

Creating smart water use for long-term sustainability

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ABSTRACT

Manly, at the gateway to Sydney's northern beaches, is an iconic Australian destination. Over the past several years Manly Council has undertaken a series of stormwater treatment and re-use projects designed to prevent stormwater pollution and to reduce potable water consumption in an ultra-urban catchment. Begun in 2000, the Stormwater Treatment and Re-use (STAR) Project was an innovative project set in a long-established and highly populated coastal area with a high coverage of impervious surfaces. The STAR Project was developed in response to community and Council concern over continued water quality problems associated with stormwater run off and negative impacts on swimming at Manly's iconic ocean beach. It was a demonstration project involving both public and private partnership, including all levels of government, industry, universities and community. Building on the experience gained in the STAR project, and with the assistance of State and Australian Government grants, Manly has gone on to a series of new stormwater re-use projects involving different partners and a diversity of initiatives. Strategies for implementing sustainable water management systems in highly urbanised communities present real challenges for our cities. With the use of technology and scientific research, strategic planning can result in water smart use with the capacity to address our population's ever-growing demand for water. This paper will outline the benefits of smart water use, and discuss future opportunities for investment through the implementation of a water savings action plan.

KEYWORDS: Water cycle management, sustainable use, water savings action plan

1. INTRODUCTION

The Manly Local Government Area covers just 15.2 square kilometres and has a population of approximately 39,000 people. More than 70% of the area's boundaries are water – the ocean, Sydney Harbour foreshores and the streams that flow to them.

Each year Manly is host to some 6 million visitors, many of whom come to engage in recreational activities associated with the iconic ocean beach, sheltered bays, a coastal lagoon, rocky headlands and rugged clifflines that are all part of Manly.

Both residents and visitors consistently identify beaches, waterways and bushland as important aspects of the character and amenity of the area.

Manly's vision, identified in consultation with the residents of the area, is of

A vibrant and inclusive community which values its heritage and works together to create a sustainable lifestyle and environment for all to enjoy.

Manly Council has traditionally focused on draining stormwater so that it does not contribute to flooding, and on addressing pollution incidents as they occur.

Faced with declining water quality and community expectations of a healthy Manly Lagoon and Ocean Beach, Manly Council resolved to develop a sustainable water cycle management program. The program seeks to assist in restoring Manly Lagoon to a condition suitable for swimming, to ensure that Manly's Ocean Beach is suitable for recreational use all year round, and at the same time to secure water supply to maintain Manly's open spaces.

This paper explores the progress made since the sustainable water cycle management program commenced in 2000.

2. WATER CYCLE MANAGEMENT: ITS PLACE IN MANLY'S SUSTAINABILITY STRATEGY

2.1 Water cycle management as part of Local Agenda 21

Manly Council has a strong and ongoing commitment to sustainability, catalysed by the Local Agenda 21 (UNCED, 1992) document developed as part of the UN Conference on Environment and Development held in Rio de Janeiro in 1992. As part of Manly's 1998 Conservation Strategy developed in response to Local Agenda 21, Council committed to improved water quality and management, and in 2001 a Water Cycle Manager was appointed for the first time.

Each successive 4-yearly review and update of the Conservation Strategy, and its transformation to a Sustainability Strategy (Rose et al. 2008), has seen the emphasis on water cycle management enhanced, such that the 2006 Manly Sustainability Strategy, as part of the theme addressing 'A natural, sustainable Manly' commits to programs:

- Protecting our water cycle and catchments,
- Sustaining marine environments,
- Managing coastline and estuaries,
- A water cycle management program, and
- Responsible production and purchasing.

2.2 The water consumption cycle in Manly

In 2005/06 Manly's Water Cycle Manager developed a model of the total water cycle and current water use by Council across all its facilities and operations. Recognising that, through integrated management drinking water could be conserved, flooding alleviated, pollution reduced, and open spaces better maintained.

