GEELONG ATLAS OF ALTERNATIVE WATER OPPORTUNITIES

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OVERVIEW

They say that necessity is the mother of invention. This has certainly been the case for the regional city of Geelong in Victoria, which is rapidly transforming to a water resilient city through an Integrated Water Cycle Management (IWCM) approach. A 14-year drought and population driven demand growth has prompted a greater emphasis on alternative, decentralised water supply solutions by the city's primary water managers, Barwon Water and the City of Greater Geelong (CoGG). However, these initiatives have largely occurred in a fragmented way.

Both organisations have recognised the need for greater collaboration to ensure an integrated approach to urban water management that ensure a more water resilient city in which water is a cornerstone of liveability, sustainability and productivity. This paper presents the development of the Geelong Atlas of Alternative Water Opportunities as an example of such a collaborative approach.

The Atlas identifies existing, planned and potential alternative (non potable) water supply solutions including harvesting and reuse of stormwater, supply of recycled water from wastewater treatment plants and aquifer storage and recovery (ASR) to facilitate either source. The Atlas will be available online as a resource for raising awareness of alternative water opportunities. The Atlas has been an important project for greater collaboration between Geelong’s two main water managers and has created a foundation level of regional support for integrated water cycle management, which has now been formalised through a broader regional network.

BACKGROUND

Geelong

‘Located 75km southwest of Melbourne, Geelong is Victoria’s largest provincial centre and its fastest growing region’ (COGG, 2012). The city has a population of 212,000 people and has a strong manufacturing and education employment base. Its liveability, proximity to Melbourne and coastal hinterland and vibrant economy contribute to its growing popularity.
The City of Greater Geelong

The City of Greater Geelong provides municipal services to a population of over 220,000 in Geelong and the Bellarine Peninsula. The COGG operates and maintains an extensive network of urban stormwater and drainage infrastructure and is responsible for considerable lengths of urban waterways. The COGG also owns and manages a wide portfolio of public sporting grounds and open space, with extensive irrigation systems.

Barwon Water

Barwon Water is responsible for the provision of potable water, sewerage and recycled water services to more than 270,000 permanent residents in an area covering the Geelong, the Bellarine, Surf Coast, Colac Otway and Golden Plains. Barwon Water operates a centralised urban potable water supply system in Geelong. Drinking water for Geelong comes from the Barwon and Moorabool river catchments, supplemented from groundwater during times of drought. Surface water and groundwater is transferred to holding basins, treated and then distributed via gravity networks to urban residential and business customers. Domestic customers comprise 91.7 percent of the customer base and use about 65% of potable water supplied (Barwon Water, 2012).

Geelong’s water security challenge

Geelong’s urban water supply system is facing two significant strategic challenges, threats to inflows due to climatic changes and rising demand driven by population growth. The catchments supplying the city of Geelong’s drinking water experience a wide range of rainfall variability, as demonstrated in Figure 1, which shows long-term historical inflows to Barwon Water’s major surface water storage, the West Barwon Reservoir.

The long-term average inflow to this reservoir is approximately 29Gigalitres (GL) per year. A 14-year drought, commencing in the late 1990’s saw that figure decrease by one third. In four of those years, surface water inflows were less than one third of the long-term average.

Population growth has also led to a steady increase in demand for potable water over the same period. The Geelong region is one of the fastest growing in Australia at over 1.5% per annum (Figure 2). Barwon Water’s rate of new connection to the water network is growing at over 2% per year.

Responses to the water security challenge

In response to the water security threat at the height of the drought, restrictions were introduced in the early 2000’s and were raised to stage 4 level in 2006. Residents and businesses responded admirably, reducing annual consumption by 26% per year. At the property scale there has been significant uptake of water efficient appliances and behaviours and a strong uptake of alternative water sources including rainwater tanks and grey water recycling.

