Water Recycling: Recent History of Local Government Initiatives in South East Queensland

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The Urban Water Security Research Alliance (UWSRA) is a $50 million partnership over five years between the Queensland Government, CSIRO's Water for a Healthy Country Flagship, Griffith University and The University of Queensland. The Alliance has been formed to address South East Queensland's emerging urban water issues with a focus on water security and recycling. The program will bring new research capacity to South East Queensland tailored to tackling existing and anticipated future issues to inform the implementation of the Water Strategy.

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FOREWORD

Water is fundamental to our quality of life, to economic growth and to the environment. With its booming economy and growing population, Australia's South East Queensland (SEQ) region faces increasing pressure on its water resources. These pressures are compounded by the impact of climate variability and accelerating climate change.

The Urban Water Security Research Alliance, through targeted, multidisciplinary research initiatives, has been formed to address the region's emerging urban water issues.

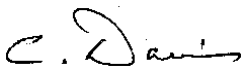
As the largest regionally focused urban water research program in Australia, the Alliance is focused on water security and recycling, but will align research where appropriate with other water research programs such as those of other SEQ water agencies, CSIRO's Water for a Healthy Country National Research Flagship, Water Quality Research Australia, eWater CRC and the Water Services Association of Australia (WSAA).

The Alliance is a partnership between the Queensland Government, CSIRO's Water for a Healthy Country National Research Flagship, The University of Queensland and Griffith University. It brings new research capacity to SEQ, tailored to tackling existing and anticipated future risks, assumptions and uncertainties facing water supply strategy. It is a $50 million partnership over five years.

Alliance research is examining fundamental issues necessary to deliver the region's water needs, including:

- ensuring the reliability and safety of recycled water systems.
- advising on infrastructure and technology for the recycling of wastewater and stormwater.
- building scientific knowledge into the management of health and safety risks in the water supply system.
- increasing community confidence in the future of water supply.

This report is part of a series summarising the output from the Urban Water Security Research Alliance. All reports and additional information about the Alliance can be found at http://www.urbanwateralliance.org.au/about.html.



Chris Davis
Chair, Urban Water Security Research Alliance

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Introduction

The Queensland Government initiated its Western Corridor Recycled Water Project in 2006-07 during the recent 'millennium drought', several years after releasing its Queensland Water Recycling Strategy (2001). This recent investment in a potable-quality water recycling facility signified for the first time a high-level State policy commitment to the use of recycled water for a full range of purposes including potable supplies.

In previous decades, local councils had been the authorities most involved in considering and developing the use of recycled water throughout the State. As issues of water supply and sewerage were then generally the responsibility of local government, councils tended to be the level of government that closely considered and, in some instances, embraced the concept of water reuse. A large number of these schemes were initiated on a small scale for limited purposes in rural and regional Queensland, often out of necessity due to dry climate and decentralised population. However, the discussions became more focused in larger urban areas in the 1990s when a number of local governments in South East Queensland (SEQ) became heavily involved in water recycling proposals. A 50% State Government subsidy helped prioritise water recycling projects at that time.

This report examines the evolutionary development of water recycling in SEQ, focusing on the major projects and proposals, particularly for potable reuse in that period, the drivers motivating their interest in innovation, and the policy and regulatory context of these developments. Some lessons emerge in relation to the regulatory context for technical innovation, the complexities of multi-level governance, the interplay between professional expertise and public confidence in water safety, and the need for leadership.

This study draws on public policy documents, regulatory documents, internal reports, media reports and a number of interviews with key people connected with this story of initiative and resistance.

Overview of Water Reuse in SEQ

During the 1990s, the dominant professional perspective of water and sewerage engineers shifted to supporting inclusion of potable reuse options in water industry strategies, as part of water cycle management. The breakthrough underlying this new optimism by water professionals was the realisation that the technology had become available (reverse osmosis and ultraviolet disinfection). The view that "we can do this, we just need to convince the people", was often heard during the nineties, according to interviews conducted for this report. The trend was begun by Gold Coast City Council in 1988, and then picked up by several councils experiencing growth. But things did not go well for water reuse in the 1990s, and this paper attempts both to describe the evolution of some key developments and to analyse the serious obstacles to success. The recent phases in SEQ water reuse were:

Prior to 1990s:	Opportunistic effluent irrigation.
1990s:	Experimentation with potable reuse, unsupported by policy.
2001-2007:	Growing legitimacy through recognition in policy and legislation.
Post 2007:	Maturity via policy coordination and strategic planning for sustainable water.

How significant was the shift in professional opinion in favour of water reuse? There were many engineers keen to implement this new approach for achieving public purpose goals. Several councils tried to implement it, despite repeated failures to "convince the people".

In essence, initiatives for potable reuse were an attempt at culture change within the water sector itself and more broadly. However, water management is a traditionally conservative sector, operating in a complex multi-sectoral activity, and not well trained in major change management and community education. Although the engineers were trained in continuous improvement and best practice, the move towards potable reuse was a policy step-change, a transformational issue. In South East Queensland there were not the facilitative factors that had made Melbourne's transition towards a

water sensitive city more rapid, according to Brown and Clarke (2007). To use Brown and Clarke's 'transition' model, in SEQ there had been few institutional change ingredients – there was no central champion and no enabling context.

Water management has traditionally been the province of engineers. However, the history of potable reuse attempts in SEQ shows us that expert opinion was not decisive; the challenge was in educating and convincing the general public. Their lack of acceptance was reported regularly across the region. In considering water options, the public were reported to be concerned about health risks first, followed by cost and then environmental impacts (Dolnicar and Hurlimann, 2010). However, there is also another perspective. Engineers interviewed for this report said that it was a vocal minority in the public whose views were reported in the media and who influenced others with scare campaigns. And from almost 600 interviews conducted at the height of the drought, Nancarrow *et al.* (2007) reported that nearly three-quarters of surveyed SEQ residents would accept purified recycled water being added to drinking water supplied by Wivenhoe Dam if severe drought persisted.

The recent history of water reuse proposals shows that the proponents of potable reuse need to thoroughly understand the political climate in each community before undertaking a potable reuse project, and particularly before planning any form of consultation – and they need to be prepared to demonstrate leadership over time. Further, regardless of opinion trends which may come and go, the need for the courage to lead and at the same time avoid demonising those who are not 'believers' will remain important (Furnham, 2004).

These are political risks. But there are also the water quality management risks. This was seen as an option to be undertaken only in response to an emergency or extreme event. The actual risk and the perception of risk are seldom aligned. It has been commonly held that if members of the public were sufficiently educated about risks to water quality, they would accept that the risks could be managed (Stenekes *et al.,* 2006). However, there is more to achieving social acceptance of the risks of potable reuse than experts simply providing one-way educational presentations on complex issues to the public. The effectiveness of communications regarding risks is closely related to the degree of trust developed in the communicator and the authorities (Bickerstaff, 2004; Nancarrow *et al*., 2007; WRCOE, 2010). Early and meaningful opportunities for public participation in decision-making – two-way communication – are viewed as essential to the development of trust (Po *et al*., 2005). Despite this, the technocratic model of consultation (decide-announce-defend: DAD) continues to be used by authorities in many countries; such a model is counter to the development of trust.

It is essential to maintain the confidence of consumers in their water supplier (Radcliffe, 2004). However, many members of the public have shown a lack of confidence in their water supplier to manage all the risks of potable reuse (and incidents involving threats to water quality from other causes – such as fluoride mis-dosing or dual reticulation cross-connections – do not build trust). However, the emotive 'yuk' factor is perhaps as powerful in the minds of many citizens as the perceived technical risks and the perceived competence of water suppliers. If the local water supplier is not completely trusted, then support from eminent and trusted leaders, backed by independent information sources, may be needed to help people decide in favour of potable reuse (Dolnicar and Hurlimann, 2010).

In SEQ, the political blame for 'failed experiments' was heaped on the shoulders of local authorities up to 2007. The burden of educating and persuading the public about water quality, and accepting scientific assurances about the negligible risks attached to potable water reuse, should not have been borne by local government alone. Local government did not have the resources or expertise to play an unsupported role of leading innovation in the water industry. In 2007, the then Queensland Premier, Peter Beattie, called potable reuse the 'Armageddon Solution', but a year later called for mandatory potable reuse. His emotive phrase perhaps summed up for many their perception of the risks involved, i.e. it was seen as a last resort measure to be taken only in emergency conditions. It is refreshing therefore, after the struggles of so many individual SEQ councils, unsupported in their efforts by higher levels of government, that the National Water Commission (NWC), in its recent position statement on urban water recycling, promotes potable reuse as a valid option, subject to the usual need for objective decision-making about its suitability vis-à-vis other options (NWC, 2010).

The water recycling industry in Queensland is now much more mature following the efforts of local governments in the 1990s and the policy responses to the water crisis in the following decade. Through this extended period, the issues have gradually been identified and debated, problems analysed, policy instruments assessed, stakeholders consulted, and decisions made and implemented, though not without some caution following the return of major rainfall in 2009 and beyond. In 1990, there was both an absence of policy and regulatory interest in water reuse, and a corresponding lack of incentives and lack of supportive oversight. The contrast with recent years is stark. Best-practice approaches for recycled water management plans were embodied in the Queensland Water Recycling Guidelines 2005 (Qld EPA, 2005). There is now a standardised industry approach to water health protection. The Water Supply Safety and Reliability Act 2008, requires all schemes to have a recycled water management plan (RWMP) to protect public health (s200). In the RWMP, hazards and risks must be identified and controlled, similar to a HACCP approach in the food industry. And if the scheme is to be used to provide drinking water, it must have a water quality management plan (s629). The Public Health Act 2005 has also been amended to define 'fit for use' recycled water as that which does not cause harm to the person exposed to it (s57D).

In addition to standardising the approach to health protection in water recycling, there have also been parallel reforms for environmental protection for waterways, with the Environmental Protection (Water) Policy 2009 and the recent State Planning Policy (Healthy Waters) 2010. The former requires a local government to have a total water cycle management plan (TWCMP) which includes recycling, while the latter requires a waste water management plan to be prepared for all point-source discharges and for recycling to be used as an environmental values protection tool. However, one criticism that has already been made is that TWCM by local government is not possible within the regional water grid area, as they do not have control over the entire water cycle in their own areas.

A recent national survey of community attitudes towards water supply options shows that two thirds of those surveyed believe they should have a say in source selection. It reveals current preferences for the reuse of stormwater (77%), building new dams (64%), desalination (60%), and greywater reuse at home (60%) over using treated wastewater (48%). However, most (60%) also acknowledge that they have insufficient information to make an informed decision (AWA, 2010). Overriding much of the debate is the issue of building trust in water authorities on public health-related issues, given that scientific expertise is insufficient to create high confidence in new technologies (Australian Water Recycling Centre of Excellence, 2010).

New thinking has emerged in several areas, including new residential estates with decentralised water systems; and the governance structures are in place for further development and evaluation of outcomes. What is needed for cultural change to occur in relation to acceptance of water recycling, and for communities to feel that sound decisions will be made on their behalf? Is a triple-bottom-line (TBL) sustainability decision framework needed? While TBL is now considered a standard part of environmental decision-making (Harding *et al*., 2009; Baldwin and Uhlmann, 2010), and the principles are incorporated in Queensland legislation, people have not had the opportunity to use such a tool to help them form their own views. Participation in decision-making via informed deliberations can allow them to collectively make their own assessment of the risks (Joss and Bellucci, 2002).

