Tamworth REGIONAL COUNCIL

Urban Street Tree Management Plan

Greening and Cooling the Tamworth Region

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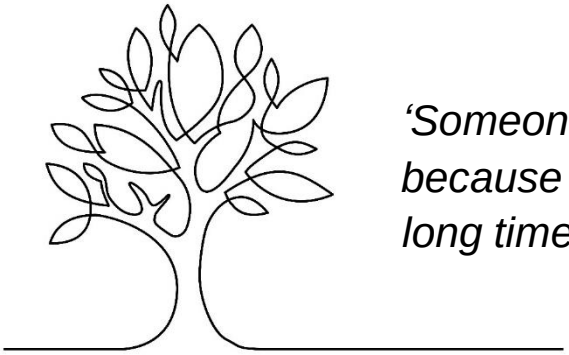


'Someone is sitting in the shade today because someone planted a tree a long time ago'

Warren Buffet

Introduction

Together with our community, Tamworth Regional Council is committed to greening and cooling our region in a responsible and sustainable way.

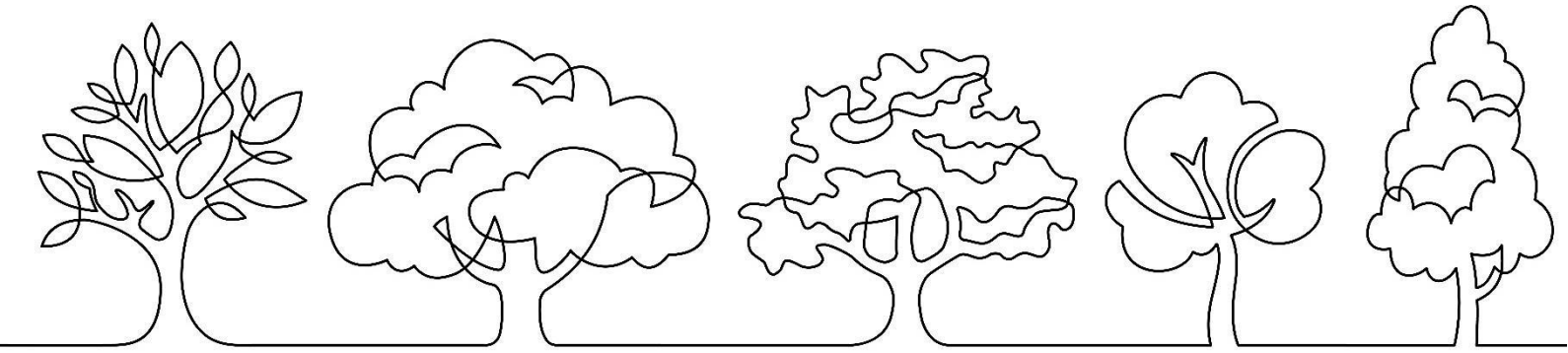
We will aim to substantially increase the number of shade trees and implement sound maintenance practices to ensure that trees planted today will be there for the benefit of current and future generations.

Maintaining and increasing green spaces and streetscapes increases the appeal and liveability of urban spaces by decreasing temperatures during the summer months; providing habitat, health and well-being benefits.

*'The **Right Tree**, of the **Right Size**, planted at the **Right Time** of year, in the **Right Location**, leads to the **Right Result**.'*

The Urban Street Tree Management Plan has been developed with the assistance of the Urban Street Tree Advisory Group.

Together, we will green and cool the Tamworth region!



Blueprint 100

Tamworth Regional Council has embarked on a process to draw all its efforts toward a coordinated approach for future planning and infrastructure delivery. This has been coined Blueprint 100. It encompasses the Local Strategic Planning Statement, Growth Management Strategy and other council initiatives.

Blueprint 100 is a strategy to guide future use of land within the region towards a population of 100,000 people. For the Council area, it will ensure that there is sufficient infrastructure and opportunities for jobs growth and great places for people to live.

The Urban Street Tree Management Plan links to Blueprint 100 through the themes of design with nature, facilitate smart growth and housing choices. Through the provision of a more liveable environment creating an improved amenity for people to reside.


East Tamworth

Section 1: Street Tree Hierarchy

Tamworth Regional Council will use a street hierarchy to plan the way that street trees are managed across the region. This document will outline the hierarchy and the designs along with the levels of service for maintenance and development.

A street hierarchy is an urban planning tool for laying out road networks to guide vehicle movement throughout an urban environment. This type of design also allows for the creation of street tree avenues to create an inviting environment.

1.1 Street Hierarchy

The following types of streets and roads will create the structure for future street tree plantings.

Highways / Town Entrances	• These roads will be themed with tree avenues to provide a sense of arrival at towns and villages. • To provide a more aesthetically pleasing entrance these roads will have a High level of maintenance and inspection. • Due to the nature of these roads and the volume of traffic the planting of new trees will be carried out by Council. • A preference for a single species where possible.
Arterial roads & streets	• These roads / streets will be themed with tree avenues to provide a consistent themed tree avenue. • To provide a more aesthetically pleasing avenue these roads / streets will have a Medium level of maintenance and inspection. • Due to the nature of these roads / streets and the volume of traffic the planting of new trees can be undertaken in conjunction with Council. • A preference for a single species where possible.
Local streets	• These streets will have mixed tree species and the only restriction will be around overhead powerlines and street lights. • In new sub division Council will allow the developer to theme these streets as part of a beautification process. • These streets will have a low level of maintenance and inspection. • These streets will have a palate selected tree species by Council for the community to select from. The only requirement will be around overhead powerlines. This is to reduce the overall maintenance and prevent the heavy regular pruning currently being undertaken by Essential Energy. • As these streets have a lower level of risk around work being undertaken Council will let the residents plant the new trees. A guide to the location and how to plant a street tree will be provided when the new trees are given out to the resident.

1.2 Factors Affecting Street Trees

1.2.1 Service Networks

Road reserves are the main corridors for service networks. They accommodate electricity, telecommunications, water, sewerage and gas lines. However, historically these services have not coordinated, and conflicts between street trees and services occur.

1.2.2 Trees and Overhead Services

Overhead power lines are a significant problem in most areas. Overhead power lines can restrict the development of uniform avenues, may require the planting of different species on either side of the street, and increase the need for maintenance pruning where larger trees exist under the power lines.

Aerial bundled cabling has been installed in some areas of the Tamworth Region, this is aimed at reducing the extent of pruning required. However, pruning practices based on the clearance widths plus a significant width for regrowth has still resulted in holes in the canopies of street trees up to 4m. If the clearance area only was pruned, the hole around the cables only needs to be 1000mm wide, but would require more regular pruning.

1.2.3 Trees and under Powerlines

Trees appropriate for planting under powerlines have been listed in the Street Tree Species List. Trees safe to grow directly under powerlines need to be a maximum of 7m tall at maturity. The species shown with a Small in the TRC height Category lists in the Street Tree Species List have been proposed as being suitable for planting within the TRC area.

1.2.4 Footpaths

The installation of paved, concrete or bitumen footpaths reduces the space for street trees and if the wrong species is planted adjacent to a footpath the tree can slowly damage the path. This then creates a hazard for users of footpaths and puts a further burden on Council through maintenance to reduce or eliminate this hazard.

1.2.5 Street Types

Consideration of the type of street, dimensions, traffic volume and verge width will have a significant impact on the determination of suitable street tree plantings. For the purpose of this plan, the Region's streets have been divided into 3 types as listed below.

a. Highways / Town Entrances

b. Arterial Roads and Streets

c. Local Streets

The available space for trees in each of the above street types will determine the suitability of the tree for its application. Available space for roots and canopy is the most important criteria for selection of the street tree species.

The dimensions of a tree at maturity are important for the physical and visual contribution to the streetscape. Existing constraints within the street (verge width, extent of pavement, location of underground and overhead assets and building setbacks) may limit the size of the tree that can be supported.

It is important the trees do not interfere with pedestrian and vehicular access, services or conflicts with paved surfaces and footings. The optimum size of the tree will be a balance between these elements.

Verge and median widths, building setback and proximity to overhead and underground assets will influence the selection of appropriate species in a street. Most streetscape verges within the Region are relatively wide.

1.3 Service Levels

Service levels relate to the inspection and maintenance which Council provides to the street trees in line with the street hierarchy.

High Service Level	• Visual Inspection of trees on an annual basis. • Directional pruning and uplifting carried out on an annual basis.
Medium Service Level	• Visual Inspection of trees undertaken over a four-year period. • Directional pruning and uplifting carried out over a four-year period.
Low Service Level	• Inspection and works carried out upon request using Council's Customer Request system.

Oxley Lookout, Tamworth

Section 2: Street Tree Selection Criteria

Street trees are living and growing assets that take time to reach maturity and offer increasing value (benefits) over time until they decline and die. A street tree may take 30-50 years to reach maturity and have a lifespan of 100-150 years, depending on species, environment and other factors. In Australia, we are experiencing a decline of some of our early, grand avenue plantings. It is likely that lifespans will reduce with drier and hotter environmental conditions. Please refer to Appendix A for the Recommended Street Tree Species List.

2.1 Street Tree Selection Criteria

Tree selection is based on a number of criteria, but of primary importance is a species suitability to individual street conditions. Other considerations include:

- Amenity
- Character
- Shade
- Biodiversity
- Maintenance requirements
- Seasonal interest
- Planting constraints imposed by the built environment
- Adaptability to a range of climatic conditions
- Existing species occurrence
- Is the street/road listed within the Street Tree Hierarchy by TRC

The fabric of the existing established urban forest needs to be taken into account when selecting new street tree plantings. For example, the suggested street tree plantings as per the Street Tree Hierarchy have generally been selected based on the existing tree species as a base. Many of the avenues and streets have a wide variety of established species occurring along their length with little consistency or regard to streetscape hierarchy or formal avenue plantings. The species listed are not intended as a short-term replacement strategy, but as long-term guidance for creating future consistency along these streets when trees are required to be removed or replaced.

2.1.1 Tree Form and Scale

Tree species will be selected so that the ultimate mature size of the tree canopy is appropriate to the particular street considering the site constraints, such as verge width, overhead power lines, building alignments and vehicle clearances. Council will use the largest appropriate species possible for the given location.

Selected species should have an appropriate and predictable form, usually with an upright trunk and stable branch structure. Street trees need to have a form that allows traffic and pedestrian movements easily around and under the tree.

2.1.2 Proposed Tree Type

The Street Tree Species List includes both evergreen and deciduous trees. Evergreen species provide year-round screening, greenery and shelter from winds. Deciduous trees provide seasonal interest whilst maximising summer shading and winter light. This is particularly relevant for buildings located on the southern side of a narrow street with small setbacks.

2.1.3 Local Conditions

Recommendations have been made for tree species for the key streets and avenues within each town and village. Generally, where two or more species have been recommended for one street or avenue, this is to provide a lower growing species for planting under wires and a taller species where no wires are present on the opposite side of the street/avenue.

In some cases, two or more species may be recommended to provide alternative choices. Other tree species can be selected from the Street Tree Species List to plant in the remainder of each town and village once site conditions have been considered. The species which occur on other land uses have been noted as a guide for what grows well in that locality.

2.1.4 Existing Soil Conditions

Soil types are based on broad scale mapping and are intended as a guide only. Local soil conditions may vary within towns.

2.1.5 Existing Species Occurrence

The Existing Street Tree Species (Appendix A) list is based on field investigations, experience and are not necessarily indicative of all species occurring in the towns and villages.

Existing species is one of the best ways to determine whether a plant should be listed on the street tree species list. Plants that cannot adapt to the local conditions usually die or are affected greatly and are less likely to be selected by residents and staff.

2.1.6 Growth Rate

The growth rate of a plant is important when selecting a species for the use as a street tree. Trees which are fast growing can have issues with strength and infrastructure damage. Alternatively, trees which are very slow growing will take too long to create the shade or the appearance within a street.

2.1.7 Maintenance Requirements

It is important to select species which have a low to moderate level of maintenance over the life of the tree. The lower the maintenance the more easily the tree is to manage and care for.

2.1.8 Weed Species Trees

Trees and shrubs which are known to be invasive or problematic will be removed or identified within the street tree list. Council has an obligation as the local authority to help prevent infestation by plants to land which it either owns or manages.

The street tree species list will be checked periodically against the state weeds list for the local area to prevent weed species trees and shrubs from being planted.

Any person wishing to plant a species which has been identified as a weed species will be informed and will need to select another species.

2.1.9 Fruit Trees

Whilst fruit trees can be highly desirable they are not typically appropriate for use as urban street trees due to a range of factors outlined below. It is better to accommodate the desire for edible fruit trees within individual private yards where there is greater freedom and their management obligations are clearly defined. The main implications in using fruit trees as street trees are:

- A fruit tree is usually small growing, and does not achieve the desired urban tree canopy outcomes. They also tend to be relatively short lived compared to many other tree species that would otherwise be utilised. Often a fruit tree only has a productive life for the production of fruit of 15 to 25 years before it is replaced in an orchard situation.
- Generally speaking, for a fruit tree to successfully grow and produce edible fruit they require very favourable growing environments. Typically, urban trees face a much harsher growing environment than is suited for a fruit tree to grow, thrive and produce good fruit.
- The level of maintenance required for a fruit tree is much greater than many other species of trees. Most fruit trees need regular and expert pruning and fruit thinning to succeed. The onus of cleaning up spoiled fruit, spraying for pests and diseases, etc. and the ultimate responsibility and liability regarding the fruit is also unclear, and can lead to numerous legal complications. Owners who may diligently tend to the tree initially may also move away, and maintenance falls back on the Council.
- The financial cost involved to manage and maintain a fruit tree would ultimately be greater and would fall back to Council, even if residents initially offer to maintain the trees.

Although Council does not typically support the use of fruit trees for street tree plantings, for the reasons outlined above, there may be some special circumstances when a fruit tree is planted. Ultimately the decision to plant a fruit tree will be determined by Council and permitted on a case-by-case basis, and only when the other overall objectives of the Urban Street Tree Management Plan are not compromised and canopy coverage in the street is already well catered.

