment technology performance leading to lower capital and operating costs.

These benefits are recognised by stakeholders, and applying the Framework to high exposure wastewater treatment schemes while utilising existing organisations to deliver it has their support. However, stakeholders recognise benefits beyond application to high exposure wastewater treatment schemes, and strongly support broadening the scope to include stormwater, grey-water, groundwater and decentralised systems. Consultations suggested that these areas are experiencing the most growth, and present the greater challenge for regulators. Stakeholders suggested that limiting the Framework to high exposure wastewater schemes may unnecessarily limit the benefits of the Framework.

However, quantitative analysis was not undertaken to consider the net economic benefits of a wider scope of application, so while Option three has the strong support of stakeholders, the additional economic costs and benefits that might result from an expansion of scope have not been quantified. In practice, the scope of the Framework will in large part be determined by the Rule Setting Group developing and agreeing water treatment technology guidelines and protocols for different applications. Given this, the implementation of Option one, with its strong economic benefits and stakeholder support, does not preclude either an immediate or staged transition to a wider scope of application. The Rule Setting Group would be well placed to make recommendations on the timing and feasibility of developing guidelines and protocols for different applications.

4.6.1 Recommendation

In light of the conclusion above, it is recommended that Option one be implemented, with immediate consideration given to priorities for developing a wider range of validation protocols including for stormwater, grey water, groundwater and decentralised systems.

4.6.2 Notes on broadening of scope

Given the flexibility of the Framework, the pursuit of any of the options described in this section does not preclude the Framework from being expanded further in the future. The key issues related to expanding scope include:

- Developing validation protocols for a wider range or water treatment technologies for use in a wider range of water treatment systems
- The costs of developing those protocols, and the impacts on industry and the Framework administrator of having a wider range of water treatment systems included under the Framework

While states and territories would still determine regulatory requirements (including which types of water treatment systems require the use of validated technology) there may be benefits in eventually including all forms of water treatment technologies under the Framework, regardless of the regulatory requirements.

The increase in scope would improve economies of scale and contribute to the Framework's viability and longevity given the variable nature of validation demand for different types of water treatment systems (for example, demand for recycling technologies may be lower during wetter climatic periods but drinking water or other water treatment system demand may follow different demand patterns). The increase in scope would also contribute to brand value and provide assurance and confidence and a range of other benefits across a wider range of treatment types.

In the United States, the Californian EPA validates both drinking water and recycled water technologies, and further consideration of this example may be instructive in considering future broadening of scope.

4.7 Summary

This section has discussed options for implementation of the Framework, including different scope and organisational arrangements. A preferred option has been selected based on the costs and benefits of that approach in addition to stakeholder needs. While this option is

preferred, specific matters related to implementation need to be resolved. The following section discusses approaches to implementing the new Framework entities (the Rule Setting Group, framework administrator, certification body and database manager), as well as proposed modifications to some aspects of the Framework to facilitate implementation.

5 Implementation strategy

This section provides high level guidance on implementation of the Framework, based on the preferred Option Three. It includes points raised during consultation, as implementation was a key focus for many stakeholders who accepted the need for the Framework but wished to see or discuss more detail regarding implementation.

This section outlines some minor modifications to the approach to the Framework proposed during Phase one development of the Framework (see Muston and Halliwell 2011) consistent with the preferred option. Also noted here are a range of matters to be resolved through a more detailed implementation plan, business plan, or through the initial work of the RSG and Framework Administrator, pending a decision by an appropriate decision making body to implement the Framework.

5.1 New functions under the Framework

5.1.1 Framework administrator

The Framework Administrator's role is to coordinate management and operation of the Framework, including: coordinating the Rule Setting Group; managing the approval and updating of validation protocols; and administrative and coordination activities associated with other aspects of the Framework such as certification and the database of validated technologies.

Modifications from the draft Framework approach

Under Phase one development of the Framework, the certification body and database manager aspects were indicated as possibly separate entities to the Framework Administrator. Under the proposed approach, these functions would initially be delivered by the Framework Administrator. This is because the total number of validated technologies, or new validations per year, is not expected to be sufficiently high to warrant delivering these functions separately and there are efficiencies gained from housing these functions together. The need to deliver these functions via separate entities could be considered in the future, pending growth in demand for validation.

Consultation

There were a number of discussions about the most appropriate home for the Framework (i.e. the Framework Administrator) with general acceptance that there are a limited number of appropriate existing organisations at the national level.

It was suggested that the Commonwealth would need to recognise the Framework and take on a leadership role, and for the Framework to be credible it would need to be housed in a government agency – industry certification was not considered appropriate by most regulators.

Many discussions on Framework administration led to discussion of the role of Department of Sustainability, Environment Water Population and Communities (DSEWPaC), including their role in managing the National Water Quality Management Strategy (NWQMS) which houses the Australian Guidelines for Water Recycling (AGWR) and Australian Drinking Water Guidelines (AGWR).

Many stakeholders thought that given the synergies between the Framework, the AGWR, and water quality more generally, that the NWQMS was the logical home for the Framework. It was also suggested by a number of stakeholders that the current review of the NWQMS being led by DSEWPaC would present an important opportunity to integrate the Framework under new arrangements for management of the NWQMS.

Discussions with DSEWPaC representatives suggested that while there is alignment between the Framework and the NWQMS and AGWR, various matters related to decision making, governance and cost-sharing or recovery would need to be resolved to progress any proposal for new functions under the NWQMS. While DSEWPaC representatives were not dismissive of supporting the Framework, they indicated that any proposals would need the support of a newly formed water quality sub group that sits under the Water Thematic Oversight Group.

There was universal interest from regulators and government agencies in recovering the costs of establishing and operating the Framework. An approach where costs were recovered from industry was generally preferred, and noted as being critical for implementation of the Framework. As a next step, stakeholders wanted to see the detail of how the cost recovery model would work in practice, including the fee structure, the service or product being provided to participants, estimates of revenue from validations, and estimates of cash and in-kind resources required from states. It was suggested that a business plan be developed to help determine revenue projections, and that this should be reviewed it over time.

Proposed approach

Based on the cost-benefit analysis estimate of 1.5 staff being required to administer the Framework, it is proposes that 1.5 full time equivalent staff be initially allocated to deliver the Framework Administrator function under the broader management of the NWQMS. The NWQMS includes the AGWR and the ADWG, and other national level water quality management guidelines[24]. There are important synergies between the NWQMS and the Framework given the AGWR requirement for validation to be undertaken. In addition, the NWQMS is currently under strategic review[25] which presents an opportunity to consider if the Framework could be integrated into the management of the NWQMS. This approach will depend on the scope of future NWQMS arrangements determined by the WTOG, but if the approach is supported, it is logical that the additional staff resources would reside in the area currently managing the NWQMS. This role is currently delivered by DSEWPaC. Alternatives to this proposed approach are discussed in Section 5.3.

Matters to be resolved

Implementation of this approach would require the in principle support of the water-quality sub-group under the COAG Water Thematic Oversight Group. Through this process, state and territory governments and the Australian Government would need to agree that: DSEWPaC is an appropriate organisation in which to accommodate the required staff; and that the Framework should be managed under the NWQMS.

How the costs of administering the framework will be met still needs to be resolved. It is proposed that these costs would be met through either:

[24] See http://www.environment.gov.au/water/policy-programs/nwqms/

[25] See http://www.environment.gov.au/water/publications/quality/water-quality-final-report.html

- a cost recovery model from industry, collected through application fees for technologies to be assessed and included on the national database; or
- contributions made by state and territory governments through a COAG split or similar cost sharing model, recognising the benefits that states and territories receive from the Framework including mitigating the need to undertake validation at the state level. If this option was pursued, a decision would need to be made by the Senior Officials Committee of the Standing Council on Environment and Water.

As is discussed under Section 5.6.1 below, an appropriate monitoring and review process needs to be put in place to determine if the Framework is meeting its objectives, and if administrative functions are being delivered effectively. This would include consideration of whether the level of resourcing is adequate. Increasing demand for validations may mean that resource allocations need to be increased in the future.

The Framework Administrator would also need to be established in advance of the Framework becoming operational. This would ensure that: existing validation protocols could be confirmed and made ready for use; the national database could be built and tested and existing validations loaded onto it ready for use; and other administrative arrangements could be put in place, including criteria for and listings of independent assessors and certifiers. This may require 6 to 12 months of operations prior to the first new validation, which would have implications for cost recovery, and may necessitate seed funding to meet start-up costs.

5.1.2 Rule setting group

The Rule Setting Group (RSG) would be convened by the Framework Administrator, and would notionally include representatives of state and territory regulatory agencies in addition to utility and technology supplier representatives and technical specialists.

Modifications from the draft Framework approach

There are no proposed modifications to the approach proposed under Phase one development of the Framework.

Consultation

There was widespread interest in the Rule Setting Group (RSG) amongst stakeholders, and jurisdictions all expressed a desire to be involved in the group.

