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Desalination 188 (2006) 185–194

DESALINATION

www.elsevier.com/locate/desal

A recycled water strategy for regional urban communities

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Received 15 November 2004; accepted 29 April 2005

Abstract

The efficient use of water to meet the social, economic and environmental needs of our communities is becoming a consistent theme throughout much of Australia. This is particularly important for the Grampians Wimmera Mallee Water (GWMWater) region, especially given the extremely dry period currently being experienced. One of the options attracting the interest of government, community and industry as an accepted alternative to the finite limited fresh water supplies, is the use of recycled water, or treated wastewater. For over 30 years GWMWater has led the Victorian Water industry in recycled water use, with now over 92% reuse of urban wastewater now used within the region. GWMWater supplies over 30 customers with recycled water and has developed a process that assesses the technical, environmental, economic and social aspects of recycled water initiatives. A recycled water strategy has been development based on sustainability (Triple Bottom Line) principles and seeks to balance the development needs for water with emerging environmental imperatives [1]. To strengthen the process, GWMWater engages the community and stakeholders in the assessment and decision-making process, resulting in improved understanding of recycled water use viability issues and management requirements.

Keywords: Recycled water; Sustainability; Triple Bottom Line; Consultation; Integration

1. Introducing GWMWater

GWMWater is a regional water authority that operates in the western and northwestern region of Victoria. The Authority provides water to 7,000 rural customers for stock, domestic and irrigation

use, and supplies water to 52,000 urban customers living in 74 towns, as well as providing sewerage services to 21 towns. GWMWater provides urban services to the largest geographical region in the State, which encompasses in excess of 60,000 km² or around 25% of the State.

Presented at the International Conference on Integrated Concepts on Water Recycling, Wollongong, NSW Australia, 14–17 February 2005.

2. Recycled water — an increasingly valuable resource

The efficient use of water to meet the social, economic and environmental needs of our community is becoming a major priority throughout Australia. This is particularly important for GWMWater, especially given the prolonged and extremely dry period that continues to be experienced in western Victoria.

Recycled water derived from wastewater collected by urban sewerage systems is attracting the interest of government, the community and industry, and there is an increasing acceptance of using recycled water as an alternative to, or substitute for, limited fresh water supplies.

In June 2004, the Victorian Government released “Securing Our Water Future Together” [2] (also known as the White Paper) which outlines the agenda for future water management in Victoria. The water reform package contained in the White Paper articulates policies and actions for smarter sustainable management and use of recycled water across the State.

3. The GWMWater’s experience with recycled water

Over 32 years, GWMWater has been able to supply recycled water for community benefit and regional development. GWMWater supplies 30 third party customers with recycled water for irrigation use on vineyard operations, olive plantations, agricultural lands and a plant breeding and research facility. Watering of community facilities occurs on golf courses, racetracks, cemeteries and other recreational facilities such as public gardens, sporting ovals and tennis courts.

In 2002/03, only 3.5% of the total volume of wastewater collected was discharged to natural surface water systems, and this was further reduced to around 1% in 2003/04. GWMWater has almost recycled in full the urban wastewater

generated within the region, with several noteworthy schemes in operation at Horsham, Ararat, Charlton and Warracknabeal. However, it is recognised that scope still exists to improve the way in which recycled water is beneficially used within the region.

Wastewater is treated to a secondary standard, or Class C requirement, at all wastewater treatment plants [3].

4. The GWMWater Recycled Water Strategy

A Recycled Water Strategy for the Grampians Wimmera Mallee region has recently been developed, which provides a definitive and measurable means of assessing the efficiency, effectiveness and sustainability of both current and future recycled water initiatives.

GWMWater recognised the need for a better management approach — one that is not “regulatory driven”, allowing the “true value” of recycled water to be captured and the corresponding benefits to be realised.

The Recycled Water Strategy builds on 32 years of knowledge, experience and capability that GWMWater has developed through the existing schemes and supply arrangements [4].

The Strategy contains key guidelines and criteria that enable future recycled water initiatives to be quantitatively assessed, as well as enabling existing schemes to be benchmarked.

The strategic framework for assessment of recycled water initiatives that underpins the Strategy, integrates the technical, environmental, economic and social aspects, or “Triple Bottom Line” (TBL) principles. It seeks to provide a balance between development needs for water and emerging environmental imperatives, through community and stakeholder involvement.

The community are engaged in the development of the recycled water initiatives, which promotes an improved understanding by the community and interested parties of recycled water use, viability issues and management requirements.

