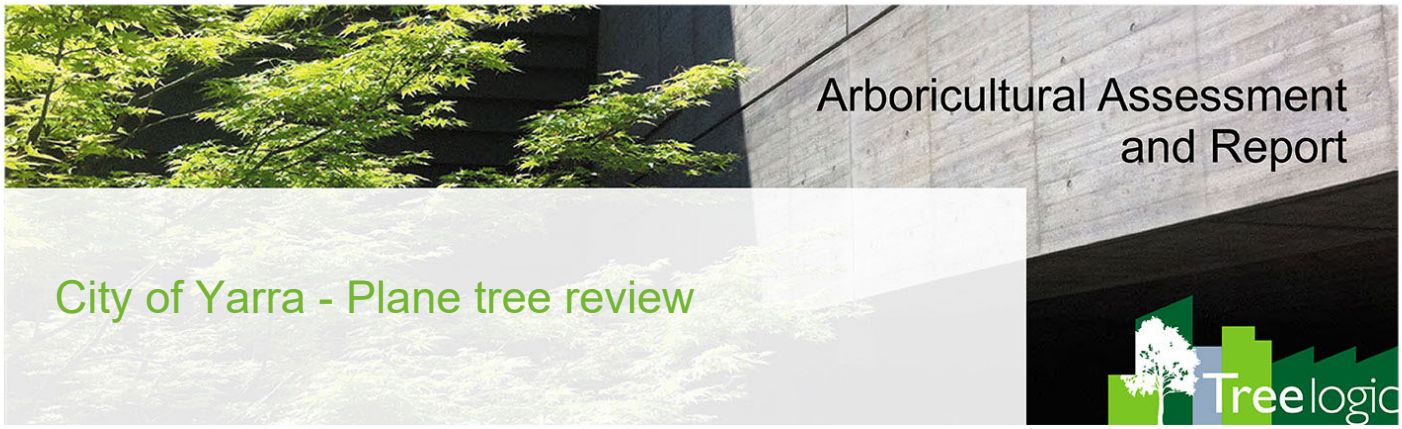

Arboricultural Assessment and Report

City of Yarra - Plane tree review

18th April 2019 I Tree Logic Ref. 009946

Prepared for Susan Stanes | Senior Coordinator Design and Place Making | City of Yarra

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Scope of works

The aim of the arboricultural consultancy is to provide information to address issues raised in Council resolution12.3.

Information being sought:

- Overview of recommended species diversity levels for tree species in urban landscapes. Some indication of an industry standard for a recommended percentage of Plane trees for the City of Yarra (The City of Yarra Urban Forest Strategy states that 16.2% of all trees within the City are plane trees and 12% of London Planes).
- The latest evidence which demonstrates any adverse health effects from London plane trees and to what extent
- Any evidence of lesser effects from other plane tree species
- Recommendations of appropriate alternative species that may be more suited than plane trees to residential streets and historic heritage areas, which could progressively replace Plane trees to reduce maintenance costs and limit public liability claims as well as creating a suitably shady canopy.

The review and arboricultural advice will take into consideration the policy and strategic direction of tree management within the City as identified in the City of Yarra Street Tree Policy 2014 and the Urban Forest Strategy 2017.

Introduction

Overview of London Plane Tree

The London Plane tree (*Platanus* × *acerifolia*), is a hybrid cross between American sycamore (*P. occidentalis*) and Oriental planetree (*P. orientalis*). The original cross may have occurred as early as the 1640s, after which this tree became widely planted in London and other major European cities because of its perceived tolerance for urban pollution. London Plane typically

grows as a single-trunk tree to 20 to 30 metres (less frequently to 36 m) tall with horizontal branching and a rounded habit. Trunk diameter typically ranges from 1 to 2.5 metres.

The signature ornamental feature of this tree is its brown bark which exfoliates in irregular pieces to reveal creamy white inner bark. Mature trees typically display mottled white bark that facilitates identification from great distances. The large 3-5 lobed medium to dark green leaves (10-23 cm wide) have coarse marginal teeth. The under-surfaces of the leaves and the young parts of the plant are often clothed with an evanescent or more or less persistent felt of stellate of simple hairs (trichomes). In autumn, foliage typically turns an undistinguished yellow-brown.