Government and regulatory stakeholders felt the right representatives would be necessary to ensure the RSG would work effectively, including achieving agreement on rule setting, but were confident that this would be possible. Stakeholders suggested the RSG must include regulators, but that it should also include input and advice from the manufacturing and research sectors.

Some concerns were raised about how resource intensive the RSG may be, citing the example of challenges in updating other national guidelines such as the AGWR. The majority of stakeholders did not see a problem with in-kind resourcing for guideline development and suggested it should be feasible. Some stakeholders noted that there is evidence of established in-kind support for national water-quality related processes, such as NHMRC's Water Quality Advisory Committee and the National Recycled Water Regulators forum, that have been successful and self-sustaining. However, it was noted that protocol development may require more resources and expertise than could be contributed in-kind from the jurisdictions. The

general consensus regarding resourcing included: providing the RSG with seed funding to deal with initial workload; rules setting being delivered in-kind from then on; and protocol development, testing and certification being outsourced, with costs recovered through validation fees.

There was also significant interest in the Terms of Reference for the RSG, with the request that these be developed as a next step, including membership, roles, responsibilities and lines of reporting and accountability. It was generally agreed that the RSG should come under or be linked to a Ministerial Council or COAG, to engender confidence in the oversight and governance arrangements.

Proposed approach

The proposed approach is to establish the Framework Administrator prior to the Rule Setting Group. This would allow the administrator to resolve a number of matters related to implementation of the RSG outlined below, before the Framework becomes operational. The RSG is an integral part of the Framework's operation and the matters outlined below would need to be resolved well in advance the Framework commencing operation. Governance, membership and resourcing arrangements for the RSG may need to be determined at a senior national level such as the Water Thematic Oversight Group or its newly formed water-quality sub-group.

Matters to be resolved

Further matters that need to be resolved as part of a detailed implementation plan, or by the Framework Administrator once it is established, include:

- The RSG terms of reference, governance arrangements, and specific membership
- RSG meeting frequency, initial agenda and priority tasks (such as which validation protocols may need to be prioritised)
- How the RSG is resourced:
  - Consultations have noted the limitations of in-kind arrangements such as those used to assist in development of the ADWG. If a cost recovery model from industry is pursued this would present an opportunity to meet the costs of RSG operations, but seed funding may still be required.
  - Resourcing for protocol development also needs to be resolved. The RSG members are likely to outsource protocol development to the scientific community or consultants. Some protocols are currently being developed by the Centre, but further consideration is needed to determine how protocol development is funded in future. Again, an industry cost-recovery model could contribute to meeting these costs.

5.1.3 Independent assessors[26]

Under the draft Framework, independent assessors are proposed to review and/or prepare validation study designs and endorse the validation studies undertaken. Independent assessors are to be provided by the private sector and not resourced publically, although consideration needs to be given to how they are engaged and funded to undertake validation study reviews on behalf of the Framework Administrator. Independent assessors already exist in some jurisdictions and provide services in relation to state and territory based validation processes. These assessors could continue operating under the Framework subject to meeting criteria for approval, but with services being provided to industry and the national Framework administrator rather than state or territory agencies (although the Framework would not preclude assessors from working for state agencies on other matters).

Modifications from the draft Framework approach

The proposed approach does not involve significant modifications from the approach proposed under Phase one development of the Framework, although there are a number of matters to be resolved to ensure the independence of the assessors and clarify how the framework administrator and industry engages them.

Consultation

Consultation suggested that potential or actual conflicts of interest need to be dealt with effectively, including how independent assessors are engaged by both the Framework administrator and by technology proponents while still ensuring their independence and rigour in reviewing validation studies prepared by proponents. Because Independent Assessors can be engaged on both sides of the validation 'transaction', these are important issues to address.

It was suggested that the RSG could consider what the requirements of Independent Assessors should be (e.g. criteria for participation in the Framework) and that these requirements, along with the list of assessors, be endorsed by the Water Thematic Oversight Group to provide standing.

It was also suggested that wherever possible, existing regulatory arrangements to ensure the standard of assessors should be utilised rather than creating new arrangements, such as potentially utilising JAS-ANZ or similar accreditation schemes.

Proposed approach

A listing of accepted Independent Assessors would be maintained by the Framework Administrator. The Rule Setting Group would determine the criteria the Independent Assessors would need to meet to be accepted on the listing, which could be maintained in a similar fashion to expert consultancy panels maintained by Australian Government agencies. However, in this case, the listing would need to be available for use by both the Framework Administrator and scheme or technology proponents. Industry would select from the listing to engage Independent Assessors to assist them in designing validation studies. The assessors

[26] Independent assessors already operate in some jurisdictions with broadly similar roles to that proposed under the Framework, but given the significance of their national role under the Framework they have been presented as 'new' functions here.

would be engaged by the Framework Administrator to review the validation studies prepared and submitted for approval by proponents against the protocols approved by the RSG and issued by the administrator.

Matters to be resolved

The governance arrangement for Independent Assessors is an important issue given the different roles they play under the Framework. There are examples in other industries that may be instructive (e.g. approved lists of Auditors), but governance arrangements need to be explored through a more detailed implementation plan and specified in operational documentation. Specific matters that need to be addressed include:

- The criteria the Independent Assessors have to meet to be included on a panel or listing
- How the assessors are selected and remunerated for the different roles they are proposed to undertake
- How costs for validation study reviews are recovered while maintaining independence and avoiding conflict of interest
- How to ensure adequate competition in the market for assessors while maintaining independence and high standards of work

5.1.4 Certification body

Phase one development of the Framework suggested a certification body provide certification of the validation study to the proponent and for access by state and territory regulators. This is intended to assure both the proponent and regulator that the technology in question has been validated. The operation of the certification body is one area where minor modifications are proposed, however, the proposed approach ensures the intended outcomes of certification can still to be achieved.

Modifications from the draft Framework approach

Phase one development of the Framework suggested the role of the certification body is to assess validation reports and provide proponents with validation certifications. However, certification schemes require a large number of products to be viable[27], and based on the relatively modest number of pre-existing and future technologies anticipated to be validated under the Framework, a large scale certification scheme cannot be justified at this time.

As states and territories maintain ultimate regulatory control over recycled water scheme and treatment system approvals, the Framework cannot absolutely guarantee proponents that states will accept the technology for use. What it can do is provide assurance to proponents that the technology has been validated against the national protocols, which are ultimately approved by states and territories (via the RSG). In addition to requiring a large number of

[27] For example, Food Safety Australia New Zealand administers over 2,000 different food products with 170 full time and 22 part time staff and annual expenditure of $22m. NICNAS regulates over 40,000 different chemicals with 69 staff and $9m in annual expenditure, and the Therapeutic Goods Administration administers 70,000 different therapeutic goods.

products, for a national certification scheme to be workable and effective it would require this ultimate approval to be made at the national level and for the certification scheme to have national legislative and regulatory backing.

Consultation

Consultations confirmed that some form of documented assurance to both proponents and regulators confirming (or not confirming) validation of a technology was absolutely required, but agreed that based on the volume of throughput a large scale certification scheme could not be justified.

Consultation also included discussions on the way costs of certification could be recovered, such as through application fees plus ongoing licence fees to smooth revenue and pay for brand value. It was suggested that the products certification provides brand value and could justify licencing fees, and that certification could be reviewed at intervals and fees sought for re certification.

As noted above, it was suggested that start-up funding would most likely be required prior to revenue being generated through any fees for certification.

Proposed approach

The proposed approach involves the certification body function being absorbed by the Framework Administrator, and delivered by the proposed 1.5 FTE staffing load.

Under the Framework, the administrator would engage Independent Assessors to assess submitted validation reports prepared by proponents (or consultants on their behalf) against the national validation protocols.

The results of those assessments would be provided to the certification 'body' – in this case, an entity within the Framework Administrator – for confirmation that both the validation study had been completed in accordance with requirements, and that the study had demonstrated the technology had achieved validation. The certification body would then issue a statement to the proponent that the technology had been validated against the national protocol (subject to appropriate operational or environmental conditions)[28]. Following this, the Framework Administrator would load the information on the validated technology onto the database and website.

This approach would still provide proponents with recognition that their technologies had been successfully validated against the national protocols, but mitigate any risk that proponents could challenge decisions made by state and territory regulators not to allow use of a validated technology for other reasons. It also mitigates the significant costs associated with large scale certification schemes.

Matters to be resolved

A key matter related for certification is the form and wording of the statement to proponents that their technology has been validated against a national protocol. This could be resolved through a more detailed implementation plan or as an initial activity of the Framework Administrator and RSG.

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[28] The proponent would use the statement to include for project proposals, scheme design, and marketing purposes, including confirming validation with state and territory regulators.