Local Lessons Learnt

Case studies of some of the major projects and proposals, particularly for potable reuse, were undertaken and a number of lessons have emerged in relation to the regulatory context for technical innovation, the complexities of multi-level governance, the interplay between professional expertise and public confidence in water safety, and the need for leadership. Lessons learnt include:

- Take the change process slowly
- Plan for a lengthy consultation/education period where all options are brainstormed
- Try hard to involve the silent majority and to obtain its views
- Directly involve those who oppose the initiative
- Genuinely listen to concerns raised; two-way communication will build mutual trust
- Balance the input from stakeholders
- Provide rebuttals to the claims of opposing groups in easily understood terms

- Take an even-handed approach to education and strategy development; avoid selling pre-conceived solutions or listening only to selected groups
- Examine direct potable reuse from the start of the study
- Educate media in the issues to promote balanced reporting
- Ensure that an appropriate support network, including eminent champions and State Government backing, is in place
- Understand the political climate in the community
- Maintain Council unity and avoid the issue turning into a political one
- Begin consultation at the start of an election term; do not consult immediately before or during an election.

1. SCOPE AND METHODS

This paper is not exhaustive but includes most of the significant experiences in SEQ in relation to local initiatives to establish water reuse projects which included potable reuse among the options. In 2007-08 the State Government took water planning responsibilities away from local authorities and itself took control of developing a regional approach to water strategy and water infrastructure. The role of councils in seeking innovative local solutions was thus diminished, and cases such as those analysed in this paper are much less likely to recur in the future.

Two methods were used to conduct the research for this paper:

1. Literature review: the relevant material examined includes local, state and federal government policy documents, project reports, meeting minutes, professional associations' documents, scholarly journal articles, and media reports.
2. Interviews: semi-structured interviews were conducted with a wide range of key stakeholders at local and state level who have been involved in the history of SEQ water recycling, including former public servants, local government councillors, local government water engineers, water industry consultants, and other significant community members. The names of interviewees have not been revealed when personal views and perspectives have been expressed.

The report has been structured so that the Executive Summary provides a high level overview of the evolutionary development of water recycling in SEQ together with providing overall conclusions of the study in the form of lessons learnt from a series of case studies of water reuse projects which included potable reuse as an option. The lessons learnt relate to actions which could have improved the chances of acceptance of water reuse proposals. The main body of the report provides a detailed description of the evolution of water reuse in SEQ. It also provides an assessment of case studies of local government initiatives to establish water reuse projects. Potable reuse case studies form the main focus of the report but a few case studies of non-potable water recycling have also been included as well as reference to a case study outside of SEQ. Conclusions, including lessons learnt, are included individually for each specific case study, with overall conclusions summarised as part of the Executive Summary rather than being included as a final report chapter.

2. EARLY HISTORY OF WATER REUSE IN SEQ

Prior to the 1990s water recycling was not widespread in SEQ. The standard practice of local authorities at the time was to produce effluent from Sewage Treatment Plants (STPs) at a standard required by the relevant Queensland legislation. Effluent meeting this standard was then discharged to the environment. In practice this meant discharge into waterways. Around 1993, approximately 88% of all treated effluent in Queensland was discharged through rivers and estuaries, another 1% discharged directly through ocean outfalls, and about 10% of total treated effluent was discharged to land (Bryan, Gardner and Beavers, 1994). In relation to the latter, the application of treated effluent to land constituted the main form of water recycling in this period, with approximately 93% of effluent discharged to land used as part of an effluent reuse scheme (Bryan *et al.,* 1994). In the mid 1980s, such schemes included irrigation of the Middlemount Golf Course in Central Queensland, Oxley Golf Course (supplied by Oxley Creek STP), and the University of Queensland playing fields (supplied by Fairfield STP). In the late 1980s, effluent from the Bribie Island STP was injected into an aquifer to provide a hydraulic barrier to saltwater intrusion into the Bribie groundwater that was treated for potable supply.

As the amount of effluent generated in SEQ far exceeded the capacity of available land for irrigation, the number of land disposal schemes which could operate was limited. Whilst the discharge of treated effluent to land represented a kind of water recycling, it was sometimes practised to avoid discharging effluent to waterways. Thus, if a council was unable to discharge its treated effluent to waterways, land disposal was viewed as the next best option. In this sense the effluent was used to irrigate areas that would not be otherwise irrigated (Bryan *et al*., 1994). This occurred without any planned strategy to replace potable water with recycled water. Furthermore, due to the high nutrient levels in treated effluent, it is likely that the practice of discharge to waterways was environmentally damaging (Gardner, Bryan, Hu, Gordon and Beavers, 1993). There were no environmental management plans in place to govern these practices.

Some water recycling also occurred through unplanned, indirect potable reuse, in which effluent discharged to a waterway from an upstream community was withdrawn for drinking by a downstream community. For instance, the Condamine River, into which Toowoomba discharged its treated wastewater (via Gowrie Creek), was found to contain 8.6% and 7.3% sewage effluent at the downstream towns of Dalby and Chinchilla respectively (Hamilton, 1991). Following the mixing of Condamine River water with other water supplies, the mean dilution of effluent present in drinking supplies was found to be 6.6% at Chinchilla and 4.3% at Dalby. As irrigators along Gowrie Creek irrigated their crops with water drawn from this waterway, this also constituted a form of agricultural water recycling. Unplanned, indirect potable reuse also occurred along the Brisbane River (Hamilton, 1991). In 1999, towns in more than 18 local government areas drew their potable water supplies downstream of another town's STP discharge point (White, 1998). The people in these towns were apparently unaware of this situation.

Prior to the 1990s there had been very little success in persuading industry to utilise treated effluent from STPs (Department of Primary Industries and Energy, 1991). One of the few examples of such industrial reuse was a leather tannery, New Wave Leathers in Toowoomba (formerly Dixons Wetblue), which started using recycled water in its tannery business in the 1970s. As the cooling and wash down water used by the tannery did not have to be of drinking quality, New Wave Leathers agreed to purchase on average 7 ML of recycled water per week from the Toowoomba City Council (Institute for Sustainability and Innovation and CSIRO 2008: 142). However, since this paper focuses on the role of local government in water recycling initiatives, industry-based projects to access recycled water or to install onsite recycling of water are not examined.

The greater prevalence of small-scale water recycling in rural and regional Queensland is historically attributable to the need for additional water supplies in specific localities. Limited harvesting and recycling of rainwater occurred during this period, mainly through the collection of roof water by rain water tanks, and this was used for both non-potable and potable purposes. These practices were mainly confined to the rural and regional areas of Queensland, with little or no drive by local authorities in SEQ to increase the use of rainwater tanks as the Health Department discouraged their use owing to

their potential to breed mosquitoes. The collection and recycling of on-site stormwater runoff also occurred on golf courses (Anderson, 1996) but, in general, stormwater was not used to a large extent as a water source in urban Queensland (McCourt, 1996). The on-site reuse of greywater (water from baths, showers, basins or laundries) was considered illegal in sewered areas and was also neither widely used nor closely examined in SEQ local governments.

In summary, the instances of water recycling in SEQ prior to the 1990s were few, and were sometimes unplanned. There were two main reasons. Firstly, according to interviews with some professionals who were working in the field, water scarcity was not in the mindset of SEQ engineers and policy makers at the time. There had been no catastrophic failure of supply in SEQ. Water was considered to be supplied by storage dams and local authorities had an adequate supply of water from existing water storages. With the exception of a few small communities, there was no demonstrated need for additional supply options. Secondly, legislation at the time required only basic treatment of effluent before it could be discharged to the environment. Consequently it was more cost effective and easier for councils to discharge treated effluent to waterways than it was to reuse the effluent (Department of Primary Industries and Energy, 1991).

Pine Rivers Shire Council represents an exception to this scenario. In the late eighties, it constructed the first biological nutrient removal (BNR) plant in SEQ to remove nitrogen and phosphorus and by the mid-nineties was irrigating the South Pine Sporting Complex and the Wantima Golf Course and nearby pastures with the effluent. Ten years later, it went on to reticulate the treated effluent to the newly constructed Eatons Hill State Primary School, which was opened by the Premier.

Generally however, there was no overarching State legislation facilitating water recycling and no State subsidies to local governments to encourage the pursuit of water recycling at the time. Neither was there a strategic policy framework aiming to promote natural resource management and environmental sustainability, which might have encouraged bolder decision-making.

3. PRESSURES FOR CHANGE SINCE THE MID-1990S

The situation changed in the 1990s when a number of factors converged to facilitate the use of recycled water in SEQ (for the SEQ Local Authorities in 1994, see Figure 1). Firstly, there was a continuing very high level of population growth in SEQ with corresponding projected increases in water demand. There was considerable pride in political and business circles concerning the high growth rate, especially in SEQ. This underlying demographic trend helped to alert professionals to future issues relevant to securing urban water supplies. Secondly, and more specifically, the legislative and policy framework began to change: the new Queensland Environmental Department finalised a new Environmental Protection Act in 1994 and the Environmental Protection (Water) Policy in 1997, which, amongst other matters, covered effluent reuse schemes and placed more stringent conditions on methods for disposal of effluent. Under this legislation, higher treatment levels were required before effluent could be discharged to the environment. With many sewage treatment plants at the time unable to produce effluent of the quality required, councils were faced with the decision either to upgrade their STPs and increase their operating costs (an expensive process) or to find alternatives to discharging to waterways or land-based uses. Consequently, in this new enabling environment, many local authorities developed a preference for effluent reuse as it was potentially a more economically viable option. Local government water recycling began in SEQ largely as a side effect of minimising waterway discharge to meet EPA requirements; it was compliance driven, rather than seeking to promote *beneficial reuse* options.

Figure 1: Map of SEQ Local Government areas in 1994 (Source: ABS).

At the same time, the environmental effects of discharging increasing amounts of effluent to waterways were becoming apparent to both local government and the public. Coastal waters were experiencing declining water quality and loss of habitat, while cases of eutrophication in inland waters were also increasing (Thomas, Gomboso, Oliver and Ritchie, 1997). As the community became aware of the detrimental effects that such practices were having on their surrounding environment, they began to campaign for higher standards and voice their opposition to current sewage treatment and disposal practices. Jenifer Simpson, a community member who called herself the Miss Marple of Sewage, published a small book called *Dinosaur Technology* where she said 'The old attitudes towards coping with our waste are no longer viable' (Simpson, 1993). Accordingly, as community voices became more vocal, local governments developed a greater interest in public consultation, something to which they were hitherto unaccustomed. Maroochy Shire Council and its project partners won best paper in the management section for a paper on consultative methods at the 1993 Australian Water Association conference (Sabburg *et al.,* 1993).

In the early 1990s, a number of innovative engineers in the water industry from local and state government and consulting firms also began to examine and promote water recycling. Previously, there had been only civil engineers managing water supply. Now chemical engineers and scientists joined in the conversation. State subsidies to local government for STP upgrades, that included water recycling, were increased to 50% of the capital cost. It was a new field, there was little constraining legislation, and local professionals felt as if they were in a brave new world, conducting pioneering work into the potential of water recycling. This became a discussion topic at many Australian Water Association (AWA) conferences. However, from interviews conducted, it appears councils generally did not communicate closely with one another, nor did they learn in detail from each other's experiences with potable reuse proposals, as outlined in the cases analysed below. However, while there were several key government and non-government figures favouring reuse in SEQ, there was no one organisation or individual champion driving the practice and the regulatory context was not geared to facilitate and legitimise changes towards water recycling. This left proponents unsupported and proved disastrous when they began to consult the public.

In 1994, attention to sewage treatment and disposal was given a significant boost with the very extensive Brisbane River and Moreton Bay Wastewater Management Study. Although the objective of the study was to improve water quality in Moreton Bay, the then Lord Mayor of Brisbane City Council (BCC) was also keen to see the Brisbane River restored to become the focus of the city. The initial focus on STP upgrades to reduce point-source pollution provided further impetus for effluent recycling by Local Authorities. Six Councils were initially involved in the study but more came on board as it proceeded. The extended period of study gave rise to the suspicion by some participating Councils that BCC was delaying as long as possible committing to the expensive STP upgrades (to biological nutrient removal or BNR), seen as necessary to improve discharge water quality. Community environmental groups also became more focused on these issues and the Brisbane River Management Group came into being. The end result of many years of work by all these bodies was the creation of the Healthy Waterways Partnership in 2001, providing a cooperative governance arrangement to drive continued improvements in river water quality, following expensive STP upgrades and the restoration of the river as the city's centerpiece for arts, recreation and tourism. In essence, the Healthy Waterways Partnership came to represent the importance of involving multiple players and addressing a range of inter-linked issues that are significant for urban water management.

