



# **Bankstown and Campsie Urban Tree Canopy Master Plan**

**Final Draft**  
March 2021

# Bankstown and Campsie Urban Tree Canopy Master

## Plan

Phase 1 Report

**Project Number:** S20-020  
**Produced for:** Canterbury Bankstown Council

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# 1.0

## Introduction

# 1.1 Introduction

## Background

The Urban Tree Canopy Master Plan (UTCMP) is one of many technical studies that provides input into Council's Master Plans for Bankstown and Campsie.

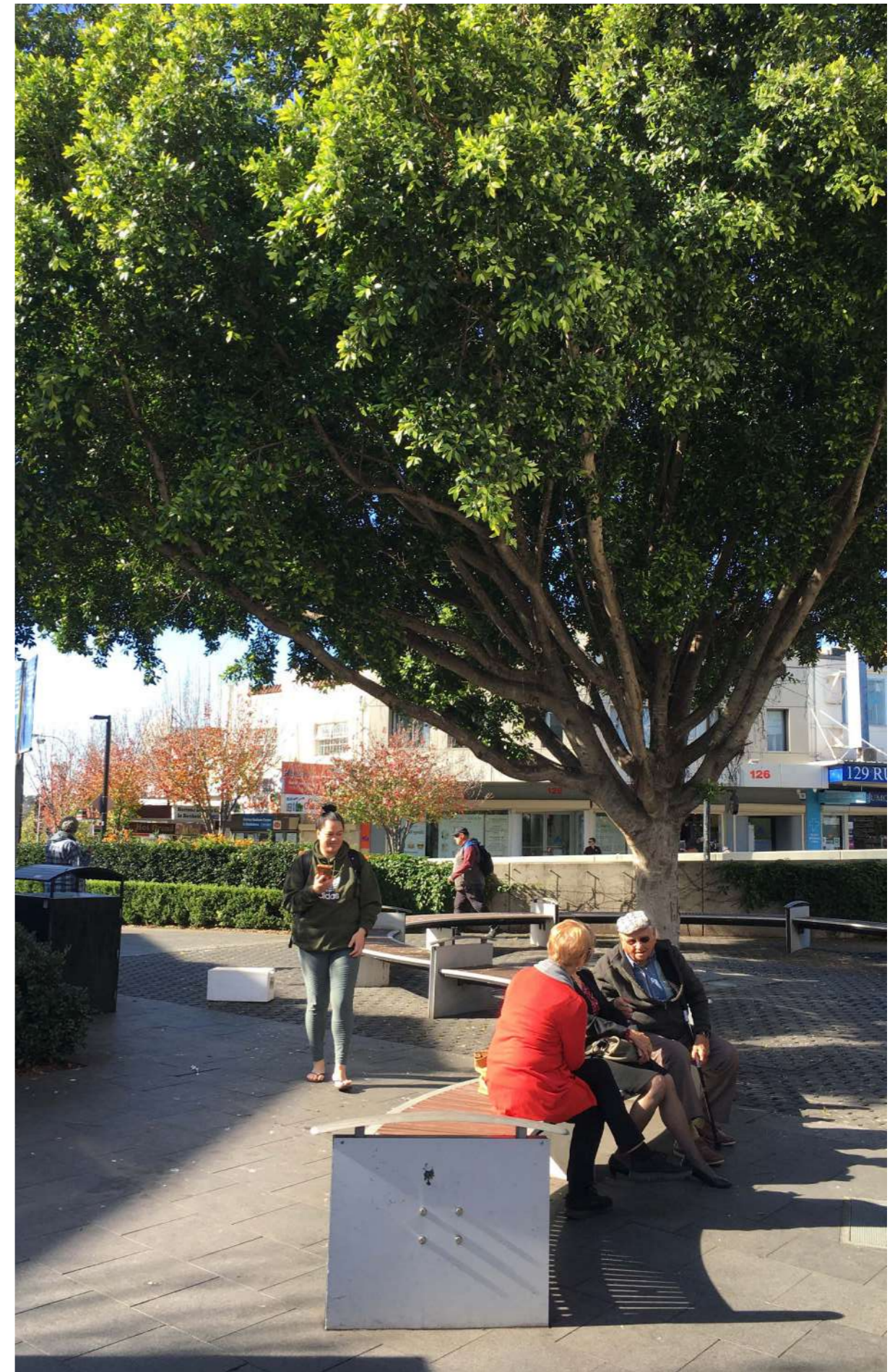
The UTCMP will be used by Council to inform the planning process and achieve a higher standard of urban greening and landscaping in Bankstown City Centre and Campsie Town Centre.

The UTCMP has been developed alongside recommendations for DCP landscaping controls for Bankstown City Centre and Campsie Town Centre that will ensure the aims of the UTCMP are achieved across private development.

## Objectives

The objectives of this master plan are to:

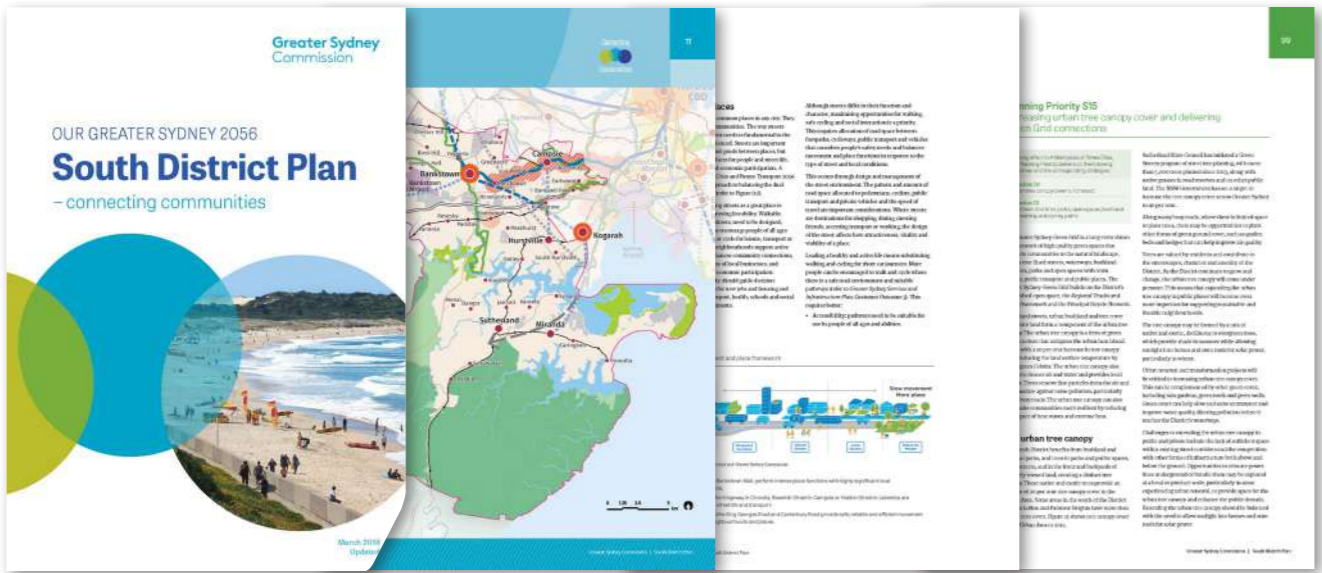
- + Increase tree canopy cover across Bankstown City Centre and Campsie Town Centre in line with the draft Local Strategic Planning Statement (LSPS) Connective City 2036, including 25% cover for medium-high density areas and 15% cover across commercial centres
- + Collect, review and amend data regarding trees in Bankstown City Centre and Campsie Town Centre using Council's App for data collection, Konect
- + Elevate the role of trees as critical infrastructure within the planning process
- + Identify gaps in urban tree canopy
- + Assess urban infrastructure that impede opportunities for new tree planting
- + Mitigate urban heat island effect in Bankstown City Centre and Campsie Town Centre and increase shading in urban spaces
- + Retain water in the urban environment
- + Improve the diversity of age and of tree species for effective long-term management
- + Prioritise selecting native and endemic tree species from threatened ecological communities present in the location prior to European settlement
- + Consider exotic trees if necessary where appropriate to location and orientation
- + Apply innovative techniques for collecting, analysing, modelling and visualising tree canopy data, which are smart and cost effective
- + Increase the value residents give to trees



# 1.2 Strategic Context

The following State and Local Government documents set out the strategic context for the Master Plan. Each of these has been considered in terms of their relevance to urban tree canopy.

## South District Plan



**Year**  
2018

**Format**  
Document/ A4, 124 pages

**Author**  
Greater Sydney Commission

**Status**  
Current

**Area of relevance**  
State/ South District

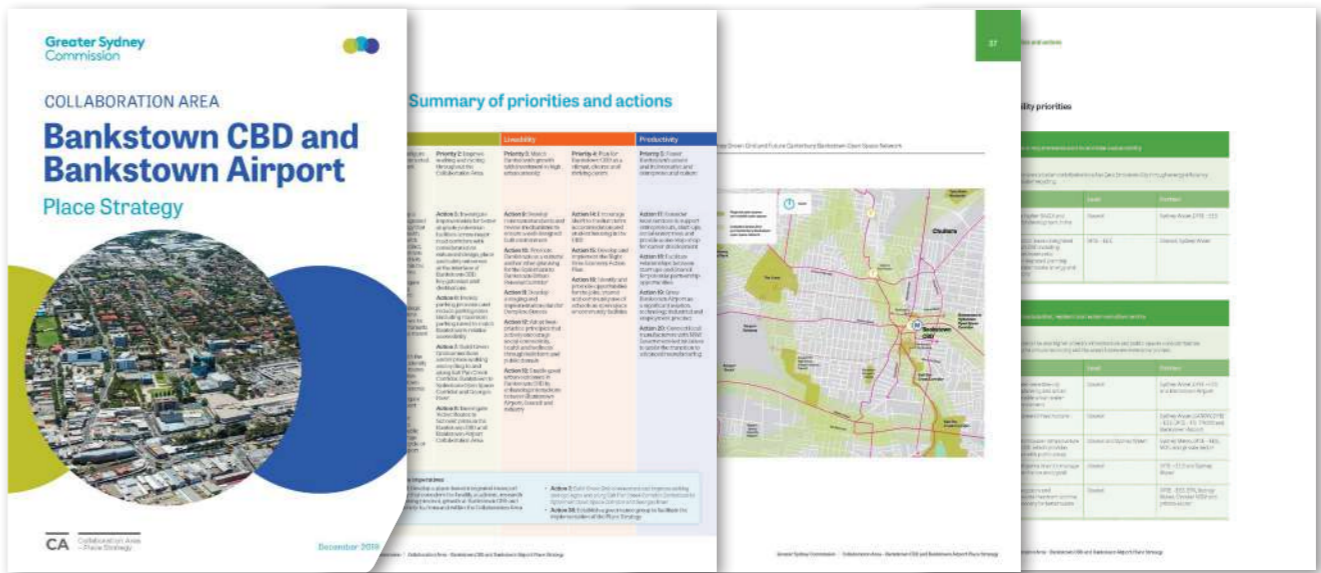
**Location**  
South District, NSW, Australia

The South District Plan is a 20-year plan to manage growth in the context of economic, social and environmental matters to achieve the 40-year vision for Greater Sydney. It is a guide for implementing the Greater Sydney Region Plan, A Metropolis of Three Cities, at a district level and is a bridge between regional and local planning.

**Considerations**

The South District Plan is an important document as it refers directly to the Canterbury Bankstown context. The plan includes a section on urban tree canopy and outlines specific opportunities in increasing urban canopy as well as some of the challenges associated with locating new tree planting and measures to overcome these challenges.

## Bankstown CBD and Bankstown Airport Place Strategy



**Year**  
2019

**Format**  
Document/ A4, 70 pages

**Author**  
Greater Sydney Commission

**Status**  
Current

**Area of relevance**  
City

**Location**  
Bankstown, NSW, Australia

The Bankstown CBD and Airport Place Strategy establishes a vision for Bankstown CBD and Bankstown Airport Collaboration Area based on the community's vision expressed in the City of Canterbury Bankstown Council's strategies and policies including CBCity2028. The Place Strategy identifies impediments and opportunities, sets priorities for the Collaboration Area and identifies actions to deliver the vision.

**Considerations**

The Bankstown CBD and Airport Place Strategy refers to the Collaboration Area's low urban canopy coverage and identifies that not only physical implementations be incorporated, such as habitat corridors and increased urban tree planting, but also community education initiatives.

## Community Strategic Plan CBCity 2028



**Year**  
2018

**Format**  
Strategic Plan, 31 pages

**Author**  
Canterbury-Bankstown City

**Status**  
Current

**Area of relevance**  
City

**Location**  
The city of Canterbury  
Bankstown, New South Wales  
(NSW), Australia

The CBCity 2028 – it's a 10-year plan to guide the City of Canterbury Bankstown on its journey to be a thriving, dynamic city of people who are interested and interesting – unapologetically themselves.

### Considerations

The CBCity 2028 has been developed after more than 10,000 community members had their say on how they want Canterbury Bankstown to look in 10 years time. This Community Strategic Plan is an aspirational vision of how to get there. The key components to consider within the document are:

- + One vision: Canterbury-Bankstown is thriving, dynamic and real.
- + Seven destinations
- + Seven transformations

## Connective City 2036 - Local Strategic Planning Statement



**Year**  
2020

**Format**  
Document/ A3, 104 pages

**Author**  
Canterbury-Bankstown City

**Status**  
Final

**Area of relevance**  
City

**Location**  
Canterbury - Bankstown,  
NSW, Australia

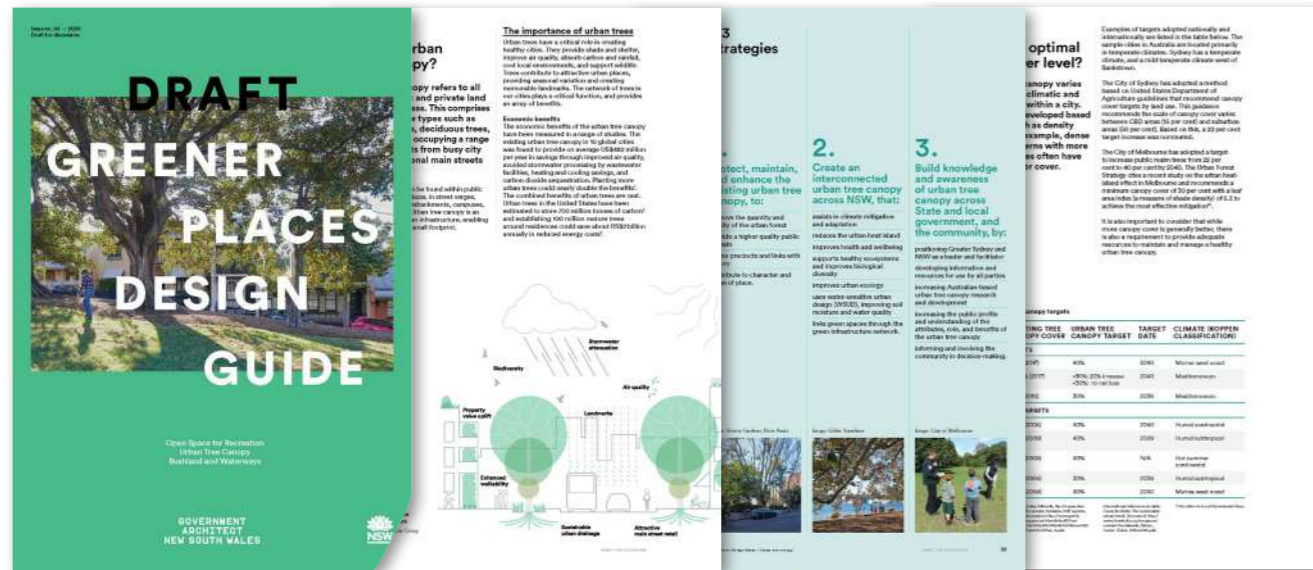
Canterbury-Bankstown is in the heart of greater Sydney and a City of more than 360,000 people which is projected to grow to 500,000 people in the next 20 years. A City of this scale needs a sophisticated, considered plan to guide how it will grow and change – a plan that brings together all the critical elements that make a city and build an even greater place.

*Connective City 2036* will create opportunities for the people who live and work in the City. It focuses on better quality of, and access to, transport options, protection and enhancement of environmental areas and precious waterways, and a commitment to vibrant centres and quality suburbs. *Connective City 2036* includes priorities and actions to achieve this vision for the City.

### Considerations

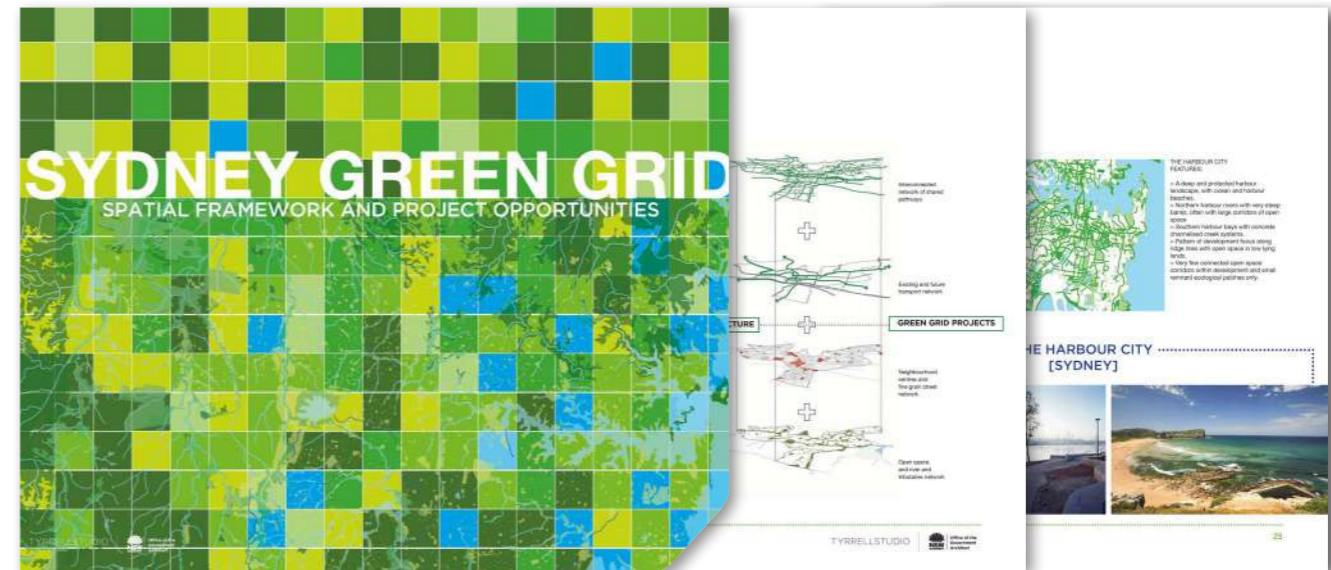
The *Connective City 2036* outlines a Green Web Plan that aims at creating an integrated network of ecological and green spaces between urban and suburban places. Their plan to connect regional and local open space both physically and ecologically provides opportunities for pockets of remnant native vegetation to be connected via wildlife corridors through carefully selected vegetation species.

## Greener Places + Draft Greener Places Design Guide



<p><b>Year</b> 2020</p> <p><b>Format</b> Guideline</p> <p><b>Author</b> Government Architect NSW</p> <p><b>Status</b> Framework - Current Design Guide - Draft</p> <p><b>Area of relevance</b> State</p> <p><b>Location</b> NSW, Australia</p>	<p>Greener Places is a green infrastructure policy produced by the Government Architect NSW to guide the planning, design and delivery of Green Infrastructure in urban areas across New South Wales. It aims to create a healthier, more liveable and sustainable urban environment by improving community access to recreation and exercise, supporting walking and cycling connections, and improving the resilience of urban areas.</p> <p><b>Considerations</b></p> <p>Greener Places provides a solid framework for Green Infrastructure considerations. The Urban Tree Canopy component of Greener Places Draft Guide is of particular relevance to this study, outlining the importance of urban trees, targets for canopy cover and strategies for the protection of existing trees and increasing tree canopy cover. The principles and strategies identified should be considered and incorporated into the Bankstown and Campsie Urban Tree Canopy Master Plan.</p>
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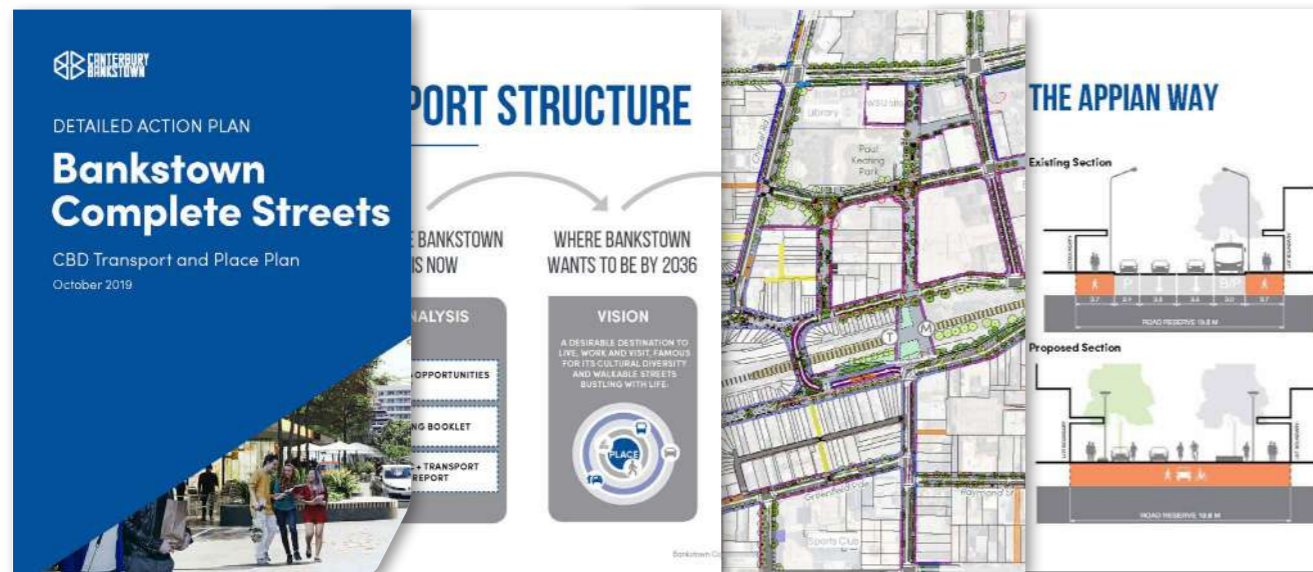
## Green Grid



<p><b>Year</b> 2017</p> <p><b>Format</b> Guideline</p> <p><b>Author</b> Government Architect NSW</p> <p><b>Status</b> Current</p> <p><b>Area of relevance</b> Greater Sydney</p> <p><b>Location</b> NSW, Australia</p>	<p>In this report the hydrological, recreational and ecological fragments of the city are mapped and then distilled into a proposition for a cohesive green infrastructure network for greater Sydney.</p> <p>This report builds on investigations undertaken by the Office of the Government Architect for the Department of Planning and Environment in the development of District Plans. It interrogates the vision and objectives of the Sydney Green Grid and uses a combination of GIS data mapping and consultation to develop an overview of the green infrastructure needs and character of each district.</p> <p><b>Considerations</b></p> <p>Blue and green infrastructure elements and connections identified in this document should be incorporated into the Master Plans.</p>
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## Bankstown Complete Streets



**Year**  
2019

'Complete Streets' is an approach that combines smart transport planning with good design to create an attractive destination.

**Format**  
Document/ A4, 280 pages

Bankstown Complete Streets will guide street and transport upgrades in Bankstown CBD. The concepts and recommendations will be rolled out progressively over the next 15-20 years.

**Author**  
Canterbury-Bankstown City

Importantly, there would be further detailed design and community consultation for each street prior to any works or changes being implemented.

**Status**  
Current

### Considerations

**Area of relevance**  
City

The Bankstown Complete Streets Plan looks at ways to improve the streetscape of the Bankstown CBD. The document illustrates opportunities for additional tree planting within the CBD as well as alternative street layouts and typologies which lend themselves to other ecological improvements. Their Concept Design plans identify streets for proposed tree planting, garden beds as well as trees to be retained which can be considered as a guideline for the Urban Tree Canopy Master Plan.

**Location**  
Bankstown, NSW, Australia

# 1.3 The Importance of Tree Canopy

## What is Urban Tree Canopy?

"Urban tree canopy refers to all trees on public and private land within urban areas. This comprises a variety of tree types such as exotics, natives, deciduous and evergreens occupying a range of environments from busy city centres to regional main streets and suburbs."

Greener Places Design Guide, GANSW

## The Importance of Tree Canopy

In the context of developed urban areas, trees are now widely recognised for the ecosystem services they provide. Those services comprise of various direct and indirect environmental, economic and community benefits.<sup>1</sup>

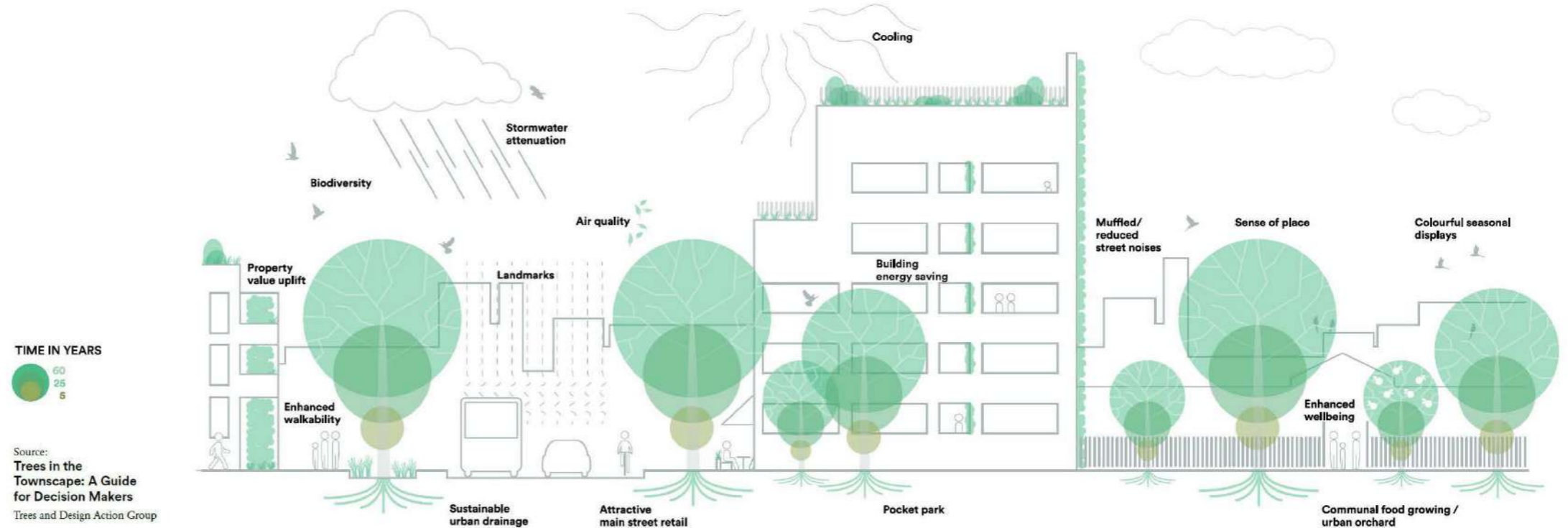
### Ecosystem Services:

- + Temperature moderation
- + Sequestration of atmospheric carbon
- + Air purification
- + Stormwater management
- + Improved building energy efficiency
- + Increased property values
- + Habitat creation and species survival
- + Biodiversity of species

### Improved health and wellbeing:

Tree canopies also provide health and wellbeing benefits to their surrounding communities and visitors alike. This includes:

- + Providing shade and shelter
- + Improved air quality
- + Reduced occurrences of obesity, hypertension and heart conditions
- + Reduced stress
- + Improved cognitive function and mental health
- + Maintaining and supporting wildlife
- + Contributing to the aesthetic of the urban environment, including mitigating the impacts of built form in dense areas.



<sup>1</sup>The benefits of trees canopy are clearly outlined in the *Greener Places Design Guide (GANSW)*. Refer to the guide for additional information and references.

The Importance of Tree Canopy  
Source: Greener Places Design Guide, GANSW

**2.0**

Current Conditions

# 2.1 Tree Canopy Cover

Tree canopy cover for Bankstown City Centre and Campsie Town Centre was analysed based on a 2016 dataset compiled by the NSW Department of Planning, Industry and Environment. While the data has limitations due to it being over five years old, it still allows for generalised observations to be made of the state of canopy cover for these areas.

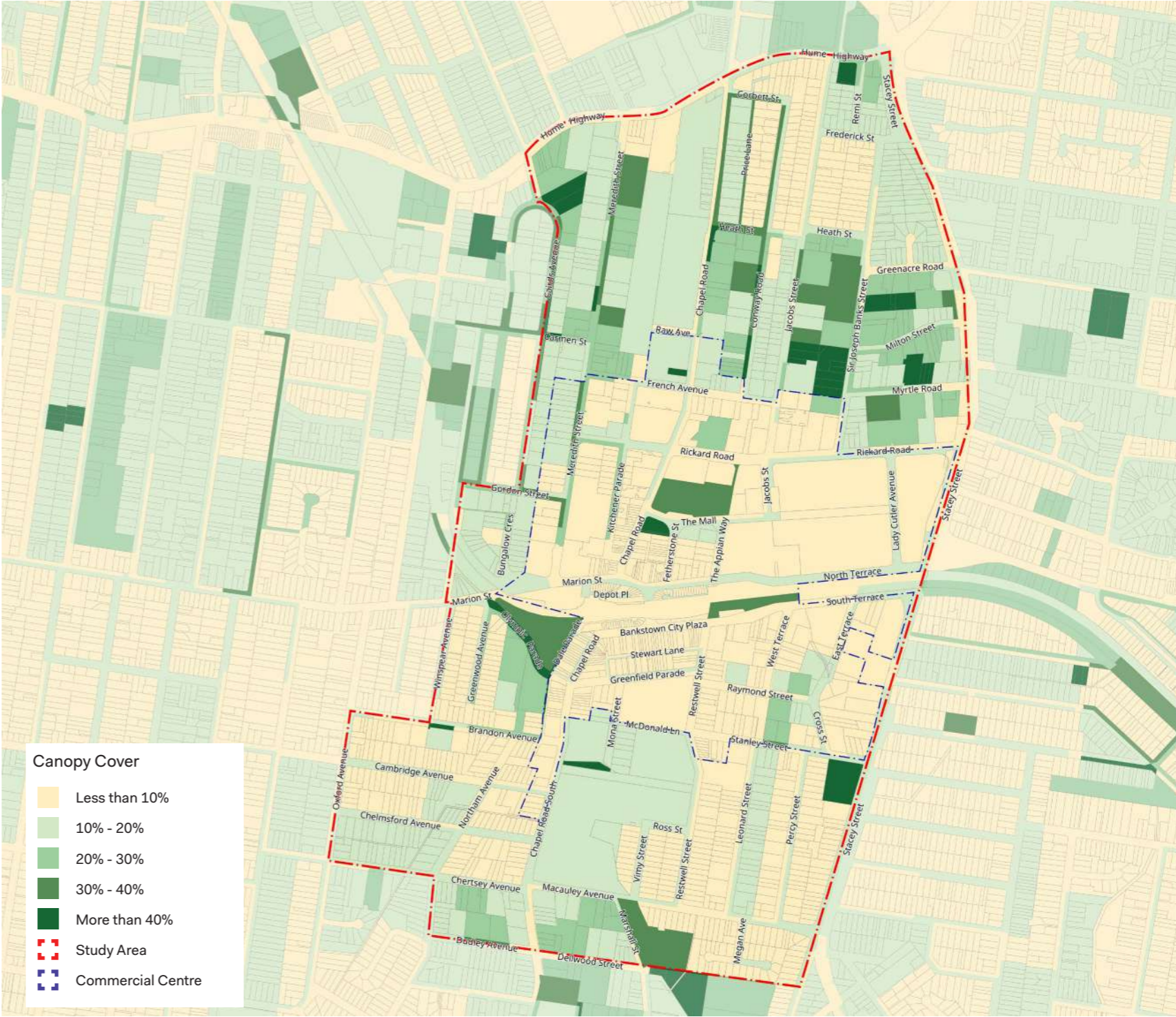
## Bankstown

Bankstown has an overall canopy cover of 14%. Within the commercial centre canopy cover is lower than the average, with large areas of less than 10% canopy cover. This is largely a result of more constrained road typologies and greater site coverage typical of the urban character of this area. Higher canopy cover percentages can be found across the open spaces and streets and private lots in lower density residential areas.

Increasing the canopy cover within the central commercial area of Bankstown will be a key priority of the Master Plan, incorporating the Bankstown Complete Streets initiative and ensuring canopy cover percentages increase across the entirety of Bankstown City Centre.