The statement needs to demonstrate to proponents that validation under the national scheme is valuable, and provide assurance that state and territory regulators would recognise and approve use of the validated technology in most cases[29]. But it cannot explicitly or implicitly guarantee that state and territory regulators will approve use of the technology in all circumstances, as this is ultimately a decision made by those regulators. The system used in California may be instructive in this regard as it provides a statement to proponents similar to that described here.

5.1.5 Database manager

Under Phase one development of the Framework, the anticipated scale of database operations and management appears to have been higher than that required based on the anticipated volume of existing and new technologies validated. As a result, some descaling of the approach to the database is proposed.

Modifications from the draft Framework approach

Phase one suggested outsourcing of database functions, potentially to agencies already involved in water related data management such as the Bureau of Meteorology, but with the Framework Administrator still maintaining oversight.

Such an approach assumes significant technical requirements of the database and significant scale, neither of which is anticipated based on the number of pre-existing validations and future validations established through the cost-benefit analysis.

Consultation

Consultations indicated widespread support for the national database, and there was general agreement on it being central to the operation of the Framework. Most stakeholders agreed that the database need not be an expensive nor highly customised piece of infrastructure, suggesting it had a small number of key functions that could be achieved at low cost. Most stakeholders agreed this could be achieved through a small Microsoft Access or Excel database, as long as it provided sufficient functionality and did not preclude the database growing significantly in the future if demand warranted it.

There was widespread agreement on the need to provide different levels of access to information held in the database, including securing commercially sensitive data from being viewed by competing technology providers while ensuring regulators have access to sufficiently detailed validation data. Stakeholders agreed a high degree of external functionality, such as comprehensive web based functionality, was unlikely to be required, but warranted further discussion with stakeholders about their needs during implementation. Stakeholders agreed that public internet presence outlining and promoting the Framework and its operation, including all protocols and approval processes was necessary but a separate matter to the database itself.

[29] That is, in most of the cases where the technology is proposed to be used consistent with the operational or environmental requirements of its validation

Proposed approach

The proposed approach involves construction of a smaller scale database (such as a Microsoft Excel or Access database) to be developed in house by the Framework Administrator (such as through DSEWPaC's internal IT capacity) or outsourced to a consultant at low cost.

The database only need contain: a listing of validated technologies; the conditions for their validation; data relating to the validation study, including the validation report; and the statement of validation. These are not significant technical requirements, and public internet access to certain information (such information on the Framework, protocol development, and limited access to non-sensitive information included in the database) could easily be built within existing Australian Government information technology infrastructure.

Construction of a smaller scale Access or Excel database in the near term does not preclude the database being migrated to a larger scale more technically sophisticated system in the future if the volume of technologies validated increases significantly, or greater functionality is required.

Matters to be resolved

A more detailed implementation plan would be the appropriate place to resolve detailed matters related to the database, including:

- The specific content requirements of the database, the users who will need to access the database, and their functionality and information needs
- The different levels of access and security for different users
- The internal capacity and capability of the Framework Administrator's organisation to develop and/or deliver the database
- Resources available to outsource construction of the database if development by a consultant was the preferred option
- Where the database will be hosted and who will provide ongoing IT support
- Which technologies already validated by state regulators will be grandfathered to the national scheme and included on the database, and when and how this will happen.

5.2 Existing entities under the Framework

5.2.1 Analytical capability

The Framework includes the use of analytical capability (such as laboratories) to undertake validation testing for technologies. These facilities already exist, but Phase one development of the Framework proposed to place additional registration requirements on analytical facilities, including collection of registration fees to manage a listing of certified facilities for proponents to access.

Modifications from the draft Framework approach

Modifications to the approach proposed in Phase one includes not placing additional requirements on analytical facilities, and not requiring registration of facilities nor the

collection of fees from facilities for this registration. Analytical facilities (such as laboratories) are regulated under other regulatory frameworks and so it is difficult to justify additional constraints on laboratories or analytical facilities in this regard. It is proposed that rather than additional requirements being put in place, that existing regulatory or other requirements are leveraged through validation protocols. It is proposed that technology proponents be free to choose the laboratories that they engage to undertake testing, subject to meeting any specific testing requirements specified in a validation protocol (which may include use of particular types of laboratories for specific types of validation studies or tests).

Consultation

It was suggested that wherever possible, the Framework should leverage off existing regulatory frameworks to minimise costs associated with implementing and running the Framework. Suggestions were made to use existing frameworks such as JAS-ANZ for independent assessors and NATA for laboratories.

It was also suggested that protocols developed under the Framework should require proponents to meet other existing regulations or standards if required, rather than recreating duplicative regulatory type approaches under the Framework.

Proposed approach

Validation protocols should specify that testing needs to be undertaken in accordance with whatever conditions are required for validating a particular type or group of technologies. If a protocol has specific testing requirements such as the type of analytical facilities that need to be used, then they should be specified there. For example, a protocol may include the requirement that a type of validation test must be undertaken at an analytical facility that has been approved under another regulatory scheme, such as NATA, or alternatively all validation protocols may specify this requirement. If the proponent does not undertake testing in accordance with these requirements then the validation study would not be endorsed by an Independent Assessor nor accepted for review by the Framework Administrator.

This would achieve the same outcome as that proposed under Phase one development of the Framework, but at lower total cost. It also enables a flexible approach that is responsive to the needs of particular technologies (because protocols can be revised and change the analytical facility requirements under them), and allows other regulatory mechanisms for laboratories to perform their existing functions without any duplication due to the validation Framework. It also avoids any potential competition issues as the Framework does not indicate preferred facilities, it simply specifies outcome requirements.

Matters to be resolved

The specific analytical requirements under validation protocols are a matter best resolved by the Rule Setting Group. Matters that should be resolved include:

- The default, or baseline analytical, testing or laboratory requirements to be specified in all validation protocols (e.g. all testing to be done in NATA accredited laboratories)
- The specific analytical requirements of each validation protocol (e.g. a specific testing capability for validating certain technologies)

5.2.2 Research & specialists

Development of the Framework under Phase 1 proposed to draw on research and specialists to support protocol development and other aspects of the Framework on an as needs basis. No modifications are proposed to this approach, and the Rule Setting Group and Framework Administrator should be free to draw on the skills and expertise of research and specialists on an as needs basis subject to available funding and other resources.

5.2.3 Proponents

Section 3 outlines the changes in validation process that will occur if the Framework is implemented, which includes various changes to the way scheme and technology proponents demonstrate validation of their technologies. No changes are proposed regarding how scheme or technology proponents would operate under the Framework, although further work is required to determine if a cost-recovery model is feasible, including consideration of its operation and impact on proponents.

Another issue that may need to be addressed in relation to proponents is the need to educate them about the changes in validation processes under the Framework. This could be an initial activity for the Framework Administrator who could undertake an education, information and marketing campaign for industry.

During consultations, marketing was raised as an important aspect of driving uptake and participation in the Framework – it was suggested that a marketing plan be developed and to leverage off water industry and other networks to help promote it.

5.2.4 State and territory regulators

Section 3 also outlines how the Framework will change validation processes for state and territory regulators. States and territories will continue to maintain regulatory responsibility for total recycled water scheme and water treatment system approvals. They will draw on the national database to establish which technologies have been validated and will no longer undertake state or territory specific validations of treatment technologies included within the scope of the Framework.

States and territories will need to participate in the Rule Setting Group and will play a key decision making role in regard to validation protocols to be adopted at the national level and used by the Framework. The new arrangements are expected to result in a net decrease in costs of validation for states and territories, but cost sharing and/or recovery of the national Framework's operational costs still needs to be determined, as does resourcing the involvement of the Rule Setting Group participants.

5.3 Risk analysis and management

The following table provides a high level risk assessment related to implementation and operation of the Framework consistent with option three.

Table 8. Risk analysis and management

Risk	Management
Inability to engage appropriate decision making body and confirm implementation of the Framework	Consultation with the view of partnership with stakeholders in state and territories to assist with engagement and representation with decision making body.
Ongoing confusion regarding the scope or operation of the Framework	Develop clear presentation materials explaining the scope and operation of the Framework. Present the results of the final business case to key stakeholders, along with detail of the cost recovery model. Produce clear briefing material for stakeholders, including material suitable for Ministerial briefing.
Cannot find an appropriate home for the Framework administration functions	Consultation with potential Framework administration hosts to determine their expectations, requirements and resources. Ensure effective and collaborative engagement with DSEWPaC throughout development of next steps. Consider feasibility of alternative hosts for administration functions, including: • State or territory agencies or regulators • Standalone organisation • Standards Australia • National Water Commission • National Health and Medical Research Council • Australian Water Recycling Centre of Excellence • Bureau of Meteorology • Department of Health and Ageing
Start-up funds are difficult to secure	Clearly articulate the benefits of the framework including outcomes of the business case to potential funding bodies. Discuss potential for contributions to start-up funding with states and territories. Discuss the possibility of seed funding with the Australian Water Recycling Centre of Excellence. Develop detailed implementation plan, including development of a cost-sharing model, which details the fee structure, the service or product being provided to participants, estimates of revenue from validations, and estimates of cash and in-kind resources required from states.