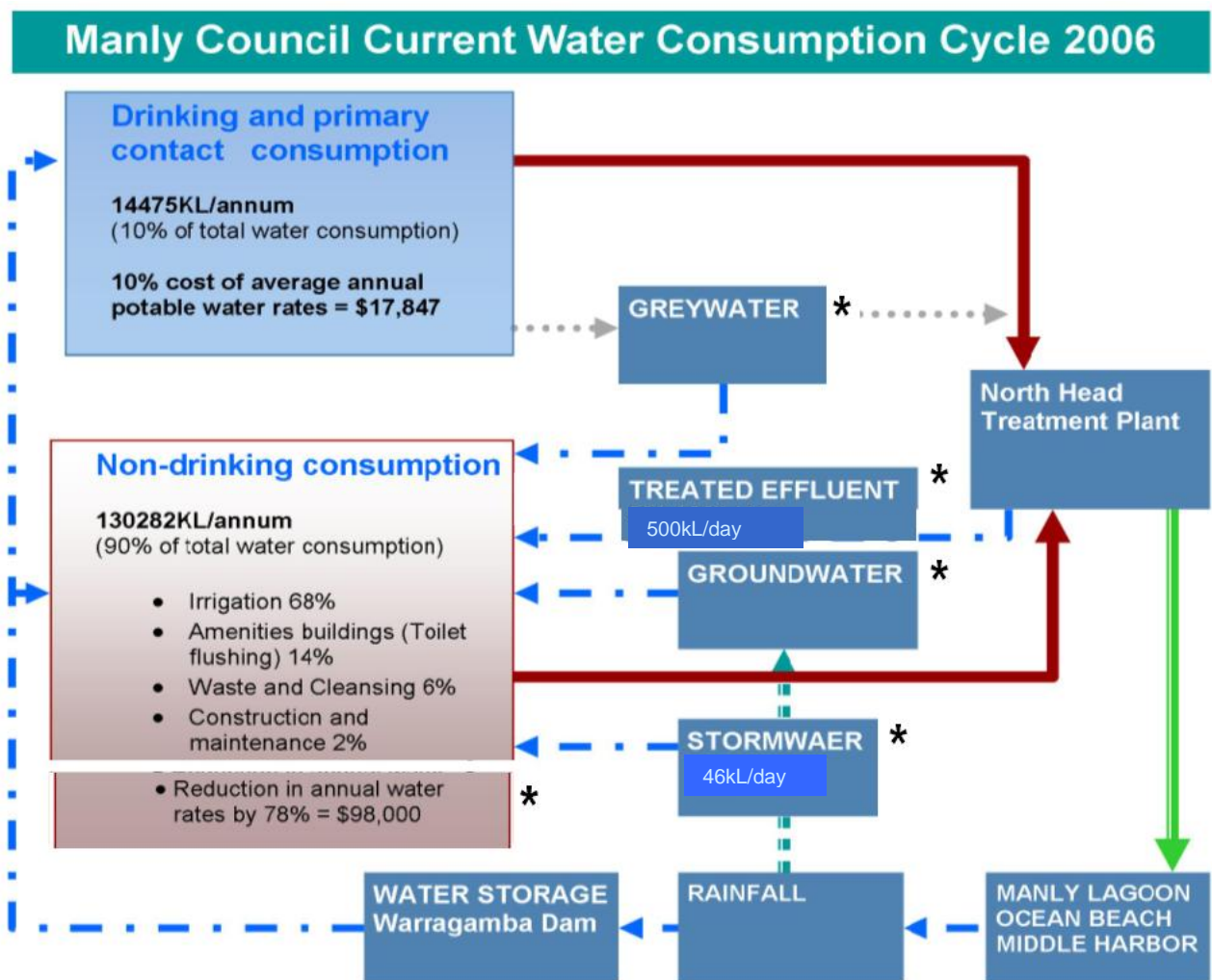


Figure 1: Manly's water consumption cycle, as at 2006, and savings realised.
* indicates new water sources emerging from Water Cycle Management program

More recent experience and ongoing refinement of both the demand and consumption aspects of the model has seen some changes to the estimates presented. This refinement will continue as Council's water cycle management and community responses to it continue.