2.2 Species Recommendations

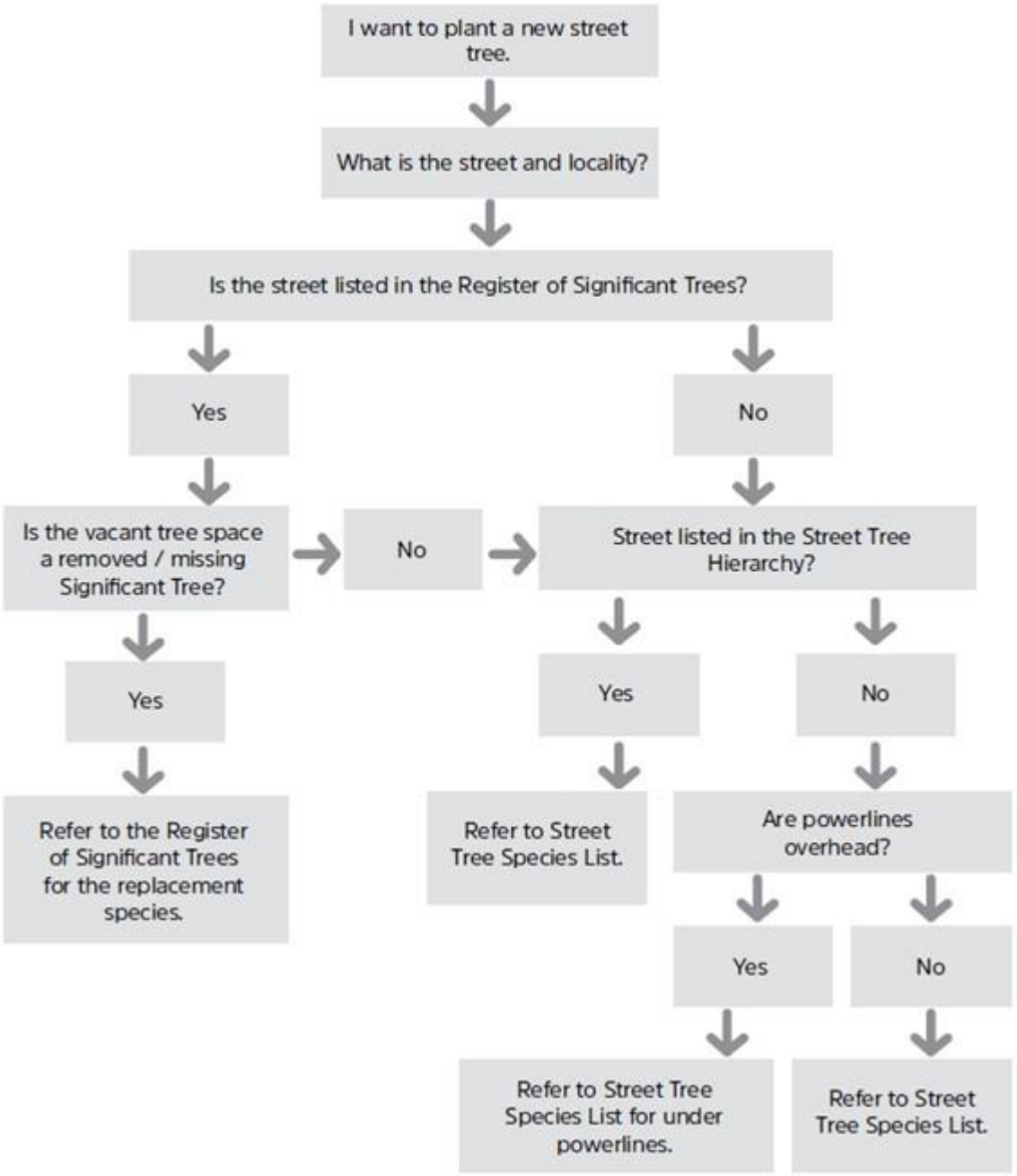
Recommendations for selection of trees in each town are based on a combination of factors including:

- Observations of tree species already growing successfully in the towns and villages
- The prevalence of that species
- Which species are growing in other places outside the streetscape and appear to be healthy
- Selecting species that will provide a variety of types of canopy cover and structure, as well as differing landscape character to assist in creating a hierarchy of streets within towns and villages
- Improvement of the town and village centre amenity and shade
- Agreeance that those species currently occurring are likely to grow well there in short to medium term future and that these species should be used elsewhere in town if appropriate
- Review of which species currently have a broad geographical distribution and are therefore most likely to adapt to climate change
- Review with TRC officers of which species have performed well over time and those that have maintenance issues

2.3 Street Tree Selection Process

Diagram 1 outlines the process to be undertaken when determining which tree should be planted where within the Tamworth Regional Council area.

Diagram 1. Street Tree Selection Procedure



King George Avenue

Section 3: Street Tree Removal Policy

OBJECTIVE: To preserve, enhance and develop attractive, streetscapes and public open space areas within the environments of Tamworth Regional Council, while minimising the risk to public safety and property.

POLICY:

Tamworth Regional Council is committed to managing the trees within its urban streetscapes and public open spaces to ensure the history and amenity of the region is preserved and enhanced for future generations.

In formulating this Policy Council recognises the significant contribution trees make to our scenic amenity and the important role trees play in providing:

- Aesthetics, shade and cooling;
- Health and well-being;
- Improve the environment;
- Habitat for local wildlife and corridors for wildlife movement;
- Consumption of carbon dioxide and production of oxygen;
- Wind reduction and noise abatement;
- Filter rainwater and reduce stormwater runoff;
- Improved property value;
- Tourist and event attraction; and
- A contribution to cultural history and local identity.

Council also recognises the risk trees pose to people and property. It is Council's intention to minimise these risks and the possible consequences.

This Policy provides clear guidelines for how and when trees located on Council controlled property will be removed and/or replaced. The following principles will apply:

a. Citizens will not be permitted to damage, remove or cause the removal of trees from Council controlled property and in such cases, Council may initiate legal action;

b. Council will receive requests from citizens for the removal of trees;

c. These requests will be registered as a Customer Request in Council's electronic Customer Request Management System (CRMS), as a point of reference and statistical data;

d. All requests for tree removal will be assessed by arboriculture qualified staff or arboriculture qualified contractors, using Council's Tree Hazard Assessment Form;

e. All requests for tree removal will be assessed against Council's Significant Tree Register;

f. Trees will only be removed if one or more of the following criteria is met:

i. The structural condition of the tree poses a high risk to person or property and the cost of maintaining or remediating the risk to a low level is considered excessive;

ii. The tree is dead or the health of the tree is in irreversible decline (except in a reserve where the tree is providing a nesting habitat);

iii. The tree impinges on an approved development of Council land;

iv. If the tree is causing damage to property and the damage caused by the tree cannot be reasonably abated or remedied through accepted arboricultural treatment or reasonable re-design;

v. The tree is hazardous to motorists or pedestrians due to obstruction of sightlines causing an unsafe traffic or pedestrian environment in accordance with the Roads Act 1993;

vi. The tree is affected by road works (e.g. new road, road widening, service location and/or re-location, etc.) and all other options to retain the tree have been deemed inappropriate;

vii. The tree is contributing to a widespread environmental issue (e.g. fruit fly infestation); and

viii. The tree is in danger of contact with overhead powerlines and selective pruning is not practical;

g. The following are not considered sufficient reasons for the removal of trees from Council controlled property:

i. Improve views from private property;

ii. The tree variety is disliked;

iii. The tree is blocking the sun or solar access to a property;

iv. The tree causes allergy or other health problems;

v. The tree is causing leaf litter problems;

vi. The tree is obscuring advertising billboards; and

vii. The tree is in the way of a non-essential property access and/or verge paving option.

h. Where a tree, having met the above criteria, is removed from Council controlled property it will be replaced with a suitable species, if possible, in a location as close as possible to the original site.

DELEGATION

The Manager, Sport and Recreation along with the Horticulture and Arboriculture Specialist, through the Director Regional Services and the General Manager, has delegated authority to authorise the removal and replacement of trees under this Policy.

Section 4: Street Tree Planting Plan and Embellishment

Council's goal is to plant a minimum of one tree in front of every urban property throughout the region.

Council will use a number of initiatives to promote and assist with the greening of the towns and villages within the Tamworth Regional Council area.

4.1 Targeted Street Tree Planting Program / Adopt a Street Tree

The Street Tree Planting Program is a Council funded initiative that facilitates the involvement of local residents in the beautification of their local area. It is coordinated by the Sports and Recreation Division and provides a formalised mechanism through which Council offers guidance and funding while residents provide labour and ongoing maintenance.

All residents and owners of properties within an affected street shall be included in the consultation process. All residents and owners of properties nearby the street shall also be included; i.e. corner properties. Councillors shall receive a copy of information distributed to residents for reference.

The following components are deemed necessary in consulting adequately with property owners and residents:

- An introduction letter that provides a brief description defining the area to be planted and the reason for the planting.
- A list that indicates the existing vacant spaces for new trees to be planted.
- A survey with a list of tree species which can be selected. On Highway and Arterial roads Council will have a selected theme and, in these cases, this is the species which will be planted.

At least 21 days (including three weekends) shall be allowed for the return of surveys. Included in the survey shall be cultural information, a photograph of each of the tree species and a site that an established specimen can be viewed.

The tree indicated on the surveys returned to Council, shall be the nominated street tree for each site.

Residents will be encouraged to assist with the planting of the new trees along with the care and maintenance of the tree till it has fully established itself.

During Water Restriction Periods Council will assist with the watering of trees.

4.2 Volunteer Groups

Council will encourage groups of volunteers to assist with street tree planting. These groups are usually made up of people who wish to make a difference and are willing to put an effort in to see a successful outcome for the community.

Council will assist these groups with the correct planting procedure, plants, planting supplies, alternate water source (if required) and guidance to use the most appropriate species for the location they have chosen.

4.3 National Tree Day

National Tree Day is an annual event which Council currently participates in. Currently this program is only open to school and Council's 355 Committee's.

4.4 Residents

Council will encourage and assist residents who take the initiative in planting new street trees in front of their property. This assistance will extend to the selection of the plant along with the planting location, procedure and maintenance requirements for the new plants.

This information is available on Council's website.

4.5 New Developments

The current Subdivision Guidelines allows for the planting of new street trees by Developers. This type of planting is set out in the Engineering Design Minimum Standards for Subdivisions and Developments.

4.6 Replacement Trees

Where Council removes a tree, it is a requirement that a new tree be planted to replace the removed tree. The replacement tree will need to be suitable for the location and planted in accordance with the Planting Procedure.

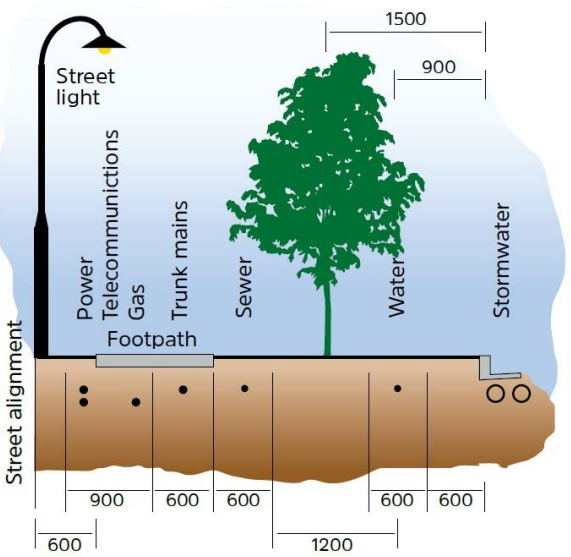
Residents will be given a list of plants (Please see Appendix A: Street Tree Species List) which are suitable as a replacement tree. The replacement tree should be planted in a timely manner after the removal has taken place.

4.7 Tree Planting Guidelines

4.7.1 Layout and Placement

There are many limitations to the positioning of street trees on road reserves immediately behind the kerb. Distances from infrastructure elements such as intersections, light and electricity poles, stormwater inlets, underground service pits and bus stops, are important in determining final planting locations.

Typically, this will require individual site assessment by Council staff and will be determined on a case by case basis.



4.7.2 Spacing of Street Trees

Considering clearance requirements, street trees are to be planted with appropriate spacing.

4.7.3 Wide Streets and Planting

Where the streets are significantly wide such as East Tamworth, Barraba then planting in the centre of the street can be looked at as an additional way of providing shade and a way to create avenues.

Underground services still need to be considered when planning, species selection and the final planting location.

Alternatively, planting trees in the parking area adjacent to the kerb instead of the footpath can be considered when the footpath doesn't allow the planting of trees due to concrete footpaths or overhead power lines.

4.7.4 Verge and Footpath Widths

The width of a verge and footpath is an essential consideration in the selection of a tree species and street tree planting details. A small tree in a wide verge free of obstructions is a lost opportunity for a large shade tree that would greatly add to the appearance of the streetscape and the canopy coverage. Conversely a tree with too large an ultimate size for the width of the footpath can become both an expensive maintenance burden, and a danger to pedestrians and public and private infrastructure.

4.7.5 In Road Planting

Many roads throughout the Tamworth Region have opportunities for additional and larger street tree planting, if the planting is located within the vehicular carriage way rather than the verge. This also allows trees to be planted in streets that have narrow grass strips or where overhead wires or awnings would otherwise present great challenges to achieving successful tree planting.

Any in-road street planting proposed will need to take into consideration the existing traffic and signage visibility, lot access and parking issues, underlying soil conditions and services. Council will aim to minimise disruptions to, or excessive removal, of parking spaces.

Special attention will be paid to achieving appropriate drainage towards the tree planting together with adequate soil volumes, road pavement protection, and trunk protection where necessary via bollards or preferably barrier kerbs.

The objective is to plant reasonable sized street trees that are away from overhead power lines and provide a more aesthetically pleasing street. This also allows trees to be planted further away from adjoining houses/shops, reducing any impact of street trees on adjoining properties. Many of these opportunities could be combined with rearrangement of parking and provisions of perpendicular or angled parking to minimise any parking loss.

4.7.6 Above and Below Ground Infrastructure

One of the greatest functional issues to consider with street tree selection is the presence of overhead power lines. One solution to this problem is to select very small tree species, which is viable for narrow streets, however with wide streets these small trees are often out of scale with the surrounding streetscape. The installation of Aerial Bundled Conductors (ABC) allows for reduced line clearance resulting in less pruning and in turn, less impact on the tree canopies. Aerial bundled conductors are overhead power lines using several insulated conductors bundled tightly together. Where ABC has been installed, larger trees can be planted and the canopy extends into and past the wires.

High pressure gas mains, water mains, sewer mains and electricity easements sometimes prohibit establishment of trees due to the depth of the service and potential liabilities if the service is damaged. Similarly, underground structures, wall footings and the like may also limit the ability of a tree to be planted and successfully grow. These issues are often localised and do not affect the whole street. Each identified planting site will be assessed by Council on its merits to determine the feasibility of establishing the trees with consideration to underground services and structures.

4.7.7 General Solar Access

Street tree species should be selected to provide an appropriate level of solar access to dwellings. This applies most prominently to the more urban areas and where there are smaller dwellings on the southern side of the carriage ways.

