CITY OF PERTH
City of Light

Street Tree Guide

2023

Acknowledgement of Country

The City of Perth acknowledges the traditional custodians of the land that we are situated on, the Whadjuk people of the Nyoongar nation and Aboriginal people from other lands. We celebrate the continuing traditions, living culture, and the spiritual connection to Boorloo and the Derbarl Yerrigan. We offer our respects to Elders past and present.

Nyoongar translation

The City of Perth kaditj kalyakool moondang-ak kaaradj midi boodjar-ak ngala nyinny, Whadjuk Noongar yoongar wer bandany Aboriginal yoongar yooarme boodjar-ool. Ngalangwoola Boorloo wer Derbal Yerrigan kalyakoorl, wongin kadadjiny wer, wirn-yoodan. Ngalang kaditj Birdiya koora wer yeyi moondang-ak kaaradjiny.

Contents

1.
Introduction

1.1 Purpose of the Street Tree Guide

The Street Tree Guide is part of a suite of documents that will help deliver the City's commitment to urban greening set out in the Urban Greening Strategy 2023-2036, and achieve the goals of the Urban Forest Plan 2023-2036 (see Figure 1).

The Guide provides information on the City's agreed approach to new street tree selection, design and planting. It explains how and why we have selected particular tree species for planting within individual streets and updates our planting processes and procedures based on current evidence and industry best practice.

The Guide is supported by the City's Design and Construction Notes which provide more detailed technical guidance on the design and installation of the physical infrastructure required to support successful street tree planting. Together, both documents provide the comprehensive design and technical framework needed to achieve efficient, consistent and high quality planting outcomes across the city.

The Guide applies to all street trees but excludes parkland trees and trees on private land.

The Guide will be reviewed and updated every four years to incorporate lessons learned, updates in industry best practice, research and innovation.

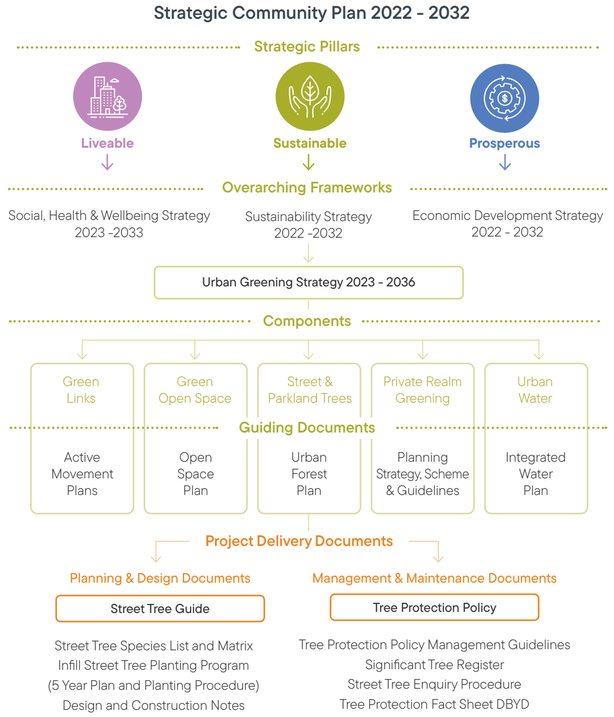


Figure 1: Integrated planning framework

1.2 Who is our audience?

The Guide is an operational, 'how to' document designed to assist with the delivery of a range of street tree planting programs. While its primary purpose is to support the delivery of the Urban Forest Infill Street Tree Planting Program, it will also be used to inform other City street tree planting programs and private sector initiatives (see Figure 2).

This Guide is therefore intended for a wide audience including:

- City employees and contractors — involved in the design and delivery of new street trees.
- Design professionals and developers — landscape architects, arborists and civil engineers.
- Utility providers — service providers undertaking works close to street trees.
- Our community — people with an interest in learning more about the urban forest.

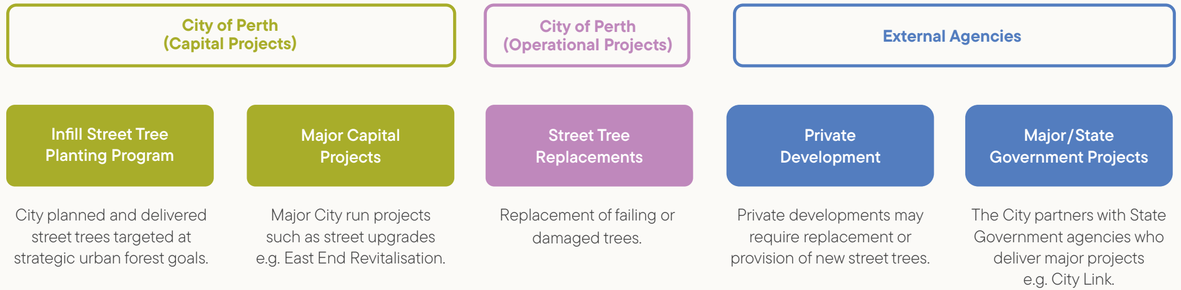


Figure 2: Delivery methods of street trees

1.3 Why are street trees important?

Our street trees make a significant contribution to Perth's on-going development as a liveable, sustainable and prosperous city and a high quality of life for our residents, visitors and businesses.

Delivering community benefits

Trees bring colour, shade and a human scale to our streets, helping to make them great places for people to be (see Figure 3). Distinctive patterns and high quality planting can also reinforce cultural, heritage and natural character, strengthening people's connection to place.

