

# **Attachment B**

<b>Supporting Information</b>
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Attachment B  
November, 2022

# Street Tree Master Plan 2022

## Supporting information

We acknowledge the Gadigal of the Eora Nation  
as the Traditional Custodians of our local area.

**CITY OF SYDNEY**



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Please note, the City's Street Tree Master Plan is now online and is available at ([link to be inserted once created](#)).

The online version provides improved functionality, including search and filtering tools for species or planting information, and links to other supporting information.

This supplementary information is provided as an alternative and accessible version of the information. Tables outlining the species proposed in the different street locations (i.e. footpaths, constrained, traffic islands and median strips) are available for download.

We recommend using the online version where possible.



# Why we need this plan

The Street Tree Master Plan is a critical part of the City of Sydney's suite of policies and strategies that we use to proactively manage our urban forest. Trees like all living things, grow, age and eventually die. We've carefully developed this plan to **guide our future street tree planting**. It guides where trees are planted and what species will be used to replace existing trees when they eventually reach the end of their useful lives.

Our focus for future street tree planting responds to the challenges facing our communities and city from the impacts of climate change and the need to build more resilient and sustainable communities.

**This plan is focused on increasing canopy cover and species diversity, to help us meet our greening and canopy targets, and our core objectives to create a cool, calm and resilient city.**

This plan aims to achieve innovative and well considered tree planting solutions for all our streets and laneways. We recognise our streets are critical connections between our homes, workplaces, and the wider landscape. We travel, socialise, and dine on our streets and we interact, living and working next to them every day.

We must ensure they:

- support improvements in our community's health and wellbeing
- are resilient, valued and attractive places
- contribute to sustainable outcomes and mitigate urban heat island effects
- help to conserve, support, complement and restore our natural environments
- help to minimise energy consumption and reduce emissions.

To develop this plan we have:

- Reviewed each street across the local area and assessed the performance of the existing street trees as well as the unique character and landscape conditions of the street.
- Reviewed the 2011 plan's planting palette on each street.
- Engaged experts in the field of street tree planting with a range of skill sets – arboriculture, plant science and Indigenous ecology.
- Reviewed our tree species list to ensure proposed trees are suitable and resilient for a changing climate.
- Consulted with the community and listened to feedback.
- Recognised the need to balance a range of competing priorities and aspirations related to street trees.

This is a plan for the future. It means we use it when choosing species for new planting locations and where a replacement tree is required.

- Greening Sydney Strategy 2021
- Tree Management and Donation Policy (draft 2023)
- Urban Forest Strategy (draft 2023)
- Street Tree Master Plan (draft 2023)
- Register of Significant Trees 2013.

Existing trees will not be removed to implement the new species listed in the plan. This will only happen gradually – as existing trees need replacing. Existing street trees will normally be left to grow for their natural life and they will only be removed once they have become a safety issue or an unacceptable hazard. The exception to this might be when major street improvements or infrastructure upgrade works are required. However, tree removal will always be a last resort option.

We hope you find this document useful and share our passion in making Sydney a green, cool, calm and resilient city.

We've also considered the many other existing NSW Government and City of Sydney policies that also influence the future use and development of our streets.

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## Key objectives

The key objectives of the Street Tree Master Plan 2023 are to:

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## Strategic context

The Street Tree Master Plan 2023 provides a valuable guide to the planting of street trees throughout the City of Sydney local area. The plan consists of the following key components:

- an interactive online map which nominates the tree species and planting arrangements for each street, allowing users to view and filter the information for a variety of uses
- introductory information relating to context, objectives and use of the plan
- supporting information detailing the various criteria, factors and principles that guided tree species selection
- technical guidelines for the supply, installation, and establishment of new street trees
- links to other key resources and documents.

The plan is part of the City of Sydney's suite of tree management policies. Collectively these provide the necessary tools to effectively manage our urban forest and street trees. Our major tree management documents include:

- increase canopy cover and promote the establishment of attractive, resilient and well shaded streets
- develop a palette of reliable street tree species that is well suited to the street environment and are likely to thrive into the future
- increase the use of locally Indigenous species, improve the biodiversity of our streets, and increase habitat for native fauna
- improve the health and wellbeing of our communities by creating streets that promote and support active transport, and social interaction
- inform and direct a consistent and effective approach to tree planting in streets – ensuring 'the right tree for the right place'
- reinforce and enhance the character of our city's precincts through distinct and appropriate street tree planting.

# Street and urban context

The original vegetation of the local area was a diverse mix of trees, shrubs and other plants uniquely adapted to various habitats and ecosystems that evolved for millennia. Trees today must contend with a disturbed and altered landscape. Natural soil profiles are rare and paved surfaces interrupt the infiltration of water and nutrients. Roads, buildings and other grey infrastructure combine to change local growing conditions, with reflected heat and wind tunnels a common constraint in many parts of the city. Urban trees, especially street trees, must be tough and capable of withstanding these harsh conditions.

Trees are critical infrastructure in our streets. They are significant to the physical makeup and appearance of our streets and are critical in our overall impression of public spaces. One of the most significant factors that often makes 'a place' is its street trees.

The City of Sydney local area covers 26.15 square kilometres with a population of more than 248,000 people. Given its location as the economic and cultural heart of the Sydney metropolitan area, our area is densely urbanised. As the oldest European settlement in Australia, some buildings and landscapes date from the early 1800s and includes many items of historic value.

In broad terms, our local area consists of several distinctive land use types and street typologies that present a variety of opportunities and challenges for street trees. Street tree selection has to respond and relate to the individual circumstances presented within those streets. These key typologies include the following.

## Inner city and central business district/high and mid-rise apartments and commercial districts

Factors influencing tree selection and placement in these areas include:

- heavily used pedestrian zones and usually fully paved environments
- severe competition for above and below ground space and access to adequate soil volumes due to services, driveway entries, awnings, underground structures and tunnels
- the need to maintain clear sight lines to signage, traffic lights, pedestrian crossings, bus stops
- heavy overshadowing from tall buildings
- extreme wind tunnelling and downdrafts from tall buildings
- the need to maintain adequate clearances for bus and truck movements, even very close to footpaths.

## Older medium density inner city residential and terrace housing

Factors influencing tree selection and placement in these areas include:

- often very narrow fully paved footpaths
- narrow streets or streets that have been converted to increase car parking availability
- competition for above and below ground space and access to adequate soil volumes due to services, driveway entries, and overhead power lines
- minimal setbacks to adjoining buildings
- the need to maintain adequate solar access to adjoining residential premises.