This becomes less of a consideration where houses are on larger lots and are set back from the street. In these instances, the street trees typically have smaller influences and the residents have an opportunity to manage and consider their sunshine and shade requirements within their own gardens and open areas.

4.7.8 Tree Pit Dimensions

As an absolute minimum, an access width of 900mm is needed between the back of any tree pit and the building/ boundary line. Since the minimum practical width of any tree pits is usually 600mm, the minimum width of a footpath where a tree can be safely planted is 1500mm (600mm plus 900mm). This is also subject to the following other conditions:

- There are no obstructions overhanging the building line from the front yard of the adjacent property (eg. other trees, shrubs, vines, awnings) and;
- The lower branches of the tree can be pruned to a height of at least 2400mm.

Further problems occur on very narrow roads where parking is restricted to one side only. Larger vehicles may tend to ride up over the kerb onto the verge to avoid parked cars. In this case trees may only be planted on one side of the street even if the verge is sufficiently wide.

4.7.9 Water Restrictions

Water restrictions are another hurdle to planting new street trees. New trees require watering to increase their chance of survival in this hot dry environment.

Street tree planting will only occur when the water restrictions are below level 3. Tree planting when water restrictions are higher than level 2 in the towns or villages can occur if an alternate source of water is available such as bore water, recycled water or captured rainwater.

Other measures to assist with watering are the use of Greenwells, mulch and tree guards. Greenwell's help to hold a larger amount of water and direct it to the plant's roots. These can allow for a larger amount and faster delivery of water without the concern of runoff or erosion.

Picture of a Greenwell

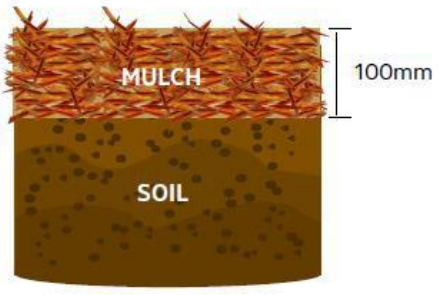
4.7.10 Tree Establishment

The importance of after-care tree maintenance requirements cannot be over stressed.

If undertaken correctly, this facet of the tree planting process can greatly increase the success of the planting.

Mulching is particularly important for successful tree establishment. Mulching reduces weed competition, enhances root growth, prevents soil compaction (improved aeration) and maintains a more constant moisture gradient by reducing evaporation.

- Mulch should be maintained at the base of each tree for a minimum two years after planting.
- Mulch should be no more than 100mm in depth and should cover a circular area of 600mm.
- Mulch should be of a type with large particle size.



A regular watering program is required to ensure tree establishment. Monitoring of watering is necessary to ascertain the plants need and watering frequency. Watering should continue for 12 months with one watering per month with ongoing monitoring.

This can be dependent on climatic and site conditions. Specific recommendations for watering are impractical due to the enormous variety of situations and tree requirements. A variation in watering requirements within the individual road sections of the towns and villages is expected.

During periods of water restrictions, recycled or collected rain water will be used upon all recently planted trees for the duration of the two-year tree establishment period.

A program of tree establishment and after-care maintenance that includes watering, mulching and weed control will extend for a minimum two years after planting. The period of after-care maintenance may be extended, depending upon seasonal conditions and tree establishment.

All trees will be formative pruned two years after planting to provide good branch structure, direct growth to a desired shape to accommodate site constraints and reduce encroachment on utilities, buildings, pedestrian and vehicular clearance spaces as the tree matures.

Formative pruning shall be carried out in accordance with clause 7.2.5 of AS 4373 - 2007, Pruning of amenity trees.

Tree in West Tamworth

4.7.11 Functional Requirements

Species selected for street tree planting also need to fulfil certain functional criteria to ensure successful establishment and reduced ongoing maintenance and management issues. Some general functional criteria are outlined below.

4.7.12 Safety and Maintenance Considerations

The selected species must have a limited shedding of leaves and fruit for a street environment. Those with large or heavy seed pods, excessive leaf drop, or fleshy fruit or flowers which may lead to slip hazards will typically be avoided, particularly in heavily used paved environments.

Generally, trees preferred by Council will be those that require minimal maintenance after the initial establishment phase. Trees with excessive maintenance requirements or trees that need to be regularly treated for pest and diseases will not be selected. The selected species will not be prone to major limb shear. Limb loss occurs on an occasional basis for most trees, sometimes due to wind induced mechanical breakage and sometimes for self-regulated removal. This is a natural process and must be expected to occur from time to time. Some trees that are particularly renowned for having brittle branches and regular branch drop will typically be avoided for use as street trees.

Alternate footpath materials can be used to reduce possible damage

Species that are renowned for vigorous or particularly large root systems that have the potential to cause pavement uplift will be avoided. We must bear in mind that no guarantee can be given that a particular street tree species will not have an impact on nearby kerbs and pavements. The Council may also investigate the use of alternative footpath materials and planting pit designs to minimise tree root/paving interaction.

4.7.13 Tree Species Availability and Performance

Proven performance of the species under the environmental conditions of the locality is vitally important. New species should be trialled on smaller scales before implementing their more widespread use. Similarly, premature failure in one given situation should not necessarily rule out further trials being undertaken of particularly promising new species.

The selected plant species must be able to be commercially grown and available in a range of suitable sizes for street planting. Generally, the tree nursery stock used will be a minimum of 200mm pot to provide a cost-effective way of planting greater numbers of plants.

In high profile areas Council may choose to use larger plants for the initial impact and reduce vandalism to the street trees.

Many of the costs associated with the management of trees in the urban environment are at the early establishment period and over-maturity phases. Using species with a longer lifespan will help minimise tree management costs over time and lengthens the period where a tree requires minimal financial and resource inputs.

4.7.14 Consistency and Visual Uniformity on Main Streets

The intention of this principle is to establish a more uniform visual character for each of the main streets in the urban centres, creating a sense of identity or 'sense of place' that compliments the surrounding architectural forms and provides streets with a distinctive and recognisable character. Inconsistent street plantings with a large number of different species may be appropriate and can add interest to some special streetscapes. However, they are often more difficult for Council to manage and may not be appropriate in many locations.

In many cases the proposed species will be an extension or continuation of the dominant existing species, if that species has been deemed to be suitable in scale and growth habit.

4.7.15 Mixed Species

Council plans to allow residents who live in local streets as per the Street Tree Hierarchy List to choose from a palette of street trees. This will allow these areas to have a mixture of small, medium and large trees.

Highway and Arterial Roads as outlined by the Street Tree Hierarchy have been designed to have a small mixture of species however where possible a single species has been chosen. This may, for example, be in the form of one side of the street being a smaller species to fit under overhead wires and a larger species on the other side where absence of services and verge space permit. Issues such as tree supply, tree planting, tree maintenance and street cleaning frequency are all more difficult with highly mixed species streets.

Some streets may also benefit from a planned alternating mix of species. These are usually designed to cater for the continuation of a pre-existing street condition and importantly to balance the provision of native and exotic trees and/ or deciduous and evergreen trees. Attempts may be made to alternate the two (or more) species to provide for the designed intention of the mixed species street.

The selection of species to plant and the exact location within the street shall be at the sole discretion of the Council. Individual requests by adjoining residents for one or other of the species will typically not be accommodated unless it is in an area where a palette is provided.

4.7.16 Increased Canopy Coverage

Subject to verge width and constraints such as overhead power lines and building setbacks, larger growing street trees will be selected wherever possible. Too often small trees are currently planted on both sides of a street, when a larger growing tree could have been planted on the non-wire side of the street. A larger canopy tree contributes to the aesthetics of the street and overall environmental performance.

4.7.17 Planting Adjacent to Parks

Where parks have very prominent boundary tree canopies that often contribute or even extend over the adjoining streets the introduction of competing street trees along these streets is usually discouraged in order to avoid intrusive impacts on the park and minimise any future canopy conflicts. This also allows larger and more major trees along the park edges.

4.7.18 Entrances to Towns and Villages

Creating a sense of arrival for each town and village through consistent and distinct street tree planting rather than traditional gateway planting is recommended. Each experience should be unique and respond to the individual needs and character of that centre. The use of landmark trees at either end of a centre is less effective in creating a sense of arrival particularly in the Tamworth LGA where such planting would be lost in the complexity and scale of the existing trees and native vegetation. A carefully designed sign, sculpture or garden display may be more effective as an entry statement and in line with the character of the region.

4.7.19 Vegetation on Rural Road Corridors between Towns and Villages

Tree planting and vegetation beyond the urban boundaries should be distinct from the trees in the urban areas to create a visual separation between the urban centres. Typically, the planting should be native species that reinforce the rural or bushland setting.

4.7.20 WSUD

Water Sensitive Urban Design (WSUD) opportunities should be considered when designing in-road planting, subject to the constraints imposed by tree pits, drainage and normal rain garden parameters.

Peel Street, Tamworth

Section 5: Open Space Tree Planting Plan

The Open Space Tree Planting Plan sets out to provide shade along with improving the local ecosystem in the urban environment.

5.1 Volunteer Groups

Council will encourage and assist groups of volunteers with open space tree planting. These groups are usually made up of people who wish to make a difference and are willing to put an effort in to see a successful outcome for the community.

These groups will need to have permission from Council prior to commencement.

Council will assist these groups with plants, planting supplies, alternate water source and a planting guide along with expertise in the selection of the most appropriate species for the location they have chosen.

5.2 Community Planting Days

Staff will investigate and organise community planting days in the future (i.e.: spring and autumn).

5.3 National Tree Day

National Tree Day is a great opportunity to get the community involved in their local park to assist with tree planting to provide a sense of ownership and beautification of Council parks.

5.4 Tree Planting Guidelines

5.4.1 Layout and Placement

Unlike roads parks provide a great opportunity to plant large trees to create shade and structure to the facility. Distances from infrastructure are different as parks are usually free from many underground services.

There are still some limitations within parks and these revolve around the adjacent neighbours and some of the more recent types of infrastructure such as detention basins and levies.

5.4.2 Water Restrictions

Water restrictions are another hurdle to planting new trees. New trees require watering to increase their chance of survival in this hot dry environment.

Tree planting when water restrictions are higher than level 2 in the towns or villages can occur if an alternate source of water is available such as bore water, recycled water or captured rainwater.

Other measures to assist with watering are the use of Greenwells, mulch and tree guards. Greenwells help to hold a larger amount of water and direct it to the plant's roots. These can allow for a larger amount and faster delivery of water without the concern of runoff or erosion.

5.4.3 Tree Establishment

The importance of the correct planting technique along with after-care of the young tree cannot be over stressed.

If undertaken correctly, this facet of the tree planting process can greatly increase the success of the planting.

Preparation of the hole is important to assist tree roots to grow out and down. Ripping the hole and watering a week prior to the planting will help the tree establish and provide a deep water source.

Mulching is particularly important for successful tree establishment. Mulching reduces weed competition, enhances root growth, prevents soil compaction (improved aeration) and maintains a more constant moisture gradient by reducing evaporation.

- Mulch shall be maintained at the base of each tree for a minimum two years after planting.
- Mulch should be no more than 100mm in depth and should cover a circular area of 600mm.
- Mulch shall be of a type with large particle size.

A regular watering program is required to ensure tree establishment. Monitoring of watering requirements is necessary to ascertain plant needs and watering frequency. Watering will continue for 12 months with one watering per month with ongoing monitoring.

This can be dependent on climatic and site conditions. Specific recommendations for watering are impractical due to the enormous variety of situations and tree requirements. A variation in watering requirements within the individual road sections of the towns and villages is expected.

During periods of water restrictions, recycled or collected rain water will be used upon all recently planted trees for the duration of the two-year tree establishment period.

A program of tree establishment and after-care maintenance that includes watering, mulching and weed control will extend for a minimum two years after planting. The period of after-care maintenance may be extended, depending upon seasonal conditions and tree establishment. All trees will be formative pruned two years after planting to provide good branch structure, direct growth to a desired shape to vehicular clearance spaces as the tree matures.

Section 6: Minimum Standards for Street Tree Landscaping

Refer to the Engineering Minimum Standards for Subdivisions and Developments.

Roundabout in South Tamworth

Nundle

Section 7: Main Street Tree Replacement Plan

The Main Street Tree Replacement Plan provides guidance in how Council will plant and renew street trees within the main CBD streets for all towns and villages.

There are significant benefits to having an established street tree theme within the main CBD areas of the towns and villages. These benefits include the provision of shade, character and general wellbeing.

The following methods provide information in how the different methods can be utilised and how they differ from each other.

Manilla Street, Manilla

7.1 Method of Replacement

A number of options for block removal of trees and replacement can be used as illustrated in Figure 1. Each applicable street will need to be individually assessed to determine which approach will be most appropriate and have the least impact on the streetscape and be dependent on available funding.

An important aspect to the proposal for phased removal is the establishment of a programme of interplanting. This can occur where the existing tree spacing is significantly wider than the proposed planting interval or where a tree has been removed. By incorporating interplanting into the broader programme of tree removal, the effect is to copy nature by providing new trees to take over before old trees become senescent and die. By allowing new trees to grow between existing trees for 5-10 years, the visual impact of tree removal will be greatly reduced.

Where trees have been removed it is recommended that, where possible, replacement trees should be planted in approximately the same location as the removed tree, following excavation of roots and any necessary adjustments to the planting hole. Where existing trees have been known to interfere with utilities, access or lines of sight, the replacement tree should be located in the nearest appropriate location.

7.1.1 Staggered removal

Staggered removal and replacement, as shown in Figure 1 - Option 1, is advised where trees are aging or senescing at different rates but the overall population in the location or street have relatively moderate useful life expectancies, 15-20 years or so.

- Individual specimens are becoming hazardous, declining or succumbed to a single incidental affliction such as termites or mechanical damage.
- Individual specimens are disrupting utilities in a manner that cannot be addressed through maintenance or repair.

The selection of trees to be removed should be based on their condition and these should be carefully scrutinized for removal to satisfy the replacement pattern. The advantage of this method of replacement planting is that it varies the age class of trees and allows for their establishment prior to other specimens requiring removal, so a moderate degree of streetscape amenity is maintained. It also reduces the incidence of suppression that is often caused by more dominant trees. One of the drawbacks of this type of planting is that it does restrict complete improvement of the soil due to the necessity to avoid damaging the root system of trees being retained and competition with the roots for water and nutrients with existing trees.