Street trees create valuable habitat for our local flora and fauna and provide a range of other tangible ecosystem services including carbon storage and sequestration, improved air quality, stormwater management and energy saving.

As our cities get hotter the cooling effect provided by large healthy tree canopies will make a critical contribution to our city.

Great city streets include trees

1 Shade

- Tree canopies provide shade and help cool the city, creating a comfortable and inviting pedestrian environment.
- Shading can also protect and extend the life of the city's road surfaces (Center for Urban Forest Research).

2 Traffic calming

- Trees can help make a street feel narrow, changing how drivers perceive and respond to the street environment; reducing vehicle speed and calming driving behaviour.
- Trees provide a physical and psychological barrier between pedestrians and moving traffic, enhancing a pedestrian's feeling of safety.

3 Human scale and experience

- Trees help scale city streets to human dimensions and improve pedestrian comfort.
- Colour, texture and seasonal variation provided by street trees improve a pedestrian's sensory experience and help connect city dwellers to nature.

"Good cities know that streets move people, not just cars. Great cities know that streets are also places to linger and enjoy."

- Toderian, 2017

Figure 3: Great city streets include healthy street trees

Meeting our greening targets

The city is currently home to nearly 9,000 street trees which provide more than half of our canopy cover within the public realm.

The Urban Greening Strategy and Urban Forest Plan have set ambitious targets to increase the level of urban greening across the city. This includes creating a greener street network and increasing the levels of canopy cover in the public realm to 30 percent within 30 years.

As streets typically account for 80 percent of public open space (Gehl), new street trees have a critical role to play in meeting these targets (see Figure 4).

Public open space

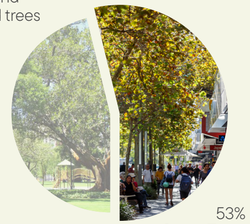
20%
Parks

80%
Streets

Streets
often account
for **80%** of public
open space in cities
-Gehl Architects

Urban forest

47%
Private and
parkland trees



53%
Street Trees

Street Trees
(owned or managed by CoP)
account for **53%**
of the urban forest canopy

Figure 4: Importance of street trees to the urban forest

Right: Hay Street, East Perth

1.4 Why do we need a Street Tree Guide?

Just as there is an increased understanding of the value of planting more trees in our city streets, there is a growing realisation of how difficult it can be to achieve successful outcomes.

Key challenges

Our streets are challenging environments for trees. Trees need access to the essential elements of space, sunlight and soils with appropriate levels of water, oxygen and mineral nutrients.

While these elements are readily available in natural environments, they are harder to come by within highly modified city streets (see Figure 5).

Over time we have learned that standard planting practices can result in underperforming trees. Inadequate soil volumes place extra pressure on trees in what is already a very challenging environment, resulting in short useful life expectancy and high replacement costs.

This can also have a negative impact on canopy cover and provide a poor return on investment.

A wealth of international research and case studies now proves the benefits and return on investment of providing street trees with additional soil volume via engineered soil systems.

The Street Tree Guide aims to align the City with international best practice by creating larger 'tree homes' based on engineered soil systems to provide additional soil volumes wherever there is adequate space available below ground.

In some instances this may mean that fewer street trees are planted in individual streets. However the loss of potential canopy cover through reduced tree numbers will be compensated for by the development of larger, healthier and more long lived canopy in those trees planted in 'tree homes'.

Right: Engineered soil system. Image Credit: Blue Green Urban

Our streets are also busy, multifunctional spaces. Trees have to compete for space against a range of other city infrastructure, both above and below ground.

The City's main aim when planning street space is to make them open, welcoming, and safe, with a primary focus on pedestrians. This supports a dynamic and diverse city life.

Pedestrians should have an unobstructed path of travel allowing them to move directly and comfortably along city streets, regardless of ability. A consistent pedestrian clearance zone should be provided against the building line, with public realm infrastructure, including street trees, located outside this zone. The width of the zone will vary depending on the function of the street.

Existing infrastructure often limits where trees can be placed, and each case should be evaluated based on a range of factors, both aspirational and practical.

Where conflicts emerge priority will generally be given to new tree planting, recoginsing that the living nature of trees means that their position and location is relatively fixed, whereas other street infrastructure can be moved more easily and at less expense.

Planting new trees in such a contested environment requires co-ordination and input across a wide range of internal and external stakeholders. If we are to achieve sustainable and high quality tree planting outcomes there needs to be a clear understanding of these broad expectations across a range of disciplines, authorities and delivery teams.

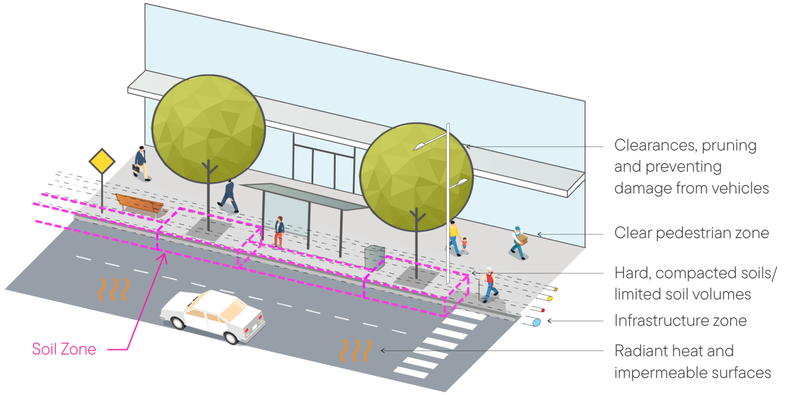


Figure 5: Street tree challenges and aspirations

1.5 What are we trying to achieve?

By setting out the reasoning, design thinking and processes underpinning improved tree selection and planting practices, the Guide aims to ensure that new street tree planting programs achieve the following objectives:

