Case Study 1

Bioretention Swale at Oaklands Station

WATER SENSITIVE URBAN DESIGN SYSTEM
- Bioretention swale

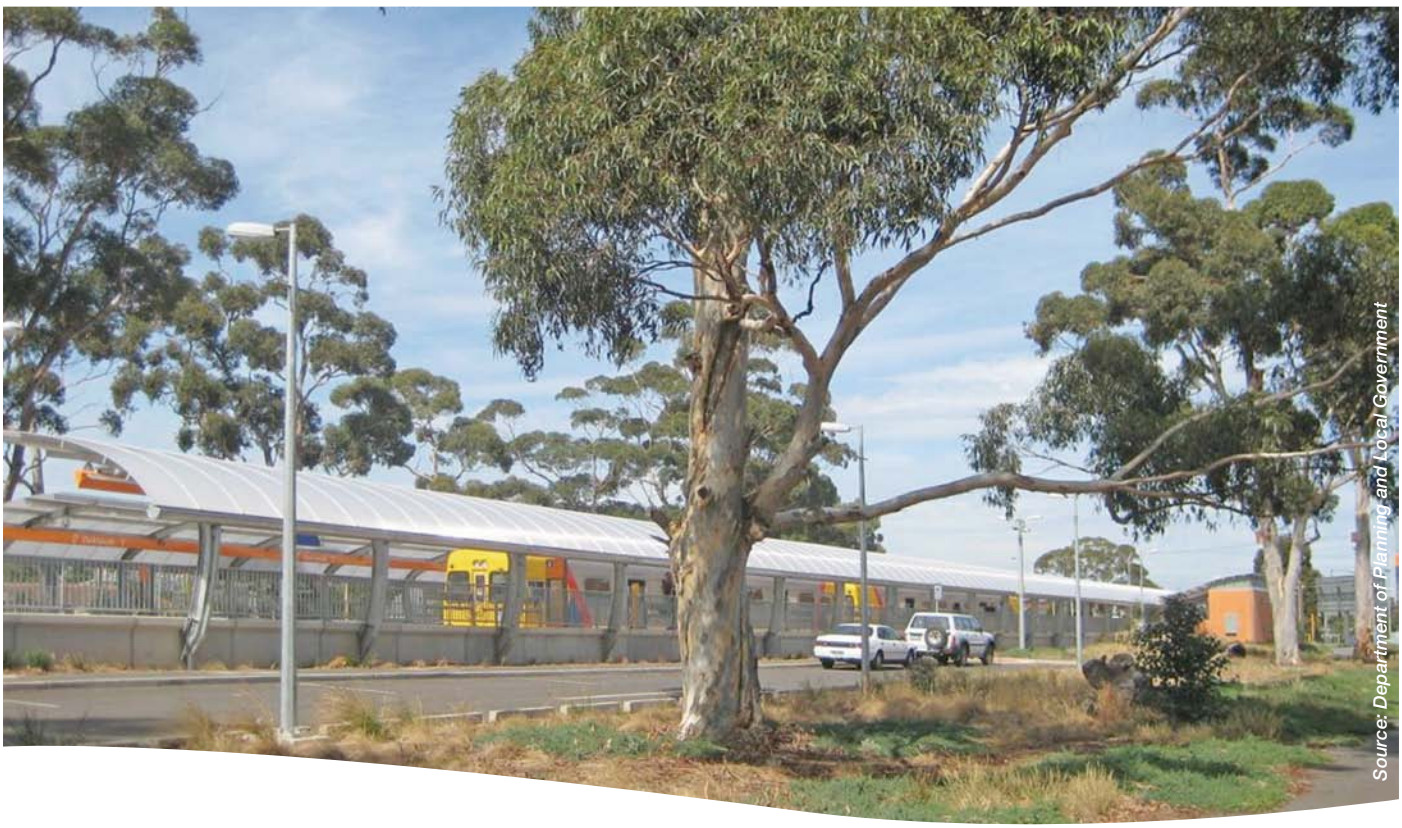
LOCATION
- Corner Murray Terrace and Morphett Road, Oaklands Park