7.1.2 Block Removal

Whole block removal and replacement, as shown in Figure 1 - Option 2, is advised and necessary where trees are either:

- Declining at the similar rates through environment stress factors.
- Have succumbed to a host specific pest or disease.
- Where the removal of one or several specimens amongst a block does not provide adequate area above and at ground level for replacement planting.

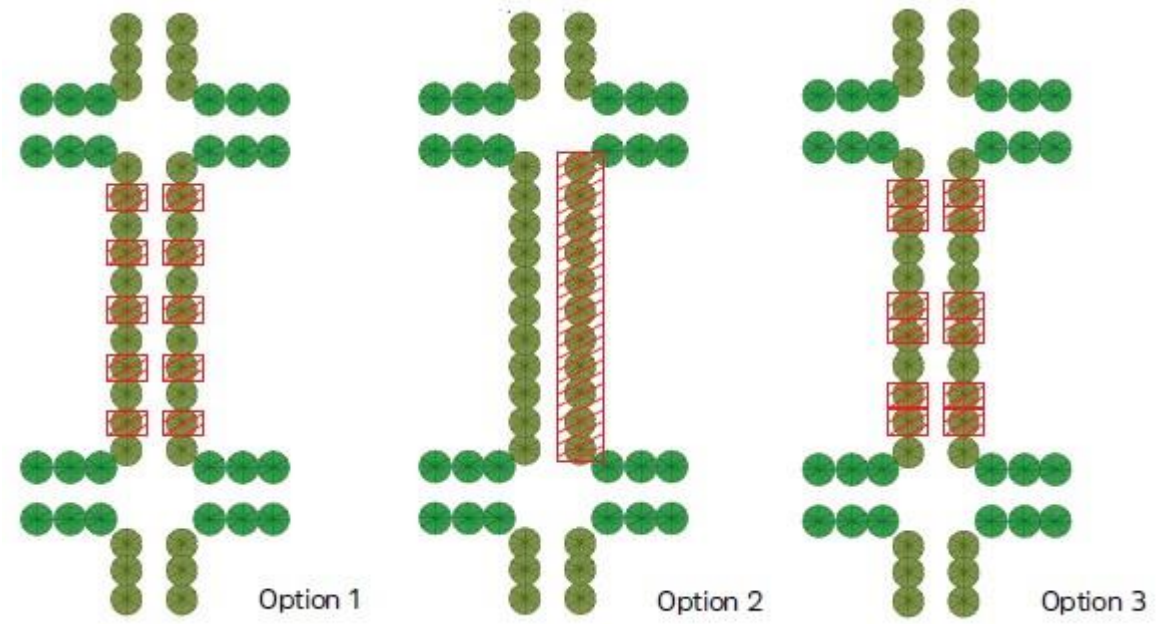
Block removal has several advantages over the selective and staggered removal and replacement plan option including:

- The ability to realign, repair and protect any utilities that may impede or conflict with the trees future growth.
- Easier maintenance and establishment, without conflict, suppression or competition with other trees.
- The ability to undertake soil modification and amelioration on a larger scale for faster establishment.
- Consistent and uniform growth rates and patterns can be achieved.

7.1.3 Block Removal - reduced density of planting

This removal option, as shown in Figure 1 - Option 3, may be applicable in streets where trees have been closely planted in the past (typically 5-6 metres). This would involve removing two mature trees and providing one tree midway as a replacement. By removing and replacing trees in this way a uniform avenue of trees can still be maintained.

Figure 1. Options for Street Tree Replacement.



7.2 Individual Replacement

Individual tree replacement is advised where only an individual specimen requires removal and applies where:

- All of the trees are of the same age class and relative maturity.
- There is space for the tree to become established, or space can be provided through selective pruning (refer AS 4373 - 2007 Section 7.5).
- There is a desire to introduce smaller species that will be more suitable in a particular instance than the existing street tree species.
- The opportunity and desire to provide for two compatible size classes of tree, dominant and under-storey.
- Where there is a need to remove a tree due to infrastructure damage.

7.3 Planting Systems

There are several ways to plant trees within these high pedestrian and vehicular areas. These include the use of:

- Stratavaults;
- Structural soils;
- Permeable pavements; and
- Root barriers

7.3.1 Stratavaults

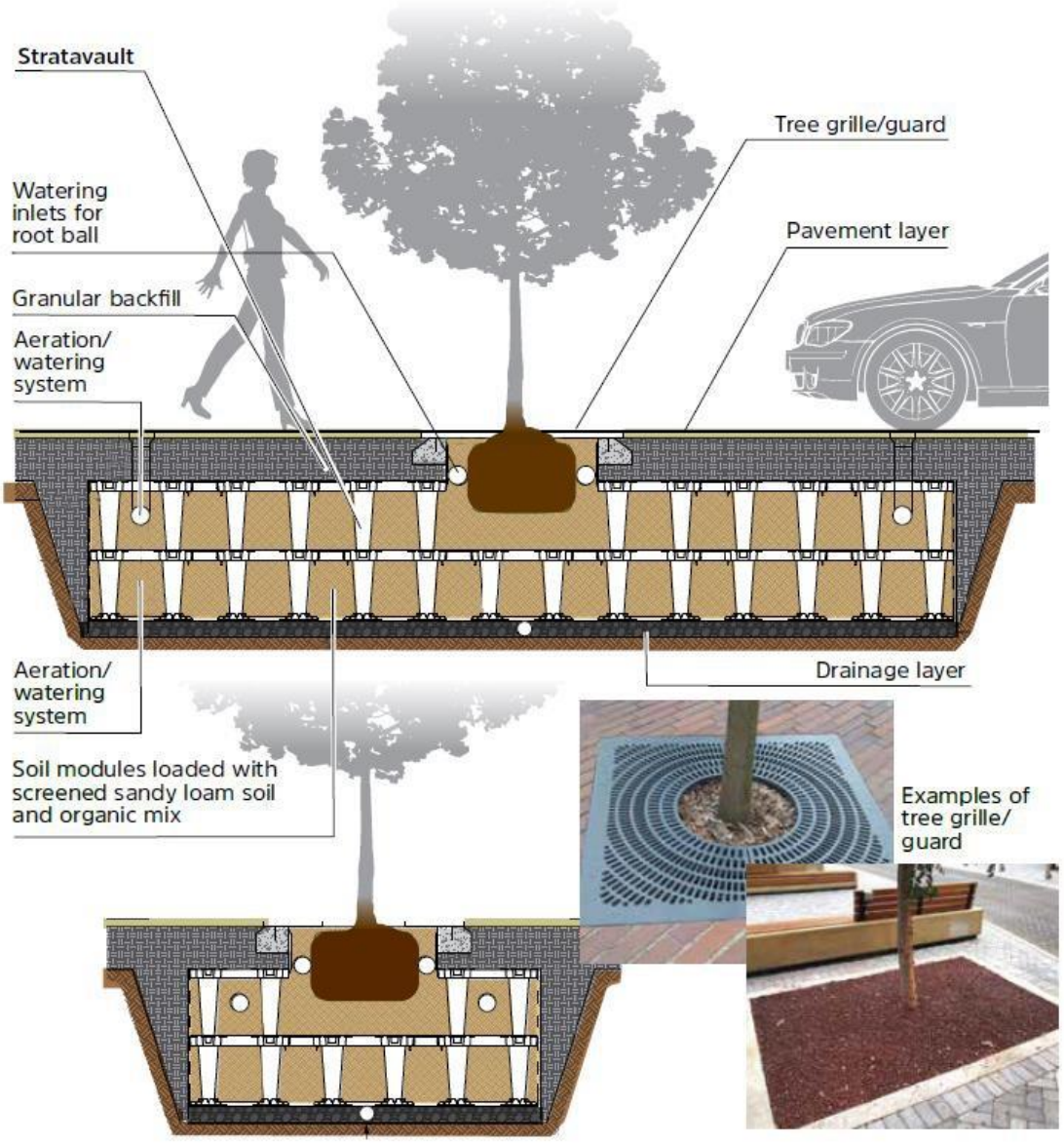
Stratavaults such as the ones manufactured by CityGreen provide a purpose-built area for the trees roots to grow and absorb water, nutrients and air.

A stratavault is a planting system which consists of a plastic modular interlocking system to create a structural underground cell for tree roots. This system also always the root zone area to be used as a car park or roadway without compacting the root zone of the tree.

These are the ultimate solution for planting trees with a barrier to prevent roots from growing out and causing damage. They are also rated for vehicles to drive over them without damaging footpaths or road surfaces.

These can also be used to filter stormwater prior to this water entering a stormwater system or river system.

Figure 2. Typical diagram of a CityGreen Stratavault.



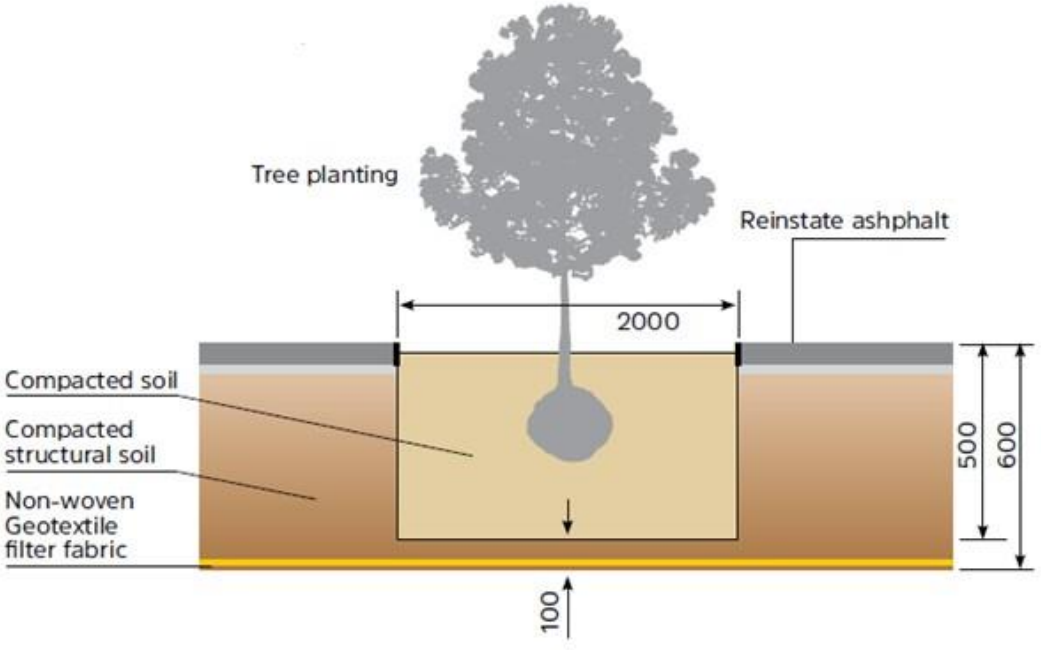
7.3.2 Structural Soils

Structural soil is a medium that can be compacted to pavement design while permitting root growth for trees. It is mainly a mixture of stone and soil.

This type of soil can be used as an alternative to a stratavault when planting trees in roads. The structural soils provide an area where the tree roots can growth and absorb water, nutrients and air.

Typical structural soil

Figure 3. Typical diagram of a structural soil tree pit.



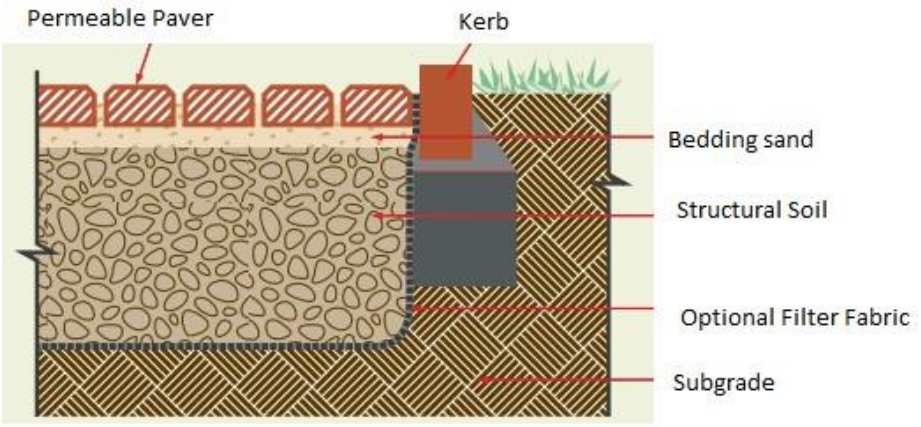
7.3.3 Permeable Pavements

Permeable pavements are pavements which allow water to pass through them to an underlying structure in this case either a stratavault or a structural soil to provide water for street trees.

There are several different types of products which can be used. These are as follows:

- Permeable pavers such as Hydropavers;
- Porous asphalt and
- No fines concrete.

Figure 4. Typical diagram of a permeable pavement.

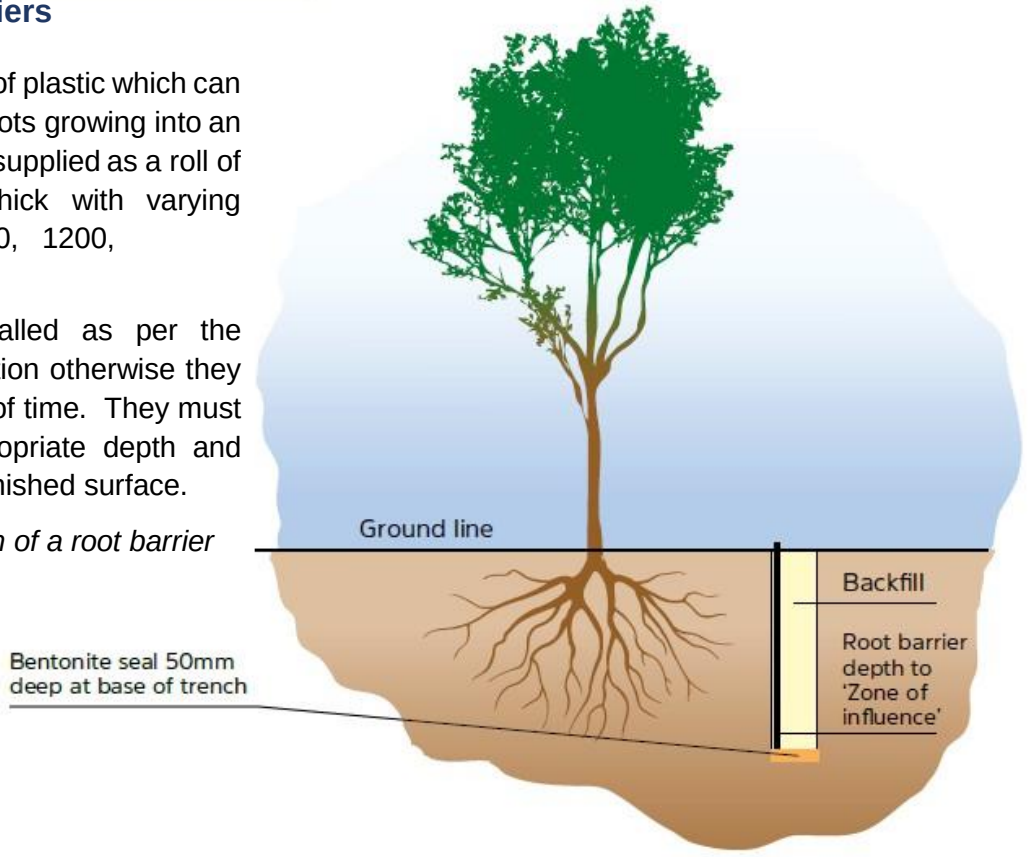


7.3.4 Root Barriers

Root barriers are a layer of plastic which can be installed to prevent roots growing into an area. They are generally supplied as a roll of plastic approx. 1mm thick with varying heights (450, 600, 900, 1200, 1500mm) and 30m long.

