

Street Trees in Challenging Spaces:

A shareable resource with a suite of solutions

Project overview July 2021



CITY OF WEST TORRENS

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Production acknowledgment

The design guidelines were produced by JPE for the City of West Torrens, with funding assistance from Green Adelaide and input from metropolitan Adelaide councils. Graphics included in this document have been provided by JPE.

Kaurna Acknowledgement

The City of West Torrens acknowledges that the Kaurna people and their descendants are still and will always be the first peoples of the land. The City of West Torrens commits to valuing and supporting the Kaurna people's inherent relationship to the land.

This project is jointly funded by the City of West Torrens and Green Adelaide.





New design guidelines for growing trees in challenging spaces

Design guidelines for the planning and planting of council-owned trees have been prepared to assist in growing healthy and vibrant trees in confined, or other challenging, spaces, resulting in an increase in tree canopy cover and cooling of urban heat.

The design guidelines address a range of challenging scenarios by incorporating civil engineering and horticultural expertise, such as Water Sensitive Urban Design (WSUD), tree type selection and healthy growing arrangements. Applying these designs will provide greater confidence in producing healthy and vibrant tree growth, without roots causing disruption to surrounding roads and footpaths, therefore reducing ongoing maintenance.

This document provides a summary of the design guidelines.

The full version of the design guidelines can be viewed and downloaded on our website - westtorrens.sa.gov.au.

How will the guidelines be used?

The design guidelines are intended to be used as a reference to provide information on the horticultural and civil aspects of growing trees in challenging public spaces.

The full version of the design guidelines document is presented in two parts:

Volume 1: Background key issues

- **Desktop study** - South Australia, Australia, international.
- **Adelaide metropolitan council consultation** - council surveys, trial sites, typical details.
- **Defining challenging sites** - infrastructure and space constraints, tree growth requirements and species selection.

Volume 2: Design guidelines

- **Introduction** - summary of Volume 1 key findings, guiding principles.
- **Challenging scenarios** - illustrated glossary.
- **Support infrastructure.**
- **Scenarios and design solutions** - design solutions, applications, detail solutions.
- **Technical details.**

Background

Councils are focusing efforts on street tree planting to maximise the benefits they provide for our community and the environment. However, there are challenging spaces that currently do not lend themselves to successful tree growth and this can hamper efforts to expand tree canopy cover across council areas, as well as continue to cause conflict with roads and footpaths due to tree roots.

Narrow, confined spaces can prevent the growth of healthy and vibrant tree canopy due to the poor growing conditions they offer. These trees often cause damage to roads and footpaths as their roots seek water near the surface, resulting in substantially reduced asset life and hence greater life cycle costs of maintaining assets. These trees are often removed due to these conflicts, before they reach a mature age and before they are able to provide the multiple benefits that trees are valued for.

It is increasingly clear that if we continue to use traditional designs for street tree planting, trees will not reach their full growth potential, footpaths and roads will suffer damage and maintenance works will remain a cost burden for councils and ratepayers, while tree canopy cover will continue to stagnate or decrease across metropolitan Adelaide. Although not specifically addressed, providing space requirements for services is resulting in fewer spaces where street trees can be installed.

The design guidelines provide a collation of improved practices to growing trees in challenging spaces so they grow quicker and healthier than what could have been achieved using a traditional approach to tree planting.

The design guidelines provide details and an essential 'tool kit' for councils to advocate for greater opportunities for tree plantings within areas that were once considered impractical.

A summary of benefits that the design guidelines can achieve include:

- Quicker, healthier and more vibrant tree growth.
- Improved visual amenity and sense of place and pride.
- Streetscape with increased shade for pedestrians, cyclists and vehicles.
- Reduced urban heat.
- Improved general stormwater management resulting in less ponding.
- Habitat for wildlife.
- Increased property values through street greening.

Development of the guidelines

The City of West Torrens received funding contribution from the South Australian Government's Greener Neighbourhoods program to undertake research and develop design guidelines for growing street trees in challenging spaces, leading to improved tree canopy cover and reduced urban heat.

The design guidelines for 'Trees in Challenging Spaces' sits within a broader framework of Council plans, policies and strategies relating to cooling and greening our spaces, climate change, transport plans and our Community Plan.

The design guidelines have been prepared by a multi-disciplinary team, lead by specialist landscape architects at JPE, under the guidance of staff at the City of West

Torrens, and in consultant with other metropolitan councils. Understanding the range of challenging conditions across the metropolitan area has helped to develop designs that are useful for other councils to grow more vibrant trees and canopy cover, thereby enhancing the canopy cover across metropolitan Adelaide.

Councils were invited to participate in site visits, online surveys and workshops to help build a greater understanding of growing trees in challenging spaces and, importantly, to develop a set of designs to improve growing conditions and increase overall canopy cover.

Challenging spaces

Nine metropolitan councils provided details of their street tree planting challenges. These councils represent a range of landscape settings and built forms across Adelaide, which provides confidence that the solutions will meet a wide variety of situations for many councils.