Although water recycling in the 1990s was driven by local government, including a few visionary and well-informed mayors, the influence of a few key community members in particular localities, such as Jenifer Simpson, should not be overlooked. A loose coalition of individuals and groups saw the potential of water recycling in the 1990s. The EPA began work on an ambitious draft policy proposal requiring 100% recycling of municipal effluent, but did not proceed after a key consultation meeting with councils, organised by the AWA, where it was claimed that this goal was only remotely possible for dry weather flows but not at all in wet weather. Potable water recycling proposals generated a great deal of controversy amongst Councillors and outrage in the community. Community groups such as Citizens Against Drinking Sewage (CADS) arose during one of the controversies and subsequently turned their attention to other such proposals by SEQ councils. The 'yuk factor' along with concerns about health impacts, were their main drivers.

4. TOWARDS A QUEENSLAND WATER RECYCLING STRATEGY

Eventually, the volume of projects and the lack of a systematic approach and conflicting public views prompted the State Government to assist local governments by establishing the 3-year project to develop a Queensland Wastewater Reuse Strategy (later renamed the Queensland Water Recycling Strategy, QWRS) in the then Department of Natural Resources (DNR) in 1998 with a small budget of $500,000. Its purpose was to optimise the use of 'all domestic, industrial and rural effluents and urban stormwater' (Qld DNR, 1998, piii). Eleven background/discussion papers (see Bibliography) were developed for consultation in preparation for the development of best practice recycling guidelines. One of the first was a comprehensive base-line study of municipal effluent recycling, which found that it was 11.7% of total volume generated and was being mainly used for irrigation in SEQ. In Brisbane, Beaudesert, Ipswich, Maroochy, the Gold Coast, Redcliffe and Redlands, this meant irrigation of parks and golf courses. It was also being used for irrigation of crops and nurseries and for road construction in Maroochy, and irrigation of pasture and sporting fields at Gatton (White, 1998). Other background papers focused on public education, recycling by agriculture and industry, recycling of stormwater, groundwater recharge, greywater reuse, demonstration projects, and the economic and legislative context.

Another QWRS strategy was *demonstration* of recycling innovations. In 2000, the Advanced Water Recycling Demonstration Plant (AWRDP) was launched by the Minister for the Environment and Heritage and Natural Resources with a goal to help the community achieve 'greater understanding and acceptance of water recycling within the community' (Launch Invitation, 2000). Pine Rivers Shire Council had won the right to establish the $1m pilot plant at the South Pine Sporting Association Complex at Albany Creek and subsequently provided tours of the water treatment technology advances that were now readily available for industry, the general public, sporting bodies, parents, players and school children. The plant was seen as good publicity for the Council and the State and had significance at a location like the South Pine Sporting Association. An interviewee for this paper indicated that, while it was a good tool for education of school children, it didn't seem to shift community views about water recycling. It was thought that the next generation might be more supportive.

The QWRS secretariat also formed a Water Recycling Special Interest Group to bring together SEQ recycling proponents to share their stories and promote the practice.

The Queensland Water Recycling Strategy was developed collaboratively via community and industry consultation around the State, and was completed in 2001 after the unit was transferred to the EPA. In the later 1990s, there were continuing differences of opinion with government and even within the EPA, where the Sustainable Industries division was supportive and the regulatory division was sceptical. The final Strategy bluntly stated that 'the option of indirect potable use through the dilution and storage of highly treated effluent is not on the agenda of the Queensland Government' (Qld EPA, 2001: p22). It further emphasised that 'The Queensland Government does not support the use of treated effluent for direct potable purposes and does not intend to change this position' (Qld EPA, 2001: p24).

Nevertheless, the policy contributed to the change process, and the volume of non-potable recycling increased. In the 2000-01 Performance Monitoring Report for Non-Major Utilities in Australia, Caloundra City Council reported irrigating 7.5% of its treated effluent on its parks and gardens; Maroochy supplied 5% of its effluent for commercial uses and 15% for rural irrigation; Noosa reported irrigating all its effluent on its parks and gardens; and Redlands reported 100% going to commercial users (AWA, 2002: p33). Based on the risk management approach adopted from the food industry, the final Queensland Water Recycling *Guidelines* were released in 2005 (Qld EPA, 2005).

During the early 2000s, the term total water cycle management (TWCM) began to achieve currency, though most of the focus was on centralised application, rather than decentralised options. TWCM encouraged Local Authorities to consider all sources in the water cycle when planning their water security strategies; and this included potable reuse options for treated wastewater.

While social, environmental and financial features of water supply options were examined, no sustainability planning tool was being used. The *Queensland Water Act* 2000 was the first legislative instrument to mandate a sustainability objectives approach, and s.10 (3) included references to water recycling; a requirement for recycled water management plans also emerged. Gold Coast Water published the first local government water sustainability report in 2002, where it reported the percentage of recycled water used as one of its indicators of environmental sustainability.

Schemes for a number of different recycled supplies are examined below, but more attention is given to drinking water projects as they have attracted higher levels of opposition and greater political hesitation. At the time of writing (late 2010), 8% of municipal effluent is being recycled in Queensland (van der Bruggen, 2010) – less than when the QWRS project began in 1998. Removal of the 50% State Government subsidy has effectively re-prioritised recycled water projects so that they are no longer commercially viable. To our knowledge, no local authority in Australia, let alone in SEQ, has succeeded in implementing a project to supply recycled wastewater for drinking purposes. In fact, Australians have indicated they are prepared to pay more to avoid this option (Hurlimann, 2007). Even though the treatment processes for desalination and purified recycled water are similar, and desalination is more costly (Stanford *et al.,* 2010), there is a preference for desalination because of the perceived unsavoury link between STPs and human consumption of reused water (Dolnicar and Hurlimann, 2010).

5. RECYCLED WATER FOR DRINKING - CASE STUDIES

5.1 Introduction

Potable water recycling schemes were investigated by a number of local authorities through Queensland and elsewhere in the last twenty years. Some SEQ councils focused directly on potable use of recycled water while some identified it as a possible long-term option among a range of water recycling uses. One of the first councils to evaluate the possibility of drinking recycled water was the Gold Coast City Council which, in 1988, conducted a survey assessing community acceptance of drinking recycled water. Of the 1,508 people surveyed, 13.3% agreed that wastewater should be recycled for drinking with 57.4% disagreeing but not strongly (Hamilton, 1991). The following year, the NSW town of Coffs Harbour proposed to discharge recycled water into the town's drinking supply. The proposal deeply divided both the community and Council, with one Councillor going as far as calling on the State Government to hold a referendum on the issue (Steinhaur, 1989). No referendum was needed as the proposal was eventually abandoned, though it had succeeded in bringing potable water recycling to the minds of citizens. Around the same time, another survey was administered, examining the possible drinking of recycled water. The survey was administered to residents of SEQ and Coffs Harbour as part of a Masters thesis, with funding by the Australian Water Research Advisory Committee and the Gold Coast City Council. The survey results reported an immediate acceptance of potable reuse by 19% of respondents, with an outright rejection of potable reuse by less than 5% of respondents (Hamilton, 1991). A large majority of respondents (76%) were hesitant and wanted some convincing justification and reassurance before accepting drinking recycled water. Whilst the results of the two surveys and the failed Coffs Harbour proposal did not demonstrate strong support for drinking recycled water, they certainly raised the profile of this option. From here, it was not long before local governments in SEQ examined and developed schemes for potable reuse. Those councils that developed potable reuse schemes are examined more fully in the case studies below, while councils which identified recycled water as potential future source of potable supply will be noted in less detail.

5.2 Logan, Coomera, South Moreton Bay Regional Wastewater Management Study

The first councils in SEQ to directly consider potable reuse in the formation of their wastewater management strategy were the neighbouring local authorities of Logan City, Redland Shire (Redland City from 2008), Beaudesert Shire (southern areas amalgamated to form the Scenic Rim Regional Council in 2008; northern areas amalgamated with Logan City Council in 2008) and Albert Shire (amalgamated with the Gold Coast City Council in 1995). With the region's then population expected to rise from 200,000 to 900,000 over the next century, the councils agreed it was necessary to formulate a strategic plan for the collection, treatment and disposal of sewage for the short, medium and long term. Consequently, in 1992, the four local authorities, along with the Queensland Departments of Environment and of Primary Industries (Water Resources Division), commissioned a regional wastewater management study for the combined region, to be prepared by a major engineering firm (Sinclair Knight Merz, 1994). Both effluent reuse and environmental impact were to be considered in developing the strategy, with investigations focusing on minimising the amount of effluent that was discharged to the environment (Jeffs, 1992). The study was also to provide monitoring data concerning the environmental health of the region's waterways.

The public was involved in the strategy's development through two streams: 1) the community at large and 2) stakeholder groups (local resident associations, service clubs, conservation groups, and representatives from the cane and fishing industries). In addition to gathering community input and reporting interim results, the community consultation component aimed to promote community ownership of and responsibility for the wastewater management plan. The participation of the community at large in the consultation process was generally very low, which the consultants concluded was due to the complexity of the issue, with community views reported indirectly via communications with key stakeholders (Sinclair Knight Merz, 1994). Nevertheless, following

community consultation and further analysis of both technical and demographic information, six basic strategies were identified for further examination:

1. Combined Council Strategies (with continuation of each Council's current planning strategy, with effluent generally discharged to waterways);
2. Combined Council Strategies with Dual Reticulation;
3. Combined Council Strategies with Potable Reuse (recycled water discharged to Hinze Dam);
4. Dispersed Treatment with Irrigation;
5. Dispersed Treatment with Dual Reticulation; and
6. Centralised Treatment Strategy.

These six options were then examined through a scoring and weighting system which considered factors such as environmental impact and cost. Through this process, strategies 1, 3 and 6 scored the highest ratings. The study was brought to an early completion because water quality monitoring by the consultants and State Departments had found no "pollution of concern" (Anon, 1994: p7) flowing into the waterways of the study area. This decision was apparently inconsistent with the stated concerns of the Queensland Minister for Environment and Heritage, who at the time was expressing apprehension over the ability of STPs in Queensland to meet their licensing conditions (Anon, 1994). Nevertheless, the Logan, Coomera, South Moreton Bay Regional Wastewater Management Study was finalised, and recommended that each Council continue its current planning strategies as the sewerage loads from the region's projected population growth could be managed in an economically sustainable manner. The report did however state that future improvements in sewerage treatment and effluent reuse would provide enhanced environmental protection, and that larger STPs could allow for potable reuse in the future (Sinclair Knight Merz, 1994).

The report also recommended that the Beenleigh STP be phased out at the end of its economic life and a new, larger STP be constructed in the northern region of Albert Shire. Residents of the area quickly became alarmed, concerned over the effect that discharges from the proposed STP would have on the environment in their area. Cane growers in the region were also strong opponents of the proposal, concerned over the environmental effects. Growers stated that while they would be interested in using recycled water for crop irrigation, they would do so only if it was provided at no cost. The leader of the Australian Democrats even weighed into the issue, stating it was time for Albert Shire to consider reusing their wastewater instead of discharging it to the environment (Miller, 1994). Eventually the proposal was dropped, and a new wastewater strategy for the region was developed (the Northern Wastewater Strategy, discussed later). Thus, whilst the Councils of Logan City, Redland Shire, Beaudesert Shire and Albert Shire had examined potable reuse, ultimately they never developed any proposals for potable recycled water. The next local council that examined the issue came to a more positive conclusion.

