CRC for
Water Sensitive Cities

Glenelg to Adelaide Pipeline (GAP)

Location:
Adelaide, South Australia

Case Study — Prepared by Cooperative Research Centre for Water Sensitive Cities, August 2020

Australian Government
Department of Industry, Science, Energy and Resources

Business Cooperative Research Centres Program

Insight

The Glenelg to Adelaide pipeline delivers a reliable climate-independent water supply to irrigate open space in western and central Adelaide. Retrofitting a centralised, fit-for-purpose water supply system dedicated to maintaining green, open spaces consolidates Adelaide as a leader in urban water management.

Project description

Commissioned in 2008 and completed in 2010, the Glenelg to Adelaide Pipeline (GAP) was built to deliver treated wastewater from Glenelg (on Adelaide's coast) to the parklands that encircle the Adelaide CBD. The milestone project can deliver 3.8 GL of high quality treated wastewater via a 50 km network of pipe.

The GAP provides 400–800 ML of treated wastewater to irrigate Adelaide parklands each year, including those managed by the City of Adelaide, the City of West Torrens, the City of Unley and private entities (e.g. Pulteney Grammar School).

SA Water owns and operates the GAP and associated infrastructure. The project involved designing and constructing a tertiary treatment plant to further improve water quality, including a chlorine dosing plant, amiad filters and two 7.5 ML and two 4 ML lined and covered storage ponds. Three major pump stations were constructed to pump water throughout the pipe network.

Glass fibre reinforced plastic (GRP) pipes were used for the 10 km of trunk mains and a mix of polyvinyl chloride, glass fibre reinforced plastic and high-density polyethylene was used for the 40 km of distribution pipes.

What does this case study demonstrate?

Each case study has been selected to demonstrate specific solutions, benefits or enabling structures that support the creation of water sensitive cities. This case study focuses on:

- Alternative water supplies
- Leadership and influence
- Amenity and urban greening
- Ecosystem health
- Wastewater management and recycling

The drivers

Adelaide needed to harness alterative water supplies to ensure open spaces are resilient to the effects of drought

- **Secure an alternative water supply for irrigation**
  The GAP offers councils and other land managers a secure, fit-for-purpose water supply that is predictable, consistent and most importantly buffered from the effects of drought and exempt from water restrictions. Adelaide has traditionally relied on reservoirs in the Mount Lofty Ranges and the River Murray for mains-supplied water. Between 1996 and 2010, the City of Adelaide, which manages the Adelaide Parklands, reduced water use from 750 ML each year to 350 ML, the result of water restrictions during the Millennium Drought. Historically, the Adelaide Parklands used a mix of mains-supplied potable water and groundwater, but the ongoing use of groundwater was limited because of high salinity levels. The city needed an alternative water supply.
- **Reduce reliance on the River Murray**
  The Millennium Drought not only highlighted South Australia's reliance on the River Murray as a source of water supply, but also demonstrated the reliance on high-quality potable water for irrigation. Potable water restrictions significantly affected the quality of Adelaide's open spaces, reducing their amenity and ecological value.
- **Deliver broader environmental gains**
  Treated wastewater is discharged into Gulf St Vincent. The Gulf is bounded to the north, east and west by land, creating a well-protected, low energy marine environment. Water movement in Gulf St Vincent is minimal and the discharge of nutrient rich wastewater has affected seagrass meadows. SA Water, the South Australian water utility, was encouraged to identify new reuse opportunities for wastewater and help reduce the amount returned to the marine environment.
- **Meet community expectations**
  Water restrictions and reduced irrigation caused large vegetation die-off in the public and private realms, stimulating a loss of open space amenity and community concern. The community demonstrated the value they placed on green open spaces and voiced their feedback.

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Images: SADB

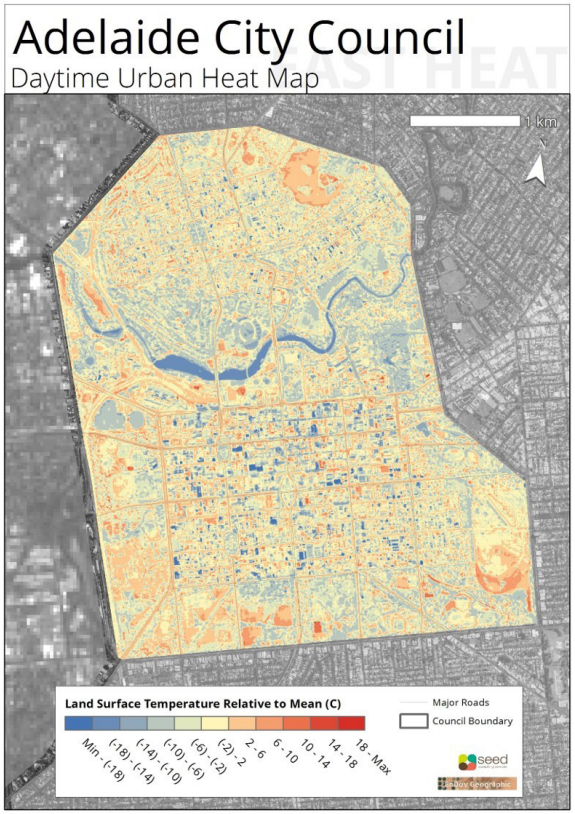
The outcomes

Creating a cool, green city by redirecting high-quality wastewater from the marine to the terrestrial environment.

