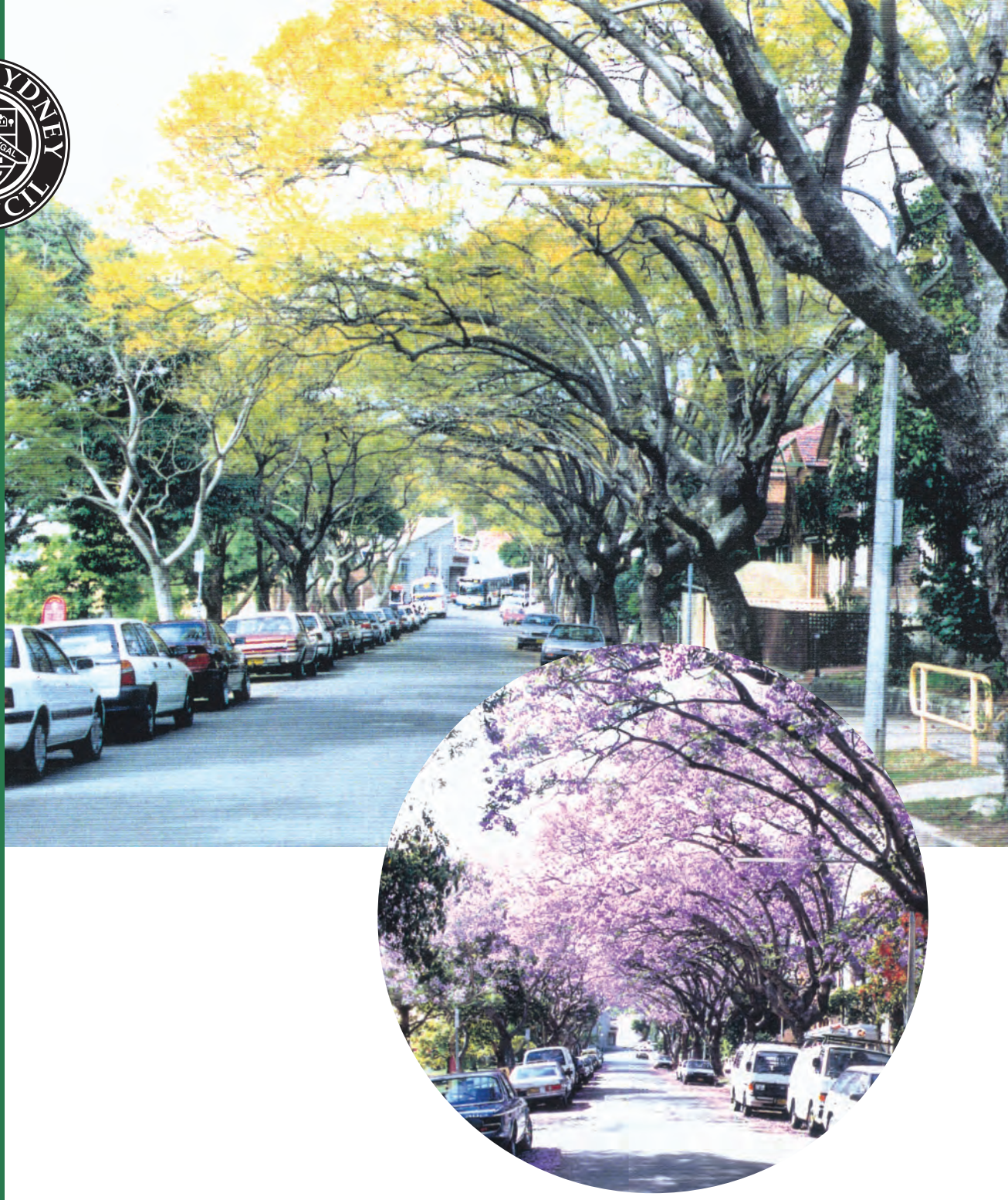

NORTH SYDNEY COUNCIL

STREET TREE STRATEGY

2016

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1.0 INTRODUCTION

1.1 SCOPE AND PURPOSE OF THE STRATEGY

1.1.1 Objective

The objective of this document is to provide the framework and guidelines to ensure that all existing street trees are managed in accordance with industry best practice, maximising their benefits to the North Sydney Community. The preparation of this policy document provides an opportunity to highlight areas where improvement may be made in public amenity, aesthetics, safety or economics, with the ultimate goal being to develop an ideal streetscape environment.

1.1.2 Ideal Streetscape Environment

An ideal streetscape environment is a Council area where every street capable of accommodating trees, is planted with a species of tree which is not only appropriate to the site conditions, but also to the character and history of the street. To create a unique 'Sense of Place', with a wide diversity of species used throughout the Council area, selected and located carefully to maximise public amenity and minimise any adverse affects on adjacent individuals or structures. Where the species chosen, in addition to being appropriate to the land capability, is also considerate to existing urban fauna.

A Council area where street trees are a major feature, creating not only visual unity, but pleasant links between larger open space areas, business districts and residential areas; links that are safe and appropriate for both humans and urban wildlife using them as habitat corridors. A Council where the street trees are used effectively to emphasise the uniqueness of individual communities or urban villages and where these living assets are managed in a manner which ensures public safety, whilst using maintenance schedules and techniques which are both arboriculturally correct and economically achievable.

1.1.3 Preamble

The production of a Street Tree Strategy is an attempt to consolidate and clarify the immense range of issues associated with the management of such a diverse resource. The strategy explores the current character of this living resource in terms of both past and present influences, and establishes clear directions for the future development and management of the streetscapes of North Sydney.

The strategy is divided into four parts:

Part 1: Is the introduction component of the Strategy. It examines what a street tree strategy is and outlines its purpose and scope. It explains the linkage between this document and Council's land management goals. Part 1 also details the functions and importance of street trees, defines the characteristics of the existing streetscapes and briefly overviews the history of street tree planting in North Sydney. It identifies the major factors affecting the physical growth of trees and the management issues which influence decision making.

Part 2: Is the policy component of the document. It explains Councils management philosophy and also details Council's approach to risk management and liability issues. It details current management practices and covers all aspects of urban tree management, from species selection, planting new trees, maintaining existing trees, right through to removing and replacing old trees.

Part 3: Is the policy implementation and performance component of the strategy. A matrix sets out the policy objectives, proposed actions and performance indicators for each policy issue, with each issue being given a priority rating.

Part 4: Contains the appendices as well as supporting material and background information that, though not essential to a basic understanding of the strategy, provides an important resource base.

1.1.4 What Is the Street Tree Strategy?

This strategy is an important document providing clear guidelines for the effective short and long-term management of the network of trees, which comprise the basis of virtually all streetscapes in the North Sydney area. This network currently consists of over 16,500 individual trees.