Risk	Management
Inability to agree on validation protocols	Establish clear roles and responsibilities for the RSG. Including terms of reference, membership commitments and governance arrangements. Governance arrangements for RSG should include process for determining validation protocols, including management of divergent view and disagreements. Ensure the RSG has sufficient resourcing.
Cost sharing or cost-recovery model cannot be agreed	Develop detailed implementation plan, including development of a cost-sharing model that has industry and government support before putting to decision making body. Undertake consultation during development of the model. Engage a third party to assist with facilitation, advocacy consultation and/or negotiation.
Perception by proponents that existing schemes were approved under more (or less) conservative protocols prior to Framework implementation	Develop detailed implementation plan with consultation with states and territories, and existing scheme proponents. Ensure all stakeholders are actively involved in the RSG. Encourage jurisdictions to incorporate 5 or 10 year reviews of existing approvals into their validation requirements.
Perception that a national Framework removes ability of states and territories to regulate schemes effectively	Ensure states and territories are engaged regarding implementation and the scope of the Framework. Ensure states and territories understand that they will continue to maintain regulatory responsibility for total recycled water scheme and water treatment system approvals.
Risk that staff working on Framework administration do not have sufficient subject matter expertise, and/or transience of staff impacts on framework delivery.	Place the framework administration role in an organisation with some familiarity with water quality issues. Ensure the administration and governance arrangements are robust, and functions are well defined so that they can be maintained even in the presence of transience. Ensure the RSG are responsible for making decisions related to technical matters and protocol development is outsourced where necessary. Develop an effective business plan to manage these issues.
Machinery of Government changes impact on implementation of the Framework	Ensure adequate planning is put in place, including realistically estimating required timeframes. Ensure briefing materials are effective and clearly demonstrate the benefits of the Framework, and the timeframes and path critical elements for implementation.

Risk	Management
The Water Thematic Oversight Group does not support implementation	Undertake additional advocacy consultation to present the results of the business case to WTOG representatives and gain a better understanding of any concerns or needs they may have in relation to implementation. Develop Q&A's and back pocket brief for WTOG and DSEWPaC around potential points of risk or concern.
Resources not available to complete detailed implementation work	Discuss the potential for funding with the Centre. Discuss with states and territories and the Commonwealth. Discuss with industry representative bodies.
The RSG are insufficiently resourced to develop protocols in a timely fashion	Undertake detailed implementation planning including developing cost-sharing or recovery models that can sufficiently resource protocol development. Develop priorities for protocols based on needs of states and territories and projections for future validation demand. Prioritise protocols for accepting existing validations (eg those done overseas) which may take less time and resources to review and implement.
Existing and large scale technology providers may gain a 'first-movers' advantage on the national database	Under existing arrangements there is already an entrenched advantage for validated technologies. With implementation of the Framework and an efficient and equitable cost-recovery model, competition will increase due to decreased validation costs. A detailed implementation plan should however address the specifics of the cost-recovery model to ensure it is not discriminatory or anti-competitive.
Flood of applications to place technologies on the database swamps the framework administrator and results in delays or other problems	Prepare detailed implementation plan that addresses this issue. Include staged implementation, such as ordering groups or types of technologies that will be placed on the database over time. Communicate these plans to stakeholders and industry.
RSG does not result in the 'right' membership – ie people with the right technical expertise.	Ensure a collaborative and consultative approach to developing the detailed implementation plan, and the terms of reference and membership of the RSG. Ensure consultations with existing experts on validation in states and territories and consult the project steering committee and the Centre.

5.4 Funding and cost sharing arrangements

The major cost components that would accrue to those implementing the Framework include:

- Staffing and operational costs such as office space and equipment associated with the Framework Administrator
- Validation protocol development
- Participation of Rule Setting Group members (either in-kind or remunerated)
- Database development, hosting and management
- Reviewing validation studies[30]

Two main approaches to ongoing funding for these costs include:

- Cost-sharing between the Australian and state and territory governments
  - This approach would socialise the costs of the Framework, which may be justified on the basis of the range of public benefits that result from the Framework, but may be difficult to gain support for given current budgetary and economic challenges.
  - Further work would be required to determine the proportional contributions given there is likely to be an uneven distribution of benefits to states and territories from implementing the Framework (some states are likely to implement more recycling schemes than others, thereby benefiting more from the national scheme than others).
- Cost-recovery from industry
  - This approach could include application fees (and/or ongoing licensing fees) being collected from proponents wishing to have their technologies validated and included on the national database, with these costs constructed in such a way as to cover all the costs of running the Framework. However, fees would need to be constructed in such a way that it did not create a barrier to participation and suppress competition and innovation and ensure sufficient revenue given the variable nature of validation demand.

Consultations with state and territory representatives suggest that a cost-recovery model from industry would be the preferred option; however, development of such a model was outside the scope of this business case.

If a cost-recovery model is implemented, start-up costs may not be covered, or may not be covered for some time after they are incurred due to delayed revenue from applications.

Start-up funds may be needed for the first 6 to 12 months of the administrator's operation in order to undertake priority tasks to bring the Framework into operation. These costs could potentially be recovered by application fees collected over time, or could be met through other funding sources (such as cash contributions by states and territories, or grants) with future validations only covering the ongoing costs of managing the Framework from its operational start date.

[30] These reviews are proposed to be undertaken by the private sector (by Independent Assessors) but depending on the cost-recovery or cost-sharing model, review costs could be borne by the administrator or by industry.

Due to the variable nature of demand for validations careful consideration would need to be given to the cost-recovery model to ensure the Framework remains viable over time.

5.5 Priority activities

Priority activities for the Framework Administrator to undertake before the Framework could become operation include:

- Establishing the RSG including Terms of Reference, membership and governance arrangements
- Determining the priority validation protocols and agreeing a timeline for subsequent protocols (including the relative priority of broader protocols such as stormwater)
- Agreeing and establishing the validation protocols
- Establishing the database
- Transferring existing validations onto the national database
- Establishing the list of independent assessors
- Establishing the form of the validation statement (or certification statement)

Further consideration of these priority activities, including their sequencing and timing, should be the subject of a more detailed implementation plan.

5.6 Other implementation and operation matters

5.6.1 Monitoring and review

To ensure appropriate information is available upon which to assess the effectiveness of the Framework in delivering on its objectives, a monitoring and review process should be developed and implemented. While this is beyond the scope of this business case, key aspects to monitor once the Framework becomes operational might include:

- Demand for validations and volume of validations undertaken
- Growth in new technologies
- Ability to develop and agree protocols in timely fashion
- Capacity of the Rule Setting Group including adequacy of resourcing
- Sufficiency of overall resourcing for Framework delivery, including staffing levels
- Effectiveness of any cost-recovery model in meeting costs but not creating a barrier to entry for new technologies
- Feedback from industry on their participation in the Framework
- Data or information against risks identified in a risk management or project management plan

A detailed monitoring and review plan should be developed and implemented by the Framework Administrator prior to the Framework becoming operational. An interim review of the Framework should occur at around 12 months after implementation and a major review at around 2 or 3 years after commencement.

5.6.2 Skills and capability

Further consideration may be necessary on the extent to which technical skills are required within the Framework Administrator. The approach the RSG take to making technical and scientific decisions may impact on the level of scientific knowledge required by the Administrator. This is a matter that could be further explored in an implementation plan.

5.7 Next steps

The recommended next steps to progress implementation of the Framework are:

1. The Centre should meet with DSEWPaC to discuss the final business case and the preferred approach to the Water Quality Sub Group (WQSG) or Water Thematic Oversight Group (WTOG), including the preparation of a paper for consideration.
2. The Centre should work with DSEWPaC to assist in the preparation of a paper to the WQSG or WTOG, which would aim to gain in principle support for the implementation of the Framework subject to development and agreement of a detailed implementation plan, including a cost-sharing or cost-recovery model and business plan.
3. If agreed, the Centre should prepare or assist in preparing supporting material for the paper, including Q&A's on the Framework, a further description or summary of work to be completed, and a back pocket brief.
4. Targeted consultation by the Centre or its representative with members of WQSG and/or the WTOG to further build understanding and awareness and obtain information on key issues that need to be addressed to ensure their support for the Framework. Updates should also be provided to key stakeholders involved in the business case and cost-benefit analysis to update them on progress.
5. Subject to the agreement of WQSG or WTOG, the Centre should prepare the detailed implementation plan, cost sharing and cost-recovery model options, and business plan.
6. Presentation of the implementation plan to the WQSG (via a second paper developed by the Centre and/or DSEWPaC) for decision by that group or referral to the WTOG for decision.