## Street Tree Master Plan 2022

### Supporting information

#### Light industrial and low-rise commercial areas

Factors influencing tree selections and placement in these areas include:

- often wider streets that need to accommodate large trucks and kerbside car parking
- severe competition for space due to major services and large driveway entries
- more generous footpaths, often with grass and narrow pedestrian paths offering good opportunities for tree planting
- overhead powerlines usually present on one side of the street
- variable setback conditions, but often with very good setbacks to the adjoining buildings.

#### Suburban residential housing

Although not common in our local area, these areas are often in the more favourable sandy soil conditions, with factors influencing the tree selections and placement being:

- often lower traffic volumes and wider streets
- more generous footpaths, often with a grassed verge strip and a narrow pedestrian path offering good opportunities for tree planting
- overhead powerlines but usually present on only one side of the street
- good setbacks to adjoining buildings.

#### Laneways

Due to the age and style of development throughout much of the inner city, and older terrace housing areas, our area has many narrow laneways. These are often very narrow streets that are dominated by parking and access to adjoining shops, businesses and residential properties. They usually have very little planned tree planting. Trees that are in such laneways are often trees that may have been planted or fostered by well-intentioned residents but may not be entirely appropriate for their location.

We recognise laneways offer spaces to enhance our urban greening and we have considered the potential of all laneways as part of the Street Tree Master Plan review. With

carefully planned traffic island planting and adjustments to parking, useful trees can be introduced and make a valuable contribution to our canopy cover, summer shading, biodiversity and urban heat mitigation.

Streets within our local area that have similar typologies, land use, and similar underlying soils and environmental conditions have been grouped to form plan precincts. The specific conditions relating to each precinct are described in summaries available within the plan map ([link to be inserted once created](#)).

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## Who will use the STMP and how to apply it

The plan is intended for use by:

- City of Sydney employees and service providers – as a guide for the planting of trees within the city's streets.
- Landowners, developers and designers – to assist in the appropriate selection and planting of quality trees.
- The general public – to foster a better understanding of the future and desired tree planting and street tree character for our local area.

The way you might use this online resource is outlined below.

1. Refer to the online map of the entire City of Sydney area and **identify the future tree species** nominated for planting in your street and surrounding neighbourhood. This includes trees within the footpath, and potentially within traffic islands and median strips.
2. Review the supporting information that outlines the context to the street tree planting, the various **precincts** and rationale behind the **tree species selections** to understand the many complex considerations involved in selecting any street tree.
3. If you are unfamiliar with the tree species, you may want to click on the links that provide images of the proposed trees.



## Acknowledgements

The City of Sydney credits and acknowledges the following people and organisations for their contribution to the development and review of the Street Tree Master Plan.

City of Sydney project team:

Karen Sweeney – Urban Forest Manager

Phillip Julian – Urban Forester, Strategy and Systems

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Arterra project team:

Robert Smart – Director, Landscape Architect, Arborist

Christina Kanellaki – Heritage and Landscape Architect, Arborist

Ian Groundwater – Arboricultural Assistant

Ciaron Dunn – Director of Djaambulgu Girriin, Indigenous Ecologist

This project is part of the Greener Neighbourhoods grant program that is proudly funded by the NSW Government. The grant funding contributed towards the review of the tree species list and the review of each street across the local area to select the most appropriate species for planting.



Buckland Street, Alexandria. Katherine Griffiths 2018

# Street tree selection

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## Principles and ideals

Street trees are living things growing in a very unnatural environment. They may behave and respond to the prevailing conditions in a variety of unpredictable ways. No street tree can be perfect all the time and in every situation. It is always necessary to find the 'best' fit for the circumstances. Often there will be compromises between the needs of the tree, the desires of the community, the designed intent and the way the tree eventually interacts with the urban environment over its lifetime.

In this plan we have incorporated the following principles and ideals:

- **Adapting to future climate** – It is important to recognise the trees that have historically been planted and currently grow in Sydney may not be the trees that we can rely on to thrive in our city in 20 or 30 years. We must think further ahead and choose species that are likely to thrive in warmer conditions and more frequent and longer heatwaves.
- **Establishing a comprehensive tree species list** – Although there are thousands of trees to choose from, only a select set of trees have been identified as candidates for street tree planting in the City of Sydney. We have analysed hundreds of potential trees based on their physical traits, expert experience and opinion, including Indigenous ecological knowledge, biodiversity needs, historical performance, and their ability to survive in our predicted future climate.
- **Right tree in the right place** – After developing a well-considered list of the most suitable trees, it is still important to select the tree most suitable for the particular location and situation. We try to match the ultimate mature tree size with the soil and

physical space available, overhead and surrounding constraints, exposure, soil type, microclimates, vehicle and pedestrian clearances, historic associations and other aesthetic and functional considerations.

- **Indigenous knowledge** – Incorporating Indigenous ecological knowledge, including the acknowledgement and understanding the underlying natural landscape conditions, has helped to foster the increased use of local indigenous species, resulting in an increased diversity of species and resilience of our urban forest for all living things and systems.
- **Biodiversity improvement** – Loss of biodiversity and natural systems in our local area, throughout Australia and the world is great cause for concern. We selected locally indigenous species where appropriate and strengthened existing habitat corridors to achieve an increased diversity of street tree species.

The tree species chosen for our street tree planting are the most appropriate trees for the following reasons. They are trees that are:

- well adapted to the expected climatic and soil conditions
- proven, long lived and hardy urban trees of reasonably uniform and predictable growth habits and forms
- generally resistant to most currently known pests and diseases
- generally adaptable and tolerant to the wide variety of conditions experienced in the street environment
- not presenting unacceptable risks within an urban environment if grown in good conditions and with adequate ongoing care and management



- generally available within the nursery industry in a variety of larger sizes
- have a desirable form or growth habit, especially branch clearances that won't restrict pedestrian or traffic movements.

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## Adapting to the future climate

The United Nations describes climate change as the defining issue of our time. Climate change poses a serious risk to all people, future generations, and should be treated as a national emergency. We are already seeing the impacts of climate change, particularly in our urban areas. Heat records have continued to be broken, with Sydney reaching its highest ever-recorded temperature, and Penrith reaching a staggering 48.9°C during the heatwaves of January 2020. Sydney had many months with below average rainfall in 2019, with its annual total rainfall in the driest 15% of all years recorded. More recently, in 2022 we have experienced the highest annual rainfall on record.