AVERAGE ANNUAL RAINFALL
- 546 mm (Adelaide, Kent Town)

YEAR ESTABLISHED
- Winter 2008 (with some infill planting in winter 2009)

RESPONSIBLE AUTHORITY
- Department of Transport, Energy and Infrastructure

Case study prepared by Rural Solutions SA, Environmental Design and Management Team, November 2009



Source: Department of Planning and Local Government

Background

This is one of several case studies providing examples of bioretention and swale systems that have been incorporated into landscaping in public spaces.

Project objectives

The project aims to:

- capture stormwater run-off on site and recharge the aquifer to sustain mature significant gum trees and reduce pollution entering waterways
- maintain a healthy, flourishing garden with native plants
- encourage local wildlife to visit and nest at the Oaklands Station site
- implement crime prevention principles
- create an open space for the enjoyment of local residents and train commuters
- demonstrate urban biodiversity concepts to the wider community.

Project description

Stormwater from the station car park is directed into a polypropylene-lined, vegetated swale. The swale is filled with coarse sand and topped with decorative gravel and planted with predominantly Knobby Club-rush *(Ficinia nodosa* Syn. *Isolepis nodosa*), which helps filter pollutants from the stormwater. Agricultural pipe at the bottom of the swale captures the filtered stormwater and directs it into several rock-filled sumps.

The surface of the sumps is covered with a geotextile fabric and a minimum of 200 mm of organic loam. Local native grass species have been planted on top of the sumps. As the site contains several large Eucalypts, the sumps have been designed to act as soakage pits and therefore are not lined, allowing water to soak into the root zone of the trees.

As well as improving the health of the trees through stormwater capture, the project aims to enhance the biodiversity and habitat values of the site through the provision of nest boxes and the use of local native understorey species in the landscaping.

Lessons learned

The site has been well maintained since establishment, which is essential to the successful functioning of a water sensitive urban design system.

At the time of the observations for this case study (November 2009) the system was working well in terms of capturing and moving stormwater away from the hard surfaces and into the garden beds; however, vegetation in the lined vegetation swales suffered from water stress towards the end of the first (2009–10) summer. This could be addressed in future by using soils (filter media) with a higher moisture-holding capacity such as sandy loam over the transitional and drainage layer.

The plants on the sumps and in surrounding natural soils were growing very well, which is testimony to the importance of using local native plants in an irrigation-free system.

Soil specifications

Vegetated sumps:

- 1000 mm wide
- 300 mm deep
- polypropylene liner
- 20 mm gravel (145 mm deep)
- coarse sand (145 mm deep)
- 13 mm gravel mulch (10 mm deep)

Sumps:

- 700 mm deep (could not go any deeper because of contaminated soil)
- 100 mm rock (400 mm deep)
- 20 mm gravel (200 mm deep)
- soil (organic loam) (100 mm deep)
- mulch/landscape rock

Maintenance suggestions

Sedges in swales:

- Prune back sedges hard every two years in spring to remove dead material and increase nutrient uptake.

Sumps:

- Cut back summer-active grasses in October and winter-active grasses in April, every one to two years.
- Regularly sweep or blow excess plant debris in gutters back onto larger garden areas. Sweep gravel back into beds.
- Apply slow-release fertiliser (suitable for natives) in spring every third year to help keep plants looking fresh and green.