Trees

Canopy
Increased levels of high quality, interconnected tree canopy to cool our streets

Health
Improved tree health and useful life expectancy of our street trees

Diversity
Greater levels of diversity within our street tree population to improve resilience

Streets

Sense of place
Support the unique character and quality of our street network

Environmental benefits
Improve the delivery of ecosystem services and levels of biodiversity

Process

Shared understanding
Foster an appreciation of trees as critcial street infrastructure and promote a shared understanding of the City's agreed tree planting practices

Return on investment
Maximise investment by improving processes and practices to promote consistent and high quality outcomes

Redefine success
Measure success by our ability to achieve optimum canopy size, health and lifespan for individual trees rather than the number of trees planted

Right: Murray Street Mall, Central Perth

2.
How we select and plant street trees

2.1 Species selection

Successful street tree planting begins with the selection of robust and reliable species that have the ability to survive and thrive in difficult street environments, along with other key characteristics needed to ensure they make a positive contribution to the quality and character of the street they are placed in (see Figure 6).

Street tree species list

The preparation of the Street Tree Guide has included a review of the City's current tree list to identify a contemporary palette of species suitable for planting across a range of streets. The review process included a comprehensive arboricultural assessment of the potential impact of ongoing climate change on our current and future street tree population.

The list of species currently approved for use as street trees is included in Appendix A. The list is reviewed and updated regularly to take account of on-going research and the impact of new or emerging pests and diseases.

Street tree trials

To help improve the diversity and resilience of our planting palette the City also carries out regular trials of new species that have the potential to perform well as street trees. If a species proves successful they are added to the tree list.

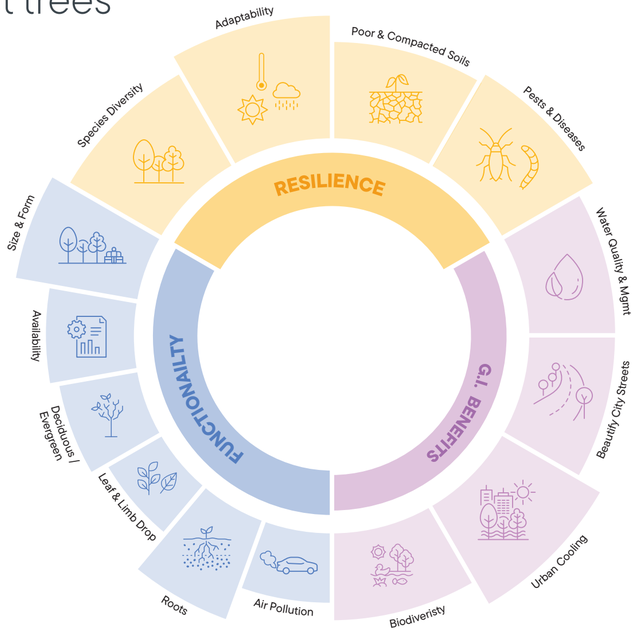


Figure 6: Street Tree species selection criteria

2.2 Right tree for the right place

The City's approach to selecting the tree species to be planted within a particular street is underpinned by the 'right tree for the right place' philosophy.

Put simply, this aims to ensure that the species selected for planting within the street can perform appropriately given the overall context and environmental conditions of its planting site; maximising the delivery of community benefits while minimising tree establishment, management and maintenance costs.

Individual tree species are then assessed against a wide range of selection criteria that aim to ensure that the species chosen is the best fit for the particular street it is to be planted in.

Some criteria hold greater importance than others such as resilience, adaptability and canopy provision.

Street tree species matrix

The City has assigned preferred species to all streets in the Street Tree Species Matrix set out in Appendix B. The selection has been based on many parameters including, but not limited to, overall urban forest health, canopy cover, diversity, resilence to climate change, suitability for local conditions, tree size, form, shade provision and existing trees.

Right: Royal Street, Claisebrook

2.3 Urban design

Urban design principles

Support Urban Cooling

Focus efforts on maximising canopy cover and cooling urban hot spots, generating an even distribution of trees and locating trees in response to solar pathways and surrounding buildings to maximise shading.

Enhance Legibility and Wayfinding

Street trees contribute to the hierarchy of streets and unique character of different streets or precincts, enabling more intuitive wayfinding.

Reinforce Local Character and Sense of Place

Reinforce cultural, heritage and natural character through tree planting, strengthening people's connection to place.

Create Biodiversity Links

Link green infrastructure (G.I.) assets across the city with biodiversity corridors of both native and exotic species which support a variety of life and provide a variety of G.I. benefits.

Human Scale and Comfort

Street trees provide a sense of comfort and human scale to wide streets or streets surrounded by tall buildings.

Left: Hay Street, West Perth

Street tree layout typologies

Formal

Large and significant cultural and commercial streets command effective avenue planting for enhanced public realm, human scale, sense of place, legibility and wayfinding.

Traditional boulevard planting requires consistent species, spacing and treatments for a visually consistent and striking aesthetic. Relevant streets are identified by the City's Urban Design Framework.

Where a dominant species or two already exists on a street, the intent would be continue its use.

Informal

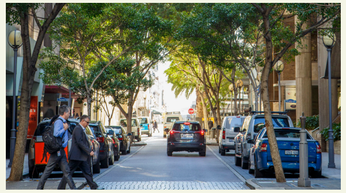
Large feature trees can help boost canopy, utilise leftover space and enhance wayfinding as legible landmarks.