They need to be installed as per the manufacturer's specification otherwise they will fail in a short period of time. They must be installed to an appropriate depth and extend higher than the finished surface.

Figure 5. Typical diagram of a root barrier



7.3.5 Staking and Tree Guards

New tree plantings should have stakes and/or tree guards as they help to protect the trees against wind and human interaction. Stakes are generally hardwood with a minimum size of 38 x38 x 1500mm and the ties should be made from hessian tape and installed so they are loose enough to not damage the stem.

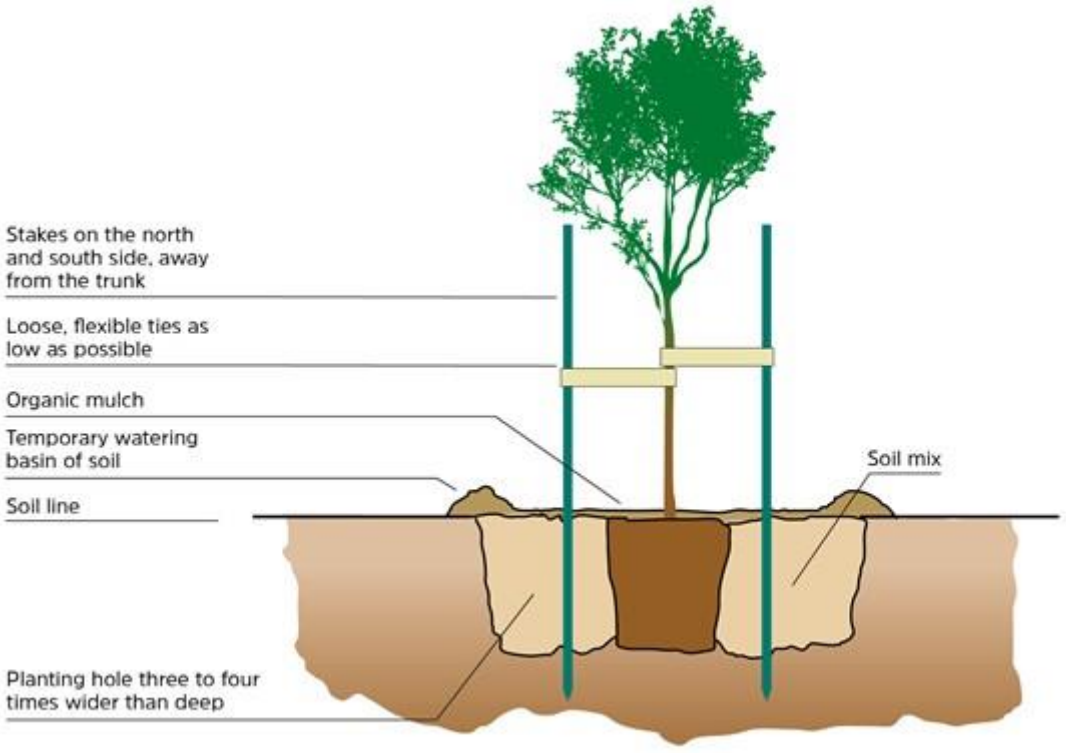


Figure 6. Typical diagram for staking a tree.

Mesh tree guard (Wilungra Tree guard from Aborgreen)

7.4 Tree Planting Constraints

7.4.1 Services

The road reserves are used as service corridors for private properties. This has an effect when it comes to planting street trees as these services can get in the way or the trees can damage them.

Services which are commonly seen in road reserves are:

- Electricity overhead and underground
- Water and sewer pipes
- Gas pipes
- Telephone lines overhead and underground
- Optic fibre cables overhead and underground
- Stormwater drains

Tree roots which enter sewer pipes can cause blockages which can affect large areas of the network. Due to the larger nutrient loaded water the trees will grow faster and larger than trees which do not have roots in these pipes.

7.4.2 Car Parking

Street trees are usually planted within the footpath to allow for car parking adjacent to the kerb. In some cases, trees have and can be planted in the road surface however this reduces car parking.

Some reasons for planting in the road surface are that buildings have awnings to the kerb, overhead power lines, wide streets and no room in the footpath due to paths.

7.4.3 Stormwater Drains

Stormwater drains can be a hindrance for planting street trees as they are usually large and can take up a large area where trees could be planted.

In the Tamworth CBD there are some specific stormwater drains which are different to the normal drains in most other areas. These are known as pressure tunnels and they are larger due to the volume of water they are designed to carry.

Stormwater drains if they are poorly installed or have aged badly can let tree roots into them causing them to be partially or completely blocked over time. Trees which have their roots in these lines are generally larger than the neighbouring trees.

7.4.4 Footpath Finish

Footpath finishes can interfere with or can be damaged by trees. Tree roots spread out from the trunk or main stem to support and feed the tree as it grows. Structural roots are generally larger as they need to support the tree.

A traditional grass footpath generally doesn't show the movement as the roots grow unless they come to the surface. Whereas concrete, paved and asphalt footpaths show the change relatively quickly and they will keep changing as the tree roots grow. Footpaths with hard impermeable surfaces do not let water through and the tree roots will keep growing.

Section 8: Notification Plan

Where a tree, having met the criteria in Item f of the Tree Removal Policy and is proposed to be removed from a highly visible public place (e.g. street tree) Council staff will follow the Communication Strategy.

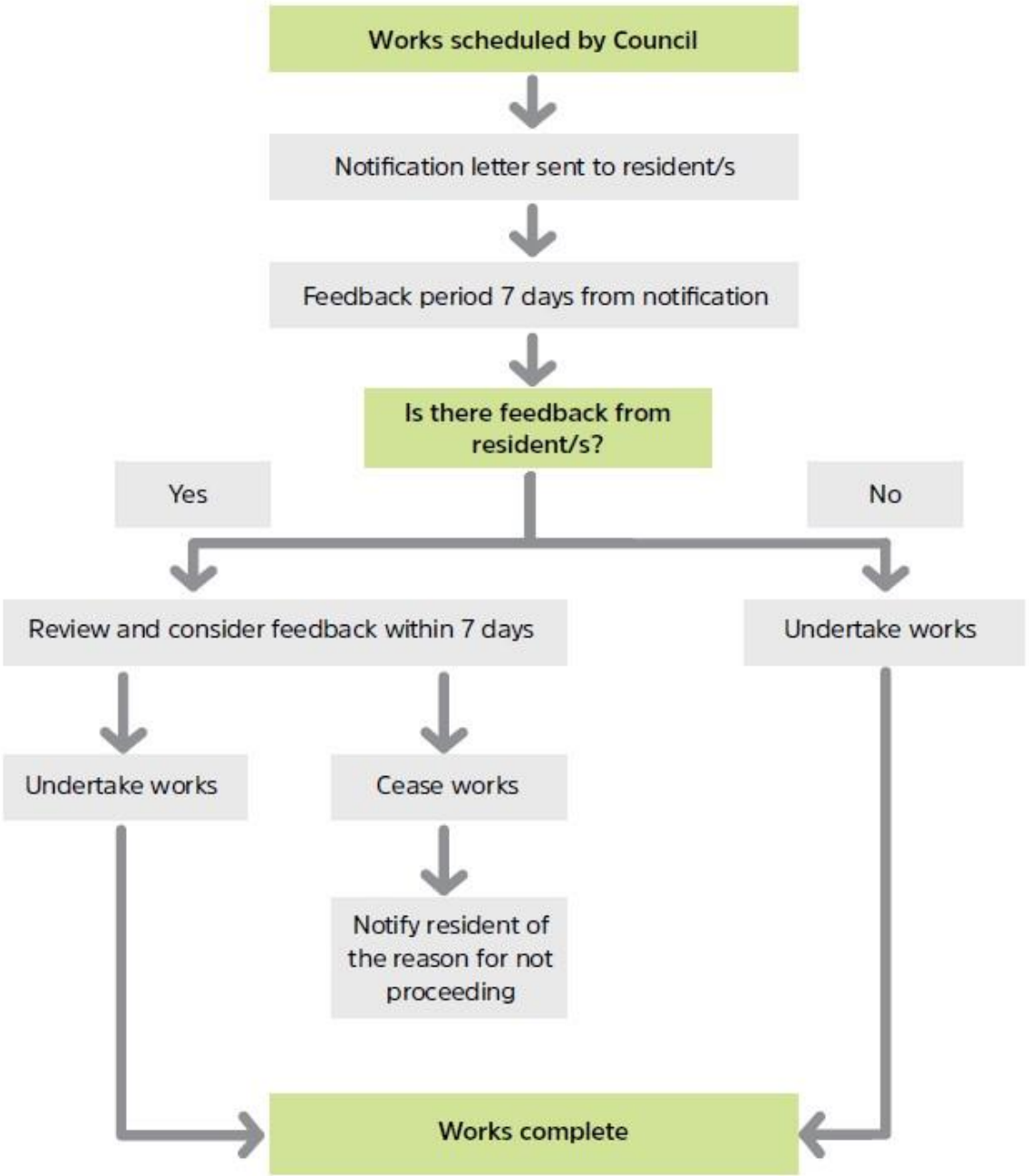
Communication Strategy

This strategy is to inform the various groups of the decision to remove a tree and outlines who will receive notification of the intended works.

The Tree Removal Communication Form (Appendix D) is to be completed for all tree removals.

- The Tree Location, Tree of Type and Type of Work are to be circled.
- The Communication column then provides the type of Communication required prior to the works.
- Should the Communication column show 2 different levels of Communication then the higher-level Communication shall be undertaken.
- **Communication Level 1** – Letter to residents in vicinity by the Supervisor of the Tree Team.
- **Communication Level 2** – Send an email to **trccomms@tamworth.nsw.gov.au** with a reason why the tree is being pruned or removed and a scheduled removal date for the works. Communications will determine whether the media is notified of the works.
- **Communication Levels 3** – To be completed and signed by the Horticulture & Arboriculture Specialist or the Manager Sports & Recreation. An email shall be sent to the Manager Sports & Recreation regarding the works including the reason and scheduled removal date. The Manager Sports & Recreation shall then forward the email to the Director and the Councillor's.
- This completed form shall be attached to the CRM.

Communication flowchart



Section 9: Tree Risk Management

This manual seeks to emphasise that councils must be aware of their actual responsibility concerning the management of Trees and Tree Roots. Some of these responsibilities are written in relevant legislation such as the Local Government Act 1993 and the Environmental Planning Act 1979, Trees (Disputes between Neighbours) Act 2006 and their corresponding Regulations.

The Tree Risk Management Plan sets out how Council will identify, assess and manage risk in relation to street and park trees. This plan follows the guidance outlined in Statewide Mutual Best Practice Manual Trees and Tree Roots recognising the importance of managing risks associated with urban forests.

Interactions between trees and the built environment are complex and not well understood. These potential interactions must be given consideration when designing for new construction as well as new trees and when developing strategies to manage and maintain existing trees.

Urban forests are recognised as significant community assets worthy of retention, protection and expansion. The enormous benefits that accrue from urban forests are only achieved when the density of the tree canopy is appropriate and when each individual tree is properly selected and maintained.

The management of the urban forest should aim for sustainability, built in resilience and intergenerational equity.

9.1 Basic Risk Management Definitions

Risk	Effect of uncertainty on objectives
Hazard	Anything with potential to harm health, life or property
Risk management	Coordinated activities to direct and control with regard to risk
Risk assessment	The overall process for risk identification, risk analysis and risk evaluation

In determining risk, the following matters should be taken into consideration:

- The magnitude of the risk,
- The degree of probability of its occurrence,
- The expense, difficulty and inconvenience of taking alleviating action, and
- Any other conflicting responsibilities.

It is essential to know the quantity and quality of the urban forest for which you are responsible. In order to understand Councils tree assets, Council proposes to inspect and document the characteristics and hazards associated with trees in the urban forest based on the likelihood of an incident occurring. This is based on the pedestrian traffic assessed where trees grow.

This is the common means of gathering information relevant to determining your level of risk and priority for tree management. The tree survey forms the basis for establishment of an urban street tree management plan.

All documentation relating to inspections of trees will be kept within council's electronic document management system (State Records Act 1998).

Table 1. outlines the inspection regime to gather initial information relating to tree assets and their risk levels.

Table 1. Inspection Regime

Category	Inspection time frame
• Schools, preschools and hospital areas • CBD / shopping areas • Regional and district parks	1 Year
• Cemeteries • Local parks	2 Years
• Neighbourhood parks	3 Years

Once the initial inspection information has been collected a schedule for an inspection programme will be developed for these trees, and the starting date of these scheduled inspections.

Table 2. shows the intervals between inspections for trees relating to their risk rating level.

