Government of South Australia
Adelaide and Mount Lofty Ranges
Natural Resources Management Board

Stormwater treatment & re-use

V1SEP10

Stormwater treatment and re-use schemes achieve natural resources management outcomes and provide multiple benefits to the community, as well as contributing to water security for South Australia.

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With South Australia's water resources under increasing stress, the Adelaide and Mount Lofty Ranges Natural Resources Management Board showcases the harvesting and re-use of urban stormwater as a viable alternative water source.

Stormwater is a valuable resource that can help reduce pressure on other water resources in South Australia. Properly treated, it can be re-used for a range of purposes, such as parks and gardens, flushing toilets and agriculture. In an established urban setting, however, it can be very difficult to find sufficient open space upon which to construct wetlands of sufficient size, together with the aquifer storage and recovery (ASR) infrastructure required for the treatment and re-use of stormwater.

Golf courses can be ideal for this purpose as they often have sufficient open space and also use large volumes of water for irrigation during the summer.

The Grange Golf Club, Royal Adelaide Golf Club and Glenelg Golf Club, located in the western suburbs of Adelaide, are among South Australia's premier sporting venues. Traditionally, groundwater was used to irrigate the golf courses during the summer but all three Clubs were committed to the development of more sustainable options over the long term.

Table 1: Area of wetland and water saved

Club	Total area of wetlands (m2)	Stormwater harvested (mL)
Glenelg	12,000	250 - 300
Grange	24,000	250 - 320
Royal Adelaide	9,500	250 - 300

Feasibility studies indicated that wetland and ASR schemes would help reduce this dependency on groundwater.

The Adelaide and Mount Lofty Ranges Natural Resources Management Board facilitated partnerships between local, state and federal Government and industry and coordinated the delivery of the three ASR schemes, collectively titled the Metropolitan Adelaide Stormwater Re-use Project.

These wetland and ASR schemes showcase innovative water resource management, demonstrating what can be done in an urban setting to contribute to water security for South Australia.

Where does the stormwater come from?

Stormwater used in these schemes comes from the rain which falls on urban and peri-urban Adelaide. Without capture, the stormwater would drain into the Gulf St Vincent without further treatment.

Although the stormwater can contain a range pollutants, including grime, sediment, chemicals and nutrients which are washed off roads and gardens, it usually has relatively low levels of dissolved salts.

To effectively capture the quantities of stormwater generated in winter, large wetlands are required where the stormwater can be held for a period of time. Importantly, a good aquifer is needed as well

so that sufficient water can be stored underground over the winter period.

So, wetland aquifer storage and recovery schemes require not only a supply of stormwater, but also sufficient open space to construct artificial wetlands and a suitable nearby aquifer.

This is why golf courses are ideal for stormwater reuse schemes - they have sufficient open space as well as a requirement for large volumes of water for irrigation during the summer.

How do wetlands clean water?

Wetlands provide a natural system for cleaning stormwater. Essentially, they act as bio-filters for the polluted stormwater from urban and peri-urban areas upstream. Stormwater needs to be retained within the system long enough for pollutants to be removed and stored while the clean water is slowly injected underground, via bores into an aquifer.

Most of the pollutants in stormwater are attached to fine particles of soil and organic material. These particles settle out in the wetlands and are captured by the dense reed beds as the water flows through them.

Other pollutants, such as nutrients, are utilised by the vegetation surrounding the wetlands. Nutrients are washed into stormwater when excessive fertiliser is applied to urban gardens, for example. If these nutrients are not removed prior to entering the sea, algal blooms can result.

The benefits

The benefits of wetland and ASR schemes include:

- Reduced impacts to aquatic and marine water quality by removal of debris, nutrients and other pollutants in stormwater entering the Gulf St Vincent via West Lakes, the Port River and the Patawalonga.
- Reduced impact on the beaches near stormwater outlets.
- Re-creation of native aquatic, semi-aquatic and riparian habitats. A return of native bird and fish species has already been noted in the completed wetlands.
- Connectivity between the pre-European remnant flora and fauna communities located on all three golf courses and the new habitat provided by the restored wetlands.
- An aesthetic asset that increases the amenity of the local area.
- Immediate groundwater pressure improvement and long-term salinity reduction of underground water supplies by “refreshing” with low salinity stormwater.
- Save almost 1000 million litres of water a year by using stormwater to replace water drawn

Figure 1: Habitat creation for local biodiversity is an additional benefit to wetland and ASR schemes

from underground water supplies and other traditional sources.

- A sustainable irrigation water supply for three internationally-rated golf courses.

How does the wetland system work?

As shown in Figure 2, the stormwater harvesting system involves a number of components. This includes pumps to divert water from stormwater systems, a sedimentation basin to trap coarse sediments, treatment wetlands to improve water quality by removing nutrients and giving time for pollutants to break down and, finally, aquifer injection/extraction bores and pumps to store and retrieve treated water.