5.3 Noosa Coastal Sewerage Strategy

5.3.1 Background

Noosa Shire (1994 pop. 31,686) is located approximately 130 kilometres to the north of Brisbane (it was amalgamated with neighbouring Councils in 2008 to form the Sunshine Coast Regional Council). As an attractive holiday and residential destination, Noosa was experiencing large population increases in the early 1990s, resulting in the Shire's STP nearing its capacity and requiring an upgrade. At the same time, population research undertaken by the Council had predicted soon achieving a desirable maximum population for Noosa. The Council resolved to develop a long term sewerage strategy for the region (Chapple, Uhlmann, Simpson and Playford, 1996). As a 'green' council, it wanted to maintain its reputation as a pristine eco-tourism destination and both the Council and the community expected that the sewerage strategy would improve disposal practices (discharging treated matter through an ocean outfall). However, the Council did not have a pre-determined solution in mind and agreed to investigate the use of recycled water when it was raised by local environmental groups which viewed it as a means to both increase water supply and postpone the need for a regional dam on

the Mary River (Simpson, 1999). From the outset, the Council was genuinely interested in the community's views and wanted to involve citizens in the planning process as much as possible, with the goal of fostering community ownership of the strategy (Chapple *et al.*, 1996). To this end, both technical consultants (Sinclair Knight Merz) and community consultants (Nexus Australia) were commissioned to develop a sewerage strategy for Noosa Shire.

There was no supporting government legislation or subsidy driving water recycling. However, when it was raised as an option by Jenifer Simpson representing the green group Sunshine Coast Environment Council, it became a challenge for Noosa Council to become the first in Australia to take such a pioneering step.

During the study's 18-month consultation period, the process of developing a sewerage strategy for Noosa was overtaken by political controversy linked to a series of sewage spills, and the Shire's ageing sewerage system was blamed when raw sewage leaked into local waterways. Such leaks became a lingering issue, with rumours circulating that local beaches were contaminated and unsafe for recreational use (Cohen, 1994). A Council report also revealed that the Shire's sewerage pump stations were operating at full capacity, and that, if not upgraded, they ran the risk of failure and widespread environmental pollution. This prospect became an issue in the upcoming Local Government Election, with many candidates quick to blame the current Council for the state of the sewerage system. The debate escalated further when there were rumours of alleged sabotage at the Noosa Sewage Treatment plant, which (whether real or not) served to illustrate the contentious nature of the issue. This on-going debate politicised the process for developing a sewerage strategy for Noosa.

Despite these obstacles, the study progressed. The first phase of the community consultation had identified key stakeholder sectors in the area, including those with environmental, business, residential and government backgrounds. The technical consultants then developed a number of possible treatment options for presentation to community and key stakeholders. The categories and associated options were:

1. Disposal to Water
    - Discharge recycled water to Burgess Creek (current method)
    - Discharge recycled water to Noosa River estuary
    - Piped ocean discharge
    - Discharge recycled water to Lake Weyba
2. Disposal to Land
    - Irrigate pastures and treed areas with recycled water
    - Irrigation of Council parks and gardens with recycled water
3. Recycling
    - Irrigate private lawns and gardens with recycled water
    - Discharge recycled water to Lake MacDonald water supply
    - Use of onsite treatment systems

Before the options were presented to the community, an environmental group in the region held an 'Alternative Sewerage Expo' to educate the public about alternative methods of sewage disposal. The education material provided in the Expo, which was not associated with the Council's strategy development, favoured water recycling and opposed ocean outfall. The Expo signified the organisational impact of green groups in the area, a recurring feature throughout Noosa's proposal development. The second phase of the community consultation commenced a few days later, with a survey newsletter distributed to the community detailing the nine possible treatment options. Residents were asked to number the options in order of preference and return the survey. Following this survey newsletter, a public meeting was held in which the treatment options were discussed, along with information provided by the technical consultants. Based on the results of the newsletter survey (386 replies) and public meeting (100 attendees) three options were short-listed by Council for further development. These options were:

- irrigate pastures and treed areas with recycled water;
- discharge recycled water to Lake MacDonald water supply; and
- discharge recycled water to Burgess Creek (current method).

While the technical consultants were further examining the short-listed options, a second public meeting was organised by environmental groups in the region and, though sponsored by Noosa Council, this meeting did not form part of the official schedule of community consultation. The meeting was opened by the Queensland Minister for Environment and Heritage, who had earlier expressed interest in helping Noosa Shire Council with its sewerage strategy. Though there was no talk of State Government funding, the Minister was open to treating Noosa as a model system for other regions in the area.

5.3.2 The Proposal

Following a further examination of the short-listed options, the technical consultants presented their results to Council and the key stakeholder groups. Upon receiving the results, the parties resolved to add another treatment option: direct potable reuse, whereby recycled water would be introduced directly into the Shire's water supply. The push for direct potable reuse came from an organised group of key stakeholders with similar environmental views, who more or less developed the direct potable strategy themselves. These final four options were then evaluated through a second newsletter survey and public meeting, with direct potable reuse becoming the most favoured treatment option.

5.3.3 The Reaction

The support for direct potable reuse displayed in the survey and public meeting results led the Mayor to predict that Council would vote to adopt a sewerage strategy that involved water recycling (Bennett, 1994a). The Office for the Minister for Environment and Heritage was quick to praise Noosa for its support of potable reuse, though there was still no talk of funding or support from the State Government. Community opposition to the Mayor's prediction was immediate, with many residents concerned over the negative effects that drinking recycled water could have on Noosa's tourism industry (Nockles, 1994). Community members also expressed lack of trust in the reliability of the technology, doubting its ability to produce clean and safe drinking water. One of the newly elected Councillors voiced opposition to any plan that involved drinking recycled water, and urged the community to do the same. Objecting to the Mayor's prediction that Council would vote to adopt potable reuse, the Councillor stated that drinking recycled water was not a foregone conclusion (Bennett, 1994b).

5.3.4 The Outcome

Although the Shire Chairman won the election and became Noosa's first Mayor, two of the three newly elected Councillors had not been involved in the lengthy consultation/education process and, perhaps as a result, were opposed to water recycling. At a committee meeting of the Noosa Council, a recommendation was passed to authorise planning for the augmentation of the STP and to investigate the feasibility of direct potable reuse. Much debate occurred in reaching this position, with the recommendation passing by only one vote. At the ordinary Council meeting which debated the issue three days later, Council voted 6-4 to authorise investigations into the feasibility of non-potable reuse, reversing the previous decision to investigate direct potable reuse.

5.3.5 Conclusion

The former Mayor of Noosa, Noel Playford, summed up the history of the proposal by stating: 'had we at the start considered that potable reuse was an option, we could have devised a strategy which specifically addressed the issue during the consultation stage, and the decision may have been different' (Chapple *et al.,* 1996: p388). Noosa's main aim in developing a sewerage strategy was to develop an alternative treatment and disposal method which allowed the Council to cope with the expected population growth. Only towards the end of the consultation period was direct potable reuse added as a treatment option. With the preceding community consultation not having provided full information about this option, it is not surprising the proposal did not win community support.

Furthermore the community opposition to the direct reuse proposal revealed that the community was not well informed about the issues surrounding the proposal. The consultation program largely focused on interactions with a minority of individuals who made the effort to attend public meeting or return newsletter surveys, with little attempt to communicate with the silent majority – who remained unheard and uninformed (Chapple *et al.,* 1996). The apparently disproportionate impact that environmental groups had on the strategy may also have contributed to the ultimate failure of the proposal. Despite Noosa's strong environmental consciousness, having a contentious issue such as recycled water promoted strongly by green groups was possibly too much for many residents.

In retrospect, the chances of success may have been improved by some or all of the following:

- examining direct potable reuse from the start of the study;
- planning for a lengthy consultation/ education period beginning at the start of an election term, where all options are brainstormed;
- maintaining Council unity and avoiding the issue turning into a political one;
- balancing the input from stakeholders (input from environmental groups should not be greater than other groups);
- expending extra effort in reaching more members of the community (though it is very difficult to reach those who remain uninterested);
- gaining the support of the State Government; and/or
- reducing the strong 'green' justification and emphasising that the purpose of the proposal was also to supply good drinking water for Noosa.

The former Mayor reflected with disappointment, in a recent interview, that even now the community might well choose an ocean outfall before potable reuse as a sewage disposal strategy, assuming costs were equal.

Even if these steps had been taken to increase support, potable water recycling might still have failed to be approved for Noosa. There were no supportive guidelines or regulations linked to the Environmental Protection Act, and there were no other communities in Australia (and only one internationally at that time) operating such a scheme for potable recycled water. Yet despite the failure of Noosa's proposal, it was not long before another council examined the practice.

5.4 Northern Wastewater Strategy and Reclaimed Water Scheme

Following the earlier failed proposal for a new STP in Albert Shire (as part of the Logan, Coomera, South Moreton Bay Regional Wastewater Management Study), the region still required sewerage upgrades to cope with increased population growth. In March 1995, Albert Shire was amalgamated with Gold Coast City, with the enhanced Gold Coast City Council now responsible for managing the massive growth expected in the sub-region. Recognising the effect such growth would have on Council's water supply and sewerage services, the Gold Coast City Council formed the Northern Wastewater Strategy Advisory Committee to develop a sewerage strategy for the region. The committee included representatives from business, environment, farming, community and university groups, as well as government officers from four Departments – Environment, Tourism, Small Business and Industry, and Natural Resources. As with the earlier wastewater management studies, community consultation formed an integral part of the strategy's development.

The scheme developed by the committee, entitled the *Northern Wastewater Strategy*, recommended a multi-faceted approach to wastewater reuse (Gold Coast City Council, 1996). The primary reuse options identified were environmental flows, and irrigation of caneland and dedicated open spaces, with direct potable reuse identified as an additional reuse option contingent upon community acceptance. The report also demonstrated the need for additional water sources. With so many possible uses for recycled water identified by the strategy, Council decided to conduct further consultations with the key stakeholders who could benefit from recycled water produced within the region. Consequently the Northern Wastewater Effluent Reuse Advisory Committee was formed. The committee was made up of representatives from Council, community and farming groups, as well as State Government departments. Once again, community consultation formed a major part of the strategy development process, with the impacts of various water recycling options discussed with the relevant stakeholders.

The final strategy, entitled the *Reclaimed Water Scheme*, advocated caneland irrigation, wetlands regeneration, open space irrigation and water for power plant cooling as principal reuse options (Gold Coast City Council, 1998). Potable reuse was considered a reuse option in the medium to long term, again contingent upon community acceptance and the need to augment existing water sources (Lawrence, Hallgath and Gaul, 2000). By 2004-05, 47% of the effluent from the upgraded Beenleigh WWTP was being reused – 17% to cane farmers and 30% for cooling towers at the Rocky Point Cogeneration Plant – with a 70% reduction in nutrients being discharged.

5.5 Toowoomba Sewerage Strategy

In late 1991, the world's largest toxic algal bloom had occurred in the Darling River (Donnelly, Grace and Hart, 1997). The Wetalla Wastewater Treatment Plant, operated by the Toowoomba City Council, was identified as the largest contributor of nutrients to the Darling River System (Appelgren and Clewett, 1995). In the aftermath of the algal bloom outbreak, the Toowoomba City Council became aware of its responsibility in protecting the water quality of the downstream river systems. Consequently, Council commissioned the engineering firm Sinclair Knight Merz to develop a sewerage strategy to allow for economically and environmentally sustainable effluent disposal.

Through this strategy process, a number of effluent disposal and reuse options were considered, including continued discharge to Gowrie Creek, land disposal, agricultural and industrial use, aquifer recharge and potable reuse. In May 1995, a report was submitted to the Environment Industry Development Network, detailing a proposed water recycling demonstration project. A proponent of the project and Toowoomba City Councillor came out in favour of water recycling, stating that treating effluent to produce drinking quality recycled water would significantly increase Toowoomba's water supply yield and postpone the need for augmentation of Toowoomba's Water Treatment Plant (Anon, 1995a).