Table 2. Risk Level Inspection Time Frames

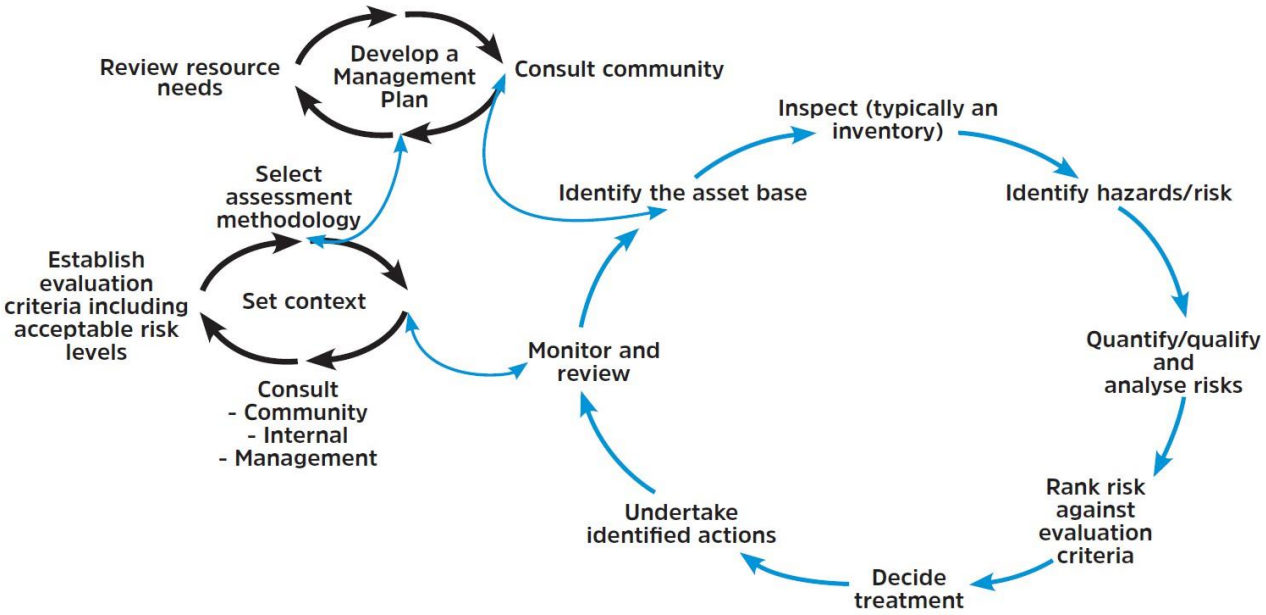
Risk level	Inspection time frame
• Low	24 months
• Medium	12 months
• High	6 months
• Extreme	1 month

Tree fallen over after storm, Oxley Vale

9.2 Implementing Councils Risk Management Strategy for Existing Trees

Council proposes to systematically assess each tree under Councils control in order to determine an appropriate risk management strategy subject to available resources. Figure 1, shows the method for making such assessments. Due to limited resources, Council will focus attention on trees in areas of greatest potential risk e.g. schools, hospitals, central business districts, shopping precincts, major roads public open space and cemeteries.

Figure 1. Urban Tree Risk Management



Many aspects of this process require specialist arboriculture knowledge. Appendix C shows the Arboriculture Australia's Tree Hazard Assessment Qualification (TRAQ) checklist which council will use to assess trees. This is used in conjunction with Table 6 - Risk Management and Hazard Abatement Strategies.

The risk management strategies are those that appear in Table 7. These strategies have been generally adopted by the Australian amenity tree industry as remedies for risk reduction whilst preserving appropriate trees.

When assessing the financial risk of tree retention, Council must consider three matters:

- Damage to Council property - this information can be obtained from maintenance records, replacement costs and the like held by Council;
- Damage to third party property - this includes damage to fences, paths and driveways, services, motor vehicles and homes; and
- Injury to third party - slips, trips and falls as a result of damage attributed to trees and tree roots amount for about 30% of all claims received by Councils insurance Mutual (approximate). Council must be confident that its action in planting the tree does not increase its exposure.

9.2.1 Tree Inspection

In assessing a tree, it is necessary for an appropriately skilled and experienced person to systematically inspect the tree(s). A Tree Risk Assessment should be kept of the inspection.

Tree Risk Assessments shall be conducted by a suitably qualified arborist and Council will have staff trained in the Tree Risk Assessment Qualification (TRAQ) through Arboriculture Australia. Table 3 provides the minimum AQF level for the different inspection levels.

Table 3: Inspection Levels and AQF Levels

Inspection Type	Minimum AQF Level
Level 1 – Visual Assessment	**3**
Level 2 – Basic Assessment	**5**
Level 3 – Advanced Assessment	**5**

The Tree Risk Assessment should be used as a guide only; additional information may be required to make a reasonable assessment. It may be necessary for an above and/or underground inspection to be performed to gain a complete picture of a tree's health and risk. Accessing the tree must comply with the New South Wales WorkCover Code of Practice for the Amenity Tree Industry along with the Australian Standard AS4970-2009 Protecting Trees on Development Sites.

- A Level 1 Visual Assessment is an evaluation of trees either from a vehicle or walking down a path / street. Limited detail is recorded during this type of inspection.
- A Level 2 Basic Assessment is an evaluation of a tree using probes, mallet or binoculars to inspect a trees structure or health. A form (Appendix C) is usually completed for each tree.
- A Level 3 Advanced Assessment is an evaluation of a tree using climbing /EWP and includes investigation of the root system using of resistance drilling or the use of compressed air tools. A detailed written report of the tree including photos and test results including mitigation, maintenance or removal recommendations.

9.2.2 Risk Assessment

A Tree Risk Assessment, Appendix C is a systematic process for determining the potential for a tree or one of its parts, to fail and in so doing, injure people or damage property. Since trees are living, dynamic (i.e. constantly growing) organisms they do have the potential to cause damage or injury if a mechanical failure occurs.

The degree of risk or hazard will vary with the size of the tree, type and location of defect, tree species and the nature of the target.

Tree hazard assessment involves three components:

- A tree with the potential to fail or cause injury;
- An environment that may contribute to that failure or injury; and
- A person or asset that would be injured or damaged (i.e. the target).

Each of these components and their interactions must be considered. Tree Risk assessments are categorised in 3 levels and must be carried out by appropriately trained and experienced arborists with a minimum of an AQF Level 3 for Level 1 inspections and AQF level 5 or higher for Level 2 and 3 inspections. It must be understood that assessing whether or not to keep a tree which is dangerous is largely dependent on context.

9.2.3 Tree Risk Matrix

The risk rating for trees is a calculation of the likelihood of a failure and the impact in relation to the consequence. Table 4 details an industry accepted risk rating matrix.

Table 4: Risk Rating Matrix

Likelihood of failure & impact	Consequences of failure			
	Negligible	**Minor**	**Significant**	**Severe**
Very likely	Low	Moderate	High	Very High
Likely	Low	Moderate	High	High
Somewhat likely	Low	Low	Moderate	Moderate
Unlikely	Low	Low	Low	Low

Once a risk rating has been calculated an intervention level can be established. Table 5, details the intervention timeframes which Council intends to use to remediate the risk. Intervention timeframes will be followed in line with Councils resources.

Table 5: Intervention Timeframes

Risk rating	Time frame
Low	Within 4 months
Moderate	1 month
High	14 days
Very High	7 days

9.2.4 Hazard Abatement

Once a basic risk assessment has been performed, the appropriate risk management strategy should be determined. Table 6 lists risk management options for existing trees. These options should be reviewed in consultation with the inspecting arborist.

Table 6. Risk Management for Existing Trees

Strategy	Description
Monitor trip points	Where no other practical method can be employed to prevent this occurring, a regular trip point inspection program should be instigated and pavement replaced or repaired as necessary or the implementation of a no-go zone through fencing.
Flexible pathways	Use of flexible material such as bitumen, paving, or rubber compounds for footpaths and tree surrounds, will reduce the occurrence of trip points and may be less expensive and easier than concrete to maintain or replace when necessary.
Re-direct pathways	Where space allows, pathways should be re-directed away from trees/tree roots. It may also be beneficial to reduce the newly directed pathway width.
Bridging Footpaths	Self-supporting construction methods, such as pier and beam could be used to raise pathways above the roots, allowing for root expansion without damaging the pavement. Timber bridges are an effective option
Root pruning	Non-structural roots could be pruned on a predetermined basis under the guidance of a qualified arborist (AQF Level 5). This practice could be combined with installation of root barriers where appropriate.
Root barriers	In some circumstances root barriers may be useful in deflecting roots away from pavement or services.
Tree Root System Protection	The use of AS4970-2009 - Tree Root Protection on Construction Sites using the Tree Protection Zones and Structural Root Zones are an effective method to preserve trees which could be impacted through construction.
Directional or Horizontal boring for services	Directional boring rather than open trenching for underground services will greatly reduce public risk as well reducing injury to tree roots. If located deeply, root contact with the pipeline may be minimised as the majority of roots of most species will remain within the top 1 metre of soil (based on a soil with medium texture).
PVC welded piping	Replacement of old porous clay pipe mains with PVC or polyurethane mainlines will significantly reduce the potential for tree root entry.
Preventative tree maintenance	Trees in public areas should be regularly inspected and maintenance, such as dead-wooding and developmental pruning carried out as prescribed. Pruning should always be specified and undertaken in accordance with AS4373-2007 - Pruning of Amenity Trees by an AQF Level 3 or higher.
Raising pathways	Where appropriate, pathways could be raised to reduce direct root pressure on the pavement. Care must be taken not to build up soil against the trunk of a tree. Aeration piping, in conjunction with geo-textile fabric and gravel should be installed between root zone and new pavement to aid with gas exchange to roots. Care should be taken to shape the new surface to drain water away from the trunk of the tree.

Strategy	Description
Insulated (ABC) cabling	Replacement of uninsulated overhead power lines with insulated & bundled cables will reduce both the clearance needed and the pruning costs and severity.
Underground power & Communications cables	The initially high cost of installing power underground may in fact be a practical option when compared with the projected cost of repeated pruning, the risk that this work involves to operators, the negative impact on trees, loss of public amenity and of urban forest economic contributions.
Diverting services	Services could be diverted along roadways, rather than in the nature strip where a valuable stand of trees is present. To make this option more attractive to service providers, Councils may wish to consider waiving road opening fees.
Diverting kerb/gutter	When possible, kerb/gutter could be diverted around tree roots or further away from the trunk, creating an island around the tree.
Enlarging root zone	Where space allows, a designated area above the root zone of the tree should be enlarged/created to accommodate surface roots. Rather than turf, this area could be formed into a garden bed, mulched or covered with a suitable tree grate.
Formative pruning	Early pruning will reduce the development of structural weaknesses in older trees. Refer to AS4373-2007 *Pruning of Amenity Trees.*
Remove target	In some situations, it is preferable to remove a potential target, such as a seat rather than to remove a tree in order to abate a hazard.
Remove the defect	This could include pruning of live or dead branches, roots or the removal of co-dominant stems.
Tree engineering	In some cases, cabling may be used to support tree structure or to control the direction of a possible failure. This is highly specialised work.
Tree removal	In some situations, it may be preferable to remove a tree and replace with a more suitable species, perhaps in an alternative location. In all cases of tree removal, it is necessary to ensure that the removal is mitigated in order to ensure the future integrity of the urban forest.

9.2.5 Risk Management Control Strategies for New Tree Planting

Table 7, provides a range of risk management controls that may be implemented to ensure new tree plantings are compatible with the site and circumstances. These strategies can reduce the negative interaction between trees and infrastructure.

Table 7. Risk Management for New Trees

Control Strategy	Description
Root barriers	**Installation of root barriers to manufacturer's specification at the time of planting may assist tree roots to develop away from services, pavements and other structures.** **NOTE OF CAUTION Root barriers are not applicable for all circumstances due to:** • **Tree root barriers do require periodic monitoring as roots deflected downwards will return to the surface if soil oxygen levels are not sufficient to support growth at depth.** • **Roots can also grow over or around the barrier in some situations.** • **The barriers may prevent trees from establishing a stabilising root system.**
Soil compaction	**Proper compaction of the soil when back filling trenches or around utility easements and house footings will direct tree roots away from these areas. By achieving and maintaining compaction to 95% root growth can be inhibited through the deprivation of oxygen.**
Pseudo street trees	**Residents could be encouraged to plant trees within their boundaries in preference to street tree planting. This might allow larger species to be used, and reduce pressure on pavements and services.**
Provision of aeration and irrigation	**Where there is to be continuous paving around a tree, the installation of an aeration and irrigation system is essential. Where irrigation is installed and properly operating, a tree root system will be proportionally smaller than without irrigation.**
Design of new roads and pathways	**The design of new roads and footpaths should be undertaken with consideration for tree planting on the nature strip or in the road pavement to ensure appropriate allocation of space.**
Pavement Openings	**Pavement openings at the base of the tree should be as large as possible to reduce the future impact of buttressing roots on pavements. Position of the tree should be a good distance (e.g. 1 m) from the kerb line to reduce the likelihood of future cracking.**
Root Vaults	**In high value precincts (e.g. heritage, retail, and the like) the use of load bearing sub grade vault systems will provide root volume for the selected species at maturity. Examples include the use of structural soil, plastic cell systems and concrete beam structures that allow a trafficable hard surface without compromising tree root development. The cost of vault systems should be seen as a long term investment in tree growth and the avoidance of negative costly tree root interactions. Partial vault systems may be used at a lesser cost whilst still reducing the risk of interaction within the primary zone of influence around the tree.**

9.3 Tree Roots and Infrastructure

A trees growth is strongly influenced by below-ground conditions. Tree root growth is opportunistic and will proliferate wherever moisture, aeration, nutrition and soil structure are favourable. Tree root growth in the urban environment is highly modified and is not governed by property boundaries.

There are a number of common conflicts with tree roots in the built environment.

9.3.1 Direct Damage

Direct damage is the distortion of built structures as the growing tree root exerts pressure. Direct damage by tree roots is usually limited to light-built structures such as pavements and low walls and can also be witnessed in buildings of sub-standard footings.

9.3.2 Indirect Damage

Indirect damage is the distortion of built structures as the growing tree root takes up soil moisture. Often there are multiple factors contributing to foundation movement and are seldom associated with tree root growth alone. For this reason, claims of indirect tree root damage must be accurately investigated.

Leaking pipes (as a result of poor construction, old earthenware, cracked and faulty joints and degradation) can create a moisture gradient that encourages tree root growth in the direction of the pipe.

The property owner is responsible for the maintenance, repair and replacement from the legal point of discharge, usually near the property boundary kerb. Council should always be given the opportunity to inspect the pipes and offending tree roots prior to the property owner undertaking repair works.

Council will seek to resolve tree root conflicts in the following manner:

- All claims of direct tree root damage from public trees will be investigated;
- Council will seek practical solutions to reduce the risk of damage to infrastructure from public trees;
- Tree removal will only be considered if no practical or cost effective arboriculturally sound solution can be found;
- Every effort will be taken to ensure that replacement and future public trees will not themselves result in similar damage to structures;
- Claims of indirect tree root damage to structures will be investigated if a geotechnical or structural engineering report implicates tree root damage;
- Should tree root growth cause foundation movement the Council will seek a viable arboriculturally sound solution to rectify the situation and to retain the public tree; and
- The removal of public trees for indirect property damage will only be considered if a geotechnical or structural engineer's report attributes the damage to tree root growth and if no practical alternative arboriculture solution can be obtained. Potential for soil heave as a result of tree removal must also be considered.