Small, non-showy, monoecious flowers appear in small rounded clusters in April. Male flowers are yellowish and are held on short stalks on branchlets of the previous year and female flowers are reddish in clusters growing on short stalks on older branchlets. During its flowering season, the released pollen can attain high levels, for example, up to 14% of total pollen in some areas of Spain (Asam, Hofer, Wolf, Aglas, & Wallner, 2015).

Female flowers give way to fuzzy, long-stalked, spherical fruiting balls (to 4 cm diameter) that ripen to brown in March and often remain on the tree over winter, breaking up or falling off the following spring. Fruiting balls appear in pairs. Each fruiting ball consists of numerous, densely-packed, tiny seed-like fruits (achenes). A tuft of long bristly pappose hairs is attached to the base of each seed that assist the wind dispersal of the seed.

The plane tree (*Platanus* spp.) in Australia has primarily been used as a large amenity and ornamental tree. In Melbourne it is a regular and common component of larger urban parks, many streets, and is regularly used in many other forms of landscaping where a large tree can be used. It is similarly used as an urban parkland and street tree in cities throughout the temperate regions of the world.

The plane tree has many advantages as an ornamental tree including great size and longevity where these are required. Other advantages include a moderate shade that is enough to allow grass or other plants to grow below it, tolerance of pollution, tolerance of difficult soil conditions, and tolerance of pruning, including bad pruning. One of the parents of London Plane is *P. occidentalis* (American Sycamore) which can tolerate weeks of flooding, even complete submersion of seedlings, provided that the water is aerated. This also indicates the species has good tolerance of compacted sites, i.e. low oxygen levels. The tree has good tolerance of changes to its growing environment and loss of root system. Due to its tolerances the plane tree is one of the most successful urban trees which have subsequently seen it used extensively around the world.

There are 20,854 public street trees in the City of Yarra and many more park trees. London Planes account for 12% (approximately 2,500) of the total street tree population; combining other Plane species *Platanus* spp. comprise 16.2% of the total street tree population. London Planes are the most common street tree in Yarra.

Appropriate diversity guidelines

There is a clear understanding that communities should plant a variety of tree species. Since the 1800‘s, there is a chronological order of events where a major pest or disease has devastated a population of urban trees (primarily in the Northern Hemisphere), which should make the requirement to state the importance of diversity as redundant. It is generally understood that diversity of tree species used in urban landscapes will increase the resiliency of the urban forest. Tree diversity within an urban forest landscape provides functional, aesthetic benefits as well as biological/ ecological advantages. “A common tenet of popular ecology is that high species diversity contributes to the stability of ecosystems by reducing hazards of catastrophic loss of a particular species” (Richards, 1983). However, there is much evidence from plant ecological studies that relationships between diversity and stability cannot be as simply expressed as this premise suggests.

Street tree species do not occur as a monoculture to the extent found in agricultural crops or forest plantations; nor are monocultures logical over the range of street conditions encountered over a municipality. Most urban tree populations around the world are dominated by a relatively few species that have proven adaptable and useful under austere conditions, and Planes are certainly in that group.

Achieving an appropriate diversity of tree species is one important factor in achieving a sustainable urban forest. However, there should be a suite of management tools utilised to manage and sustain a healthy, vibrant urban forest that responds to a community’s requirements.

There are guidelines or rules that aim to set target levels for taxon diversity within a street tree population. Santamour (1990) suggests that there should be no more than 30% of any one family, 20% of any one genus, or 10% of one species in an urban tree population. This is the typically used numerical limit placed on tree diversity within a municipality in Australia.

This rule was predicated on the significant losses of elm to Dutch Elm Disease (DED) during the 1950’s and 60’s, however the implementation of contemporary approaches to pest and disease management, sanitation cutting and appropriate plant spacing, would have reduced the losses and impact on the landscape (Richards, 1983). Watson (2018) also suggests that regardless of suggested percentage diversity targets, damage from a single invasive pest with a wider host range can still be extensive.