In 2010 internationally accepted urban forest modelling and assessment software was used to calculate the asset value and ecosystem services (benefits value) provided by the North Sydney street tree population (as listed in the 2008 database). The replacement value of these 16,500 trees was estimated at $22,012,802 and the net annual return in benefits is $3,095,002 per annum.

The recognition of the value and the major role that trees play in the urban environment is a crucial step in the development of management goals and policies. The quality of our streetscapes has an enormous impact on the quality of life of all those who live or work in the area. The obvious aspects of aesthetics and environmental purification are supported by many other, more subtle, functions of trees such as habitat, traffic calming, privacy, and recreation.

The rationale for this plan occurs as a result of North Sydney Council's desire to produce a consistent and useful set of guidelines governing the direction of management of this resource.

This street tree strategy documents the management planning process. It involves an ongoing and systematic analysis of North Sydney Council's Tree Management Program and strategic direction, and creates a framework for decision-making and resource allocation. This document has been developed in accordance with recognised risk management principles and aims to reflect the objectives of the Statewide Best Practice Manual for Trees and Tree Root management (2013), which suggests that the following fundamental information needs to be identified before a tree management policy can be drawn up, for example:

- What is the size, composition, health and condition of the tree population?
- Where are these trees located?
- What existing staff, equipment and methods are in place or required? and
- What are the financial resources and how are they to be allocated?

This street tree strategy is:

- a document that summarises the goals of Council with respect to street tree management. It documents the means of achieving these goals and represents the basic instrument of public accountability.
- a document incorporating directions, actions and forecasts.
- the foundation on which operational and financial decisions will be made.
- the basis on which performance will be measured.

The street tree strategy aims to be:

- relevant to Council employees, residents, community groups, government and other authorities
- flexible enough to be used as a dynamic management tool.

This Strategy will be reviewed regularly to assess implementation. A major review after approximately 5 years will allow policy and planning issues to be revisited and updated.

How this Strategy relates to Other Council Documents

North Sydney Community Strategic Plan 2013-2023

The North Sydney Community Strategic Plan is Council's most important strategic document and sets the direction for where the community of North Sydney wants to be in the year 2023. The Plan is founded on the guiding principles of sustainability and a quadruple bottom line (QBL) approach. The Strategic Plan Vision addresses

environmental, social, economic and civic leadership considerations through five key directions:

1 - Living environment

2 - Built environment

3 - Economic Vitality

4 - Social vitality

5 - Civic Leadership

To put the 2020 Vision into practice, Council has developed a number of sub-plans including: A Long term Resourcing Strategy, a 4-year Delivery Program and annual Operational Plans

North Sydney Delivery Program

North Sydney Council 4 year fixed term Delivery Program replaces the former 3 year Council Management Plan, and describes the actions required to achieve the objectives outlined in the Community Strategic Plan. The directions and goals within the Delivery Program that relate to this Urban Forest Strategy are listed below

Direction 1 – Our Living Environment

Goals

1.1 Natural Environment and Urban Greenspace

1.2 Health and Cleanliness of Local Waterways

1.3 Environmental Footprint

1.4 Public Open Space, Recreation Facilities and Services

Direction 2 – Our Built Environment

Goals

2.1 Infrastructure and Assets

2.2 Land Use and Development

2.3 Compliance Management

2.4 Sustainable Transport

2.5 Traffic Management

Direction 3 – Economic Vitality

Goals

3.1 Local Economy

3.2 North Sydney CBD

Direction 4 – Social Vitality

Goals

4.1 Local Communities

4.2 Health and Wellbeing

4.3 Community Safety and Accessibility

Direction 5 – Civic Leadership

Goals

5.1 Sustainable North Sydney

5.2 Community Engagement

North Sydney Local Environmental Plan (NSLEP 2013)

NSLEP is the principal document through which Council administers and controls development within the North Sydney Local Government Area. The NSLEP provides development controls for new buildings and other developments. The controls cover building height, floor space ratios, environmental protection measures, tree protection measures, landscaping requirements, overshadowing and heritage and conservation protection requirements.

North Sydney Development Control Plan (DCP 2013)

North Sydney Council undertook a major review of its development control plans and now all these plans are contained in a single document known as North Sydney Development Control Plan 2013. The DCP contains Council's detailed provisions on all aspects of development. Unlike the North Sydney LEP, these provisions are not legally binding; however they are given weight in the assessment of development applications. There are specific sections that relate to management of trees:

- Section 15 - Bushland
- Section 16 - Tree and Vegetation Management

North Sydney Open Space Plans of Management

North Sydney Council's set of 12 Plans of Management provide clear guidelines for the effective short and long-term management of all parks and reserves owned by Council or under Council's control. They provide a framework within which managers can develop a balanced response to current opportunities and address future pressures. The Plans also ensure that the unique qualities of North Sydney's parks and reserves are conserved, and that future development is appropriate. Plans of Management may deal with one particular park or reserve (Significant area Plans of Management), they may cover a number of similar use areas such as sportsgrounds or bushland (Generic Plans of Management) or they may cover a number of areas united by a common geographical feature, such as the harbour foreshore (Geographical Plans of Management).

1.2 CHARACTERISTICS AND RESOURCES

1.2.1 Benefits Of Street Trees

To effectively develop policy relating to street trees it is essential to understand why they are planted in the first place. The benefits of trees in the urban environment can be broken down into several broad areas: Environmental Benefits, Functional Benefits, Cultural and Aesthetic Benefits

Environmental Benefits

The physical presence of trees modifies the immediate environment in which they are located and provides the following benefits to the community:

- atmospheric purification
- habitat and corridors for urban wildlife
- shade to protect residents, walkers and cyclists from harmful UV rays
- modulation of temperatures by both shading and increased humidity
- reduction in the effects of seasonal change i.e. shedding leaves in winter allowing more sunlight through.
- deflection of wind and reduction of wind tunnel effects
- entrapment of dust and other airborne particles
- protection from rain and hail
- reduction of erosion through the binding action of roots
- reduction of pollution in urban runoff through filtration of waterborne particles and nutrients

Large Plane trees (Platanus sp.) on Falcon street provide immense leaf area to act as a pollution trap in this very high-traffic area. They also shade the black bitumen road reducing the urban heat island effect and create a buffer between roadway and residential dwellings.