The main limiting factor for planting street trees is the lack of space, such as narrow nature strip planting, followed by conflicts with infrastructure and underground and overhead services.

Another factor is public perception - street tree planting is one of the most visible representations of council in public space - and can create conflict between the council and residents due to perceived potential property damage, expenditure and maintenance requirements.

Of the nine councils surveyed, 14 individual staff responses were provided around the challenges that they faced.

Key issues and challenges faced by councils when planting new street trees are also summarised in the following feedback:

Infrastructure and space constraints:

- narrow street and verge
- increased building densities.

Tree growth requirements and species selection:

- soil volume
- water absorption
- tree planting standards
- appropriate tree selection.

The consequences of unsuitable tree planting are most commonly characterised by lifting pavements, followed by damage to other infrastructure and the tree itself.



Lack of space within verge for tree growth



Conflict with underground services



Conflict with civil infrastructure



Conflict with overhead wires

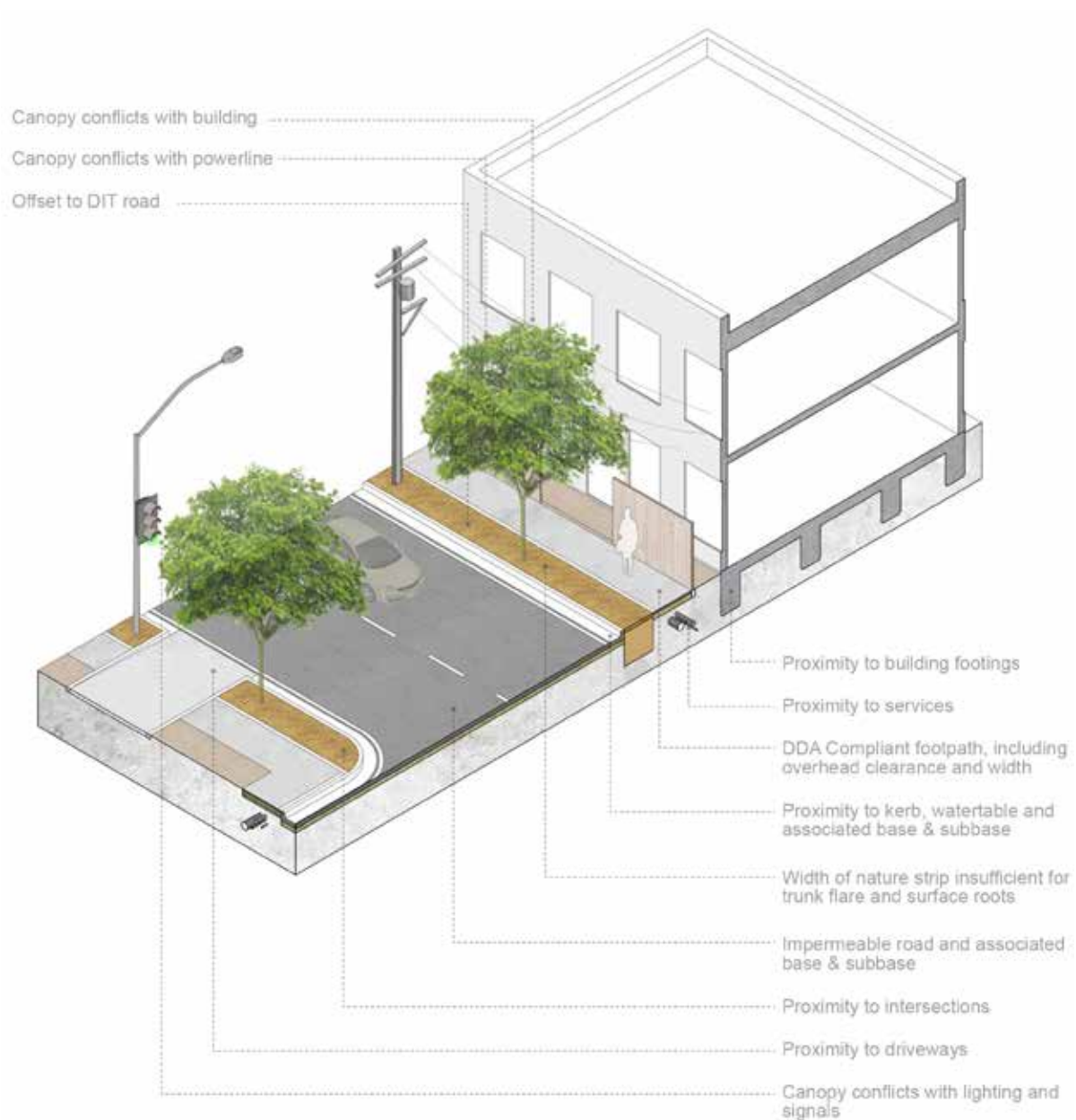


DIT setout requirements



Cost of installation

The following diagram illustrates the types of challenging scenarios for tree planting and subsequent tree growth and health.