Miller and Miller (1991) recommended that "liberal use" of a species should not exceed 10%. Jaenson et.al. (1992) suggested that city foresters should use species percentages derived from rapid, sample surveys to "reassess their recommended species lists to achieve a 5%-10% ceiling on any one tree species".

These simple numerical limits have no scientific basis. Regardless of percentage, a species might be considered overused if it is often planted where other proven species are likely to be better suited (Richards, 1993). It is hardly a criticism to use a proven species for critical/high profile planting sites; particularly where species form iconic avenues within a city. A logical

process would be to use these proven species to where they are believed to provide the most benefit or best available choice and encourage suitable alternatives elsewhere. This would result in a reduced planting rate for a common species, but its relatively high success rate will maintain its prominence in the population (Richards, 1993).

“Street tree diversity should relate to the range of conditions and objectives in a community rather than to simple numerical standards” (Richards, 1993). The urban environment can be a stressful place for trees which limits the palette of species suitable for cultivation; typically, there is less diversity of species and shorter-lived species growing in streets than what is growing within public open space and urban parks.

The concept of species diversity should not be at the cost of species prominence, urban adaptability, canopy cover and management resource allocation.

Establishing diversity targets should consider factors such as scale, land use and site characteristics. Diversity goals should be set as high as realistically possible but with the understanding that urban environments are typically difficult with limitations on the number of species that perform well, and those that do should not be replaced by underperforming or untrialled species (Watson, 2018).

I believe that the accepted level of species diversity will evolve based on the continuum of the dynamic nature of tree removal and replacement works taking into consideration the changes in species/variety availability, changes to environmental or planting sites and changes to community expectations. Setting strict diversity numbers are unrealistic and typically not achievable, due to community concerns about tree removal, and under current management regimes and resourcing allocations.

Based on the Yarra Council resolution to investigate the management of Plane trees within the context of tree diversity guidelines, I would offer the following suggestions:

- Aim to reduce the Plane population to less than 10% of the total street tree population (approximately 1,300 Plane trees) over the next 5-years.
- Undertake an audit of the Plane tree population within the City to ascertain streets where:
    - A total removal and replacement program could occur based on the removal criteria outlined in the policy.
    - Existing Plane trees can be replaced with an alternative species when they are removed; results a slower turnover of the Planes within a street.
- Remove problematic Plane trees that meet any of the removal criteria.
- Consider rationalising the use of Plane trees in every street, such as within local roads and maintain them in high profile/prominent sites such as arterials, existing established avenues or where space allows.
- Align Plane tree removal programs with other street infrastructure maintenance programs or programmed upgrade works to enable design solutions to be incorporated to support alternative large trees.

- Educate the community as to approach being taken by Council and the alternatives been sought.

Existing policies and strategic directives

Removals and replacements should be based on the policy directives and the Urban Forest Strategy 2017, where it is opined that 'London plane trees are currently over represented in Yarra streets compared to best practice.'

The City of Yarra Street Tree Policy has elements that would be supportive of rationalising Plane tree populations.

Objective 2 – Improve the Quality of Street Trees

2. Actions

2.2 Select trees that are less likely to have an adverse impact on surrounding Infrastructure.

Objective 3 – Increase diversity of street tree species

3. Actions

3.1 Trial new tree species to broaden the available palate of trees available for planting across the Municipality.

Objective 5 - Integrated Streetscape Design

5. Actions

5.1 Coordinate street tree planting with other Council services that have an impact on the amenity and management of streetscapes and associated infrastructure.

Tree removal criteria

Street tree removal and replacement criteria as listed in the City of Yarra Street Tree Policy 2014. Consistent with Objective 1 of the Street Tree Policy, Council's preference is for trees to be retained wherever possible.