Positioning trees close to the traffic lanes on small streets slow vehicles and enhance pedestrian safety.

In less significant or formal streets, a less formal approach can help maximize biodiversity, native species and habitat.

Boulevard example, St Georges Terrace

Avenue example, Hay Street



Traffic calming, King Street

Formal alignment on a residential street, Nedlands

Feature tree, Murray Street

Diversity / bosques, Brown Street

Tree spacing

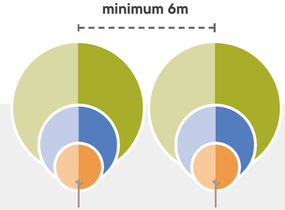
Trees should be allowed ample space to fully mature and provide maximum benefits. This depends on species, available soil volume, mature canopy size and many other factors such as overhead power lines or awnings.

Generally, street trees should be no less than 6m apart (more for larger species), however smaller spacings will be considered for smaller species and infill or succession planting.

Set out should generally aim for evenly spaced trees along the street with suitable offsets from cross-overs, street furniture, underground services and other infrastructure.

As a general guide, spacing should be approximately:

Small species: 6-8m
Medium species: 8-10m
Large species: 10-15m



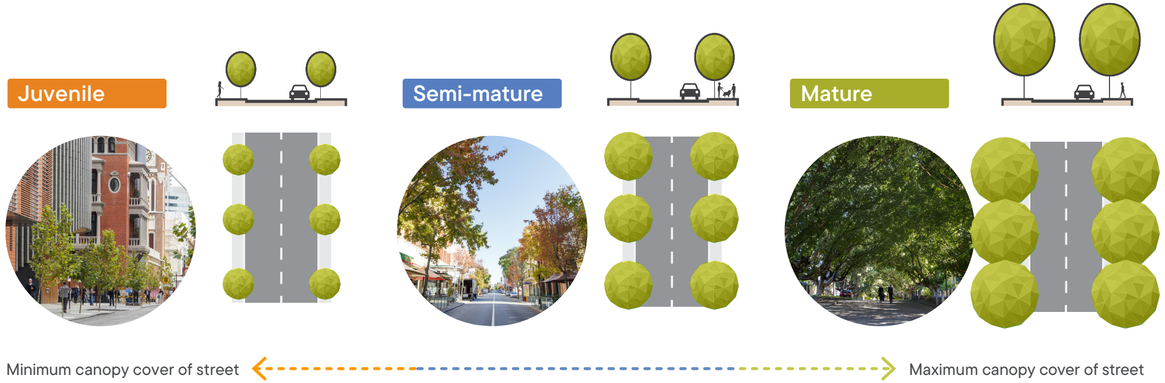


Figure 7: Tree spacing

Barrack Street, Central Perth

Traffic signals on outreach arms, Roe Street, Northbridge

Underground services running through structural cells

Street tree alignments

Consistency

Trees should generally be aligned longitudinally along the street. This provides visual consistency, elevating the urban quality but also human scale and comfort of the street.

Trees should avoid being located directly outside property doors, hydrants and emergency egress routes.

Ideally, trees in paved streets should be one full paver off the back of kerb. However consistency with existing alignment takes precedence.

Intersections

Trees should not be located where they may impact driver's sight lines to signals, signage or other vehicles.

Extended footpaths and/or mounting signals to outreach arms can enable trees to be planted closer to intersections. This should be implemented where possible since intersections tend to be large, exposed hot spots where pedestrians mill and wait.

Wide corners with large sight triangles may cause cars to speed through the intersection. Trees and various objects naturally slow drivers as they approach intersections with caution.

Trees should be a minimum of 1.8m from all crossovers to allow sufficient sight lines and clearance.

Services

Following standard or existing alignments minimises risk of clashes with underground utilities or nearby infrastructure.

Trees can and should be installed near utilities. Minimum offsets and protection measures should be implemented as per the Utility Providers Code of Conduct, Western Australia.

Narrow footpaths

Pedestrian clearways should always be maximised. Tree locations in narrow footpaths must be reviewed by the City to ensure adequate space for pedestrian movements and tree growth.

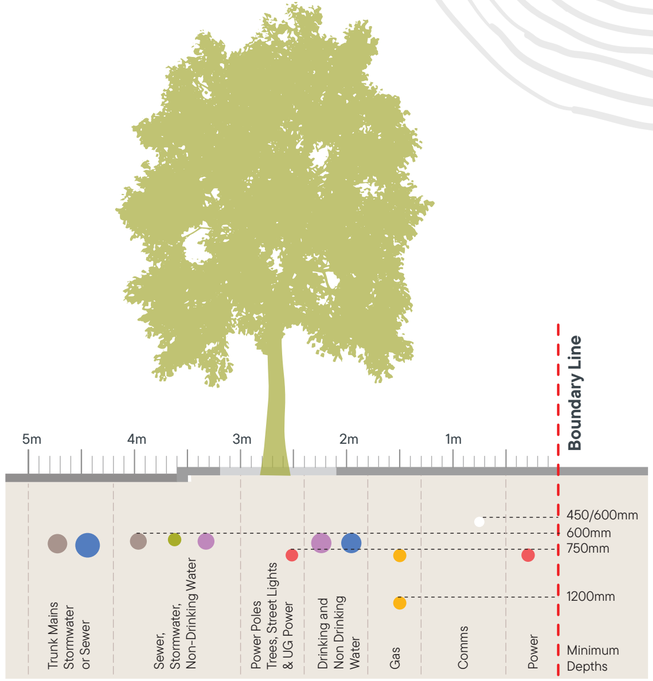


Figure 8: Standard road reserve allocations (Utility Providers Code of Practice for Western Australia, 2018)