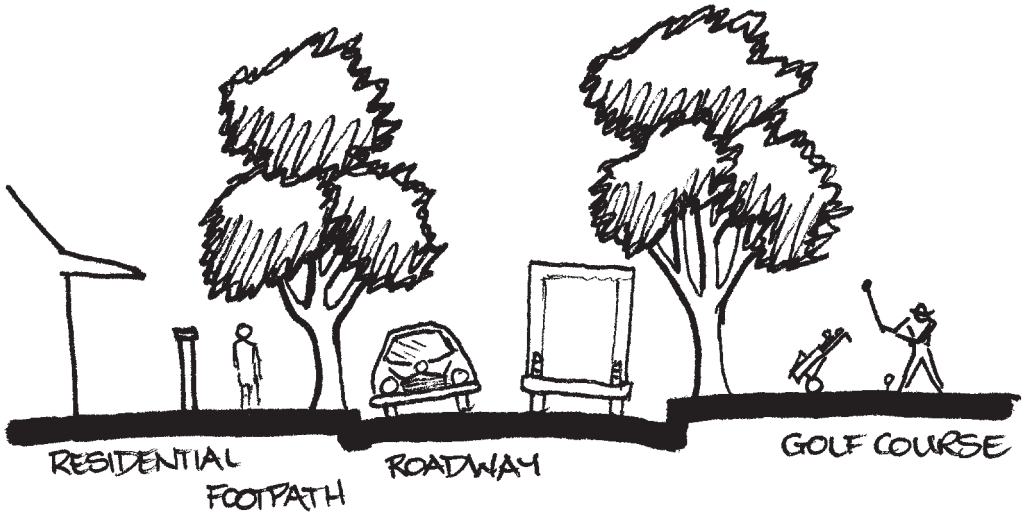
The Urban Heat Island Effect is one of the greatest emerging urban challenges. Localised warming is occurring due to the increase in the large amounts of paved and dark coloured surfaces like roads, roofs, large buildings and car parks. The sun's heat is absorbed not reflected and causes the surface and ambient temperatures to rise. On hot summer days, cities can be several degrees hotter than their rural surrounds. The Urban Heat Island Effect has the potential to adversely impact a city's public health, air quality and energy use. Pollution becomes worse as gases are more volatile with increased temperatures. Energy consumption and thus carbon emissions increase as more air conditioning is used and public health is impacted through both the increased heat and the increased pollution.

Trees can reduce temperatures by up to 5 degrees Celsius. Temperatures are cooler around trees and vegetation because of the effects of evaporation and shading. Shade from trees prevents the ground from heating up and water that is naturally transpired from the leaves of plants humidifies the air: when this water (humidity) evaporates it cools the air.

Functional Benefits

Street trees can play an important role in the social functioning of communities. A number of functional benefits of street trees are set out below:

- Linking of spaces. E.g. large open space areas such as parks are visually linked by street tree plantings. Street trees also create pleasant linkages between residential areas and commercial areas that may otherwise be quite disjointed.
- Economic effects of street trees result from both environmental and social functions. The 'greenness' or 'leafiness' of an area can affect the monetary value of properties in that area.
- Definition of space and delineation of conflicting land use. Trees separate pedestrians from vehicles and protect pedestrians, vehicles and buildings from golf balls.

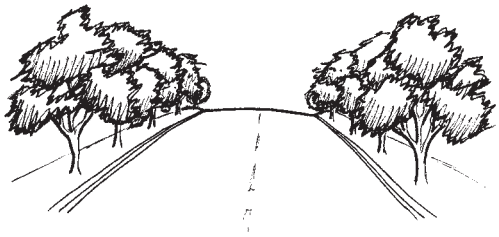


Trees separate pedestrians from vehicles and protect pedestrians, vehicles and buildings from golf balls.

- Traffic control is a major function carried out by trees: It can be broken down into a number of individual components.
- Trees can both physically and psychologically narrow the carriageway, which slows traffic speeds, improving resident, walker and cyclist safety and amenity.

Figure 1 – Trees used to narrow the carriageway and slow traffic speeds in Illiliwa Street, Cremorne. Left: 1997 and right: 2016

- Trees can indicate to drivers changes in direction and slope giving them time to adjust speeds accordingly.
- Trees can provide reference points from which drivers can gauge their speed, trees planted close together will give drivers a sensation of travelling fast as they will be passing many in a short period of time.



Trees used to indicate crests

Trees used to indicate curves

- Dense planting of trees can indicate to drivers a need to take caution as it creates a sense of enclosure.

Hayberry street traffic calming incorporates kerb blisters planted with large canopy trees to create a distinctive streetscape that effectively restricts traffic speeds

- Careful location of trees can protect drivers from blinding sun at dawn and dusk or can be used near hazards such as embankments.
- Street trees can be useful in protecting adjacent properties from light spill from headlights and street lighting

Cultural and Aesthetic Benefits

Effective street planting can establish a local character and generate a sense of community. Trees can also increase public enjoyment and the aesthetic appearance of the street, transforming a bare verge into a potential recreation area: a place where people can gather and socialise. A number of cultural and aesthetic benefits of street trees are set out below:

- they can create a local character or 'sense of place'
- they can reflect the history of an area; indicating either the indigenous vegetation of the area or reflecting a particular historical period or event. E.g. Memorial plantings
- they aesthetically enhance an area in a number of ways:
- by humanising the scale of high-rise developments, large commercial areas, multi lane roadways and other broad scale land uses.
- by softening the hard surfaces of the built environment.
- by framing desirable views or screening undesirable sights.
- by introducing natural sound, scent and movement into the environment.

Left: A mature Kauri Pine (Agathus robusta) makes a dominant statement of nature in the urban environment. Right: Crepe Myrtles (Lagerstroemia indica) provide a perfect buffer between residential property and the street. Note the shade over cars, the softening of the large masonry wall but still light into and views out of property windows.

While many of the benefits described above are difficult to quantify, it is undeniable that trees provide value to the community. There have been numerous international studies undertaken that prove and quantify the environmental benefits of trees (in energy savings, pollution control etc). There have also been studies undertaken that indicate trees have positive impacts on social functioning, improving concentration in children and even reducing crime rates (Frances E. Kuo & William C. Sullivan, Human-Environment Research Laboratory, University of Illinois).

1.2.2 BRIEF HISTORY OF NORTH SYDNEY

Pre European Settlement

The North Sydney area is comprised of a range of landforms, from the rocky sandstone cliffs of the foreshores to the rolling hills of the higher ground of Crows Nest. The soils are mainly shallow and nutrient poor, derived from sandstone, with some heavy clays derived from shale parent material. Originally the area supported Angophora woodland on the sandstone slopes down to the Harbour's edge and tall Blue Gum forest on the shale topped ridges of Crows Nest and other higher parts of the Council area.

Prior to the arrival of the Europeans, the North Sydney area was inhabited by Aborigines known as the 'Cam-mer-ray-gal', who held considerable authority over other tribes of the Sydney region. (North Sydney Heritage Study Review 1993, Godden Mackay)

Aborigines used trees and their products extensively. The bark was removed to make canoes, to build shelters, for coffins and wrappings for the dead, and for shields. Boomerangs, spear throwers, spears and clubs were made from hardwood timber and the gnarls on the sides of trees were often used to make coolamons (containers).