2.3 Efficient stormwater treatment and re-use in Manly: The beginnings

In 2000, Council recognised opportunities for a demonstration Stormwater Treatment and Re-use (STAR) project involving capture of stormwater from local streets through changed infrastructure, underground treatment and storage to improve the quality of the water captured, and re-use to irrigate Norfolk Pines and the surrounding grassed area that are part of a heritage listed Manly Ocean Beach precinct.

The project was innovative in its engineering, technical, partnership and community engagement, and after comprehensive scoping by a multi-disciplinary team involving business, community, Council and government agencies, Council was successful in obtaining a major Commonwealth grant to support the work.

Focused on a single highly urbanised sub-catchment, the STAR project adopted a ‘treatment train’ approach to reduce stormwater run-off to the iconic Ocean Beach, and in doing so to prevent pollution at source, and at the end-of-pipe point of discharge to the stormwater network. As described by Shackel et al. (2003) permeable street paving was used in a key residential street feeding the stormwater system in the sub-catchment. This was combined with pit inserts, increased street sweeping, and local community education and involvement all served to reduce water and pollutant discharge to the stormwater pipes discharging to Manly Ocean Beach.

Captured water was delivered to underground storage tanks via geotextile cells filled with an ‘ecosoil’ treatment system.

Both Council’s Water Cycle Manager and research staff from the University of New South Wales monitored the quality of the treated water to ensure that it was of an appropriate quality for re-use in irrigating the heritage beachfront area under which the treatment and storage tanks are located.

The whole project provided important testing and demonstration of several commercial products involved under challenging high-use beachfront conditions, with the various manufacturers being willing participants in the project because of the promotional value the project brought for their products. After some initial concerns at the disruptions caused by street rebuilding, local residents became proud promoters of an innovative project in their neighbourhood and were vigilant ‘watchdogs’ ensuring that Council met its commitments to street sweeping, pit cleaning and other aspects of the project.

From Council’s perspective, the project provided improved stormwater quality and attenuated flows to Ocean Beach, an ability to replace potable water with water of a quality more appropriate to its use in irrigating the heritage pines and the high-use public Ocean Beach foreshore, and increased community awareness and involvement in water cycle management.

2.4 Building on the STAR project

The STAR project was, for Manly Council, the beginning of a journey to improved stormwater capture and re-use as part of an integrated approach to water conservation and re-use.

Numerous other projects have followed. These include:

- Harvesting and re-use as part of a major redevelopment of Council’s service depot. Both collection of roof water, and capture, treatment and re-use of surface runoff now contribute to pollution prevention, flood alleviation in the adjoining waterway, and savings of potable water use through replacement use of water of a quality more appropriate to uses such as machinery washdown and toilet flushing.
- A major upgrade of the Corso – the pedestrian way that forms the heart of Manly’s CBD – provided another opportunity introduce stormwater capture and re-use by installing an underground tank that reduced runoff to the Ocean Beach and provided water for irrigation and local street cleaning.

A suite of other water cycle management initiatives (see Table 1) have followed since the 2000-01 STAR project, each of them bringing with them benefits of pollution prevention, water sources alternative to potable water, and in several instances localised flood alleviation.