Right: Murray Street, West Perth

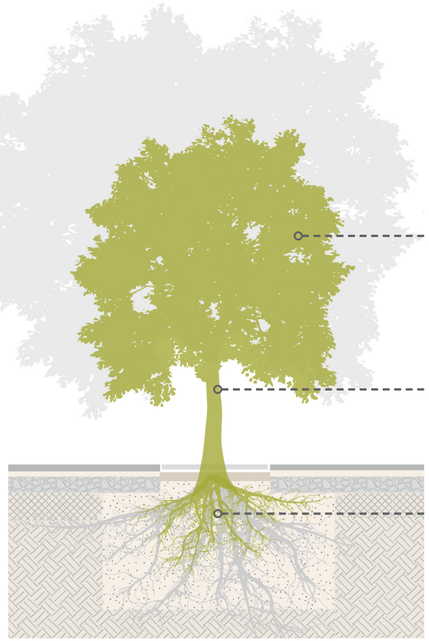
2.4 Detailed design

Needs of an urban tree

Trees in urban environments face challenging growing conditions compared to their natural habitat of a forest.

Proliferation of hard surfaces, compacted anaerobic soils, competition for space and human traffic require certain characteristics of trees to be successful and provide maximum long term benefits.

The various parts of a street tree provide numerous benefits and challenges.



Canopy

- Requires sufficient space to fully mature and provide maximum benefit
- Highly variable in shape, size and GI benefits

Trunk

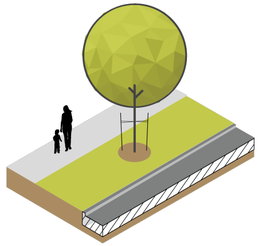
- Good structure important for long term health
- Street trees require a clear, straight trunk to allow for pedestrian and vehicle movements and minimise risk of damage to the tree

Root System

- Requires adequate volume of quality soil
- Requires water, oxygen, nutrients and space
- Highly variable in size and needs
- Often in competition and conflict with other urban infrastructure

Figure 9: Basic needs of a street tree

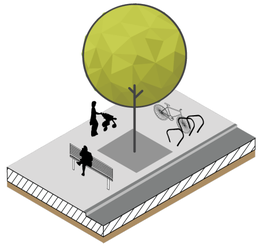
Urban tree home typologies



Soft

Grass or vegetated verge with adjacent footpath

- Generally plenty of healthy soil available
- Naturally receives rain water
- Fewer utilities, flexible locations
- Mulch ring, stakes and ties required
- Irrigation / truck watering required for establishment (5 years)
- Refer to Design and Construction Notes Book 700



Hard

Paved footpath, plaza, pedestrian or vehicle thoroughfare

- Healthy soil typically very limited
- Structural cells or soils often required
- Competition for space high, locations not flexible
- Grates often required for pedestrian movements
- Irrigation or truck watering generally required
- Refer to following pages for further design guidance and; Design and Construction Notes Book 700

Urban tree home typologies

The environments our street trees live in vary dramatically from the soft, green residential verges of Crawley and Nedlands to highly urban, hard and hot pavements of Central Perth, where utilities proliferate and competition for space is high.

Due to these inhospitable conditions, it is important we create the best environment possible for our street trees to establish and thrive long term. Therefore, the City has progressed beyond digging 1x1m pits where trees tend to struggle, underperform and even die. The City now aims to provide each street tree an 'Urban Tree Home' where its basic needs of soil, space, water and protection are all provided for.

A tree planted in these conditions should live in its home for many decades. Given the immovable nature of a tree, the City prioritises tree alignment and health over other infrastructure which is generally movable and replaceable. Therefore, it is important we design urban tree homes appropriately to maximise the longevity of each tree and minimise maintenance issues in the future.

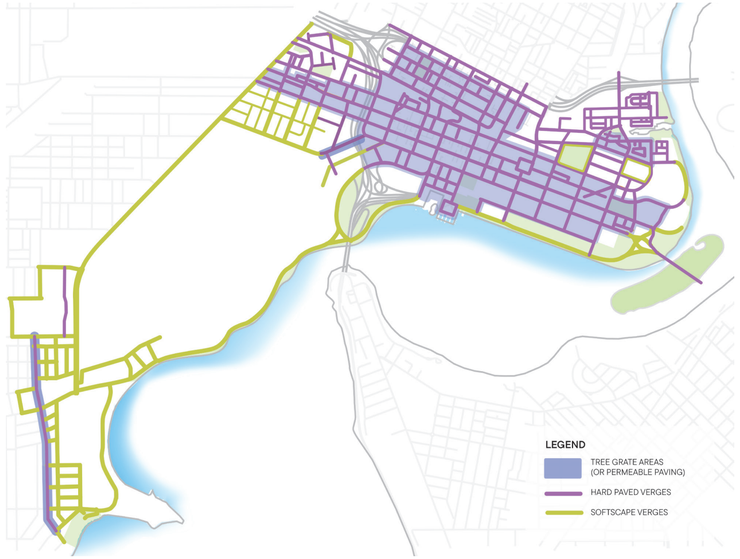


Figure 10 : Urban tree home typologies
Note: Many streets comprise a mix of hard and soft verges. This map indicates the predominant typology of each streets' verges.
Note: Active city streets require tree grates or permeable paving to allow pedestrian movements and permeability. These streets are indicated above.