Claims of property damage from tree roots must comply with Council guidelines for submitting a claim. The Council will not remove public trees for unjustified claims of pipe or sewer damage from tree root activity.

9.4 Interactions between trees and structures

Interactions between trees and structures are complex and there are likely to be other factors contributing to any given situation. It is therefore not beneficial to focus concern entirely onto a tree or tree species when developing a tree risk management strategy.

Factors that commonly contribute to negative interactions between trees and structures include:

- The soil type; its structure and depth;
- The tree species and its genetic disposition;
- The design of the structure;
- The construction materials and methods adopted;
- The age of the structure (as with trees, structures have a 'useful life span' and have to be maintained and then replaced within a set timeframe); and
- The type of previous land use e.g. industrial sites where soil contamination and/or layers of fill can impede normal biological processes.

Typical interactions leading to conflict involve trees and power lines (e.g. causing fires and loss of power) trees and poles, trees and footpaths (e.g. tripping points), trees and pipes, repair of footpaths and trees, installation of underground services near trees.

Tree root damaging stormwater drain

ANZAC Park, Tamworth

Appendix A – Recommended Street Tree Species List

The Tamworth Region has a unique harsh climatic variation that makes tree establishment extremely challenging. With a range of -4 to 44 degrees Celsius our tree selection has to be hardy to thrive in these conditions. The following lists provided a broad selection of native and exotic trees that once established, can tolerate these variations. Greening success is not only dependent on species selection but also correct planting timing. It is also proven that healthier, robust trees are a result of planting smaller stock, which as young trees are more adaptable and likely to thrive. Tubestock is commonly used with native trees to attain superior results. Native species are best planted in Autumn or Spring, depending on the frost tolerance of the respective species. Deciduous trees come either bare rooted or potted up. The best time to plant bare rooted stock in our region is in July, while potted deciduous trees are best planted in late Autumn and Winter. If the above considerations are followed, along with the correct tree selection, you give your tree the absolute best start and opportunity to be a beautiful long-term asset in our hot summers and cold winters.

Common Name/s	Genus	Species	Variety	Tree Size	Growth Rate	Frost Rating	Type	Habit / Form	Powerlines	Useful Life Expectancy	Flower	Biodiversity Value	Origin	Signature Tree	Major Avenue	Local Streets	Planting Time
Bottlebrush	Callistemon	sp		Small	Medium	Hardy	Evergreen	CN	Yes	Medium	Su	High	Native			Yes	Autumn
Euky Dwarf	Eucalyptus	leucoxylon	Euky Dwarf	Small	Medium	Hardy	Evergreen	RS	Yes	Long	Su	High	Native		Yes	Yes	Autumn
Crepe Mrytle	Lagerstoemia	indica		Small	Medium	Deciduous	Deciduous	CU	Yes	Medium	Su	Low	Exotic			Yes	Winter
Melaleuca	Melaleuca	sp		Small	Fast	Hardy	Evergreen	CU	Yes	Medium	Su	High	Native			Yes	Spring, Autumn
Flowering Plum	Prunus	cerasifera	Nigra	Small	Fast	Deciduous	Deciduous	CU	Yes	Medium	Sp	Low	Exotic			Yes	Winter
Weeping Myall	Acacia	pendula		Medium	Medium	Hardy	Evergreen	CU	No	Short	Sp	High	Local Native			Yes	Autumn
Queensland Bottle Tree	Brachychiton	rupestris		Medium	Slow	Hardy, Tender when Young	Evergreen	CR	No	Long	Sp	High	Native	Yes	Yes		Spring
Carob Tree	Ceratonia	siliqua		Medium	Medium	Hardy	Evergreen	CS	No	Long	Au	Low	Exotic		Yes	Yes	Spring, Autumn
Coral Gum	Eucalyptus	torquata		Medium	Medium	Moderate, Tender when Young	Evergreen	CR	Yes	Medium	Su	High	Native			Yes	Spring
Flowering Ash	Fraxinus	ornus		Medium	Medium	Evergreen	Evergreen	CR	Yes	Medium	Sp	Low	Exotic		Yes	Yes	Spring
Velvet Ash	Fraxinus	velutina		Medium	Fast	Deciduous	Deciduous	CR	Yes	Medium	NA	Low	Exotic		Yes	Yes	Winter
Wilga	Geijera	parviflora		Medium	Slow	Light	Evergreen	CR	No	Long	Sp, Su, Wi	High	Local Native			Yes	Autumn
Golden Rain Tree	Koelreuteria	paniculata		Medium	Fast	Deciduous	Deciduous	CR	Yes	Medium	NA	Low	Exotic		Yes	Yes	Winter
Chinese Pistache	Pistacia	chinensis		Medium	Medium	Deciduous	Deciduous	CR	Yes	Medium	NA	Low	Exotic		Yes	Yes	Winter
Manchurian Pear	Pyrus	ussuriensis		Medium	Medium	Deciduous	Deciduous	CRN	No	Medium	Sp	Low	Exotic		Yes	Yes	Winter
Ornamental Pear	Pyrus	sp		Medium	Medium	Deciduous	Deciduous	CN	No	Medium	sp	Low	Exotic		Yes	Yes	Winter
Holly Oak	Quercus	ilex		Medium	Medium	Hardy	Evergreen	CR	No	Long	NA	Low	Exotic	Yes			Spring
Chinese Tallow Tree	Triadica	sebifera		Medium	Fast	Deciduous	Deciduous	CR	Yes	Medium	NA	Low	Exotic		Yes	Yes	Winter
Kurrajong Tree	Brachychiton	populneus		Large	Slow	Very Hardy, Tender when Young	Evergreen	CR	No	Long	Sp	High	Local Native		Yes	Yes	Spring
Cadaghi	Corymbia	torelliana		Large	Fast	Moderate, Tender when Young	Evergreen	CS	No	Medium	Su	High	Native		Yes		Spring
Spotted Gum	Corymbia	maculata		Large	Slow	Moderate, Tender when Young	Evergreen	OS	No	Long	Su	High	Native	Yes	Yes		Spring
Bimble Box	Eucalyptus	populnea		Large	Fast	Hardy	Evergreen	OS	No	Long	Su	High	Native		Yes		Autumn

Common Name/s	Genus	Species	Variety	Tree Size	Growth Rate	Frost Rating	Type	Habit / Form	Powerlines	Useful Life Expectancy	Flower	Biodiversity Value	Origin	Signature Tree	Major Avenue	Local Streets	Planting Time
Blakely's Red Gum	Eucalyptus	blakelyi		Large	Fast	Hardy	Evergreen	OS	No	Long	Su	High	Local Native	Yes	Yes		Autumn
Chinchilla White Gum	Eucalyptus	argophloia		Large	Fast	Hardy	Evergreen	OS	No	Long	Au, Wi	High	Native		Yes	Yes	Autumn
Grey Box	Eucalyptus	moluccana		Large	Fast	Moderate	Evergreen	OS	No	Long	Su	High	Native	Yes	Yes		Autumn
Mugga Ironbark	Eucalyptus	sideroxylon		Large	Fast	Hardy	Evergreen	OS	No	Long	Su	High	Local Native		Yes		Autumn
Narrow Leaf Iron Bark	Eucalyptus	crebra		Large	Fast	Hardy	Evergreen	OS	No	Long	Su	High	Local Native	Yes	Yes		Autumn
White Box	Eucalyptus	albens		Large	Fast	Hardy	Evergreen	OS	No	Long	Su, Au, Wi, Sp	High	Local Native				Autumn
Yellow Box	Eucalyptus	melliodora		Large	Fast	Hardy	Evergreen	OS	No	Long	Su, Au, Wi, Sp	High	Local Native				Autumn
Desert Ash	Fraxinus	angustifolia		Large	Medium	Deciduous	Deciduous	CS	No	Long	NA	Low	Exotic		Yes	Yes	Winter
Silky Oak	Grevillea	robusta		Large	Medium	Tender when young	Evergreen	ON	No	Long	Sp	High	Native	Yes	Yes	Yes	Spring
Jacaranda	Jacaranda	mimosifolia		Large	Medium	Deciduous, Tender when Young	Deciduous	OS	No	Long	SP	Low	Exotic		Yes	Yes	Spring
Bradford Pear	Pyrus	calleryana	Bradford	Large	Medium	Deciduous	Deciduous	CN	No	Medium	Sp	Low	Exotic		Yes	Yes	Winter
Pin Oak	Quercus	palustris		Large	Slow	Deciduous	Deciduous	ON	No	Long	NA	Low	Exotic	Yes	Yes		Winter
Chinese Elm	Ulmus	parvifolia		Large	Fast	Semi-Deciduous	Semi-Deciduous	OS	No	Long	NA	Low	Exotic		Yes	Yes	Winter

Habit/Form	
C	Compact/dense foilage
O	Open crown/canopy
U	Upright
R	Rounded
S	Spreading
N	Narrow/columnar or pyramidal

Tree size	
Small	<7m
Medium	7-15m
Large	>15m

Useful Life Expectancy	
Short	<10yrs
Medium	10 to 30 years
Long	>30 years

Flower	
Sp	Spring
Su	Summer
Wi	Winter
NA	Not Applicable

Appendix B – Feature Tree Park List

Common Name/s	Genus	Species	Variety	Tree Size	Growth Rate	Frost Rating	Type	Habit / Form	Powerlines	Useful Life Expectancy	Flower	Biodiversity Value	Origin	Signature Tree	Major Avenue	Local Streets	Planting Time
Red Maple	Acer	rubrum	Varieties	Small	Slow	Deciduous	Deciduous	CU	Yes	Long	NA	Low	Exotic		Yes	Yes	Winter
Euky Dwarf	Eucalyptus	leucoxylon	Euky Dwarf	Small	Medium	Hardy	Evergreen	RS	Yes	Long	Su	High	Native		Yes	Yes	Autumn
Crepe Mrytle	Lagerstroemia	indica		Small	Medium	Deciduous	Deciduous	CU	Yes	Medium	Su	Low	Exotic			Yes	Winter
Flowering Plum	Prunus	cerasifera	Nigra	Small	Fast	Deciduous	Deciduous	CU	Yes	Medium	Sp	Low	Exotic			Yes	Winter
Mulga	Acacia	aneura		Medium	Medium	Hardy	Evergreen	U	Yes	Medium	Sp	High	Native			Yes	Autumn
Weeping Myall	Acacia	pendula		Medium	Medium	Hardy	Evergreen	CU	No	Short	Sp	High	Local Native			Yes	Autumn
Queensland Bottle Tree	Brachychiton	rupestris		Medium	Slow	Hardy, Tender when Young	Evergreen	CR	No	Long	Sp	High	Native	Yes	Yes		Spring
Bottlebrush	Callistemon	sp		Medium	Medium	Hardy	Evergreen	CN	Yes	Medium	Su	High	Native			Yes	Autumn
Cape Chestnut	Calodendrum	capense		Medium	slow	Tender when young	Evergreen	CR	Yes	Long	Su	High	Exotic		Yes		Spring
Carob Tree	Ceratonia	siliqua		Medium	Medium	Hardy	Evergreen	CS	No	Long	Au	Low	Exotic		Yes	Yes	Spring, Autumn
Tuckeroo	Cupaniopsis	anacardioides		Medium	Fast	Hardy	Evergreen	CR	Yes	Medium	Su	HIgh	Native			Yes	Autumn
Silver Princess	Eucalyptus	caesia		Medium	Fast	Moderate	Evergreen	OS	Yes	Medium	Su	HIgh	Native			Yes	Spring
Coral Gum	Eucalyptus	torquata		Medium	Medium	Moderate, Tender when Young	Evergreen	CR	Yes	Medium	Su	High	Native			Yes	Spring, Autumn
Flowering Ash	Fraxinus	ornus		Medium	Medium	Evergreen	Evergreen	CR	Yes	Medium	Sp	Low	Exotic		Yes	Yes	Spring
Velvet Ash	Fraxinus	velutina		Medium	Fast	Deciduous	Deciduous	NC	Yes	Medium	NA	Low	Exotic		Yes	Yes	Winter
Wilga	Geijera	parviflora		Medium	Slow	Light	Evergreen	CR	No	Long	Sp, Su, Wi	High	Local Native			Yes	Autumn
Native Frangipani	Hymenosporum	flavum		Medium	Medium	Tender when young	Evergreen	OU	Yes	Short	Sp	High	Native			Yes	Spring
Golden Rain Tree	Koelreuteria	paniculata		Medium	Fast	Deciduous	Deciduous	CR	Yes	Medium	NA	Low	Exotic		Yes	Yes	Winter
Magnolia Little Gem	Magnolia	grandiflora	Little Gem	Medium	Medium	Hardy	Evergreen	CU	Yes	Long	Su	Low	Exotic		Yes	Yes	Autumn
Melaleuca	Melaleuca	sp		Medium	Fast	Hardy	Evergreen	CU	Yes	Medium	Su	High	Native			Yes	Spring, Autumn
Chinese Pistache	Pistacia	chinensis		Medium	Medium	Deciduous	Deciduous	CR	Yes	Medium	NA	Low	Exotic		Yes	Yes	Winter
Butterbush	Pittosporum	angustifolium		Medium	Medium	Hardy	Evergreen	CU	Yes	Medium	Sp	High	Local Native			Yes	Autumn
Plum Pine	Podocarpus	elatus		Medium	Slow	Tender when young	Evergreen	CN	No	Long	Su	High	Exotic		Yes	Yes	Spring
Wild Lemon	Psydrax	odorata		Medium	Medium	Hardy	Evergreen	CU	Yes	Medium	Sp	High	Native			Yes	Autumn
Ornamental Pear	Pyrus	sp		Medium	Medium	Deciduous	Deciduous	CN	No	Medium	sp	Low	Exotic		Yes	Yes	Winter
Manchurian Pear	Pyrus	ussuriensis		Medium	Medium	Deciduous	Deciduous	CRN	No	Medium	Sp	Low	Exotic		Yes	Yes	Winter