The submission of the report and the Councillor's comments brought Council's investigations into water recycling to the attention of the citizens, who were quick to voice their opposition. Just four days after the Councillor's comments, the Deputy Mayor of Toowoomba stated that, while he supported recycled water for industrial purposes, there was no need to augment Toowoomba's drinking water supplies with recycled water (Searle, 1995). The community was still alarmed, expressing comments such as 'it's not pure to drink or bathe in another's water' and 'build more dams and please don't contaminate my water by any man-made mistakes' (Pendlebury, 1995: p10). Nevertheless, in July 1996, the Environmental Industry Development Network, made up of the Department of Industry Science and Tourism, the CRC for Waste Management and Pollution Control, and the Environment Management Industry Association of Australia, released a proposal for a demonstration project to recycle water in Toowoomba. The Network aimed to develop a 'world class water reuse project' demonstrating the 'commercial, economical and environmental benefits of water reuse with minimum risk to the customer' (Environment Industry Development Network, 1996). The proposal aimed to utilise a staged demonstration scheme initially involving industrial reuse to achieve public acceptability of potable reuse. It is not clear what became of the proposal report. According to the director of engineering services at the Toowoomba Regional Council, there is no evidence that Council ever received a final proposal or endorsed the proposal (Flanagan, 2007).

5.6 Caloundra/ Maroochy Strategic Wastewater Management Study

5.6.1 Background

The City of Caloundra (1995 pop. 56,870) and Shire of Maroochy (1995 pop. 86,040) were neighbouring Local Government Areas located just south of Noosa (since amalgamated with Noosa Shire to form the Sunshine Coast Regional Council). Similar to Noosa, both Caloundra and Maroochy were facing large population growth and community opposition to their current method of sewage disposal (discharging recycled water through freshwater, estuaries, and ocean outfalls), as well as a general direction by the community and council to recycle more water (Sabburg *et al.,* 1993). The councils' water supply issues were different, however. Maroochy was facing more significant

challenges as its water supply was located at an elevated position. Well-informed by the Shire's water supply and sewerage engineers, the Maroochy Council supported both water metering and potable reuse. Also strengthened by Noosa's interest in potable reuse, the two Councils formed a Strategic Wastewater Management Steering Committee and agreed to jointly fund a Strategic Wastewater Management Study to address their wastewater problems. The study was to develop a strategy for the long-term (50 years), medium- and short-term management of wastewater for both Caloundra and Maroochy with broad community involvement (Sinclair Knight Merz, 1997). The Strategic Wastewater Management Study was supervised by a steering committee comprising of Caloundra and Maroochy Shire councillors as well as representatives from the Urban Development Institute, Queensland Department of Environment and Heritage, Sunshine Coast Environmental Council (previously involved in the steering committee of the Noosa Coastal Sewerage Strategy), Department of Primary Industries, Department of Health, and Council officers.

As with the Logan, Coomera, South Moreton Bay, and Noosa investigations, the Caloundra/Maroochy study involved both technical analysis (Sinclair Knight Merz/Cardno and Davies Consortium) and community consultation (Rowland Rogers) in the development of the wastewater strategy. However, personnel in this project believed they would be more successful in achieving acceptance of potable reuse as they would be consulting throughout the strategy development. The first stage of the technical consultation involved the development of eight possible treatment options under three broad categories. The categories and associated options were:

1. Discharge to Water
   - Freshwater
   - Estuarine
   - Oceanic
2. Apply to Land
   - Irrigate local caneland
   - Hinterland horticulture
   - Pump inland
3. Reuse of Effluent
   - Indirect potable
   - Direct potable

These options and categories were then discussed at a series of over 30 discussion groups as part of the first phase of the community consultation. This was not the first time Maroochy Shire Council had undertaken consultation on effluent management, so it may be that some community members had already developed a degree of trust in the technocrats. In an earlier consultation, community members had said that it made a difference when they got to know council staff as "humans who valued the same things". Questionnaires and a telephone poll were used to gauge community preferences for the options and categories. The results of the community consultation were then used by the steering committee to shortlist three options:

- discharge to water;
- indirect potable reuse; and
- direct potable reuse.

As Caloundra City Council had less pressing water supply issues than Maroochy and a previous 1995 strategy had combined water supply and wastewater together in a new approach, they proposed to discharge treated effluent to Ewen Maddock Dam and test water quality over a five-year period prior to any potable reuse. Primary treated effluent from septic trenches was already entering the dam, so this proposal would lead to improved dam water quality. There was no strong intention to have the public drink the water, however, and direct potable reuse was not being pursued by the council. The proposal did, however, receive conflicting responses from the regulatory and planning sides of the EPA, with the former taking a risk averse approach in contrast to the planning side which was promoting effluent reuse as a more sustainable approach than simply irrigating treated effluent to state forest.

The short-listed options were then presented through a community workshop with indirect potable reuse the preferred option, followed closely by direct potable reuse. Hence the subsequent technical consultation focused on developing a strategy whereby potable reuse was utilised as much as possible. A final technical consultation was then completed, whereby the treatment options were analysed in terms of the operational, public health, environmental and economic objectives of the study.

5.6.2 The Proposal

The completed Caloundra/Maroochy Strategic Wastewater Management Study was presented to Caloundra and Maroochy Councils in August 1997. The study advocated a strategy that incorporated a mix of discharge, irrigation and potable reuse; although the study noted that options for potable reuse were based on the assumption that community acceptance for the practice would be forthcoming, as indicated by a survey or referendum. Integral to the potable reuse proposal was the construction of a pilot study at Landsborough, a small town within the boundary of Caloundra City Council. At the time, Landsborough was without a sewerage system, with Council planning to construct a sewage treatment plant to service the area. Under the pilot study it was proposed that the construction of the treatment plant at Landsborough would proceed, with additional treatment processes added to the plant to produce water suitable for drinking. Following the construction of the plant, recycled water would be discharged to the nearby Ewen Maddock Dam, which at the time was offline and not supplying water to Caloundra. An artificial wetland was planned to mediate the transfer of recycled water from the treatment plant to the dam. Recycled water would not be supplied to residents until an extensive five-year period of water quality monitoring declared the water safe for drinking purposes and there was community support for the practice. The pilot study was also to act as a means of demonstrating that indirect potable reuse was safe and viable. If the community accepted potable reuse, the study recommended the construction of additional water reclamation plants close to sewage treatment plants in Caloundra City and Maroochy Shire to allow for indirect and direct potable reuse. The final recommendations of the study advocated a mix of solutions incorporating, irrigation, ocean outfall, discharge to fresh water and estuaries and indirect and direct potable reuse for the various treatment plants in the area. Upon receiving the report, both Councils agreed to adopt the study for planning purposes for future wastewater infrastructure. At that time, the Federal and State Governments and the Councils would each fund one third for recycled water infrastructure. A local newspaper reported the Councils had stated that, if the report was *not* adopted, three new dams would be required before 2051 (Furler, 1997).

5.6.3 The Reaction

A lengthy and apparently successful period of consultation had been conducted with the community during which it was noted that the population growth assumptions went unchallenged. Then a small group arose led by one resident very loudly opposing the potable reuse proposal. This group came to be known as the Citizens Against Drinking Sewage (CADS). CADS grew to become the main opponent of Caloundra/Maroochy's recycled water proposal, basing their campaign on the notion that chemical compounds present in wastewater could not be reliably removed by any treatment processes. Their most widely publicised claim was that Endocrine Disrupting Chemicals would be present in recycled water; chemicals which CADS claimed could 'give men female characteristics or shrink and deform male sexual organs' (Lamble, 1998: p7). CADS furthermore claimed potable water recycling was only being investigated at the behest of landholders and environmentalists in the area opposed to the construction of a new dam (Lamble, 1998), and also that the councils were proceeding with the proposal knowing that earlier surveys had demonstrated community opposition to recycling water in Ewen Maddock Dam (Anon, 1995b; Jones, 1999).

Although the rise of CADS was an issue for the entire study, only Caloundra interfaced with the group, and not very successfully. They used the services of technical experts to try to provide a balanced and informed perspective, but found it very difficult to discuss technical issues with CADS, which was asking for a full guarantee that the proposal would be risk-free.

In addition to community opposition, there was also resistance to the project from State Government. The proposed Landsborough Water Reclamation Plant, the plant at the centre of the potable reuse pilot study, required an environmental approval licence from the Queensland Department of Environment

and Heritage before it could be commissioned and operated. Despite issuing a draft environmental licence one year earlier, the Department expressed concerns over whether the recycled water in Ewen Maddock Dam would meet the objectives of the Environmental Protection Policy (Water) (Caloundra City Council, 1998). The Departments of Health and Water Resources were also unsupportive. Consequently, in August 1998 the Caloundra City Council made an urgent request for a report outlining the cost and feasibility of alternatives to releasing recycled water from the Landsborough Water Reclamation Plant into the Ewen Maddock Dam. After the preliminary results of this investigation were reported and subsequent communication with the Department of Environment and Heritage occurred, it appeared an environmental approval licence would be granted for the Landsborough Water Reclamation Plant if alternatives to release into the Ewen Maddock Dam were pursued. To further influence Council, CADS delivered a petition with over 8,000 signatures opposing the potable water recycling project. A number of Councillors also made it known that they would not support the project in its current form.

5.6.4 The Outcome

Eventually, in October 1998, after extensive community debate and discussions with the Department of Environment and Heritage, the Caloundra City agreed to discontinue their proposal to discharge recycled water into the Ewen Maddock Dam. Councillors instead agreed to implement a program whereby recycled water from the Landsborough Water Reclamation Plant was used to irrigate nearby private land with excess water diverted to an ocean outfall. Furthermore, Caloundra City Council resolved to upgrade and downsize the Caloundra Wastewater Treatment Plant, with the recycled water used for irrigation and the excess sent to an ocean outfall. Some Council members were delighted with the result, though one Councillor remarked the public outcry over the project was 'born out of fear rather than information' (Holmes, 1998: p5). Water reuse, however, continued to remain in the wastewater strategy for the former Maroochy Council area, and was seen by Maroochy Water Services as being consistent with the SEQ Water and Wastewater Infrastructure and Management Study in its 'dependence on potable reuse in the future' (MWS, 2000).

5.6.5 Conclusion

It was difficult to quantify the extent of public support for potable recycling as the views of the silent majority were difficult to be heard under the very loud protests of CADS. However, It appears that many residents of Caloundra and Maroochy were never in favour of potable recycling, with aspects of the community consultation process described as biased, lacking objectivity and with an over-representation of environmental groups in the decision-making process (Nexus Australia, 1999). Thus, the underlying support for potable reuse on which the project was based was at a much lower level than reported. The lack of State Government support was also a factor, with the Department of Environment and Heritage very reluctant to issue an environmental approval licence, although with strong public opposition from some quarters it is hard to imagine the project would have definitely proceeded, even with Departmental approval.

Senior informants believe that the Councils undertook a sound consultation program, but have the following observations:

- CADS can form in any community and can undo already positive relationship building with the community.
- Once emotive opposition campaigns emerged, councils were unable to run an effective objective and lengthy education program due to the emotional climate in the community.
- The Councils educated the editors of the local papers, and these media did not play a significant role in further 'beating up' the story.
- The consensual approach among Councillors was only undermined as the election drew near and Caloundra decided not to pursue potable reuse.
- A significant period of consultation was conducted prior to the election and avoided during the election. However, by then the debate was already characterised by strong fundamentalist views.
- The Councils provided rebuttals to the claims of groups such as CADS, though there was some uncertainty about the popular accessibility of the terms used in these rebuttals.

- Caloundra tried to directly involve those who opposed the initiative, but unsuccessfully.
- Several Government agencies were involved and the Councils provided education to improve understanding and gain their support. However the regulatory side of the EPA was not involved.
- While the Councils used different methods over a lengthy period of consultation, they believe they were unable to reach the whole community (silent majority), not just those who want to be consulted. This remains a challenge.