Effective management of street trees requires street trees to be removed from time to time to limit risk to person and/or infrastructure, and reduce life cycle costs or to provide a street tree canopy for current and future residents,

Reasons for removal include, but are not limited to:

- Trees that are dead, dying or unsafe;
- Minimisation or elimination of risk to the public;
- **Trees that are the subject of public liability claims**;
- **Trees that are in inappropriate locations due to tree size, structure or root network**;

- Trees that are adversely impacting on vehicle and/or pedestrian safety;
- **Trees that are causing damage to public or private infrastructure**;
- Trees that are identified for removal following consultation as part of a street tree planting program;
- Trees that are identified as weed species; and
- **Trees that are causing excessive renewal and maintenance costs to surrounding infrastructure**.

The reasons listed in bold are assumed to be more apparent with large Plane trees in the City.

However, consideration needs to be given to adhering to Objective 1 – Net Increase in the number of street trees and overall street tree canopy. The Plane trees across the City would be providing substantial canopy coverage with associate environmental benefits.

Other Councils approaches to Plane tree management

In terms of changing community expectations and in conjunction with associated management issues with a growing population, Plane trees are coming under more scrutiny and Councils are pondering their longer-term viability and overall dependence on the genus. This is particularly the case with the City of Melbourne, where they are no longer planting Plane trees into new landscapes and will retain them only in key areas such as Elizabeth Street, Swanston Street, Bourke Street and Collins Street, the rest of the CBD will be gradually changed as and when trees die. The City of Melbourne will be reducing the plane tree population over time.

To a lesser extent, the City of Stonnington are reviewing the use of Plane trees along their main roads and considering rationalising Plane tree avenues if other considerations are met.

The City of Port Phillip is about to embark on a policy direction for the management of their Plane tree populations taking into consideration similar management issues that the City of Yarra is experiencing. An outcome is to develop a management approach that could rationalise their use in line with diversity targets.

A cost/benefit approach to tree removal decision making

A cost benefit approach could be adopted to aid tree removal decisions.

Seven case studies of existing streets with recognised tree root issues was undertaken in an inner-city municipality in 2016 to develop up strategies and costings for how they could be managed. This involved a range of typical street typologies found in the study city.

The first step was to establish a dollar value of the existing trees. The i-Tree Eco Structural Tree Value (see https://www.itreetools.org/eco/) was used to calculate an estimated value for the trees. The system is based on the Council of Tree and Landscape Appraisers method that has been adapted for Australian conditions. The value considers the amenity value as well as the environmental benefits, such as carbon sequestration and pollution uptake, in the calculation.

Costs for the installation of root barriers were taken from supplied information on existing costs. In all cases the lowest costs were attributed to each example.

Bear in mind that the maintenance costs do not include the processing of requests, multiple inspections, and that the barrier may not solve the issue or be a one-off solution.

Table 1. Comparison of values for case studies

Street	Dominant species	Individual tree value (i-Tree)	Collective tree value (i-Tree)	Avg. tree root barrier cost
Street No. 1	Liquidambar	$7,131	$684,576.00	$4,477.50
Street No. 2	Claret Ash & Callery pear	$1,362.50 (average)	$76,300.00	$3,230.00
Street No. 3	London Plane	$8,648 (P/L side), $11,647 (Non P/L side)	$1,183,108.00	$5,970.00
Street No. 4	London Plane	$9,598 (P/L side), $10, 259 (Non P/L side)	$944,199.00	$5,373.00
Street No. 5	London Plane	$2,490 (P/L side), $3,385 (Non P/L side)	$168,780.00	$2,709.00
Street No. 6	London Plane	$4,869	$141,201.00	$6,740.00
Street No. 7	*Melaleuca* spp., Callery Pear, Claret Ash	$3,168 (avg)	$316,800.00	$2,783.00
		Total value of trees in the case studies	$3,514,964.00	

In the examples of Street No. 2 (assessed section) and to a lesser degree Street No. 5, the case studies found that the estimated value of the trees was less than the estimated costs for a typical root barrier. This type of analysis could allow Council to make a cost/benefit analysis regarding the management of the trees. In this study it suggested that it may be worthwhile investigating design options and/or removal and replacement programs for these two streets.