A changing climate has the potential to degrade the liveability of our local area, with more frequent extremes of heat, drought, floods and other severe weather events likely to test the resilience of our communities, and natural and built environments. Many of the trees growing in our local area today may not be adapted to the future conditions we are likely to experience.

Adapting to climate change is critical for a sustainable and forward-thinking approach to managing our street trees. There needs to be a gradual change and adoption of more resilient tree species that evidence shows are better suited to warmer climates, increased heatwave extremes, and drought conditions. We will also investigate and promote the increased use of water sensitive design strategies that may assist to passively irrigate our street trees. This will allow them to better deal with extremes and drought conditions.

## Species list development

We have developed a comprehensive list of trees species considered most suitable for planting in our local area. We considered and assessed hundreds of potential trees based on their physical traits, expert experience and opinion, biodiversity needs, historical performance, Indigenous ecological knowledge, and their ability to survive into the future changing climate. From this, a list was developed of trees that are determined to be most suitable and desirable for planting in our local area. This wider list covers not only potential street trees but also trees suited to a broad range of other possible locations such as our large public parks and smaller neighbourhood parks, and private properties.

Trees considered to be unsuitable for planting in our local area were excluded from the list. Trees may have been excluded for reasons such as susceptibility to pests or disease, a tendency to be weedy, unlikely to adapt to our future climate, known severe allergens or irritants, and unreliable performance or being short lived.

The species we have selected for this plan is a subset of the wider list. These species are more specifically chosen to fulfil the taxing needs of the street environment.

The list was developed using the knowledge of the City of Sydney's experienced employees and service providers that have a long history of managing and planting trees throughout the local area. We have also engaged with several industry and technical experts in the field of street tree selection. These included:

- Anna Hopwood – TreeIQ
- Dr Manuel Esperon-Rodriguez – Western Sydney University
- Ciaron Dunn – Djaambulgu Girriin
- Robert Smart – Arterra Design.

More detailed information can be found in the tree species list: development and use report in the Urban Forest Strategy ([link to be inserted once created](#)).

## Right tree in the right place

In assessing what tree to choose for a given space it is vital to recognise that trees are living organisms. No tree can accommodate all constraints and requirements perfectly. There is no perfect urban street tree. It will always be necessary to compromise and identify the best fit for a space or street.

Our key tree selection objective is still to ensure the selection of the 'right tree for the right place'. In other words, to ensure the selection of the species is optimised for the local environmental conditions and any other constraints of the planting location. The selection of species aims to ensure the tree makes a positive contribution to the environmental, amenity, aesthetic and heritage values of the area and that foreseeable negative aspects are minimised.

When selecting an urban street tree it is vital to consider many important physical and other factors. These relate to the fundamental environmental, functional and aesthetic requirements. The following is the criteria considered in selecting a street tree for a location.

### Ultimate size, habit and form of the tree

**Tree size** – The trees selected will be in scale with the streetscape, and where appropriate we will always use the largest growing species possible for the space available. Very large trees within confined spaces often result in unacceptably high management costs and infrastructure and property damage. Conversely, small growing trees in broad streets rarely contribute significantly to visual quality of the street or vital canopy cover.

Species should still be selected to ensure the ultimate mature size of the tree is in scale with the street giving consideration to the relevant constraints, such as footpath and nature strip widths, overhead powerlines, building setbacks and vehicle clearances. The optimum range is a tree that is not too small that it fails to make a contribution to the amenity of the street, and not so large it dominates and causes significant problems. In some instances, the constraints imposed by the street environment will limit the size of street tree selected or even restrict tree planting altogether. This is frequently the case with the majority of our very narrow laneways and footpaths.

This plan now nominates 'constrained' species in many locations to help further guide the selection of a smaller growing tree where specific circumstances may limit the otherwise preferred street trees.

**Tree form** – Street tree species should have an appropriate and predictable form, usually with an upright trunk with spreading and stable branch structures. Street trees need to have a form that allows traffic and pedestrian movements around and under the tree. In the city centre, in particular, desirable tree forms include trees with a single straight main trunk that supports a domed crown, or in some locations with narrow columnar forms.

### Compatibility with site conditions

The capacity of a tree to establish and grow successfully depends on the environmental conditions at the planting location being within the tolerance range of the species selected. The underlying geology and soil provides access to nutrients and water as well as physical support for the tree. Soils can differ greatly in terms of their available nutrients they provide, their drainage characteristics, oxygenation and depths.

The western part of our local area, including Chippendale, St Peters, Erskineville, Newtown and parts of Glebe are situated overlying Wianamatta shales which usually produce heavy clay soils with moderate fertility and higher water holding capacity.

In Pyrmont and Ultimo and on the eastern side of the city in areas such as Woolloomooloo, Darlinghurst and Surry Hills the underlying geology is Hawkesbury sandstones which typically produce very shallow, sandy, and low nutrient soils.

The southern areas from Moore Park to Rosebery are situated on ancient dune sands which have been blown inland from the coast. These soils consist of relatively nutrient poor soils, but they are typically deep and well drained sandy profiles, and can present very good conditions for tree planting and growth.

Many areas throughout the City of Sydney area are also highly disturbed and the original soils have been completely removed and replaced with imported fill, often including rubble, building debris and other unnatural landfill materials. This is particularly common around the harbour foreshore and older industrial areas.



## Street Tree Master Plan 2022

### Supporting information

All street trees, by their position and nature, may interact and conflict with kerbs, pavements and services. Correct placement, providing adequate soil volumes, creating suitable pavement openings and choosing appropriately sized trees is all important. Trees are chosen to ensure the size and spread of their root systems is compatible with the space available. The City of Sydney also investigates the use of alternative footpath materials and other designs to help minimise tree root and infrastructure conflicts.

Proven performance of the species under the current and future environmental conditions of the precinct is vitally important. Trees are a very long-term investment and substantial amounts of money are often invested in their purchase, planting and maintenance. New species should and will be trialled in limited locations before implementing their more widespread use. If a trialled species does not perform as expected, an alternative species with similar attributes (such as mature size, evergreen/deciduous, form) will be used.

About the climatic conditions, Sydney is located on the south-east coast of Australia and enjoys a moderate (temperate) climate. It generally escapes the extremes of temperatures common in the interior of the continent and the very high humidity of the more tropical coastal areas. It generally experiences a warm and wet summer and autumn and then a cool and drier winter and spring. Mean daily maximum temperatures (25°C) occur between December and March with mean daily minimum (<10°C) between June and August. The street trees selected must be able to thrive in both our current and our predicted future climatic conditions.

