



CRC for
Water Sensitive Cities

Angus Creek Stormwater and Reuse Scheme

Location:
**Rooty Hill,
NSW**



Case Study — Prepared by Cooperative Research Centre for Water Sensitive Cities, September 2018



Business
Cooperative Research
Centres Programme

Insight

Stormwater harvesting and reuse scheme for a major water user in urban Sydney

Project description

The Blacktown International Sportspark Sydney (the Sportspark) is an elite international sporting facility, attracting 750,000 visitors per year, which requires substantial volumes of water for irrigation. The Angus Creek stormwater harvesting and reuse scheme (the scheme) extracts excess stormwater flows from Angus Creek and harvests stormwater runoff from the Sportspark's hard

surfaces to irrigate the Sportspark and neighbouring reserves. This supplies up to 200ML of fit-for-purpose water per year. The scheme incorporates natural treatment processes from storage ponds, floating wetland rafts, a 3,300m² wetland and mechanical/chemical treatment via screen filters, chlorination and UV disinfection to provide water quality suitable for spray irrigation with no access restrictions.

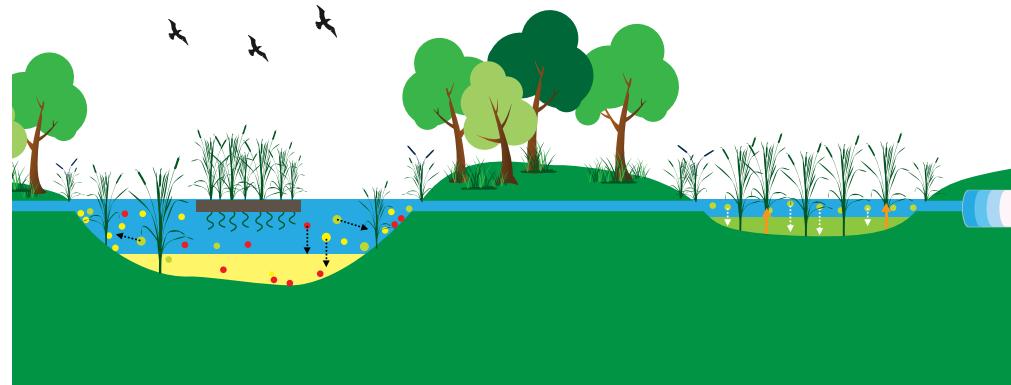


Diagram showing inlet to the storage pond including floating wetland rafts

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:

Rainwater and stormwater harvesting

Stormwater treatment

Water sensitive parks and open spaces

Alternative water supplies

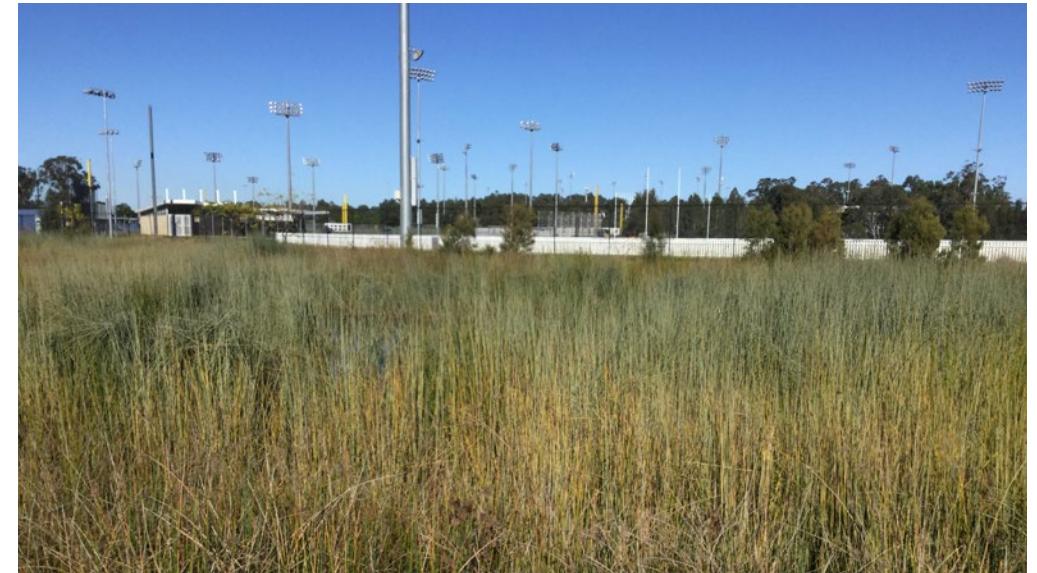
Governance and policy

The drivers

A sustainable irrigation water source was needed that would improve drought resilience and the local environment.

- Create drought resilience of elite sporting facility. Provide a reliable fit-for-purpose source of water for irrigation even under potential future water restrictions during drought periods.
- Improve condition of local waterways. The scheme harvests stormwater from the 655 hectare Angus Creek catchment, which generates about 2,000ML of runoff each year. By extracting flows above 10L/s it is reducing the impact of excessive stormwater flows on the downstream environment.
- Be financially sustainable. Council charges the internal users of the water per kL, similar to the water utility, and this funding is used to fund the employment of a Stormwater Harvesting Officer, who oversees the scheme and others within Council, and funds the ongoing operation and maintenance actions associated with the scheme.
- Be carbon neutral. The scheme included the installation of a 40kW solar system to offset the electricity used by the pumps and treatment measures.

→
Wetlands



→
Floating wetlands



The innovations

Multi-functional design and self-financing governance models underpinned the scheme's success

- **Storage ponds with floating wetlands** – The scheme's main storage includes three storage ponds that incorporate floating wetlands. The ponds provide a dual purpose of storing 8ML of stormwater as well as acting as the flood detention basins for the Sportspark. Extracting water from the ponds increases the flood storage capacity. The ponds provide stormwater treatment by allowing the suspended solids to settle down while the water is moving through the linked ponds and the floating wetlands treat the stormwater through biological uptake of nutrients present in the water.

- **Supervisory Control and Data Acquisition (SCADA) computer system** – The scheme uses a SCADA system (commonly used technology for drinking water treatment systems) to collect and analyse real time water quality and quantity data to control the pumping and treatment systems. The system uses multiple online water quality monitoring points that collect and measure turbidity, oxidation-reduction potential (ORP), and electric conductivity. These are used as critical control points that can turn off pump switches, preventing the system from harvesting unsatisfactory water (i.e. water not suitable for irrigation).
- **Self-funded operation and maintenance** – At the time of publication, it is believed that this is the only stormwater harvesting scheme in New South Wales that captures the full water savings, which would have

been paid-for potable water, to provide a sustainable finance model for the ongoing costs of the scheme. The scheme is self-funded by internal sale of water to the water users at the same cost as potable water. This reduces the need for other sources (such as general rates revenue) to fund ongoing operation and maintenance costs. The funding generated also employs a stormwater harvesting officer responsible for overseeing this project and any future schemes that are developed. This approach promotes the use of harvested stormwater over potable, ensures the scheme is well maintained to produce water that is fit-for-purpose at all times, and encourages constant scheme improvement to produce as much harvested stormwater as possible.

The outcomes

 Cities providing ecosystem services	 Cities as water supply catchments	 Cities comprising water sensitive communities
<ul style="list-style-type: none">Reduced nutrients and pollutants in the downstream waterway – By extracting flows from Angus Creek, the amount of stormwater in the creek is reduced, which reduces overall pollutant loads downstream of the extraction point.Reduced urban excess flows in Angus Creek – Extracting excess flows into Angus Creek can reduce creek bank erosion, and reduce stresses on aquatic ecosystems sensitive to large and frequent flows.Environmental monitoring – Macro-invertebrate analysis and water quality monitoring will provide valuable data for long term environmental management.	<ul style="list-style-type: none">Reduced reliance on mains water – The harvesting and reuse scheme can supply up to 200ML of water per year, which would otherwise be supplied through mains imported water.Fit-for-purpose supply of water at major facility scale – The scheme provides water that is suitably treated for irrigation purposes and public health risk mitigation. It reduces the use of potable water for low risk end uses (i.e. spray irrigation).	<ul style="list-style-type: none">Community involved in decision-making – Online and face-to-face community consultation forums were undertaken for the project. The community participants showed substantial support for the project, indicating the scheme made economic sense, was a good use of resources, and was a great way to save water and improve the condition of local waterways.