Allergy problems

Most species of Plane are known to cause bronchial problems, similar to hay-fever with some people. This is primarily due to the hairs and down shed from the young leaves and fruit more so than allergic reaction to pollen production. Sercombe, et al, (2011) found that Platanus bioaerosols exist in high concentrations between August and November in inner-urban Sydney but were not associated with seasonal symptoms. Platanus trichomes (fine hair outgrowths) from foliage and fruits are inhaled and may constitute a respiratory irritant.

These trichomes are a problem particularly in spring and early summer. It affects most seriously any people working with or disturbing the foliage, such as people pruning or carrying out other work on the trees. *Platanus orientalis* has produced conjunctival and nasopharyngeal irritation in tree workers from its leaf hairs.

It has also been known to cause problems with people in areas adjacent to the disturbed foliage. Some people are not affected. Pruning work on these trees sometimes must be halted until late summer till most of the hairs are shed and staff are able to work on it again.

Hairs are present both on the leaves and on the fruit to protect the young tissue from sunlight damage. Later in the season other protection develops in the mature leaves (mostly from

pigments in the leaf), and the hairs are shed to ensure that it photosynthesises at maximum efficiency. The bronchial reaction is due to irritation of the mucal membranes by the leaf hairs. The victim is usually fully recovered the following day, and it is not believed to cause any long-term health problems. Plane trees are sometimes included in listings of poisonous plants because of this reaction.

The propensity for plane trees to cause allergic reactions has been documented in Australian medical journals. “Hayfever and asthma occurring in a male individual, who pruned a plane tree, was attributed to downy material which was found on the leaves and ‘seed balls’ during the summer. Other trees did not affect him nor did plane trees at other times of the year. Scratch tests with a watery suspension of the downy material from the leaves produced positive reactions” (Zacharin 1933).

The most relevant allergens from the *Platanus* x *acerifolia* pollen have been determined. A major allergen, specific of this pollen, and named Pla a 1, has been purified and characterized (Asturias, et al 2002). The periods for pollen production would be from August to October with peak periods during September.

The following graph indicates the periods of greatest pollen production from plane trees through the year. Graph from Nitiu and Mallo (2002).

Figure 7. Pollen calendar of *Platanus* spp. expressed as sums of daily concentrations.

Figure. Pollen Calendar of Platanus *spp.*

It should be noted however that many other species of tree (primarily wind pollinated species) can cause allergenic reaction. The worst offenders from the plant kingdom are the grasses and weed species and these are particularly problematic species in Melbourne due to the location of extensive open grassland to the north and prevailing wind patterns.

Respiratory concerns associated with the various Plane tree species and cultivars will continue and is a component of the ongoing management of these trees in urban landscapes.

Alternative species

The following tree species and cultivars could be considered as suitable replacements for *Platanus* spp. in the City of Yarra. Consideration has also been given to various tree sizes to assist in selecting trees for the various street typologies and constraints across the City.

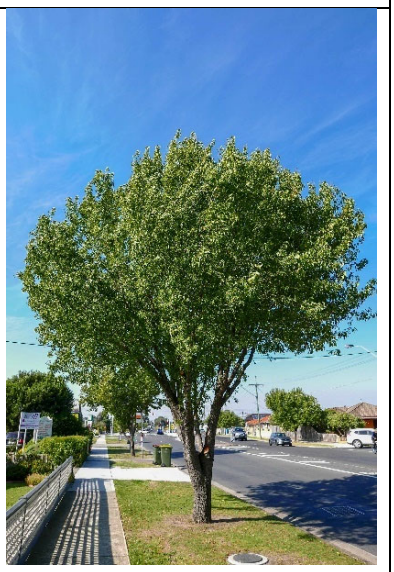
The tree selections should consider:

- Pending climate change predictions
- Existing rainfall averages
- General soil types
- Species/cultivars or their propagules are currently available in Australia.