It is also important to consider the microclimatic conditions that present in a particular location. In the city centre and high-rise inner city areas experience overshadowing caused by tall buildings, wind tunnel effects and reflected and re-radiated heat that require tree species that are particularly hardy and resilient to these adverse conditions.

#### Dormancy and foliage character

The street tree species palette includes both evergreen and deciduous trees, which differ in the type and quality of the shade they cast. Evergreen species provide all year screening, greenery and shelter from winds. Deciduous trees provide seasonal interest while

maximising winter light. In residential areas and some city centre streets deciduous trees are extremely useful to maximise summer shading and winter light, particularly for footpaths and buildings located in east-west oriented streets.

The foliage size and colour of tree leaves may also influence the visual texture and aesthetics of a street scape.

#### Historic and cultural associations

The selection of species may have natural, historical or cultural associations in a particular street or precinct. Tree selection should consider the historical context of the precinct. Many areas such as Glebe, Potts Point, Darlinghurst, Newtown, Surry Hills and Chippendale contain intact period architecture, particularly from the Victorian era. If appropriate, street trees are chosen to be sympathetic to the heritage values of the surrounding built environment to further strengthen the sense of place for these areas.

#### Longevity and growth rate

Many of the costs associated with managing trees in an urban environment are associated with the early establishment and then the ageing phase and removal of the tree. Using longer lived tree species that require less frequent replacements help minimise tree management costs and maximise tree related benefits.

#### Resistance to pest and disease

The selected tree species should be resistant to foreseeable pests and disease. A greater diversity of species across the city is important in reducing the potential impact of any future devastating diseases that may impact a specific tree species.

#### Wind tolerance and resistance to damage or branch failures

Limb loss may occur on an occasional basis for most trees due to age or to wind and storm breakage. Trees that are renowned for having particularly brittle branches, poor branch attachments and regularly known for sudden failure of larger limbs will be avoided for use as street trees.

#### Pollution tolerance

The city environment and areas close to busy arterial roads are subject to higher levels of photochemical pollution that is expelled from

vehicle exhausts. Trees selected for these areas need to be able to tolerate these vehicle emissions and pollutants.

Deciduous trees are generally considerably more tolerant than evergreen species due to the duration over which different species retain their leaves. The longer the life of a leaf the greater the likelihood that the threshold levels for pollutant damage will be exceeded.

### Maintenance requirements

Tree species are selected to minimise maintenance once they have become established. Trees that require excessive ongoing maintenance, repeated pruning, or pest and disease control are typically avoided.

### Amount of tree litter (bark, flowers, fruit, leaves)

It is a natural function of all trees to shed leaves, fruit or bark to some degree. In urban settings this is usually easily managed through routine maintenance of the surrounding area. The selected tree species must have an acceptable level of maintenance associated with it and suited to the surrounding location. Trees with large or heavy seed pods, excessive leaf drop, hard and round fruits, or fleshy fruits or flowers which may lead to slip and fall hazards are typically avoided.

### Commercial availability

The selected trees must be capable of being commercially grown and available in a suitable size for planting in streets. Generally, the tree nursery stock that will be used for our streets are super advanced stock to provide suitable visual impact and the adequate resistance to casual damage or intentional vandalism.

### Risk of becoming an environmental weed; and

Some species are known to be, or have the potential to be, serious environmental weeds due to their ability to self-propagate and invade bushland areas. Those with known propensity for this within the Sydney and urban context are avoided.

### Contribution to biodiversity and habitat outcomes.

Trees provide shelter, food and other habitat resources for a range of fauna species, including small mammals, birds, reptiles and insects. Wherever possible, consideration has been given to planting trees which expand and provide a connection between open spaces or

other vegetated areas. Particularly those identified as priority habitat areas in the City of Sydney's Urban Ecology Strategic Action Plan, to increase the area of available habitat and assist in the movement of native fauna between those areas. Although native trees are preferable in this regard, exotic species also have some habitat value. A mix of species are used where appropriate.

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## Indigenous knowledge

The City of Sydney acknowledges the Gadigal of the Eora Nation as the Traditional Custodians of our local area, and we acknowledge their continuous and deep connection to Country. Country includes the landscape – land, water and sky, the plants and animals, and the relationship between these.

Complex cultural land management practices are embedded in Aboriginal and Torres Strait Islander responsibilities to care of Country. This knowledge and approach to land management and ecology, built up over thousands of years remains important today to the ongoing management of the urban forest as a resilient, thriving, and adaptive living system.

Collaborating with an Indigenous Ecologist through the review of the plan has provided an opportunity to incorporate an Indigenous perspective and knowledge with the following key elements and outcomes:

- Incorporation of more tree species that are locally indigenous to Sydney and nearby regions.
- Selections of species that relate to the previous ecology of the immediate area to assist with connecting with Country.
- Embracing greater diversity of street trees within many of our individual streets.
- Reintroduction of some iconic and locally indigenous trees in areas of heightened cultural significance such as the harbour's edge and important civic places.
- Multi-generational approach to managing the urban forest and species selection.

Never has it been more pertinent to consider our responsibility to look after Country. As espoused by Elder April Bright: "If you don't look after country, country won't look after you".

## Diversity, biodiversity and habitat

This plan strives to increase the diversity of street tree species, thereby providing a greater diversity and abundance of food sources, shelter, roosting and nesting opportunities. This has typically been through providing a greater diversity of trees within individual streets, often in combination with increased use of native species, while still catering to some important other needs such as winter solar access, appropriate tree sizes, tree longevity, tree form and habit, ongoing maintenance requirements, heritage and community expectations.

Sydney's natural landscape has changed dramatically. In the past 220 years, we have altered the soils, the way water moves and displaced ecological systems. Ecosystem health and biodiversity is important for a sustainable world. Protecting and improving urban biodiversity, while also reclaiming and managing functional ecosystem health in the city, can play a vital role in improving community health and wellbeing and the liveability of the city.

Street trees are an important part of our wider urban forest and can provide valuable and linked corridors of vegetation and canopy that can promote and enhance native habitat and provide sources of food, shelter and other benefits for our native birds, animals, insects and other creatures. Well planted and shady streets can provide important respite and corridors for the movement of species. This can be particularly important for bees and other insects that may not be able to fly large distances in more open or exposed areas.

We have planned and initiated longer term reductions in the use of some street tree species in certain areas, where we have identified historical over reliance on one or two species, such as of London plane trees (*Platanus x acerifolia*) in our northern suburbs, and broadleaf paperbarks (*Melaleuca quinquenervia*) in our southern suburbs.