For the COGG, the imposition of water restrictions at the peak of the drought stimulated the need for a re-evaluation of the city’s use of water for irrigating sports grounds and public open space. Irrigation of almost 80 sporting sites put the COGG in the regions top 10 water users. Under restrictions, only a few special areas could be irrigated, including Kardinia Park AFL ground and the Geelong Botanic Gardens. Simultaneously, the COGG was receiving increasing numbers of requests for access to water from COGG’s stormwater infrastructure.
In response to these issues, the COGG developed its Sustainable Water Use Plan, which identified priority sporting ground sites for water management action and identified the value of such spaces from a liveability perspective. It also developed Future Directions Strategy and a Stormwater Resource Inventory and Guidelines for third party access to stormwater resources.

Armed with these plans, COGG embarked on a multi pronged strategy to improve sporting ground conditions, including conversion to low water use turf grasses, irrigation upgrades, carting water and securing alternative sources of water for irrigation, particularly stormwater. This planning enabled the COGG to appoint a dedicated stormwater project officer who then coordinated successful applications to the Commonwealth to secure $2.5M funding for five stormwater harvesting and reuse projects.

In response to the drought, Barwon Water has embarked on a water source diversification strategy since 2008 to reduce reliance on traditional climate dependant surface water sources. New water sources include groundwater from the Anglesea Borefield and bulk water from the Melbourne Supply System via the Melbourne Geelong Pipeline. Barwon Water is also building two new Class A Recycled Water plants to substitute up to 15% of Geelong’s future water needs with recycled water. The Northern Water Plant in Corio will service the Shell refinery, the region’s largest water user. The Black Rock Water Reclamation Plant will provide recycled water to up to 25,000 new homes in the Armstrong Creek Urban Growth Area and Torquay North.

**Integrated water cycle management**

The collective response to the water security threat in Geelong demonstrates the multi-layered complexity of urban water system management. Decisions are made by an interconnected web of players acting at several sub-system scales, property, precinct and regional. Historically, most of these decisions have been made unilaterally, with limited consideration of the broader impact on the urban water system. Management of the urban water system has tended to be segmented and separated because of this complexity. Whilst this enabled organisations to remain focused on delivering their core business effectively and efficiently, it has limited our collective ability to consider the urban water system as a whole.

The drought breaking rains of the past two years has provided the COGG and Barwon Water with a chance to re-think the urban water system from an integrated perspective. In 2011, the two organisations agreed to work together to progress the integrated water cycle management approach to develop a more resilient urban water system that makes Geelong more liveable, sustainable and productive.

A first step in this new approach was to develop a shared understanding of IWCM in a local context. IWCM is considered to be taking a systems approach to enhancing the resilience of the urban water system, particularly its ability to recover from shocks or adjust with changes. It recognises multiples layers or subsystems and the interdependencies of the community, the environment and the economy.

A vision for a more water resilient Geelong has emerged from this discourse, a city with an urban water system that exhibits the following characteristics:

- diversity in its water supply portfolio across all scales
• efficiency in water use across those scales
• adaptability of the urban water system infrastructure
• cohesion between the community and the natural environment.

(Adapted from Fiskel, 2003).

GEELONG ATLAS OF WATER OPPORTUNITIES

Given that future demands for alternative water sources over the longer term are not well understood, a priority action for the two organisations was development of the Geelong Atlas of Alternative Water Opportunities. The aim of the Atlas was to provide accurate and accessible information on existing and potential supplies and demands for alternative water opportunities across the city.

Scope

The Atlas was limited to areas within the existing and future urban boundaries of the City of Greater Geelong (see Figure 3). Alternative water opportunities referred to harvesting and reuse of stormwater, recycled water from centralised or localized water reclamation plants and medium scale rainwater reuse (>1ML). The solutions needed to be linked in some way to the key themes of liveability, sustainability or productivity, as defined by the Living Melbourne, Living Victoria Roadmap (Figure 3).