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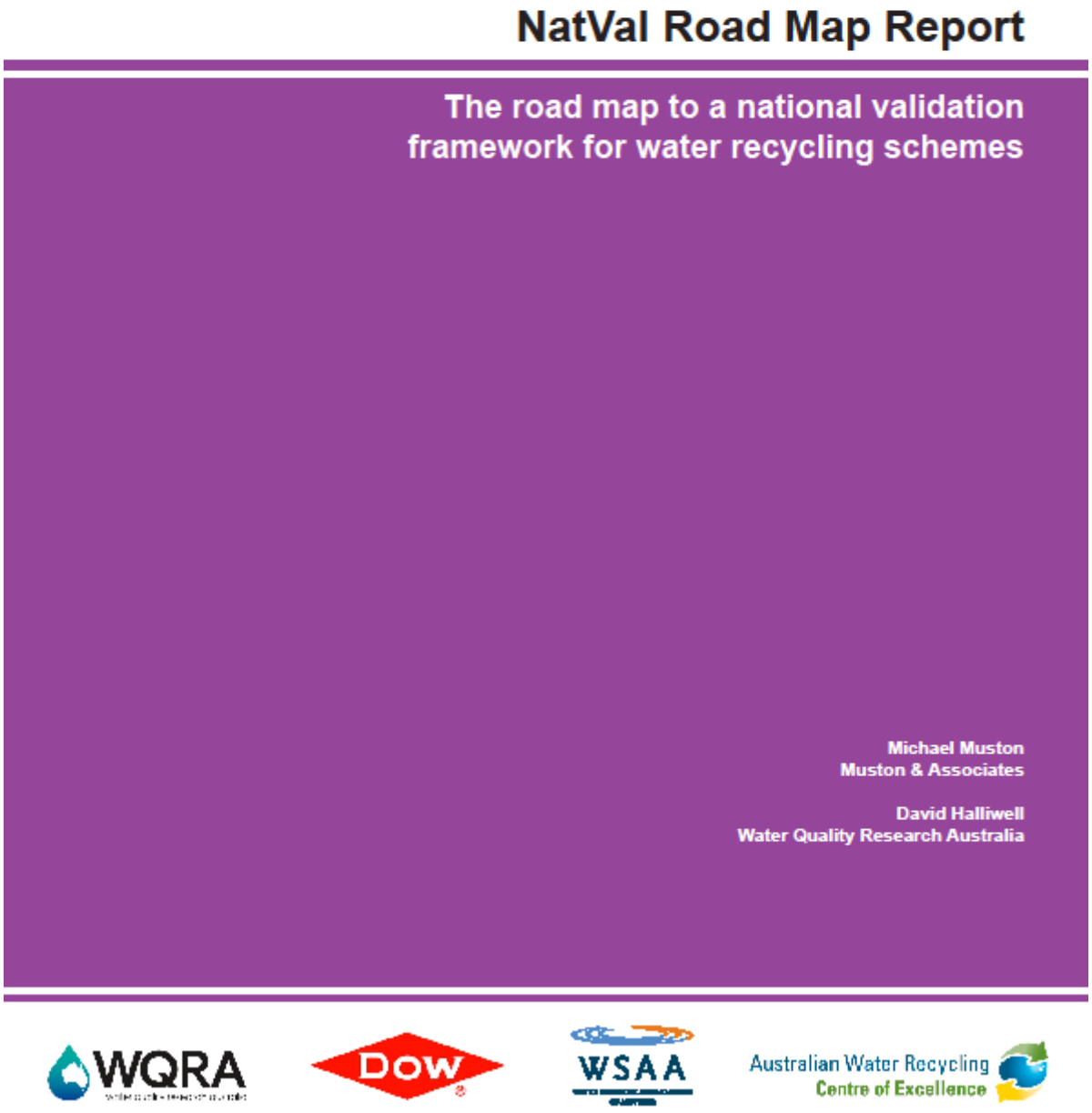
Appendix A – The NatVal Road Map Report



Appendix B – Cost benefit analysis

COMMERCIAL IN CONFIDENCE

FINAL REPORT

National Validation Framework for Water Recycling

Cost Benefit Analysis

Prepared for
The Australian Water Recycling Centre of Excellence

December 2012

THE CENTRE FOR INTERNATIONAL ECONOMICS
www.TheCIE.com.au

Appendix C – Project participants and stakeholders consulted

The project steering committee

The Project Steering Committee was created by the Centre and had the following members:

- Jan Bowman (Chair)
- Joel Byrnes, AECOM
- Amanda Chadwick, IPART
- David Cunliffe, South Australian Department of Health
- Adam Lovell, Water Services Association of Australia
- Yvan Poussade, Veolia Water

Organisations consulted in development of the Business Case

The following organisations were consulted in development of this Business Case and the independent cost-benefit analysis. The Business Case consultations aimed to ensure understanding of and build support for the Framework, including outlining initial findings, discussing qualitative and quantitative costs and benefits and other impacts, as well as possible implementation options and approaches.

The cost-benefit analysis consultations aimed to identify and quantify the costs and benefits associated with implementing the Framework. Discussions were held with regulators, utilities, private service providers and technology suppliers to gather data and information to support the analysis.

Organisation	Business Case	Cost-benefit analysis
Water and environment agencies		
Department of Sustainability, Environment, Water, Population and Communities	✔	
NSW Metropolitan Water Directorate	✔	
NSW Office of Water	✔	✔
Department of Energy and Water Supply (Queensland)	✔	✔
Department of Environment, Water and Natural Resources (South Australia)	✔	
Department of Primary Industries, Parks, Water and Environment (Tasmania)	✔	

Organisation	Business Case	Cost-benefit analysis
Department of Sustainability and Environment (Victoria)	✔	
Department of Water (Western Australia)	✔	
Environment and Sustainable Development Directorate (ACT)	✔	
Office of Living Victoria		✔
Health agencies		
National Health and Medical Research Council	✔	
NSW Health	✔	✔
Department of Health (Northern Territory)	✔	
Queensland Health	✔	
SA Health	✔	
Victoria Health	✔	✔
Department of Health (Western Australia)	✔	✔
Economic regulators		
Independent Pricing and Regulatory Tribunal (New South Wales)	✔	✔
Essential Services Commission of South Australia	✔	
Essential Services Commission (Victoria)	✔	
Public water utilities		
ACTEW Water	✔	✔
Melbourne Water		✔
Power and Water Corporation (Northern Territory)		✔
SA Water	✔	✔
Seqwater		✔
Sydney Water Corporation		✔

Organisation	Business Case	Cost-benefit analysis
Water Corporation (Western Australia)	✔	✔
Yarra Valley Water		✔
Private water industry		
CH2M Hill		✔
Koch Membranes		✔
Osmoflo		✔
PentAir		✔
Siemens	✔	✔
The Water Factory Company	✔	✔
Trojan UV		✔
Veolia Water	✔	
Industry associations		
Australian Water Association	✔	
NSW Water Directorate	✔	✔
Queensland Water Directorate	✔	✔
Smart Approved WaterMark	✔	
Water Australia	✔	
Water Services Association of Australia	✔	✔
Research organisations		
CSIRO		✔
National Centre of Excellence in Desalination Australia	✔	
University of New South Wales		✔

Appendix D – Water recycling in Australia

Water recycling

Water recycling (or water reclamation and reuse) in Australia generally refers to the treatment of reclaimed water or wastewater to produce water that can be used for other beneficial purposes that otherwise may not have occurred. Recycling can involve treatment of different types of source water and different end uses. Treatment processes involved may depend on the type of source water and the water quality requirements of the intended use.

Sources of water can include rainwater, stormwater, grey-water, sewage, and industrial effluents. Potential end uses can include parks, gardens and playing fields, agricultural and horticultural irrigation, domestic non potable use, industrial use, environmental flows and potable use. While water recycling for potable use exists internationally, in Australia there is no direct potable reuse and only limited examples of indirect potable reuse.

Water recycling in Australia generally occurs either:

- on-site, such as in single households, small treatment systems in buildings or residential developments, or industrial and commercial sites, and only involves treatment of sewage in limited cases; or
- in centralised sewage treatment plants such as those managed by water utilities (Power 2010).

With advances in water recycling technology and water distribution systems, and changes in the relative costs of different water supply options, the potential to recycle a greater range of water sources is increasing, with some sources previously considered waste products now viewed as potential resources.

Drivers of water recycling

Various drivers influence the development and management of water recycling. Early drivers included environmental and sustainability concerns related to discharge water quality from treatment plants, while more contemporary drivers include the need to diversify water supplies to manage supply and demand pressures, and the need to protect public health as recycled water comes into closer contact with people.

Environmental concerns and sustainability

Early water recycling efforts were driven by the need to improve wastewater treatment due to concerns about effluent discharges into receiving environments. Many sewage systems discharged raw or poorly treated sewage which had negative impacts on receiving environments. In the early1990's, Australian states and territories established Environment Protection Authorities which imposed standards on effluent discharge from sewage treatment plants resulting in increased interest in recycling for productive purposes on land as an alternative to installing expensive biological nutrient removal plants (Radcliffe 2004).