Guiding principles

A set of guiding principles have been developed following the research and consultation. These principles summarise the key factors for successful tree planting outcomes.



'The Roots get the Shoots'

Available soil volume is critical to success of trees. Encouraging root growth will result in thriving tree canopies.



The Right Tree for the Right Location

A better understanding of appropriate tree species and which species are most likely to impact on infrastructure compared to others is crucial when selecting trees.



Happy Trees Happy Infrastructure

Providing the needs of the tree results in reduced impact on surrounding infrastructure. Considered needs include space, oxygen, nutrients and water. If tree needs aren't met, trees will seek space, water, nutrient elsewhere and by doing so damage infrastructure.



Prioritise Trees

Trees increase street value, civic pride & well being, and can provide financial benefits to residents & council. Street Trees provide landscape amenity, contribute to street & neighbourhood identity, & improve community stewardship. Considering trees as essential street infrastructure & prioritising them in the design & planning process ensures their success in the landscape and an overall benefit to the landscape and community.



Cost Efficient Solutions Maximise Implementation

Council budgets allow for asset renewal, new tree planting and tree maintenance yearly and the cost of standard tree planting needs to be responsive to these budgets. The final details will provide tools to plant trees for a range of budgets, while considering long and short term cost investment.



An Integrated Approach

The best outcomes for all can be achieved through equal ownership, engagement and commitment between horticultural, engineering, infrastructure, asset management and other involved disciplines.

Key considerations

To address challenging streetscape environments, the following process is provided; key issues to be considered include:

Tree selection:

- Choose tree species that are the right shape and scale for the street type.
- Select the right tree for the right location.

Soil volume:

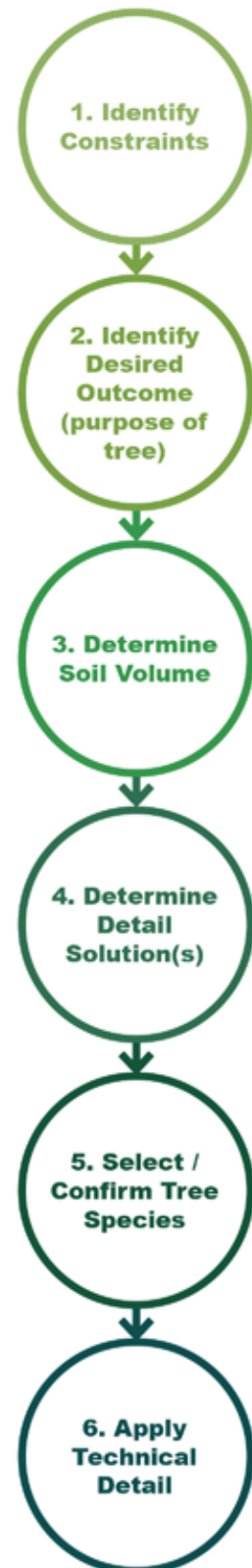
- Understand in situ soil profile and soil type.
- A tree needs soil volume for the root system to appropriately establish, survive and flourish. 'The roots get the shoots.'
- It is recognised that current street tree planting practices are only achieving an average of 1m³ or less of prepared soil volume per tree.
- An increase in prepared soil volume greater than 1m³ will improve the success of the tree growth and future tree resilience.

Water absorption:

- A tree requires access to water to effectively establish and survive.
- A recommended surface opening for appropriate water absorption that will improve tree growth is 2.2m².
- Currently permeable paving and passive irrigation are the most common techniques used to improve street tree growth among Adelaide metropolitan councils.

Street trees:

- It is important to determine the economic benefit and return for each tree, ensuring street trees as a valued asset and investment for the future.
- Selecting the right tree for the right location is fundamental to the future success of a tree. There are various scales of tree suited to various scales of infrastructure and street type.
- Tree species should be selected based on:
 - o Canopy size and relationship with the scale of the streetscape.
 - o Root growth and required tree pit detail suited to each tree planting scenario.
 - o Soil type and micro-climate.



Design guidelines

Key elements that create a challenging scenario:

1. Limited space below ground.
2. Limited space above ground.
3. Lack of access to water.

Technical design solutions have been prepared to address these types of challenging scenarios. They are generic, typical details that should be approached as a starting point, to be adapted to various situations as they arise in tree planting projects.

Some challenges are able to be addressed through localised details, while others may require changes to the site, street and the wider precinct.

Elements to address space constraints below and above the ground for tree pit and growth:

- Verge.
- Parking Lane.
- Road Corridor.
- Footpath.
- Relationship with services.

Elements to address access to water:

- Kerb and watertable.
- Surface treatment.
- Other passive irrigation.

Multiple design solutions respond to the above challenges and provide options which may best suit individual requirements.

The full version of the design guidelines can be accessed via the 'Trees in challenging spaces' section on our website westtorrens.sa.gov.au/trees

Right: tree well and inlet construction

Back cover: a tree pit inlet which channels stormwater to street trees.





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