Common Name/s	Genus	Species	Variety	Tree Size	Growth Rate	Frost Rating	Type	Habit / Form	Powerlines	Useful Life Expectancy	Flower	Biodiversity Value	Origin	Signature Tree	Major Avenue	Local Streets	Planting Time
Holly Oak	Quercus	ilex		Medium	Medium	Hardy	Evergreen	CR	No	Long	NA	Low	Exotic	Yes			Spring
Chinese Tallow Tree	Triadica	sebifera		Medium	Fast	Deciduous	Deciduous	CR	Yes	Medium	NA	Low	Exotic		Yes	Yes	Winter
Illawarra Flame Tree	Brachychiton	acerifolius		Large	Medium	Moderate	Evergreen	UN	No	Long	Su	High	Native	Yes	Yes		Spring
Kurrajong Tree	Brachychiton	populneus		Large	Slow	Very Hardy, Tender when Young	Evergreen	CR	No	Long	Sp	High	Local Native		Yes	Yes	Spring
Belah	Casuarina	cristata		Large	Medium	Hardy	Evergreen	OU	No	Medium	NA	High	Local Native			Yes	Spring, Autumn
She-Oak	Casuarina	cunninghamiana		Large	Slow	Hardy	Evergreen	OU	No	Long	NA	High	Local Native		Yes	Yes	Spring, Autumn
Spotted Gum	Corymbia	maculata		Large	Slow	Moderate, Tender when Young	Evergreen	OS	No	Long	Su	High	Native	Yes	Yes		Spring
Cadaghi	Corymbia	torelliana		Large	Fast	Moderate, Tender when Young	Evergreen	CS	No	Medium	Su	High	Native		Yes		Spring
White Box	Eucalyptus	albens		Large	Fast	Hardy	Evergreen	OS	No	Long	Su, Au, Wi, Sp	High	Local Native				Autumn
Chinchilla White Gum	Eucalyptus	argophloia		Large	Fast	Hardy	Evergreen	OS	No	Long	Au, Wi	High	Native		Yes	Yes	Autumn
Blakely's Red Gum	Eucalyptus	blakelyi		Large	Fast	Hardy	Evergreen	OS	No	Long	Su	High	Local Native	Yes	Yes		Autumn
Narrow Leaf Iron Bark	Eucalyptus	crebra		Large	Fast	Hardy	Evergreen	OS	No	Long	Su	High	Local Native	Yes	Yes		Autumn
Yellow Box	Eucalyptus	melliodora		Large	Fast	Hardy	Evergreen	OS	No	Long	Su, Au, Wi, Sp	High	Local Native				Autumn
Grey Box	Eucalyptus	moluccana		Large	Fast	Moderate	Evergreen	OS	No	Long	Su	High	Native	Yes	Yes		Spring
Bimble Box	Eucalyptus	populnea		Large	Fast	Hardy	Evergreen	OS	No	Long	Su	High	Native		Yes		Autumn
Mugga Ironbark	Eucalyptus	sideroxylon		Large	Fast	Hardy	Evergreen	OS	No	Long	Su	High	Local Native		Yes		Autumn
Claret Ash	Fraxinus	augustifolia	Raywood	Large	Medium	Deciduous	Deciduous	CR	No	Medium	Sp	Low	Exotic		Yes	Yes	Winter
Desert Ash	Fraxinus	augustifolia		Large	Medium	Deciduous	Deciduous	CS	No	Long	NA	Low	Exotic		Yes	Yes	Winter
Evergreen Ash	Fraxinus	griffithii		Large	Medium	Tender when young	Evergreen	CR	Yes	Medium	Sp	Low	Exotic		Yes	Yes	Spring
Green Ash	Fraxinus	pennsylvanica		Large	Medium	Deciduous	Deciduous	CU	Yes	Long	Sp	Low	Exotic		Yes	Yes	Winter
Silky Oak	Grevillea	robusta		Large	Medium	Tender when young	Evergreen	ON	No	Long	Sp	High	Native	Yes	Yes	Yes	Spring
Jacaranda	Jacaranda	mimosifolia		Large	Medium	Deciduous, Tender when Young	Deciduous	OS	No	Long	SP	Low	Exotic		Yes	Yes	Spring
Liquidamber	Liquidamber	styraciflua		Large	Medium	Deciduous	Deciduous	ON	No	Long	NA	Low	Exotic		Yes	Yes	Winter
London Plane Tree	Platanus	xacerifolia		Large	Medium	Deciduous	Deciduous	OS	No	Long	Sp	Low	Exotic	Yes			Winter
Bradford Pear	Pyrus	calleryana	Bradford	Large	Medium	Deciduous	Deciduous	CN	No	Medium	Sp	Low	Exotic		Yes	Yes	Winter
Pin Oak	Quercus	palustris		Large	Slow	Deciduous	Deciduous	ON	No	Long	NA	Low	Exotic	Yes	Yes		Winter
English Oak	Quercus	robur		Large	Medium	Deciduous	Deciduous	OS	No	Long	NA	Low	Exotic	Yes	Yes		Winter
Chinese Elm	Ulmus	parvifolia		Large	Fast	Semi-Deciduous	Semi-Deciduous	OS	No	Long	NA	Low	Exotic		Yes	Yes	Winter

Useful Life Expectancy	
Short	<10yrs
Medium	10 to 30 years
Long	>30 years

Habit/Form	
C	Compact/dense foilage
O	Open crown/canopy
U	Upright
R	Rounded
S	Spreading
N	Narrow/columnar or pyramidal

Tree size	
Small	<7m
Medium	7-15m
Large	>15m

Flower	
Sp	Spring
Su	Summer
Wi	Winter
NA	Not Applicable

Appendix C – Tree Risk Assessment Form

Please see the following page.

Basic Tree Risk Assessment Form

Client _____ Date _____ Time _____

Address/Tree location _____ Tree no. _____ Sheet _____ of _____

Tree species _____ dbh _____ Height _____ Crown spread dia. _____

Assessor(s) _____ Tools used _____ **Time frame** _____

Target Assessment

Target number	Target description	Target protection	Target zone: Target within drip line	Target zone: Target within 1x Ht.	Target zone: Target within 1.5 x Ht.	Occupancy rate (1–rare, 2 – occasional, 3 – frequent, 4 – constant)	Practical to move target?	Restriction practical?
1								
2								
3								
4								

Site Factors

History of failures _____ **Topography** Flat☐ Slope☐ _____% **Aspect**

Site changes None☐ Grade change☐ Site clearing☐ Changed soil hydrology☐ Root cuts☐ Describe _____

Soil conditions Limited volume☐ Saturated☐ Shallow☐ Compacted☐ Pavement over roots☐ _____% Describe _____

Tree Health and Species Profile

Vigor Low☐ Normal☐ High☐ **Foliage** None (seasonal)☐ None (dead)☐ Normal _____% Chlorotic _____% Necrotic _____%

Pests/Biotic _____ **Abiotic** _____

Species failure profile Branches☐ Trunk☐ Roots☐ Describe _____

Load Factors

Wind exposure Protected☐ Partial☐ Full☐ Wind funneling☐ _____ **Relative crown size** Small☐ Medium☐ Large☐ **Crown density** Sparse☐ Normal☐ Dense☐ **Interior branches** Few☐ Normal☐ Dense☐ **Vines/Mistletoe/Moss** ☐ _____

Recent or expected change in load factors _____

Tree Defects and Conditions Affecting the Likelihood of Failure

— Crown and Branches —

Unbalanced crown ☐ LCR _____%

Dead twigs/branches ☐ _____% overall Max. dia. _____

Broken/Hangers Number _____ Max. dia. _____

Over-extended branches ☐

Pruning history

Crown cleaned ☐ Thinned ☐ Raised ☐

Reduced ☐ Topped ☐ Lion-tailed ☐

Flush cuts ☐ Other _____

Cracks ☐ _____ Lightning damage ☐

Codominant ☐ _____ Included bark ☐

Weak attachments ☐ _____ Cavity/Nest hole____% circ.

Previous branch failures ☐ _____ Similar branches present ☐

Dead/Missing bark ☐ Cankers/Galls/Burls ☐ Sapwood damage/decay ☐

Conks ☐ Heartwood decay ☐ _____

Response growth _____

_____ Condition(s) of concern _____

Part Size _____ Fall Distance _____

Load on defect N/A☐ Minor ☐ Moderate☐ Significant☐

Likelihood of failure Improbable☐ Possible☐ Probable ☐ Imminent ☐

— Trunk —

Dead/Missing bark ☐ Abnormal bark texture/color ☐

Codominant stems ☐ Included bark ☐ Cracks ☐

Sapwood damage/decay ☐ Cankers/Galls/Burls ☐ Sap ooze ☐

Lightning damage ☐ Heartwood decay ☐ Conks/Mushrooms ☐

Part Size _____ Fall Distance _____

Load on defect N/A☐ Minor ☐ Moderate☐ Significant☐

Likelihood of failure Improbable☐ Possible☐ Probable ☐ Imminent ☐

— Roots and Root Collar —

Collar buried/Not visible ☐ Depth_____ Stem girdling ☐

Dead ☐ Decay ☐

Conks/Mushrooms ☐ Ooze ☐

Cavity ☐ ____% circ. Cracks ☐ Cut/Damaged roots ☐ Distance from trunk _____

Cavity/Nest hole _____ % circ. Depth _____ Poor taper ☐

Lean _____° Corrected? _____

Response growth _____

Condition(s) of concern _____

Part Size _____ Fall Distance _____

Load on defect N/A ☐ Minor ☐ Moderate ☐ Significant ☐

Likelihood of failure Improbable ☐ Possible ☐ Probable ☐ Imminent ☐

Root plate lifting ☐ Soil weakness ☐

Response growth

Condition(s) of concern _____

Part Size _____ Fall Distance _____

Load on defect N/A ☐ Minor ☐ Moderate ☐ Significant ☐

Likelihood of failure Improbable ☐ Possible ☐ Probable ☐ Imminent ☐

Risk Categorization

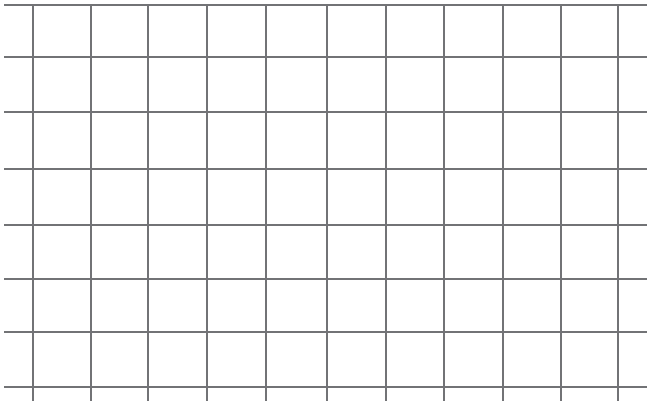
Target *(Target number or description)*	Tree part	Condition(s) of concern	Likelihood: Failure: Improbable	Failure: Possible	Failure: Probable	Failure: Imminent	Likelihood: Impact: Very low	Impact: Low	Impact: Medium	Impact: High	Failure & Impact *(from Matrix 1)*: Unlikely	Somewhat	Likely	Very likely	Consequences: Negligible	Minor	Significant	Severe	Risk rating *(from Matrix 2)*

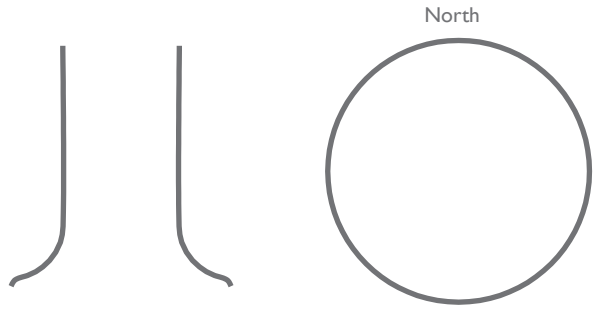
Matrix 1. Likelihood matrix.

Likelihood of Failure	Likelihood of Impact			
	Very low	Low	Medium	High
Imminent	Unlikely	Somewhat likely	Likely	Very likely
Probable	Unlikely	Unlikely	Somewhat likely	Likely
Possible	Unlikely	Unlikely	Unlikely	Somewhat likely
Improbable	Unlikely	Unlikely	Unlikely	Unlikely

Matrix 2. Risk rating matrix.

Likelihood of Failure & Impact	Consequences of Failure			
	Negligible	Minor	Significant	Severe
Very likely	Low	Moderate	High	Extreme
Likely	Low	Moderate	High	High
Somewhat likely	Low	Low	Moderate	Moderate
Unlikely	Low	Low	Low	Low





Notes, explanations, descriptions

_____

_____

_____

_____

_____

Mitigation options

1. _____ **Residual risk** _____
2. _____ **Residual risk** _____
3. _____ **Residual risk** _____
4. _____ **Residual risk** _____

Overall tree risk rating Low ☐ Moderate ☐ High ☐ Extreme ☐

Overall residual risk None ☐ Low ☐ Moderate ☐ High ☐ Extreme ☐ **Recommended inspection interval** _____

Data ☐ Final ☐ Preliminary **Advanced assessment needed** ☐No ☐Yes-Type/Reason _____

Inspection limitations ☐None ☐Visibility ☐Access ☐Vines ☐Root collar buried Describe _____

Appendix D - Tree Pruning and Removal Communication Form

Address	
Resident Name	
Contact Phone Number	
CRM Number	

Tree Location

Local / Rural Road	Communication 1	Yes	No
Main Road / Highway	Communication 1,2	Yes	No
Local / Neighbour Park	Communication 1,2	Yes	No
Regional / District Park	Communication 2,3	Yes	No

Type of Tree

Street Shrub (less than 4m)	Communication 1	Yes	No
Street Tree (larger than 4m)	Communication 1,2	Yes	No
Park Tree (larger than 4m)	Communication 2,3	Yes	No
Significant Tree	Communication 1,2,3	Yes	No

Type of Work

Pruning of a Significant Tree	Communication 1,2,3	Yes	No
Removal of a Shrub	Communication 1	Yes	No
Removal of a Tree	Communication 1,2	Yes	No
Removal of a Significant Tree	Communication 1,2,3	Yes	No

Communication

1	Have the near by residents been notified?	Yes	No
2	Have you sent an email to Corporate Communications?	Yes	No
3	Have the Manager, Director and Councillors been advised via email?	Yes	No

Completed by (*circle below*)

Supervisor / Horticulture & Arboriculture Specialist

Name	**Date**

These works have been approved by (*circle below*)

Supervisor / Horticulture & Arboriculture Specialist / Manager Sports & Recreation

Name	**Date**

Works Completed

Name	**Date**

References

- AS 4373-2007 - Pruning Amenity Trees Pruning Types, Classes And Suitability
- AS4970-2009 - Tree Root Protection on Construction Sites
- Environment Act 1979
- State Archives and Records Authority GA39 Local Government Records
- Local Government Act 1993
- State Records Act 1998
- Civil Liability Act 2002
- Trees (Dispute between Neighbours) Act 2006