More recently, environment and sustainability continues to be a driver. For example urban grey-water recycling systems have the ability to reduce nutrient and contaminant loads in receiving environments, and can add to amenity and environmental values.

Water availability and security

Historically, water supply in Australia has focused on large scale dams that help smooth variable rainfall patterns and enable relatively cheap and plentiful supply of water. However, recent prolonged and severe drought has challenged the security of these sources, resulting in increased focus on alternative sources such as recycling and desalination. While in many cases alternative sources were or are still not able to compete with traditional sources on the basis of cost, the need to create less climate dependent sources has increased investment. Supply diversification and conservation has been a major driver of much recent investment in recycling.

While water recycling is not completely independent of climate, the reuse of wastewater or use of water that previously utilised (such as stormwater) can decrease pressure on existing potable sources. The multiple use of water through recycling can help prolong available resources and maximise the benefits of a given climatic supply.

Changes in the volume, location, and timing of rainfall due to climate change are also exacerbating concerns about availability and security of supply and this may drive continued interest and investment in recycling in the future. Baseline population and demand growth may also impact on the ability of existing supplies to meet future requirements and drive future recycling.

Public health

The introduction of clean water supply and sewage disposal is strongly related to reductions in infectious diseases and improvements in life expectancy (ABS 2011). These improvements have largely been achieved by separating water supply and sewage systems and maintained by ensuring effective water treatment and monitoring. However, water recycling can bring sewage or other hazardous sources back in closer contact with water supply and the public.

Water recycling can present new or increased risks associated with treating new sources of supply or treating existing sources to higher standards. The complexity of recycling systems or technologies and distribution systems can also present risks. As the treatment processes or end uses come increasingly closer to contact with the public (e.g. from some agricultural reuse where there is minimal or no contact, to potable reuse where there is consumption), the risks to public health become increasingly apparent. These risks can be significant, with the potential to result in large scale human illness or loss of life.

As a result of these risks, there is a strong relationship between water recycling and public health standards and the implementation and management of recycling is often driven by strong regulatory arrangements designed to assure public health.

Types and extent of recycling

Regional agriculture, horticulture and viticulture

Most early examples of water recycling involved application of water to land for agricultural, horticultural or viticultural purposes through irrigation systems in regional areas. Wastewater plants would often only apply minimal additional levels of treatment to water supplied as there was generally minimal risk of human contact. However, variables affecting the quality of agricultural output would be monitored (such as nutrients in soils). Examples include South

Australia's bolivar STP which supplies water for horticulture in the Virginia Triangle, and the Christies Beach WWTP which supplies irrigation water for vineyards.

Urban domestic and commercial (and third pipe)

Early urban examples also involved application to land following from experience gained in the rural context, including use of recycled water in municipal parks and gardens and sports fields. Further urban uses include urban horticulture (such as nurseries), domestic uses such as watering parks and gardens, and industrial uses. Recycled water can be supplied from centralised treatment plants directly or via third pipe systems, or from decentralised systems for on-site use or distribution. Third pipe systems can supply businesses or households with non-potable water for indoor or outdoor use and are mostly operated from a centralised plant. Decentralised systems usually source water from sewer mains close by or from on-site generated wastewater.

Centralised scheme examples include Sydney's Rouse Hill residential third pipe scheme, Melbourne's Western and Eastern Treatment Plants, South Australia's Mawson Lakes and Seaford Meadows and Queensland's South Caboolture and Pimpama-Coomera schemes. Decentralised examples include Kogarah and Pennant Hills Golf Clubs in Sydney, and a new underground scheme being developed at the Melbourne Cricket Ground. Decentralised systems also occur in buildings, such as Council House Two (CH2) in Melbourne, Sydney Water Head office in Parramatta and the GAP house in Brisbane (AWRCOE 2012).

Industrial

Industrial uses of recycled water are common where users are close to water treatment plants, and water is often delivered by third pipe to industrial sites. Uses can include fire fighting, cooling or steam production in power plants and other users, fuel production, paper mills and cardboard factories, and steel and plastics production, and other manufacturing. Examples include Eraring Power Station and the Wollongong Water Recycling project in NSW, Luggage Point and the Western Corridor Recycled Water Scheme in Queensland, Perth's Kwinana water recycling project and treatment plants in Somers, Altona and Geelong in Victoria (AWRCOE 2012).

Potable reuse

Recycling for potable use is achieved using indirect potable reuse (IPR) which introduces the recycled water into existing potable supply sources such as dams or aquifers and undergoes further drinking water treatment, or direct potable reuse (DPR) which involves introducing the recycled water directly into the distribution system without additional treatment. IPR has been considered in Goulburn, NSW, the ACT and Toowoomba, Queensland, but did not proceed. IPR is possible in Queensland using the Western Corridor Recycled Water Scheme (via Wivenhoe Dam) but is not currently being utilised. In Western Australia, IPR may become possible at Beenyup via the Leederville aquifer. There are no current examples of DPR in Australia.

Environmental flows

Water from recycled water projects can be used to provide environmental flows to rivers and to recharge aquifers, reducing demand on other sources and maintain environmental outcomes that may not otherwise have been possible to do. In NSW, the Western Sydney Replacement Flows project reintroduces water to the Hawkesbury-Nepean system and a similar scheme is currently under consideration for the Yarra River in Victoria (AWRCOE 2012).

Stormwater

Stormwater is increasingly being considered as a potential recycled water supply source, with a range of research and development projects currently underway. Stormwater harvesting is operational in South Australia for irrigation of parklands and agricultural areas. The City of Orange has implemented an IPR scheme using stormwater captured from its Blackmans Swamp Creek and Yarra Valley Water in Victoria has commenced planning for a stormwater to potable reuse scheme (AWRCOE 2012).

Extent of recycling

In 2004 it was estimated that over five hundred sewage treatment plants engaged in recycling of at least part of their treated effluent, with between 150 GL and 200 GL of effluent recycled per year (Radcliffe 2004).

Data collected by the National Water Commission suggests that in 2005-06 urban and bulk water utilities supplied approximately 147 GL of recycled water nationally, and that this peaked in 2009-10 at around 244 GL before declining to approximately 220 GL in 2010-11[31]. The Commission reported that in 2005-06 major urban utilities recycled around 9 per cent of their wastewater[32], and data collected in 2010-11 suggested that across all urban utilities nationally this had risen to approximately 19%[33]. Table below provides data on recycling in Australia's capital cities from 2007-08 to 2010-11.

Table 9. Recycling in Australia's capital cities

City	Total recycled water supplied (ML)				% of effluent recycled			
	2007-08	*2008-09*	*2009-10*	*2010-11*	*2007-08*	*2008-09*	*2009-10*	*2010-11*
Sydney	24163	25442	33683	47521	4	5	7	10
Melbourne	65188	65906	63277	32244	23	23	21	9
Brisbane	5931	9055	8070	10144	6	8	37	19
Perth	7947	7635	7551	9134	6	6	6	7
Adelaide	25562	25501	24393	19802	31	31	30	22
Canberra	3789	4207	4249	4305	12	14	14	12
Darwin	n.a.	480	441	305	n.a.	3	3	2
Total	132580	138226	141664	123455				

Source: National Water Commission National Performance Report data

[31] National Water Commission National Performance Report dataset at: http://archive.nwc.gov.au/library/topic/npr/nprs-2010-11-urban

[32] http://nwc.gov.au/media/commission/2007/first-national-performance-report-for-urban-water-utilities-released

[33] Aither analysis based on National Performance Report data.

Data collected for the independent cost-benefit analysis of the Framework suggested that in 2012 there were at least 815 water recycling schemes across Australia, with the bulk of schemes in NSW, Queensland and Victoria. Source water types included wastewater, stormwater, grey-water, mine water and others, with the majority of end uses being agricultural, urban irrigation and commercial or industrial (see Appendix B).

Constraints and opportunities

While water recycling has grown significantly over the last two decades in Australia, water recycling still faces a range of constraints including:

- Risks around effectively protecting public and environmental health
- Public acceptance and/or lack of awareness
- Policy bans
- Lack of consolidated data and information
- Regulatory complexity and/or barriers
- Technology, technical and scientific barriers
- Gaps in research, knowledge, and understanding
- Logistical problems such as proximity to required infrastructure or challenges in integrating into existing infrastructure and distribution systems
- Total costs, relative costs (to other supply sources), and other economic issues such as information on the true costs and benefits of recycling
- High or uncertain ongoing maintenance and compliance costs

Opportunities for growth in water recycling may occur through:

- Greater use of stormwater, grey-water, managed aquifer recharge, industrial reuse and sewer mining
- Increased use of decentralised rather than centralised systems
- Application to a wider range of end uses, including potable use
- Greenfields developments and new 'green' buildings
- Increased use of MBR technology
- Regional areas with fewer supply options (such as desalination) than major metropolitan cities

Appendix E – Policy, regulation and institutional arrangements

Under Australia's constitution states and territories have primary responsibility for managing water resources, but all three levels of government have involvement. The Australian Government assists with national coordination, policy frameworks, reform, and investment (such as major infrastructure). States and territories manage policy, legislation and regulation for water and public health, including for water service provision and recycling projects. Local government provides water services in some areas (Qld and NSW), but otherwise generally plays a role where property developments involve recycling, or in relation to wastewater and stormwater assets in their area (such as a local sewer mining project).