Trees were regularly climbed for the purpose of gathering food and shallow toe holds were often cut into the trunk to assist climbing. Both animals (such as possum and koala) and bees (for honey) were sought and often fires were lit at the base of the tree to flush the insects and animals out. (Aboriginal Sites of NSW 1988, National Parks and Wildlife Service)

Post-European Settlement

North Sydney has developed from its earliest European settlement as an area of large estates and small waterfront industries, through to a predominantly residential area, to its present day position as a major commercial centre with medium density residential surrounds.

In 1788 Lieutenant Ball conducted an exploration of the North Shore. Based on his reports that the area was 'a jumble of rocks and thick woods' the area was generally considered valueless and was ignored other than for the purpose of timber getting and shell collection for the production of lime.

The earliest land grants in the North Sydney area were made in 1794, but most of these were not taken up, merely traded for better land elsewhere. By 1830, most of the present Council area of North Sydney was held in six properties.

In the period 1830 to 1860 the North Shore became more attractive as a residential location. Residential development began at Neutral Bay in 1831 and was buoyed by the ship building industry which was growing in the area. At Kirribilli, Lavender Bay and Milsons Point a similar pattern of development was underway.

The mansions being constructed by these first North Shore residents demanded a complementary growth of working class residents to provide the work and services to support them. From 1838, when the township of St Leonards was first and gazetted, the population grew slowly but steadily. A middle class of residents developed, among whom maritime trades predominated. In this decade butchers, bakers, cobblers and grocers appeared. The shore had gradually developed from an uninhabited, undeveloped and undesirable locality to one which supported a small but steady community with many of the residents prominent merchants or administrators of the colony.

The period from 1860 to 1890 was one of economic and urban expansion. The population reached 52000 in 1925 and stands at a similar level today. (North Sydney Heritage Review 1993, Godden Mackay Pty Ltd).

The construction of the Sydney Harbour Bridge in 1932 dramatically altered the character of transportation in the area as roads took over from ferries. "It would appear that the upgrading of the streets and the beautification by street planting has occurred at times of civic celebration such as the Centenary, the Jubilee and the end of World Wars I and II". (Street Trees of Sydney, Helen Armstrong 1980). Since WWII, Council has continued to plant trees both as a matter of course in response to community expectation, and to commemorate special events, and the Council area now boasts over 16,500 individual street trees.

Planting Patterns And Styles

Street tree species and planting patterns are a direct result of the combination of physical and cultural influences. Physical factors include landform, soil and climate, whilst cultural

factors are related to the social requirements and beliefs of the community at the time of planting, the management practices of the Council and the surrounding land use.

In Sydney as a whole, the street plantings from 1870 to 1900 were mostly Canary Island Date Palms (*Phoenix canariensis*), Moreton Bay Figs (*Ficus rubiginosa*), Norfolk Island Pines (*Araucaria heterophylla*) and the occasional avenue of Plane trees (*Platanus sp.*). This reflects the style of gardening of the early colony, where the aim was either to create a landscape reminiscent of the European homeland or to create a landscape portraying an 'Antipodean Utopia' of lush tropical vegetation.

Left: Reed Street Phoenix Palms planted circa 1930s. Photo taken 1997. Right: photo taken 2016

Left: Hazelbank Road, Wollstonecraft, Plane trees (Platanus sp.) planted 1920's. Photo taken 2005. Right: photo taken 2016

From the 1900's until the 1930's, plantings were predominantly the more lush Brush box (*Lophostemon confertus*) and Camphorlaurel (*Cinnamomum camphora*), with Brush box continuing to be heavily planted throughout the 1940's and 50's. During the 1950's an increase in the planting of deciduous exotics occurred, with the Jacaranda (*Jacaranda mimosifolia*) becoming popular. The Hills Weeping Fig (*Ficul microcarpa 'Hillii'*)also became popular during this period. This mixture of exotics and Brush box continued until the early 1970's, when Australian Natives became a dominant planting theme.

Brushbox (Lophostemon confertus) in Milner Crescent, Wollstonecraft planted 1940's.

Planting Style Summary

Examples of many of these species can be found in the North Sydney area and although not all date back to the abovementioned periods, they are a continuation of the style.

Period	Dominant species
1870-1900	Canary Island Date Palms, Moreton Bay Figs, Norfolk Island Pines, Plane trees
1900-1930	Brushbox, Camphorlaurel
1930-1970	Brushbox, Jacaranda, Hills Weeping Fig
1970-1990	Australian Natives, Eucalypts, Paperbarks, Bottlebrush
1990-2005	Jacaranda, Brushbox, Bottlebrush and other Australian Natives
2005-Present	Diverse range of species to reflect existing species mix and striving to ensure no one genus makes up more than 10% of the street tree population

1.3 NORTH SYDNEY STREETSCAPES

The location of the North Sydney Council area between Middle Harbour and Sydney Harbour affords an extensive network of water frontages. This has had a definite impact on street tree planting in the area, not only with regard to the selection of species which are tolerant to the exposure to salt laden winds and the coastal soils, but also with regard to the issue of water views.

Views from Luna Park across to the City and Opera House

Views from Clarke Park, in an elevated area of Lavender Bay

As with most Sydney Councils, North Sydney Council has a vast array of streetscapes to maintain. These vary from healthy, well-selected plantings performing an important functional role in the street, through to ageing plantings that are in an irreversible state of decline, requiring extremely high levels of maintenance and making little positive contribution to the streetscape.

There is considerable diversity of species across the Council area, but more than two thirds of street trees are within the first 20 genus in the table below. (Information obtained from Nth Sydney Council street tree database, data collected 1999, 2008 and 2013)

	Common Name	Botanic Name	1999 Approx % of total street trees	2008 Approx % of total street trees	2013 Approx % of total stree trees
1	Bottlebrush	Callistemon species	14.5	15	16
2	Plane Tree	Platanus species	11.5	11	10.8
3	Gum Tree	Eucalyptus, Corymbia, Angophora	5.5	7.1	8.6
4	Brushbox	Lophostemon confertus	8	8	8
5	Jacaranda	Jacaranda mimosifolia	5	5.6	5.8
6	Chinese Tallowwood	Sapium sebiferum	5.5	5.4	5.1
7	Paperbark	Melaleuca quinquenervia	3.5	4.2	4
8	Photinia	Photinia species	2.5	2.7	2.9
9	Watergum	Tristaniopsis laurina	2.5	2.7	2.9
10	Fig	Ficus species		2.2	2.2
11	Crepe Myrtle	Lagerstroemia			2.1
12	Casuarina	Allocasuarina & Casuarina			2
13	Camelia	Camelia species	1.5	2	1.9
14	Flowering Plum	Prunus cerasifera nigra		1.7	1.6
15	Banksia	Banksia			1.4
16	Qld Firewheel	Stenocarpus sinuatus		0.7	1
17	Lillipilly	Syzigium			1
18	Oleander	Nerium oleander	1	0.9	0.9
19	Hibiscus	Hibiscus species	1.5	0.7	0.7
20	Wild Olive	Olea africana	1	0.8	0.7
21	Peppercorn	Schinus areira		0.8	0.7
22	Tea Tree	Leptospermum petersonii		0.7	0.7
23	Camphorlaurel	Cinnamomum camphora		0.8	0.6
24	Ash	Fraxinus species		0.7	0.5
	Vacant		2	6	8