Stormwater is collected by stormwater drainage infrastructure and normally exits via outlets to the coast or river. Instead, it is diverted via a pump station to the initial inlet where coarse sediment and floating debris is removed (Figure 3).

Then, stormwater passes through the system of wetland cells, which are surrounded with dense bands of vegetation. Finer sediment particles with pollutants are trapped in these wetland cells by the fringing vegetation and their bio-films.

Finally, after being detained for a number of days, treated water is pumped from the final wetland cell to the aquifer for storage underground until needed.

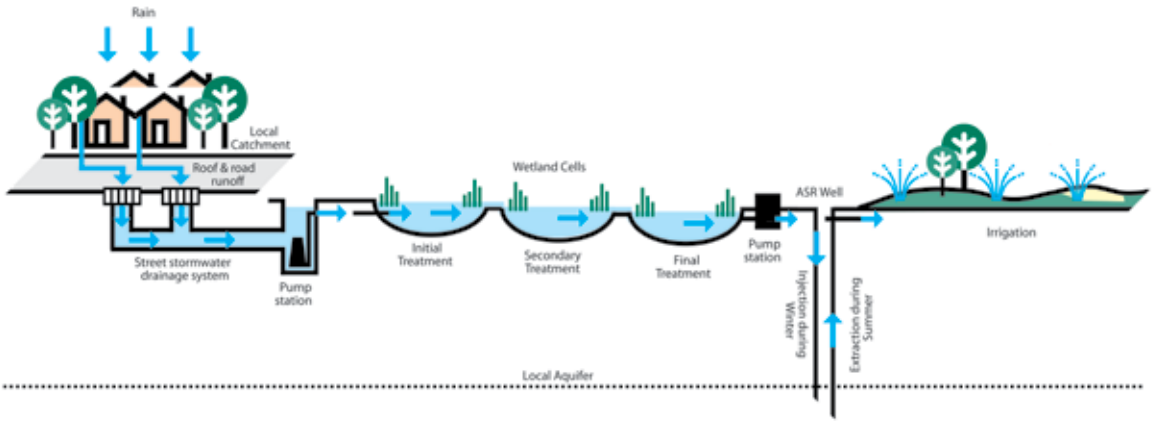
How does aquifer storage and recovery work?

The term “aquifer storage” simply refers to the artificial recharge of an underground aquifer by allowing water to flow or be injected into it via a bore. Because water generally flows very slowly through aquifers, any water injected into it forms a ‘bubble’ around the bore.

The “recovery” phase occurs when this bubble of water is retrieved at a later date. In this way the aquifer is used like an underground water storage reservoir to hold water collected during the winter for use during the drier Adelaide summer.

Figure 3: Water from the sedimentation pond passes through this inlet, but debris is excluded

Figure 2: Wetland and aquifer storage and recovery schematic



CONTACT US

Eastwood
T: 8273 9100
E: reception@adelaide.nrm.sa.gov.au

Gawler
T: 8523 7700
E: gawler.office@adelaide.nrm.sa.gov.au

Lobethal
T: 8389 5900
E: lobethal.office@adelaide.nrm.sa.gov.au

Willunga
T: 8550 3400
E: willunga.office@adelaide.nrm.sa.gov.au

What about mosquitoes?

Designers of wetlands are well aware of the kinds of aquatic habitats that favour mosquitoes. Mosquitoes usually breed in puddles, rather than in ponds, wetlands or rivers. Well-designed and well-managed wetlands provide a home to predators of mosquitoes and do not pose a mosquito-breeding problem.

Constructed wetlands incorporate:

- Strategies to minimise the creation of mosquito habitats during the establishment phase.
- Designs that avoid isolated puddles or ponds.
- Wetlands that are stocked with fish and invertebrates which are mosquito predators.
- Ongoing mosquito monitoring to identify numbers, species and breeding sites.

Fish, dragonfly larvae, flatworms, water beetles, birds, midges and even some species of mosquito feed on mosquito larvae. These predators reduce the number of mosquitoes that make it to adulthood, keeping numbers down.

The Board's mosquito monitoring at these and other wetlands over a number of years has consistently demonstrated that they are not a significant source of mosquito nuisance.

Who was involved with this project?

Table 2 shows the principal financial contributors for the three wetland and ASR schemes.

- Adelaide and Mount Lofty Ranges Natural Resources Management Board (which incorporates the former Torrens and Patawalonga Catchment Water Management Boards)
- Department of Water, Land and Biodiversity Conservation
- National Water Commission
- Glenelg Golf Club
- The Grange Golf Club
- The Royal Adelaide Golf Club

Table 2: Funding sources

Contributors	Inputs ($)
Australian Government	2.35 million
South Australian Government	2.35 million
Glenelg, Grange and Royal Adelaide Golf Clubs	1.8 million
Total	**6.5 million**

Natural resources management is about caring for our land, water, plants and animals - balancing people's needs with those of nature.

Figure 4: Local communities benefit from the improved amenity provided by wetland and ASR schemes

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