Water utilities and the private sector play major roles in recycled water projects. Utilities (public or private) are often proponents of recycling schemes and can also be involved in technology or process development. Manufacturers and technology providers generally develop or provide the treatment barriers that make water recycling projects possible.

As has been documented in recent studies (see Power 2010 and PwC 2011) and is outlined below, policy, regulation and institutional arrangements governing recycled water and water quality in Australia can be complex. Some previous studies have suggested there is a need to improve the regulatory and institutional arrangements surrounding recycled water and the urban water sector more generally (see PwC 2011, NWC 2011, and PC 2011).

Australian Government

The Australian Government does not manage water resources directly, nor does it directly regulate or manage water recycling, however it does play a role in facilitating national coordination. The Australian Government has assisted in the development of policy frameworks affecting recycled water (such as the National Water Quality Management Strategy (NWQMS) and the National Water Initiative (NWI)) and facilitated and incentivised reforms in the urban water sector (through competition reforms and the NWI). It has also provided references to the Productivity Commission to review matters related to water recycling such as infrastructure and the urban water sector. In recent years it also has made significant investments in recycling and desalination research and infrastructure.

The NWQMS and National Guidelines

The NWQMS is a joint national approach to improving water quality and has been managed by the Australian Government in cooperation with state and territory governments since 1992[34]. Under the strategy, guidelines are developed for managing different aspects of water quality (e.g. drinking, recycled, industrial), and includes the Australian Drinking Water Guidelines (ADWG) and the Australian Guidelines for Water Recycling (AGWR). These documents provide guidance to states and territories on the management of drinking and recycled water quality and related matters. Notably, the guidelines are not mandatory, and while they do encourage consistency, jurisdictions are free to choose to what degree their legislation and regulations are consistent with the guidelines.

[34] http://www.environment.gov.au/water/policy-programs/nwqms/

Australian Guidelines for Water Recycling

The Australian Guidelines for Water Recycling (AGWR) are a key driver of validation effort in Australia as they require that each treatment barrier in recycled water schemes be validated prior to scheme operation. The AGWR were developed in part due to inconsistencies between early state based guidelines on the use of water reclamation and reuse. The AGWR (and the ADWG) are based on the principle of preventative risk management rather than end point monitoring. They can be applied to any recycled water scheme, including small on-site and large utility schemes, as can apply to sewage and grey-water. The guidelines were developed with input from states and territories and are intended to be translated into state based legislation and regulations. However, as noted above and in Power (2010), jurisdictions do not necessarily adopt the guidelines consistently or to the same extent.

Other elements of the Australian Government's involvement in water recycling include:

- Department of Sustainability Environment Water Population and Communities: responsible for urban and environmental water issues at the national level, manages the NWQMS and the Australian Government's investments in water recycling
- National Water Commission: Responsible for driving implementation of the National Water Initiative, and has invested in a range of projects and research related to water recycling
- National Health and Medical Research Council: oversees development the Australian Drinking Water Guidelines and Australian Guidelines for Water Recycling and manages the Water Quality Advisory Committee who advise the NHMRC on drinking and recycled water issues
- COAG Standing Council on Environment and Water: The Australia Government coordinates the SCEW who consider matters of national significance on environment and water issues

The Australian Government is also a major investor in water recycling development and implementation. Research and development has been funded through Water for the Future, Water Smart Australia, the Raising National Water Standards Program, and the National Urban Water and Desalination Plan.

State and territory governments

State and territory governments are responsible for the water, environment protection and public health legislation related to the provision of water and wastewater services, including recycled water. Several different agencies can have responsibilities for approving the use of recycled water under a single Act and its associated regulations, while a single scheme may trigger different Acts, regulations and agency involvement (Power, 2010).

In response to the development of recycled water schemes, some regulators have adapted existing regulation while others have developed new regulations specific to recycling (Power, 2010). In most jurisdictions, the public health regulator, environment protection regulator and plumbing regulator are involved formally or informally. The water industry is subject to economic regulation, so economic regulators may also have a role in recycled water approvals, particularly in New South Wales where third party access regulation is in place.

Over the last decade, and particularly in response to drought periods, state and territory governments have invested in recycled water including through direct investment or subsidies.

In addition, some government policies, such as the BASIX scheme in NSW, resulted in an increase in investment in recycling.

The validation and accreditation of recycled water treatment technologies is generally run by a central agency, usually the public health regulator or plumbing regulator. The validation and verification of recycled water schemes varies between jurisdictions. For smaller on-site schemes, local government may be the approving agency but for larger recycled water schemes it is usually the public health, environment protection or economic regulator, with other government agencies providing advice. The requirements of validation also vary depending on the end use of the water.

Local government

In Australian states (but not territories), local governments are responsible for on-site wastewater management schemes, including on-site recycled water schemes. While the regulatory process for these schemes is similar, there are significant differences in the size of the schemes the local government may be responsible for, ranging from below 0.54 kL/day in Western Australia to below 100 kL/day in Tasmania (Power, 2010). Approval of development applications (DA) by local government may also be required for recycled water schemes. Local government is not generally involved in the accreditation of treatment technologies, although they may act in an advisory role in some instances.

Local governments may also be involved as proponents of recycled water schemes. Drivers of local government schemes are often environmental discharge regulations or efforts to contribute to the concept of 'liveable cities'. Where a local government is the scheme proponent, it may be involved in the validation of treatment technologies schemes as scheme project partner. In some cases a local government proponent may make a contribution towards payment of the cost of validation.

In New South Wales and Queensland regional areas, local governments own and operate water and wastewater utilities and may have a higher degree of involvement than local governments in other states.

Public and private utilities

Public and private water and wastewater utilities are often proponents of water recycling schemes. In some jurisdictions public utilities have recycled water targets built into long term water plans and operating licences. Water recycling may also be required to avoid wastewater discharge to the environment to meet environment regulations.

As proponents of schemes, utilities are often required to compile and submit applications for validation of technologies and schemes. Utilities may contribute to the cost of validation testing.

In New South Wales, where the *Water Industry Competition Act 2006 (WICA*) has allowed third party access to the wastewater network, private water utilities are involved in the delivery of recycled water services. Private schemes are regulated differently to public utility and local government schemes in New South Wales, with the economic regulator IPART involved in licence application and assessment.

Technology providers

Technology providers include organisations that provide individual treatment technology units (for example, membrane filtration units) or full service technology providers (providing design and installation of treatment train systems). Technology providers contribute to the continual improvement of water recycling through innovation including the development of new technologies and treatment train combinations.

Technology providers are responsible for validation testing of their technologies. This may take place within their own laboratories, in external laboratories or in-situ. Testing of a technology may take place in one or multiple jurisdictions (including international jurisdictions) depending on the requirements of local regulators. Subsequent applications for validation may be based on original testing although some regulators may require additional testing.

Research, scientific and academic sectors

The research, scientific and academic sectors contribute to improvement of water recycling knowledge through scientific research on treatment technologies, water quality, and public health and environment impacts. Laboratories analyse water quality samples for validation, and may also be used by technology providers or scheme proponents for undertaking or confirming validation testing of individual technologies or pilot systems. Individuals from these sectors may also be engaged by proponents or regulators as independent assessors within the validation process.

Appendix F – Extended notes on validation

Water recycling schemes and water treatment systems usually include multiple treatment barriers, with the number depending on the source water, level of risk, and end use. These treatment barriers may be comprised of individual technologies or unit processes, or larger process trains. Validation can be undertaken for the individual technology or unit process, or for a larger process train. In either case, validation is the scientific substantiation of the technology's ability to effectively control hazards. The definition provided in the AGWR is[35]:

The substantiation by scientific evidence (investigative or experimental studies) of existing or new processes and the operational criteria to ensure capability to effectively control hazards.

Validation is most commonly undertaken through scientific studies in a controlled environment such as a laboratory, but can also be undertaken in-situ. However, it is usually required *before* the technology is installed. Validation can involve independent testing of a new process or technology, or reviewing or accepting existing validation studies associated with a technology.

Broad groups of recycled water treatment technologies exist[36], and there may be a range of different scientific procedures that can be used to validate technologies within those groups (see Table 5 in Muston and Halliwell 2011).

Validation vs verification

The treatment performance of entire recycling or water treatment systems may not always equal the sum of the individual treatment barriers (for a range of technical reasons). As a result, regulators often require that the performance of water recycling schemes is *verified* once installed.