Using the above table and the North Sydney Street Tree Database, some broad summaries can be made of the North Sydney Tree population as follows:

- Approximately 80% of the North Sydney tree population is made up of the first 20 genus listed in the above table.
- In 1999 Approximately 50% of the tree population was made up of native species. In 2013 the native % has increased slightly to 54%
- Approximately 30% of the tree population is made up of deciduous trees and this has remained steady since 1999
- Approx 5.8% of the street tree population has a life expectancy of less than 5 years. This is a decrease from 9% in 1999 but a slight increase from 3% in 2008.
- In 1999 Vacant Tree sites made up approximately 2% of total tree planting sites. This percentage increased to 6% in 2008 and 8% in 2013 however the increase can be attributed to actively seeking out potential new tree sites during the more recent audits. Preliminary investigation of some of the vacant sites also revealed the following:
    - Sites that are overshadowed by canopy trees on private property and therefore not conducive to planting at this point in time
    - Sites where it is desirable to maintain scenic views

Large trees delineate between the commercial area and residential zone at the end of Hayberry Street, Crows Nest. The trees are in scale with the commercial buildings and provide a screen or buffer for local residents.

1.4 MANAGEMENT ISSUES

1.4.1 Tree Growth Requirements

There are five essential requirements for tree survival; light, water, air, nutrients and space. Without an adequate supply of all of these, trees are unable to carry out their necessary functions. The ratio of supply of the above requirements varies from site to site, and in nature, local vegetation has had many generations to adapt to their specific site conditions.

Trees planted in an urban environment must survive under less than ideal conditions. The urban environment is characterised by reduced sunlight (due to overshadowing by buildings), reduced water infiltration (due to paved surfaces), increased soil compaction, and an abundance of air borne and soil borne contaminants.

The most important function that a tree must carry out to survive is photosynthesis which is performed by the leaves using carbon dioxide from the air, and water and nutrients from the soil. This process cannot be performed without adequate light. The roots are the means of extracting the necessary moisture and nutrients from the soil and the trunk is the means by which moisture and nutrients are transported to the leaves. Without the health of all parts of the tree, the photosynthetic rate is reduced.

Once photosynthetic rates are reduced, so too is tree vigour. This will result in the tree being less able to cope with normal environmental factors such as periods of dry weather, pests, diseases and physical damage such as storm damage.

Leaves require sunlight and clean air. The deposition of airborne particles onto the leaf surface reduces the amount of sunlight reaching the leaf and clogs the pores through which the leaves absorb the carbon dioxide necessary for photosynthesis. Where there is inadequate light, growth and metabolic functions are reduced, placing the tree under stress.

Tree trunks and branches in an urban environment are more likely to be physically damaged than those in a natural setting. Wounds created on the tree are potential entry points for pests and diseases. As the vascular system of a tree is just beneath the bark, wounds also result in a reduction in the amount of water and nutrient transported to the leaves, again reducing general vigour.

The efficient functioning of the root system is crucial to the overall health of the tree. The heavy roots close to the trunk act as anchors, while the more fibrous roots extend out to take up moisture and nutrients. Compacted soils inhibit root development and restrict their functioning due to impenetrability and lack of oxygen.

1.4.2 Tree Root Systems

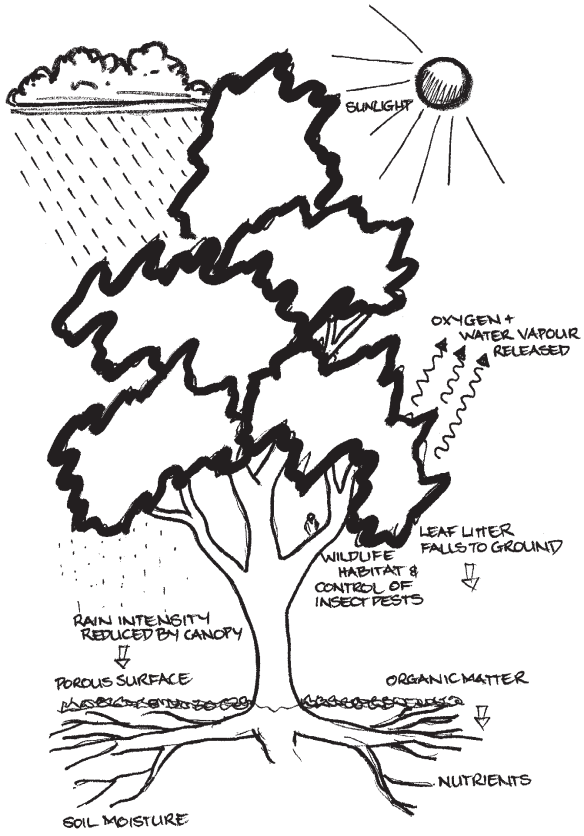
There are few exhaustive studies on tree root systems however industry accepts the influential studies of Perry (1982) who proposed:

- The bulk of root growth is predominantly lateral in soils, parallel with the surface, On medium textured soils the bulk of the root system is found in the top 1.0 metre of soil with most of this in the top 300mm. Deeper roots represent only a small fraction of the total root mass,
- Tap toots do not persist in transplanted trees and are less common than generally imagined in trees that have established in situ. The most important roots are the lateral roots described above,
- The trees environment (and the soil environment) is probably more important than genotype (the genetic constitution of an individual) in determining tree rooting patterns and depth of rooting,
- Tree roots do not grow towards anything in particular, but are opportunistic, concentrating wherever conditions are favourable. (favourable conditions can be defined as soil penetrative resistance of less than 0.2 - 0.3 Mpa; soil oxygen levels greater than 13.0% of soil pore atmosphere, and adequate soil moisture),
- The actual behaviour and architecture of the root systems of most species can only be determined by excavation; this is not practical. However the data generated by several scientific studies plus observations, supports the model proposed by Perry.