We are also planning to introduce far more trees into our streets, including some streets that have never had trees, such as smaller laneways and other smaller streets. We are planning to achieve this through increased use of in-road planting initiatives and continued adoption of under grounding of powerlines and

converting key streets to aerial bundled cables. We have also aimed to increase the use of more locally indigenous species. The combination of these initiatives and our continued goal to increase urban greening generally will allow our streets to improve ecological connections and provide useful stepping stones for our native urban fauna, particularly between major parklands such as Sydney Park, Moore Park, Jubilee Park and The Domain and other harbour foreshores.

## Other important street tree selection and placement factors

Our local area is a highly artificial, constructed and constrained environment within a diverse cultural and urban landscape setting consisting of interconnected streets, pathways and surrounding buildings and parks. Trees play an important role in the greening of our local area and the environment, and enriching appreciation and cultural experience of a place. There are numerous specific and complex considerations that go into the ultimate selection of our street trees. This includes some of the following considerations that also contribute to how we plan and plant our streets.

### Trialling of new or untested species

We have focused on exploring and selecting some trees species that are expected to be more resilient to the forecast impacts of climate, thereby providing greater resilience for our tree canopy and urban forest, particularly in times of droughts, heatwaves and generally warmer climate scenarios.

The trialling of new and lesser-proven species will generally be undertaken on less prominent local streets and laneways. They will be closely monitored for performance and suitability in the years following their installation. Trialling new species is an important way to identify and assess trees that may contribute to our key objectives into the future.

However, trialling new species also has challenges. The commercial availability of such species can pose difficulties in sourcing adequate trees in the required sizes and numbers and at the times required. If the trial species fails to thrive in our conditions or is

susceptible to unexpected pests or diseases then the wider use of that particular species may be limited to only more optimised sites or abandoned altogether. If a trialled species does not perform as expected, an alternative species with similar attributes (such as mature size, evergreen/deciduous, form) will be substituted.

### Pest and disease resilience

International precedents show that widespread infestations of serious and harmful pests and diseases can have devastating consequences on parts of our urban tree populations.

There are several major pest and disease threats that may impact the trees in the City of Sydney area. These are typically introduced pests and diseases that can potentially have devastating impacts on certain species of trees. Specifically, these include pests such as:

#### Phytophthora root rot

Phytophthora root rot (*Phytophthora sp.*) is a serious microscopic plant pathogen that infects and kills a broad range of tree species and is widespread in many of our urban environments. It is spread mainly by movement of infested soil, roots, plant material and free soil water. Any activity that moves soil, water or plant material can spread this pathogen. This includes soil in new plants, on tools, footwear and vehicles.

*Phytophthora* is now increasingly common in the landscape, across large portions of the country. It is responsible for extensive tree death and decline. There are no effective treatments. Once plants are infected decline is typically rapid. *Phytophthora* destroys the ability of a plant to take up water from the soil, often leading to catastrophic wilting, foliage collapse, and then death of the tree. The progression of the disease is highly species specific, with some trees able to withstand the affects for several years with only minor symptoms, while others can be killed within a very short period.

The best defence against the disease is maintaining healthy trees and promoting healthy soils that possess numerous naturally occurring and often competing fungi and microbes, helping to keep the balance of microbes and may even prey on the *Phytophthora* itself.

#### Sycamore lace bug

Sycamore lace bug (*Corythucha ciliata*) is an insect pest introduced from North America that mostly affects London plane trees. It was most probably introduced to NSW in 2006 and prefers to feed on London plane trees (*Platanus x acerifolia*). The tiny adults and nymphs feed on the underside of the leaves, causing bronzing, chlorosis and premature leaf drop. Severe infestations can cause complete defoliation. Several consecutive years of infestation may kill affected trees. Control is difficult and expensive.

It is now widespread in the Sydney basin and evidence suggests it is spreading along major transport routes. Establishment of younger trees in affected areas is proving to be particularly difficult.

The ultimate effect of this pest on Sydney's plane tree population is still evolving but attempts have been made in this plan to greatly reduce the reliance on plane trees while treatments such as insecticide injections are used on affected trees to maintain their health and longevity.

#### Myrtle rust

Myrtle rust (*Uredo rangeli*) is a particularly serious fungal disease native to South America. It was first detected in Australia on the Central Coast of NSW in April 2010. This fungus can affect plants belonging to the family Myrtaceae which includes many of the very common native species such as eucalypts, paperbarks, myrtles, lilly pillys, bottlebrush and water gums. These trees continue to represent a very large proportion of the City of Sydney's street trees and surrounding native vegetation communities.

It is easily spread and the NSW Department of Agriculture, Fisheries and Forestry has now advised it does not believe the disease can be effectively contained or eradicated. It has been listed as a key threatening process under the *NSW Biodiversity Conservation Act 2009*.

When severely infected, young plants and new growth may become stunted and in worst case the plant may die. Little is currently known about the disease and its impacts to plants under Australian conditions. Treatment using various fungicides may be possible, but this will usually prove unviable on large trees in public areas. Control will only apply to small plants and controlled nursery environments and the



like. The ultimate effect of this disease is still not known. Tree species known to be highly susceptible to myrtle rust have not been selected for use in this plan.

### **Fusarium wilt**

Fusarium wilt, caused by the fungus *Fusarium oxysporum*, is a devastating disease of certain species of palms, including *Phoenix* and *Washingtonia*. Fusarium Wilt has been observed at many locations in Sydney, including in the City of Sydney's parks.

The fungus causes a vascular wilt, obstructing the water-conducting tissue, which results in desiccation and death of the fronds. The fungus produces short and long-lived spores that can live in the soil and plant tissue for long periods, usually years. Because most of the root system is left behind after a palm dies from this disease, this mass of roots may act as a reservoir for the fungus for a long time.

The disease symptoms normally appear first on the oldest (lowest) living leaves, and then progressively move upward in the canopy until the palm is killed. Transmission of the fungus from palm to palm is mainly through contaminated pruning tools. Once a palm is infected it usually ultimately dies.

### **Overhead powerlines**

Most significant of all factors that limit the benefits trees can contribute to a streetscape is the conflict between overhead power cables and tree canopies in our older and more established suburbs. We have been proactively coordinating with Ausgrid in the continued installation of aerial bundled cables. These consist of several insulated wires bundled into a single cable, eliminating the need for the wide strung powerlines that conflict with tree growth. These cables also allow for reduced pruning clearance requirements resulting in less impact on tree canopies. To maximise the benefits from these cables, we may review existing trees and the nominated species within this plan.