Tree selections for City of Yarra – alternatives to Plane trees

Small trees 3-8 metres in height

Name: Montpelier Maple (*Acer monspessulanum*) **Height:** 6-8 metres **Width:** 5-8 metres **Description:** Small tree with oval to rounded form. The leaves can be variable, but typically three-blunt lobes, shiny dark green. Foliage is typically thick, leathery, turning yellow in autumn. The flowers are yellow-green and held in pendulous flower clusters. The flowers appear simultaneously with the new leaves. The fruit is a samara (winged seed) with many being sterile. Montpelier Maple is tolerant of dry conditions. It is intolerant of saline and sodic soils. It will grow in full sun to part shade.	

Name: Crimson Sentry Norway Maple (*Acer platanoides* 'Crimson Sentry') **Height:** 7-8 metres **Width:** 4-5 metres **Description:** Broadly columnar in form with a dense canopy of dark purple leaves with five sharp lobes. Leaves turn from purple to golden-brown autumn foliage. Moderate to high tolerance of dry conditions. Very tolerant of a wide array of soils. Adapts to extremes in soils; sand, clay, acid to alkaline.	
Name: Ornamental Pear (*Pyrus betulaefolia* 'Southworth' Dancer'™) **Height:** 5-8 metres **Width:** 4-7 metres **Description:** Small tree with vase form becoming oval to rounded. Silver-grey maturing to shiny, mid-grey foliage turning yellow in autumn. Profuse white flowers in spring. Different in form/texture to other pears. Adapts to most soil types and has high to moderate drought tolerance.	

Medium trees 9-15 metres in height

Name: Elsrijk Hedge Maple (*Acer campestre* 'Elsrijk') **Height:** 8-10 metres **Width:** 5-8 metres **Description:** An oval to widely conical shaped tree with a dark, dense crown. Small dark green leaves, colouring yellow in autumn. Bark grey-black, lightly ridged and furrowed. Adapts to a wide range of soils, from poorly drained clays to well drained sand (except dry infertile sandy soil). Will tolerate drought, air pollution and soil compaction. Grows well in cut-outs in hard-paved areas.	

Name: European Nettle Tree (*Celtis australis*) **Height:** 10-15 metres **Width:** 6-12 metres **Description:** Smooth grey bark. Alternating leaves are narrow and sharp-toothed on margins. Dark green and rough above, pubescent, grey-green below. Foliage turns yellow in autumn. Small, green flowers, either singly or in small clusters followed by a small, dark-purple berry-like drupe. Adapts to most soils. Prefers light well-drained, sandy, and loamy soils, including those nutritionally poor; it can tolerate drought but not shade.	
Name: Allee Chinese Elm (*Ulmus parvifolia* 'Emer II' Allee) **Height:** 12-15 metres **Width:** 8-12 metres **Description:** Vase-shaped to broad domed tree with ascending branches. Small, glossy, dark green leaves. The trunk is irregularly fluted, and the bark exfoliates in puzzle-like patterns exposing rich shades of grey, green, brown and orange-brown. Adaptable to most soils and can cope with extreme conditions. Tolerates compaction and a restricted root zone. Allee is resistant to elm leaf beetles and Dutch elm disease. Structural, formative pruning is important to develop a strong central leader. Since growth is relatively fast, frequent, light pruning's are recommended over infrequent, severe pruning's. Also use: *Ulmus parvifolia* 'Todd'	
Name: Frontier Elm (*Ulmus minor* x *parvifolia* 'Frontier') **Height:** 10-12 metres tall by 5-10 metres **Width:** 5-10 metres **Description:** 'Frontier' develops a vase or pyramidal shape with ascending branches. Moderate to fast growth rate. Alternate leaves with toothed edges; glossy dark green reportedly turning, to red-burgundy in autumn, which is unusual for elms. Seldom flowers and fruits. Bark is relatively smooth, grey-green in colour and marked with orange lenticels. As with most trees, the Frontier Elm will perform best in well-drained, moist soils. However, it is very adaptable to a range of soil types including poorly drained (The Morton Arboretum, 2018) and paved areas. Tolerant of alkaline soils. Tolerant of heat and drought. Very tolerant of urban conditions. The Frontier Elm has good resistance to Dutch elm disease (DED) and moderate resistance to elm leaf beetle. Will become available through Metropolitan Trees. Image from Van den Berk Nurseries.	