Interestingly, although potable reuse did not commence as a result of this project, two high profile activities did so. One was the development of a water recycling demonstration plant, which was later funded through the Queensland Water Recycling Strategy and hosted by Pine Rivers Shire Council. The second was a state-wide, and subsequently national, water education program called 'We all use water", developed with the support of the Sunshine Coast Environment Council, the Australian Water Association (AWA) and a Natural Heritage Trust federal grant. The educational materials included the second and third books by Jenifer Simpson, called 'Water Quality: from wastewater to drinking water to even better' (Simpson *et al.*, 1996), and 'The Coetanger River Catchment' (Simpson, 2000). (Jenifer's latest book, 'From waste-d-water to pure water', focusing on a water quality star rating, was published in 2008 with the assistance of the National Water Commission.)

In an interview for this paper, one of the engineers involved in that period said that a life-cycle analysis shows *direct* potable reuse is cheaper than indirect, and he would promote it again locally given the opportunity. However, there would need to be a minimum size and quality system to make a decentralised system cost-effective. He refers to dual reticulation as a "stop-gap, short-term" technology. Currently, the Council principally recycles treated effluent on sporting ovals, golf courses, turf farms and for road construction. The engineer believes that purified recycled water could be added to SEQ dams now with appropriate treatment technology. But he still wonders how to effectively reach the silent majority, a conundrum which has challenged many. While he would propose potable reuse, he would place much more emphasis on a lengthy education program.

5.7 South Caboolture Wastewater Reuse Strategy

5.7.1 Background

Soon after the commencement of the Caloundra-Maroochy study, the neighbouring Caboolture Council attempted a potable reuse strategy. The Shire of Caboolture (1996 pop. 100,757) was a Local Government Area located between the Sunshine Coast and Brisbane (since amalgamated with neighbouring Councils to form the Moreton Bay Regional Council). The Shire had been one of the first local governments to fully meter water use and institute water restrictions and a 3-block pricing tariff. However, rising water demand (due to a 3% annual population growth) and insufficient local water supplies forced Council to purchase up to 75% of its supplies from the Brisbane City Council and Seqwater. New dam sites were also explored; although drought was not then a major issue. At the same time, the EPA was tightening its effluent discharge requirements due to the poor condition of the Caboolture River. This left Council faced with a decision – to cease discharging treated effluent from the South Caboolture STP into the river and instead construct a 19 km pipeline to discharge to marine waters, or upgrade the STP to produce very high quality product for discharge. As both options would cost about the same, Council resolved to solve both water supply and sewage problems with potable water recycling. The project was driven by the vision and enthusiasm of the Mayor and Council's water supply engineer who said it simply 'made sense' and would make their water supply secure. It was considered a unique project which created a lot of interest, and occurred in parallel with, but slightly behind, both Noosa and Caloundra-Maroochy sewerage strategies, but was not directly influenced by them.

The Council commissioned an engineering firm (KME Engineers) to investigate the feasibility of building a new advanced treatment plant to reuse effluent from the South Caboolture Sewage Treatment Plant, to supply purified water at potable standard. Unlike the previous Noosa and Caloundra/Maroochy investigations, Caboolture Shire Council commissioned no community consultation for the preparation of their sewerage strategy; the strategy was developed purely by the technical consultant. The water supply engineer believed that with the support of the visionary Mayor, they would be able to overcome people's concerns.

5.7.2 The Proposal

The engineering firm recommended to Council that a Recycled Water Treatment Plant be constructed near the existing South Caboolture Sewage Treatment Plant. Initially the recycled water was to be discharged back into the Caboolture River, though once the recycled water was verified as safe it was proposed that the water be discharged into the Caboolture Weir and treated again by the Water Treatment Plant. Following a period of further safety testing, it was proposed that the recycled water could be discharged directly from the Water Treatment Plant into the water reticulation network (Caboolture Shire Council, 1996). Despite the objections of one Councillor, Council remained supportive and moved to continue with the investigations of the proposal and submit the report for the approval of two Queensland Departments – Primary Industries and Environment and Heritage. At the recommendation of the engineering firm, Council also agreed to undertake a program of community consultation. Council thought that there would be community members who would not like to 'drink sewage' but that the resistance could be overcome with good information (interview 2010). Jenifer Simpson assisted Council in its public education program of consultation by telling residents that 'all water has a history'.

5.7.3 The Reaction

Following the announcement of the proposal, Council began a six-month period of community education, consisting of a leaflet, two full day community workshops, a telephone hotline, and fact sheets. This however did little to win community support, with groups soon forming to oppose the proposal (including the re-emergence of CADS). Concerns such as Council's lack of consultation with the community and the fast pace at which they were progressing with the project were raised by such groups (Anon, 1996). In response to this community opposition, one Councillor moved to suspend action on the project until State Government approval was received, though the motion failed to gain support and Council continued with the project. Two months after the announcement of the proposal, Council received a letter from the Queensland Department of Health advising that the Department would be closely monitoring the project as it doubted the acceptability of recycled water for potable use. Two months after this, the Queensland Minister for Local Government and Planning announced that an additional subsidy would be provided for the project as it included water recycling, bringing the subsidy level to 50%. The Minister reaffirmed the report's recommendation that extensive testing by the Department of Health should occur before considering the introduction of recycled water. In September 1996, the Mayor of Caboolture Shire submitted a Minute to Council with the view of improving the community's understanding of the proposal. The Mayor reaffirmed that extensive quality testing would occur on the water produced by the Water Treatment Plant over a number of years, with the results of such testing determining whether potable reuse was an option. The Mayor further announced the public would be surveyed to determine its acceptance of the scheme. Community support was still not forthcoming, whereas a hostile petition containing 500 signatures opposing the proposal was presented to Council in November 1996.

5.7.4 The Outcome

As was happening in Noosa, potable reuse became a contentious issue and a 'political football' in the early 1997 Local Government elections at Caboolture, with a mayoral candidate running on a platform opposing it. The incumbent popular Mayor lost his position, and three other Councillors were also not returned to office following the elections. The new Council proposed to cease investigation of potable water recycling for the Shire, though it did agree to proceed with the construction of the new South Caboolture Environment Protection Water Treatment Plant, so named to avoid conveying any connection with potable reuse. Citing licensing conditions and requirements over effluent quality imposed by the Environmental Protection Act, Council stated the new Water Treatment Plant would aim to improve the water quality of the Caboolture River. Subsequently, a recycled water management plan (RWMP) was prepared, requiring significant effort. The plant was eventually renamed a Water Reclamation Plant and attempts were made to sell recycled water to the Narangba industrial estate, which includes a dual reticulation system. However, there were insufficient users and it was not considered economically viable. Commissioned in 1999, the Caboolture plant produces approximately 10 ML/day of high quality recycled water of which 0.5 ML is supplied via dual reticulation for toilet

flushing and outdoor uses in nearby residential developments. As the infrastructure is already in place, future residential developments may also be connected. The local hospital uses recycled water for toilet flushing and for cooling water for air conditioning; recycled water is used for watering sports fields and parks, gardens and lawns and dust control; and tankers collect the water from the treatment plant and use it for roadworks, general construction and other outdoor uses. An attempt was also made around 2005, to build a small STP to serve the unsewered coastal township of Donnybrook and supply treated effluent to farms at Donnybrook and in dual reticulation to development. However, the farmers did not want to pay for the resource, and Cab Water could not meet EPA's requirement to recycle. The original plan was to dispose of excess treated effluent by irrigation of an area of forestry, but the project was effectively prevented when the EPA maintained that, after a period of one year, 100% of the effluent would have to be recycled. The effluent from the population of 600 is now pumped to Bribie Island where it is treated and discharged.

5.7.5 Conclusion

Caboolture Shire Council received an extremely negative reaction to its potable reuse proposal, with the defeated Mayor later admitting he made a fatal error in trying to introduce potable reuse into Caboolture without an adequate amount of time for public acceptance (Furler and Waddington, 1997). Yet, even with a longer time frame for public approval, it is hard to imagine the proposal being successful. The lack of any public consultation in developing the potable reuse project immediately put the public offside, making it difficult for the community to later believe the Mayor's claims that they would have a chance to vote on the project's introduction. It is hard to understand why no community consultation was undertaken before developing the proposal. The theory was advanced that perhaps Caboolture Council saw signs of community support for the Caloundra/Maroochy proposal and immediately proposed a potable reuse project, unaware such community support was insecure (Nexus Australia, 1999). However, an interviewee recalls that Council was uninfluenced by happenings elsewhere. At any rate, the Caboolture case study demonstrates that it is well nigh impossible to introduce water recycling without community involvement in the planning stages, and that the political ramifications for attempting to do so can be severe. An interviewee from another council recalls that the defeat was noticed by other SEQ councils and that henceforth no one was prepared to push for any major potable reuse strategies (the 2004 projects at Pimpama-Coomera and Toowoomba seven years later, finally changed that). It is now out of favour to mention the benefits of 'recycled water' in most councils. And the preparation of a recycled water management plan (RWMP) did not prevented cross-connections from occurring, although apparently these incidents did not cause a large amount of bad publicity at the time.

Although, many years later, those involved still believe that the use of recycled water would have improved the security of their water supplies, they are much less supportive of new dual reticulation projects as these duplicate infrastructure, the compliance costs are high within the current regulatory regime without subsidy, and cross-connections are difficult to detect. Since, in their experience, 'it costs more to produce A+ recycled water than potable water, but people expect to pay less for it, they believe it is not possible to recoup the costs of treatment and distribution of recycled water unless they have a take-or-pay agreement with a bulk water customer such as for agriculture. Finally, they believe that even though public attitudes have changed little, the State Government level should take the lead with a firm position on the use of recycled water for indirect potable reuse, and commence adding it to Wivenhoe Dam while the dilution factor is high.

In the view of local professionals, the SEQ Water Grid has the potential to fragment rather than integrate the total water cycle, with water utilities responsible for only specific elements of it. While the Water Grid Manager can take a regional approach to recycling, there is virtually no incentive to recycle water locally. However, it is argued that smaller schemes have the potential to receive acceptance in new developments, while adding recycled water to Wivenhoe via the Western Corridor Recycled Water Scheme would be much more difficult, based on a former Premier's comments about it being the Armageddon solution.

The following steps could have been taken in the late 1990s by the Caboolture Shire Council to improve the proposal's chances of success:

- recognise the main driver of opposition, the yuk factor;
- conduct a longer public education and public relations program to provide balanced information;
- consult the community when developing the sewerage strategy;
- use a longer period of community consultation;
- gain the support of State Government;
- not allow the issue to be hijacked by elections/politics/loudest community voices;
- not conduct an education/consultation program immediately before or during an election period; and
- have a unified Council – no divisions.

Following the failure of the Caloundra-Maroochy and Caboolture proposals, potable water recycling fell off the map for a number of years in SEQ. In 2001 the lack of State Government support was explicit in the Queensland Water Recycling Strategy: 'the Queensland Government does not support the use of recycled water for direct potable purposes and does not intend to change this position' (Queensland EPA, 2001: p24). Yet the Queensland Government could not foresee the long lasting drought that was about to hit the region, and once again force potable reuse back into the minds of local government.

5.8 Gold Coast Water Futures and Pimpama-Coomera Waterfuture Master Plan

In 2002, when Gold Coast Water released its first sustainability report, it claimed to have achieved almost 14% recycling of its effluent through golf course, sporting field and park irrigation. According to its 2004-5 sustainability report, recycled water was also being used for toilet flushing at major venues such as Jupiters Casino and the Gold Coast Convention and Exhibition Centre.