An alternative solution to this problem is to select smaller tree species. This is often viable for very narrow streets, however in wide streets small trees are inevitably out of scale with the streetscape and present a poor environmental, social and aesthetic outcome.

Underground power cables are also an option, particularly for new developments such as at Green Square, Zetland and Alexandria. Most new developments allow the undergrounding of power and allow for the unrestricted adoption of larger trees and lower ongoing maintenance costs. In established areas, the cost of undergrounding existing powerlines is often prohibitive and difficult to manage around the roots of existing mature trees.

### **Narrow footpaths**

An important factor in species selection is the width of the footpath or verge that is available planting. Trees planted in footpaths less than 1300mm wide (from the building line to the back of the kerb) force pedestrians, particularly those with strollers, walking aids or using wheelchairs, to divert onto the road. As it is safer to encourage pedestrians to stay on the footpath, trees will therefore not be planted in any footpaths less than 1300mm in width.

In streets with footpaths less than 1300mm that already have tree planting, no new tree planting will be undertaken. However, in-road planting or creating 'shared zone' pedestrian options can be explored to install new or additional trees.

### **Locally endemic versus exotic species**

Locally indigenous trees have had the advantage of evolving to our local climate. They have evolved in harmony with naturally occurring organisms such as insects and fungi. Their use can promote biodiversity and creation of wildlife corridors, reinforcing a local sense of place, connection with Country.

Locally indigenous species are often highly adapted to bushfires and as a consequence they have a natural tendency to have vigorous growth for brief periods after fires when soil nutrients are temporarily higher and they race to re-establish a forest canopy. When these trees are grown in an urban environment that is free of fires and high in nutrients they may become very elongated, structurally weak and the foliage and bark may become more susceptible to attack by insects and other pests.

Many of the familiar natives such as eucalypt trees are often very large trees that are unsuited to planting in smaller streets and close to buildings. They often originate from open and much drier vegetation communities with impoverished soils. These species often perform poorly as street trees, within inner

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urban areas, due to their more specialised physiology. They are often adapted to soils of very low nutrient status and with perfect drainage where they are less susceptible to pathogens. Soils in our streets often have vastly different properties, and often these species don't thrive.

An important advantage of many exotic species, in an inner urban context, is that they include most of the useful and proven deciduous trees that can provide solar access to the streets and houses during winter. There are very few natives that are deciduous, and generally those that lose their leaves in spring or early summer (an inheritance of their more monsoonal origins). Red cedars and white cedars (*Toona ciliata* and *Melia azedarach*) are native trees that have winter deciduous attributes, but both suffer from severe pest problems under urban conditions and are usually unreliable performers.

Many exotic deciduous species have the advantage of decades, if not hundreds of years of selective breeding which ensures improved reliability. They are usually pollution tolerant, often demonstrate greater resilience to interference with their roots or damage during construction works. The canopy shape and branching architecture of many exotic trees are also able to tolerate the pruning and shaping required for urban environments.

In summary both natives and exotics have their strengths and weaknesses for use as street trees. This plan aims to plant the right tree for the right place, for the right reason and strike an appropriate balance between native and non-native species.

#### Landscape design principles

A key feature of our local area is the harbour foreshore that extends from Rushcutters Bay to Glebe and Blackwattle Bay.

A principle that has been reinforced in this plan is to establish, where appropriate, native figs and palm trees and other endemic trees such as the Sydney red gum (*Angophora costata*), red bloodwood (*Corymbia gummifera*) and cheese tree (*Glochidion ferdinandii*) along the streets running towards and adjoining the foreshore. This will provide a stronger definition, return of a native character and a greater 'sense of place' of the original harbour edge. Palm trees will often be used in clusters or in more formal avenues to identify key nodes

without blocking some important views to the harbour and historic buildings.

Many of the City of Sydney's parks, such as Hyde Park, Redfern Park, Prince Alfred Park and Victoria Park have large trees, remaining from early Victorian period planting. These large and prominent tree canopies frequently extend well over the adjoining streets. The planting of street trees along these streets is often avoided to minimise canopy conflicts. This also allows the park and its major trees along the park edges to remain a feature of the street.

#### Solar access

Where required, species should be selected that will provide an appropriate level of solar access to dwellings during winter. This is usually most important in east-west oriented streets in areas with older terrace buildings that were not well designed for passive natural light. It can also be important in high-rise apartment streets where deciduous or less dense trees can provide light to otherwise very shaded streets in winter. In meeting this objective, consideration is also given to other principles such as species diversity and the existing street characters.

#### Reinforcing key cultural and commercial streets

Major 'gateway' streets include Anzac Parade, Oxford Street, William Street and Parramatta Road/Broadway. These gateways have already, or will be, further acknowledged and celebrated by public space improvements such as footpath widening, which together with continued tree planting, will create prominent and recognisable tree-lined avenues to reinforce their importance.