Large trees >15 metres in height

Name: Emerald Queen Norway Maple (*Acer platanoides* 'Emerald Queen') **Height:** 15-18 metres **Width:** 8-10 metres **Description:** Large, oval to rounded canopy. Lightly leathery, leaf has a light-pink colour when it unfurls, but later turns shiny green. Tree has brilliant yellow autumn colour. The tree is easily transplanted, with moderate to fast growth rate. It is adapted to a wide variety of soils (including alkaline). Successfully grows in urban areas where air pollution, poor drainage, compacted soil, and/or drought are common. Suitable for paved areas & cutouts. Image from Van den Berk Nurseries.	
Name: Autumn Blaze Freeman Maple (*Acer* x *freemanii* 'Autumn Blaze') **Height:** 15-20 metres **Width:** 9-12 metres **Description:** Narrow-domed to broad-pyramidal tree with ascending branches. Like *A. rubrum,* but more tolerant of drier sites. The bark is smooth grey. The bright green, 5-lobed dissected leaves have red stems and a greyish underside. In autumn the foliage turns deep orange-red to intense red. The autumn colour persists quite a long time before the leaf falls. Although the plant is female, fruits rarely form. A. x freemanii, 'Jeffersred' flourishes on most soils if they are not too limy. Easily grown in average, medium to wet, well-drained soils in full sun to part shade. Established trees have some tolerance for drought conditions. Successfully grows in urban areas where air pollution, poor drainage, compacted soil, and/or drought are common. Suitable for paved areas & cutouts	
Name: Cimmaron Green Ash (*Fraxinus pennsylvanica* 'Cimmzam' Cimmaron™) **Height:** 12-18 metres **Width:** 8-12 metres **Description:** Pyramidal (while young), narrow domed to rounded tree with dense, lustrous foliage, which turns burgundy to red in autumn; which it can hold well into autumn. Attractive dark grey bark which becomes deeply furrowed. Reportedly seedless variety. An impressive, ornamental feature tree which provides great summer shade and is capable of withstanding relatively extreme climatic conditions, being tolerant of frost as well as drought. Suitable for a range of conditions, including clay and compacted soils. Transplants readily.	

Name: Urbanite Green Ash (*Fraxinus pennsylvanica* 'Urbdell' Urbanite™) **Height:** 12-18 metres **Width:** 8-10 metres **Description:** Broadly conical to narrow-domed crown with strong branch architecture and little-to-no seed set. Dense, lustrous foliage turns pale yellow to deep bronze in autumn. Attractive dark grey-brown bark which becomes deeply furrowed as it matures. Prefers well-drained, moist soils, however, it is very adaptable to poor soils, rocky soils, various soil pHs, compacted soils, wet sites, dry sites, pollution, and salt spray; an extremely urban tolerant cultivar (as the cultivar name suggest). Transplants readily.	

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- Unless expressed otherwise: i) Information contained in the Report will cover those items that were outlined in the project brief or that were examined during the assessment and reflect the condition of those items at the time of inspection; and ii) The inspection is limited to visual examination of accessible components without dissection, excavation or probing unless otherwise stipulated.
- There is no warranty or guarantee, expressed or implied by Tree Logic, that the problems or deficiencies of the plants or site in question may not arise in the future.
- All instructions (verbal or written) that define the scope of the Report have been included in the Report and all documents and other materials that the Tree Logic consultant has been instructed to consider or to take into account in preparing the Report have been included or listed within the Report.
- The Report is strictly limited to the matters stated in it and does not apply by implication to any other matters.

To the writer's knowledge all facts, matter and all assumptions upon which the Report proceeds have been stated within the body of the report and all opinion contained within the report will be fully researched and referenced and any such opinion not duly researched is based upon the writer's experience and observation.