

# GREEN INFRASTRUCTURE CASE STUDY: LINEAR RESERVE WINDSOR STREET, UNLEY

*Green infrastructure is a green network - of green spaces, street trees and other vegetation (including wetlands, rain gardens, and green walls and roofs) - strategically planned, designed and managed to support the liveability, sustainability and resilience of an urban area. Green infrastructure is integrated, connected and multifunctional. It is integrated with development and other infrastructure, it links existing and new green assets across the public and private realms, and it provides multiple social, economic and environmental functions. Green infrastructure is essential infrastructure for our cities and towns.*

*This is one of a suite of case studies demonstrating how various types of green infrastructure were planned, designed and delivered, how they're maintained, and the challenges and lessons along the way.*

## PROJECT OVERVIEW

The City of Unley had a vision to develop a unique linear trail for residents on a site that was once a concrete drain. The Windsor Street Linear Reserve features locally indigenous vegetation and provides a scenic corridor from near Fisher Street, Fullarton at its southern end, to Henry Codd Reserve at Parkside, at its northern end. This was the first part of a broader vision to develop native plant corridors that allow people to traverse the City of Unley from Urrbrae to the Adelaide Parklands and provide unhindered corridors for native bird movement.

An open concrete drain has been replaced with:

- Reinforced concrete box culverts
- 11,000 m<sup>2</sup> of linear reserve
- 15,000 locally indigenous plants (84 species)
- 1 km of meandering paths
- Street furniture – stone wall seating, 3 benches, 1 drinking fountain, 2 dog/bird water dishes, 2 bins and 4 bridges
- 12 Interpretive signs

## ABOUT THIS SITE

### ORGANISATION

City of Unley

### SETTING

Public streetscape

### GREEN INFRASTRUCTURE FEATURES

Linear reserve comprising of 11,000m<sup>2</sup> of open space and 15,000 local native plants.

### COST

\$480,000 (source: The Advertiser).



Windsor Street Trail: Foster St. to Cremorne St., 2016 - 12 years after planting.

## FINANCIAL PARTNERS

This project was a pilot with part funding from the Planning and Development Fund which aimed to “enable a unique development in an inner urban area”. (c. \$190,000).

## GREEN INFRASTRUCTURE PLANNING AND DESIGN

Major construction works to reduce flooding of Glen Osmond Creek along Windsor Street were undertaken between 1997 and 2000. The existing open culvert tended to flood, which made it a priority for improvement. When the open concrete drain was replaced with reinforced box culverts, limited thought was given to the surface treatment. Council’s Open Space Team and field staff developed the vision of a native plant corridor and set about creating 11,000 m<sup>2</sup> of new open space that now links Fisher Street to Henry Codd Reserve and another new native plant corridor along Glen Osmond Linear Trail that was created in 2014 in partnership with Bike SA.

The Windsor Street Linear Reserve was part of the City of Unley’s Open Space Strategy Plan (1997) and Unley Environmental Action Plan (1998) to link open spaces, commercial and community facilities and residential areas while enhancing biodiversity and amenity. The linear reserve acts as a native plant corridor as well as a commuter corridor, exercise pathway and passive park environment.

On-ground works were completed in five stages from 2003 to 2006 as part of the City of Unley’s Centenary celebrations. Locally indigenous plants, including some of conservation significance, were sourced from seed collected in native vegetation remnants in parks around the area.

Approximately 70 European street trees, mostly ash and elms, were removed in stages from the eastern side of the street to accommodate the new native plant landscape. The elms were significant by some residents but some were diseased and needed replacing. Manchurian pears (*Pyrus ussuriensis*) were planted on the western side, which provide a contrasting visual outlook and are appropriate for the width of the footpath.