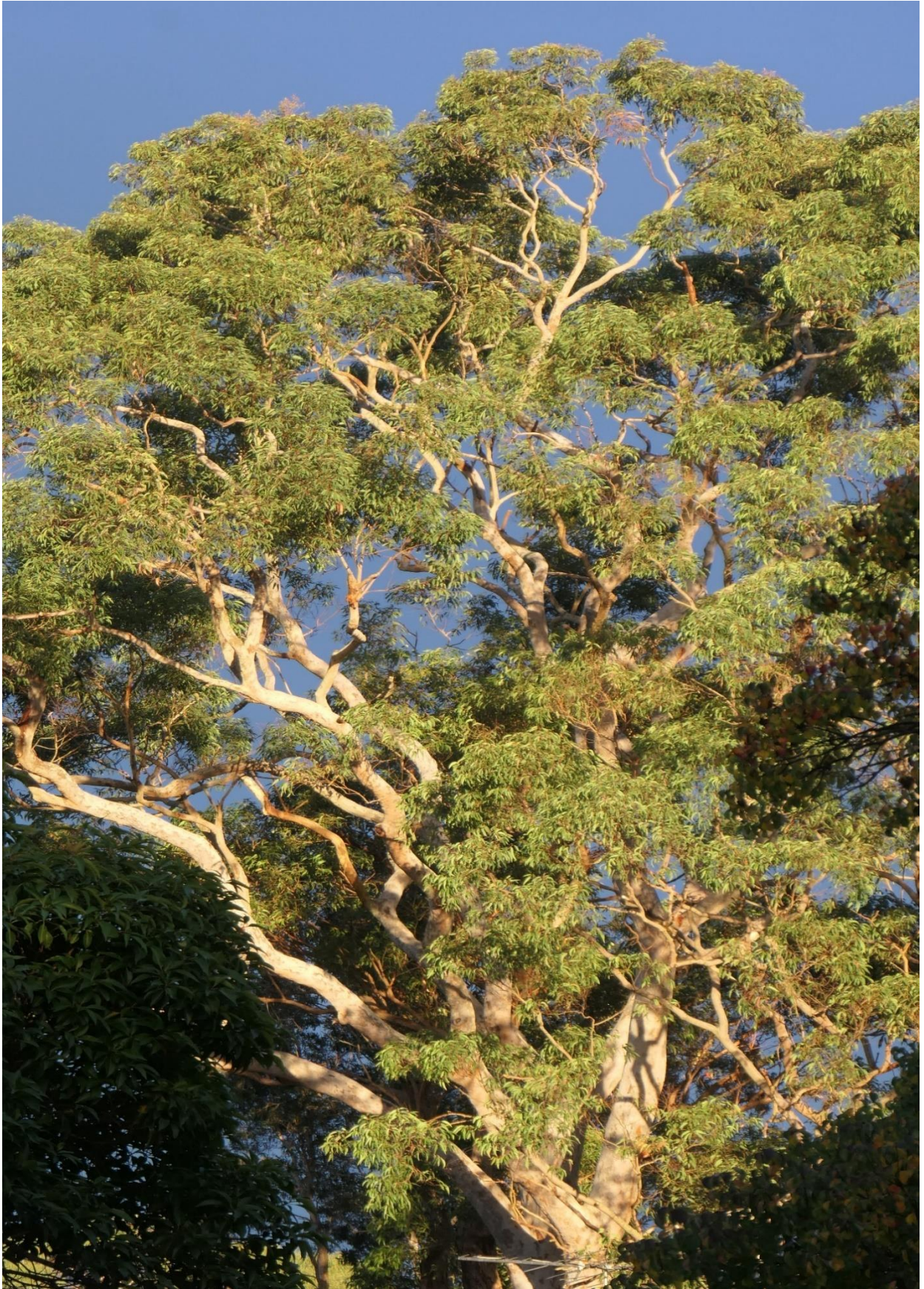
The state and regional roads in our area include some major connections such as Anzac Parade, George Street, Parramatta Road/Broadway, William Street, South Dowling Street, Harris Street, Botany Road, Abercrombie Street, Regent Street and Cleveland Street.

These prominent and wide streets form major vehicle or pedestrian corridors and are often considered different in character to the local streets they divide or bound. These streets are strengthened with a consistent and unified tree planting scheme, using some of the hardiest and most reliable trees.



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Sydney red gum (*Angophora costata*), Arterra Design 2022





# Planting arrangements

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## Footpaths

The most common street tree planting is achieved by placing trees within the footpath directly behind the kerb, or in landscaped verges between the kerb and footpath. This may be on either side of the street and have a variety of surface treatments including permeable paving, grass or garden beds. Several different planting techniques and placements may be possible and are detailed in our standard technical details ([insert link](#)).

For each street segment, this plan nominates which tree species is to be planted. It may specify a single species or a species for each side of the street, or an alternating mix of species. Up to three different species have been nominated for footpaths within each street segment. As a result, many streets have now been designed to have a greater mixture of tree species.

For some streets no footpath planting is suitable. This may be due to narrow width of the footpath or shop awnings. Where no footpath planting is possible, planting within the roadway will be prioritised.

Where this plan nominates a species for 'both' footpaths it is expected the species will be planted on both sides of the street. If it is determined different species are only planted on a single side, that species will have a particular orientation nominated, such as 'north side' or 'south side' only.

Where two (or more) species are nominated for 'both sides' this indicates the species are planted in a mixed or alternating arrangement. This allowed for the continuation of pre-existing street planting, the introduction of greater

diversity, and the option for both deciduous and evergreen trees within a street

The ultimate selection of which of the species to plant may be influenced by issues such as nursery stock availability, tree size, available soil volumes and the specific characteristics of the individual planting location.

Where no footpath species are nominated, then it has been determined that the footpath cannot accommodate tree planting. This may be due to intrinsic obstructions, overhead or underground services or narrow footpath width. In some instances, it may also be due to important historic buildings or the relationship to adjoining parks.

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## Traffic islands and median strips

The planting of trees within the road or in specifically designed traffic islands or median strips are opportunities to increase our tree canopy within the street network beyond that provided by common planting within the footpath or verge.

In-road planting provides a range of benefits including traffic calming by narrowing roadways and reducing vehicle speeds, opportunity to install trees clear of overhead services, opportunity for passive irrigation and more integrated stormwater management and maximising shade on road pavements by locating trees within the roadway itself.

There are three types of inroad tree planting currently being implemented:

- Tree planting within median strips – raised landscaped median strips usually in the centre of the road resulting in no impact on



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parking. These are usually limited to roads with sufficient width.

- Tree planting within traffic islands or blisters – traffic islands adjacent to the kerbs in parking lanes. This is carefully managed to limit impacts on parking capacity.
- Tree planting within laneways – landscaped traffic islands can be installed, often replacing some parking spaces where sufficient lane width is available.

The City of Sydney continues to identify numerous potential in-road planting sites. Using our new online street management tools we now have the ability to consider and specify the desired species that will be used for such special circumstances. These species may be different to the trees that have been otherwise specified for footpaths to ensure clearances to traffic and help us maximise canopy coverage and biodiversity.

The exact details of these planting opportunities will be dictated by more detailed design and analysis that will include assessments of drainage, available soil depths and volume, underground and overhead services, parking and traffic analysis and budget prioritisation.

In many streets with wide carriage ways, traffic islands along the edges of the road or creating central median strip plantings may both be possible options. The decision of which style of treatment is to be used will be subject to individual street and traffic assessments and more detailed consultation with the immediate local community.

The proposed species to be planted in-road will be in line with this plan unless special circumstances or unidentified design constraints dictate otherwise.

If no species is indicated, then it has been determined that in-road planting is extremely unlikely or not feasible for that street segment.

space above and below ground compared to small trees. Applying the 'right tree for the right place' principle, smaller trees have a place within our urban forest, particularly in areas where physical space or overhead infrastructure present as overriding constraints.

In some instances, the constraints within a particular planting location will limit the size of the street tree that is selected or would otherwise restrict tree planting altogether. This plan often includes the nomination of what is termed a 'constrained' tree species. This nomination provides an alternative species that can be considered by the City of Sydney when conditions prevent the otherwise preferred and anticipated street tree from being installed. These are generally isolated or non-typical situations within a street. This allows a tree to be planted where, in the past, it may not have been possible based on the preferred species not being suitable for such a constrained site.