Verification assesses whether a scheme is performing, whereas validation assesses whether it is likely to perform based on the performance of the individual barriers. Verification may occur before, or continue during, production of recycled water by the scheme, and usually involves monitoring to demonstrate that water quality targets are and can continue to be met. Ongoing verification data can help establish the treatment performance of the scheme under a range of operating conditions. Verification can also improve understanding of the operational performance of different treatment technologies, given other components and operating conditions.

Water quality requirements and validation

Validation establishes how well a technology can 'improve' the quality of the source water it treats. Validation does not determine the water quality requirements for the water produced by a system or for a particular end use.

- Jurisdiction regulators determine the water quality requirements based on a risk management approach for particular end uses, and these are determined independently of validation.

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[35] See EPHC 2006 page 362, and section 2.9.2 on page 72.

[36] For example, membrane treatment system technologies, disinfection and oxidation technologies, biological treatment systems, absorptive treatment systems, and natural treatment systems (Muston & Halliwell 2011).

- Output water quality requirements (and source water quality) will drive the level of treatment required and the type of technologies that may be installed in a given system.

Crediting treatment performance of technologies

Validation usually results in a technology being credited for its performance by confirming a log reduction value (LRV)[37] that the technology can achieve for a particular parameter[38]. Given source water characteristics, and output water quality requirements, scheme proponents will look to optimise the number of treatment barriers and require information on the performance of technologies in order to design treatment trains. This can be complicated by the fact that:

- Regulators in different jurisdictions may give relatively higher or lower credits (LRV's) to the same or similar technology.
- No standard or default LRVs exist for specific technologies or types of technologies.

Recognition of existing validation

Some technologies applied in recycling schemes in Australia have already been validated in other domestic or international jurisdictions. However, jurisdictions may or may not accept these validations and allow use of the technology in schemes in their jurisdiction. This may result from differences in methodological approaches or requirements, different performance crediting, insufficient evidence or different evidence requirements, different operating or environmental conditions, or due to other perceived or actual differences in local characteristics or requirements.

In some instances, jurisdictions do informally recognise existing validations from interstate or overseas regulators in North America and Europe. However, there is no established process in place. Where informal recognition occurs, regulators may still wish to assess documentation or data provided, but new validation studies may not be required.

Mutual recognition vs Uniform protocols

The National Validation Framework is different to a *mutual recognition* framework. Under a mutual recognition framework, frequently adopted to enhance the inter-operability of professional and trade qualifications across state boundaries, the current validation approach (or amended but still differing versions) in one jurisdiction would be accepted by another jurisdiction. Under the National Validation Framework, however, a common set of agreed validation protocols would be adopted by each jurisdiction to ensure uniform rigour in validation of technology. The Road Map envisages developing guidelines for validating technologies and further notes that:

> "Validation data should only be accepted from organisations with a level of accreditation or quality assurance consistent with or higher than that specified by the data quality objectives agreed by the Framework Administrator." (p34)

[37] Log reduction in this context means the logarithmic reduction of hazards present in the source water (such as virus and protozoa or chemicals).

[38] Given a range of parameters including operating conditions and source water characteristics.

This requirement extends to cases where technology has been validated overseas. A technology that has already been validated under USEPA guidelines, for example, would still be required to be validated in Australia – unless under National Validation the US validation approach was considered to be a sufficiently rigorous protocol.

Exclusions from the definition of validation

Biologically influenced processes would not be eligible for pre-validation. These processes currently require 'case by case' in situ validation and this would continue under National Validation. As noted in the *Draft guidelines for validating treatment processes for pathogen reduction Supporting Class A water recycling schemes in Victoria:*

> "For biologically influenced treatment processes such as activated sludge, membrane bioreactors and media filtration (due to variability in wastewater catchments, flora of the biological media and seasonality): validation testing must be undertaken on the treatment process unit as a whole and in-situ." (p25)

The focus of the proposed Framework is on those technologies that do not require in-situ validation, although the Road Map does include a component for 'in situ validation'.

Validation is conditional

As per the Draft Guidelines for Validating Treatment Processes for Pathogen Reduction Supporting Class A water recycling schemes in Victoria, "validation testing must be conducted at full-scale and be site specific". However, as further noted:

> "Pre-validated membrane modules can be used provided the validation testing conditions, including design configuration, operating conditions (validated range or limits) and control philosophy, are representative of in-situ"(p24)

The National Validation Framework is human health directed through path removal requirements, although there may be side benefits for the environment.

Pre-validation vs Existing schemes

This is likely to differ between jurisdictions and be dependent on individual regulatory requirements. It is envisaged that validation would be required for all new technology units.

There are likely to be a significant number of existing schemes which are utilising technologies that have not been validated prior to installation. The extent to which such schemes would require these technologies to be validated would depend on regulatory triggers in each jurisdiction. Where technologies in existing schemes are required to be validated we would assume that the same protocols would apply as for new schemes (i.e. existing schemes would not be able to utilise existing monitoring data to provide evidence of the performance of the scheme).

Validation overseas

Regulation of recycled water internationally differs from country to country. In the USA and Canada, regulations are developed at the state rather than federal level, and as in Australia, states can differ in their approaches and requirements. In the USA in 2004, 16 states had

guidelines or standards for recycling, and In Canada individual states such as British Columbia and Alberta have developed their own separate regulations (Power 2010).

In the USA, California's Division of Drinking Water and Environmental Management details the treatment technologies that meet California's Water Recycling Criteria. The acceptance of technology is based on field testing and reports provided by manufacturers demonstrating particular levels of hazard removal. Validation is usually completed by a state utility through development of a recycling scheme, and California's Department of Human Services then considers the technology as compliant with the Water Recycling Criteria (Power 2010).

The US EPA Environment Technology Verification (ETV) Program manages verification of a broader range of environmental technologies but also involves developing testing protocols and sharing data. Data and protocols produced by the ETV are suggested to have expedited approval and implementation processes in each state (Power 2010). ETV programs also exist in Canada and Japan, and one is currently under development in the EU that includes water treatment technologies. Common themes amongst the ETV programs include ensuring the accuracy of technology performance claims, ensuring consistency and robustness in testing, and removing barriers to innovation and implementation.

Appendix G – Recycled water quality classification and validation requirements

Jurisdiction	Classification	Guideline document	Treatment technology/processes validation requirements
Australian Capital Territory	No class, based on risk levels	AGWR 2006	Yet to be specifically defined.
New South Wales	High exposure [i]	AGWR 2006	High exposure schemes require validation of treatment technologies/processes.
Northern Territory	No class, based on risk levels	AGWR 2006	Validation of treatment technologies/processes yet to be specifically defined.
Queensland	Augmentation of drinking water Class A+[ii]	Recycled Water Management Plan and Validation Guidelines 2008	Pre-commissioning validation of manufacturer's specifications (in addition to historical data and scientific literature required for all recycled water classes).
South Australia	High risk schemes [iii]	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 accepts 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.
Tasmania	Class A [iv] Plants less than 100 kL/day capacity	*Tasmanian Plumbing Code 2006, Plumbing Code of Australia 2004* *Environmental Guidelines for the Use of Recycled Water in Tasmania December 2002* AGWR 2006	The designer is required to provide detailed means of validation of treatment technologies/process as part of the permit process.

Victoria	Class A [v]	Large-scale recycled water schemes (more than 5000 L/day with discharge to the environment): • Guidelines for Environmental Management: Use of Reclaimed Water (publication 464.2) • Guidelines for Environmental Management: Dual Pipe Water Recycling Schemes – Health and Environmental Risk Management (publication 1015). 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 2006 DHS is also currently preparing *Guidelines for Validation of Treatment Processes for Class A Recycled Water Schemes*	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 process unit should be addressed separately and validation studies should be undertaken according to best practice.
Western Australia	Exposure risk level	AGWR 2006 Western Australia Department of Health Guidelines for the Use of Recycled Water in Western Australia 2009	Validation of treatment processes yet to be specifically defined.

Source: Power 2010

Notes

[i] End uses with a high level of human contact, including: residential dual reticulation; multi-unit dwellings internal reuse and external irrigation (with the potential for full public contact, no control to restrict access or minimise spray drift); agricultural irrigation unprocessed foods (e.g. salad crops); urban irrigation with unrestricted access and application (with the potential for full public contact, no control to restrict access or minimise spray drift). (DWE, 2008).

[ii] In Queensland Class A+ is the highest class of recycled water for non-drinking purposes.

[iii] Schemes with a high level of human contact, including dual reticulation and unrestricted irrigation.

[iv] In Tasmania, Class A schemes end uses can include: indirect potable groundwater recharge by spreading; indirect potable groundwater recharge by injection; non-potable municipal irrigation (uncontrolled access); urban non-potable (general household use); fire and water protection systems; agricultural: direct contact of reclaimed water with crops consumed raw; stream augmentation and groundwater recharge; urban use (garden watering and toilets); aquaculture (human food chain); and other uses subject to approval (DPIWE, 2002).

[v] In Victoria, Class A schemes are those that have a high potential for direct human contact with recycled water

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