Landscaping features:

- Eastern street intersections paved with exposed river pebble finish to concrete.
- Rocky gullies adjacent to ‘bridges’ in the paths
- Local stone walls (maximum height 450 mm) at intervals along the path provide informal seating and allow for deeper soil areas.
- Tall canopy trees with diverse groundcovers (< 1m) including grasses, herbs and shrubs. 15,000 locally occurring plants comprising of 84 species.
- Sand/loam mix was used on top of the culverts
- Depth varies from unhindered to minimum 500mm, achieved through mounding in some areas which both added depth in sections and interest to trail.
- Tall trees were planted next to the culverts not over the top with the assumption that roots will go around the culvert.

## GREEN INFRASTRUCTURE FEATURES

### LINEAR RESERVE

- 11,000 m<sup>2</sup> of new open space
- 15,000 local native plants comprising of 84 species
- 1km of meandering path over straight culvert
- Minimum 500mm soil depth using mounds in places
- Recycled stormwater used for irrigation



*Windsor Street Linear Trail during construction (2004)  
Photo: City of Unley.*



*The Windsor St trail links to Henry Codd Reserve where fruit trees have been planted by Council.*



## PLANT SPECIES SELECTION

### TREES

including wattles (*Acacia pycnantha*), sheoak (*Allocasuarina stricta*), Native Apricot (*Pittosporum phylliraeoides*) and gums (*Eucalyptus camaldulensis*, *E. leucoxylon* and *E. microcarpa*)

### TALL SHRUBS

including wattles (*A. dodinafolia*), Christmas Bush (*Bursaria spinosa*), Silver Banksia (*Banksia marginata*) and Hop-bush (*Dodonaea viscosa*)

### SHRUBS

including Eutaxia, Daisy bushes, peas, Boobialla and Grass trees

### NATIVE GRASSES AND RUSHES

including Kangaroo, Wallaby and Spear grasses and Knobby Club-rush

### LILIES

*Arthropodium strictum* and *Bulbine bulbosa*

### HERBS, GROUNDCOVERS AND CLIMBERS

groundcovers and climbers – including salt bush, daisies, pigface, goodenia, running postman and native raspberry

Threatened species planted along the reserve include Grey Box (*E. microcarpa*) and other plants that occurred in the original woodlands. Grey box gums are rare on the Adelaide Plains now with the only remnants in Unley found at Beaumont Common and Heywood Park. Their inclusion in the plant community along Windsor Street is, therefore, a significant extension of their distribution. Other threatened species include Twiggy bush pea (*Pultenaea largiflorens*), Hop bush wattle (*Acacia dodinafolia*), Lesser joyweed (*Alternanthera denticulata*), Southern cypress pine (*Callitris gracilis*), Lemon beauty heads (*Calocephalus citrius*), Garland-lily (*Calostemma purpureum*) and Notched sedge (*Carex bichenoviana*).



A range of native plants has been used. Those with higher water needs are irrigated with recycled stormwater.



City of Unley have created a beautiful and sustainable landscape of highly valuable native plant corridors with low water and chemical use that will link the hills to the parklands.

## CHALLENGES AND LESSONS

- The project has been successful due to Council staff having a very high level of ownership of the project having created the concept, helped design the landscape, planted the site, written the text for the interpretative signage and maintained the evolving habitat.
- The excellent relationship between the Open Space Team, the landscape architect and the native plant provider was important to achieving the vision.
- A staged approach was successful in terms of allowing residents to become accustomed to the new type of vegetation. The completion of Stage 1 created public interest in the rest of the street being converted to native vegetation.
- Creating a meandering path was more difficult than installing a straight path along the top of the culvert but is much more interesting and gives a sense of peace and seclusion to trial users.
- The narrow path (<3m) is intended for pedestrians only; however bikes can utilise Windsor Street and access the Glen Osmond Linear Trail from Henry Codd Reserve which was built in partnership with Bike SA as a straight, wide path with a centre line designed for shared use.
- Irrigation was only needed for the first year for most of the plants because their water requirements correspond with local rainfall.
- Supplementary irrigation using recycled stormwater is used on some of the shallower soil sections (above the culvert) in hot conditions. No adverse impacts on native vegetation have been observed to date.
- The inclusion of stone walls for seating allowed the soil depth over the culverts to be increased in some areas for deeper rooting zones.
- Inclusion of the pebbles to evoke the original creek was more expensive than a plain concrete path but adds aesthetic value and aids engagement with the natural features of the site.
- Bins are provided for dog litter. These are placed in positions that are easy to access but do not dominate or detract from the visual appearance of the reserve.
- Installation of green infrastructure and interpretive signage enabled renewal of other community features e.g. Jam Factory wall and the Fern Avenue Community Garden entrance.
- The native plant corridor provides shade and shelter for people and animals. There are anecdotal reports of an increase in the number and diversity of native birds.