Some of the instances where the 'constrained' species will be planted include where:

- overhead awnings limit larger tree sizes
- adjoining building setbacks may locally vary and become more restrictive to preferred tree planting
- footpath widths may locally vary and become more restrictive to tree planting
- underground services or nearby infrastructure impinges on the available soil volumes or physical space for planting
- localised overhead service wires to private properties impact on street tree placement
- localised overhead powerlines impact street tree placement, for example where some parts of streets, that have generally had the cables bundled, have not yet been implemented or where powerlines locally become unusually low
- significant historic buildings front the street or localised iconic views need to be maintained
- natural features and underlying geology or lack of appropriate drainage lead to reduced soil volumes and limited planting opportunities.

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## Constrained sites

Research has consistently shown that the larger the tree the greater the ecological and community benefits. However, larger trees require larger soil volumes and more physical



Median strip planting in Westmoreland Street, Glebe. Arterra Design, 2022



# STMP outcomes

This plan represents the intended gradual transition of tree species in streets over a long time frame, as trees gradually need to be removed and replaced. We have accounted for this change through a series of metrics and compared to the previous iteration of the plan produced in 2011.

These metrics show that the 2022 plan draws from a higher overall number of tree species compared to the 2011 plan. This increase is mostly due to more native or locally indigenous trees, and more evergreen trees.

An analysis of the proportional use of these species within the plan shows the 2022 plan represents a swing towards greater use of locally indigenous trees, with less use of exotic and deciduous trees.

The Shannon biodiversity index was used as an overall measure to account for species richness and evenness of the theoretical tree population represented by the plan. The results indicated a greater diversity at the species level, with a slight reduction at the family level. The reduced diversity at the family level is due to a greater reliance on locally indigenous and native trees, many of which are members of the Myrtaceae family.

Results are displayed in the following tables.

Figure 1. Tree species used in the 2011 and 2022 street tree master plans.

Type of Tree	2011 plan	2022 plan
All tree types	68	81
Evergreen	43	56
Deciduous winter	20	18
Deciduous other	5	7
Locally indigenous	20	24
Native	17	28
Exotic	31	29

Figure 2. Tree species usage in the 2011 and 2022 street tree master plans

As a proportion of the overall street network, based on a modelled number of trees for each street segment and planting arrangement.

Type of Tree	2011 plan	2022 plan
Evergreen	56%	57%
Deciduous winter	37%	35%
Deciduous other	7%	8%
Locally indigenous	28%	34%
Native	28%	23%
Exotic	45%	42%

### Figure 3. Diversity of the 2011 and 2022 street tree master plans as represented by the Shannon diversity index

Accounting for species richness and evenness within the theoretical population represented by each plan. A higher number indicates greater diversity

Taxonomic level used for diversity assessment	2011 plan	2022 plan
Species	3.31	3.50
Family	2.34	2.27

### Figure 4. Ten most used tree species in the 2011 and 2022 street tree master plans

As a proportion of the overall street network, based on a modelled number of trees for each street segment and planting arrangement.

A) 2011 plan

Species	Percentage
<i>Lophostemon confertus</i>	15%
<i>Platanus acerifolia</i>	9%
<i>Tristanopsis laurina</i>	6%
<i>Robinia pseudoacacia</i> 'Frisia'	6%
<i>Elaeocarpus reticulatus</i>	5%
<i>Jacaranda mimosifolia</i>	4%
<i>Pistacia chinensis</i>	4%
<i>Corymbia maculata</i>	4%
<i>Angophora costata</i>	4%
<i>Populus simonii</i>	4%

B) 2022 plan

Species	Percentage
<i>Lophostemon confertus</i>	12%
<i>Tristanopsis laurina</i> Luscious	5%
<i>Celtis australis</i>	5%
<i>Lagerstroemia indica</i> x <i>fauriei</i> cv.	5%
<i>Corymbia maculata</i> / <i>variegata</i>	5%
<i>Corymbia eximia</i>	5%
<i>Liriodendron tulipifera</i>	4%
<i>Angophora costata</i>	4%
<i>Waterhousea floribunda</i> Green Avenue	4%
<i>Fraxinus pennsylvanica</i>	4%



## Figure 5. 10 most used tree genus in the 2011 and 2022 street tree master plans

As a proportion of the overall street network, based on a modelled number of trees for each street segment and planting arrangement.

### A) 2011 plan

Species	Percentage
<i>Lophostemon</i>	15%
<i>Platanus</i>	9%
<i>Tristaniopsis</i>	6%
<i>Corymbia</i>	6%
<i>Robinia</i>	6%
<i>Elaeocarpus</i>	5%
<i>Jacaranda</i>	4%
<i>Pistacia</i>	4%
<i>Angophora</i>	4%
<i>Populus</i>	4%

### B) 2022 plan

Species	Percentage
<i>Lophostemon</i>	12%
<i>Corymbia</i>	11%
<i>Tristaniopsis</i>	5%
<i>Lagerstroemia</i>	5%
<i>Celtis</i>	5%
<i>Liriodendron</i>	4%
<i>Fraxinus</i>	4%
<i>Angophora</i>	4%
<i>Waterhousea</i>	4%
<i>Pyrus</i>	4%

## Figure 6. 10 most used tree families in the 2011 and 2022 street tree master plans

As a proportion of the overall street network, based on a modelled number of trees for each street segment and planting arrangement.

### A) 2011 plan

Species	Percentage
<i>Myrtaceae</i>	40%
<i>Platanaceae</i>	9%
<i>Fabaceae</i>	6%
<i>Sapindaceae</i>	6%
<i>Elaeocarpaceae</i>	5%
<i>Bignoniaceae</i>	4%
<i>Anacardiaceae</i>	4%
<i>Salicaceae</i>	4%
<i>Oleaceae</i>	3%
<i>Magnoliaceae</i>	2%

### B) 2022 plan

Species	Percentage
<i>Myrtaceae</i>	43%
<i>Sapindaceae</i>	8%
<i>Fabaceae</i>	6%
<i>Lythraceae</i>	5%
<i>Cannabaceae</i>	5%
<i>Magnoliaceae</i>	5%
<i>Oleaceae</i>	4%
<i>Rosaceae</i>	4%
<i>Bignoniaceae</i>	3%
<i>Ulmaceae</i>	3%