Urban tree home features in a hard verge

Where proposed trees lie in highly urbanised, harsh environments, the City aims to improve and optimise the conditions for tree growth through a range of measures.

Where space and street activity permit, tree homes should sit within a mulched garden bed to provide adequate soil volume with natural water infiltration and oxygenation of soil.

Where sufficient space and quality soil is not available, structural cells, structural soils, root trenching, and/or connected pits should be installed. These features can and should be installed around utilities and infrastructure. They can be used to direct roots away from vital infrastructure or toward desired pathways, e.g. nearby softscape.

Irrigation systems should be installed wherever practical.

Water runoff should be directed into the tree home for passive irrigation via water harvesting tree grates and kerb inlets wherever possible and effective.

Truck watering inlets should be installed where irrigation is not available.

Moisture sensors should be installed in all new tree homes.

Guards or stakes should be installed in areas where damage or vandalism is likely.

Stakes or anchor systems should be installed where trees are exposed to strong winds to aid establishment.

For detailed instructions on the design of tree homes, refer to the City's Design and Construction Notes — Book 700

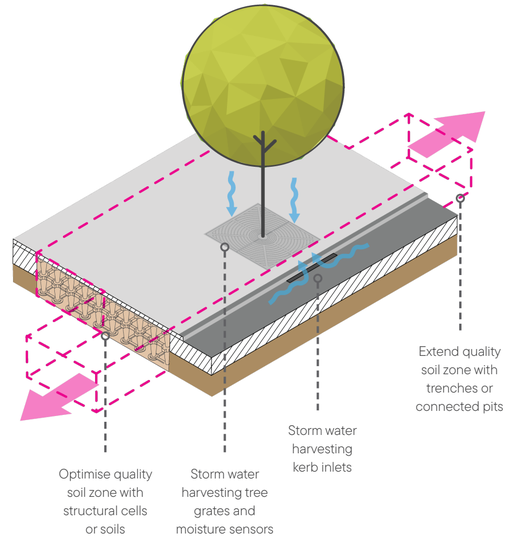


Figure 11: Features of a great urban tree home

Soil volumes

Access to sufficient volume and quality of soil is absolutely vital in street tree success.

Inadequate soil volumes result in more frequent failure and replacement with a long term life cycle cost.

Adequate soil volumes allow a tree to last for many decades, providing maximum benefit and a significant, positive, return on investment.

Industry best practice recommends 2m^3 of quality soil volume for every m^2 of mature canopy area. This translates to anywhere from 10m^3 (small species) to 80m^3 or more (large species) of soil volume. This is often unachievable in urban settings due to existing site constraints.

Where these volumes are unavailable naturally and high pedestrian or vehicle traffic is expected, engineered solutions are required. Structural cells or soils should be used to achieve these volumes.

Please refer to the street tree list for classification of species as small, medium or large.

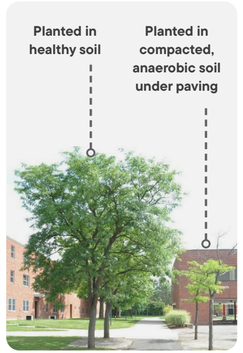


Figure 12: All other factors equal, adequate volume and quality of soil yields drastically different results (Urban, J. 2008)

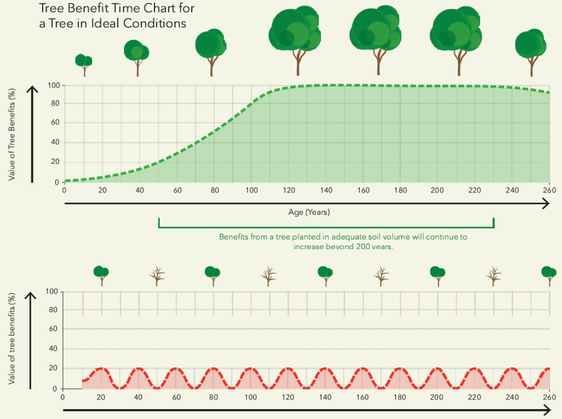


Figure 13: Research by BlueGreen (2018) demonstrates dramatically improved lifespans and net lifecycle benefits of trees with adequate soil volumes.

The City targets a minimum root-able soil volume for all new street trees of:

Small species = 10m3
Medium species = 20m3
Large species = 30m3

Structural cells and structural soils

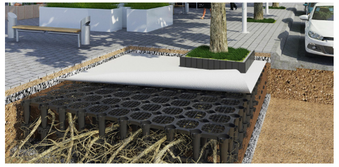
Structural cells are an engineered plastic product which support pavement to allow traffic loads without compacting the soil inside. This provides high quality soil environment for tree roots under paving.

Structural soils are an engineered soil mix containing a rock / gravel aggregate which is compacted to provide a stable sub-base for trafficable paving. Regular soil fills the gaps between aggregate particles, providing quality growing media for tree roots.

Studies show that structural cells and soils, despite a higher upfront cost, reduce lifecycle costs and increase net benefits of urban trees significantly.

Both structural cells and soils can and should be used around underground services. The modular design and construction allows for flexibility of layout and staged construction to work around existing pipes or conduits.

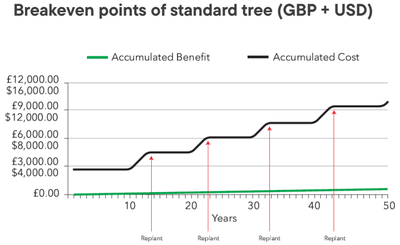
Where cells absolutely cannot be accommodated, structural soils may be the preferred alternative. In some instances, a hybrid approach may be implemented, installing a combination of cells and structural soils.