5. The GWMWater Recycled Water Framework

Fig. 1 provides an overview of the Recycled Water Framework, which has been implemented in part recently with the Mallee town of Ouyen, and the experience at Ouyen will be used to illustrate the application of the framework. A new sewerage scheme is presently being constructed at Ouyen, and recycled water is expected to be available for beneficial use by 2007. The case study presented in Section 5.1 of this paper details the progress to date on the implementation of the strategic framework at Ouyen.

5.1. The Recycled Water Framework

5.1.1. Step 1: Policy statement

The policy statement should provide a clear indication of the strategic intentions for the use of recycled water, for example the commitment by GWMWater to achieving recycled water use in full. Further reference to sustainable use of recycled water is also presented in the corporate plan and the environment policy of the organisation.

5.1.2. Step 2: Integrated water resource planning

A detailed review of water resources, regional development, environmental and social issues was undertaken to feed into the integrated water resource planning step. This step highlighted the following potential options for recycled water use at Ouyen.

- Retention of community recreation areas, which could also result in water savings through substitution for current freshwater use
- Development of high value horticulture to enable diversification in the agricultural sector
- Development of an artificial wetland or woodlot for community amenity and environmental purposes.

5.1.3. Step 3: Technical assessment and community/stakeholder consultation

5.1.3.1. Technical sieve

The use of recycled water is constrained by a number of “technical” factors relating to the risks associated with the recycled water itself, the physical features of the local area and existing/potential land use. By considering these factors early in the process, potential options can be narrowed down, or “sieved out”, from those that are feasible. Factors that should be considered are summarised in Table 1.

5.1.3.2. Stakeholder consultation and engagement in decision making

Effective engagement is essential to building sustainable recycled water schemes. It has been important to captivate potential beneficiaries by understanding their role and the potential gains before approaching them. A thorough knowledge of the integrated water resources in the region (Step 2 shown on Fig. 1) allows GWMWater to engage the community with a better understanding of areas of interest and potential benefits available. This also provides a better appreciation of particular constraints that may inhibit further progress.

Consultation and education has occurred in two stages at Ouyen. An initial Expression of Interest (EOI) workshop was held to inform stakeholders of the process and provide them with an opportunity to lodge an application of their interest (EOI) in the use of recycled water. Invitations to the workshop were in the form of mailed leaflets to the whole community, advertisements in local papers and direct letters to key stakeholders that were identified at the integrated water resource planning stage. Prospective customers participating in the workshop were then asked to submit an EOI for the use of recycled water. Table 2 lists the likely groups and individuals engaged in this process.

The EOI workshop is then followed up with a technical workshop that focuses more specifically