Land Use	TOTAL		COMMERCIAL CENTRE		OUTSIDE COMMERCIAL CENTRE	
	% Total Area	% Canopy Cover	% Area	% Canopy Cover	% Area	% Canopy Cover
Commercial	15%	5%	47%	5%	0%	10%
Residential	47%	14%	23%	8%	59%	15%
Total Private	63%	12%	70%	6%	59%	15%
Education	7%	16%		3%	10%	16%
Medical	0%	24%	1%	24%		
Infrastructure (roads)	23%	14%	27%	11%	22%	16%
Parkland	7%	28%	2%	36%	9%	27%
Total Public	37%	17%	59%	13%	26%	21%
Total Combined	100%	14%	100%	8%	100%	16%

Bankstown Canopy Cover by Land Use. Source: The NSW Urban Vegetation Cover to Modified Mesh Block 2016, DPIE



Bankstown Canopy Cover. Source: The NSW Urban Vegetation Cover to Modified Mesh Block 2016, DPIE

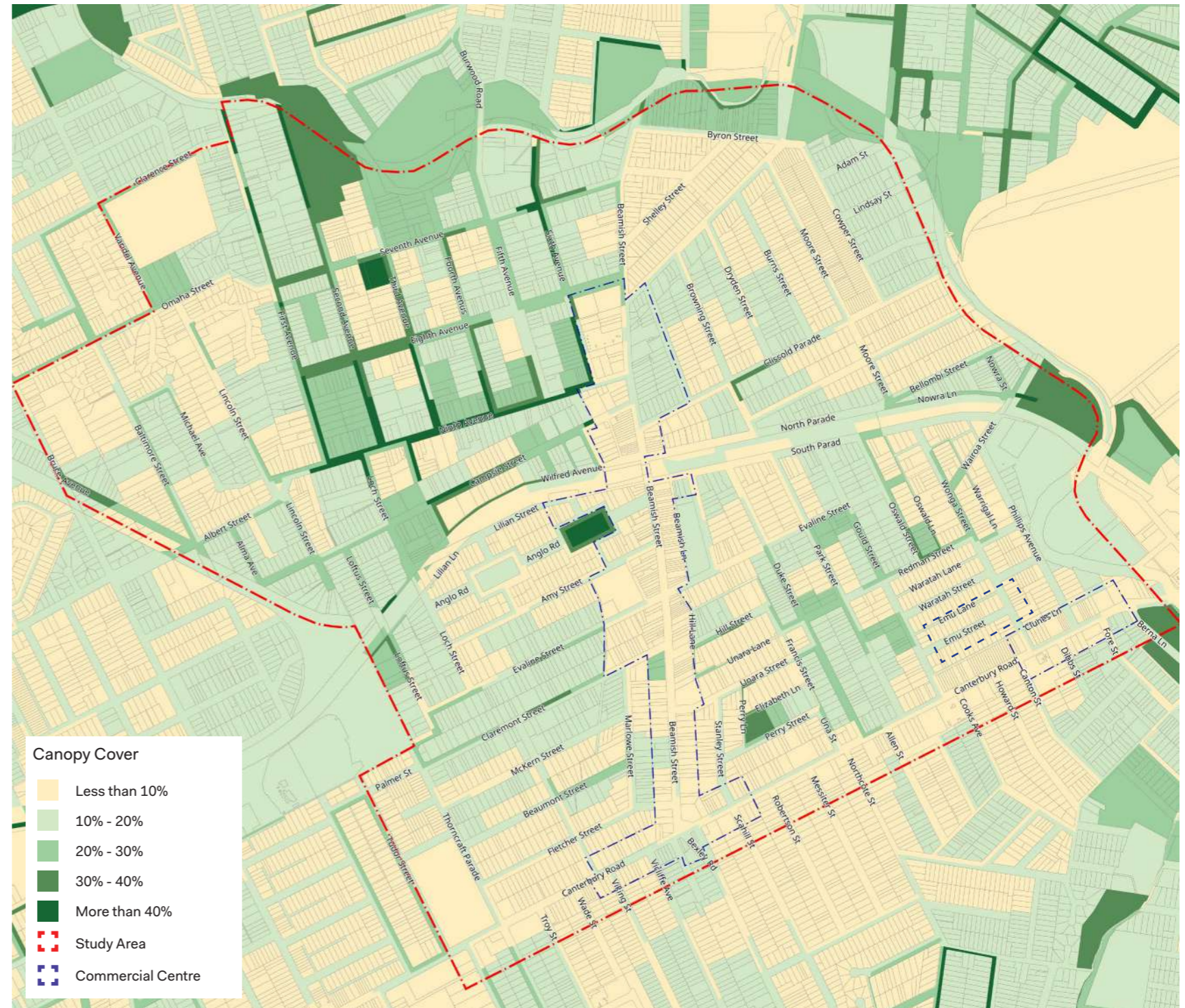
## Campsie

Campsie has an overall canopy cover of 13%. Similar to Bankstown, the commercial centres, including along Beamish Street and Canterbury Road, averages less than 10% canopy cover.

As more of the site area takes on an urban density, it will be critical to ensure that existing and new tree planting is prioritised so that overall coverage is increased rather than compromised by future development. In particular, the residential streets in the northwest of Campsie Town Centre, including Ninth Avenue, have a higher than average canopy cover that will need to be carefully protected and enhanced as this area densifies.

Land Use	TOTAL		COMMERCIAL CENTRE		OUTSIDE COMMERCIAL CENTRE	
	% Total Area	% Canopy Cover	% Area	% Canopy Cover	% Area	% Canopy Cover
Commercial	4%	5%	32%	5%	1%	6%
Industrial	0%	2%			0%	2%
Residential	65%	11%	38%	6%	67%	11%
<b>Total Private</b>	<b>68%</b>	<b>11%</b>	<b>70%</b>	<b>5%</b>	<b>68%</b>	<b>11%</b>
Education	1%	15%			1%	15%
Medical	1%	8%			1%	8%
Infrastructure (roads)	24%	17%	30%	8%	23%	18%
Parkland	6%	18%			7%	18%
<b>TOTAL Public</b>	<b>32%</b>	<b>17%</b>	<b>30%</b>	<b>8%</b>	<b>32%</b>	<b>18%</b>
<b>TOTAL Combined</b>	<b>100%</b>	<b>13%</b>	<b>100%</b>	<b>6%</b>	<b>100%</b>	<b>13%</b>

Campsie Canopy Cover by Land Use. Source: The NSW Urban Vegetation Cover to Modified Mesh Block 2016, DPIE



Campsie Canopy Cover. Source: The NSW Urban Vegetation Cover to Modified Mesh Block 2016, DPIE

## 2.2 Detailed Tree Assessment

### Methodology

A detailed tree survey was undertaken as part of this study in order to guide the Master Plan and provide Council with the details of the existing urban forest across Bankstown City Centre and Campsie Town Centre.

The survey provided the following information for each tree:

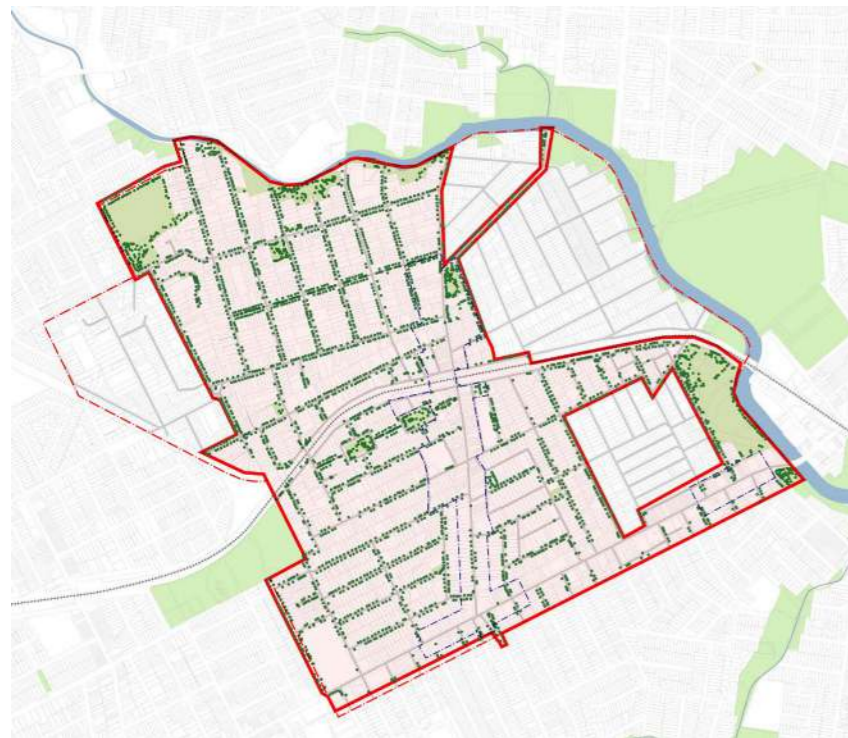
- + Location
- + Species
- + Size
- + Condition
- + Useful Life Expectancy
- + Overhead services
- + Root zone conditions
- + Age

A total of 3766 records have been collected in Campsie CBD and 1568 in Bankstown CBD.

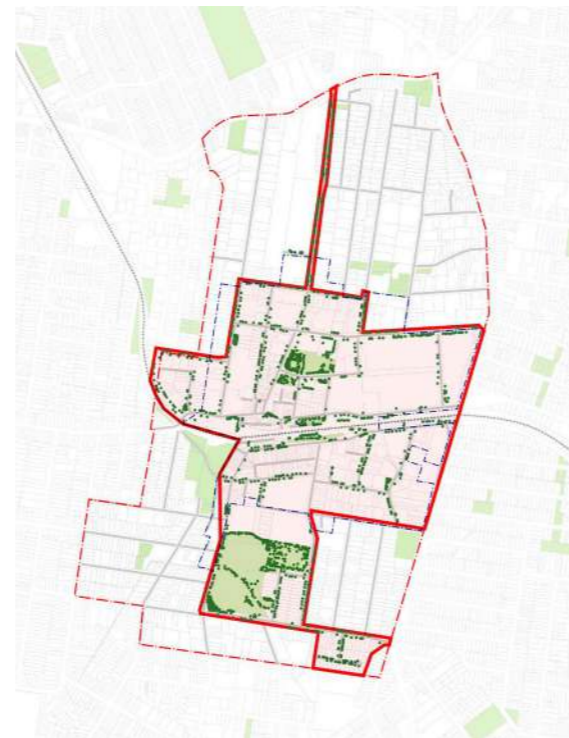
The following pages summarise the key trends and findings based on the surveyed tree populations.

Note that the survey had the following limitations that should be considered along side the trends and findings:

- + The survey covered trees on Council owned or managed land only and excluded trees on private property.
- + The tree survey did not cover the entire Bankstown City Centre and Campsie Town Centre areas, as indicated by the survey extents below.



Campsie  
  Study area  
  Extent of tree survey



Bankstown  
  Study area  
  Extent of tree survey

### The Value of Existing Trees

The following table summarises the estimated value of the trees included in the tree survey.

STRUCTURAL VALUE		
Average Structural Value	Bankstown	Campsie
Per tree	\$3,892	\$5,617
Entire Population	\$6,101,662	\$21,153,795
ECOSYSTEM SERVICES		
Air Pollution Removal	Bankstown	Campsie
Removal of Pollutants (kg)	290kg	600kg
Annual Benefit Value (\$/year)	\$16,163	\$33,312
Carbon Storage & Sequestration	Bankstown	Campsie
Annual Carbon Sequestration (tonnes)	23 tonnes	68 tonnes
Annual Benefit Value (\$/year)	\$531	\$1,555
Total Stored Carbon (tonnes)	515 tonnes	1824 tonnes
Annual Benefit Value (\$/year)	\$11,759	\$41,597
Avoided Stormwater Run-off	Bankstown	Campsie
Annual Estimated Reduction in Water Run-Off (m <sup>2</sup> )	384 m <sup>2</sup>	799 m <sup>2</sup>
Annual Benefit Value (\$/year)	\$868	\$1,807
Combined Annual Value Of Ecosystem Services	Bankstown	Campsie
	\$17,562	\$36,674
CANOPY COVER		
Canopy Cover	Bankstown	Campsie
Sum of Individual Canopy Dimension (m <sup>2</sup> )	59,099.5 m <sup>2</sup>	120,891.4 m <sup>2</sup>

These figures were calculated using the iTree Eco model. The iTree suite of tools, designed by the U.S. Forestry Service, have been developed to quantify ecosystem services for both individual trees and tree populations. iTree Eco is primarily a model for quantification of ecosystem services and generating monetary values for tree assets.

Refer to Appendix 5.2 for further information on these values and the assessment assumptions and methodology.

## Tree Species Diversity

Broad diversity is an essential element in maintaining a healthy tree population. A lack of diversity predisposes a tree population to threats from pests, disease and environmental stresses. In severe cases, an outbreak of a particular pest or disease on a certain species or family can have significant impacts on a tree population. A wide range of species provides greater resilience and long-term stability for the tree population as a whole. In addition, broad species diversity helps to support greater fauna diversity by providing a variety of food sources and habitat.

Grouping the tree population by family, genus and species, which then can be expressed in percentage terms, is an effective way of providing an overview of diversity.

A general guide is for a well-structured tree population is for no greater than 40% for any particular family, 30% for any particular genus, and 10% for any one species.<sup>1</sup>

### Bankstown Species Diversity

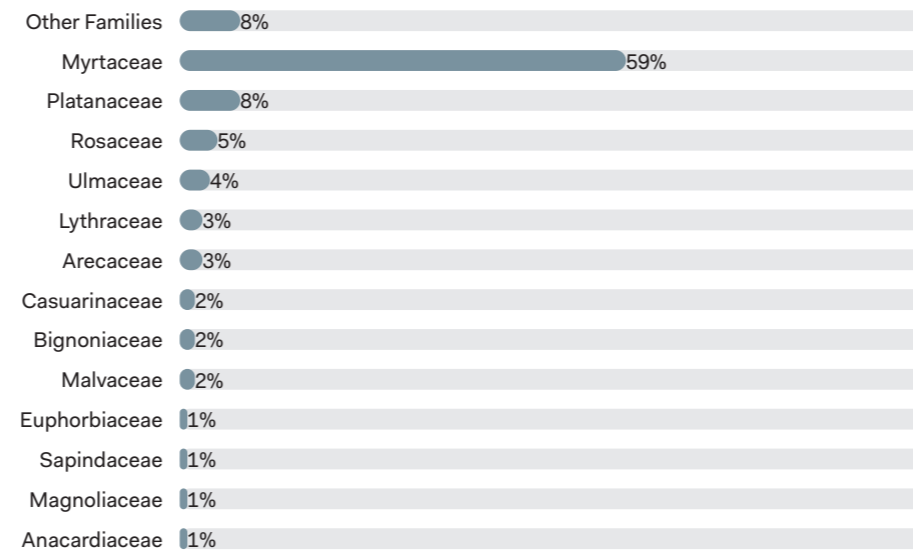
- + 33 families in total
- + 71 genera represented
- + 117 species in total

Analysis of the diversity within the Bankstown City Centre shows the distribution of family exceeds the recommended guidelines with the largest family *Myrtaceae* representing 59% of the total tree population. That said, the *Myrtaceae* family does contain a very broad range of genera and areas of natural woodland in the LGA and the Sydney Basin as a whole contain higher proportions of canopy species from this family, making it less of an issue when it comes to tree diversity.

*Eucalyptus* and *Callistemon* are the most highly represented genera at 13% although each falls well within the recommended guidelines. However, *Callistemon viminalis* is the most abundant species at 12% of the trees surveyed in Bankstown and exceeds the recommended guidelines. This is also an issue as the species is not locally indigenous and often ends up dispersing into waterways.

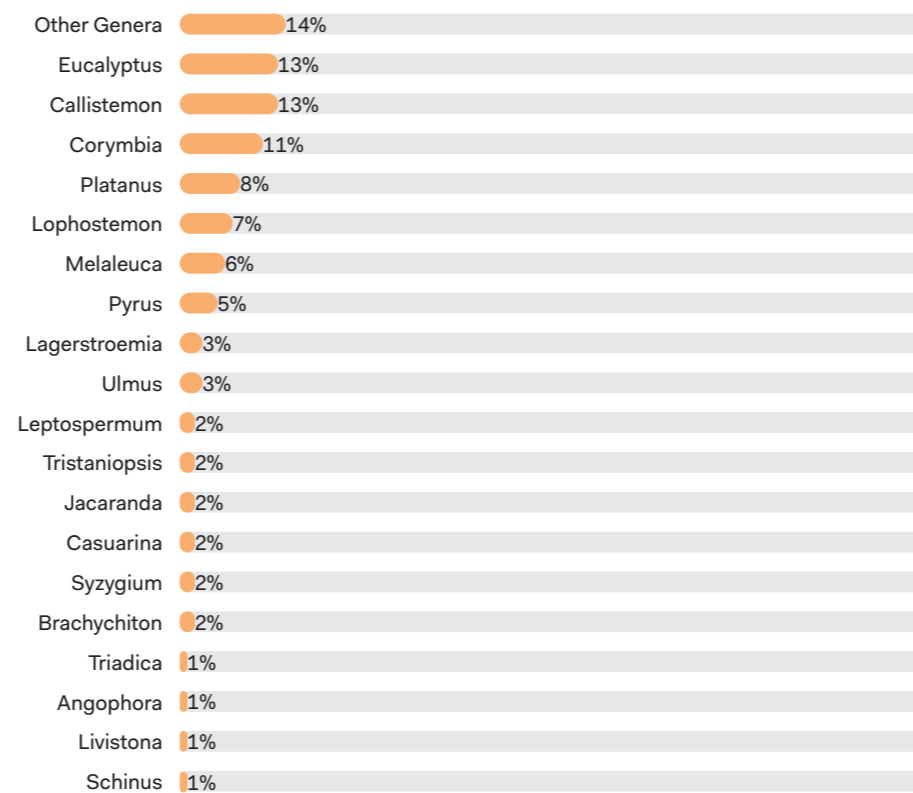
It is important to note that any tree evaluated to be in good condition will not be removed regardless of the guidelines.

### Bankstown - Family Diversity



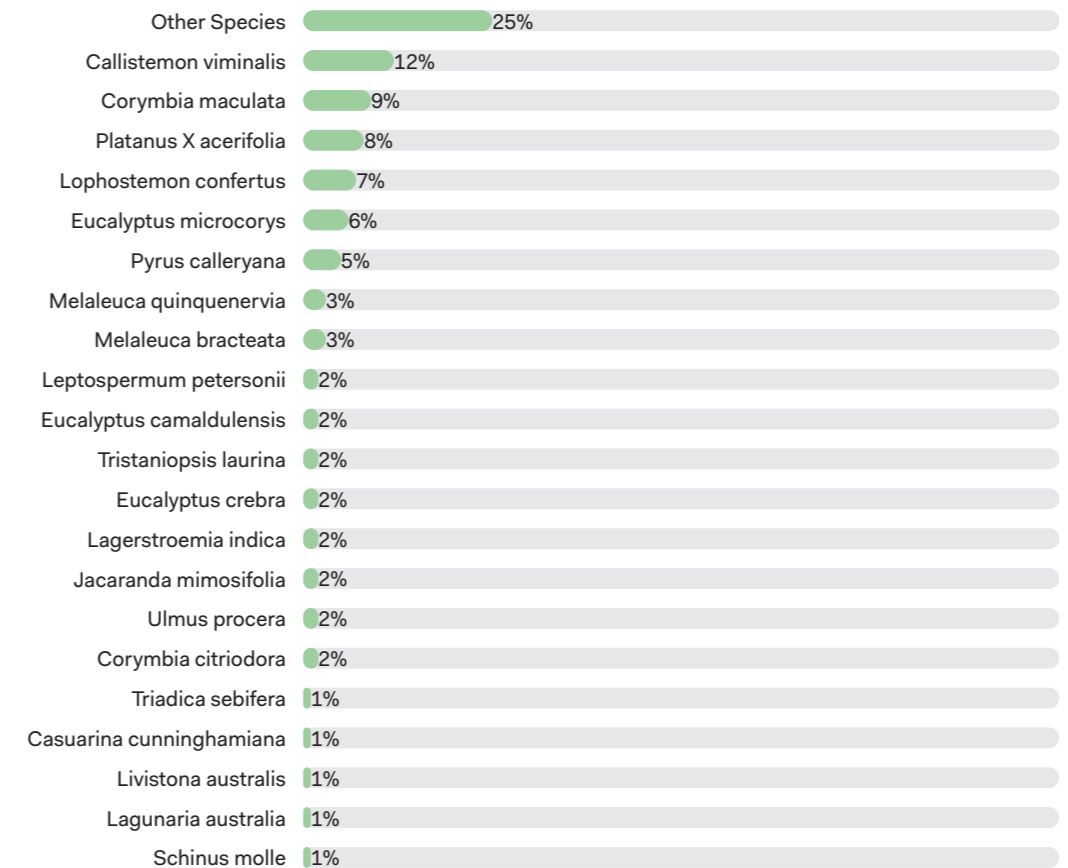
Percentage of Tree Population

### Bankstown - Genus Diversity



Percentage of Tree Population

### Bankstown - Species Diversity



Percentage of Tree Population

<sup>1</sup> These percentages are widely recognised as broad guidance and are included in the *City of Sydney Urban Forest Strategy (2013)*

### Campsie Species Diversity

- + 42 families in total
- + 96 genera represented
- + 150 species in total

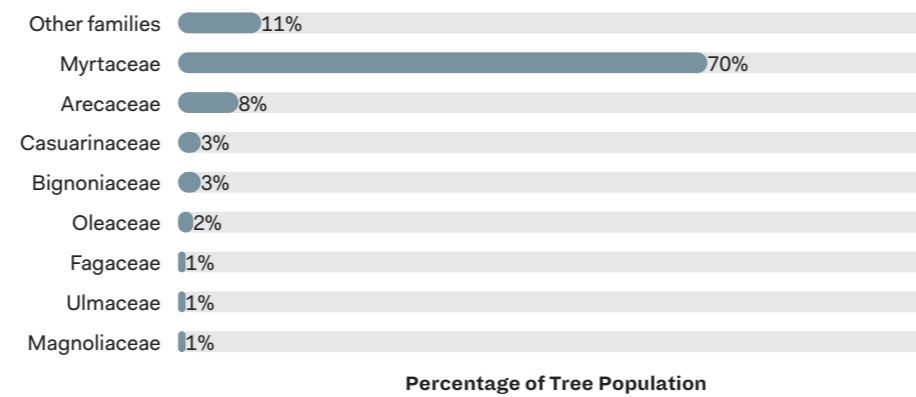
Analysis of the diversity within Campsie Town Centre shows the distribution of family far exceeds the recommended guidelines with the largest family *Myrtaceae* representing 70% of the total tree population. Although *Myrtaceae* family does contain a very broad range of genera, strategies to increase the numbers of tree families should be implemented.

*Lophostemon* is the most highly represented genus at 27% of the trees surveyed in Campsie which is approaching the recommended maximum of 30%, followed by *Callistemon* at 22%. The other genera comprising the tree population are represented in single digits and are well within the recommended guidelines.

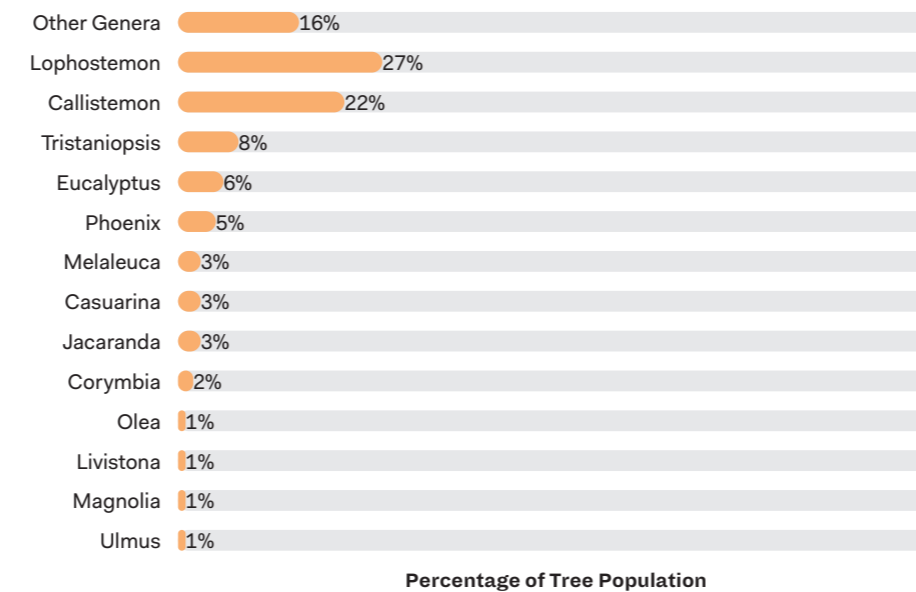
In species terms, *Lophostemon confertus* at 27% far exceeds the recommended 10% maximum for any one species as does *Callistemon viminalis* at 18%. *Tristaniopsis laurina* is the third most abundant species within the tree population and at 8% is approaching the maximum recommended guidelines.

The prevalence of certain species has in part been driven by previous efforts to establish single-species avenues and boulevards across Campsie Town Centre. This should be taken into account when implementing strategies to increase overall species diversity in the future.

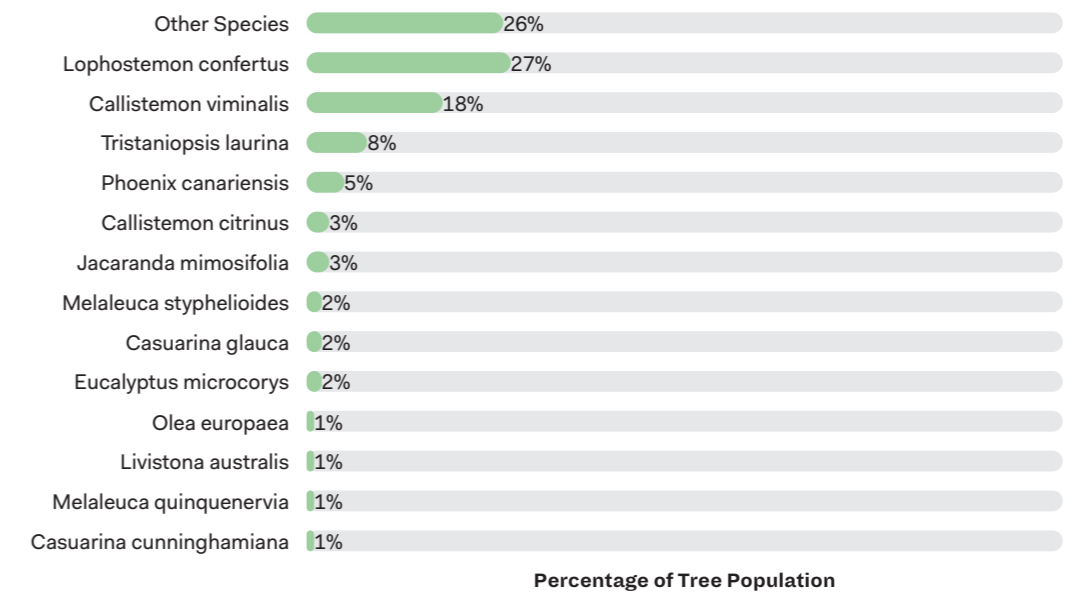
### Campsie - Family Diversity



### Campsie - Genus Diversity



### Campsie - Species Diversity





## Tree Species Origin

Tree species origin has been analysed to understand the breadth of species across both Bankstown and Campsie and guide the requirements for future planting.

The use of locally indigenous species helps to maintain and enhance biodiversity values to a greater degree than species originating from wider geographical zones. Increasing the percentages of locally indigenous species should be a key consideration in species selection for new trees.

It is important to note that when selecting native species for new plantings, the use of indigenous provenance is important to ensure that the genetic integrity of the local environment is maintained. This will also help to provide resilient plant stock within the local area as it will be growing in familiar conditions.

Non-locally indigenous and exotic trees can have other desirable attributes in terms of amenity, resilience to harsh urban microclimates and in the case of deciduous species, provide the benefits of both summer shade and winter sun. The use of Australian native species can help to provide context within a local landscape and maintain the local character of an area. Most importantly, selecting the right tree for the right place will provide the best long-term outcomes in terms of both the tree and its surrounding environment. In addition, the predicted future impacts of climate change should be considered when selecting appropriate tree species.

## Bankstown Species Origin

An analysis of the origin of species for the trees at the Bankstown City Centre shows the tree population is heavily weighted towards NSW species at 62% (including 18% locally indigenous species), followed by exotic species at 33% and Australian natives at 5%. The use of a high percentage of NSW species is likely to benefit biodiversity values and provide species which are suited to the local growing environment.



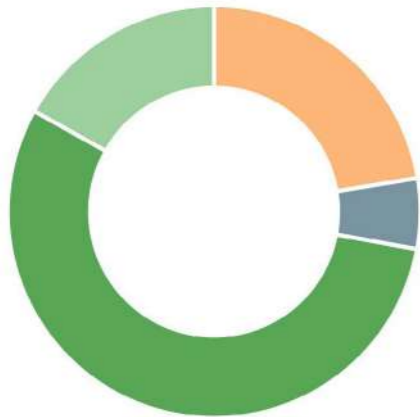
■ Australian Native ■ Exotic ■ NSW Native ■ Locally Indigenous



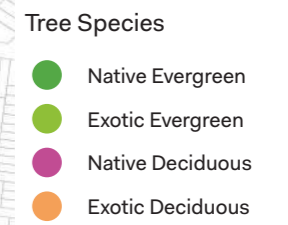
Bankstown Tree Species

### Campsie Species Origin

An analysis of the origin of species for the trees at Campsie Town Centre showed the tree population is heavily weighted towards NSW species at 72% (including 17% locally indigenous species), followed by exotic species at 23% and Australian natives at 6%. The use of a high percentage of NSW species is likely to benefit biodiversity values and provide species which are suited to the local growing environment.



■ Australian Native ■ Exotic ■ NSW Native ■ Locally Indigenous



Campsie Tree Species

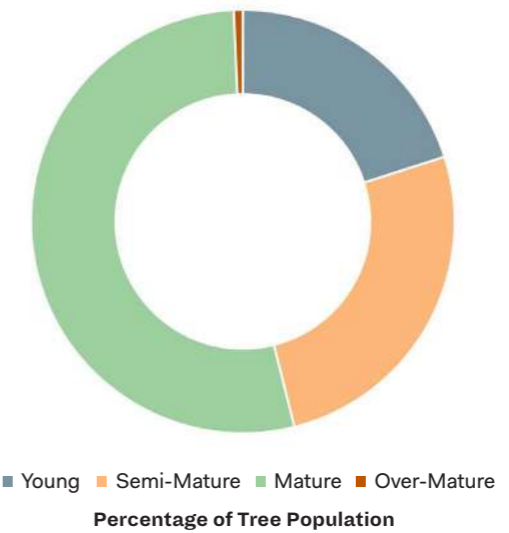
## Tree Age

Effective tree management recognises that trees are living organisms with a finite lifespan. Trees progress through a series of life stages with senescence being the final stage. The later life stages in particular can extend over many decades. Where a uniform age profile within a tree population exists, it is likely that many trees will decline and deteriorate within a similar timeframe. The removal of large numbers of trees at any one time can have significant impacts on visual amenity, raise community concerns and incur significant costs.<sup>2</sup> A high proportion of senescent (over-mature) trees may also carry an element of increased risk to the public and must be managed accordingly. By maintaining a mixture of age classes, tree removal and replacement becomes an ongoing process. This reduces the overall visual impact on the landscape from tree removals, minimises community concerns and spreads financial costs over a longer period.

<sup>2</sup>City of Sydney Urban Forest Strategy (2013)

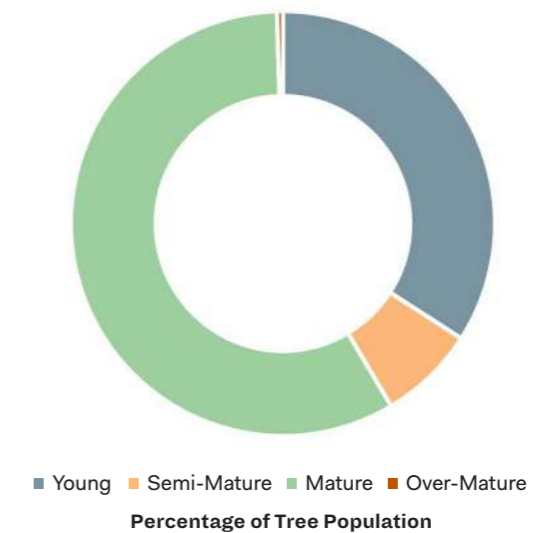
### Bankstown Tree Age

Analysis of the age classes of trees within the Bankstown City Centre shows that by far the greatest percentage of trees are in the mature age class at 53% with a reasonably well distributed mix of semi-mature and juvenile trees at 26% and 20% respectively. Senescent (over-mature) trees are present in very low numbers at only 1% of the tree population.



### Campsie Tree Age

Analysis of the age classes of trees within the Campsie Town Centre shows that by far the greatest percentage of trees are in the mature age class at 58%. Semi-mature tree numbers are low at only 7% however juvenile tree numbers fall within a desirable range at 34% of the tree population. It should be noted that in terms of a tree's life stages, the time period between the juvenile and semi-mature age class is very short in comparison to the later life stages. There are less than 1% senescent trees within the Campsie Town Centre.



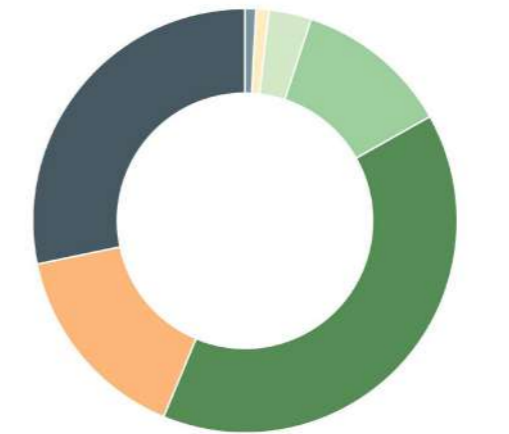
## Useful Life Expectancy

Useful Life Expectancy (ULE) is an estimate of how long a tree is likely to remain in the landscape based on its health and structural condition, site suitability, and its contribution and risk to the community. A ULE is not a static value; a tree's ULE can change over time in response to climatic changes and changes within its growing environment. Within urban environments, a ULE is generally shorter than the potential biological lifespan of the tree due to a range of factors including harsh urban growing environments, conflict with infrastructure and risk management requirements.

The allocation of a ULE is an effective landscape management tool which allows a phased, proactive approach to tree removal and replacement, and can assist when budgeting for future management costs. As a general rule, trees with a shorter ULE are likely to require greater management inputs.