Structural cells support the pavement above, whilst providing quality soil for tree roots below

Structural cells can and should be installed around existing underground services and include water harvesting systems

Structural soils support the pavement above, whilst providing quality soil for tree roots below



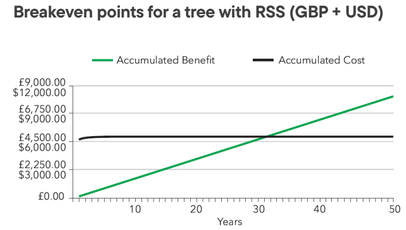


Figure 14: A tree planted in a standard pit typically needs replacing every 10-15 years, never providing the GI benefits we aim for. Trees planted with engineered soil provision typically break even around 30 years, providing a net benefit for many decades (Blue Green, 2018)

Space requirements for modified soil types

Given structural cells and soils have different costs, flexibility and spatial efficiencies, they can be useful in different situations.

The recycled plastic 'structure' of cells occupies approximately 10-15% of the space available, leaving 85-90% for root-able soil.

Structural soils are made up of 60–75% aggregate, leaving 25-40% root-able soil. Therefore, more space is required for structural soils comparatively.

Generally, structural cells are preferred over soils due to their spatial efficiency and superior soil quality. Structural cells are generally more expensive. However in granite paving, the cost of civil works can make the costs comparable.

Each location must be assessed by the City's design team in line with this Guide.

Often, the choice of engineered soil type will come down to space available. The two treatments can be installed together as a hybrid option to work around existing site constraints and achieve target soil volumes.

Quality soil zones or trenches can be used to direct roots away from infrastructure or towards nearby softscape areas. Roots will naturally seek healthy soil and avoid compacted, anaerobic soils. Tree homes should be connected via shared pits or trenches where possible since trees can share water and nutrients via their root systems and mycorrhizal networks, improving resilience.

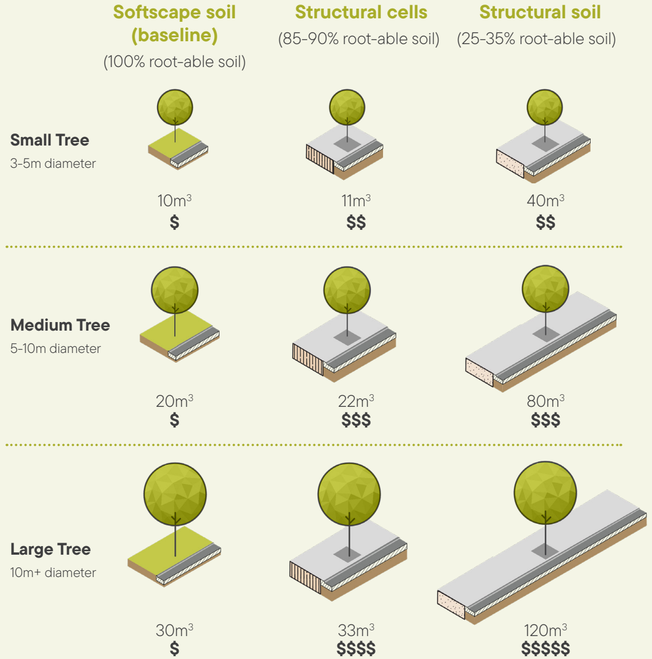


Figure 15: Space requirement and cost comparison of structural cells and soils

Water sensitive urban design features

Storm water harvesting systems

Wherever possible and practical, water harvesting kerb or drain inlets should be installed. These capture storm water and direct it toward the rootball via PVC and slotted agricultural pipe.

This passively irrigates the trees, reduces storm water runoff, filters contaminants and recharges the groundwater. Each location must be assessed by the City's designers and installation contractor for runoff potential.

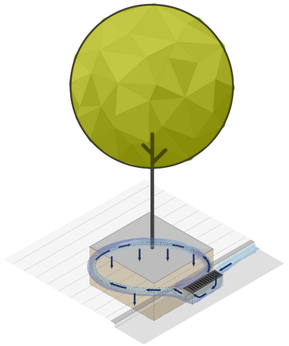


Figure 16: Typical water harvesting system

Irrigation or passive irrigation

Tree homes should include automatic irrigation where possible or practical. For example when combined with regular garden bed irrigation. However, sustainability of the water source, maintenance requirements, efficiency gains, system life span and cost must all be evaluated.

Often, installing irrigation proves to be impractical or not worthwhile. In this case, truck watering is required. The majority of street trees in the City are watered this way, using largely sustainable water sources.

All new street trees should include stormwater harvesting inlets allowing passive irrigation and water truck applications should be directed through these inlets to prevent erosion around the collar of the tree.

Moisture sensors should also be installed, allowing the provision of water to be adjusted according to weather conditions and soil moisture.

Watering inlets

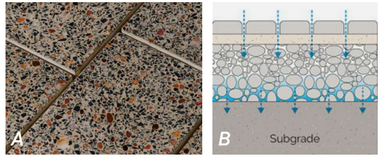
Permeable pavers

Permeable paving around trees can also assist in hydrating and aerating the soil, watering the trees, reduce storm water runoff and paving upheaval.

Implemented together with structural cells or soils, permeable pavers can help create a great urban tree home. Structurally rated geomesh can be installed under permeable pavers to reduce the sub-base thickness, increasing space for soil & tree roots.

The permeable nature of these systems prevents condensation under paving — the main cause of root /paving upheaval.

