Aquifer recharge with stormwater

City of Salisbury, Adelaide, Australia

water scarcity impact

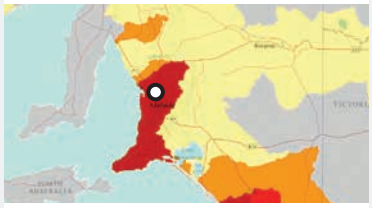
Reduced withdrawal	Main
Reduced consumption	Main
Improved water quality	
Increased productivity	
Net basin benefit	Main

volumetric impact
5 000 000 m^3/yr

capital cost
$57 000 000

estimated unit cost of water
100 ¢/m^3

Water Stress
City Of Salisbury, Australia



Arid & low water use
Low (<10%)
Low to med (10-20%)
Med to high (20-40%)
High (40-80%)
Extremely high (>80%)
No data available

Water Stress Map:
Gassert, F., M. Landis, M. Luck, P. Reig, and T. Shiao. 2013. "Aqueduct Global Maps 2.0."

Confidence level
Low Medium High

Water Scarcity Impact Key
Main Minor

Credits
We wish to acknowledge the input and support of Bruce Naumann of Salisbury Water in the preparation of this case study.

Project Overview

Overall water demand of the Adelaide metropolitan area is around 200 000 000m^3/yr. In a dry year up to 90% of this must be met from the highly stressed River Murray which is suffering from increased salinity, over extraction, increasing pollution and dying ecosystems. In 2003 Adelaide experienced extensive water restrictions for the first time since a major transfer pipeline was built in 1954. As a result a number of strategies have been developed to address the supply demand imbalance and to secure sustainable water supplies into the future.

Recognising that up to 90% of demand for potable water supply could be replaced with non-potable supply the City of Salisbury implemented the collection, storage and distribution of stormwater run-off that would have otherwise discharged to the Gulf of St Vincent. By 2009 the city had established 20 wetlands for treatment of stormwater and twenty two aquifer storage boreholes. 5 000 000m^3 of stormwater was collected in the wet months, stored and then distributed in the dry months. It is anticipated that this figure could rise to 14 000 000m^3 by 2014. The capital investment up to 2009 cost approximately US$52m.

Key Elements

- Urban stormwater harvesting from the engineered drainage network.
- Constructed wetlands and small footprint bio filtration technology for treatment prior to storage.
- Storage of treated water in a confined aquifer.
- Non-potable distribution system ("Purple" pipe system).
- Funded by grants and money borrowed by the City of Salisbury against future income from sales to customers.

Key Outcomes

- The treatment and reuse of 5 000 000m^3/yr of non-potable water.
- 20% of all injected water maintained within the aquifer (260 000m^3).
- Avoidance of pollution to the sensitive estuary environment (Barker's Inlet).
- Reduced energy cost for industry due to reduced salinity.
- Establishment of a non-potable water revenue stream.
- Payback period of five years.
- Consumptive use from evaporation is minimised through storage in the aquifer.

Adelaide, Australia

Intervention Features

- Groundwater recharge
- Non-potable water distribution system
- Stormwater harvesting

Project Levers

1) Collection, Treatment and Storage:

A harvesting weir diverts stormwater from the Dry Creek catchment (130km^2) to a gravity supply main which fills a sedimentation basin. Prior to injection in the aquifer stormwater must be treated to an acceptable standard, this is done through a system of two wetlands and six biofilters. The filtered water is then pumped to nine boreholes that are used to transport the water into the storage aquifer.

2) Water Distribution:

Stored water is recovered from the aquifer and distributed through a dedicated non-potable network serving over 500 customers; this is an all year round process.

Within a 1-2km radius of the proposed scheme there is a demand for 400 000m^3 of water from industries who are interested in receiving harvested stormwater. Further network expansion has allowed for 650 000m^3 to be distributed throughout the rest of the city.

Over 5 500m of water pipe (280-355mm diameter) as well as 4 000m of electrical and communication infrastructure was constructed as part of the project.

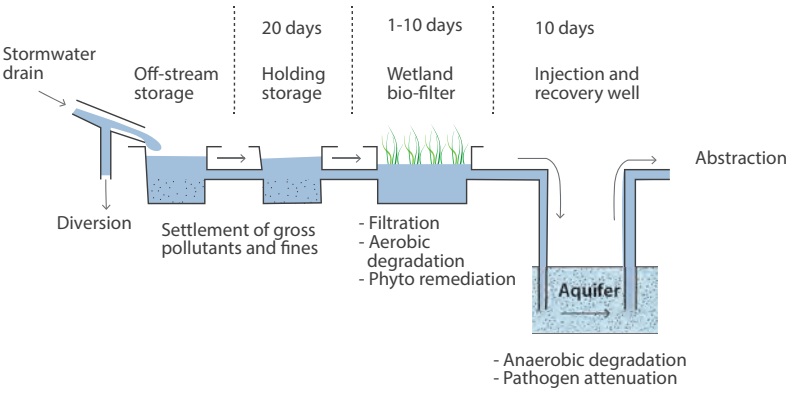
Outcomes and Challenges

Treatment and reuse of urban stormwater has resulted in a reduction of vast amounts of sediment and nutrients being discharged to the marine environment reducing pollutants.

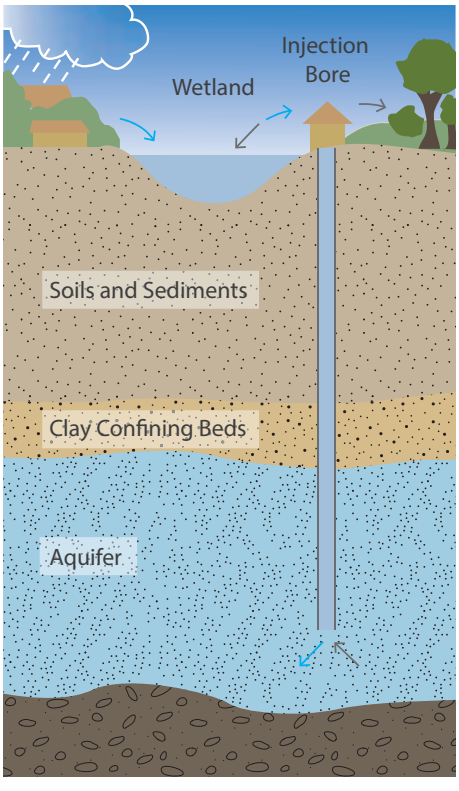
The target aquifer system has undergone stress in the past due to industrial extractions. This scheme will help provide additional fresh water to offset the impacts of this.

The scheme uses passive treatment technologies which minimises pumping, whilst the proximity to customers minimises distribution energy costs. As a result the embodied energy of the recycled water is up to 20% less than the drinking water supply.

The stormwater is of a lower salinity (200mg/l TDS than mains potable water (up to 500mg/l TDS), for some industrial customers this reduces the energy they expend to desalinate mains water.



Above: The collection, treatment and aquifer storage process



Above: Aquifer storage and recovery