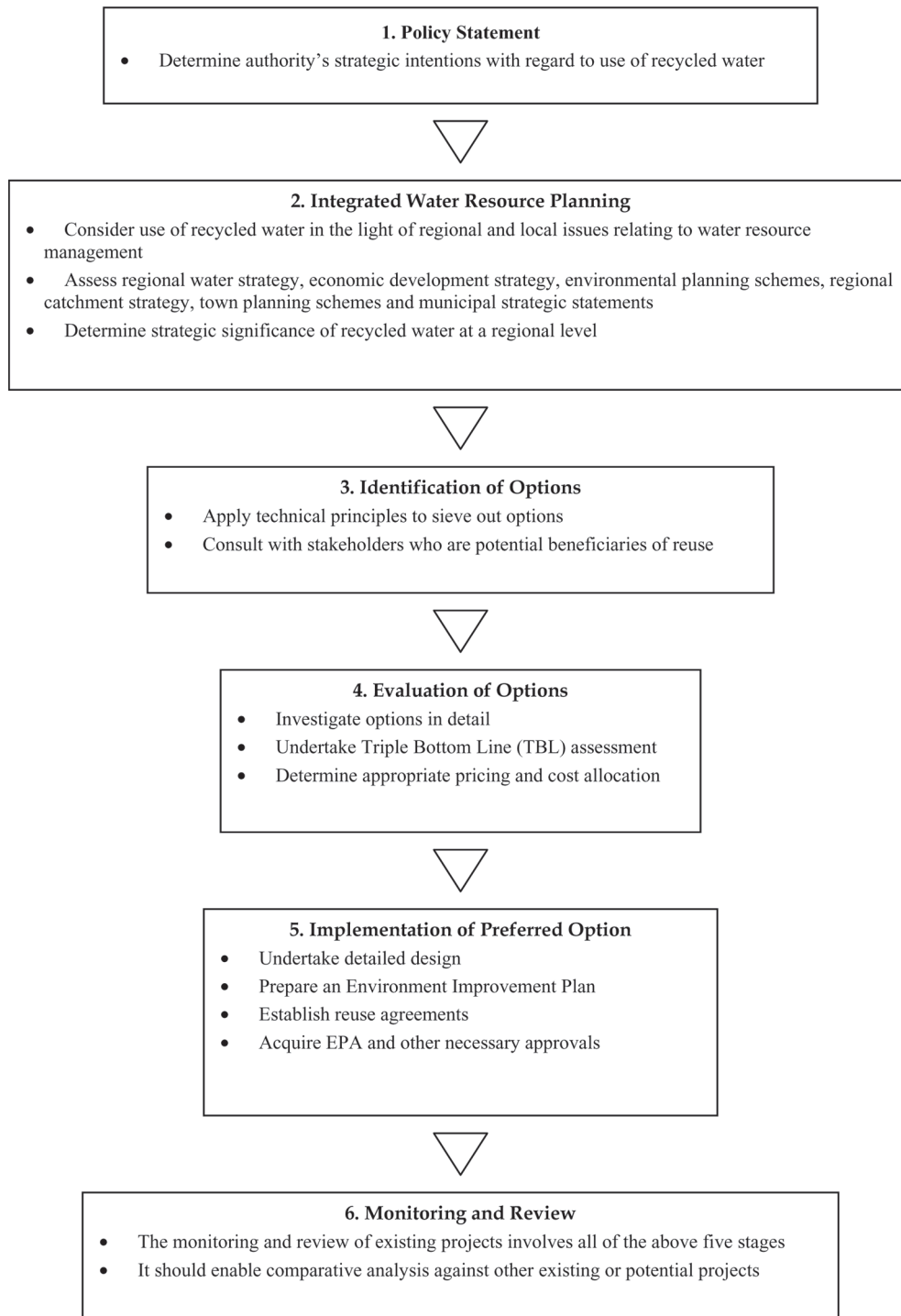


Fig. 1. Outline of the Recycled Water Framework.

Table 1
Technical sieve applied at Ouyen

Element	Data	
Recycled water	Class Salinity Nutrients Toxicants Volume	Class C 1000–1500 EC 25–30 nitrogen, 12 phosphorus No industry at Ouyen, except saleyards. 60–80 ML/annum (expected)
Natural features	Soils Topography Vegetation Surface waters Groundwater	Generally sandy soils. Flat to undulating Some significant sites to the west/south of town. No waterways in/near Ouyen. Similar across area. Groundwater not of high quality.
Existing/ potential land use	Existing infrastructure Management experience Viability	Limited existing infrastructure. Likely to be experience in recreation management only. New horticulture irrigation, retention of community recreation, wetland creation /woodlots

Table 2
Participants involved in Ouyen consultation sessions

Stakeholder	Interest
EPA	Compliance, continuous improvement and environmental sustainability
Rural City of Mildura	Benefits include social amenity, economic development and planning.
Ouyen Inc. (local progress association)	Relevant regional development and social amenity.
Mallee CMA/DSE/ environmental groups	Environmental benefits and compliance
Local community	Possible benefits include protection of public health/amenity, recreation, and improvement of open spaces.
Community groups	The golf club, trotting club, bowls club, tennis/football club, recreation reserve and schools.
Private users	Private users might include local farmers, the saleyards and a caravan park. Consultation has increased interest in use of the recycled water.
GWMWater	Potential for reduced water supply costs, reduced demand and compliance.

on Victorian Environment Protection Authority (EPA) requirements, technical issues and community concerns with recycled water use. Stakeholders and customers who expressed an interest at the first workshop were invited to this follow up session.

Participants in the technical workshop are engaged in the decision making process through

their interaction and involvement in the setting of criteria weightings. The weightings are used to assess and evaluate recycled water proposals that are received from prospective customers after the two workshops. These submissions require a greater level of detail on proposal and need to be developed with sustainability principles in mind. This is discussed in more detail in Step 4 below.

5.1.4. Step 4: Evaluation of submissions

5.1.4.1. Weighting and criteria

The Victorian Government states that, ‘Water recycling should be supported to the extent that there is a positive triple bottom line benefit’ [5].

Step 4 assesses the technical submissions based on a multi-criteria assessment technique. As part of the practical application of the technique, community and stakeholder input was supplied at Ouyen to determine the priorities and weights for the evaluation of the submissions. This evaluation step was developed with consultation from Victorian Department of Sustainability and Environment (DSE), at a time when the “Draft Guidelines for Planning and Reporting Recycled Water Programs” were also being developed [6].