METHOD

The project method involved several workshops between staff from COGG and Barwon Water. The initial scanning step involved identifying existing water demand and alternative supply options and collating key information including location, capacity, purpose, ownership, etc. This resulted in a base working map and associated database of key statistics for existing and potential opportunities, presented back to the working group for refinement. The next stage involved scoping of potential new alternative water demand and supply opportunities to a similar level of detail and mapping these in an accessible atlas format.

RESULTS

The Atlas identified a total of 186 alternative water opportunities within the City of Greater Geelong municipality, including 148 demand and 38 supply opportunities. Of the 38 supply opportunities, 19 alternative water sources already exist, another nine are in the planning stages and there are 10 feasible future opportunities. 25 of the opportunities are localised property scale projects servicing one demand, six opportunities are precinct scale projects servicing several demands and four are large-scale centralised schemes servicing multiple demands. Of the 17 stormwater projects in place or planned, 10 are open lagoon projects, 4 employ underground tank storage, 3 employ above ground
tank storage and 2 are proposed aquifer storage and recovery projects. Collectively, these opportunities represent almost 10,000ML of potable water substitution per year, which is over 1/3 of Geelong’s total potable water demand.

DISCUSSION

Water restrictions drove the COGG’s water management planning, which in turn raised awareness of the opportunity for meeting traditional water demands with decentralised, non-potable local solutions. The projects themselves would not have proceeded without external subsidy from the broader community via federal government support. Three of these projects, Grinter Reserve, Kardinia Park and Eastern Park are now operational and provide important regional case studies.

With its strong growth, proactive business, industry and community groups and commitment to citywide collaboration, Geelong is ideally placed to become a more water resilient city through an IWCM approach.

The Geelong Atlas of Alternative Water Opportunities has provided a tangible project for greater collaboration between Barwon Water and the City of Greater Geelong.

The Atlas is still in development, but presents a wide range of opportunities for the supply of alternative water to particular demands within the city. The incremental uptake of these decentralised water projects will help the city become more water resilient and make water more relevant and noticeable within the urban landscape. They are opportunities, not necessarily projects, but may be of interest to COGG, Barwon Water or third parties, such as developers or industrial customers.

This collaboration has led to better understanding of the barriers and challenges faced by each organisation in implementing decentralised water supply solutions and has stimulated staff interest towards a common goal. The water shortage driver for rapid uptake of alternative water opportunities has now dissipated, but the two organisations remain committed to investigating fit for purpose solutions where cost effective, taking into account financial, community and environmental benefits and costs.

The atlas has led to the formation of a new regional network to promote IWCM more broadly across the region. The Barwon Region Integrated Water Cycle Management network is a commitment to working together to build capacity, promote innovative solutions and raise awareness within the community of the role and value of water to the region. The focus will be on planning and creating water resilient cities and towns that are more liveable, sustainable and productive.

CONCLUSIONS

The need for a more resilient urban water system has driven a diversification of water supply sources in the city of Geelong across multiple scales and greater collaboration between its key water managers. Where once the city was served only by surface water (and occasionally groundwater) delivered in centralised networks, it now has access to significant volumes of recycled water and
There are still many barriers to implementing a more diverse urban water network across all scales and sharing of knowledge and collaboration is fundamental. Geelong has a history of organisations working together for better outcomes. The Geelong Atlas of Water Opportunities is an example of urban water managers working together to promote integrated water cycle management to enhance the resilience of a city’s urban water system.

REFERENCES


Figure 1 Annual inflows to West Barwon Reservoir

Annual Inflows to West Barwon Reservoir 1928-2011

Pre-1997 average 29000 ML/a

Post-1997 average 18800 ML/a (66%)

2010/11 year inflow
Figure 2 Population growth in Geelong


Forecast population, City of Greater Geelong

Figure 3 Future Proofing Geelong Outcomes

*Adapted from Living Melbourne, Living Victoria (2011)*