Cities providing ecosystem services	Cities as water supply catchments	Cities comprising water sensitive communities
• **Reducing reliance on the River Murray** The Murray–Darling River system has many demands placed upon it. Reducing mains supplied water sourced from the River Murray keeps water in the river system, providing downstream environmental benefits. • **Providing healthier marine ecosystem** The GAP removes megalitres of treated wastewater from the marine environment, by redirecting water that would have been discharged in Gulf St Vincent to open spaces in western and central Adelaide. • **Ensuring a high quality, non-potable water source** Treated wastewater from the GAP includes minerals and nutrients that aid plant growth, health and vigour.	• **Delivering a secure, climate-independent water supply** Water from household toilets, sinks and drains is captured, treated and redistributed for irrigation. This process provides a secure supply of fit-for-purpose water that is exempt from water restrictions, regardless of the effects of drought or dry times. • **Closing the loop** Adelaide's public open spaces are maintained to a high standard using water sourced and treated within the city itself.	• **Improving amenity** Public open spaces are improved via access to an alternative, reliable water supply. • **Buffering the urban heat island (UHI) effect** Thermal aerial imagery demonstrates the cooling effect of the irrigated vegetation in the Adelaide Parklands compared with non-irrigated vegetation and hard surfaces in the Adelaide CBD: irrigated vegetation surface temperatures can be up to 25°C cooler than hard surfaces in the CBD. A low cost alternative water supply keeps vegetation green and cushions the city from the UHI effect. • **Delivering social and economic benefits** The parklands are a highly-valued space. Every year, they host events such as the Adelaide Fringe, the Adelaide Festival, WOMADelaide and the Superloop Adelaide 500. Access to a reliable water source maintains the parklands as an attractive and relevant venue space, and enables them to recover quickly following large festivals and public events.

The lessons

- **Education is key**
  Before implementing a scheme like this, it is important to engage the community and stakeholders so that people receive science-based information early. But, engagement and education should continue throughout the process. Some stakeholders were concerned about the quality of wastewater and the impact of low saline water on irrigated vegetation.
- **Relationships and collaboration ensure everyone wins**
  This project required collaboration between local, state and federal governments. Multiple regulatory bodies were involved to ensure water used for irrigation met the required public health and reporting standards. Critical to success was a respectful and proactive working relationship between the primary customer, the City of Adelaide, and the supplier, SA Water. This constructive working relationship meant stakeholders could create solutions together and work through issues in the project design and development stages.
- **It's important to monitor soil health**
  Wastewater has a higher concentration of salts than rainwater or mains-supplied water. So, it is critical to design rigorous methods to assess soil health, review the viability of plant species and monitor underground water sources. In 2012, the University of South Australia investigated the tolerance and sensitivity of plants to the GAP water, focusing on sodium, boron, chloride and salt. Council staff now regularly monitor the health of soil, plants and aquifers, and manage soil compaction to ensure that issues associated with using wastewater are not exacerbated, such as salinity accumulating near the soil surface. To date, using GAP water has not caused any considerable groundwater contamination or affected vegetation.
- **We can cool the city**
  Cool cities are liveable cities. Using recycled water redirects a waste product to cool the people who live, work and play in the city, as well as to provide ecosystem services. GAP water irrigates large areas of land, but there is capacity to use more. Researchers are assessing the possibility of using aquifers to store excess wastewater over the wetter months when irrigation declines.
- **GAP water is a low cost option**
  Infrastructure costs associated with establishing the GAP were substantial and required funding from both the federal and state governments. But once established, the scheme now offers a low cost water supply to customers. In South Australia, GAP water is cheaper than potable water and other recycled water schemes. Recycled wastewater offers open space asset owners an option to significantly reduce their irrigation costs.



Transferability

Many Australian cities and towns can benefit from redirecting wastewater from the marine to the terrestrial environment and harnessing the value of a waste product for irrigation. But, this project is particularly transferable to cities and towns with similar water infrastructure assets and climate to South Australia.

Adelaide's climate is typified by long, hot and dry summers and cool, wet winters. Without irrigation, much of Adelaide's open space assets will die over summer.

SA Water provides water and wastewater services to 1.7 million South Australians. In Adelaide, wastewater entering the sewerage network travels through a series of mains to three major treatment plants. Once treated, the recycled water collected at the Glenelg Wastewater Treatment Plant can be delivered to open spaces through a network of underground pipes. The customer (usually councils) is responsible for maintaining the pipe network beyond the meter. The treated wastewater pipes and meter are purple, making them easy to identify.

Recycled water operators and users must comply with the *Environment Protection Act 1993* and the Environment Protection (Water Quality) Policy 2003. They are also supported by the South Australian Recycled Water Guidelines.

Business case

The project cost approximately $75 million.

It would not have been financially feasible without federal and state government funding. However, the economic, social and environmental benefits demonstrate the holistic value of this project. Monetising the the broader social, economic and environmental benefits (via benefit–cost analysis tools) would most likely show that the project is economically viable.

Project collaborators

- SA Water
- Allwater (United Water)
- State Government of South Australia
- Australian Government
- City of Adelaide
- LEED Engineering and Construction
- Guidera O'Connor
- Leighton Services
- SA Health
- SA Environment Protection Authority

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