*The Post Office box and bins are located in easy access areas that are screened to be discrete.*

- When the wooden 'bridges' deteriorated and replacement was required, council took the opportunity to trial a new recycled plastic product.

If the Open Space Team were designing this today they would have incorporated more modern Water Sensitive Urban Design (WSUD) features such as permeable paving.

## FUTURE OPPORTUNITIES

Future opportunities include:

- Extending the linear reserve so that there are linear reserves dominated by local native plant species from Urrbrae to the Adelaide Parklands. This will comprise a significant wildlife corridor from the hills to the plains through a highly urbanised landscape.
- Incorporate WSUD features such as permeable paving into similar projects.

## EDUCATION AND COMMUNITY

Local residents endured years of flooding of the Glen Osmond Creek, which had been converted from a natural streambed to a concrete drain in the 1940s, before the Windsor Street drain was replaced with an underground culvert (1997- 2000). Residents that had been regularly consulted during the infrastructure upgrade were engaged in development of the concept plan for the linear reserve, including via a Community Open Day at Fern Avenue Reserve in 2001.

A native plant corridor is an environment that assists in the enhancement and conservation of local native plant species and provides a natural passage for local native animals.



A general survey on the vision and scope was extended to residents within a 500m radius around Windsor Street to capture broader community views.

The linear reserve is an interesting and significant open space for present and future generations. The meandering path invites pedestrians to linger and observe nature. Although Glen Osmond Creek has not been restored, the intersections are paved with exposed river pebble to evoke the idea of the original creek bed and occasional 'bridges' break up the path, while hollow logs and water baths provide resources for fauna. The historic head walls to the underground culvert, which display the names of intersecting streets, were restored and add character to the street.

A suite of 12 interpretive signs informs and educates trail users about the native plants and the historic ecological character of Glen Osmond Creek.

The signs have information under headings of:

- Kurna Traditional Owners of the Adelaide Plains
- Indigenous aquatic and semi-aquatic plants of the Adelaide Plains
- Trees
- Creating and preserving habitats
- Rare plants
- Biodiversity and indigenous vegetation
- Historic sites
- Biodiversity in your garden
- Yakkas

Solid fences that were erected to block out the concrete drain have been replaced with open ones at many homes so that residents can look onto the reserve.

## AWARDS

An Award of Merit from the Australian Institute of Landscape Architects SA (AILA SA), presented to project designer, Oxigen Pty. Ltd. (2005).

A Certificate of Commendation from the Civic Trust (2005).

## MAINTENANCE

Council's Open Space Team undertakes approximately 8 hours of maintenance per week, comprising:

- General inspection of features and infrastructure
- Ensure irrigation system is working correctly
- Removal of rubbish
- Weeding, as required
- Annual succession planting in winter

**Disclaimer:** While every effort has been made to verify the accuracy of items in the Department for Environment, Water and Natural Resources' case study fact sheets, independent advice should be sought on matters of specific interest.



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**Photos:** Kelly Muller and the City of Unley.

## PROJECT DELIVERY

### CIVIL DESIGN

City of Unley

### LANDSCAPE DESIGN

James Hayter of Oxigen

### PLANT SUPPLIER

Karen Lane, Growing Bush

### CONSTRUCTED BY

City of Unley and contractors as required

### CASE STUDY CONTRIBUTORS

Trevor Stein and Kat Ryan (City of Unley)



## FOR FURTHER INFORMATION

Coordinator Environmental Projects, City of Unley