When Gold Coast Water's Waterfuture project began in 2004, its goal was to investigate 'every possible source of supply' (GCW, 2006: p4). It did not begin life as simply a wastewater strategy, as several others had done, but had broader aspirations. As expressed by an industry professional, 'we felt that we were leading the way' and sought to rise to the 'challenge to see if we could do it' (interview 7/12/10). Other drivers were Gold Coast Water's interest in sustainability (encouraged to some extent by the peak industry body, Water Services Association of Australia –WSAA), along with the need to improve security of supply, the promise of increased efficiency, find cost-effective solutions, gain the support of the community, and preserve the image of the Gold Coast as an eco-destination (interview, 7/12/10). The Strategy was significantly revised in 2006 when the major local water storage, the Hinze Dam, was down to 20% of capacity and the drought showed it could not supply as much as previously anticipated. Emphasis was then placed on finding 'climate-independent' options, including indirect potable reuse – pumping highly treated wastewater back into the dam, and treating it again before supplying it for drinking – as well as non-potable uses. In 2006, treated effluent was to be recycled daily for non-potable uses (GCW, 2006: p4), but extensive community consultation over two years had shown only mixed support for indirect potable reuse. Further investigations were to continue.

The Pimpama-Coomera Waterfuture Master Plan (PCWMP, 2004) was adopted by Gold Coast City Council in 2004 as Australia's largest fully integrated sustainable water project. This ground-breaking project was planned to serve an ultimate population of 150,000 within an area of seven thousand hectares; and the plan projected massive reductions in standard water usage of up to 84%. A significant consultation program was conducted to develop the plan and a widespread and lengthy communication and education program was conducted in preparation for residential use. Now under implementation, the Pimpama-Coomera development uses all sources in the water cycle including Class A+ recycled water supplied from a newly constructed recycled water and sewage treatment plant. A system of dual reticulation allows houses and businesses to use recycled water for outdoor purposes as well as toilet flushing. Unfortunately, there have been a few faulty cross-connections between the recycled water and the potable water supply, raising the concern of some in the community, with a subsequent threat of class action being brought against the water supplier. This has not eventuated and Gold Coast Water (later to become Allconnex) has door-knocked all residents in the area and found that they continue to support the third pipe system.

According to a water industry professional involved in these plans, it is possible that both the Government and the community have become more risk-averse rather than more trusting of recycled water options; and that, with the expense of dual reticulation and future close oversight of prices by the Queensland Competition Authority, a proposal like the PCWMP would now have greater difficulty in obtaining all the necessary support and approvals than several years ago. He also suggested that with the new regional supply and distribution arrangements, there is little apparent incentive for water businesses to encourage reduced consumption. In a hypothetical (but unlikely) future situation where the State provided the funding and took the political risks, he believes it would be technically feasible to recycle into Hinze Dam from the Merrimac STP. He supports public consultation and ongoing education so that the public mindset will change through the generations. While realising that water recycling is a 'political hot potato', he claimed that good political leadership is what is needed to take the innovation further (interview, 7/12/10).

5.9 Water Futures Toowoomba

5.9.1 Background

Toowoomba City Council (2005 pop. 95,956) was a local authority located on the rim of the Great Dividing Range 130 kilometres west of Brisbane (consolidated with other areas as the Toowoomba Regional Council from 2008). After a prolonged period of drought, more serious than in other areas of SEQ, Toowoomba City Council resolved to conduct a Water Supply Strategy Study for the region to identify when a new water source would be required and what such a source might be. The engineering firm CH2M Hill was contracted to prepare the strategy. A draft summary report of the Study was released for public consultation in August 2004. It stated that the potable reuse of wastewater was not considered to be viable at the current time, but the non-potable reuse of wastewater should be pursued as a replacement for surface water (Anon, 2006).

In late 2004, a review of water storages in SEQ by the Department of Natural Resources led to a reduction in the predicted reliable yield of Toowoomba's current water sources. With this revision it was revealed that Toowoomba's demand for water had outstripped supply for the past six years and that an additional water supply was required urgently. Following this finding by State experts, the focus of the Council's Water Supply Strategy Study therefore shifted to identifying an immediate new water source for the region. When completed, the findings of the Study indicated that indirect potable reuse of wastewater could be a potential water supply option for Toowoomba, in addition to other options such as demand management, rainwater tanks, groundwater, and greywater reuse. As with Caboolture's proposal, there was no community consultation during the development of the strategy by the external consultants; community consultation occurred only after the project report was finalised.

5.9.2 The Proposal

On 1st July 2005, Toowoomba City Council revealed its Water Futures Toowoomba initiative. At the centre of the project was a proposal for indirect potable use. Under the project, 5000 ML/y of reclaimed water from the existing Wetalla Water Reclamation Plant was proposed to be treated at an advanced water treatment plant (yet to be constructed) before being piped to Lake Cooby (one of Toowoomba's three surface water storages). The Water Futures Toowoomba project also proposed demand management and increased use of rainwater and bore water. To aid in the funding of the project, a submission was made to the Federal Government for financial support as part of the Water Smart Australia program. All nine Toowoomba City Councillors supported the project, as well as the then Queensland Premier (Peter Beattie), the local Federal Member, and all three local MPs in the State Parliament (Thorley, 2007). The cost of the project was estimated at $68 million, with funding to be split three ways between Local, State and Federal Governments. It was estimated by Council that 55% of the community were supportive of the proposal.

5.9.3 The Reaction

A few weeks after the announcement of the Water Futures Toowoomba proposal, a Toowoomba chapter of CADS (the group responsible for opposing recycled water proposals in

Caloundra/Maroochy and Caboolture) was formed. Soon after this a prominent wealthy land developer (former Mayor of Toowoomba, Mr Clive Berghofer) announced his opposition to the proposal and threw his support behind CADS. Approximately one month after this, the Toowoomba City Council agreed to develop and implement a Water Futures Public Outreach and Education Program to better inform citizens about recycled water and allow for sound judgments to be made. A key aspect of the program was the development of a project booklet outlining the Toowoomba Water Futures proposal and the overall water cycle. At this point, polling indicated Council had a two-thirds majority support from the community (Toowoomba City Council, 2006).

In October 2005, the local Federal Member, who had previously been in support of the Water Futures project, stated he did not support the project in its present form, and urged Council to note the growing community and business opposition to the proposal. Soon after this, the local State MPs also withdrew their support, together with three of the nine Toowoomba City Councillors. In December 2005, the NWC recommended to the Prime Minister, John Howard, that the Toowoomba Water Futures be approved for Commonwealth funding (Mitchell and Kerr, 2006). Despite this, a decision was still not forthcoming until March 2006, when the Commonwealth Government announced it would match State Government funding ($22.9 million) for the project, dependent upon the majority of residents voting in favour of the project in a plebiscite. In announcing the decision, the federal Minister, Malcolm Turnbull, stated that a plebiscite was the only way to accurately determine community support for the project, with both proponents and opponents claiming majority support.

This decision was not well received by Council, which believed fear campaigns would inhibit the chance of a successful referendum (Thorley, 2007). Council was furthermore concerned that its original submission had included a three-year period of community engagement before the public would access the water, but that a plebiscite did not allow for this process. It would oblige the Council to undertake an advertising and public relations campaign designed to obtain formal community endorsement. Despite these concerns, Council agreed to proceed with the referendum, selecting the following poll question: 'Do you support the addition of purified recycled water to Toowoomba's water supply via Cooby Dam as proposed by Water Futures Toowoomba?' With the question and the date set for the July 2006 plebiscite, a fierce debate emerged between the two campaign sides.

The 'Yes' campaign, in favour of the Water Futures Toowoomba project, was championed by the Toowoomba Mayor, Di Thorley, supported by the Council's director of engineering services, with the campaign funded through State and Federal funding to the amount of $460,000. As stated by Ms Thorley, the Toowoomba City Council was required to compress its proposed three-year community consultation into a three-month period (Thorley, 2007). Further complicating the matter was the sense that Council had been hung out to dry by both State and Federal politicians, with neither taking an active role in promoting the 'Yes' campaign (Thorley, 2007). The 'Yes' campaign argued that the Toowoomba Water Futures Proposal was the only way to ensure a water supply for current and future residents of Toowoomba as well as contributing towards environmental protection.

The 'No' campaign was spearheaded by developer and former Mayor Clive Berghofer, and by the Toowoomba chapter of CADS. The campaign was also supported by the three Toowoomba Councillors opposed to the proposal. The 'No' campaign received some funding from Council, but the majority of costs were privately funded. Mr Berghofer stated that adopting such a water recycling scheme would drive people away from Toowoomba and treat those who remained as guinea pigs (Mitchell, 2006). A series of advertisements in both print and media raised issues like protecting real estate values and retaining Toowoomba's 'clean and green' image as reasons to vote 'No'. A petition organised by CADS with 10,000 signatures was delivered to Council opposing the Water Futures Toowoomba project.

Due to the highly emotive nature of potable reuse (the 'yuk' factor portrayed by CADS), the debate turned ugly with personal attacks and a scare campaign occurring. Rumours and innuendos were directed at the Mayor (Fraser, 2006). The engineering consultants behind the project were also accused of being a subsidiary of an international corporation of ill-repute (which was false). The 'Yes' campaign was further jeopardised when the Queensland Premier referred to drinking recycled water as a last resort, the 'Armageddon solution' for SEQ citizens, raising queries over the nature of State Government commitment, and giving indirect support in the eyes of some critics that the people of Toowoomba were being treated as guinea pigs.

A number of blogs set up during the life of the Water Futures Toowoomba project carried the debate online; for example http://4350water.blogspot.com/; http://waterfutures.blogspot.com/; http://www.blogtoowoomba.com/entry.php?w=toowoombawatervote&e_id=531; the anonymous nature of such sites allowed many unsubstantiated claims to circulate without rebuttal.

5.9.4 The Outcome

On poll day in July 2006, the Water Futures Toowoomba proposal was defeated, with only 38.2% of voters in favour of the proposal. Following this result, the Mayor advised that indirect potable reuse was no longer an option for Toowoomba. Negotiations were then required with the State Government to find alternative solutions in a short time-frame. In early 2010, Toowoomba was connected to the SEQ Water Grid at a cost of $187 million, with the Council required to pay more than half the costs of this much more expensive option. Ironically, this linkage from Wivenhoe Dam to Lake Cooby could ensure that Toowoomba citizens will drink recycled water at some future time, because, according to the current SEQ Water Strategy, when a prolonged drought reduces the major SEQ water storages below 40% of capacity, purified recycled water will be added to the Wivenhoe water supply from the Western Corridor Recycled Water Scheme.

5.9.5 Conclusions

Toowoomba City Council residents have been successful at minimizing their water use (over the last few years it has been around 122 L/p/d). However, despite the fact that the city was literally running out of water, community members did not trust the science or their Local Government and could not be convinced of the benefits of the potable reuse of recycled water. The Water Futures Campaign was hindered by a number of factors, most notably the plebiscite which was a condition of Federal funding and ultimately sealed the fate of the project. Local plebiscites on controversial public health issues (e.g. fluoridation) are almost invariably defeated, whether in Australia, the USA or elsewhere. With only a short period in which to conduct its community consultation and education, Council was left with a huge educational task.

The proposal was undermined by being the focus of intensive public controversy. While previous proposals in Caloundra-Maroochy and Caboolture may have reached the attention of the mass media on a few occasions, the Toowoomba scheme was regularly a matter for national and international reporting. The Toowoomba Council could not cope with the level of media attention the issue received. For all its efforts to use scientists and experts to explain the safety of recycled water, it only took a few negative headlines (e.g. 'Funding for poo water plan conditional on referendum') for this work to be undone. The proposal also met a formidable grass-roots enemy in CADS, which had expanded greatly since its inception in Caloundra-Maroochy. With the backing of the respected former Mayor, Clive Berghofer, CADS was able to undermine confidence in the Council's project, even though much of the criticism was based on misinformation and emotive appeals. Lastly, the Toowoomba proposal also suffered from being viewed as somewhat of a test-case and an experiment. With both Brisbane and Goulburn (NSW) considering recycled water projects at that time, Toowoomba bore the brunt of a much larger debate between proponents and opponents of recycled water.

