IRRIGATION TECHNOLOGY: URBAN

STORMWATER PROVIDES IRRIGATION OPTIONS FOR MELBOURNE PARK

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Como Park in the City of Stonnington is regarded as a premier sporting and recreational facility and is used for cricket in summer, football in winter and other social events. The City of Stonnington is located in the southeast of Melbourne, and Como Park is set against a backdrop of stunning established native and exotic trees on the banks of the Yarra. As a result of prolonged drought and uncertain potable water supply security, the park's future as a premier facility was under threat.

Deciding that it needed to act to protect this valuable asset, the City of Stonnington teamed up with Storm Consulting to design and oversee the construction of a stormwater harvesting and reuse system. This system now supplies Como Park a guaranteed source of fit-for-purpose water and independence from potable water supply.

The project

The Como Park Stormwater Harvesting Scheme is designed to harvest flows from two Melbourne Water stormwater drains that discharge into the Yarra River. Based on historic water consumption patterns, it has been estimated that the project will save between 15 and 20 ML of potable water annually and make future irrigation independent of the potable water supply.

The first stage of the project was to carry out a water balance based on rainfall, soils, turf, landscape and park uses and determine the irrigation demand required to sustain the main oval at Como Park in good condition. The estimated irrigation area of the main oval was conservatively modelled at 2 ha.

The site at Como Park where the storage tank was installed

Concrete storage tank under construction using Humes precast components

Results of irrigation demand analysis estimate peak daily water demand of 55 kL (2.8 mm) required during January to keep the oval in top condition. During winter the daily demand is estimated to be only 10 kL or 70 kL/week. Overall, average weekly demand is about 170 kL.

Stormwater harvesting

The stormwater drains located in Como Park drain a catchment area of 365 ha and have some base flow. The volume of stormwater flowing in the two drains is enough to supply 100% of the irrigation requirements of Como Park.

The stormwater harvesting system is made up of:

- off-take connection to stormwater drain
- a filter for gross pollutants
- a pump station
- below ground concrete storage of 300,000 L capacity
- UV treatment system
- an irrigation pump.

An offtake structure is required to tap into baseflows and prevent gross pollutants from entering the system. A grated trench conveys the stormwater to a Humes Hydrofilter 1000 for further pollutant removal (<1 mm).

After water has passed through the Hydrofilter it is transferred to an underground storage structure. The storage structure comprises an arrangement of culverts sealed with a self-healing clay liner.

When required for irrigation, water is extracted from the storage tank and passed through an automatic particulate filter, through UV disinfection and a meter before going out through the existing irrigation system, where the stormwater system has been directly connected to the existing ring main.

A number of controls are required to monitor the system including a turbidity sensor; electrical conductivity sensor; hi/low water level sensors for both the sump and main storage; controls that interface the UV system with the irrigation system and the pumps and advanced telemetry that enables users to view the system status remotely.

In developing the project design, Storm Consulting used its experience and skills in the following areas:

- catchment characteristics and behaviour – size; topography, soil types; vegetation; proneness to flooding; pollutant loading
- rainfall analysis – daily rainfall patterns; 6-minute pluvio data used to model individual rainfall events; rainfall patterns in different climactic circumstances
- water quality – nutrient loads and limitations for reuse; MUSIC modelling for passive treatment options
- water balance – know exactly how much water is being used and when and where, to ensure the system was appropriately sized
- construction cost estimators – used a database of actual costs from previous projects to ensure accurate and comprehensive costing for planning and prioritising purposes.

Irrigation system integration

The stormwater supply system functions as part of the irrigation system, where harvested stormwater is treated as a priority source. Pumping operates on a pressure drop signalling the UV disinfection to start recirculating water between the storage tank and the disinfection for 15 minutes. This 15-minute period is the time needed for the UV lamps to warm up to a point that they can achieve the log pathogen reductions required for spray irrigation of a free-access site. After 15 minutes the controller switches over to the main valve that allows harvested stormwater to be irrigated for the ovals.

The stormwater harvesting system has been designed to irrigate the main oval (1.6 ha) with 300 kL, or 18 mm, per week in peak summer demand. The current licence allows for an annual irrigation depth of 500 mm (@ 5 ML/ha) in addition to annual rainfall, with room for nearly double that amount available for future irrigation of nearby open space.

Costs

Using a 20-year life for the project, we see a significant improvement on a 'business as usual approach' in many different ways.

At the moment potable water to irrigate the park costs $1.2206/kL; under mandated water prices increases this is set to rise to $1.466/kL in 2010 - 11, $1.761 in 2011 - 12, and up to $2.114 in 2012 - 13. After this, water prices may assume an increase more closely aligned with CPI of 2.47% a year. This means that in twenty years the cost to irrigate 8 ML a year would be $25,611.

If recycled water was to be carted to the site then the ongoing charges would be enormous - around $22/kL (SEWL, 2009) plus $30 delivery which equates to $594 + $30 = $624 per 27kL tanker delivered from the Lang Lang source. At that rate, 8 ML of irrigation water would cost $185,000 a year at current rates, or $297,000 assuming CPI in 20 years time.

Neither of the two above options come with the guarantee of availability or stable pricing, whereas stormwater does.

Benefits

The benefits of using stormwater include:

- a top class recreational sporting facility is maintained
- health improvements associated with having such a facility range from lower injury rates due to softer playing surface
- a green haven of healthy and vigorous vegetation in the parkland increases local biodiversity
- the system is designed with drought contingency in mind such that it can provide an emergency water
- maintaining significant vegetation, both within Como Park including historic gardens
- proving and applying the concept will effectively increase council's capacity to apply the concept elsewhere
- reducing the demand on our already stressed water storages
- reduced energy intensity associated with the supply and distribution of potable water from the proposed desalination plant.

The project also will decrease nitrogen, phosphates and suspended solids entering the Yarra River by:

- reducing erosion and preventing sediment laden runoff from entering the river
- increasing plant and turf health and growth.