Species used in the vegetated swale

Scientific name	Common name	Observations in November 2009
Ficinia nodosa Syn. *Isolepis nodosa*	Knobby Club-rush	Planted winter 2008 This is the dominant species used in the vegetated swales. • Some individual plants in the swales are displaying signs of water stress as soil moisture dries too quickly towards the end of summer, despite the use of a liner. • Pruning back in late spring can help plants survive the summer months and increase nutrient uptake. Pruning should occur every 2–3 years. • As the seasons change individual plants are responding to winter and spring rains where plants appear healthier and natural regeneration of seed was occurring. • Individuals located in low-lying soils on the sumps and surrounding natural soils are growing very well.
Gahnia filum	Chaffy Saw-sedge	Planted winter 2009
Cyperus vaginatus	Flat-sedge	Planted winter 2009 • Randomly established in vegetated swales, these species are flourishing. • Additional observations in March 2010: Plants maintained good growth and vigour during the first (2009–10) summer.

Species used on soil-capped, rock-filled sump

Scientific name	Common name	Observations in November 2009
Austrodanthonia caespitosa *A. geniculata* *A. linkii*	Wallaby Grass	• This group of plants is growing very well above and surrounding sumps, and naturally regenerating in many sections of the garden. • In certain areas the plant has naturally regenerated in the vegetated swales.
Poa poiformis	Coast Tussock Grass	• This group is growing well in the natural soil on the sumps.
Cymbopogon ambiguus	Lemon Grass (summer-active)	• Attractive summer-active grass is flourishing on the fringe of sumps.
Dianella revoluta	Black-anther Flax Lily	• Those plants located on the natural soil and on the raised soil bed surrounding the sumps are doing very well. • Avoid wet or boggy areas.
Lomandra multiflora ssp. dura	Hard Mat-rush	• This group is growing very well on the natural soil and raised soil bed. • Avoid wet or boggy areas.

Other plants used in general landscaping

Scientific name	Common name
Acacia cupularis prostrate	Umbrella Wattle (ground cover form)
Allocasuarina verticillata	Drooping Sheoak
Austrostipa elegantissima	Spear Grass (summer-active)
Calocephalus citrina	Lemon Beauty Heads
Carpobrotus rossii	Pig Face
Chrysocephalum apiculatum	Everlasting
Correa pulchella orange nana	Native Fuchsia
Correa reflexa	Native Fuchsia
Correa reflexa prostrate	Native Fuchsia (low growing)
Dianella revoluta / and D. 'Little Rev' */ and D. brevicaulis*	Flax Lily
Dichanthium sericeum	Silky Blue Grass (summer-active)
Disphyma crassifolium	Pig Face (small leaf)
Eremophila glabra	Tar Bush/Emu Bush (ground cover form)
Enchylaena tomentosa	Ruby Salt Bush
Eucalyptus cladocalyx	Sugar Gum
Eutaxia microphylla diffusa	Bush Pea
Goodenia albiflora	White Goodenia (will sucker grey/blue plant)
Goodenia varia	Goodenia
Hardenbergia violacea	Native Violet
Isolepis nodosa	Knobby Club-rush
Kunzea pomifera	Muntries
Lomandra multiflora dura	Mat-rush
Lomandra densiflora	Mat-rush
Olearia ramulosa	Twiggy Daisy (compact grey form)
Orthrosanthus multiflorus	KI Flax
Rhagodia candolleana	Sea Berry Saltbush
Scaevola albida compact coastal form	Fan Flower
Themeda triandra	Kangaroo Grass (summer-active)
Wahlenbergia stricta	Blue Bells

Construction of the sump

Ficinia nodosa and Austrodanthonia spp. growing well in the natural soil on the sump (left), while some of the Ficinia nodosa plants in the swale (right) are drying out

Ficinia nodosa (foreground) and Austrodanthonia spp. (background) growing well in the natural soil on the sump.

Dianella revoluta 'Little Rev' (Black-anther Flax Lily) growing well in the natural soil

Swale: Ficinia nodosa (right) and Enchylaena tomentose (left)

Sump: Poa poifiormis (foreground) and Austrodanthonia spp. (background)

Ficinia nodosa doing well in the vegetated swale adjacent to car parking

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