Business case

Costs	Benefits
<p>Capital cost: \$6.2 million, including:</p> <ul style="list-style-type: none"> • Aquifer investigations: \$700,000 • Design and modelling: \$400,000 • Mechanical components, including filters, pumps and communications: \$500,000 • Solar panel system: \$60,000 • Civil construction: \$4,000,000 • Floating wetlands: \$160,000 • Planting: \$275,000 • Water quality monitoring: \$115,000 	<ul style="list-style-type: none"> • Reduction in the purchasing of potable water for irrigation from water utility. Savings are used to support a sustainable finance model for the ongoing costs of the scheme (refer to information provided above). • Reduced urban excess flow and pollutant loads for downstream Angus Creek • Increased security of water supply during drought periods, where water restrictions would otherwise limit irrigation of the facility. This will result in increased turf quality/playability, as well as increased amenity for non-playing areas.

The lessons

- **Approvals to extract water and construct creek works are challenging and can challenge a project's viability** – There were many challenges in acquiring approvals to extract water and construct creek works that divert water from the creek into the off-take dam. NSW Office of Water provided an exemption to Blacktown City Council from purchasing the 200 water unit shares initially required. The need to purchase water unit shares could potentially make any creek stormwater harvesting and reuse project financially unviable.
- **Blacktown City Council's Steering Committee proved highly useful** – The steering committee provided leadership and guidance, and was a useful vehicle for communicating project progress to all relevant stakeholders.
- **Bird predation in establishment phase can be addressed by increasing water levels** – The large water bird population was a major concern during the wetland establishment phase. The solution used on this project was to increase the water levels to make it harder for water birds to reach the bottom of the wetland and remove the plants. It is worth noting however, this method slowed plant growth rates which prolonged the establishment period.
- **Wetland animals and algae blocking screen filter proved useful** – It was found that small wildlife (mainly snails and gambusia) and some algae stands were making their way into the pump station, causing blockages in the downstream screen filter. This was requiring higher frequency manual cleaning than originally anticipated. Council was able to minimise the issues by installing a 200 micron mesh in the wetland pit to collect and store the algae and animals before being pumped into the screen filter. The litter basket provides a much greater surface area and will only require infrequent maintenance compared to the screen filter.

Transferability

This project is transferable to other high end open space and recreation facilities where irrigation demands are high (i.e. suitable economies of scale). This project would be applicable to other areas where an adjacent waterway can be drawn upon for water supply, and where the adjacent waterway is subject to urban excess flows or otherwise where large catchment flows can be captured for stormwater harvesting (e.g. through pipe flow diversions). Governance regarding the creek extraction and construction works may be a limiting factor, as was nearly the case for this project.

Another major limiting factor for transferability is that the scheme can only harvest stormwater during rainfall events or when flow is above 10L/s, which was a requirement from the NSW Office of Water. This requirement affected the design of the scheme, and resulted in the inclusion of additional components, including large pumps to maximise fast extraction, large water storages able to hold six to eight weeks' worth of irrigation, and treatment measures capable of handling higher turbidity loads associated with storm flows.

Project collaborators

- Blacktown City Council
- Optimal Stormwater Pty Ltd (responsible for commissioning of the scheme and current mechanical maintenance contractor)

→
Ponds in foreground and wetland in background

Awards

2016 Highly commended for the IPWEA Award for Excellence in Environmental Enhancement Project or Initiative including Recovering, Recycling and Reusing

Additional information

More information about Angus Creek Stormwater and Reuse Scheme can be found at:

- [Angus Creek Case Study](#)
- [Commissioning of Angus Creek Stormwater Harvesting and Reuse Scheme \(Stormwater NSW Conference Proceedings\)](#)



Cooperative Research Centre for Water Sensitive Cities