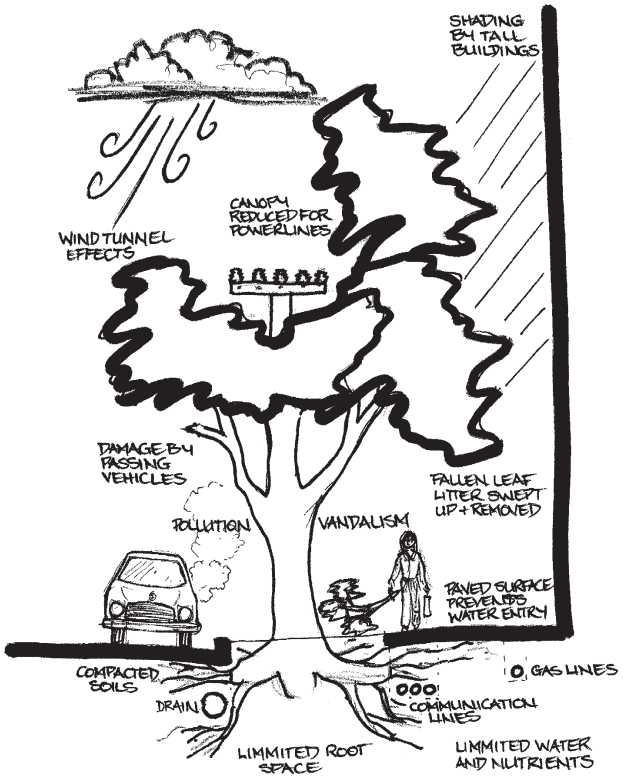
Typical tree root system (source: International Society of Arboriculture

1.4.3 Urban constraints

In an urban environment there is usually considerable competition for space beneath the ground with many services installed such as gas, water, sewer and electricity, and often major infrastructure such as tunnels, underground car parks, railways or even commercial areas such as Greenwood Plaza.



Natural Environment



Urban Environment

2. POLICY

2.1 STREET TREE MANAGEMENT IN NORTH SYDNEY

Tree management in North Sydney is based on an understanding of the essential requirements for tree growth, the physical characteristics of the North Sydney area, the desired functions of street trees, and Council's desired streetscape outcomes. These desired outcomes are based on achieving the highest level of long term benefit to the community using available funds and resources in the most cost effective manner.

2.2 MANAGEMENT PHILOSOPHY

2.2.1 Urban Forest Policy

In 2011 North Sydney Council adopted the North Sydney Urban Forest Strategy. This document sets out North Sydney's urban forest goals and the means by which these will be achieved. Urban forest can be defined as the totality of trees and shrubs on all public and private land in and around urban areas and is measured as a canopy cover percentage of the total area. Urban Forest is now recognised as a primary component of the urban ecosystem.

The urban forest is a public infrastructure system – it is one component of a complex built environment that includes roads, car parks, footpaths, underground and overhead services, buildings and other structures. The planned, systematic, and integrated management of urban trees is referred to as Urban and/or Community Forestry. Like its commercial counterpart, the urban forest is a net producer of products. The commercial forest produces timber and woodchip on a rotational basis and in return receives inputs from strategic planning, management and routine maintenance to ensure a sustainable supply of those products.

By comparison an urban forest produces numerous, but less tangible, benefits (see Part 1 on Benefits of Street Trees). These benefits, whilst poorly defined and less tangible than products like timber and woodchip, are arguably of greater value in assisting sustainable urban living in the twenty-first century.

Urban forests are internationally recognised as significant community assets worthy of retention, protection and expansion. However, 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 maintained.

The Urban Forest Strategy took internationally accepted canopy targets and applied them to the North Sydney setting to come up with canopy cover goals for the North

Sydney Local Government area. Based on local land use and the goals of 15% cover in CBD areas, 25% cover in urban areas and 50% cover in suburban areas, the total canopy cover goal for North Sydney is 35.5%.

Using aerial photos Council has been able to demonstrate that overall average canopy cover has increased from 19.5% in 1997 to 24% in 2001, 34% in 2008 and the canopy cover was most recently measured at 31% in 2014. The slight decline in the last measurement could be attributed to a new and possibly more accurate method of data collection using LIDAR but overall, North Sydney has been gradually increasing canopy cover, particularly on public land.

North Sydney Council will use aerial mapping and other resources to continue to monitor canopy cover and to ensure that as a minimum, the existing level of canopy cover is maintained and that ideally the targets set in The North Sydney Urban Forest Strategy are met. The overall canopy cover target for North Sydney is 36.5% so Council is quite close to achieving that goal.

North Sydney Council will also endeavour to capitalise on traditional tree products as street trees reach the end of their safe useful life and have to be removed. This includes chipping felled trees for use as garden mulch and milling or other recycling of suitable saw logs. Council will also continue to work with Taronga Zoo to provide prunings from appropriate fodder trees as food for their animals eg, when African Olives are pruned or removed the foliage is fed to African species such as the giraffes.

2.2.2 Continuous Cover Arboriculture

North Sydney Council has adopted the principles of Continuous Cover Arboriculture. This is a forest management phrase that embodies the principle of growing trees of all ages in the same area for the multiple benefits that delivers. One of those benefits is that the visual amenity of forests managed in this way does not fluctuate wildly.

A common feature of urban tree planting is large tracts of trees of a similar size or age. The implications of this are that many trees will reach maturity and need removing at about the same time, resulting in rapid changes to the local landscape. It is inevitable that as trees mature they will need removing and replacing; good management should seek to spread these operations over the whole rotation, reducing the number and impact of removals at any one time.

Sustained amenity is achieved by establishing a range of age classes within a local population; from new planting right through to mature trees. An effective way of achieving this is to remove and replace trees that are not performing because they

are not suited to the site or they are interfering with better performing trees. North Sydney Council has adopted the continuous cover arboriculture approach through its Streetscape Enhancement Program and through the management approach used for Plane Trees (*Plantanus sp.*).

By planting Plane trees (*Plantanus sp.*) at relatively close spacings (in comparison to their mature dimensions) and providing a range of age classes in the one avenue, mature trees can be strategically removed at that point in time when their maintenance costs begin to outweigh their benefits. Generally the turn-around time in North Sydney is approximately 20-40 years and the impacts of tree removal on amenity and urban forest benefits are minimised. See section 2.2.3 for more specific information about Plane Trees (*Plantanus sp.*) in North Sydney.

New young Plane trees (Platanus sp.) planted in between mature trees to ensure ongoing amenity of the Heritage listed avenue in Hazelbank Road .

2.2.3 Species Preferences

Natives vs Exotics

Proven performance of a selected species in a particular environment must be a prime consideration. Whilst there are numerous natives that have proven successful in an urban setting, there are many more species whose performance is yet unknown. There is considerable debate in the arboriculture industry regarding the use of locally indigenous species. Whilst indigenous species may be well suited to the local environmental conditions pre human settlement, the growing conditions in an urban

setting, particularly a street situation, are very different from natural conditions (e.g. soil compaction, higher nutrient levels, altered drainage patterns, etc - see part 1-7 on urban constraints) and often indigenous species cannot cope with these restrictions. The issues listed above are major contributors to the degradation of natural bushland.