Table 3 outlines the criteria used to evaluate submissions and the actual weightings determined by the Ouyen stakeholders that participated in the second consultation session (Step 3 of the framework). This process of engaging the community in developing the weightings ensures conflicting concerns are taken into account and provides for a more credible outcome.

5.1.4.2. Scoring submissions

The score for each option (presented in Table 4) is determined relative to a base-case option, which generally represents a low value use in terms of

financial return, for example pasture irrigation on adjoining land. GWMWater assessed each proposal at Ouyen in order to maintain confidentiality, with each submission assessed and scored as better or worse than the base case.

5.1.4.3. Assessment of submissions

To ensure confidentiality for individual submissions, the proposed options presented in Table 5 do not describe or represent any of the actual submissions received from the Ouyen community, but provide a hypothetical example to show how submissions are evaluated.

Table 6 shows the four hypothetical proposals using the weightings and scoring system in Tables 3 and 4, and this evaluation confirms whether the proposals can generate an overall sustainable outcome that are greater in value than the base-case. In this example, all four proposals would generate positive sustainability benefits. However, given the amount of recycled water available, only one option can be chosen and so, in this case, the preferred option would involve distributing recycled water to the golf course, closely followed by the establishment of a community woodlot.

The final index and outcome on the assessment of each of the options are subject to challenge through a sensitivity analysis and a sanity check. In a situation where two options would generate

Table 3
Weighting and criteria

Criteria	Weight (%)
Environmental impacts	10
Water resource impacts	10
Regional development impacts	15
Social impacts	30
Technical factors	10
Costs and benefits	15
Risk factors	10
Total	100

Table 4
The scoring system

Impact	Score
Very much better	+4
Much better	+3
Moderately better	+2
Little better.	+1
No change	0
Little worse.	-1
Moderately worse	-2
Much worse	-3
Very much worse	-4

Table 5
Example of recycled water use proposals

Submission 1: Retail sales	Submission 2: Golf course	Submission 3: Community Woodlot	Submission 4: 3rd pipe residential
Construction of a pipeline to provide Class C recycled water to potential new horticultural developments within 15 km of the WWTP.	Supplying Class A recycled water to irrigate the local public golf course, which currently has dry fairways and relies on town supplies for its greens. (Substitution)	Providing Class C recycled water for use by a committee of volunteers for a community tree lot for firewood.	Supplying Class A recycled water for retrofitting residential development for use in toilet flushing and garden watering.

Table 6
Outcome of sustainability evaluation

Criteria	Weight (%)	Retail sales		Golf course		Wood lot		3rd pipe	
Environmental impacts	10	+2	0.2	+2	0.2	+2	0.2	+2	0.2
Water resource impacts	10	+1	0.1	+3	0.3	+1	0.1	+4	0.4
Regional development impacts	15	+3	0.45	+1	0.15	+2	0.3	+1	0.15
Social impacts	30	+2	0.6	+4	1.2	+3	0.9	+2	0.6
Technical factors	10	0	0	-2	-0.2	+1	0.1	-3	-0.3
Costs and benefits	15	-3	-0.45	-2	-0.3	-2	-0.3	-4	-0.6
Risk factors	10	-3	-0.3	-1	-0.1	-1	-0.1	-3	-0.3
Total			0.6		1.25		1.2		0.15

similar benefits, further community consultation to determine the preferred option for the community is desirable.

The final outcome of this step could provide the basis for a recommendation to the Board of Management to progress with Step 5, implementation of the preferred option.

5.1.5. Step 5: Implementation of preferred option

The purpose of this step is to ensure the preferred option is implemented in an appropriate manner that meets regulatory requirements and best practice standards. This involves:

- Undertaking detailed design of the works;
- Preparation of an Environment Improvement Plan;

- Establishing recycled water supply agreements; and
- Acquiring EPA and other necessary approvals.

This Step is generally well understood by the water industry and so the detail of this step has not been discussed. For example, GWMWater has experience in the detailed design and installation of 30 recycled water schemes. GWMWater has also developed a suite of supporting documents, including a standard agreement for the sale of recycled water and a generic environment improvement plan that complies with the requirements set out in EPA guidelines [3].

5.1.6. Step 6: Monitoring and review

Ongoing monitoring and review of existing recycled water schemes is critical in ensuring the

continuation of the best available option. Changes in the availability or cost of technology, the recycled water quality or quantity available, the needs of the community, potential customers (eg. industry), environmental priorities and so on, may present new opportunities for improving recycled water use and so provide reasons for reviewing schemes.

As part of the ongoing monitoring and review, auditing and reporting requirements must also be adhered to. A checklist of issues/topics relating to the six-step recycled water framework forms part of the Recycled Water Strategy, to assist in the planning and implementation of new recycled water schemes and the benchmarking of existing schemes.