Project	Project Description	Function		
		Pollution Prevention	Flood Alleviation	Alternative Water Sourcing
Effluent/ Grey water re-use for irrigation	Demand Manage. Nutrient recycling, membrane treatment.	☑		☑
Council Depot Stormwater Harvesting and Re-use	Roof Collection and Re-use; Surface Runoff Treatment and Reuse	☑	☑	☑
Manly Ocean Beach STAR Project (Stormwater Treatment and Re-use)	Stormwater Runoff Treatment and Re-use, Groundwater top-up, infiltration.	☑	☑	☑
Seachange	Community education; Tank Subsidies, workshops	☑		☑
Manly Tennis Courts - (Keirle Park) – Roof Harvesting and re-use; Irrigation and toilet flushing	Roof Collection and Re-use Sewage fix.	☑	☑	☑
Ivanhoe Park Groundwater Extraction	Groundwater Extraction, Storage and Re-use	☑		☑
Clontarf/ LM Grahams Groundwater Extraction	Groundwater Extraction, Storage and Re-use	☑		☑
Water Cycle Monitoring	Groundwater, Stormwater and Grey water Monitoring of quantity and quality	☑		☑
Seaforth Oval Stormwater Harvesting and Re-use	Roof Collection and Re-use; Surface Runoff Treatment and Re-use	☑	☑	☑
Manly Flats Water Cycle Management	Pipe Construction; Stormwater infiltration and Recovery; Detention and Re-use	☑	☑	☑
Tania Park Stormwater Treatment Project	Stormwater Runoff Treatment prior to natural drainage	☑	☑	

Table 1: Manly Council Water Cycle Management - Projects summary

Having been successful in obtaining from the NSW Government a major Water Savings grant, Council is currently working with Sydney Water to overcome some initial problems encountered in implementing a re-use project. This project will take bio-membrane treated surplus water from the North Head sewage treatment plant and transport it to sites such as Manly Golf Club and nearby Council owned sporting fields. Community attitudes, water quality and other aspects of this project are being monitored independently by University of Western Sydney's staff in the Irrigation Futures Cooperative Research Centre.

2.5 Holistic water cycle management

While the actual figures have changed over time, holistic water cycle management has become an integral part of Council operations, with 50% savings on the cost of potable water already achieved since 2001. 71,238kL (40.4%) of potable water use has been saved. At 2006-07 prices of potable water and wastewater disposal this reduces Council's water bills by approximately \$130,000 per year, and as water prices rise this will escalate.

To date achievement have been through demand reduction at Council facilities and in Council operations, development of water supplies alternative to potable water and of a quality more appropriate to use, education and dissemination of water-wise messages to the community, clubs and sporting groups who are users of Council facilities, and development of a senior management awareness of and commitment to integrated water cycle management.

Consistent with the requirements of the NSW Government's *Energy Administration Amendment (Water and Energy Savings) Act* introduced in 2005, Manly Council is currently finalising a Water Savings Action Plan building on recent achievements and proposing further savings measures to be implemented during the between 2008/09 and 2012/13. Total anticipated savings from all cost-effective measures proposed in the plan are 19,025KL per year, to be achieved for a capital outlay of around \$95,000 over the coming four years. These measures are predicted to provide an 18% overall Internal Rate of Return on investment, equivalent to a 5.5 year payback period.

2.6 Factors enabling the change

A number of factors have been critical in enabling Manly Council to achieving the progress made to date. These include

- Capital funding obtained from external sources – both State and federal Government grants and business partnerships and demonstration opportunities through which substantial 'in-kind' contributions have been obtained
- Community engagement and acceptance of the works being undertaken
- The capacity within Council (both among staff and elected representatives) to act as a catalyst and facilitator in complex projects pursuing new experiences for all participants
- The Manly Environment Levy, which has provided often-needed matching funds to enable project funding from other sources.

3. CONCLUSIONS

Integrated whole-of-life cycle water management is a new way of thinking for many in local government. However, as the Manly experience is demonstrating, the benefits to be gained are numerous. Developing and implementing integrated plans for managing drinking water,

greywater, treated effluent, stormwater and rainfall provides social and environmental benefits as well as the economic benefits highlighted in this paper. These benefits accrue to all who are involved. Impacts of pollution can be prevented or minimised, flooding alleviated, and water sources alternative to potable water accessed appropriate to the uses to which that water is being put.

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