### Bankstown Useful Life Expectancy

Roughly half (54%) of the tree population within the Bankstown City Centre falls within the ULE range of 20-40 years, with trees with a ULE of 40+ years representing 28%. 15% of the trees have a ULE range of 6-20 years and 2% of population has a ULE range of <6 years. The breakdown of these ULE ranges is considered acceptable.

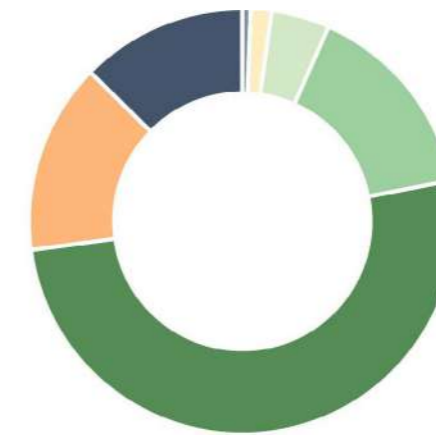


0 years 1-5 years 6-10 years 11-20 years  
21-30 years 31-40 years 40+ years

Percentage of Tree Population

### Campsie Useful Life Expectancy

The greatest percentage of the tree population within the Campsie City Centre falls within the ULE range of 20-40 years at 66% and trees with a ULE of 40+ years represent 13%. 19% of the trees have a ULE range of 6-20 years and 3% of population has a ULE range of <6 years. The breakdown of these ULE ranges is considered acceptable.



0 years 1-5 years 6-10 years 11-20 years  
21-30 years 31-40 years 40+ years

Percentage of Tree Population

## Tree Size

### Size Class

Within a tree population, a range of tree sizes and habits adds a level of structure and complexity which when used effectively can complement and enhance the surrounding built environment. Small and upright, columnar and fastigate trees can be utilized in restricted growing environments to provide the greening of a space whilst minimizing ongoing maintenance requirements and conflict with adjacent structures. Whilst small tree species can be important design elements in the landscape, their contribution to the primary urban forest canopy is minimal and research shows the cost benefits provided by large trees to be proportionately much greater than that of small trees due to their ability to shade, screen, absorb greater volumes of carbon dioxide and pollutants and help reduce the scale of large buildings.

A general guide for the tree population to be represented by tree heights of 10% small trees (3-5m), 45% medium trees (5-10m), 35% large trees (10-20m) and 10% extra-large trees (20m+).<sup>3</sup>

An assessment of the tree data from both precincts shows the distribution of small, medium and large species to be heavily skewed towards small and medium sized trees. Whilst smaller trees are invaluable for planting in restricted areas and below overhead service lines, the contribution provided by these trees in terms of amenity, shade and a range of additional ecosystem service benefits is limited. Research shows that a single large tree provides the aforementioned benefits to a proportionately higher degree than multiple smaller trees. Therefore, it is important to identify those areas which can accommodate large and extra-large species wherever possible in order to diversify the stratum of canopy cover and gain the maximum possible benefits from the tree population.

<sup>3</sup> These percentages are widely recognised as broad guidance and are included in the *City of Sydney Urban Forest Strategy (2013)*

### Bankstown Tree Size

Small 31%  
Medium 40%  
Large 29%  
Extra Large <1%



■ Small (<5m) ■ Medium (5-10m)  
■ Large (11-20m) ■ Extra Large (>20m)  
Percentage of Tree Population

### Campsie Tree Size

Small 36%  
Medium 44%  
Large 19%  
Extra Large 1%



■ Small (<5m) ■ Medium (5-10m)  
■ Large (11-20m) ■ Extra Large (>20m)  
Percentage of Tree Population

## 2.3 Challenges and Opportunities

While there are many challenges involved in creating a robust and expansive urban tree canopy across Bankstown and Campsie, they can also present opportunities for creative solutions as part of this UTCMP.

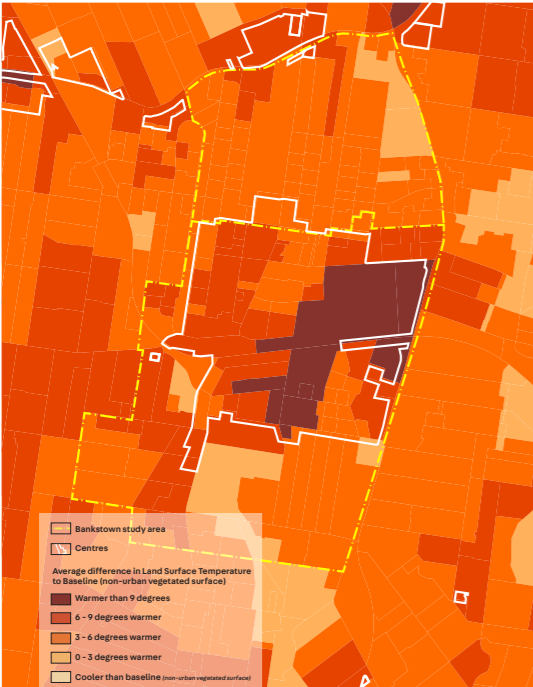
### Urban Heat Island and Climate Change

Urban heat island is the phenomenon of increased temperature in urban areas, caused by loss of vegetation, changes in built form, and increased areas of dark impervious surfaces such as asphalt.

Tree canopy can reduce urban temperatures by:

- + Transpiring water;
- + Changing wind speeds;
- + Shading surfaces; and
- + Modifying the heat absorbed by urban surfaces

Climate change will increase extreme weather events and the severity and frequency of hot days in Bankstown City Centre and Campsie Town Centre, making the tree canopy even more critical in mitigating these impacts. The changing climate will also need to be taken into account when selecting species and providing growing conditions for trees.



Bankstown Surface Temperatures

### Competition for physical space

Existing and proposed trees in urban areas are often compromised by overhead wires above ground where canopy pruning by utility companies and restrictions on the size of new tree plantings limit canopy cover. Measures such as aerial bundling of wires or undergrounding can help to reduce these constraints, however, these solutions require liaison with utility providers and can be expensive and only achievable as part of a wider uplift in development density.

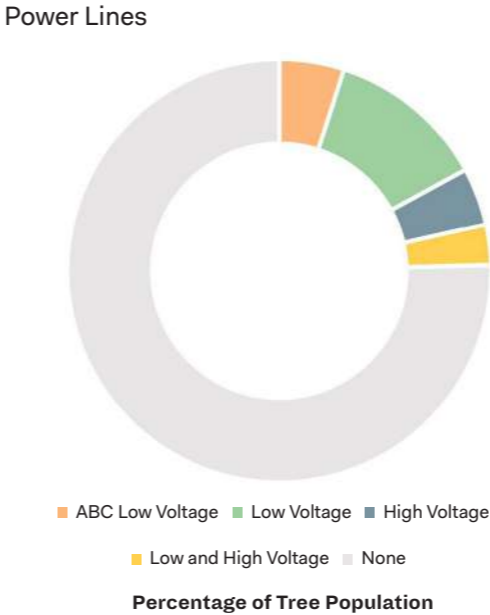
Underground utilities also constrain urban tree canopy. The upgrading of existing underground services or installation of new ones often causes damage to existing trees. Service allocations in terms of spatial requirements within road reserves and the requirements from utility companies to protect their assets from tree roots etc impose significant constraints on new street tree planting. Council's priority should be to underground services below the road or footpath or excavating to a depth in which they will not be impacted by tree roots in order to implement and achieve urban forest in both centres.

In addition, awnings within commercial centres can often preclude street trees or limit their size. Above ground utility infrastructure and street lighting, and visibility requirements for traffic lights and sight lines for vehicular movement across intersections can also limit the number and size of street trees.

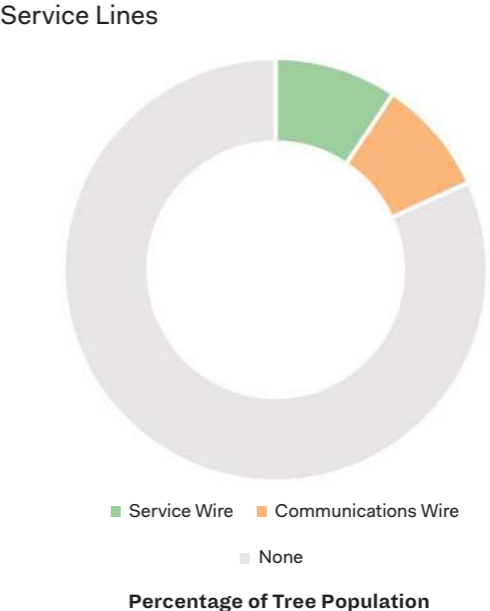
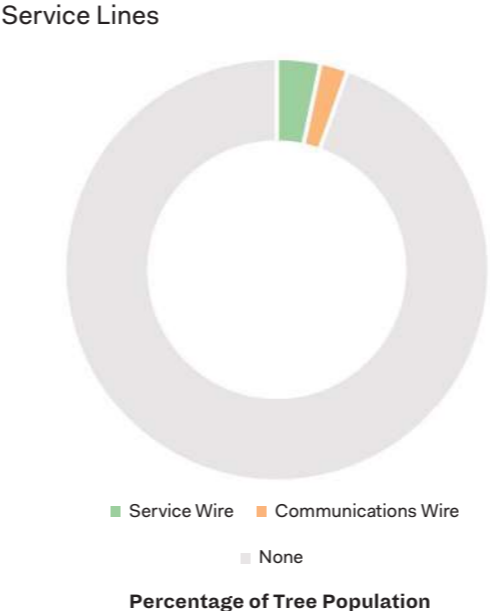
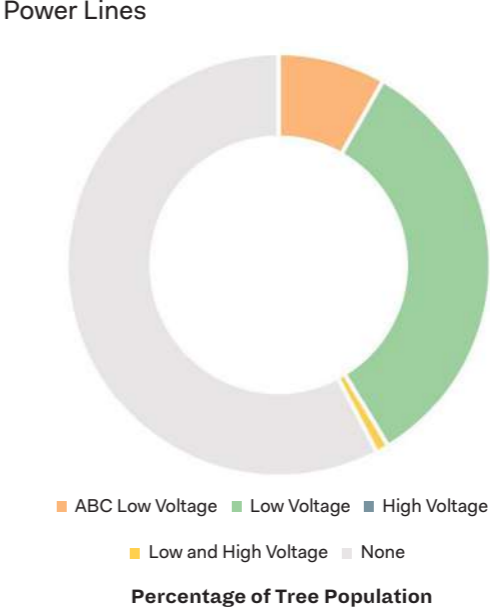


Streetscape of existing tree canopy on Clissold Parade, Campsie

Surveyed trees impacted by power and service lines - Bankstown:

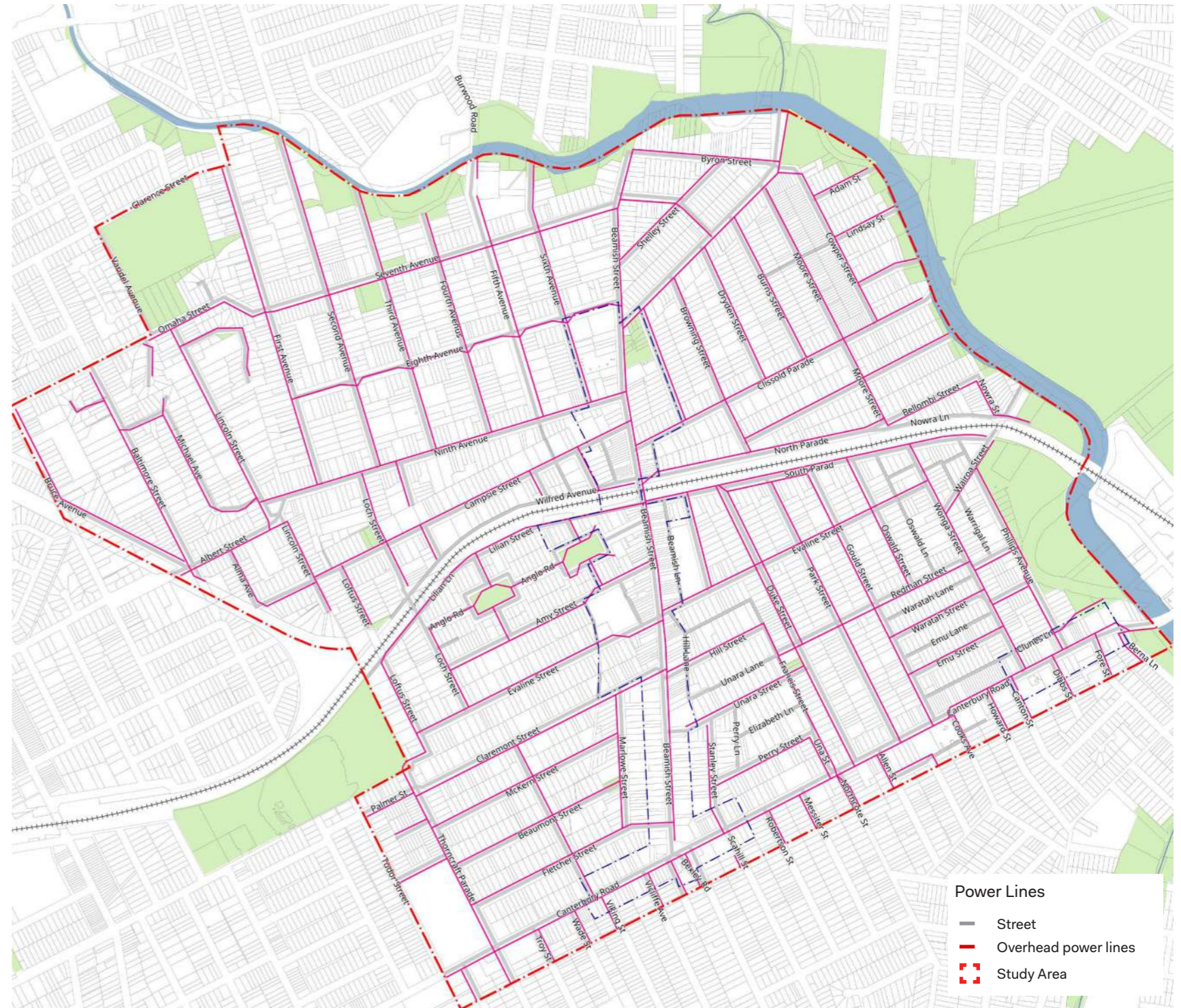


Surveyed trees impacted by power and service lines - Campsie:





Bankstown Overhead Power Lines



Campsie Overhead Power Lines

## Planning and Design

Urban intensification creates significant challenges to increasing tree canopy cover. Increased development densities often result in greater site coverage by buildings and pavements, resulting in:

- + Reductions in the extent of vegetation on private land, especially large canopy trees.
- + Reduction of permeable ground surfaces that allow for the infiltration of rainwater into the soil.
- + Increased shading of streets by buildings, potentially to the extent that tree growth suffers due to a lack of sunlight.
- + Increased pressures on public space to accommodate more uses – whether for recreation in parks or for traffic and parking in streets. This can result in direct competition with plantings for space as well as making more demanding growth conditions due to more extensive hard or compacted surfaces.



Increased site coverage across higher density areas limits surrounding tree canopies

## Risk Management

The urban tree canopy must be maintained in a safe, healthy and aesthetically appealing condition to maximise its many benefits. Adhering to best practice in tree management and maintenance will maximise the health and longevity of individual trees and minimise Council's and the community's exposure to risk.

Trees are living, dynamic organisms that pose some risk of harm to people and property. Management of unreasonable risk is an appropriate response; however, the elimination of all risk from trees in our community is not practical nor environmentally sound, as this would require the removal of many urban trees. This is not desirable as the very small risk that the population of trees represent is outweighed by the benefits that the trees provide.

A tree risk assessment is undertaken to identify trees that pose a risk of harm to people or property that is greater than the risk threshold that is acceptable, based on normal community standards of risk and any specific factors for the particular tree or location. There are a number of approaches to urban tree risk assessment. A standardised and systematic process for assessing tree risk is the International Society of Arboriculture's Tree Risk Assessment Qualification.

Such processes ensure the results of a tree risk assessment provide the community and Council with sufficient information to make informed decisions to enhance tree benefits, health, and longevity. Mitigation measures are recommended for trees that have been identified as an unacceptable risk in order to reduce the risk to an acceptable level.

However, undertaking a risk assessment for every Council owned tree across all streets and parks is not viable. What is more important is the preparation of a set of protocols which outline the frequency of inspections depending on the land use, how inspections are done and by whom, and timeframes for action. An individual tree risk assessment would only be undertaken in situations where a hazard cannot be resolved through routine maintenance (i.e. pruning).

## Community Expectations

Community perceptions regarding trees vary. The benefits of trees such as aesthetics and shade are widely acknowledged, however many residents and business owners have concerns with trees, especially within or adjacent to their property in terms of perceived safety risk from falling limbs or leaves, damage to property or infrastructure, overshadowing and maintenance.

The urban tree canopy affects everyone in the community. Engaging the wider community involves not only informing them about the importance and benefits of green infrastructure, but also highlighting the role it plays in ensuring the liveability, sustainability and identity of our cities and neighbourhoods.

The success of a tree canopy master plan relies on the commitment of citizens and local businesses to support and enhance work done in the public realm, and to translate the benefits of increased urban tree canopy into action in the private realm.

Council ultimately manages street and park trees for and on behalf of the community, and seeks to protect trees on private property in order for all the community to receive their benefits. It is important that Council assists the community to understand how and why it makes its decisions on the management of urban trees. It is also important for Council to value the community's opinion and undertake meaningful two way consultation and communication in relation to tree removal, renewal and management.

It is also important that people recognise and are informed about the need for change. Trees are living organisms and as such will grow, mature and eventually die. As trees age they will require maintenance and then eventually require removal and replacement. In an urban environment an aging or hazardous tree cannot usually be left until it completely falls apart. Some parts of the community often have expectations of trees being retained for very long periods or indefinitely. There will come a time, however, when the benefit of keeping an individual tree is far outweighed by the hazard to life or property and the monetary cost of maintaining it.

## Tree Vandalism

Tree vandalism can occur in a variety of forms, including poisoning, pruning, damage and removal. This kind of vandalism has a significant and cumulative impact on the urban tree population, canopy cover and the environment.

Reducing tree vandalism can be challenging but strategies can include:

- + developing a community information strategy to communicate the numerous environmental, social and economic benefits that trees provide;
- + engaging with the community regarding projects impacting on trees such as streetscape planning, tree removal and tree planting;
- + providing accurate and regularly updated information on tree management;
- + encouraging community stewardship of the urban tree population for example through promoting involvement in community planting days or programs such as the Blacktown Cool Streets program;
- + responding appropriately when tree vandalism has occurred (refer to Council's Street Tree Management Policy); and
- + developing appropriate planting techniques and specifications, including careful consideration of tree stock size and protection measures.



## Water and Soil Moisture

As water is the primary element needed for vegetation growth, extended periods of drought and water restrictions damage the health of the urban tree population and increase tree mortality. The long term effect of low water availability causes drought related stress and reduces useful life expectancy of trees.

Access to adequate soil moisture enables trees to actively transpire and assist with atmospheric cooling. Low soil moisture can reduce evapotranspiration and limit the potential for trees to reduce urban heat.

Urban areas have fundamentally low levels of water permeability. The existing soil and substrate acts as a huge reservoir that can provide water for a healthy tree population. Ground surfaces need to allow rainfall and run-off to enter the soil. This natural reservoir has wider benefits in addition to vegetation health, including improved water quality, decreased flooding risk and reduced damage to infrastructure due to soil movement.

Permeation of water through the entire soil profile is also critical. Surface irrigation reduces trees' resilience by encouraging shallow root systems. Deep watering encourages deep root growth which allows trees to be better able to access soil moisture during low rainfall periods.

With expected long-term low water futures and a desired move away from reliance on costly potable water, alternative water sources are needed to ensure healthy vegetation growth. The use of Water Sensitive Urban Design (WSUD) and passive irrigation techniques can achieve a variety of sustainable urban stormwater management objectives as well as promoting adequate soil moisture and the ongoing health of the urban tree population.

## Problematic Trees and Weeds

While trees provide a range of benefits to the environment and community, there are some tree species that are more problematic than others in certain environments. This may be because they are classified as weed species, are short-lived, are more susceptible to pests and disease, are not suitable for urban conditions, are more prone to damage infrastructure, or are considered high risk in terms of public safety.

A number of tree species are listed as exempt from protection under Council's Tree Management Order.

The Urban Tree Canopy Master Plan should provide guidelines on suitable tree types for streets and open spaces within Bankstown City Centre and Campsie Town Centre, along with recommended species lists for each type. Council should also provide guidance on appropriate tree species for different locations and conditions on private land.

## Pests and Disease

Widespread infestations of harmful pests and diseases can have devastating impacts on urban tree populations. The impact of pests and disease on urban trees is only likely to increase due to increased temperatures, lower rainfall and soil moisture, and increased risk of importation of pests from overseas. Some pests and diseases are impossible to eradicate and treatment can be expensive, difficult or limited in its efficacy.

A trees ability to withstand pests and diseases depends in part on its health and growing conditions. With urban trees having to cope with compacted soils, shade, wind, pollution, limited water, restricted root systems and regular pruning, their resilience can be affected.

The challenge is to improve biodiversity and reduce the risk of canopy cover loss from pests and disease, whilst still ensuring that urban tree species are able to thrive and provide the desired canopy cover.

Family, genus and species diversity in the urban tree population is the best tool to limit the impact of pest and

## Future Climate

Climate change is the change in the average pattern of weather over a long period of time. There is clear evidence that our climate is changing, due largely to human activities.

The Australian Government's most recent report on climate change, *Critical Decade 2017: Accelerating Climate Action*, states unequivocally that it is 'beyond doubt' that climate change is occurring. The primary cause of the observed warming and associated changes since the mid-20th century – human emissions of greenhouse gases – is also known with a high level of confidence.

The most widely used indicator of climate change is the global mean, annual average, near-surface air temperature – commonly referred to as the global average temperature. This has risen by about 0.17°C over the last three decades. More notably, the global average temperature from 2001-2010 was 0.46°C above the 1961–1990 average, making it the warmest decade on record.

Whilst the effects of climate change are just becoming discernible, they will become increasingly prominent. The effects over coming decades will include warmer average temperatures, heat waves, more extreme storm events and lower average annual rainfall. We have already observed the damage caused by extreme heat and floods in Australia in recent years, and it is likely that these events will become more prevalent.

The risks to cities of more severe weather conditions will increase, bringing with them high economic, social and environmental costs. For the urban tree population, the impacts of climate change will include:

Higher average temperatures:

- + Decline in health for the existing trees species suited to Sydney's current (cooler) climate.
- + Increased impact from pests, as their life cycle and reproduction rates increase, coupled with improved ability to survive over-winter, will increase the detrimental impact on tree health.

- + Increase in the range of pests or other pathogens that can extend their geographical range to include Sydney, effectively increasing urban tree population's vulnerability.
- + Increase in the range of tree species from northern NSW, QLD that may now be more suitable for planting in the future warmer climate.

Extreme Heat Events:

- + Premature death of some trees / species, not tolerant to heat or associated water stress. This will be particularly evident in young trees, that have not built up the stored energy or resources required to survive such events.
- + Trees' leaves are scorched, leading to decline in tree health.

Long-term drought and decreased rainfall:

- + Increase premature tree deaths, and detrimental impacts to tree health.
- + Impact on the number of new trees that may be planted in the event of water restrictions.

Flooding and increased rainfall intensity:

- + Heavy rains can lead to tree stability issues, and health impacts where inundation occurs over longer periods.
- + Disease impacts may also worsen, with inundation improving the environment for pathogens that cause root rot or decay in trees.

Extreme weather events:

- + High winds and heavy rains can lead to increased branch and whole tree failures. Importantly, this can impact trees that are in otherwise perfect health and condition.
- + Increased risk, claims and litigation, from any damage caused by tree failure.
- + Increased community concern about large canopy trees, due to perceived risk impacts. Desire by many to remove trees, which only worsens urban heat island and climate change impacts.

**3.0**

Tree Canopy Master Plan

## 3.1 Principles

The following principles have been developed to guide the Urban Tree Canopy Master Plan:

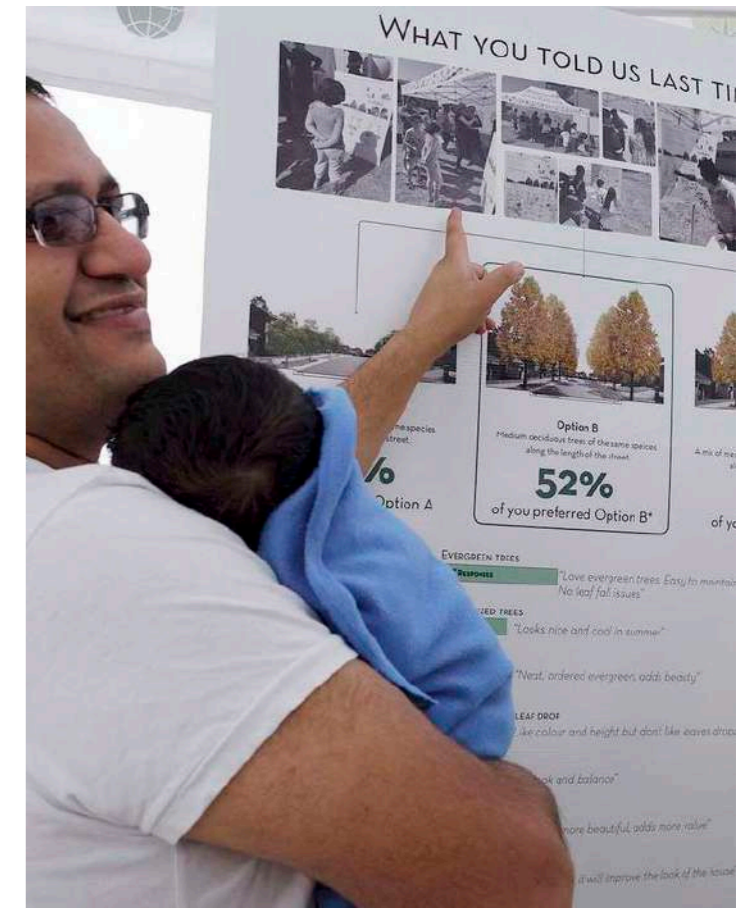
1. Maintain and protect the existing urban tree canopy
2. Increase urban tree canopy on public land by new plantings in public open space and streets
3. Increase urban tree canopy on private land through appropriate planning controls linked to canopy cover targets
4. Improve tree health and species/age diversity
5. Replace aging, diseased or inappropriate species of trees
6. Achieve appropriate urban tree canopy cover targets
7. Improve urban ecology
8. Use tree planting to enhance and reinforce a sense of place
9. Promote sustainable water management and improve soil moisture
10. Engage with the community to obtain their support to protect and enhance the urban tree canopy
11. Adopt appropriate monitoring and review mechanisms
12. Prioritise larger trees within the urban environment



Bankstown Complete Streets design for Appian Way



Tree planting on private land. Source: The Village Balgowlah, OCULUS/AJ+C



Engaging with Community. Source: Blacktown Cool Streets Pilot Program, Gallagher Studios

# 3.2 Targets

## Tree canopy cover targets

The *Connective City 2036* and *Greener Places* policies set clear targets for canopy cover in urban areas, including: 25% target for Medium - High Density areas; and 15% target for Commercial Centres.

In considering the land uses within these more generalised zones, the Tree Canopy Master Plan breaks these targets down into the adjacent targets for open space, streets and private land.

These targets are based on several considerations, including:

- + Setting high targets for open space and streets, which generally have the greatest potential for canopy cover as well as being more easily controlled given their public ownership; and
- + Setting achievable targets for private land that will promote significant new tree planting and ensure that the overall canopy cover targets are achieved while avoiding excessive constraints on new development.

Refer to *Section 4.0 Implementation* for methods of achieving these targets.

### Overall Canopy Cover Targets

- 15% Target for Commercial Centre
- 25% Target for outside of Commercial Centre



Bankstown



Campsie

### Targets by Land Use

- 40% target for open space
- 40% target for streets
- 20% target for private land outside of commercial centres
- 5% target for private land within commercial centres

## Understanding the targets

The adjacent tables compares the 2016 canopy cover<sup>1</sup> across Bankstown City Centre and Campsie Town Centre with the new canopy cover targets.

The tables provide an indicative number of new trees that will need to be planted to achieve the targets, based on the shortfalls in canopy cover and an average tree canopy diameter of 8m (50m<sup>2</sup> cover per tree) for new trees in streets and on private land, and 10m (80m<sup>2</sup>) for trees in open space. Note these numbers do not take into account trees being removed or the growth of existing trees, and therefore can only be taken to be a rough approximation of tree numbers.

These tables illustrate the need for a significant number of new trees, including a high proportion of new trees to be planted on public land across streets and open spaces. Achieving these targets will be challenging and require carefully considered public domain design and funding for the provision, planting and maintenance of new trees.

Regarding the lack of new trees noted for private land within commercial centres, this will still require no net loss of tree canopy cover across these areas. Setting a 5% minimum for individual development sites will also push up the overall percentage for this land use above 5% when considering that a large percentage of these sites do not currently meet this minimum.

<sup>1</sup>The NSW Urban Vegetation Cover to Modified Mesh Block 2016, DPIE

### Bankstown

**Commercial Center**  
% of land use  
Canopy Cover  
**Outside Commercial Centre**  
% of land use  
Canopy Cover

Total Canopy Cover		Open Space			Streets			Private		
Existing	Target	Existing	Target	New Trees	Existing	Target	New Trees	Existing	Target	New Trees
		2%	2%		27%	27%		71%	71%	
8%	15%	36%	40%	9	11%	40%	1151	5%	5%	0
		9%	9%		22%	22%		69%	69%	
16%	25%	27%	40%	216	16%	40%	1563	11%	20%	915

### Campsie

**Commercial Center**  
% of land use  
Canopy Cover  
**Outside Commercial Centre**  
% of land use  
Canopy Cover

Total Canopy Cover		Open Space			Streets			Private		
Existing	Target	Existing	Target	New Trees	Existing	Target	New Trees	Existing	Target	New Trees
		0%	0%		30%	30%		70%	70%	
6%	15%	0%	0%	NA	8%	40%	654	5%	5%	0
		7%	7%		23%	23%		70%	70%	
13%	25%	18%	40%	632	18%	40%	3358	11%	20%	4063

# 3.3 Tree Type Plans

These plans indicate the preferred dominant tree type for any road or open space, based on species origin (native or exotic) and if they are deciduous or evergreen. The plans are intended to guide future new and replacement tree types and do not suggest that healthy existing trees that don't adhere to the indicated tree type be removed.

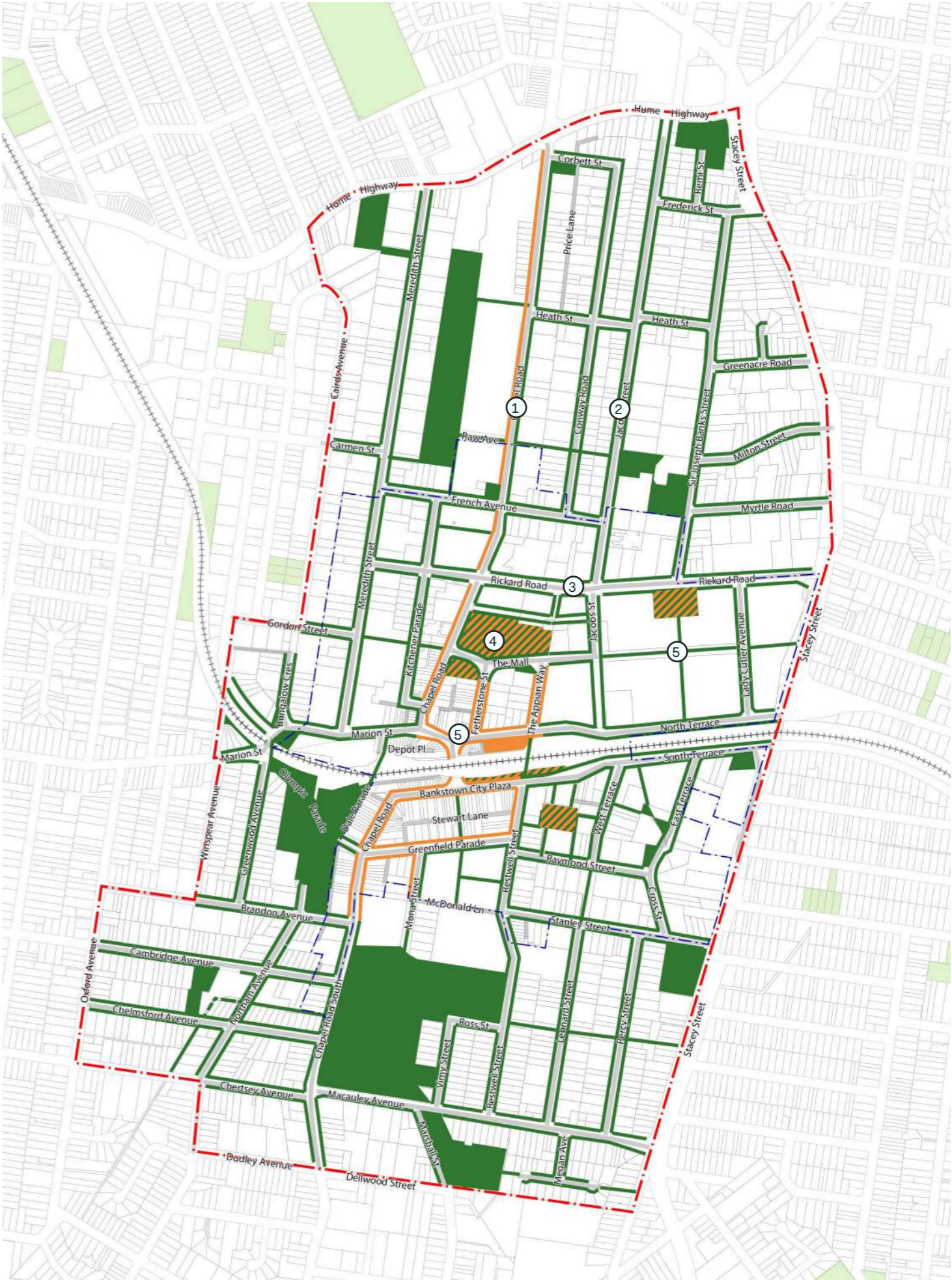
The following factors have been taken into account when nominating the species type:

- + Existing tree types;
- + Local character;
- + Microclimate, including street orientation; and
- + Street prominence/ hierarchy.