These systems are subject to a trial by the City.



Example of permeable unit pavers.

(A) Aesthetic view of pre-cast concrete pavers with nib gaps to allow permeability. Visual finish is consistent with standard city paving.

(B) Section diagram of permeable paving profile and infiltration.

2.5 Procurement

Contract growing

Wherever possible, the City contract grows street trees 2-3 years ahead of installation. It is important that any party procuring street trees for the City does so well in advance to ensure:

- Quality and quantity of stock
- Sourcing of less commonly available species or sizes

Form and habit requirements are particularly important for street trees to allow pedestrian movement and avoid damage by vehicles or vandalism.

Generally, street tree stock should be at least 200L to ensure successful establishment in an urban environment.

For full details on tree procurement, quality control & installation, refer to Design and Construction Notes Book 700

Quality control

The City will only procure and accept high quality tree stock from accredited nurseries.

The City's arborist must periodically inspect trees numerous times during 'growing up' and again at delivery to ensure standards are met.

All tree stock must adhere the City's minimum standards outlined in Design and Construction Notes Book 700, which include:

- True to type (species & provenance)
- Tree habit
- Crown, trunk and rootball integrity
- Size
- Trunk taper

Trees which do not conform to the City's standards will be rejected.

Figure 17: Tree stock quality standards

Quality standards

Crown:

- Proportionate to trunk and root ball
- Well balanced
- Clearly defined central leader
- Healthy leaves
- Free of pests and diseases
- Pruned appropriately

Trunk:

- Centrally placed
- Proportionate to tree height
- Free of deformities
- Sound stem junctions
- Min 1.8m clear stem

Roots:

- Root crown at surface of rootball
- Well distributed – no circling or girdling
- White and healthy
- Soil volume intact when removed from growing container

2.6 Installation

Installation is to be carried out by qualified contractors in accordance with all relevant City documents.

The City's Design and Construction Notes Book 700 include all relevant specifications and construction details regarding site set out, excavation, hardware, materials and planting.

If excavation reveals unexpected utilities or other conditions which compromise the designed soil volumes or other tree home details, or prevent planting in the agreed location, the contractor is to contact City staff, provide photos and discuss the optimal solution.

Tree guards and stakes are only to be installed in areas at risk of damage or vandalism as instructed by the City's representative. Tree guards may be deemed necessary in the following situations:

- Highly active, urban areas such as the CBD
- Narrow footpaths
- Wind tunnels
- Small tree stock
- Shallow planting due to underground services
- Entertainment precincts
- High probability of vandalism

To maximise a tree's success, planting will generally take place between the cooler months of April and October each year.

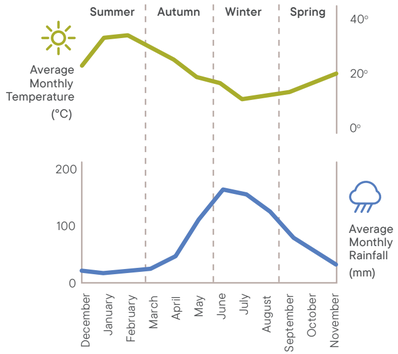


Figure 18: Perth's seasonal rainfall and temperature patterns

Right: New tree planting on Roe Street

2.7 Maintenance and monitoring

Post planting inspections

Each new street tree is inspected to ensure it has been planted in accordance with the City's standards and practices.

Data capture

Trees are then captured on the City's central tree database. This database records the location and performance of each tree against a range of key performance indicators.

Establishment

Every new street tree is given additional care and maintenance for an initial three to five year establishment period to help it adapt and thrive in its new environment. This includes watering, fertilising, pest control and pruning. Beyond this, it is important trees are capable of thriving with minimal maintenance.

Replacement planting

The City monitors tree health and useful life expectancy (ULE) over time. Failed, under-performing and ageing trees will be replaced strategically to maintain the overall health and performance of the urban forest. Replacement should be staged to minimise temporary negative effects of removal and replacement.

The removal and replacement of an existing street tree is generally limited to trees that are:

- Dead — except where they are creating habitat in more natural landscapes
- Diseased — except where cost effective rehabilitation treatments are available
- Damaged or vandalised, particularly where they have become hazardous
- In health decline and at the end of their useful life expectancy
- Under-performing and unlikely to mature and provide important GI benefits

Left: Example of under performing street trees, Hay Street, Central Perth

Permable paving

Some trees will outgrow their homes. Particularly if they have been planted too high or without sufficient healthy soil volume. This often disrupts paving and kerbs, creating tripping hazards and harming the tree's health.

As part of regular inspections, any maintenance or replacement of tree grates and adjacent paving is recorded. It is vital for long term tree health, that grates are cut or removed before the trunk starts to grow around them.

If a grate needs removal, a mulch pit is failing or paving is being damaged, the City's preferred treatment is permeable resin bound aggregate (RBA) paving.

This provides a consistent, aesthetically pleasing, low maintenance surface suitable for foot traffic. The extent of this treatment may vary with the tree's size, extent of disruption, width of footpath and ability to maintain universal accessibilty standards.

Large established trees often damage paving and create trip hazards in the urban environment.

Old style tree grates should be replaced with new style grates as part of capital projects to achieve consistency across the City.

Tree grates must be monitored, cut neatly and removed as the tree grows to maintain health and longevity.

Porous resin bound aggregate (RBA) paving is the City's preferred treatment to be retrofitted around established trees which have outgrown their grates or pits.

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Appendices

A. Street Tree Species List

B. Street Tree Species Matrix

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