Water sector informants involved in this campaign noted that community consultation and education programs about such a controversial topic, particularly in a conservative community, will readily provoke a scare campaign. In this case, it was 'a short, well-funded, sharp, and nasty' campaign playing on people's fears. For example, there was little public accountability in the television advertisements for the No campaign. They were expertly designed, containing very simple but powerfully emotive images which were highly misleading. Members of the community wanted a 100% (no-risk) guarantee, and nothing from the science experts would be sufficiently convincing in their eyes.

Despite this difficult situation, the Council continued to operate its information campaign according to plan, avoided becoming reactive, and remained accountable for its messages. Council officers grappled with providing sufficient information for people to evaluate the potable reuse proposal effectively, while at the same time not overwhelming them with information. They concluded that

many citizens could not be expected to process all the detail, and that the simple messages in the fear campaign determined the vote.

Water professionals commented that potable reuse may also become an opportunistic political football if, for example, there are pre-existing conflicts between key personalities in the community. In this case, the debate was even further confused by the number of players and the range of water supply options mentioned as alternatives to potable reuse (some highly impractical and unverified). The media were also happy to sensationalise the debate at local and wider levels. The water professionals concluded that understanding the political climate in the community is crucial, and that political leaders at each level need to take responsibility for recommending and implementing a preferred option. In order to achieve this, both the politicians and the community need to be better educated about the safety and value of PRW. They also recommend that future proponents obtain bipartisan support, that lengthy education or consultation campaigns use a wide range of communication and public relations tools, and demonstration projects where available. However, as with fluoridation, they believe that the PRW decision should be a regional or state-wide decision rather than a patchwork of local decisions made under conditions of urgency and controversy; and on this basis they support adding purified recycled water to Wivenhoe Dam now, while it is less of a political issue and for maximum dilution of water sources.

Some steps which could have been taken in 2005-06 to improve the proposal's chances of success include:

- employing a much longer period of community education (a three-year period as originally proposed);
- utilising community consultation in developing the strategy (as with the Caboolture case study, developing a potable reuse strategy prior to wider community input is counter-productive);
- maintaining the unanimous and bipartisan support for the proposal within Council, and also from local State and Federal MPs; and
- hiring public relations consultants to cope with the level of media attention.

5.10 Developments since 2008

It is understood that no local authorities within Queensland have seriously examined potable reuse since the failure of the Water Futures Toowoomba proposal in 2006. In the meantime, the local government system of Queensland was restructured in 2008 through boundary changes and amalgamations. As a result of this process, the number of LGAs in SEQ diminished from eighteen to ten, though for some planning purposes the Toowoomba Regional Council is additionally included (see Figure 2).

Figure 2: SEQ Local Government areas in 2008 (Source: Queensland Department of Planning).

6. NON-POTABLE REUSE CASE STUDIES

Whilst the focus of water recycling is often placed on potable reuse, the focal point of this paper, the recycling of water for non-drinking purposes has been just as important, given that potable-quality water is required for only a minority of consumptive uses. The 1990s saw a variety of different types of non-potable water recycling projects initiated in SEQ.

6.1 Wetlands

An alternative to the costly process of upgrading STPs is to use artificial wetlands to further treat wastewater. Artificial wetlands treat wastewater through the reduction of biological oxygen demand and suspended solids, and also the removal of nutrients (Sinclair Knight Merz, 2000). Following such treatment, out-flowing water from the wetland is then suitable for irrigating golf courses, fields, pastures, and many other uses (Greenway and Simpson, 1996). Due to insufficient knowledge in designing and operating artificial wetlands in tropical and arid areas such as Queensland, the Queensland Government established the Artificial Wetlands for Water Pollution Control Research Program in 1992 to fill this void. The project received a grant from the National Landcare Program.

Between 1992 and 1995, ten pilot wetlands were constructed throughout Queensland, including two in SEQ: Logan City and Caboolture Shire. The wetland sites were selected with consultations with the Local Governments. Nine of the projects were free surface water wetlands (water flows above the wetland bed) while the tenth was a sub-surface flow wetland (water flows through soil or gravel). The Logan City artificial wetland doubled as a university study, examining the use of Melaleuca trees in wastewater treatment (Bolton and Greenway, 1997). The Logan City Council was interested in the project as it had the potential to act as a more economically form of wastewater treatment. The Caboolture Shire wetland project also acted as a joint university study (Mitchell, 1995).

The overall results of the pilot studies demonstrate that, while artificial wetlands could not produce effluent at a level similar to that of advanced treatment plants, they were able to reduce the levels of organic matter, suspended solids, nutrients and algal matter in wastewater and produce water suitable for some reuse purposes (Greenway and Simpson, 1996).

Outside of the State Government program, a number of other artificial wetlands have been constructed throughout Queensland, either as pilot studies or fully functional treatment facilities. For instance, the Rosewood Wetland, constructed by Ipswich City Council in 1995, treats effluent which is then used to irrigate the Rosewood Golf Course (Ipswich City Council). Other wetlands within SEQ include Landsborough (Caloundra City Council), Cooroy (Noosa Shire Council), and Oxley Creek (Brisbane City Council).

6.2 Lockyer Valley and Darling Downs

The Lockyer Valley and the Darling Downs are extremely fertile crop growing regions located between Ipswich and Toowoomba. In the mid 1990s, declining water supplies were threatening the regions productivity. In an effort to increase water supplies, a recycled water proposal was made by the Queensland National Party's Waste Water Management Policy Committee, and the proposal was developed further by local Councillors before it was presented to the Water Infrastructure Task Force in 1995 (Rickuss, 2004). From here the proposal was further developed by the community groups in the region. One of the groups was Darling Downs Vision 2000, formed in 1995. The group consisted of representatives from business, agriculture and community backgrounds, who, annoyed at the lack of interest afforded to their water situation by all levels of Government, decided to take the matter into their own hands (Pyper, 2003).Two years later, the Queensland Department of Natural Resources completed a study examining the possibility of piping recycled water from Brisbane, Ipswich and the Gold Coast to the Lockyer Valley and nearby Darling Downs region for crop irrigation (Queensland Department of Natural Resources, 1998). There have been many subsequent proposals and studies into using recycled water for irrigation within the Lockyer Valley and the Darling Downs, but so far no project has been successful. The main reason the projects have been unable to get off the ground is the price differential between what growers are willing to pay for recycled water, and the true cost of

building and operating the necessary infrastructure to pipe the water to the farms. With the State Government consistently unwilling to provide large subsidies to support the project (Barton, 2003), the future of the proposal has remained doubtful for many years.

6.3 The WC Fields Project

In early discussions of the application of recycled water to land-based uses, it was unknown whether this practice was ecologically sustainable, due to the high nutrient levels present in non-potable grades of recycled water. To address this, a project was initiated in 1995 involving the University of Queensland, the Queensland Department of Natural Resources and the Redland Shire Council. The project was funded through the Natural Heritage Trust and aimed to examine the effect of recycled water on the growth and nitrogen uptake of trees and pastures (Moss, Edraki, Gardner, Bloesch and Dart, 1998). Results generated through the study were incorporated to help Councils initiate sustainable irrigation schemes involving recycled water.

6.4 BP Bulwer Island Refinery

As part of the Queensland Clean Fuels Project, the Bulwer Island BP Oil Refinery was substantially redeveloped. The expansions led not only to the production of cleaner fuels, but also to a threefold increase in the refinery's water consumption. Located in close proximity to the refinery was the Luggage Point STP, which at the time discharged its effluent into Moreton Bay via the Brisbane River. In order to meet the refinery's increased water demand, whilst at the same time reducing the effluent load on Moreton Bay, the Brisbane City Council developed a plan in 1999 to produce higher quality recycled water at the Luggage Point STP and supply the water to the BP refinery. Funding assistance for the project was received from both State and Commonwealth Governments. Essential to the success of the project was an agreement between BP and the Brisbane City Council for the refinery to accept a minimum volume of recycled water per year, and Council to guarantee the quality and quantity of the water (Marshall and Don, 2001). Given the difficulties with broader acceptance of recycled water, it is critical that at the outset a market be identified for various grades of recycled water and at the very least cost-recovery pricing agreed with potential users (Radcliffe, 2004).

6.5 Millmerran Power Station, Toowoomba

In the early 2000s the Queensland EPA ruled that effluent produced from stage three of the Wetalla Wastewater Treatment Plant in Toowoomba would not be suitable for discharge into Gowrie Creek (Kent, 2003). As with other local governments, Toowoomba Council faced the decision of a costly upgrade or finding an alternative to creek discharge. The Council's decision was to pump recycled water from the plant to the Millmerran Power Station. The recycled water was used for cooling purposes at the coal-fired power station. Toowoomba had previously proposed a scheme providing recycled water for an industrial estate and irrigation, but failed to gain the requested Commonwealth funding (Flanagan, 2007; Hamlyn-Harris, 2003).

6.6 Greywater

As previously mentioned, the domestic reuse of greywater was very limited throughout SEQ as the practice was illegal in sewered areas. However, as community demand for conservation and water recycling began to grow, so did investigations by local authorities into greywater reuse. The most notable research was conducted by the Brisbane City Council, under a grant from the Urban Water Research Association of Australia. The study concluded that while domestic greywater contains harmful chemicals and microorganisms, the greywater could safely be reused to water lawns and ornamental gardens, and potable water savings could be substantial (Jeppesen, 1996). The Queensland legislation has since been amended to allow for regulated trials of greywater reuse in sewered areas. Greywater reuse has been incorporated into the Water Supply (Safety and Reliability) Act 2008 and the amended Plumbing and Drainage Act 2002.

Currently, Brisbane City Council's *Watersmart Strategy* (2010), developed with extensive public consultation, envisages that wastewater may be treated and reused on site where practicable. In a residential setting, this will mean blackwater and greywater treated and reused in toilets and the laundry and for outdoor irrigation. It is BCC's hope and objective that 'the community supports and uses a diverse mix of alternative water sources' (BCC, 2010: p30).

6.7 Urban Stormwater and Rainwater

Many developments in Australia and SEQ have now taken up water sensitive urban design (WSUD).

6.8 Dual Reticulation

Some project initiatives associated with new communities in areas of Caboolture, Springfield, Heathwood/Brazil and Pimpama-Coomera Waterfutures, have explored dual reticulation systems in recent years.

7. RECYCLED WATER IN QUEENSLAND OUTSIDE SEQ

Despite the large number of water recycling projects that were initiated in the 1990s, the largest single scheme of that period was actually located outside of SEQ at Hervey Bay. Given it was such a successful scheme it is worthwhile noting. Gladstone and Mackay have also initiated very large recycled water projects, during the last decade.

Pulgul Creek and Eli Creek Irrigation Scheme

In 1989, the Hervey Bay City Council (later amalgamated with neighbouring Councils to form the Fraser Coast Regional Council in 2008) was facing the issues of managing increased wastewater volumes as a result of population growth. Council was informed by the EPA that it would not be allowed to increase the amount of effluent Council discharged to the ocean. Council therefore commissioned a feasibility study for an irrigation project that utilised recycled water. Council purchased 395 hectares of land adjoining 125 hectares of public reserves. On this land, Council grew sugarcane (managed by a local farmer), pasture and forestry (Chapple and Anderson, 1993). In 1992, recycled water from the Pulgul STP was connected to the land and used for irrigation. The scheme was such a success that other farmers in the region connected to the scheme. Following this promising beginning Council purchased an additional 320 hectares of land as part of a similar irrigation scheme for the region surrounding the Eli Creek STP. This scheme was also a success, with large increases in the amount of sugarcane grown and economic return. The project was later expanded in 2002 and joined to the Pulgul Irrigation Scheme via a pipeline. The combined schemes provide 8 ML/d of recycled water to ten cane farms, two turf farms, two golf courses and a flower farm, as well as nearby open spaces for irrigation (Wide Bay Water Corporation, 2006). The recycled water project has also recently included stormwater harvesting options, whereby stored stormwater is released to sewers in times of peak usage.

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