It is suggested that these plans, combined with the tree survey data, the street typologies (Section 3.5) and open space studies (Section 3.6), and the species selection guidance (Section 4.2) inform detailed design and species selection the street across Bankstown City Centre and Campsie Town Centre.

## Bankstown

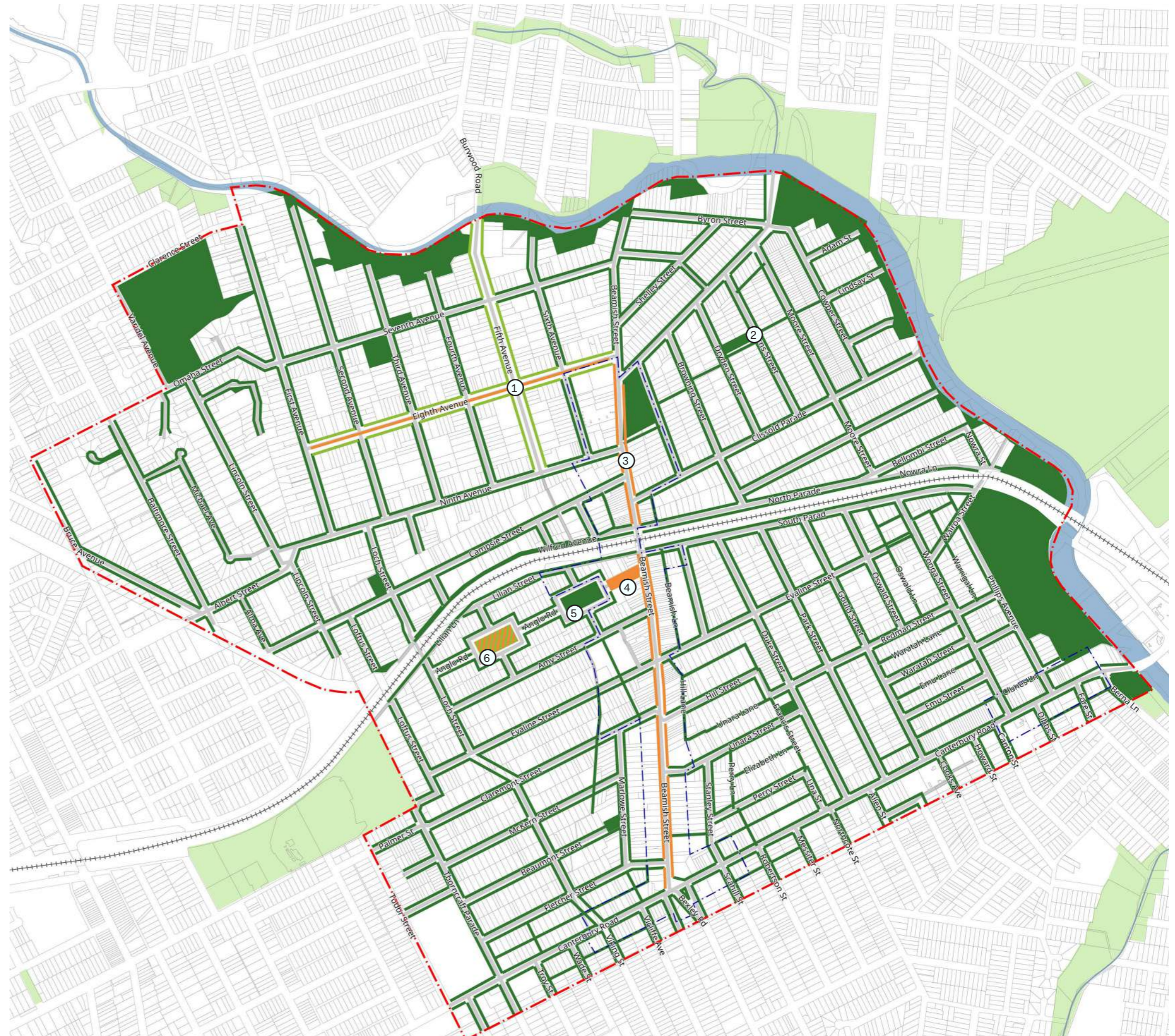
- Native evergreen trees
  - Exotic evergreen trees
  - Exotic deciduous trees
- ① East side of Chapel Road, currently planted with English Elm and Plane Trees, to remain predominantly large deciduous trees to emphasise this key entry road into the town centre. Undergrounding the power lines on this side of the road would greatly benefit the character of this street and allow for the existing and future trees to reach their mature sizes.
  - ② Majority of Bankstown to have predominantly native evergreen trees.
  - ③ Rickard Road to be planted with larger native trees to provide scale and shade to the wide road reserve.
  - ④ Paul Keating Park to retain a mix of native and deciduous trees complimentary to its role as a civic space within the town centre.
  - ⑤ Existing deciduous tree plantings to be expanded on within the town centre to create a vibrant seasonal contrast in the commercial core as well as shade in summer.
  - ⑥ Proposed street connections and open space location at Bankstown Central subject to future planning proposal.



## Campsie

- Native evergreen trees
- Exotic evergreen trees
- Exotic deciduous trees

- ① Eighth Avenue to retain Jacaranda median planting and Fifth and Eighth Avenues to retain iconic palm tree planting. Investigate opportunities to plant additional large canopy trees between palms to achieve greater canopy cover.
- ② Majority of Campsie to have predominantly native evergreen trees.
- ③ Beamish Street to be planted with larger deciduous trees to highlight the street as the primary commercial address through the town centre.
- ④ Anzac Mall tree planting to build on existing deciduous character suited to an urban plaza.
- ⑤ Anzac Park to have predominantly native trees as per the existing condition.
- ⑥ Carrington Square to retain a mix of exotic trees as per the existing condition.



# 3.4 Street Typology Plans

The following typology plans break down the streets and open spaces into typologies that can be used as a basis for achieving the future urban tree canopy across Bankstown City Centre and Campsie Town Centre.

These typologies aren't intended to provide guidance on all elements within streets and open spaces, but rather cover the range of different conditions that impact on the location, size, and provision of trees in the public domain.

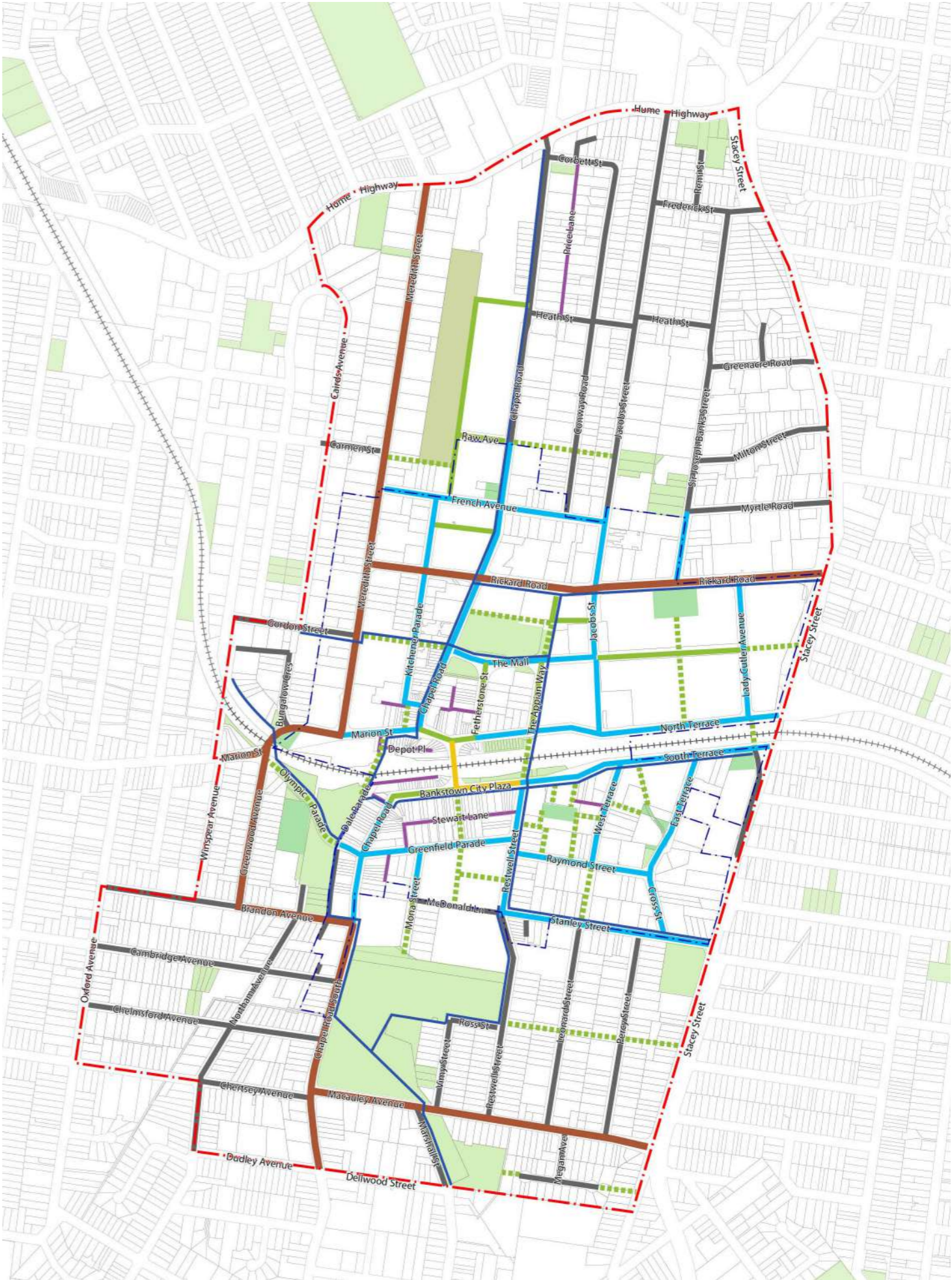
Typologies are based on the existing and proposed information available and subject to change as the wider Master Plans for the precincts are progressed.

For Bankstown, street typologies are consistent with the typologies on *Bankstown Complete Streets Transport and Place Plan* adopted by Canterbury Bankstown Council in 2019. For Campsie, the street typologies will be revised and refined as part of *Campsie Complete Streets Place Plan*, which is currently underway.

## Bankstown

- Ring Road
- Neighbourhood Street
- Neighbourhood Street - Commercial Centre
- Shared Zone
- Pedestrian Only
- Transit Street (Bus Only)
- - Separated Bike Path
- Laneway
- Existing Open Space
- Proposed Open Space
- Proposed Open Space - privately owned, publicly accessible

Note: Naming conventions for Bankstown are based on *Bankstown Complete Streets 2019*

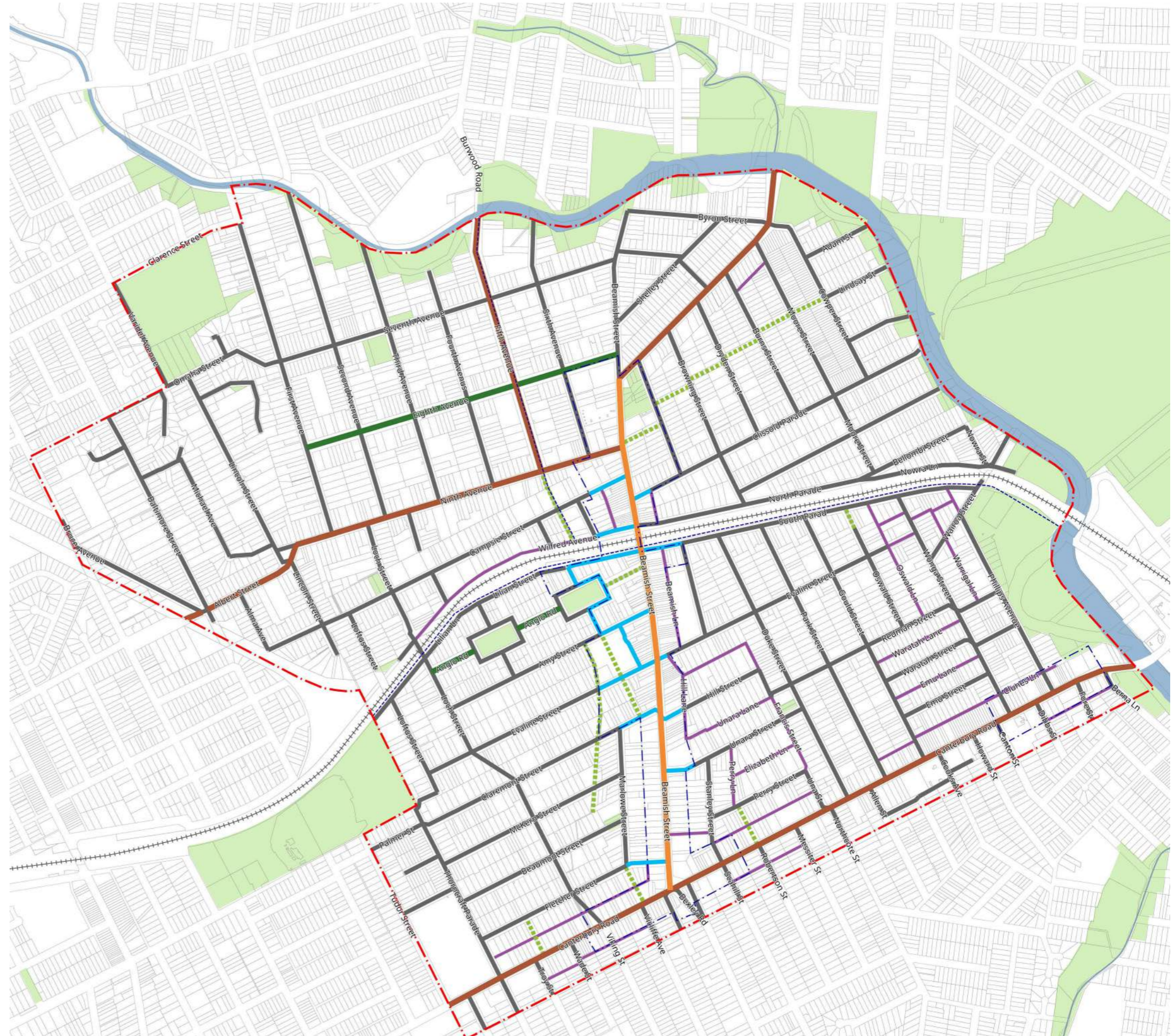




## Campsie

- Regional Road / TfNSW Classified Road
- Regional Road - Commercial Centre
- Local Street
- Local Street - Commercial Centre
- Green Street
- - - Pedestrian Only
- - - Separated Bike Path
- Laneway
- Existing Open Space
- Proposed Open Space

Note: Naming conventions for Campsie are based on *Campsie Town Centre Master Plan (DRAFT)* and is subject to review by *Campsie Complete Streets : Transport and Place Study*



## 3.5 Street Typologies

### Street Typologies

The following studies provide design guidance on how streets across Bankstown City Centre and Campsie Town Centre may achieve the 40% canopy cover target.

These plans and sections are indicative only and serve to demonstrate what a 40% cover could look like. More detailed design is required to determine the best layout for trees within road reserves, taking into consideration:

- + the functionality and layout of the street;
- + the desired character of the street; and
- + utilities and maintenance requirements, noting that undergrounding of powerlines should be a priority to allow for significant tree canopy cover.

Note these streets will be investigated further by *Campsie Complete Streets* which will be completed during 2021.

Section 4.5 provides additional considerations for street trees.

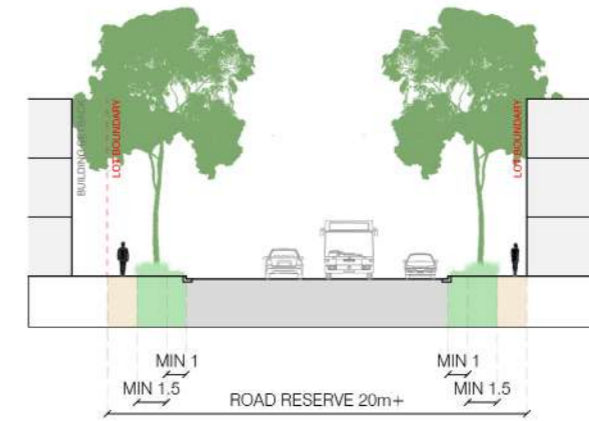
### Regional Road / TfNSW Classified Road / Ring Road

These roads have typically high traffic volumes with wide road reserves and multiple vehicle lanes. The large carriageways and clearance requirements make achieving substantial canopy cover challenging. Maintenance along these roads is also very challenging and can be a costly exercise when traffic management is required.

This typology includes Rickard Road and Meredith Street in Bankstown, and Ninth Avenue and Canterbury Road in Campsie.

#### Design Guidance:

- + Underground overhead power lines where possible
- + Select large tree species to bridge the wide carriageways and provide scale to the road reserve
- + Select appropriate species that have a high canopy to ensure clearances to traffic lanes
- + Plant trees back from the kerb (minimum 1.2m) to enable easy and safe maintenance. Investigate widening road reserves to accommodate this
- + Plant trees at spacings that will result in touching or slightly overlapping canopies at maturity
- + Consider planting verges to provide a soft edge and barrier between pedestrians and traffic lanes. Provide turf or low maintenance planting directly adjacent the kerb to enable easy and safe maintenance
- + Provide passive irrigation to trees
- + Refer to *Beyond the Pavement 2020*, TfNSW for guidelines around Classified Roads
- + Consider central median tree plantings where appropriate



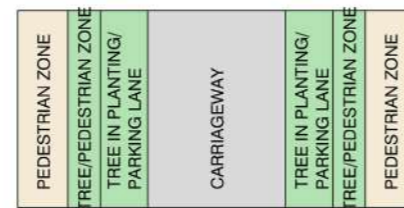
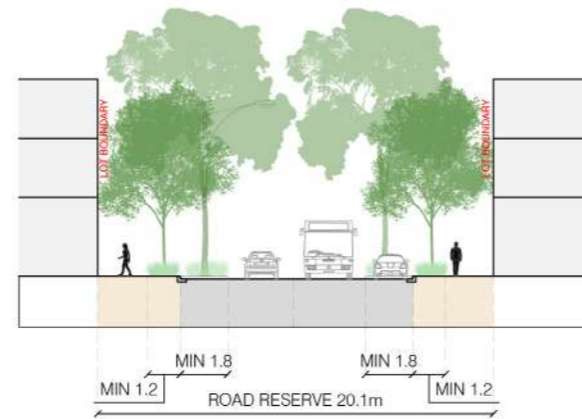
Regional Road / RMS Road / Ring Road

## Regional Road - Commercial Centre

This typology is specific to Beamish Street in Campsie, which serves as the primary commercial main street.

### Design Guidance:

- + Underground overhead power lines where possible
- + Plant large trees within the parking lanes. Note this is already occurring in sections along Beamish Street
- + Plant medium trees in narrow tree pits within the pedestrian zone adjacent parking. Consider access to cars / doors opening in the placement of trees
- + Provide continuous structural soil systems under paving within the pedestrian zone to provide adequate soil volumes to trees
- + Consider awnings in the placement of trees and select species that will clear awnings or can be pruned to avoid them. Alternatively remove or provide gaps in awnings to accommodate street trees
- + Provide passive irrigation to trees
- + Consider central median tree plantings where appropriate. Note this is already occurring in sections along Beamish Street



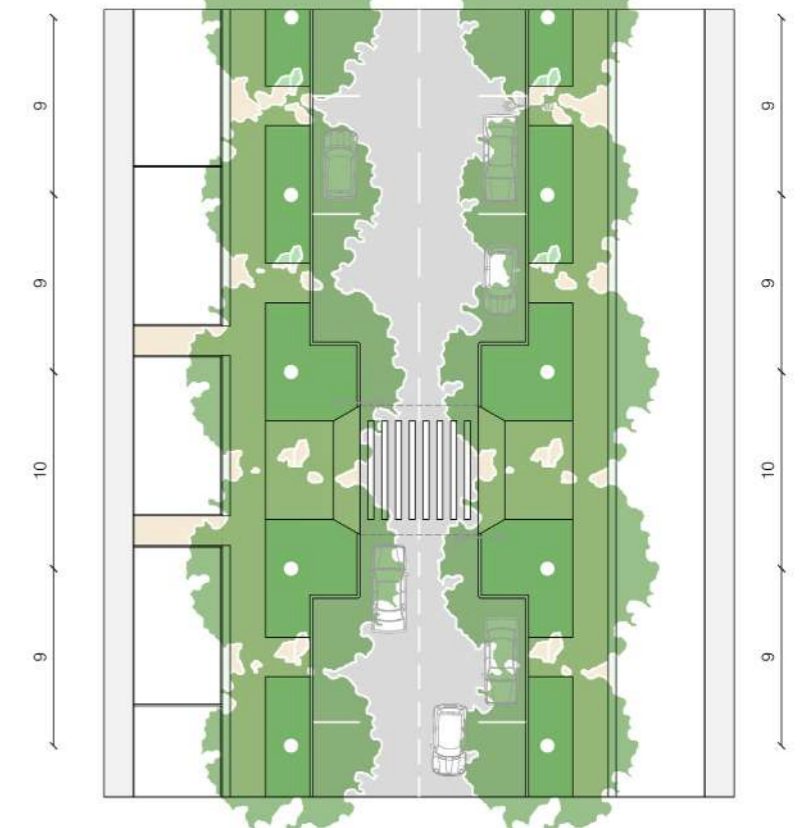
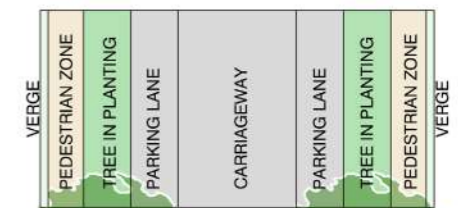
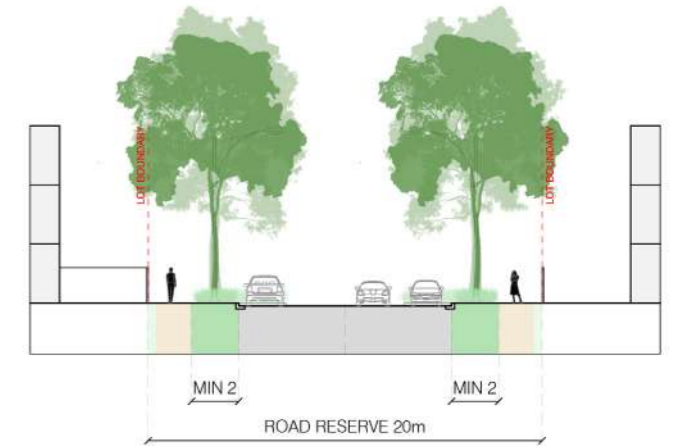
Regional Road - Commercial Centre

## Neighbourhood Street / Local Street

These streets will sit within future medium to high density housing areas and make up the majority of streets in the precincts.

### Design Guidance:

- + Underground overhead power lines where possible
- + Maximise planting and tree pit zones
- + Plant large feature trees at crossings and intersections
- + Reduce carriageway widths where possible and design for indented parking rather than wide carriageways
- + Provide passive irrigation to trees



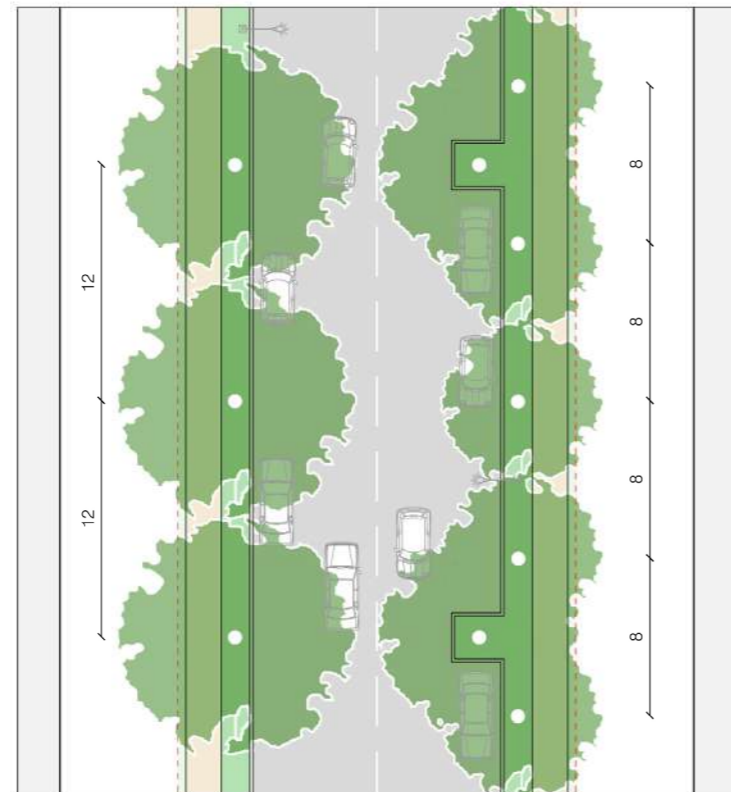
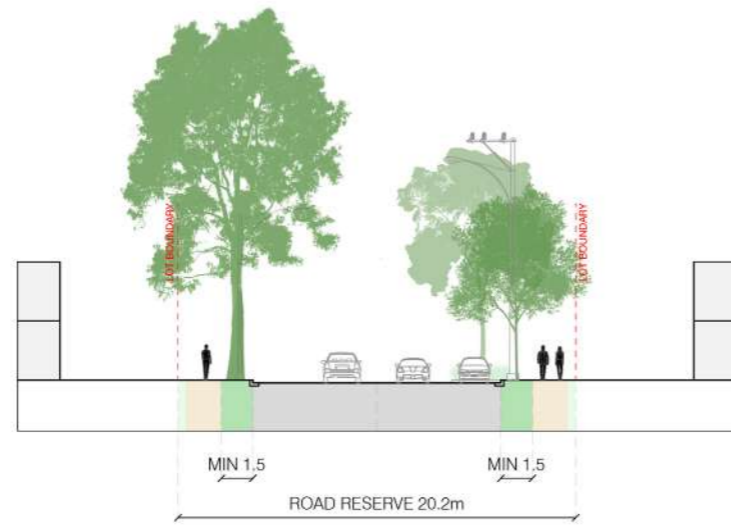
Neighbourhood Street / Local Street

## Neighbourhood Street / Local Street with overhead power lines

Most of the existing neighbourhood and local streets in Campsie and Bankstown have overhead power lines on one side. As these areas are developed into higher density neighbourhoods it is recommended that power is undergrounded to enable greater canopy cover. That said, there will be instances where streets may be upgraded with additional trees before powerline undergrounding is possible, whereby this typology will apply.

### Design Guidance:

- + Underground overhead powerlines wherever possible. Utilise bundled aerial cables as a secondary option
- + Where undergrounding is not possible, plant small-medium trees in verges underneath overhead powerlines and prune to retain required clearances to power lines
- + Implement tree pits in parking lanes to enable greater distance between trees and power lines, allowing for larger trees and less pruning
- + Plant large trees in verges located opposite overhead powerlines
- + Provide passive irrigation to trees



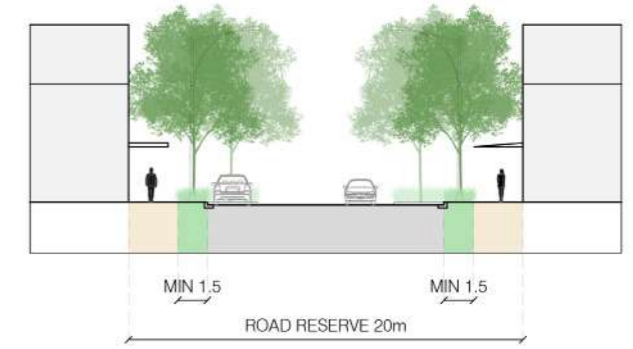
Neighbourhood Street / Local Street with overhead power lines

## Neighbourhood Street / Local Street - Commercial Centre

Within Commercial Centres there is a higher level of pedestrian movement and activity that needs to be balanced with the provision of street trees within the road reserve.

### Design Guidance:

- + Underground overhead power lines where possible
- + Plant trees within the parking lanes
- + Plant medium trees in narrow tree pits within the pedestrian zone adjacent parking. Consider access to cars / doors opening in the placement of trees
- + Provide continuous structural soil systems under paving within the pedestrian zone to provide adequate soil volumes to trees
- + Consider awnings in the placement of trees and select species that will clear awnings or can be pruned to avoid them. Alternatively remove or provide gaps in awnings to accommodate street trees
- + Reduce carriageway widths where possible
- + Provide passive irrigation to trees



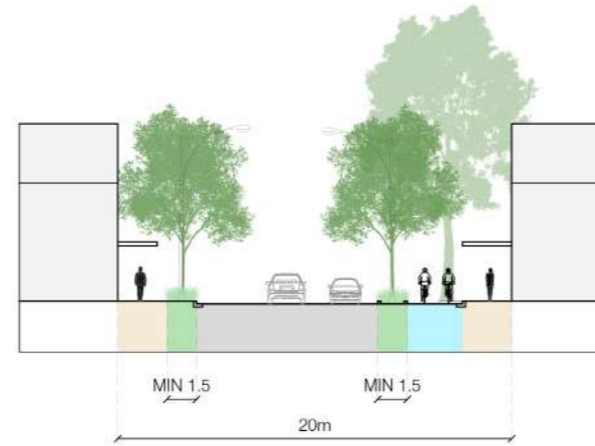
Commercial Centre Street

## Streets with separated cycle paths

This typology provides considerations for combining cycle paths with new and existing trees that will provide shade and amenity for both cyclists and pedestrians.

### Design Guidance:

- + Plan new cycle paths to allow the retention of existing trees. This may be done by taking out parking instead of trees, having localised changes in path alignment to avoid existing trees, or considering alternative cycle path arrangements
- + Consider locating trees in between the carriageway and bicycle lane, or between the bicycle lane and pedestrian zone depending on the specific conditions of the street
- + Provide structural soil systems underneath bicycle lanes if required to provide adequate soil volumes for trees. This will also assist in reducing pavement lift within the bicycle lane
- + Provide passive irrigation to trees



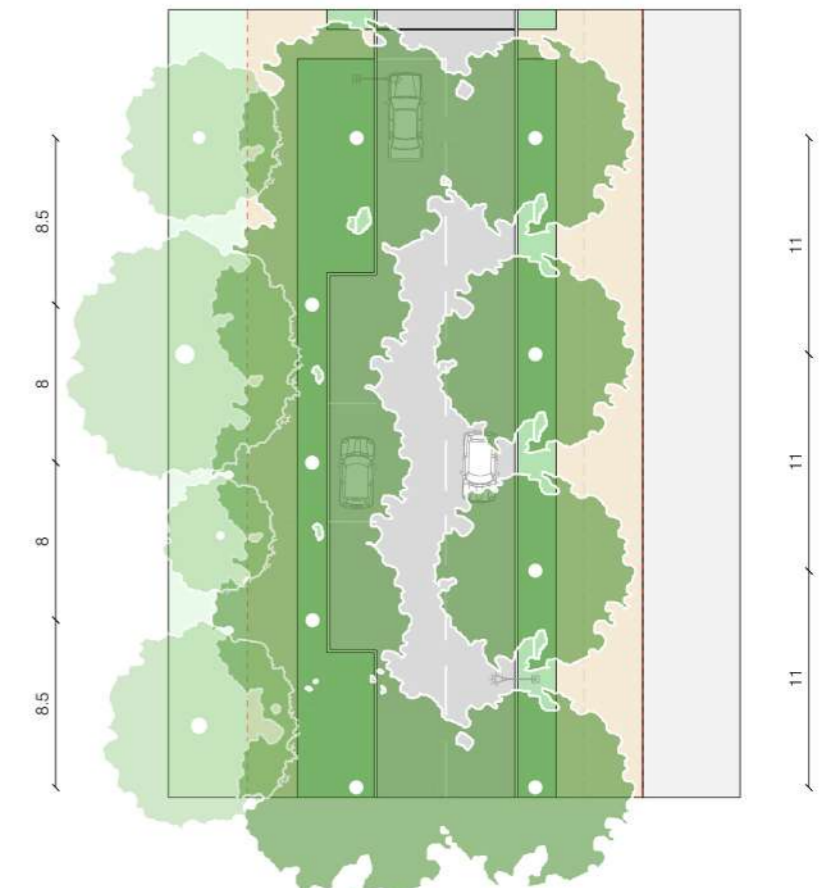
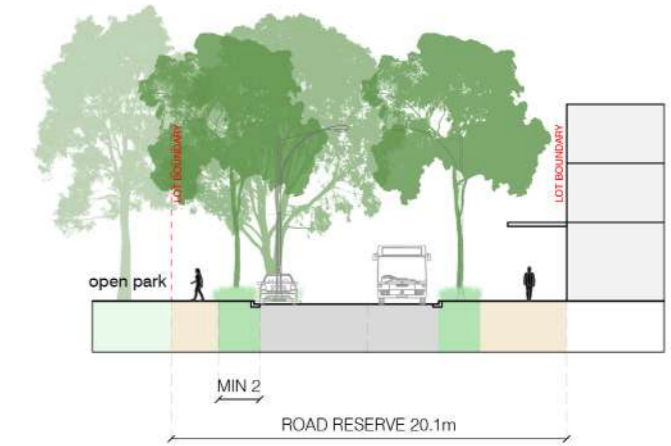
Neighbourhood Street / Local Street + separated bike path

## Streets with park edges

This typology covers the interface between streets and adjacent open spaces.