Australian natives from other parts of the country can be just as exotic (and/or invasive) to the Sydney Region as non-native trees. Many of the popular Western Australian Eucalypts and Banksias come from more than 4000km away from deep, alkaline sands, quite different to Sydney's acid soils making them much less reliable in Sydney, and Acacias from as near as Queensland can become invasive weeds in the New South Wales climate.

North Sydney Council supports research into Australian native species and is constantly on the lookout for new varieties that have been trialled and proven in an urban setting. The cost of purchasing, planting, watering and establishing a new tree is high and it is therefore important that the species chosen can be relied upon to perform in the required way.

Many exotic species have been in cultivation for hundreds, even thousands, of years and over that time they have been carefully bred for superior performance. They have been hybridised and selected for their vigour in urban growing conditions and many of them are propagated from cutting or grafting, ensuring uniformity of size, shape and growing habit. Currently North Sydney has a fairly balanced mix of natives and exotics and proposes to continue planting in this ratio.

Deciduous Trees

North Sydney has a history of deciduous tree planting and has management procedures in place to deal with the autumn leaf drop. North Sydney Council acknowledges the need for deciduous trees in certain situations:

- Heavily polluted areas where an evergreen tree would have its vigour reduced by pollution build up on foliage
- Residential areas where winter sunlight to homes is a priority
- Allowing winter sun through to homes can significantly reduce power consumption as less daytime lighting and less heating is required.
- High density areas such as Commercial Districts
- Providing office workers and shoppers with access to sunlight during the colder months (improved public amenity)
- Allowing more sunlight through to the ground to reduce the development of moss and algae on pavements (a potential slipping hazard in such high use areas)

Deciduous Plane trees in Miller St allow sunlight into the North Sydney CBD during the cooler winter months.

Plane Trees

Plane trees (*Plantanus sp.*) are a signature species in the North Sydney area and significant avenues can be found dating back to the 1920's. Further avenues were planted in the 1980's and now the species makes up approximately 10.8% of the North Sydney tree population. Platanus are an excellent example of cost effective urban forest, particularly where growing conditions are difficult:

- They perform reliably even under the most difficult of growing conditions such as heavy pollution, high wind tunnel effects and poor soils.
- They require very little maintenance during their establishment period.
- They are readily available in a range of container sizes for low purchase cost.
- They can be purchased at affordable prices as advanced specimens that have already undergone formative pruning to provide clear trunks for pedestrian and traffic vision (Advanced specimens also tend to be less prone to vandalism).

North Sydney acknowledges the debate about the allergic attributes of London Plane trees (*Platanus xhybrida*) but based on current advice from industry experts that suggests London Plane Trees are no more allergy causing than many other common urban trees, shrubs and grasses, Council will continue to plant the Platanus genus along the major arterial routes and in Central business Districts, where their large size is in

scale with the high rise buildings and their vigour is needed for the difficult growing conditions. Council will however, generally use Platanus orientalis or Platanus digitata which are slightly smaller growing and have less pubescence on the foliage.

Except in situations where the existing Plane trees are of particular heritage significance they will be gradually phased out of residential areas, as their very large size is often out of scale with the streetscape, the architecture, and the available growing space.

2.3 MANAGEMENT STRUCTURE

2.3.1 Ownership and Control

Council is responsible for all planting, removal and maintenance of roadside trees with the following exceptions:

- Electric line clearance. This is the energy provider's responsibility.
- Declared main roads which are the responsibility of the RMS (i.e. Warringah Freeway)

2.3.2 Organisational Structure

Council divisions influencing street trees

Division	Influences
Engineering Department	- construction of new infrastructure (roads, footpaths, drains) - maintenance of existing infrastructure (roads, kerb and gutters, footpaths, drains, seawalls, retaining walls) - widening of roads or footpaths - CBD Mainstreet programs (new landscaping etc)
Traffic Department	- construction of new traffic treatments (kerb blisters, chicanes, roundabouts) - road closures (often creating pocket parks)
Planning Department	- policy development (DCP's, LEP, Heritage, Strategic plans) - conditioning of tree management in accordance with AS4970 2009 Protection of Trees on Development Sites. - conditioning of street tree planting in conjunction with development approvals
Risk	- advice on risk management best practice - claims management
Technology Dept	- maintenance of mapping systems & aerial photographs (including calculation of % canopy cover)
Open Space & Environmental Services Division	- maintenance of all existing street and park trees - maintenance of all new street trees (whether planted by engineering dept, contractors or Parks dept) - strategic policy development for street trees - assessment and reporting on trees (including liability matters, public concerns and resolving problems) - administration of the Tree Preservation Order

Tree Management Team

Council's Tree Management Team (TMT) has a staff of eleven including one Tree Management Supervisor and one Tree Management Officer. The team works together to manage the health and condition of Council's trees to ensure that Council meets the highest arboricultural standards. The TMT undertakes street and park tree inspections to ensure that high quality delivery standards are met.