6. Pricing principles for recycled water

6.1. Pricing and cost sharing

Many questions and concerns from the community relate to the cost of and price for recycled water. These issues need to be acknowledged at the outset and worked through with the preferred customer. Presented below are a number of principles and issues to be considered when pricing recycled water.

- Recycled water is not a standard product in the market place. It combines the attributes both of a utility commodity and of a waste by-product.
- Some aspects of its sale can be considered within a standard pricing framework, whilst other aspects fit more sensibly within a waste disposal context.
- Within the waste-disposal context, the water authority generally has obligations to dispose of the product.
- Market factors also need to be considered where:
 - other competing products are commonly subsidised and cost recovery normally does not meet either the full costs of supply or of negative externalities; and

- the wider TBL benefits are often unpriced and sale of the product is generally unable to realise a full commercial return, given the comparable pricing of alternative market competitors; and
- a purchaser of recycled water is faced with a number of issues to do with the product, relating customer acceptance and controls on usage, that do not arise with competing products.

Given this context, it would be unrealistic, in most cases, to expect that recycled water will be able to command a premium price or recover all of the costs involved beyond the sewage treatment works to the final user.

6.2. Pricing tests

Recycled water services must comply with “Regulatory Principles”, which state they should not reflect monopoly rents or inefficient expenditure, provide incentives for sustainable use of water resources and provide the regulated entity with incentives to promote the sustainable use of water resources.

Within this context there are a number of tests, which may form part of pricing negotiations.

- *Transparency*: account for the costs incurred and the revenue recovered in delivering the recycled water services as a standalone activity, separate from the delivery of sewerage services.
- *Maximum price*: the maximum price which the water authority can charge will be set as the upper bound for cost recovery.
- *Market forces*: in practice, the price which recycled water can command will ultimately be determined by the marketplace, subject to intervention by a regulator or Government, to place a dollar value on TBL outcomes.
- *Competition*: the maximum price which can be realised will always be constrained by an upper limit set by the price of the nearest alternative means of supply.

- *Discount for overheads:* recycled water may need to provide a discount below the price for the nearest competing source of supply to reflect the increased overheads involved in handling recycled water.
- *Premium price:* there may be situations where recycled water can command a premium if it has significantly greater security or locational benefits.
- *Lower level:* the effective market price may be low if the commercial enterprise places a low value on the benefits that it will be able to realise from access to the resource.
- *Tariff structures and risk:* charges and revenues can be expressed in a number of different forms, which represent different time frames or approaches to risk sharing. These may include annual charges, up-front capital contributions, longer-term contractual commitments or levies placed on the broader community.
- *External funding:* cost recovery may also be achieved through access to sources of external funding.
- *Other:* customers may share risks with the supplier over such issues as the seasonal variation in demand through, for example, the construction of storages on the customer's site to provide for a rate of flow that better meets demand requirements.

7. Conclusion — key outcomes of the Recycled Water Strategy

The improved awareness and understanding of GWMWater staff and management, key stakeholders and the general community of the value of recycled water has been paramount to the successful development and implementation of the Recycled Water Strategy.

Engaging community and stakeholders in the development of recycled water initiatives, promotes sustainability principles and an improved understanding by the community of viability issues and management requirements.

Through the recycled water framework, guidelines and criteria have been developed to measure and evaluate the efficiency, effectiveness and sustainability of initiatives involving the use of recycled water, ensuring the achievement of Government objectives [7].

The identification of potential markets for recycled water are considered in light of an integrated water resources planning approach, providing the opportunity to demonstrate the economic value of recycled water relative to other sources of water. In a number of cases, this has necessitated the “unbundling” of the commercial elements of existing land use and recycled water entitlements that are currently in place under agreements with existing users.

The measures that have been developed are relatively generic and capable of being transposed to other regional areas where management obligations and responsibilities encompass sustainability principles.

Through better planning mechanisms, a thorough understanding of water markets, the identification of new opportunities and potential recycled water markets, GWMWater can identify the preferred recycled water use option that best satisfies sustainability and community requirements. More importantly, a strong planning framework, combined with commitment from partner entities within the community and region, can provide GWMWater with an excellent business case to seek external funding for future recycled water initiatives.

Acknowledgements

The author wishes to acknowledge the work of RM Consulting Group in the development of the Recycled Water Strategy, the Department of Sustainability and Environment, Water Sector Development, for participating in the development of GWMWater's Recycled Water Strategy and the funding support provided by Wimmera Water for Growth.

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