### Design Guidance:

- + Plant larger trees that utilise the additional space available and compliment the park character
- + Plant trees within the park that will provide shade to the road reserve
- + Consider locating, or partially locating pathways within the park to provide additional room for trees within the road reserve
- + If native vegetation communities currently exist in the park, only plant species that naturally occur in the native vegetation community present



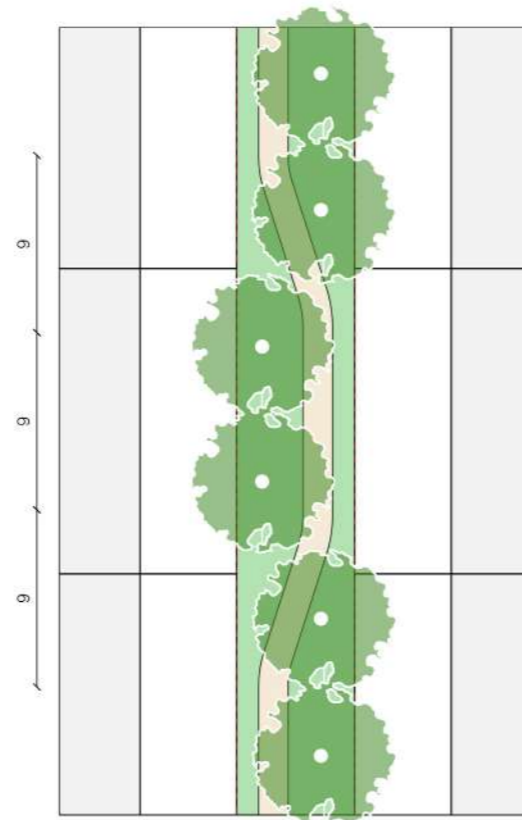
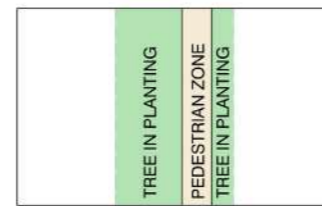
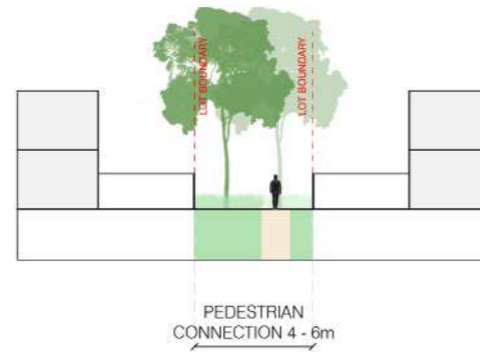
Streets with Park Edges

## Pedestrian Only connection

There are several existing and proposed pedestrian only connections throughout the residential areas. These connections are to be safe and comfortable while providing opportunities for public tree planting.

### Design Guidance:

- + Meander pathways or locate to one side to enable substantial tree planting zones in narrower connections
- + Consider the impacts of mature canopies on existing buildings and adjacent properties
- + Plant small to large trees depending on the available growing space



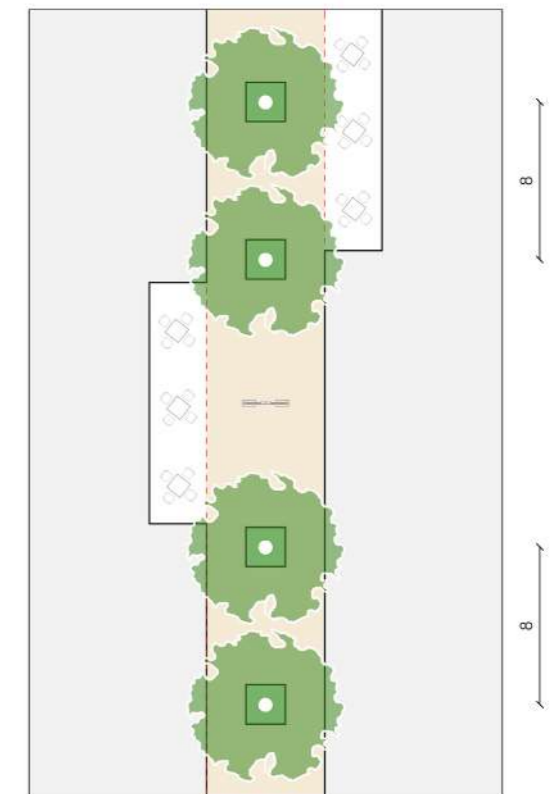
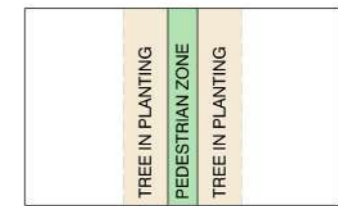
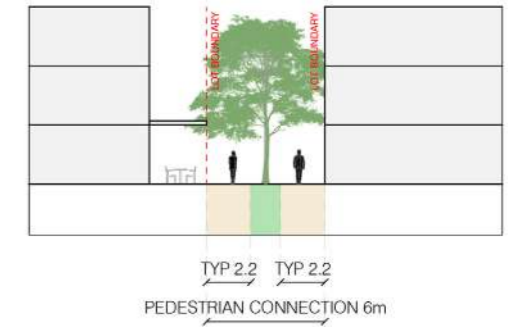
*Pedestrian Link - Local Street*

## Pedestrian Only connection - Commercial Centre

Planting trees in urban pedestrian connection provides both shade and amenity to these spaces. There are several proposed connections throughout the centres that will need to be designed with trees in mind.

### Design Guidance:

- + Consider a central row of trees in tighter connections that allows for larger trees without impacting on adjacent buildings
- + Plant small to large trees depending on the available growing space.
- + Provide continuous structural soil systems under paving within the pedestrian zone to provide sufficient soil volumes
- + Use permeable paving to maximise water infiltration and passive irrigation in the urban environment



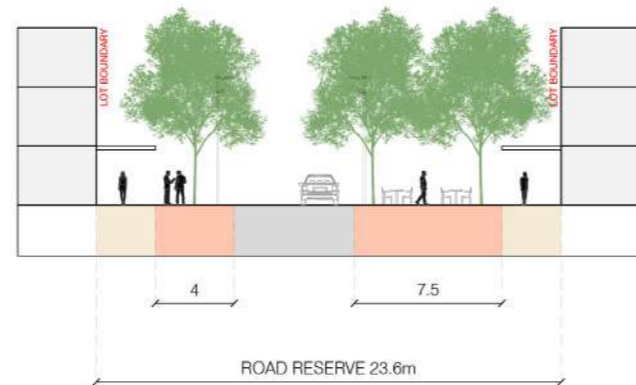
*Pedestrian Link - Commercial Centre*

## Shared Zone

There are several shared zones within Bankstown proposed as part of Bankstown Complete Streets that will increase the pedestrian accessibility and primacy within the town centre.

### Design Guidance:

- + Provide continuous structural soil systems under paving within furniture zone to connect tree planting pockets and ensure healthy/strong root growth
- + Use permeable paving to maximise water infiltration and passive irrigation in the urban environment
- + Consider deciduous tree planting to provide seasonal change and maximise solar access during winter
- + Consider a variety of tree sizes depending on the layout the space and desired character



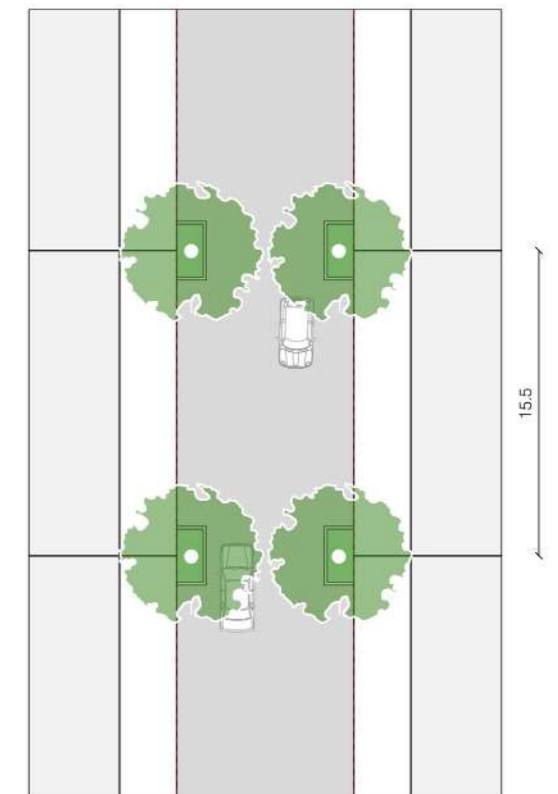
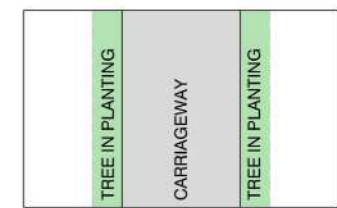
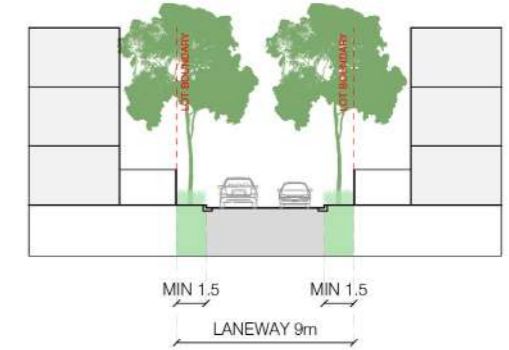
Shared Zone

## Laneway

Rear laneways are often devoid of trees given their constrained widths. With a bit of planning, it is possible to provide trees within these spaces to increase the canopy cover, especially across the numerous new laneways proposed for Bankstown City Centre and Campsie Town Centre.

### Design Guidance:

- + Design laneways as shared zones to free up room for tree planting. Trees and planting will in turn narrow the carriageway and slow traffic
- + Locate trees on boundary lines where they are less likely to be interrupted by access / driveway requirements
- + Use permeable paving to maximise water infiltration and passive irrigation in the urban environment
- + Consider a range of tree sizes depending on the available growing space



Laneway

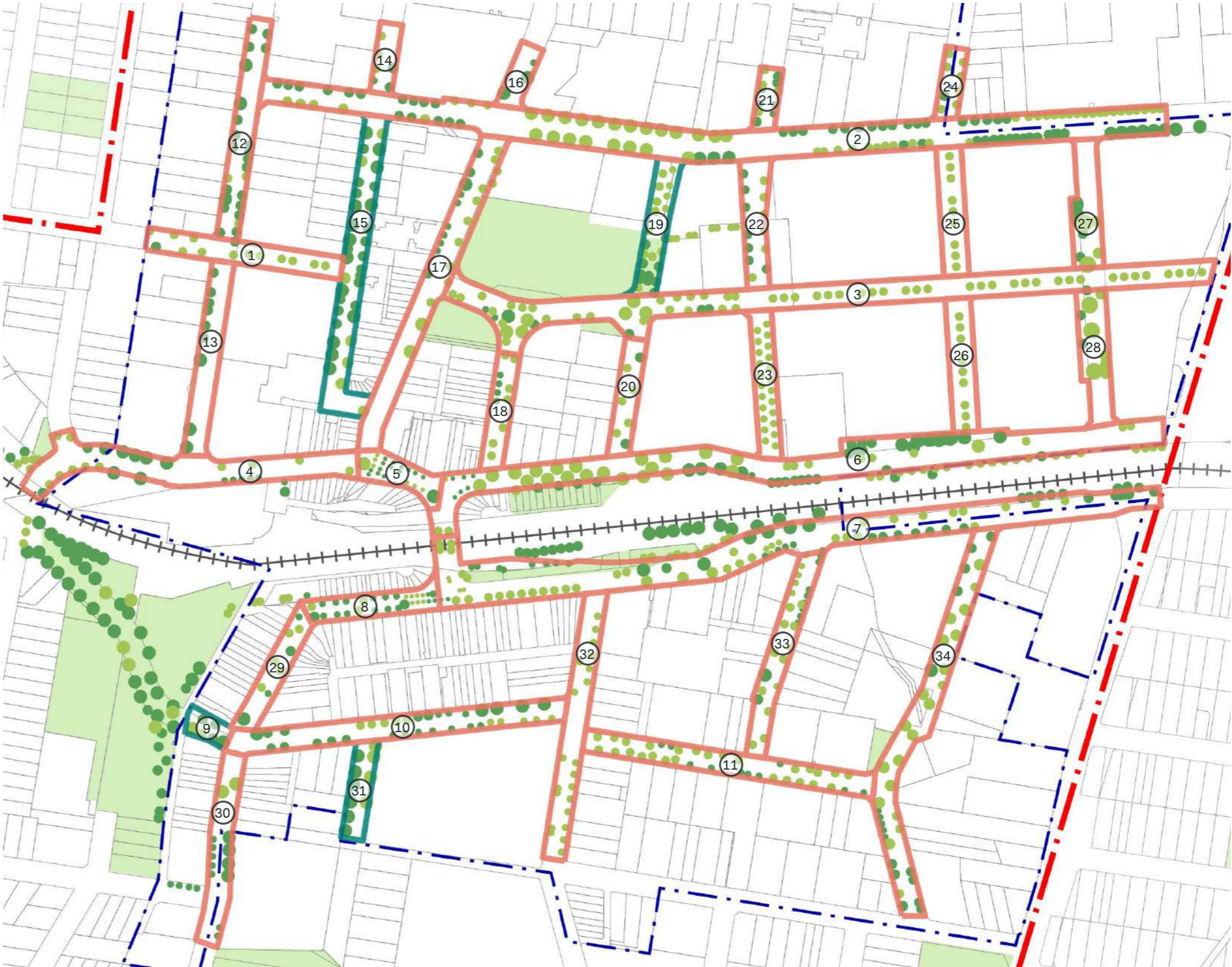
### 3.6 Review of Bankstown Complete Streets

The Bankstown Complete Streets Master Plan was examined to determine the overall canopy cover it would provide based on the plans available.

Based upon the sizes of the trees indicated in the Master Plan, which vary from 4m to 12m in diameter, the total canopy cover that would be provided within the street reserve comes to 27%.

The Urban Tree Canopy Master Plan sets a target higher than this for streets at 40% canopy cover (refer to Section 3.2). To achieve this target, more trees, larger trees, or a combination of the two would need to be provided across the Complete Streets master plan area.

It should be noted that Bankstown Complete Streets does not indicate tree species and for the purpose of this study, we have assumed that the tree sizes indicated are the proposed mature canopy sizes.



Bankstown Complete Streets canopy study



No.	Street Name	Street Area	Canopy Cover	Coverage Rate	Design Guidance to achieve 40% target
①	Gordon Street	3585m <sup>2</sup>	700m <sup>2</sup>	20%	+ Consider a combination of larger trees and a double row / groupings of smaller trees in pedestrian only segment
②	Rickard Road	20608m <sup>2</sup>	7116m <sup>2</sup>	35%	+ Increase size of proposed trees + Consider reducing tree spacings to increase the number of trees
③	The Mall	15493m <sup>2</sup>	3990m <sup>2</sup>	26%	+ Plant trees alongside the cycle path adjacent Paul Keating Park (as per 2020 Paul Keating Park Masterplan) + Increase the size of trees along the pedestrian only section of The Mall, or consider a double row of smaller trees + Note section of the mall as a shared zone as per street typology plan in Section 3.4
④	Marion Street	7179m <sup>2</sup>	1342m <sup>2</sup>	19%	+ Increase tree planting along the eastern portion of the street by reducing extent of awning or providing gaps in the awning to accommodate tree planting + Plant larger trees in the western portion of the street + Increase canopy size of proposed trees
⑤	Bankstown City Plaza A	1982m <sup>2</sup>	491m <sup>2</sup>	25%	+ Consider reducing parking to accommodate additional trees (consistent with changing from a street to a shared zone typology)
⑥	North Terrace	15826m <sup>2</sup>	4895m <sup>2</sup>	31%	+ Plant larger trees along the south-eastern side of the street. Investigate option of having trees between lanes and footpath in this area (reduce traffic lane widths, footpath width).
⑦	South Terrace	18108m <sup>2</sup>	4122m <sup>2</sup>	23%	+ Increase size of proposed trees in the eastern portion of the road + Increase number of trees by considering reducing parking, planting trees adjacent parking and planting trees adjacent the cycleway (vary side of cycleway depending on local conditions)
⑧	Bankstown City Plaza B	2557m <sup>2</sup>	772m <sup>2</sup>	30%	+ Increase size of proposed trees
⑨	Olympic Parade	916m <sup>2</sup>	444m <sup>2</sup>	49%	+ Achieves target
⑩	Greenfield Parade	6226m <sup>2</sup>	1635m <sup>2</sup>	26%	+ Increase size of proposed trees + Add extra trees between existing trees
⑪	Raymond Street	5383m <sup>2</sup>	1663m <sup>2</sup>	31%	+ Increase size of proposed trees + Add extra trees between existing trees
⑫	Meredith Street A	4035m <sup>2</sup>	1397m <sup>2</sup>	35%	+ Update 'existing trees' on south-east side of the street, as some no longer exist + Plant the largest species possible within the growing conditions available in order to provide cover over the wide carriageway
⑬	Meredith Street B	3577m <sup>2</sup>	619m <sup>2</sup>	17%	+ Provide trees on the eastern side of the street. Consider the following: + reducing lane widths to allow for tree pits on this side + reducing extent of awning or providing gaps in the awning to accommodate tree planting + Plant 3-4 additional trees on the west side of the street if possible
⑭	Kitchener Parade A	1290m <sup>2</sup>	274m <sup>2</sup>	21%	+ Reduce tree spacing + Add extra trees between existing trees on the east of street

No.	Street Name	Street Area	Canopy Cover	Coverage Rate	Design Guidance to achieve 40% target
⑮	Kitchener Parade B	5920m <sup>2</sup>	2421m <sup>2</sup>	41%	+ Achieves target
⑯	Chapel Road A	1257m <sup>2</sup>	212m <sup>2</sup>	17%	+ Plant additional large trees on east side of street + Plant larger trees if possible + Consider reducing extent of awning or providing gaps in the awning to accommodate tree planting + Consider removing some parking bays to accommodate additional trees (noting there is already a proposed net loss in parking)
⑰	Chapel Road B	6728m <sup>2</sup>	1269m <sup>2</sup>	19%	+ Plant trees between the cycle path and carriageway - this may only be achievable in a few locations where localised diversion of cycleway is possible without compromising existing trees
⑱	Fetherstone Street	2125m <sup>2</sup>	458m <sup>2</sup>	22%	+ Increase the number of trees + Consider larger 'specimen' trees within the pedestrian only area
⑲	The Appian Way B	2603m <sup>2</sup>	1033m <sup>2</sup>	40%	+ Achieves target
⑳	The Appian Way A	2117m <sup>2</sup>	384m <sup>2</sup>	18%	+ Increase size and/or density of new trees if possible. Note significant amount of underground services may result in reduced scope for trees. If this cannot be addressed in detailed design, 40% cover will not be achieved and should be offset elsewhere if possible.
㉑	Jacob Street A	1152m <sup>2</sup>	452m <sup>2</sup>	39%	+ Use larger trees (noting the proposed layout is very close to achieving the target)
㉒	Jacob Street B	2592m <sup>2</sup>	596m <sup>2</sup>	23%	+ Reduce proposed tree spacing
㉓	Jacob Street C	2716m <sup>2</sup>	740m <sup>2</sup>	27%	+ Plant larger trees
㉔	Sir Joseph Banks Street	1319m <sup>2</sup>	397m <sup>2</sup>	30%	+ Reduce proposed tree spacing
㉕	The Mall (New) A	2673m <sup>2</sup>	462m <sup>2</sup>	17%	+ Consider a combination of larger trees and a double row / groupings of smaller trees
㉖	The Mall (New) B	2778m <sup>2</sup>	457m <sup>2</sup>	16%	+ Consider a combination of larger trees and a double row / groupings of smaller trees
㉗	Lady Cutler Avenue A	2758m <sup>2</sup>	779m <sup>2</sup>	28%	+ Plant trees adjacent parking as well as within parking lane + Adjust awning extent or provide gaps to accommodate additional trees
㉘	Lady Cutler Avenue B	3028m <sup>2</sup>	1020m <sup>2</sup>	34%	+ Plant trees adjacent parking as well as within parking lane + Adjust awning extent or provide gaps to accommodate additional trees
㉙	Chapel Road C	2414m <sup>2</sup>	497m <sup>2</sup>	21%	+ Consider reducing extent of awning or providing gaps in the awning to accommodate tree planting adjacent parking + Consider removing some parking bays to accommodate additional trees
㉚	Chapel Road D	3555m <sup>2</sup>	763m <sup>2</sup>	22%	+ Consider removing some parking bays to accommodate additional trees
㉛	Mona Street	1798m <sup>2</sup>	884m <sup>2</sup>	49%	+ Achieves target
㉜	Restwell Street	4918m <sup>2</sup>	659m <sup>2</sup>	13%	+ Increase size of proposed trees + Reduce tree spacing
㉝	West Terrace	3735m <sup>2</sup>	1022m <sup>2</sup>	27%	+ Increase size of proposed trees. Select species that will grow clear trunks above awnings. + Add extra trees between existing trees adjacent parking.
㉞	East Terrace	7590m <sup>2</sup>	2455m <sup>2</sup>	32%	+ Reduce tree spacing

## 3.7 Open Space Studies

### Open Space Studies

The following studies provide design guidance on how the existing open spaces across Bankstown City Centre and Campsie Town Centre may achieve the 40% canopy cover target for open space.

These plans are indicative only and serve to demonstrate what a 40% cover could look like. More detailed design is required to determine the best layout for trees in these spaces, taking into consideration:

- + the functionality and layout of the open spaces. In particular, the inclusion of playing fields greatly impacts on the ability to achieve a 40% cover. In these locations it may be best to provide additional planting elsewhere within Bankstown City Centre and Campsie Town Centres to offset these parks;
- + providing trees for shade and amenity where it is needed the most;
- + the desired character of the open spaces;
- + safety for pedestrians and park users, considering site lines and night-time use; and
- + maintenance requirements.

#### Methodology and Assumptions:

- + The cover indicated is based on the total canopy cover (existing and proposed) as a percentage of the study areas indicated on the plans.
- + The existing canopy cover for these spaces was determined based on the tree survey data collected, rather than the 2016 canopy cover data referenced earlier in this report, and as such some discrepancies may exist.
- + Indicative number of new trees is based on an average of 80m<sup>2</sup> canopy cover per tree (~10m diameter).

#### Key Findings:

The following key findings have come out of the Open Space Studies for Campsie and Bankstown:

- + Parks with playing fields and/or other recreational facilities that reduce the land available for tree planting would require very dense areas of canopy cover across the remainder of the park, as illustrated in the diagrams. Such an outcome may compromise the character, function and safety of these spaces, as well as require significant investment with reduced overall benefit. In these instances, looking to offset canopy cover elsewhere across the may be the best course of action.
- + The existing parks currently meeting or exceeding 40% canopy cover demonstrate that comfortable and functional parks can be achieved in line with the targets. Anzac Park in particular, at 77% existing cover, demonstrates how some parks may offset the open spaces that cannot practically achieve the 40% target.
- + The large number of new trees required to achieve the target for open space, while indicative only, highlights the level of investment required to meet the targets, noting the ongoing maintenance of new trees on top of the installation costs.

Section 4.6 provides additional considerations for trees in open space.

### Rudd Park, Campsie

- + Total area: 54751m<sup>2</sup>
- + 40% canopy: 21900m<sup>2</sup>
- + Existing canopy cover: 6337.5m<sup>2</sup> (11.6%)
- + Additional canopy required to achieve 40% cover: 15562.5m<sup>2</sup> (195 new trees)

#### Design Guidance:

- + Consider additional planting elsewhere in Campsie to offset Rudd Park and allow for a few select open areas in addition to the fields
- + Provide a flexible playing field arrangement by focussing additional planting to the edges of the playing fields.
- + Achieving 40% cover requires playing fields to be reconfigured - indicative layout of 2x soccer and 2x cricket pitches shown alongside the new synthetic playing field
- + Select a variety of tree types of 4m - 20m mature diameter, with a preference for large, native trees

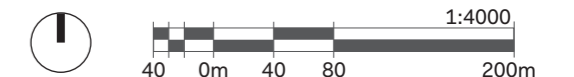


#### Legend

- Existing Canopy Cover
- Proposed canopy to meet 40% target
- - - Study area



Existing tree canopy in Rudd Park



## Tasker Park, Campsie

### 1. Little Tasker Park

- + Study Area: 11470m<sup>2</sup>
- + 40% canopy: 4588m<sup>2</sup>
- + Existing canopy cover: 5393m<sup>2</sup> (47%)




### 2. Tasker Park

- + Study Area: 67112m<sup>2</sup>
- + Existing canopy cover: 3760m<sup>2</sup> (5.6%)
- + Additional canopy required to achieve 40% cover: 23085m<sup>2</sup> (288 new trees)

#### Design Guidance:

- + Consider additional planting in Little Tasker Park, or elsewhere in Campsie, to offset Tasker Park and allow for a few select open areas in addition to the fields
- + Maintain the flexible playing field arrangement by focussing additional planting to the edges of the playing fields
- + Select a variety of tree types of 4m - 20m mature diameter, with a preference for large, native trees

#### Legend

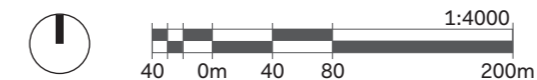
-  Existing Canopy Cover
-  Proposed canopy to meet 40% target
-  Study area



Existing tree canopy in Little Tasker Park



Existing tree canopy in Tasker Park



## Federation Reserve, Campsie



- + Total area: 18575m<sup>2</sup>
- + 40% canopy: 7430m<sup>2</sup>
- + Existing canopy cover: 2800m<sup>2</sup> (11.6%)
- + Additional canopy required to achieve 40% cover: 4630m<sup>2</sup> (58 new trees)

### Design Guidance:

- + A significant amount of new trees are required to achieve the 40% canopy target.
- + Select a variety of tree types of 4m - 20m mature diameter, with a preference for large, native trees.
- + Consolidate areas of new tree planting to allow for some areas of open parkland.

### Legend

- Existing Canopy Cover
- Proposed canopy to meet 40% target
- - - Study area



<< Existing tree canopy in Federation Reserve



Existing tree canopy in Harcourt Reserve >>

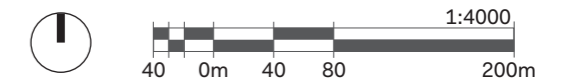
## Harcourt Reserve, Campsie



- + Total area: 4034m<sup>2</sup>
- + 40% canopy: 7430m<sup>2</sup>
- + Existing canopy cover: 1557m<sup>2</sup> (39%)
- + Additional canopy required to achieve 40% cover: 57m<sup>2</sup> (1 new tree)

### Design Guidance:

- + Retain existing mature trees
- + Minimal additional trees required to achieve 40% cover - plant native trees in keeping with the existing character of the park



## Lofts Garden, Campsie



- + Total area: 4791m<sup>2</sup>
- + 40% canopy: 1916m<sup>2</sup>
- + Existing canopy cover: 1368m<sup>2</sup> (29%)
- + Additional canopy required to achieve 40% cover: 548m<sup>2</sup> (7 new trees)

### Design Guidance:

- + Retain existing mature trees
- + Consider providing large shade trees within the central open space that will provide shaded seating areas while retaining sight lines through the park for safety
- + Preference for large native trees, however additional deciduous trees would be acceptable and in keeping with the existing character

### Legend

- Existing Canopy Cover
- Proposed canopy to meet 40% target
- - - Study area



<<Existing tree canopy in Lofts Garden (left)



Existing tree canopy in 31 Marlowe Street >>

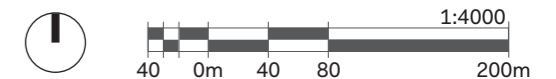
## 31 Marlowe Street, Campsie



- + Total area: 1135m<sup>2</sup>
- + 40% canopy: 454m<sup>2</sup>
- + Existing canopy cover: 178m<sup>2</sup> (15.7%)
- + Additional canopy required to achieve 40% cover: 276m<sup>2</sup> (4 new trees)

### Design Guidance:

- + Retain existing mature trees
- + Add shade trees along the main path connection - medium size trees planted in a formal / linear arrangement adjacent the path can be used to provide a contrast to the existing informal grove of large native



## Carrington Square, Campsie



- + Total area: 4641m<sup>2</sup>
- + 40% canopy: 1856m<sup>2</sup>
- + Existing canopy cover: 891m<sup>2</sup> (19.2%)
- + Additional canopy required to achieve 40% cover: 965m<sup>2</sup> (12 new trees)

### Design Guidance:

- + Plant additional trees while maintaining the existing structure of the park and accessible areas of open lawn
- + Utilise a mix of deciduous and native trees of varying sizes, planted in both formal and informal arrangements, that will compliment the existing character of the space

### Legend

- Existing Canopy Cover
- Proposed canopy to meet 40% target
- - - Study area

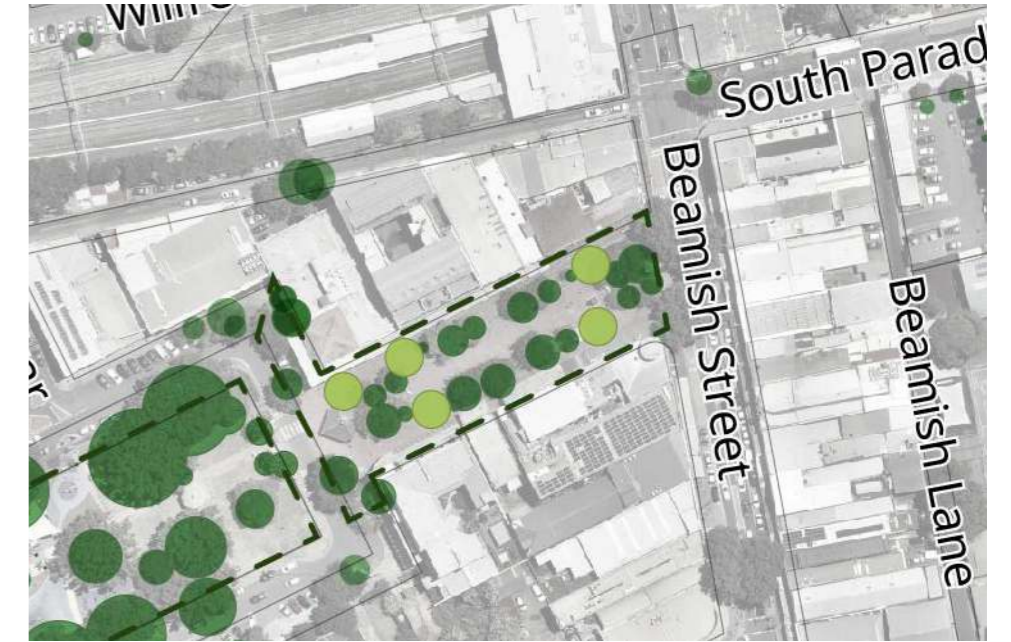


<< Existing tree canopy in Carrington Square



Existing tree canopy in Anzac Square >>

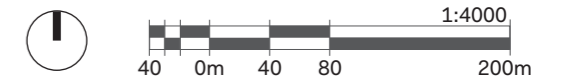
## Anzac Square, Campsie



- + Total area: 3370m<sup>2</sup>
- + 40% canopy: 1856m<sup>2</sup>
- + Existing canopy cover: 973m<sup>2</sup> (29%)
- + Additional canopy required to achieve 40% cover: 375m<sup>2</sup> (5 new trees)

### Design Guidance:

- + Supplement the existing *ulmis parvifolia* with additional deciduous trees in keeping with the existing urban character. Maintain clear sight lines and paths of travel.
- + Maintain the formal character of the square
- + Implement measures to improve the growing conditions of new and existing trees, including subsurface systems such as stratavault, and permeable paving / passive irrigation to trees.



The following open spaces in Campsie exceed the 40% target for open space.

**Design Guidance:**

- + Retain existing trees and replace when required.

**Anzac Park, Campsie**



- + Total area: 4635m<sup>2</sup>
- + 40% canopy: 1854m<sup>2</sup>
- + Existing canopy cover: 3549m<sup>2</sup> (77%)

**Loch Street Reserve, Campsie**



- + Total area: 822m<sup>2</sup>
- + 40% canopy: 329m<sup>2</sup>
- + Existing canopy cover: 541.5m<sup>2</sup> (66%)

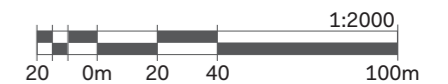
**41-43 Third Avenue, Campsie**



- + Total area: 1093m<sup>2</sup>
- + 40% canopy: 437m<sup>2</sup>
- + Existing canopy cover: 528m<sup>2</sup> (48%)

**Legend**

- Existing Canopy Cover
- - - Study area



# Bankstown Oval + Bankstown City Gardens, Bankstown

- + Total area: 71554m<sup>2</sup>
- + 40% canopy: 28622m<sup>2</sup>
- + Existing canopy cover: 7955m<sup>2</sup> (11%)
- + Additional canopy required to achieve 40% cover: 20667m<sup>2</sup> (258 new trees)

### Design Guidance:

- + The two ovals can be retained as open areas, however a large extent of the rest of the park would require tree cover to meet the 40% target.
- + Small patches of consolidated open lawn may be achieved by denser, overlapping canopies elsewhere
- + The growth of existing young trees in Bankstown City Gardens will help to contribute to the 40% target.
- + The layout and function of park areas, safety and sight lines, and tree size and character should all be considered when planting additional trees
- + Select a variety of tree types of 4m - 20m mature diameter, with a preference for large, native trees.



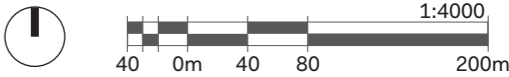
Existing tree canopy in Bankstown Oval



Existing tree canopy in Bankstown City Gardens

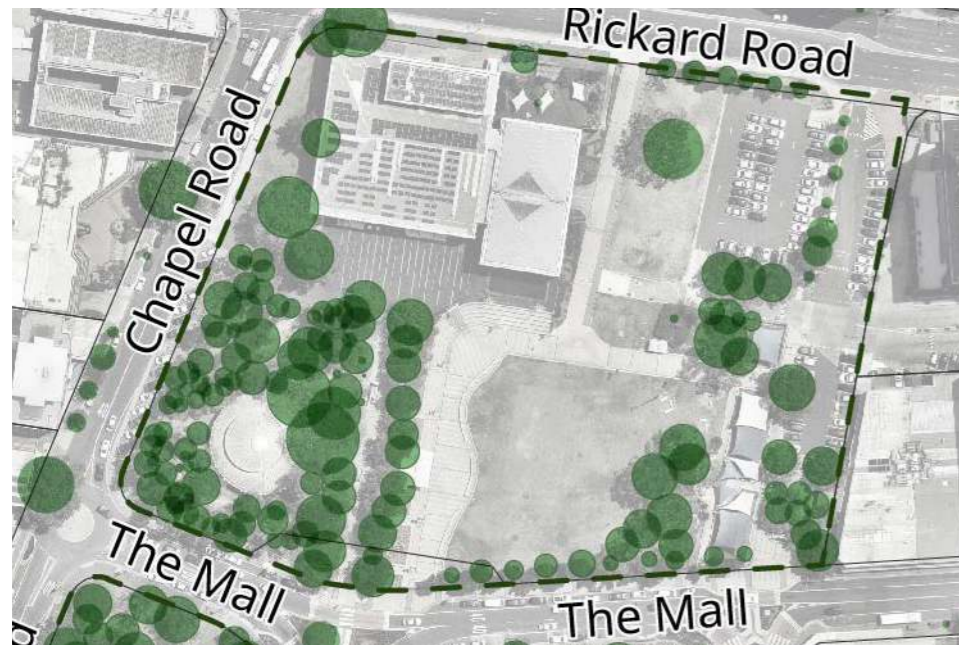
### Legend

- Existing Canopy Cover
- Proposed canopy to meet 40% target
- - - Study area





## Paul Keating Park, Bankstown



### 1. Existing Condition

- + Total area: 23906m<sup>2</sup>
- + 40% canopy: 9562m<sup>2</sup>
- + Existing canopy cover: 6019m<sup>2</sup> (25%)
- + Additional canopy required to achieve 40% cover: 3543m<sup>2</sup> (44 new trees)



Existing tree canopy in Paul Keating Park



### 2. Paul Keating Park Master Plan, adopted 2021

- + Indicative canopy cover: 6615m<sup>2</sup> (28%)
- + Additional canopy required to achieve 40% cover: 2947m<sup>2</sup> (37 new trees)



Paul Keating Park Masterplan

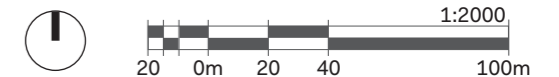


### 3. Design Guidance

- + 40% canopy cover can be achieved without major departures from the proposed Master Plan.
- + Cover may be achieved by:
  - + planting additional trees in formal arrangements adjacent paths of travel
  - + additional informal large tree plantings
  - + retaining additional existing trees where possible
  - + selecting larger tree species where appropriate
- + Select a variety of tree types of 4m - 20m mature diameter, with a preference for large trees.

#### Legend

- Existing Canopy Cover
- Masterplan - proposed trees
- Proposed canopy to meet 40% target
- - - Study area



## North Terrace, Bankstown



- + Total area: 2081m<sup>2</sup>
- + 40% canopy: 832m<sup>2</sup>
- + Existing canopy cover: 705m<sup>2</sup> (34%)
- + Additional canopy required to achieve 40% cover: 127m<sup>2</sup> (2 new trees)

### Design Guidance:

- + Retain existing trees and supplement with 2-3 new trees of a similar character



<< Existing tree canopy in North Terrace



Existing tree canopy in South Terrace >>

## South Terrace, Bankstown



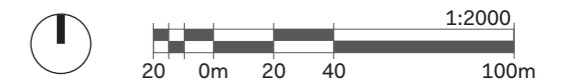
- + Total area: 2196m<sup>2</sup>
- + 40% canopy: 878m<sup>2</sup>
- + Existing canopy cover: 294m<sup>2</sup> (13%)
- + Additional canopy required to achieve 40% cover: 584m<sup>2</sup> (7 new trees)

### Design Guidance:

- + The growth of existing trees will contribute greatly to the canopy cover and should be supported
- + Additional tree planting along the pathways would assist in achieving the cover target

## Legend

- Existing Canopy Cover
- Proposed canopy to meet 40% target
- - - Study area



## Future Metro Plaza, Bankstown



- + Total area: 3852m<sup>2</sup>
- + 40% canopy: 1541m<sup>2</sup>
- + Existing canopy cover: 228m<sup>2</sup> (6%)
- + Additional canopy required to achieve 40% cover: 1313m<sup>2</sup> (16 new trees)

### Design Guidance:

- + Plant a range of small to large sized trees as part of the future metro station plaza
- + Retain existing trees where suitable
- + Maintain paths of travel and access to key station entry points
- + Consider a mix of deciduous and native trees to reflect the urban character of the plaza

### Legend

- Existing Canopy Cover
- Proposed canopy to meet 40% target
- - - Study area



<< Existing Train Station



Existing tree canopy in McLeod Reserve >>

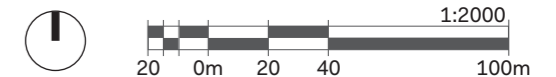
## McLeod Reserve, Bankstown



- + Total area: 7087m<sup>2</sup>
- + 40% canopy: 2835m<sup>2</sup>
- + Existing canopy cover: 2088m<sup>2</sup> (30%)
- + Additional canopy required to achieve 40% cover: 747m<sup>2</sup> (9 new trees)

### Design Guidance:

- + Plant medium to large trees to provide shade to pathways and car parking, with a preference for large native trees



The following open spaces in Bankstown exceed the 40% target for open space.

**Design Guidance:**

- + Retain existing trees and replace when required.

**RM Campbell Reserve, Bankstown**



- + Total area: 9173m<sup>2</sup>
- + 40% canopy: 3669m<sup>2</sup>
- + Existing canopy cover: 5258m<sup>2</sup> (57%)

**Apex Reserve, Bankstown**





- + Total area: 8780m<sup>2</sup>
- + 40% canopy: 3512m<sup>2</sup>
- + Existing canopy cover: 4025m<sup>2</sup> (46%)

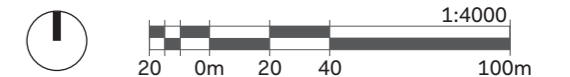
**Stevens Reserve, Bankstown**



- + Total area: 7680m<sup>2</sup>
- + 40% canopy: 3072m<sup>2</sup>
- + Existing canopy cover: 4315m<sup>2</sup> (56%)

**Legend**

-  Existing Canopy Cover
-  Study area



**Court House Reserve, Bankstown**



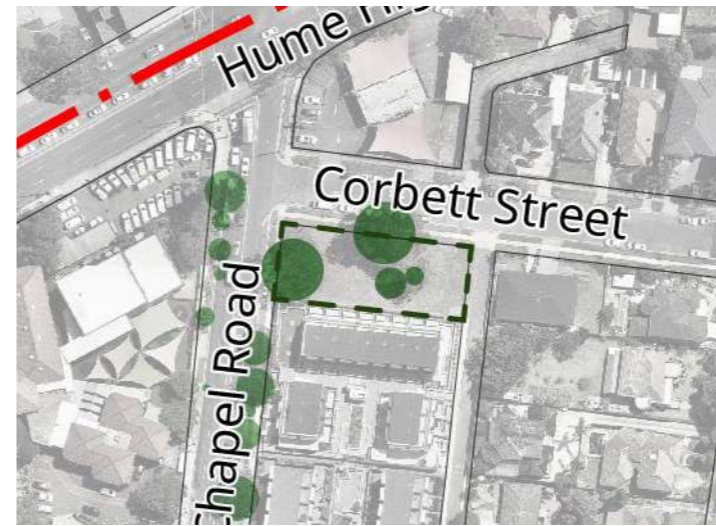
- + Total area: 2211m<sup>2</sup>
- + 40% canopy: 884.4m<sup>2</sup>
- + Existing canopy cover: 1419m<sup>2</sup> (64%)

**Phil English Reserve, Bankstown**



- + Total area: 1949m<sup>2</sup>
- + 40% canopy: 779.6m<sup>2</sup>
- + Existing canopy cover: 917m<sup>2</sup> (47%)

**551 Chapel Road N, Bankstown**



- + Total area: 994m<sup>2</sup>
- + 40% canopy: 398m<sup>2</sup>
- + Existing canopy cover: 468m<sup>2</sup> (47%)

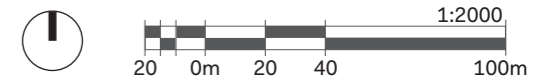
**East Terrace Reserve, Bankstown**



- + Total area: 544m<sup>2</sup>
- + 40% canopy: 217.6m<sup>2</sup>
- + Existing canopy cover: 416m<sup>2</sup> (77%)

**Legend**

- Existing Canopy Cover
- - - Study area





# 4.0 Implementation

## 4.1 Implementation Framework

### Planning

This Master Plan puts forward principles and strategies that will guide the long-term planning, development and management of the City of Canterbury Bankstown's urban tree canopy. It also outlines a set of targets to evaluate the success of implementation.

Evolution in urban tree canopy planning will need to be based on solid research, well-informed options and best practice implementation tools and processes. Creating a resilient and robust urban tree canopy requires forward planning in a similar manner to municipal strategic planning. The management and development of our urban forest needs to be undertaken with a long-term vision.

Planning, development and implementation of urban tree policy takes place at two levels: long term (strategic and spatial planning, including this document and Council's Complete Streets Program) and shorter-term (project-focused planning, such as detailed street design and construction).

The implementation of this Urban Tree Canopy Master Plan will be carried out as follows:

- + Develop clear and robust DCP controls so that developments deliver tree canopy as part of their development - both in public and private land. This is covered by the Landscape Controls Report undertaken in parallel to this Master Plan report.
- + For Bankstown, use the plans and recommendations from Bankstown Complete Streets, Urban Tree Canopy Master Plan and Public Domain Technical Manual to inform DCP controls.
- + For Campsie, use the recommendations from the Urban Tree Canopy Master Plan and the outcomes of Campsie Complete Streets to inform DCP controls.
- + Once Complete Streets process is finalised, develop an implementation strategy for the preparation of street detailed design and construction.

The success of the Urban Tree Canopy Master Plan will rely on effective 'green governance' by the City of Canterbury Bankstown, clear communications, and a widely understood implementation strategy that comprises programs that meet both short and long-term goals, including the recommended DCP controls outlined in the Landscape Controls Report.

### Green Governance

Green governance shapes the plans and decisions that influence the development of urban tree canopy. A multitude of institutions, organisations and stakeholders are involved in shaping and making policy and management decisions that affect our urban tree population.

Successful urban tree canopy master plans requires creative and effective design at all levels, from metropolitan areas down to neighbourhoods and individual development sites. Integrated planning, knowledge sharing and communication are critical components for successful green governance. They need to occur on a range of levels and work across administrative boundaries and disciplines within the municipality and beyond.

### Intra-Council integration

This involves internal stakeholder and interdepartmental cooperation. At a city scale, urban designers should work directly with landscape architects, planners, environmental officers and urban tree officers to integrate policy, practice and analytical tools, coordinating input from many other departments related to managing growth.

### Community and inter-professional integration

This integration means the role of non-public proponents becomes more influential by raising public and bi-partisan political awareness. Council should recognise the impact that changes in the urban tree canopy have on the values of communities and individual, and must therefore maintain and enhance interaction with the community to ensure these values are considered during planning and decision making.

### Inter-municipal integration

Inter-municipal integration involves the need for policy makers to link together with other local municipalities. At this scale, this calls for more systematic assessments of the urban tree canopy across a larger bio-geographical area, beyond arbitrary political boundaries.

### Locally-led action

Locally-led action on the urban forest potentially influences national action. The learning acquired from small scale autonomous urban tree projects can aid in steering policy-making and the quality and quantity of research across the country. The importance of comparable data would allow the urban tree canopy to be managed and have collective benchmarks established to ensure that national climate adaptation targets can be met.

### International cooperation

There is a need to network globally to drive uptake of the principles of contemporary urban tree canopy management, to share research and technical knowledge, and to achieve better outcomes for our cities as our urban environment continues to expand.

### Priority Actions

An implementation plan has been developed to outline priority actions and realistic delivery timeframes. The actions are directly linked to the strategic principles identified earlier within the Master Plan:

- + Actions to protect and maintain the existing urban tree canopy.
- + Actions to increase the urban tree canopy cover.
- + Actions to improve urban tree population diversity.
- + Actions to increase community knowledge and engagement.

Actions have been allocated indicative timeframes as follows:

- + Short term: 0-1 years, to be done within the timeframe of the Master Plan and DCP updates
- + Medium term: 2-5 years
- + Long term: 5 years +



Action - to be undertaken by Council	Area of influence	Timeframe
1. Implement changes to the DCP as outlined in the Bankstown and Campsie Urban Tree Canopy Controls Report	New Development	<b>Short term:</b> In conjunction with the wider Master Plans and DCP updates
2. Update the standard tree planting details as per Appendix 5.3	Streets and Open Spaces	<b>Short term:</b> In conjunction with the wider Master Plans and DCP updates
3. Prepare a Significant Tree Register. Once adopted, the register should be listed within Schedule 5 of the LEP for greater protection.	New Development Streets and Open Spaces	<b>Short term:</b> To be undertaken as soon as possible to ensure the protection of significant trees.
4. Investigate bonding high value street and park trees to provide additional protection. Bonds should be based on a Council approved valuation system.	Streets and Open Spaces	<b>Short-medium term:</b> To be implemented after the establishment of the Significant Tree Register.
5. Ensure that there are adequate resources and procedures in place for Landscape Compliance Officers to enforce revised controls. Council's approval system should include inspections to ensure that landscaping associated with new developments is implemented in accordance with relevant controls and approved plans.	New Development	<b>Short-medium term:</b> To be in place once the Master Plan and DCP updates come into effect
6. Undertake regular audits (every 5 years) of tree canopy cover on public and private land to assess current status against tree canopy cover targets.	Study areas - monitoring and reporting	<b>Ongoing, commencing in the Short Term:</b> Consider undertaking a canopy cover audit in 2021 as a base line
7. Prepare detailed design of streets for Campsie Town Centre and Bankstown City Centre based on Complete Streets and Urban Tree Canopy Master Plan.	Streets	<b>Short-medium term:</b> After the overall Master Plans have been completed and endorsed
8. Prepare a Design Guide for Campsie Town Centre in line with the Design Guide prepared for the Bankstown City Centre illustrated in Section 3.6 of this document to achieve urban tree canopy targets. The Design Guide should be prepared as part of Campsie Complete Streets.		
9. Consider the establishment of a community engagement and communication plan as regards the urban tree canopy. This should involve a variety of tools to engage the community with the Urban Tree Canopy Master Plan and other policies related to urban tree management. The plan should also enable the community to 'have a say' in future tree planting projects.	Community engagement and perception New Development Streets and Open Spaces	<b>Ongoing, commencing in the short-medium term:</b> After the overall Master Plans have been completed and endorsed

Action - to be undertaken by Council	Area of influence	Timeframe
10. Investigate opportunities for developers to contribute towards the undergrounding of powerlines, especially in commercial centres and medium-high density residential areas, to facilitate additional and larger size street tree planting.	Streets Developer contributions	<b>Short term:</b> In conjunction with the wider Master Plans and DCP updates
11. Engage with utility companies to promote aerial bundling of overhead wires (where undergrounding is not possible) and use of shared services trenches where multiple new services are being installed.	Streets	<b>Ongoing:</b> Begin engagement in the short term and coordinate as part of street upgrades and new development.
12. Investigate the development of a Green Factor Tool based on the City of Melbourne's and other international examples. This will require extensive research and development, as well as consultation with a wide range of internal and external stakeholders. Refer to the Urban Tree Canopy Controls Report for further information.	New Development	<b>Medium-long term:</b> May be considered at a later date once the effectiveness of the proposed DCP and Master Plan changes on canopy cover can be assessed (5 years+).
13. Incorporate the work undertaken on the Campsie precinct by CRC for Water Sensitive Cities as part of Campsie Complete Streets.	WSUD New Development Streets and Open Spaces	<b>Short-medium term:</b> May be undertaken at any time
14. Promote the investigation and adoption of grey and blackwater recycling, particularly on a precinct-wide basis or for larger development sites. Refer to Landscape Controls Report.	WSUD New Development Streets and Open Spaces	<b>Short-medium term:</b> May be undertaken at any time
15. Review the opportunities for integrating and retrofitting WSUD measures into existing streets and open spaces as part of Campsie Complete Streets.	WSUD Streets and Open Spaces	<b>Short-medium term:</b> May be undertaken at any time

## 4.2 Species Selection

A list of potential tree species for new plantings in Council streets and open spaces (and private development sites) has been developed in consultation with Council Officers. These tree species have been selected based on a number of criteria arising from analysis of the existing urban tree population and the desired future population including:

- + consideration of tree species that align to the pre-European vegetation zones (as outlined by the NSW State Government) to enable preservation and restoration of biodiversity
- + preference of locally indigenous species rather than NSW Native e.g. some NSW natives are considered weed species in Sydney
- + acknowledgement that there is generally preference for native evergreens, however in the context of the proposed development densities in Bankstown and Campsie, it is appropriate to consider deciduous exotics as they will allow for better solar amenity in winter
- + preference for wider diversity of species than existing as this is a key challenge in the existing tree population
- + inclusion of larger growing species for appropriate situations as the existing urban tree population has a relatively low proportion of large sized trees
- + preference for longer lived species rather than short-lived species

It should be noted that there is no perfect street tree and there will be pros and cons for each species depending on the individual planting location. Urban growing conditions are vastly different to the ecological niche of the species, and the urban trees that have been selected tend to be those which are tolerant of a wide range of conditions and have been historically successful in urban environments in the Greater Sydney area. Some trial species could be considered in selected areas.

This list provides a broad palette, as species diversity is a major consideration for a healthy urban tree population. The broad palette also provides greater flexibility at the time of planting and allows tree selection to respond to species availability.

The use of fruit trees was considered, however excluded from the species lists in this report for the following reasons:

- + the soil on road reserves is likely to contain a variety of contaminants (e.g. lead) that may be consumed by the trees and found in the fruit;
- + fruiting trees are notoriously sensitive to drought and need nutrient rich soils and ongoing fertilisation;
- + animals, including flying-foxes, will be attracted to the fruit and may contaminate the fruit leading to health issues for members of the public that consume the fruit.

While fruit trees are not included on the schedules, the use of fruit trees in streets and open spaces may provide a means to gain support for trees from the community and foster a sense of local stewardship. To facilitate this, the selection and planting of fruit trees may be implemented through a program of community consultation and coordination to ensure they are appropriately located and maintained by the community.



Large, native evergreen trees can be accommodated in open space areas (Paul Keating Park, Bankstown)



Deciduous street trees provide shade in summer but allow solar access in winter (Bankstown).

### Resource: Which Plant Where



More greenery in our towns and cities is imperative for healthy minds, healthy bodies and a healthy environment. A key challenge for greening Australia's urban environments is to ensure that future plantings are made with trees, shrubs and turf that can tolerate the climate conditions that will occur in the near future.

The Which Plant Where program is a five-year research program that will investigate how well current landscaping species will cope under the more extreme climates that Australia's cities will face and investigate opportunities for new species and varieties for the urban context. Having the confidence that tomorrow's urban plants will survive and thrive in a changing world is crucial for the long-term viability of our industries and for creating a climate-resilient urban landscape.

The ultimate aim of this research is a user-friendly Interactive Plant Features Tool that offers you the ability to select the right plants for your region. Covering all of Australia's major urban climate zones, this Plant Selector will give you confidence that you are choosing plants that have been tested for your region and that are available in your region from selected nurseries. The Interactive Plant Features Tool is due out in 2021.

Previously-developed tools provide a good number of options to select plants for purpose, colour, flowering, height or availability, but there are none that are backed by extensive testing of plants under current and future climatic conditions.

The Interactive Plant Features Tool aims to offer a large range of filters that include not just plant features but also factors such as safety, amenity value, location and co-benefits. This comprehensive tool will provide guidance and the understanding needed for successful urban plantings across Australia's urban environment now and into the future.

<https://www.whichplantwhere.com.au/>

**RING ROAD / REGIONAL ROAD / RMS ROAD**

Botanical Name	Common Name	Height	Diameter	Size	NSW Native	Locally indigenous	Exists On Site	Suitable under power lines <sup>1</sup>
<b>Native Evergreen</b>								
<i>Corymbia eximia</i> <sup>2</sup>	Yellow Bloodwood	15m	7m	L	●		●	
<i>Eucalyptus punctata</i> <sup>2</sup>	Grey Gum	35m	10m	L	●	●	●	
<i>Lophostemon confertus</i>	Brush Box	22m	10m	L	●		●	●
<i>Angophora costata</i> <sup>2</sup>	Smooth-barked Apple	15m	5m	M	●	●	●	
<i>Corymbia maculata</i> <sup>2</sup>	Spotted Gum	10m	7m	M	●	●	●	
<i>Harpullia pendula</i>	Tulipwood	10m	3m	M	●			●
<i>Tristaniopsis laurina</i>	Water Gum	10m	5m	M	●	●	●	●
<i>Melaleuca decora</i>	White Feather Honeymyrtle	7m	4m	S	●	●		●
<i>Waterhousia floribunda</i> 'Green Avenue'	Weeping Lilly Pilly	8m	5m	S	●		●	●
<b>Exotic Evergreen</b>								
<i>Fraxinus griffithii</i>	Evergreen Ash	7m	4m	S			●	●
<b>Exotic Deciduous</b>								
<i>Fraxinus pennsylvanica</i>	Green Ash	15m	8m	L				●
<i>Populus simonii</i>	Simon Poplar	18m	3m	L				
<i>Jacaranda mimosifolia</i>	Jacaranda	12m	8m	M			●	
<i>Fraxinus oxycarpa</i> 'Raywood'	Claret Ash	12m	7m	M			●	●
<i>Zelkova serrata</i> 'Green Vase'	Japanese Zelkova	10m	10m	M			●	

**REGIONAL ROAD - COMMERCIAL CENTRE (Beamish St, Campsie)**

Botanical Name	Common Name	Height	Diameter	Size	NSW Native	Locally indigenous	Exists On Site	Suitable under power lines <sup>1</sup>
<b>Native Evergreen</b>								
<i>Elaeocarpus eumundi</i>	Eumundi Quondong	15m	5m	M	●		●	
<i>Stenocarpus sinuatus</i>	Firewheel Tree	10m	7m	M	●		●	
<i>Tristaniopsis laurina</i>	Water Gum	10m	5m	M	●	●	●	●
<i>Xanthostemon chrysanthus</i>	Golden Penda	12m	8m	M				●
<i>Elaeocarpus reticulatus</i>	Blueberry Ash	10m	4m	S	●	●	●	●
<b>Native Deciduous</b>								
<i>Brachychiton discolor</i>	Queensland Lacebark	18m	10m	L	●		●	
<i>Brachychiton acerifolius</i>	Illawarra Flame Tree	12m	6m	M	●		●	
<i>Melia azedarach</i>	White Cedar	10m	8m	M	●		●	
<b>Exotic Evergreen</b>								
<i>Washingtonia robusta</i>	Mexican Fan Palm	20m	2m	L			●	
<i>Magnolia grandiflora</i> 'Exmouth'	Bull-bay Magnolia	12m	5m	M			●	●
<b>Exotic Deciduous</b>								
<i>Fraxinus pennsylvanica</i>	Green Ash	15m	8m	L				●
<i>Platanus x acerifolia</i> (syn. <i>P.hybrida</i> )	London Plane	20m	10m	L			●	
<i>Jacaranda mimosifolia</i>	Jacaranda	12m	8m	M			●	
<i>Lagerstroemia indica</i>	Crepe Myrtle	10m	4m	S			●	●

**NOTES**

1. Trees planted under powerlines will general require Selective Reduction Pruning to meet Ausgrid Clearances. The extent of such pruning or whether the species is suitable for the site will depend on the type and span of the powerline, and an individual site assessment should be undertaken to ensure the species is suitable for location.
2. All trees produce deadwood which may need to be removed. The frequency of deadwood removal will depend on the location (i.e next footpaths, roads and other high value targets) and species.

NEIGHBOURHOOD STREET / LOCAL STREET								
Botanical Name	Common Name	Height	Diameter	Size	NSW Native	Locally indigenous	Exists On Site	Suitable under power lines <sup>1</sup>
<b>Native Evergreen</b>								
<i>Alloxylon flammeum</i>	Tree Waratah	20m	8m	L	●			
<i>Alphitonia excelsa</i>	Red Ash	15m	12m	L	●			
<i>Angophora costata</i> <sup>2</sup>	Smooth-barked Apple	15m	10m	L	●	●	●	
<i>Angophora floribunda</i> <sup>2</sup>	Rough-barked Apple	15m	15m	L	●	●	●	
<i>Angophora subvelutina</i> <sup>2</sup>	Broad-leaved Apple	15m	15m	L	●			
<i>Corymbia eximia</i> <sup>2</sup>	Yellow Bloodwood	15m	7m	L	●		●	
<i>Eucalyptus punctata</i> <sup>2</sup>	Grey Gum	35m	10m	L	●	●	●	
<i>Flindersia australis</i>	Crows Ash	18m	4m	L	●		●	
<i>Lophostemon confertus</i>	Brush Box	22m	10m	L	●		●	●
<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark	18m	8m	L	●		●	●
<i>Pittosporum rhombifolium</i>	Queensland Pittosporum	15m	10m	L				
<i>Alectryon tomentosus</i>	Woolly Rambutan	12m	5m	M	●			●
<i>Angophora bakeri</i>	Narrow-leaved Apple	10m	10m	M	●	●		●
<i>Banksia serrata</i>	Old-man Banksia	16m	4m	M	●	●		●
<i>Buckinghamia celsissima</i>	Ivory Curl Flower	15m	4m	M				●
<i>Cupaniopsis anacardioides</i>	Tuckeroo	15m	15m	M	●		●	●
<i>Elaeocarpus eumundi</i>	Eumundi Quondong	15m	5m	M	●		●	
<i>Glochidion ferdinandi</i>	Cheese Tree	8m	8m	M	●	●		●
<i>Harpulia pendula</i>	Tulipwood	10m	3m	M	●			●
<i>Melaleuca bracteata</i>	Black Tea Tree	12m	8m	M	●			●
<i>Melaleuca leucadendra</i>	Weeping Paperbark	10m	5m	M				●
<i>Melaleuca styphelioides</i>	Prickly-leaved Paperbark	10m	8m	M	●	●	●	●
<i>Podocarpus elatus</i>	Brown Pine	10m	5m	M				●
<i>Stenocarpus sinuatus</i>	Firewheel Tree	10m	7m	M	●		●	
<i>Syzigium paniculatum</i>	Brush Cherry	10m	6m	M	●		●	●
<i>Tristaniopsis laurina</i>	Water Gum	10m	5m	M	●	●	●	●
<i>Xanthostemon chrysanthus</i>	Golden Penda	12m	8m	M				●
<i>Acacia binervia</i>	Coastal Myall	6m	6m	S	●	●		●
<i>Allocasuarina littoralis</i>	Black She-Oak	10m	5m	S	●	●	●	●
<i>Backhousia citriodora</i>	Lemon-scented Myrtle	10m	4m	S			●	●
<i>Banksia integrifolia</i>	Coastal Banksia	10m	4m	S	●	●	●	●
<i>Callistemon salignus</i>	Willow Bottlebrush	8m	3m	S	●	●	●	●
<i>Callistemon viminalis</i>	Bottlebrush	8m	4m	S	●		●	●
<i>Davidsonia johnsonii</i>	Davidson's Plum	6m	3m	S				●
<i>Elaeocarpus reticulatus</i>	Blueberry Ash	10m	4m	S	●	●	●	●
<i>Hibiscus tiliaceus</i>	Coast Cottonwood	8m	4m	S	●			●
<i>Melaleuca decora</i>	White Feather Honeymyrtle	7m	4m	S	●	●		●
<i>Melaleuca linariifolia</i>	Snow-in-Summer	10m	3m	S	●		●	●
<i>Syzigium leuhmannii</i>	Riberry	10m	4m	S	●		●	●
<i>Waterhousia floribunda</i> 'Green Avenue'	Weeping Lilly Pilly	8m	5m	S	●		●	●

NEIGHBOURHOOD STREET / LOCAL STREET (CONTINUED)								
Botanical Name	Common Name	Height	Diameter	Size	NSW Native	Locally indigenous	Exists On Site	Suitable under power lines <sup>1</sup>
<b>Native Deciduous</b>								
<i>Brachychiton discolor</i>	Queensland Lacebark	18m	10m	L	●		●	
<i>Brachychiton acerifolius</i>	Illawarra Flame Tree	12m	6m	M	●		●	
<i>Melia azedarach</i>	White Cedar	10m	8m	M	●		●	
<b>Exotic Evergreen</b>								
<i>Magnolia grandiflora</i> 'Exmouth'	Bull-bay Magnolia	12m	5m	M			●	●
<i>Arbutus andrachnoides</i>	Grecian Strawberry Tree	6m	6m	S				●
<i>Caesalpinia ferrea</i>	Leopard Tree	8m	2m	S				●
<i>Fraxinus griffithii</i>	Evergreen Ash	7m	4m	S			●	●
<i>Gordonia axillaris</i>	Gordonia	6m	3m	S			●	●
<i>Michelia x alba</i>	White Sandalwood	7m	4m	S				●
<i>Photinia x fraseri</i>	Red Tip Phitonia	5m	5m	S				●
<b>Exotic Deciduous</b>								
<i>Fraxinus oxycarpa</i> 'Raywood'	Claret Ash	12m	7m	M			●	●
<i>Lagerstroemia indica</i>	Crepe Myrtle	10m	4m	S			●	●
<i>Parrotia persica</i>	Persian Ironwood	7m	5m	S				●

## NOTES

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2. All trees produce deadwood which may need to be removed. The frequency of deadwood removal will depend on the location (i.e next footpaths, roads and other high value targets) and species.

**NEIGHBOURHOOD STREET / LOCAL STREET - COMMERCIAL CENTRE**

Botanical Name	Common Name	Height	Diameter	Size	NSW Native	Locally indigenous	Exists On Site	Suitable under power lines <sup>1</sup>
<b>Native Evergreen</b>								
<i>Stenocarpus sinuatus</i>	Firewheel Tree	10m	7m	M	●		●	
<i>Tristaniopsis laurina</i>	Water Gum	10m	5m	M	●	●	●	●
<i>Xanthostemon chrysanthus</i>	Golden Penda	12m	8m	M				●
<i>Elaeocarpus reticulatus</i>	Blueberry Ash	10m	4m	S	●	●	●	●
<i>Waterhousia floribunda</i> 'Green Avenue'	Weeping Lilly Pilly	8m	5m	S	●		●	●
<b>Native Deciduous</b>								
<i>Brachychiton discolor</i>	Queensland Lacebark	18m	10m	L		●	●	
<i>Brachychiton acerifolius</i>	Illawarra Flame Tree	12m	6m	M		●	●	
<i>Melia azedarach</i>	White Cedar	10m	8m	M		●	●	
<b>Exotic Evergreen</b>								
<i>Quercus ilex</i>	Holm Oak	15m	15m	L				●
<i>Washingtonia robusta</i>	Mexican Fan Palm	20m	2m	L			●	
<i>Magnolia grandiflora</i> 'Exmouth'	Bull-bay Magnolia	12m	5m	M			●	●
<i>Phoenix dactylifera</i>	Date Palm	10m	7m	M			●	
<i>Arbutus andrachnoides</i>	Grecian Strawberry Tree	6m	6m	S				●
<i>Caesalpinia ferrea</i>	Leopard Tree	8m	2m	S				●
<i>Fraxinus griffithii</i>	Evergreen Ash	7m	4m	S			●	●
<i>Gordonia axillaris</i>	Gordonia	6m	3m	S			●	●
<i>Michelia x alba</i>	White Sandalwood	7m	4m	S				●
<i>Photinia x fraseri</i>	Red Tip Phitonia	5m	5m	S				●
<b>Exotic Deciduous</b>								
<i>Fraxinus pennsylvanica</i>	Green Ash	15m	8m	L				●
<i>Ginkgo biloba</i>	Maidenhair Tree	15m	15m	L			●	
<i>Liriodendron tulipifera</i>	Tulip Tree	18m	8m	L			●	
<i>Platanus x acerifolia</i> (syn. <i>P.hybrida</i> )	London Plane	20m	10m	L			●	
<i>Populus simonii</i>	Simon Poplar	18m	3m	L				●
<i>Acer buergeranum</i>	Trident Maple	10m	6m	M				●
<i>Fraxinus oxycarpa</i> 'Raywood'	Claret Ash	12m	7m	M			●	●
<i>Jacaranda mimosifolia</i>	Jacaranda	12m	8m	M			●	●
<i>Koelreutaria bipinnata</i>	Chinese Rain Tree	12m	10m	M				●
<i>Pistacia chinensis</i>	Chinese Pistachio	10m	6m	M				●
<i>Pyrus calleryana</i> 'Cleveland Select'	Callery Pear	11m	6m	M			●	
<i>Quercus palustris</i>	Pin Oak	15m	8m	M				●
<i>Ulmus parvifolia</i> 'Todd'	Chinese Elm	10m	11m	M			●	●
<i>Zelkova serrata</i> 'Green Vase'	Japanese Zelkova	10m	10m	M			●	
<i>Koelreutaria paniculata</i>	Golden Rain Tree	10m	4m	S				●
<i>Lagerstroemia indica</i>	Crepe Myrtle	10m	4m	S			●	●
<i>Parrotia persica</i>	Persian Ironwood	7m	5m	S				●

**NOTES**

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2. All trees produce deadwood which may need to be removed. The frequency of deadwood removal will depend on the location (i.e next footpaths, roads and other high value targets) and species.
3. Fifth Avenue Campsie existing species - replace as needed to maintain heritage character

**GREEN STREET**

Botanical Name	Common Name	Height	Diameter	Size	NSW Native	Locally indigenous	Exists On Site?	Suitable under power lines <sup>1</sup>
<b>Native Evergreen</b>								
<i>Lophostemon confertus</i>	Brush Box	22m	10m	L	●		●	●
<i>Tristaniopsis laurina</i>	Water Gum	10m	5m	M	●	●	●	●
<i>Backhousia citriodora</i>	Lemon-scented Myrtle	10m	4m	S			●	●
<i>Elaeocarpus reticulatus</i>	Blueberry Ash	10m	4m	S	●	●	●	●
<i>Waterhousia floribunda</i> 'Green Avenue'	Weeping Lilly Pilly	8m	5m	S	●		●	●
<b>Exotic Evergreen</b>								
<i>Phoenix canariensis</i> <sup>3</sup>	Date Palm	10m	7m	M			●	
<b>Exotic Deciduous</b>								
<i>Ginkgo biloba</i>	Maidenhair Tree	15m	15m	L			●	
<i>Liriodendron tulipifera</i>	Tulip Tree	18m	8m	L			●	
<i>Jacaranda mimosifolia</i> <sup>3</sup>	Jacaranda	12m	8m	M			●	

**LANEWAY**

Botanical Name	Common Name	Height	Diameter	Size	NSW Native	Locally indigenous	Exists On Site?	Suitable under power lines <sup>1</sup>
<b>Native Evergreen</b>								
<i>Flindersia australis</i>	Crows Ash	18m	4m	L	●		●	
<i>Livistona australis</i>	Cabbage Tree Palm	18m	2m	L	●	●	●	
<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark	18m	8m	L	●		●	●
<i>Tristaniopsis laurina</i>	Water Gum	10m	5m	M	●	●	●	●
<i>Backhousia citriodora</i>	Lemon-scented Myrtle	10m	4m	S			●	●
<i>Callistemon salignus</i>	Willow Bottlebrush	8m	3m	S	●	●	●	●
<i>Callistemon viminalis</i>	Bottlebrush	8m	4m	S	●		●	●
<i>Davidsonia johnsonii</i>	Davidson's Plum	6m	3m	S				●
<i>Elaeocarpus reticulatus</i>	Blueberry Ash	10m	4m	S	●	●	●	●
<i>Hibiscus tiliaceus</i>	Coast Cottonwood	8m	4m	S	●			●
<i>Melaleuca decora</i>	White Feather Honey Myrtle	7m	4m	S	●	●		●
<i>Syzigium leuhmannii</i>	Riberry	10m	4m	S	●		●	●
<b>Exotic Deciduous</b>								
<i>Pyrus calleryana</i> 'Cleveland Select'	Callery Pear	11m	6m	M			●	
<i>Koelreutaria paniculata</i>	Golden Rain Tree	10m	4m	S				●
<i>Lagerstroemia indica</i>	Crepe Myrtle	10m	4m	S			●	●

**SHARED ZONE**

Botanical Name	Common Name	Height	Diameter	Size	NSW Native	Locally indigenous	Exists On Site	Suitable under power lines <sup>1</sup>
<b>Native Evergreen</b>								
<i>Livistona australis</i>	Cabbage Tree Palm	18m	2m	L	●	●	●	
<i>Elaeocarpus eumundi</i>	Eumundi Quondong	15m	5m	M	●		●	
<i>Elaeocarpus reticulatus</i>	Blueberry Ash	10m	4m	S	●	●	●	●
<b>Native Deciduous</b>								
<i>Brachychiton discolor</i>	Queensland Lacebark	18m	10m	L	●		●	
<i>Brachychiton acerifolius</i>	Illawarra Flame Tree	12m	6m	M	●		●	
<b>Exotic Evergreen</b>								
<i>Washingtonia robusta</i>	Mexican Fan Palm	20m	2m	L			●	
<i>Phoenix dactylifera</i>	Date Palm	10m	7m	M			●	
<b>Exotic Deciduous</b>								
<i>Fraxinus pennsylvanica</i>	Green Ash	15m	8m	L				
<i>Ginkgo biloba</i>	Maidenhair Tree	15m	15m	L			●	
<i>Platanus x acerifolia (syn. P.hybrida)</i>	London Plane	20m	10m	L			●	
<i>Acer buergerianum</i>	Trident Maple	10m	6m	M				
<i>Fraxinus oxycarpa 'Raywood'</i>	Claret Ash	12m	7m	M			●	
<i>Jacaranda mimosifolia</i>	Jacaranda	12m	8m	M			●	
<i>Koelreutaria bipinnata</i>	Chinese Rain Tree	12m	10m	M				
<i>Pistacia chinensis</i>	Chinese Pistachio	10m	6m	M				
<i>Pyrus calleryana 'Cleveland Select'</i>	Callery Pear	11m	6m	M			●	
<i>Ulmus parvifolia 'Todd'</i>	Chinese Elm	10m	11m	M			●	
<i>Zelkova serrata 'Green Vase'</i>	Japanese Zelkova	10m	10m	M			●	
<i>Koelreutaria paniculata</i>	Golden Rain Tree	10m	4m	S				●
<i>Lagerstroemia indica</i>	Crepe Myrtle	10m	4m	S			●	●

**PEDESTRIAN ONLY**

Botanical Name	Common Name	Height	Diameter	Size	NSW Native	Locally indigenous	Exists On Site	Suitable under power lines <sup>1</sup>
<b>Native Evergreen</b>								
<i>Corymbia maculata</i> <sup>2</sup>	Spotted Gum	20m	10m	L	●	●	●	
<i>Eucalyptus punctata</i> <sup>2</sup>	Grey Gum	35m	10m	L	●	●	●	
<i>Ficus rubiginosa</i>	Port Jackson Fig	18m	20m	L	●	●	●	
<i>Flindersia australis</i>	Crows Ash	18m	4m	L	●		●	
<i>Livistona australis</i>	Cabbage Tree Palm	18m	2m	L	●	●	●	
<i>Lophostemon confertus</i>	Brush Box	22m	10m	L	●		●	●
<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark	18m	8m	L	●		●	●
<i>Elaeocarpus eumundi</i>	Eumundi Quondong	15m	5m	M	●		●	
<i>Harpullia pendula</i>	Tulipwood	10m	3m	M	●		●	●
<i>Stenocarpus sinuatus</i>	Firewheel Tree	10m	7m	M	●		●	
<i>Tristaniaopsis laurina</i>	Water Gum	10m	5m	M	●	●	●	●
<i>Elaeocarpus reticulatus</i>	Blueberry Ash	10m	4m	S	●	●	●	
<i>Waterhousia floribunda 'Green Avenue'</i>	Weeping Lilly Pilly	8m	5m	S	●		●	
<b>Native Deciduous</b>								
<i>Brachychiton discolor</i>	Queensland Lacebark	18m	10m	L	●		●	
<i>Brachychiton acerifolius</i>	Illawarra Flame Tree	12m	6m	M	●		●	
<i>Melia azedarach</i>	White Cedar	10m	8m	M	●		●	
<b>Exotic Evergreen</b>								
<i>Fraxinus griffithii</i>	Evergreen Ash	7m	4m	S			●	
<i>Michelia x alba</i>	White Sandalwood	7m	4m	S				
<b>Exotic Deciduous</b>								
<i>Fraxinus pennsylvanica</i>	Green Ash	15m	8m	L				●
<i>Ginkgo biloba</i>	Maidenhair Tree	15m	15m	L			●	
<i>Liriodendron tulipifera</i>	Tulip Tree	18m	8m	L			●	
<i>Platanus x acerifolia (syn. P.hybrida)</i>	London Plane	20m	10m	L			●	
<i>Fraxinus oxycarpa 'Raywood'</i>	Claret Ash	12m	7m	M			●	●
<i>Koelreutaria bipinnata</i>	Chinese Rain Tree	12m	10m	M				●
<i>Pistacia chinensis</i>	Chinese Pistachio	10m	6m	M				●
<i>Pyrus calleryana 'Cleveland Select'</i>	Callery Pear	11m	6m	M			●	●
<i>Ulmus parvifolia 'Todd'</i>	Chinese Elm	10m	11m	M			●	●
<i>Zelkova serrata 'Green Vase'</i>	Japanese Zelkova	10m	10m	M			●	
<i>Koelreutaria paniculata</i>	Golden Rain Tree	10m	4m	S				
<i>Lagerstroemia indica</i>	Crepe Myrtle	10m	4m	S			●	

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**PARK EDGE**

Botanical Name	Common Name	Height	Diameter	Size	NSW Native	Locally indigenous	Exists On Site	Suitable under power lines <sup>1</sup>
<b>Native Evergreen</b>								
<i>Agathis robusta</i>	Queensland Kauri	45m	20m	L				
<i>Angophora floribunda</i> <sup>2</sup>	Rough-barked Apple	15m	15m	L	●	●	●	
<i>Angophora subvelutina</i> <sup>2</sup>	Broad-leaved Apple	15m	15m	L	●			
<i>Araucaria heterophylla</i>	Norfolk Island Pine	22m	12m	L			●	
<i>Argyrodendron actinophyllum</i>	Black Booyong	25m	10m	L				
<i>Corymbia citriodora</i> <sup>2</sup>	Lemon-scented Gum	22m	8m	L	●		●	
<i>Corymbia eximia</i> <sup>2</sup>	Yellow Bloodwood	15m	7m	L	●		●	
<i>Corymbia gummifera</i> <sup>2</sup>	Red Bloodwood	20m	10m	L	●	●	●	
<i>Corymbia maculata</i> <sup>2</sup>	Spotted Gum	20m	10m	L	●	●	●	
<i>Eucalyptus bauerana</i> <sup>2</sup>	Blue Box	30m	8m	L	●	●	●	
<i>Eucalyptus crebra</i> <sup>2</sup>	Narrow-leaved Ironbark	35m	10m	L	●	●	●	
<i>Eucalyptus fibrosa</i> <sup>2</sup>	Red Ironbark	35m	10m	L	●	●		
<i>Eucalyptus haemastoma</i> <sup>2</sup>	Scribbly Gum	15m	10m	L	●	●	●	
<i>Eucalyptus longifolia</i> <sup>2</sup>	Woollybutt	20m	10m	L	●	●		
<i>Eucalyptus microcorys</i> <sup>2</sup>	Tallowwood	22m	10m	L	●		●	
<i>Eucalyptus moluccana</i> <sup>2</sup>	Grey Box	25m	10m	L	●	●	●	
<i>Eucalyptus paniculata</i> <sup>2</sup>	Grey Ironbark	25m	10m	L	●	●		
<i>Eucalyptus piperita</i> <sup>2</sup>	Sydney Peppermint	20m	10m	L	●	●		
<i>Eucalyptus punctata</i> <sup>2</sup>	Grey Gum	35m	10m	L	●	●	●	
<i>Eucalyptus robusta</i> <sup>2</sup>	Swamp Mahogany	25m	10m	L	●	●	●	
<i>Eucalyptus saligna</i> <sup>2</sup>	Sydney Blue Gum	25m	10m	L	●	●	●	
<i>Ficus macrophylla</i>	Moreton Bay Fig	22m	35m	L	●			
<i>Ficus microcarpa</i> var. <i>hillii</i>	Hills Weeping Fig	22m	30m	L			●	
<i>Ficus rubiginosa</i>	Port Jackson Fig	18m	20m	L	●	●	●	
<i>Flindersia australis</i>	Crows Ash	18m	4m	L	●		●	
<i>Livistona australis</i>	Cabbage Tree Palm	18m	2m	L	●	●	●	
<i>Lophostemon confertus</i>	Brush Box	22m	10m	L	●		●	
<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark	18m	8m	L	●		●	
<i>Syncarpia glomulifera</i> <sup>2</sup>	Turpentine	40m	10m	L	●	●	●	
<i>Angophora costata</i> <sup>2</sup>	Smooth-barked Apple	15m	10m	M	●	●	●	
<b>Native Deciduous</b>								
<i>Brachychiton discolor</i>	Queensland Lacebark	18m	10m	L	●		●	
<i>Brachychiton acerifolius</i>	Illawarra Flame Tree	12m	6m	M	●		●	
<i>Melia azedarach</i>	White Cedar	10m	8m	M	●		●	
<b>Exotic Evergreen</b>								
<i>Washingtonia robusta</i>	Mexican Fan Palm	20m	2m	L			●	
<i>Phoenix dactylifera</i>	Date Palm	10m	7m	M			●	
<b>Exotic Deciduous</b>								
<i>Fraxinus pennsylvanica</i>	Green Ash	15m	8m	L				
<i>Ginkgo biloba</i>	Maidenhair Tree	15m	15m	L			●	
<i>Liriodendron tulipifera</i>	Tulip Tree	18m	8m	L			●	
<i>Platanus x acerifolia</i> (syn. <i>P.hybrida</i> )	London Plane	20m	10m	L			●	
<i>Populus alba</i> 'Pyramidalis'	Upright White Poplar	18m	15m	L				
<i>Populus deltoides</i>	Cottonwood	22m	15m	L				
<i>Populus simonii</i>	Simon Poplar	18m	3m	L				

**NOTES**

- Trees planted under powerlines will general require Selective Reduction Pruning to meet Ausgrid Clearances. The extent of such pruning or whether the species is suitable for the site will depend on the type and span of the powerline, and an individual site assessment should be undertaken to ensure the species is suitable for location.
- All trees produce deadwood which may need to be removed. The frequency of deadwood removal will depend on the location (i.e next footpaths, roads and other high value targets) and species.

**OPEN SPACE**

Botanical Name	Common Name	Height	Diameter	Size	NSW Native	Locally indigenous	Exists On Site	Suitable under power lines <sup>1</sup>
<b>Native Evergreen</b>								
<i>Agathis robusta</i>	Queensland Kauri	45m	20m	L				
<i>Angophora costata</i> <sup>2</sup>	Smooth-barked Apple	15m	10m	M	●	●	●	
<i>Angophora floribunda</i> <sup>2</sup>	Rough-barked Apple	15m	15m	L	●	●	●	
<i>Angophora subvelutina</i> <sup>2</sup>	Broad-leaved Apple	15m	15m	L	●			
<i>Araucaria heterophylla</i>	Norfolk Island Pine	22m	12m	L			●	
<i>Argyrodendron actinophyllum</i>	Black Booyong	25m	10m	L				
<i>Backhousia citriodora</i>	Lemon-scented Myrtle	10m	4m	S			●	
<i>Banksia integrifolia</i>	Coastal Banksia	10m	4m	S	●	●	●	
<i>Banksia serrata</i>	Old-man Banksia	16m	4m	M	●	●	●	
<i>Brachychiton populneus</i>	Kurrajong	8m	10m	M	●		●	
<i>Corymbia citriodora</i> <sup>2</sup>	Lemon-scented Gum	22m	8m	L	●		●	
<i>Corymbia eximia</i> <sup>2</sup>	Yellow Bloodwood	15m	7m	L	●		●	
<i>Corymbia gummifera</i> <sup>2</sup>	Red Bloodwood	20m	10m	L	●	●	●	
<i>Corymbia maculata</i> <sup>2</sup>	Spotted Gum	20m	10m	L	●	●	●	
<i>Cupaniopsis anacardioides</i>	Tuckeroo	15m	15m	M	●		●	
<i>Eucalyptus bauerana</i> <sup>2</sup>	Blue Box	30m	8m	L	●	●		
<i>Eucalyptus crebra</i> <sup>2</sup>	Narrow-leaved Ironbark	35m	10m	L	●	●	●	
<i>Eucalyptus fibrosa</i> <sup>2</sup>	Red Ironbark	35m	10m	L	●	●	●	
<i>Eucalyptus haemastoma</i> <sup>2</sup>	Scribbly Gum	15m	10m	L	●	●	●	
<i>Eucalyptus longifolia</i> <sup>2</sup>	Woollybutt	20m	10m	L	●	●		
<i>Eucalyptus microcorys</i> <sup>2</sup>	Tallowwood	22m	10m	L	●		●	
<i>Eucalyptus moluccana</i> <sup>2</sup>	Grey Box	25m	10m	L	●	●	●	
<i>Eucalyptus paniculata</i> <sup>2</sup>	Grey Ironbark	25m	10m	L	●	●		
<i>Eucalyptus piperita</i> <sup>2</sup>	Sydney Peppermint	20m	10m	L	●	●		
<i>Eucalyptus punctata</i> <sup>2</sup>	Grey Gum	35m	10m	L	●	●	●	
<i>Eucalyptus robusta</i> <sup>2</sup>	Swamp Mahogany	25m	10m	L	●	●	●	
<i>Eucalyptus saligna</i> <sup>2</sup>	Sydney Blue Gum	25m	10m	L	●	●	●	
<i>Ficus macrophylla</i>	Moreton Bay Fig	22m	35m	L	●			
<i>Ficus microcarpa</i> var. <i>hillii</i>	Hills Weeping Fig	22m	30m	L			●	
<i>Ficus rubiginosa</i>	Port Jackson Fig	18m	20m	L	●	●	●	
<i>Flindersia australis</i>	Crows Ash	18m	4m	L	●		●	
<i>Livistona australis</i>	Cabbage Tree Palm	18m	2m	L	●	●	●	
<i>Lophostemon confertus</i>	Brush Box	22m	10m	L	●		●	
<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark	18m	8m	L	●		●	
<i>Syncarpia glomulifera</i> <sup>2</sup>	Turpentine	40m	10m	L	●	●	●	
<i>Syzigium paniculatum</i>	Brush Cherry	10m	6m	M	●		●	
<i>Tristaniopsis laurina</i>	Water Gum	10m	5m	M	●	●	●	
<b>Native Deciduous</b>								
<i>Brachychiton acerifolius</i>	Illawarra Flame Tree	12m	6m	M	●		●	
<i>Brachychiton discolor</i>	Queensland Lacebark	18m	10m	L	●		●	
<i>Melia azedarach</i>	White Cedar	10m	8m	M	●		●	
<b>Exotic Evergreen</b>								
<i>Phoenix dactylifera</i>	Date Palm	10m	7m	M			●	
<i>Quercus ilex</i>	Holm Oak	15m	15m	L				
<i>Washingtonia robusta</i>	Mexican Fan Palm	20m	2m	L			●	
<b>Exotic Deciduous</b>								
<i>Fraxinus pennsylvanica</i>	Green Ash	15m	8m	L				
<i>Ginkgo biloba</i>	Maidenhair Tree	15m	15m	L			●	
<i>Liriodendron tulipifera</i>	Tulip Tree	18m	8m	L			●	
<i>Platanus x acerifolia</i> (syn. <i>P.hybrida</i> )	London Plane	20m	10m	L			●	
<i>Populus alba</i> 'Pyramidalis'	Upright White Poplar	18m	15m	L				
<i>Populus deltoides</i>	Cottonwood	22m	15m	L				
<i>Populus simonii</i>	Simon Poplar	18m	3m	L				
<i>Ulmus parvifolia</i> 'Todd'	Chinese Elm	10m	11m	M			●	

## 4.3 Engaging with Community

### Increase Community Knowledge and Engagement

The urban tree canopy affects everyone in the community. Engaging the wider community involves not only informing them about the importance and benefits of green infrastructure, but also highlighting the role it plays in ensuring the liveability, sustainability and identity of our cities and neighbourhoods.

Trees in particular are a sensitive and emotive issue. There are many members of the community who love trees, those that do not, and some that may actually fear them.

This Master Plan has been developed to assist the community in understanding how and why Council makes its decisions on urban tree management.

Council values its community's opinion and will undertake meaningful two way consultation and communications in relation to tree removal, renewal and management. Further, Council seeks to provide and encourage individuals and groups to take an active role in the ongoing care of their neighbourhood trees.



Simple technique for promoting the environmental benefits of different tree species (City of Canada Bay)

#### Recommended Actions:

Promote the value of a healthy urban tree canopy to the community by:

- + Developing a specialised marketing strategy to disseminate information on the numerous environmental, social and economic benefits that trees provide.
- + Identifying and cultivating partnerships with other stakeholders, that are mutually beneficial, that share similar ideals such as health or environmental departments or organisations.
- + Encouraging and supporting further research into Australian urban tree management.
- + Working with traditional owners to develop community programs that increase knowledge of the cultural significance of landscapes in our environment.
- + Developing health and wellbeing indicators to benchmark the role of our urban forests in contributing to human health.

Raise awareness among key stakeholders by:

- + Informing and consulting the community regarding projects impacting on trees such as streetscape planning, tree removal and tree planting.
- + Reviewing and updating Council's website to provide timely and accurate tree management information.
- + Preparing information sheets covering topics such as: Correct planting techniques; How to help care for trees, Solving tree problems – trees located on boundaries and neighbour conflicts.

Encourage community stewardship by:

- + Considering the implementation of a tree donation policy that encourages and supports the community to green their properties.
- + Promoting involvement in community planting days.
- + Reviewing appropriate grant scheme that help to facilitate projects that meet this masterplan's aims.

#### Resource: Greener Spaces Better Places - Who's With Us?

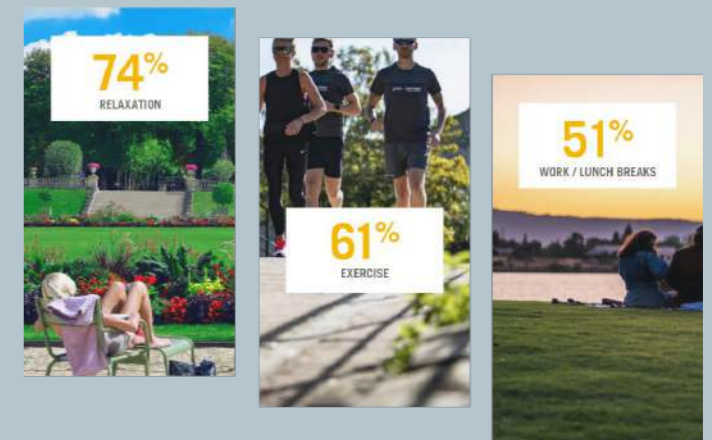


Greener Spaces Better Places (formerly 2020 Vision) is a national initiative that brings together academia, business, government, community groups and the green industry to share knowledge and find new ways to work together to make sure that as our cities and towns grow, so too do our green spaces.

The *Who's With Us? Community Attitudes Guide* provides a resource to assist councils engage with communities around urban greening.

The guide includes:

- + Research findings, including:
  - + national community attitudes survey
  - + audit of council greening strategies
  - + conversations with 15 councils regarding engaging community
  - + review of articles looking at how media talk about green space
  - + survey of developer organisations looking at how they talk about green space
- + Data on what people value and how they use green space
- + Engagement ideas
- + Customisable advertising kit





## Case Study: Council's Native Planting Initiatives

### Native Plant Giveaway

Every year, Council offers free native plant seedlings to residents and schools to help the community create habitat. This includes an annual school giveaway, spring community giveaway and National Tree Day. Plant giveaways are promoted in local newspapers, through Council's social media channels and on [cb.city/whatson](http://cb.city/whatson).

### Resources and Information

Council's webpage also includes information on nurseries where native plants can be purchased.

There is also information on creating a native garden including:

- + a "Your Native Garden Guide"
- + a map of Canterbury Bankstown planting zones
- + a native plant selector

[www.cb.city.nsw.gov.au/environment/biodiversity/native-plants](http://www.cb.city.nsw.gov.au/environment/biodiversity/native-plants)

These initiatives should be retained and promoted as part of Council's overall community engagement strategy.



Your Native Garden Guide (City of Canterbury Bankstown)

## Case Study: Blacktown Cool Streets



Cool Streets is a Blacktown City Council initiative that combines scientific research and public engagement, working with local communities to implement effective street tree plantings that provide shade in heat-affected urban areas and reduce CO2 emissions.

Cool Streets grew from Dr Libby Gallagher's research into the potential of streets to tackle climate change. The research found that a few simple changes to street design could reduce CO2 emissions, cool neighbourhoods and reduce electricity bills for residents.

The Cool Streets Method combines information modelling using the Cool Streets Model in tandem with a collaborative decision-making process.

The Cool Streets Model is software that models streetscape components to determine the best environmental outcomes. These components can include various types of trees, layouts of plantings as well as streetscape elements such as pavements and kerbs. The modelling can be applied to new and existing streets.

Once various layouts for a street are tested, street retrofit options can be ranked to determine the most effective layout to reduce CO2 emissions and maximise shading. Data is used to start a conversation with residents and other interested parties. Participants can share information, understand each other's preferences and shape an appropriate design for their street. Residents approve the final design for their street and feel a sense of ownership to look after the trees as they grow.

[www.coolstreets.com.au/blacktown-pilot-project](http://www.coolstreets.com.au/blacktown-pilot-project)

The collaborative decision-making process of this project makes it a good benchmark for similar engagement strategies that may be adopted by CBCity.



## 4.4 Retaining and Protecting Existing Trees

### Protect and Manage the Existing Tree Canopy

The most effective action for increasing average tree size and tree canopy is to protect and manage existing trees in Bankstown and Campsie.

Canterbury Bankstown's urban trees are living in a harsh urban environment, which can be unforgiving on trees. Ongoing maintenance and tree protection are vital due to the impacts of pollution, poor soil conditions, limited water and changing infrastructure.

With a large proportion of Canterbury Bankstown's canopy cover provided by Council's street and park trees, it is imperative that best practice maintenance techniques are used to improve their health and condition.

Council is committed to the long-term health of its urban trees and will prioritise the maintenance and conservation of existing trees in order to maximise the benefits already received from this asset. The following actions, of tree retention, tree protection and improved asset management have been recommended to achieve this.

#### Tree Retention

Establishing Canterbury Bankstown's urban tree canopy has already required considerable expense and represents a considerable financial asset. Planting undertaken by Council, private developers and home owners over time has created this extensive and diverse urban tree population.

Trees take many years to grow. As there is already an established urban tree canopy, it simply makes sense that Council should implement strategies and actions to retain trees that are healthy and in good condition. This applies to all trees where staged replacement may be required, as all trees contribute to the micro and macro benefits outlined before in Section 1.3.

Importantly, larger trees have been found to be more valuable (providing between 4 to 8 times the benefits) than small trees. Therefore, Council recognises it needs to promote the maintenance and protection of these assets.

#### Recommended Actions:

- + Prepare a Significant Tree Register. This should define how a tree can be considered significant, what significant means, and apply it to individual specimens regardless of provenance and whether or not they are protected by a TMO. The Significant Tree Register should identify trees that are of special aesthetic, historical, social or environmental significance. These trees can be located in public spaces, parkland, reserves, streetscapes and privately owned properties. Trees considered significant in the future can also be added to the register.
- + Regulate and assess applications to prune or remove trees through the Tree Management Orders detailed in Development Control Plans.
- + Update regulations and provide incentives to ensure current and future development projects are designed to retain existing trees and to expand the tree canopy cover.
- + Use education and regulatory compliance tools, where required, to ensure that all developments, including construction hoardings, are built in a manner that protect the trees to be retained.

- + Recognise and promote the trees listed within the Significant Tree Register (once prepared), which contribute to the environmental, cultural, social character of Canterbury Bankstown. The retention of significant trees is a priority warranting the reassessment or relocation of any proposed or existing competing activity.

#### Tree Protection

The protection of trees should be given high priority in all aspects of Council's activities.

The Tree Management Orders within DCPs will be the main tool to regulate and assess applications to prune or remove trees on private property. The use of assessment criteria by tree management staff will ensure a consistent approach to tree assessment.

Trees will also be given adequate protection from construction and other activities, such as major events, that are likely to have an adverse effect on their health and appearance. The *Australian Standard for the Protection of Trees on Development Sites (AS4970)* will be the main tool to specify and enforce the tree protection methods.

#### Recommended Actions:

- + Provide comprehensive tree protection guidelines developed in accordance with the *Australian Standard for the Protection of Trees on Development Sites (AS4970)*.
- + Ensure that development application submissions include all necessary information to allow full assessment of potential impacts on trees.
- + Impose tree protection bonds on developers and event organisers to ensure protection of Council street and park trees.
- + Enforce tree protection requirements through the available regulatory tools.
- + Refuse the pruning or removal of trees for inappropriate reasons / activities including; to create / restore a view, create solar access to solar panels, to reduce maintenance as a result of leaf, fruit, bird, bat droppings, provision of off street parking, or unsubstantiated fears of tree failure.
- + Prosecute anyone found responsible for the unauthorised pruning, removal or poisoning of trees.
- + Pursue the relocation of overhead powerlines and underground utility infrastructure away from trees or promoting other measures to reduce need for excessive canopy or root pruning.

## Asset Management

Council should ensure that high quality maintenance regimes are adopted and provide adequate resources for managing its urban tree population. Council should also keep abreast of new technology in the field of arboriculture, as well as pest and disease control and incorporate these into its management and maintenance techniques where appropriate.

Urban trees exist in an urban environment surrounded by built infrastructure, including roads, houses, drains, walls and fences. In some situations conflict occurs between these assets. In most situations the issue can be resolved without the need for tree removal, with priority given to 'tree friendly' repairs such as pier and beam footings, in conjunction with selective root pruning. Tree removal should be a "last resort option".

While trees play an important role in the urban landscape, it is also recognised that trees of the wrong type, or growing in the wrong place, can create problems and unreasonable risks in an urban environment. Property owners and public authorities have certain obligations with respect to the protection of trees, and responsibilities for any damage or injury associated with the presence, failure or growth of trees.

Tree management is all about managing the various risks and benefits of trees in the urban environment to ensure the best community outcome. Council should utilise information systems on trees to facilitate decision making and allow prioritisation of management resources.

## Recommended Actions:

- + Establish and manage a computer-based inventory of all trees as part of managing risk. Protocols should be developed to formalise existing processes to ensure Council is meeting its duty of care in managing its trees. These protocols should be followed by the tree management and maintenance teams, contractors and consultants and should include:
  - + Why trees are inspected / assessed, and who does it
  - + Overall Assessment Process
  - + How trees are inspected
  - + Risk Assessment Process
  - + Time frames for inspection and action
- + Undertake proactive maintenance regimes for Council's street and park trees assets.
- + Create best management practices for the pruning, watering, tree bases, pest and disease control and general maintenance of trees.
- + Hire appropriately qualified arboricultural staff and external service providers to undertake all maintenance activities.
- + Develop Tree Management Plans for key parks and streetscapes to provide long term strategies that guide the short term activities required to ensure the health and amenity of our tree assets.
- + Undertake regular audits of the maintenance performance to ensure all works performed are in accordance with the relevant Australian Standards.
- + Record all maintenance activities into a centralised electronic tree database, to manage the asset most effectively whilst also managing any risks.



Large, mature existing trees make a significant contribution to our urban environment (Bankstown)

## 4.5 Street Trees

### Increase Canopy Cover to Streets

It is imperative that Council increases the canopy cover across the Bankstown City Centre and Campsie Town Centre, and across the LGA as a whole.

For commercial centres, a canopy cover target of 15% has been set, and for urban residential areas, a canopy cover target of 25% has been set. These targets align with those established by the Greater Sydney Region Plan, the Department of Planning, Industry and Environment's 5 Million Trees Program, and the NSW State Government in their Greener Places design guide.

Bankstown's existing canopy cover is currently just 14% and Campsie's is just 13%. This means there is a significant gap that needs to be addressed to meet international benchmarks, State Government targets and Council's vision.

As outlined in Section 3.2, in order to achieve the overall canopy cover targets of 15% for commercial centres and 25% for urban residential areas, both public land in the form of streets and open space, and private land will need to contribute to tree canopy cover. The tree canopy cover target for streets and open space is 40%, whilst the target for private land is a minimum of 5% in commercial centres and 20% in urban residential areas.

It should be noted that achieving the tree canopy cover targets within public streets and open space is directly within Council's control. Developers will also contribute to street trees and trees on semi-public open spaces (parks, plazas, through-site links etc.).

### Achieving Canopy Cover Targets

Increasing the canopy cover in Bankstown and Campsie to achieve the nominated targets is no easy task. It involves managing the gradual removal of the existing canopy through natural attrition or due to impacts such as development, ensuring replacement trees are planted where appropriate and identifying opportunities for new trees.

Whilst this may sound straightforward, Council understands the complexity in the direct and indirect decision making processes that will impact the performance of the existing and future canopy cover.

Setting targets provides a valuable tool in making well informed and justified decisions, as well as measuring Council's performance over time. Importantly, the targets also form a transition from measuring performance based on individual trees to focusing on the collective coverage and benefits.

#### Recommended Actions:

- + Ensure that Council's related policies, plans, programs and procedures actively support canopy cover increase.
- + Maintain existing tree canopy as outlined in section 4.4.
- + Use DCP controls to provide adequate protection for existing tree canopy and setting tree canopy cover targets for new developments. Refer to Landscape Controls Report.
- + Seek new opportunities for planting in public streets and open spaces, including the planting of large canopy trees in appropriate locations.
- + Investigate grant programs that encourage and facilitate community tree planting on private property.
- + Measure canopy cover at specific intervals (every 5 years) to check Council's performance against the established targets.
- + Review this Tree Canopy Master Plan every 5 years in the light of the tree canopy cover achieved to determine if priority actions need to be updated.

### New Tree Planting

A critical element of increasing canopy coverage is ensuring good quality trees are supplied, planted correctly and receive regular maintenance in their formative years. There is no point planting if the new or replacement tree will not thrive in the site and reach maturity.

Sometimes tree failure can be attributable to the standard of stock that is planted. Council should ensure only quality trees are planted on public and private land through adherence to quality standards and specifications.

Planting a tree correctly is also vital in ensuring it establishes and provides the desired benefits. Council's standard tree planting details have been reviewed as part of this master plan and are included in Appendix B. Council also needs to assess landscape plans for private development sites to increase the successful establishment of canopy cover on private property.

The maintenance performed on newly planted and young trees is critical in ensuring you gain the maximum from the investment. Resolving minor issues such as minor defects when the tree is small is of limited expense. Resolving the issues once the tree has matured, or worse, failed, is much more costly.

#### Recommended Actions:

- + Plant in accordance with the standard tree planting details in the Landscape Controls Report.
- + Ensure only quality trees are supplied for planting. These trees should conform with the NATSPEC "Guide for assessing the quality of and purchasing of landscape trees".
- + Pay close attention to tree installation plans, details and techniques to ensure successful establishment of tree stock.
- + Undertake specialised young tree maintenance on all planted street and park trees, including formative pruning, for a minimum period of two years.

### Street Tree Locations

As outlined in section 2.3, street trees in urban areas are inherently in competition for physical space, both above and below ground. Public streets are the subject of many demands in the form of space for vehicles, parking, utilities, pedestrian footpaths and cycleways. The presence of overhead wires, awnings, bridges etc can often preclude street trees or significantly limit their size. Underground services can also preclude new street tree planting or constrain soil volumes, thereby limiting their size.

In terms of existing streets, Council should explore all available opportunities for new street tree planting and for planting the largest sized trees that are appropriate to the specific situation and location. For example, whilst many streets outside of commercial centres are constrained by overhead wires, there are often locations where wires cross the street where larger trees can be planted within verges even if the majority of trees sit below wires and are limited in size. There is also no requirement for trees on both sides of a street with overhead wires to be the same species and size - if no wires are present along one side of a street, then larger sized trees should be planted on that side with smaller trees underneath wires.

In many streets, there may also be alternative locations for trees e.g. in central medians and in parking lanes which may be less constrained by overhead wires and underground services.

## Utility Services

Utility services provide a significant constraint to increasing canopy cover in streets through:

- + precluding street tree planting altogether due to service utility allocations/easements.
- + restricting the available soil volume for street trees thereby limiting tree size and canopy cover.
- + excavation for new services installation can cause significant damage or even death to existing street trees.
- + pruning to provide clearance to overhead wires can limit tree size and canopy, as well as sometimes resulting in structural defects in existing trees.

Overcoming the challenges created by services in order to increase tree canopy cover can be difficult but the following strategies will assist Council in achieving the best outcome for the urban tree canopy.

### Recommended Actions:

- + Underground services Explore opportunities to underground electrical wires, particularly in commercial centres and higher density residential areas, including introducing appropriate DCP controls and DA conditions on private developers.
- + Liaise with utility companies to minimise the impacts of services on existing trees and explore opportunities for new tree planting. This might include the planting of some medium to large sized species with a decurrent (rounded) habit which can be pruned through selective reduction pruning to allow the powerlines to run through the crown (rather than keeping the tree pruned to below powerline level). However, the impacts to the crown of the tree will be very much dependent on the height and span of the powerlines, and the quality of the pruning works.
- + Where overhead wires cannot be undergrounded, investigate opportunities to fund and manage aerial bundled cabling where multi span wires are converted into one cable. This drastically reduces the extent of

pruning required for nominal line clearance.

- + Consider exploring the opportunity where new utilities are being layered for shared utility trenches which combine multiple services within a more compact area of the street verge to reduce the overall space dedicated to in-ground utilities and to maximise the opportunities for deep soil planting.
- + Where there are new or existing underground services, strategies for providing canopy trees may include: communication with utility companies, investigating the relocation or consolidation of services away from tree root zones, deviating from typical street layouts to provide alternate locations for trees (including asymmetrical arrangements), implementing tree root barriers or encasing services to allow trees to grow closer to services.
- + Consider the use of multi-function poles within commercial centres. Multi-function poles are street poles that accommodate several functions and services on the same pole e.g. street lighting, traffic signals/ signage, telecom/digital infrastructure, Council signage and CCTV. Installation of multi-function poles reduces the total number of poles installed in the street. This reduces street clutter, improves streetscape amenity, and minimises potential conflicts with street trees.

## Soil Volume

Tree soil volume refers to the volume of available growing media available to support the growth of street tree roots. Sufficient soil volume needs to be provided for all new street trees to ensure they are able to grow at a reasonable rate, reach maximum canopy size, and maintain vitality for the duration of their useful life.

Soil volume can be calculated by considering the availability of soil of suitable quality, and can include existing site soils in areas adjoining street tree planting and beyond adjacent property boundaries. When calculating available soil volumes, consider the alignment, space occupied and possible restriction of natural root spread and development of service trenches. Adjacent site soil can be included in soil volume calculations if it can be demonstrated that tree roots have unrestricted access to it.

### Recommended Actions:

- + Achieve maximum soil volume possible. Refer [www.elkeh.com.au/soils/](http://www.elkeh.com.au/soils/) for bespoke recommended tree soil volume calculations.
- + Where verge widths are constrained by other street elements, provide structural soil or cell systems beneath adjacent footpaths to ensure trees have adequate soil volumes.
- + In constrained soil situations, tree species selection should carefully consider the mature tree canopy and the ability of the tree to remain stable in the longer term. This will require smaller tree species to be planted in the areas of constrained soil.



Structural soil cell installation (Featherstone St, Bankstown)

## Soil Moisture

Access to adequate soil moisture enables trees to actively transpire and assist with atmospheric cooling. Low soil moisture can reduce evapotranspiration and limit the potential for trees to reduce urban heat as well as causing drought related stress and reducing useful life expectancy of trees.

The existing soil and substrate acts as a huge reservoir that can provide water for a healthy tree population. Ground surfaces need to allow rainfall and runoff to enter the soil.

Permeation of water through the entire soil profile is also critical. Deep watering encourages deep root growth better able to access soil moisture during low rainfall periods. The use of WSUD and passive irrigation techniques can achieve a variety of sustainable urban stormwater management objectives as well as promoting adequate soil moisture and the ongoing health of the urban tree population.

### Recommended Actions:

- + Incorporate the work undertaken as part of the Water Efficiency Study for Urban Tree Management by DPIE in Street Tree Management Policy, procedures and standard tree planting details. Refer to the Landscape Controls Report.



Modified broken kerbs for passive irrigation (Victoria Park, Sydney)

## 4.6 Open Space Trees

### Increase Canopy Cover across Open Spaces

As outlined in Section 3.2, in order to achieve the overall canopy cover targets of 15% for commercial centres and 25% for urban residential areas, the tree canopy cover target for open space is 40%.

#### Achieving Canopy Cover Targets

Refer to section 4.5.

#### New Tree Planting

Refer to section 4.5.

#### Open Space Tree Locations

Whilst it can be argued that trees in open space areas have less competition for physical space, both above and below ground, than those in streets, there are still numerous constraints to providing increased tree canopy in parks, reserves and other open spaces. These include:

- + the presence of active recreation facilities in the form of playing fields and sports courts which can take up large areas of land and limit the ability to increase canopy cover.
- + other competing demands for space such as playgrounds, skate parks, car parks, amenities buildings and other recreational facilities.
- + the desire for solar access to open space, particularly in winter months, which can affect the amount and type of canopy cover.

#### Recommended Actions:

- + Explore all available opportunities for new tree planting and for planting the largest sized trees that are appropriate to the specific situation and location.

#### Utility Services

Whilst utility services are typically less of a constraint within open space than within streets, they are still an important consideration. Refer to section 4.5 for more details.

#### Soil Volume

Whilst achieving adequate soil volumes for trees within open space is typically less challenging than within streets, it is still an important consideration. Refer to section 4.5 for more details.

#### Soil Moisture

Refer to section 4.5



Open space can provide opportunities for large sized trees (Tasker Park, Campsie)

## 4.7 Trees on Private Land

### Increase Canopy Cover across Private Land

As outlined in Section 3.2, in order to achieve the overall canopy cover targets of 15% for commercial centres and 25% for urban residential areas, both public land in the form of streets and open space, and private land will need to contribute to tree canopy cover. The tree canopy cover target for private land is a minimum of 5% in commercial centres and 20% in urban residential areas.

It should be noted that achieving the tree canopy cover targets within private land is through indirect control through mechanisms such as Development Control Plans (DCPs) and Tree Management Orders (TMOs).



Existing trees on private land (Bankstown)

### Achieving Canopy Cover Targets

As outlined in section 4.5, increasing the canopy cover in Bankstown City Centre and Campsie Town Centre to achieve the nominated targets will be challenging.

#### Recommended Actions:

- + Ensure that Council's related policies, plans, programs and procedures actively support canopy cover increase.
- + Maintain existing tree canopy as outlined in section 4.4.
- + Use DCP controls to provide adequate protection for existing tree canopy and setting tree canopy cover targets for new developments. Refer to Landscape Controls Report.
- + Investigate grant programs that encourage and facilitate community tree planting on private property.
- + Measure canopy cover at specific intervals (every 5 years) to check Council's performance against the established targets.
- + Review this Tree Canopy Master Plan every 5 years in the light of the tree canopy cover achieved to determine if priority actions need to be updated.

### Retaining and Protecting Existing Trees

#### Recommended Actions:

- + Regulate and assess applications to prune or remove trees through the Tree Management Orders detailed in Development Control Plans.
- + Update regulations and providing incentives to ensure current and future development projects are designed to retain existing trees and to expand the tree canopy cover.
- + Use education and regulatory compliance tools, where required, to ensure that all developments, including construction hoardings, are built in a manner that protect the trees to be retained.
- + Recognise and promote the trees listed within the Significant Tree Register (once prepared), which contribute to the environmental, cultural, social character of Canterbury Bankstown. The retention of significant trees is a priority warranting the reassessment or relocation of any proposed or existing competing activity.

Refer to section 4.4 for more details.

For the Principles, Recommended Controls and Other Actions proposed relating to tree retention and protection, refer to section 4.1 of the Landscape Controls Report.

### New Tree Planting

#### Recommended Actions:

- + Plant in accordance with approved landscape plans for private development sites.
- + Ensure only quality trees are supplied for planting. These trees should conform with the NATSPEC "Guide for assessing the quality of and purchasing of landscape trees".
- + Pay close attention to tree installation plans, details and techniques to ensure successful establishment of tree stock.
- + Ensure adequate maintenance plans are in place for new trees planted in private development sites.

For the Principles, Recommended Controls and Other Actions proposed relating to tree planting and canopy cover, refer to section 4.2 of the Landscape Controls Report.

## 4.8 Water Sensitive Urban Design

The use of Water Sensitive Urban Design (WSUD) and passive irrigation techniques can promote adequate soil moisture and the ongoing health of the urban tree population as well as achieving a variety of sustainable urban stormwater management objectives.

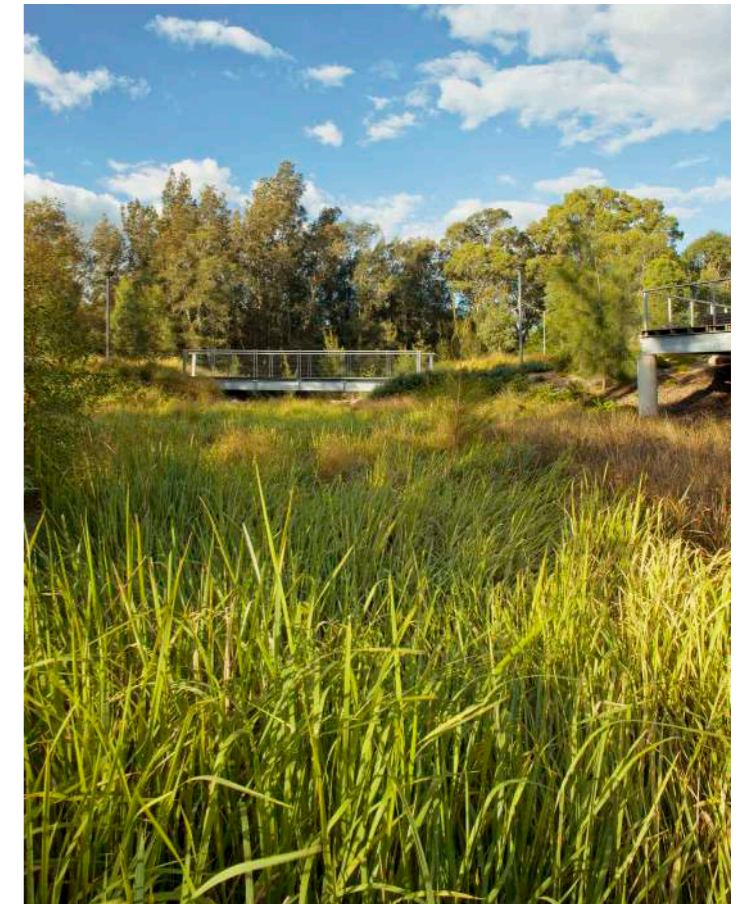
With expected long-term low water futures and a desired move away from reliance on costly potable water, alternative water sources are needed to ensure healthy vegetation growth. The use of WSUD and passive irrigation techniques can achieve a variety of sustainable urban stormwater management objectives as well as promoting adequate soil moisture and the ongoing health of the urban tree population.

### Recommended Principles for WSUD integration:

- + Integrate WSUD into the landscape design, as green and blue infrastructure are closely related and can often be co-located or combined.
- + Adopt appropriate WSUD measures for the specific situation, with reference to WSUD guidelines.
- + Maximise deep soil areas for water infiltration. This not only assists with sustainable stormwater management, but also helps to recharge soil moisture to support trees and tree canopy.
- + Consider within the landscape design the availability of rainwater for reuse, treated recycled water and the volume of any rainwater tanks in order to minimise, and ideally eliminate, the use of potable water for landscape irrigation.
- + Encourage the use of treated grey or blackwater in addition to the collection and reuse of rainwater, as there is often an inadequate and unreliable supply of rainwater to reuse for irrigation in addition to other uses such as toilet flushing.
- + Do not locate detention tanks in deep soil areas or under communal open space. They should not restrict the soil depth or volume available for trees and other plants.

### Recommended Actions:

- + Encourage Canterbury-Bankstown to become a water sensitive city.
- + Incorporate and expand water sensitive urban design measures wherever possible.
- + Ensure that available water content of soils in irrigated landscapes does not fall below 50% during vegetation growing seasons.
- + Improve soil structures to allow for oxygenation and water movement for the benefit of tree roots.
- + Replace asphalt and concrete with porous surfaces such as porous asphalt, turf, garden beds and rain gardens to reduce heat retention and encourage soil moisture retention.
- + Seek alternative water sources for all major parks and streets. Adopt the key outcomes of the Water Efficiency Study for Urban Tree Management (DPIE).
- + Review and refine WSUD opportunities identified for Campsie case study in the CRC for Water Sensitive Cities as part of Campsie Complete Streets.
- + Investigate sewer mining as a possible source of recycled water, considering:
  - + how the recycled water will be used
  - + the volume of recycled water required for the proposed end use
  - + required extraction volumes
  - + the proposed wastewater treatment system
  - + the space required for your on-site sewer mining treatment facility
  - + likely costs and savings
- + Investigate localised and/or site-specific water recycling facilities in Campsie and Bankstown as an alternative source of urban irrigation.
- + Investigate opportunities to develop/pilot a smart system to monitor soil moisture. This could monitor moisture real time and trigger site specific irrigation when moisture drops below the threshold level.



Water quality device, Rouse Hill (Image by Simon Wood)



**Case Study: Water Sensitive Urban Design Guidelines, Melbourne Water (2009)**



Melbourne Water's Water Sensitive Urban Design (WSUD) Guidelines set out Council's expectations for WSUD projects within the municipality, to inform developers and consultants.

The document provides information on the approvals process, design considerations, suitability of WSUD types in different conditions and considerations for construction, protection, maintenance and handover of WSUD assets.

*The breakdown of WSUD types in particular can serve as a useful reference for council in implementing WSUD across Campsie Town Centre and Bankstown City Centre.*

**Table A-1: Summary of treatment function, applicability and cost: Adapted from: Victorian Stormwater Committee (1999); Wong (2006); EPA (2008)**

	Bioretention swales	Bioretention basins /raingardens	Vegetated swales/ buffer strips	Sand filters	Sedimentation basins	Constructed wetlands	Ponds and shallow lakes	Rainwater tanks
<b>FUNCTION:</b> Water quality treatment: <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> Flow attenuation: <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> Stormwater conveyance: <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>								
<b>Particle size removal</b>								
Coarse-Medium particles 5000 µm - 125 µm	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
Fine particulates 125 µm - 10 µm	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
Very fine/Colloidal particulates 10 µm - 0.45 µm	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
Dissolved particles <0.45 µm								
<b>Additional function</b>		Landscape value	Aesthetic appeal Habitat values		Landscape value	Habitat, visual and recreation amenity	Habitat, visual and recreation amenity	Stormwater re-use
<b>APPLICABILITY:</b>								
Area requirement	Median strip/verge  Larger areas (with limited public access)	Streets  Limited space	Median strip/verge/ parks  Larger areas (with limited public access)	Streets/many  Limited space	Pre-treatment to wetland  Large areas	Parks/vacant land  Large areas	Aesthetic/post wetland  Large areas	On-property  Limited space
Slope considerations and approach to site constraints	Gentle slopes (< 5%). Where slopes exceed 5%, flow spreaders or check dams may be required.	Flat land. Where land is sloped terraces can be used.	Gentle slopes (< 5%). Where slopes exceed 5%, flow spreaders or check dams may be required.	Suitable for steeper slopes	Flat land	Flat land	Suitable for steep land	Suitable on most sites
Level of flow control	Conveyance	Discharge	Conveyance	Discharge	Discharge	Discharge	Discharge	Source
<b>INDICATIVE COSTS:</b>								
Installation costs	Moderate	Moderate	Low	Low/Moderate	High	High	High	Low
Maintenance costs	Moderate	Moderate	Moderate/High	Moderate	Moderate/High	Moderate	Moderate	Low

**WSUD Resource: Water Efficiency Study for Urban Tree Management, DPIE**



**Planning, Industry & Environment**

*This study by DPIE provides a valuable resource for assessing options for the integration of WSUD and Urban Tree Management, and can act as an ongoing resource for Council in implementing WSUD across Campsie Town Centre and Bankstown City Centre.*

The study highlights the following key outcomes that would assist in progressing the adoption and delivery of water efficient trees across the Greater Sydney area:

**Improved understanding of water efficient solutions:**

Water and landscape have typically been designed in isolation. The integrated planning and design of these elements together will help to deliver cost effective street trees which have ongoing resilience to the harsh urban conditions with the provision of adequate soil and water. Building the capacity of both the landscape and civil engineering industry on these integrated water efficient solutions for trees will be critical.

**Continued support of new tree projects which are resilient:**

The 5M trees program is a great initiative to support the future greening of Greater Sydney. The incorporation of requirements in the grant program to ensure the trees have suitable soil and water provisions will help to ensure this investment delivers the intended canopy cover outcomes. It will be important to ensure that capacity building is undertaken as well to ensure that these requirements can be well understood and applied.

**Integrated planning of alternative water supplies:**

To allow for the cost effective use of alternative water such as recycled water and stormwater, there needs to be appropriate planning to inform where this alternative water might be needed and the quality requirements of this water. This integrated planning will enable tree projects to capitalise on broader initiatives that may be servicing new developments or buildings.

**Best practice tree design and planting approaches:**

Most Councils have streetscape and street tree guidelines. These can typically be updated more easily than planning schemes. While these don't have the same 'teeth' as planning schemes to enforce uptake of water efficient tree pit design, they can provide useful information to guide the design of these systems to ensure they have suitable soil and water provision for the tree.

**Updates to planning documents:**

Planning schemes and policies can effectively protect and promote greening across Greater Sydney by protecting existing trees and promoting the uptake of new water efficient tree projects by setting minimum requirements.

*The adjacent excerpt from the Study provides a useful summary of potential water efficient solutions for trees.*

**WATER EFFICIENT SOLUTIONS FOR TREES**

In urban environments, the conditions are commonly harsh for trees with reduced available soil volumes due to compaction and underground services, less infiltration of water into soils due to impervious surfaces, and reflected heat from roads, buildings and pavements. Coupled with increasing climatic variability, this means all but the most drought tolerant and hardy native species will need some form of ongoing and/or supplementary irrigation to thrive and reach their full potential canopy cover.

There are a range of water efficient approaches available to support healthy and resilient tree growth. The adoption of these water efficient approaches can support the delivery of a green and cooler Greater Sydney. The following table provides a summary of a range of solutions to enable water efficient irrigation to urban trees in a range of contexts, settings and scales. The increasing scale of this application generally results in increasing benefit for tree health and vigour, and for broader benefits such as stormwater management, groundwater deep soil moisture recharge and urban cooling. The costs are also likely to increase with this increasing scale of intervention, so the right solution will be very site dependent and will respond to the objectives of a project. More intensive solutions (for example linear irrigation and infiltration trenches) may be more suitable where constructed in conjunction with other significant infrastructure projects, such as pavement resurfacing or drainage works. Conversely, where limited disturbance is required, such as in instances where trees are established and disturbance to an existing road work is not desirable, less intensive interventions may be provided at a lower cost.

● Good  
● Moderate  
● Poor

Water efficient solution	Leaky pipe around tree	Below ground infiltration trench or well	Sunken tree pit or raingarden - open	Sunken tree pit - grated	Below ground storage	Permeable pavements	Structural soils and cells	Irrigation scheduling technology	Drip irrigation	Water wells and butts	Soil moisture retention improvements
Example image											
Description	Kerb cut-outs and slotted pipes divert road stormwater into tree pit.	Kerb cut-outs direct road stormwater to a leaky infiltration trench or well.	An open sunken tree pit captures road stormwater from a vegetated surface.	A grated sunken tree pit receives stormwater from an inlet to the surface of a tree pit.	A storage below the root zone of a sunken tree pit that makes water available to plants during dry periods.	Permeable pavements allow water to pass through them from the surface. Often used with structural soils and cells.	Structural soils and cells can support roads or pavement while storing water and allowing root growth. Often used with permeable pavement.	Soil moisture probes. Programming / weather station connections.	Drip irrigation delivers water directly into the tree root zone.	Water wells and butts allow rapid filling from a water truck with slow leakage to a tree.	Soil additives can improve properties such as aeration, wetting, soil water retention capacity and others.
Site suitability											
Park suitability	●	●	●	●	●	●	●	●	●	●	●
Plaza suitability	●	●	●	●	●	●	●	●	●	●	●
Streetscape suitability	●	●	●	●	●	●	●	●	●	●	●
Likelihood of success due to the following considerations											
Design simplicity	●	●	●	●	●	●	●	●	●	●	●
Ease of retrofit	●	●	●	●	●	●	●	●	●	●	●
Poorly draining soils (water logging)	●	●	●	●	●	●	●	●	●	●	●
Likelihood of delivering the following benefits											
Stormwater treatment	●	●	●	●	●	●	●	N/A	N/A	N/A	N/A
Extended soil moisture retention	●	●	●	●	●	●	●	●	●	●	●
Connection to deep soils	●	●	●	●	●	●	●	●	●	●	●
Other considerations											
Typical water source	Stormwater from road / pavement	Stormwater from road / pavement	Stormwater from road / pavement	Stormwater from road / pavement	Stormwater from road/pavement.	Stormwater from road / pavement	Stormwater from road / pavement	Mains potable, recycled, harvested stormwater	Mains potable, recycled, harvested stormwater	Recycled water	Any
Ideal soil conditions	Freely draining soils	Freely draining soils	Any soil type with drainage, freely draining without	Any soil type with drainage, freely draining without	Any	Freely draining soils or structural soils and cells	Any	Any	Freely draining soils	Any	Response depends on soils
Typical cost range / tree**	\$500 - \$1,200	\$500 - \$1,500	\$2,000 - \$10,000	\$3,000 - \$15,000	additional \$1,000 - \$3,000	\$1,500 - \$2,000	\$5,000 - \$8,000 (soils) \$5,000 - \$25,000 (cells)	\$5,000 to \$20,000	varies	\$50 - \$400	varies
Applicability to Greater Sydney****	Suitability is not uniform across Greater Sydney depending on soil	Suitability is not uniform across Greater Sydney depending on soil	Applicable to all three cities	Applicable to all three cities	Everywhere - preferred configuration in Western Parkland City area of Sydney	Applicable to all three cities	Applicable to all three cities	Applicable to all three cities	Applicable to all three cities	Applicable to all three cities	Applicable to all three cities
Key benefits / drivers for use	• Low cost • Low complexity • Can be retrofitted • Scalable	• Low cost • Low complexity • Can be retrofitted • Scalable	• Useful for stormwater quality treatment • Underdrainage reduces risk of water logging in clay soils. • Open surface allows easy access for maintenance • Scalable • Suits a variety of contexts	• Useful for stormwater quality treatment • Underdrainage reduces risk of water logging in clay soils. • Grate reduces risk of soil compaction, whilst increasing trafficable area	• Good water availability • Low chance of waterlogging • Lined systems so can be adapted for use on podiums or areas with poor soils (e.g. sodic soils)	• Soil moisture recharge over a wider area • Pre-treatment to prevent sedimentation of other systems • Improved stormwater management	• Provides adequate soil volume in otherwise highly constrained sites • Adequate soil volume reduces risk of root damage (e.g. pavement damage) • Uncompacted soils can be provided under pavements	• Easily retrofitted to existing irrigation system • Highly reliable supply except during water restrictions when using mains water	• Where health risk prevents aerial application • Low loss of water through runoff, aerial drift and evaporation	• Low cost intervention that may improve efficiency of manual watering • Can be set up to facilitate effective watering during drought response • Generally low risk owing to low complexity solution	• Can increase soil condition to support plants including plant available water and water retention
Key management implications / risks	• Limited water volumes in pipes • Inlets and pipes can clog • No drainage so at risk of waterlogging	• Infiltration trenches not easily cleaned of sediment • No drainage so at risk of waterlogging	• Can dry out rapidly when sandy filter media used • Filter media with high organic matter can leach nutrients into stormwater • Drainage aggregate/gravel, when laid across the full base of the pit, will create a barrier to deep soil moisture access	• Can dry out rapidly when sandy filter media is used • Filter media with high organic matter can leach nutrients into stormwater • Maintenance required to ensure surface does not clog • Grate can inhibit maintenance	• Ensure the storage zone is sized for an infrequent average dry spell	• Excessive wear from very heavy traffic and turning • Clogging of the surface in the absence of effective regular maintenance	• Higher cost solution • There is a risk of compaction to roots from pavement and/or where roots could damage pavement	• Maintenance of irrigation systems can be high • Calibration of soil moisture probes required • Moderate expertise levels needed to realise benefits	• Maintenance of irrigation systems can be high in streetscapes • Prone to clogging • Linear infrastructure may be broken by other construction activities • Poor moisture distribution away from irrigation lines	• Requires manual delivery of water to fill reservoirs • Water trucks are a high cost response	• Adds cost but may be more cost effective than importing topsoil particularly if the other soil qualities are good
Cost benefit summary	Good benefit cost ratio in areas with good drainage	Good benefit cost ratio in areas with good drainage	Good benefit cost ratio in areas with poorly draining soil and requirement for stormwater treatment	Good benefit cost ratio in areas with poorly draining soil, pavement, requirement for stormwater treatment	Good benefit cost ratio for trees which may be imposed by extended dry periods	Good benefit cost ratio in areas that require a hard surface but where infiltration is desired	Good benefit cost ratio in areas where there is a risk of compaction to roots from pavement and/or where roots could damage pavement	Good benefit cost ratio where demand management is required	Good benefit cost ratio where demand management is required	Good benefit cost ratio as a temporary measure to improve watering efficiency	Good benefit cost ratio where insitu soil condition is poor

**WSUD Resources:  
CRC for Water Sensitive Cities - Ideas for a  
Water Sensitive Sydenham to Bankstown  
Urban Renewal Corridor**



This research project was led by the CRC for Water Sensitive Cities (CRCWSC) who, in conjunction with experienced researchers and practitioners from the government and industry, undertook an innovative and collaborative co-design process to promote water sensitive outcomes for the Sydenham to Bankstown Urban Renewal Corridor (Corridor).

The project delivered high-level, corridor-wide water sensitive cities principles and context-specific typologies for water-sensitive urban design (WSUD) solutions. Two case studies based on the Marrickville and Campsie precincts detailed how locally appropriate water sensitive initiatives can be applied at the precinct, street and building scales.

Across three interactive workshops, the project developed the following corridor-wide principles:

1. Water is the base layer for urban planning.
2. Make water visible in the urban landscape.
3. Community participates in planning, design and creation of their valued places.
4. Land use and infrastructure support the mobilisation of resources in a circular economy.
5. Water servicing strategy maximises community benefit before deciding on scale (centralised or local solutions).
6. A functioning ecosystem is a prerequisite for liveability of place.
7. Plan for engineering and social resilience.
8. Streets are community spaces. Communities want more from these spaces than providing for cars.
9. Buildings are part of the catchment topography – providing opportunities to treat, slow, store or harvest water.
10. Community just sees the solution. Integrated governance ensures this solution is holistic and community focused.

**Campsie Case Study**

The Campsie case study component of the project identified the following opportunities for the Campsie precinct:

- + Cooks River is not mentioned in any of the strategic plans. Council and the Cooks River Alliance want to put the Cooks River 'on the map'.
- + Anzac Park an important public space.
- + There are lots of schools in the area where open spaces can be opened to the public.
- + Old council administration building and associated open space.
- + Canterbury racecourse has a large area of open space with an undetermined future.
- + Heritage assets including Sydney Water assets.
- + Connecting Campsie to nearby urban centres using walking and cycling tracks.
- + Key sites are in process of being redeveloped, including the RSL Club, Woolworths and the Campsie Centre.
- + With the current development within the precinct, there is an opportunity to link with, and create, business hubs around the hospital and new schools.

Four key ideas were also developed for Campsie:

1. **Water Servicing:** this included a pressure sewer system, local sewer mining and a multi-functional stormwater infrastructure approach with green infrastructure includes swales, biofiltration and rainwater harvesting implemented widely across the precinct.
2. **Green lines:** a Cooks to Campsie Green Link including major 'green connections' between the river, mall and train station, and minor 'green lines' along key tree lined boulevards.
3. **Activating the public realm:** urban renewal can transform both the public and private realm: as density increases, the public realm will need to adapt too.
4. **Making the Cooks a river again:** this concept proposes that Rudd Parade form the basis of a strategic corridor for the precinct that incorporates water sensitive urban design to cleanse stormwater and increase infiltration.

***These opportunities and ideas should be reviewed, refined and incorporated into Campsie Complete Streets.***

**Case studies**

The second workshop generated ideas for two precincts – part of the Campsie CBD centre and the suburb of Marrickville.

Ideas generated for Campsie focused on:

- Water servicing
- Green lines
- Activating the public realm
- Flooding and waterway health



**On ground – opportunities**  
Campsie

## 4.9 Monitoring Progress

The development and efficient management of a resilient and robust urban tree canopy requires on-going evaluation and assessment of the physical resources, the benefits they provide and their values – economic and non-economic.

Monitoring will be undertaken in relation to the targets outlined in Section 3.2 to evaluate the Council's performance in implementing the actions described in this Master Plan.

The Urban Tree Canopy Master Plan will be subject to the principles of adaptive management. The success and progress of the actions outlined in section 4.0 will be reviewed annually and modified and adapted where:

- + Monitoring results indicate this is necessary.
- + To incorporate new advances or knowledge in the field of urban tree management.
- + To take advantage of new opportunities that may arise in Bankstown and Campsie.

The Urban Tree Canopy Master Plan will also be subject to a full review after a five year period.

### Opportunities for further information development

At present the primary data collected includes species, life expectancy and infrastructure constraints for tree establishment and growth. Additional data needs are being identified to improve Council's ability to quantify the value of environmental services provided by urban trees, assess tree survival, health and measure structural diversity, habitat characteristics and landscape connectivity. Ultimately, the data Council collects will be focused on measuring the success of the urban tree canopy master plan and improving urban tree management practices. Monitoring and research outcomes facilitate continual improvement in Council's management practices through an adaptive management approach.

Key areas for information development include:

- + Total area of the urban tree canopy including canopy cover, density and vegetation per inhabitant in the public and private realm.
- + Urban tree canopy composition, structure and age class including species, diameter at breast height, height and age classes.
- + Urban tree canopy landscape mapping including recognition of corridors linking open spaces and contributing to connectivity at a metropolitan scale (e.g. to the Greater Sydney Green Grid).
- + Urban tree canopy effects on climate amelioration including the effect of the right tree in the right place on reducing thermal discomfort, sun exposure and energy savings.
- + Urban tree canopy habitat values including tree traits and species that could provide habitat for fauna.
- + Urban tree canopy productivity, health and vitality including estimates of species growth and biomass, canopy growth over time and impacts of biotic and abiotic tree health factors.
- + Urban tree canopy contribution to the carbon cycle including carbon storage and sequestration rates with

consideration of the effect of events such as drought on tree productivity and health.

- + Contributions to air quality including pollution removal, noise reduction, energy savings and cooling.
- + Contribution to conserving and maintaining soil and water resources, by estimating values for infiltration and draining while considering soil properties such as pH, bulk density, water content and soil carbon.
- + Socioeconomic benefits including outdoor activities, property values, wellbeing, sense of place, and cultural heritage.
- + Establish community connection including the perceived benefits and nuisances.
- + Urban tree canopy disservices including species that have a high allergenicity index, are highly prone to pest and diseases, have low ULE, and are higher emitters of volatile organic compounds.
- + Economic value of the urban tree canopy in terms of property values, carbon stored, energy savings, health benefits etc.
- + Spatial distribution of urban tree canopy ecosystem services.
- + Spatial analysis of the urban heat island using thermal, road density and population density mapping (or building density map) and normalised difference vegetation (NDVI) mapping.
- + Establish a thermal map relationship between urbanization, UHI and canopy cover for Bankstown City Centre and Campsie Town Centre.

Council may wish to partner with Greener Spaces Better Places in order to pool resources in the analysis of green and tree canopy cover.

# 5.0 Appendices

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## 5.1 iTree Eco Report

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## 5.2 Typical Tree Planting Details