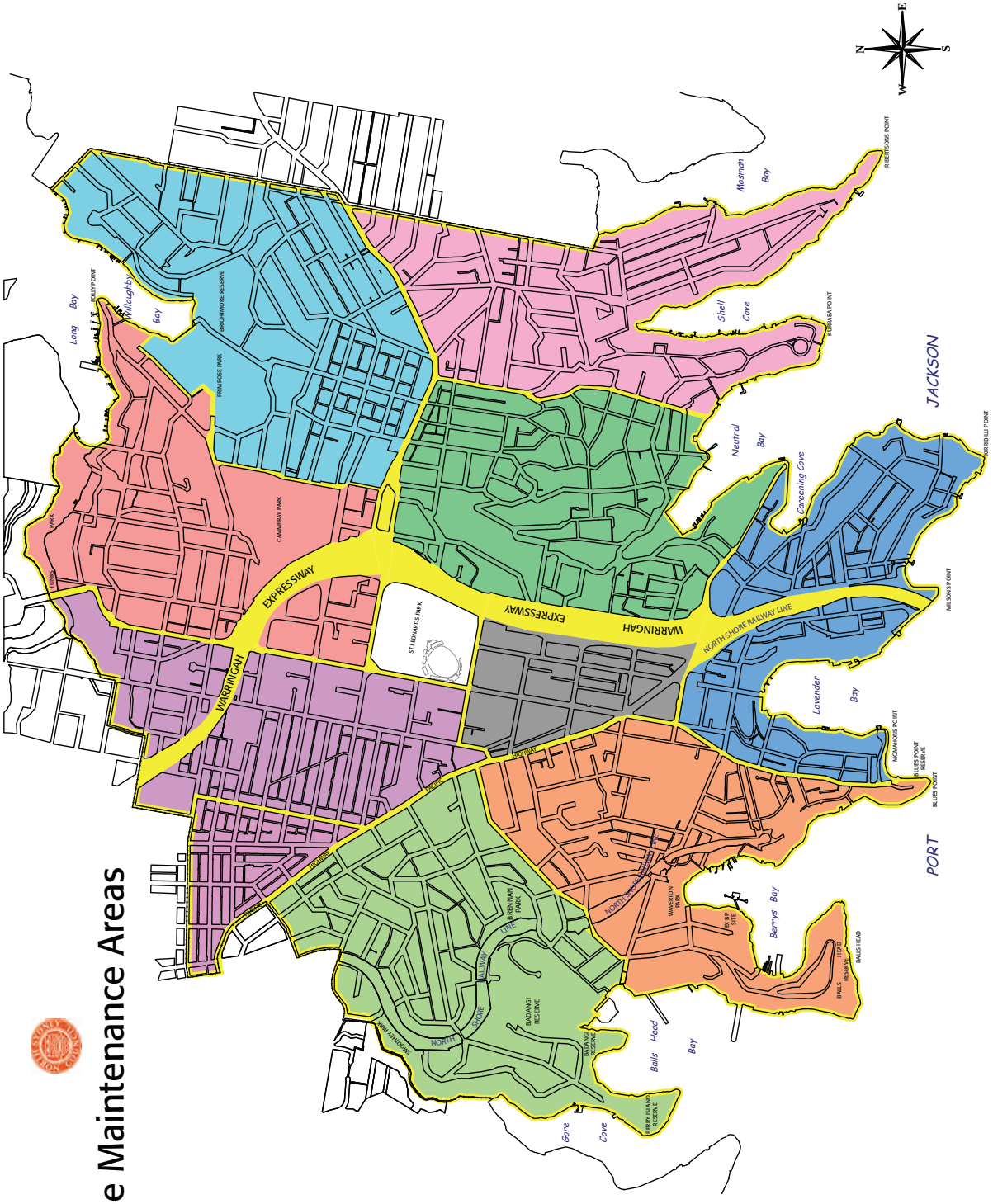
The team is divided into three sections that consist of a Proactive Tree Management Team, Reactive Tree Management Team and Tree Planting Team. These teams are equipped with a number of trucks, a ute, an elevated work platform (EWP) and wood-chipper. The teams are organised to provide the most efficient completion of maintenance tasks and may vary in accordance with time of year. (e.g. during peak planting times more staff may be directed to this function).

North Sydney Council has been broken down into 25 Precincts. The Proactive Tree Management Team undertakes target safety clearance pruning on council's street trees on a daily basis. The team moves systematically from precinct to precinct, taking approximately 18 months to complete an inspection and maintenance cycle. While they are within a precinct, staff will carry out all necessary actions to maintain the street and park trees in healthy and safe condition. The team also maintains clearances over paths in parks and undertakes general inspections of trees over high usage areas such as paths, playgrounds and picnic tables.

The Reactive Tree Management Team is responsible for all reactive tree works including tree removals, essential pruning, customer requests and emergency tree works. In the event of storms all teams will be diverted to emergency clean up work. Response to incidents involving trees will be assessed and attended to on a priority basis.

Council's Planting Team is responsible for the planting of Council's streetscape including the replacement of removed trees, planting of new street and park trees and their establishment. The Planting Team is also responsible for the up keep of Council's tree surrounds including the monitoring of pebblecrete, rubber tree surrounds, installation of deco granite mulch and weed control.

Map of work zones



2.4 MANAGEMENT ACTIVITIES

The main goal of the Tree Management Section is to ensure the health and longevity of the Urban Forest to secure ongoing amenity for the residents of North Sydney. This includes maintenance of the existing tree population as well as the planting of new trees.

Maintenance of existing trees involves:

- Regular visual inspection
- Carrying out of necessary pruning:
  - For traffic clearance and vision, essential safety signage and pedestrian access and vision
  - To maintain adequate clearances around buildings and services
  - To maintain a safe and healthy tree crown
- Scheduling timely removal and replacement as trees reach the end of their safe useful life
- Responding to emergency situations such as storms
- Responding to resident requests
- Monitoring and responding to Pests and Diseases

Establishment of new trees involves:

- Identifying appropriate locations
- Planting appropriate species
- Establishment
- Formative pruning
  - To minimise future hazards
  - To minimise future maintenance
  - To maintain species integrity

2.4.1 Maintenance of Existing Trees

North Sydney Council has a network of over 16,500 existing street trees. All of these are inspected approximately every 18 months. North Sydney Council arborists carry out any necessary pruning and maintenance except for wire clearance work, which is carried out by contractors on behalf of Energy Australia.

Wire Clearance Work

Council's arborists work in accordance with the Australian Standard for Pruning of Amenity Trees (AS4373 - 2007) however the energy providers have legislation allowing them to prune to meet their own power line clearance requirements. In most suburban situations with exposed conductors on traditional poles with cross-arms, this means 1.5m clearance around the power lines plus allowance for one year's growth (which is at the discretion of the relevant tree worker).

In the past, there was a 50/50 cost-sharing arrangement with the energy provider to convert exposed conductors to aerial bundled cables (ABC) but this has since ceased. By converting the existing exposed conductors to ABC, Council was able to achieve marked improvements in the streetscape amenity and tree longevity.

Locations that were converted under this program included:

- where the exposed conductors went through habitat trees (leading to electrocution deaths of native wildlife) e.g. Larkin St, Kurraba Rd
- Where Energy Australia pruning practices were destroying the integrity of visually significant or heritage trees (e.g. Hazelbank Road, Pacific Hwy)
- And where Streetscape Enhancement programs were underway.

ABC has the advantages of:

- being insulated so there is no threat to wildlife
- being bundled together into the one cable so there is less visual impact on scenic views
- requiring less clearance space therefore greatly reducing the amount of tree pruning required. (only 0.5m clearance is required around ABC and small twigs are permitted to touch the wire between pruning events)
- being significantly cheaper than undergrounding (undergrounding $50-$80,000 per span not including connections to individual houses, ABC approx $5,000-$10,000 per span)

Hills Weeping Figs (Ficus Microcarpa 'Hillii') in Larkin St are typical period plantings and high value habitat trees. ABC cables have been installed to reduce the impact of wire clearance pruning.

Why Prune?

It is important to the efficiency of the Tree Management Team that pruning is only carried out where there is an identified need. Research has revealed that most pruning places stress on the tree and to minimise stress on street trees in North Sydney they will only be pruned where a need has been identified.

Types of Pruning carried out by North Sydney Council

In Accordance with the Australian Standard for Pruning of Amenity Trees (AS4373-2007) and in accordance with the Workcover code of practice for Amenity Tree Workers, Council staff will carry out the following types of pruning:

- General Pruning – Removal of dead, dying, diseased, defective and conflicting branches
- Deadwooding
- Selective Pruning – Removal of identified branches that are causing a specific problem e.g., obstructing essential traffic or safety signage, obstructing access, interfering with buildings or services.

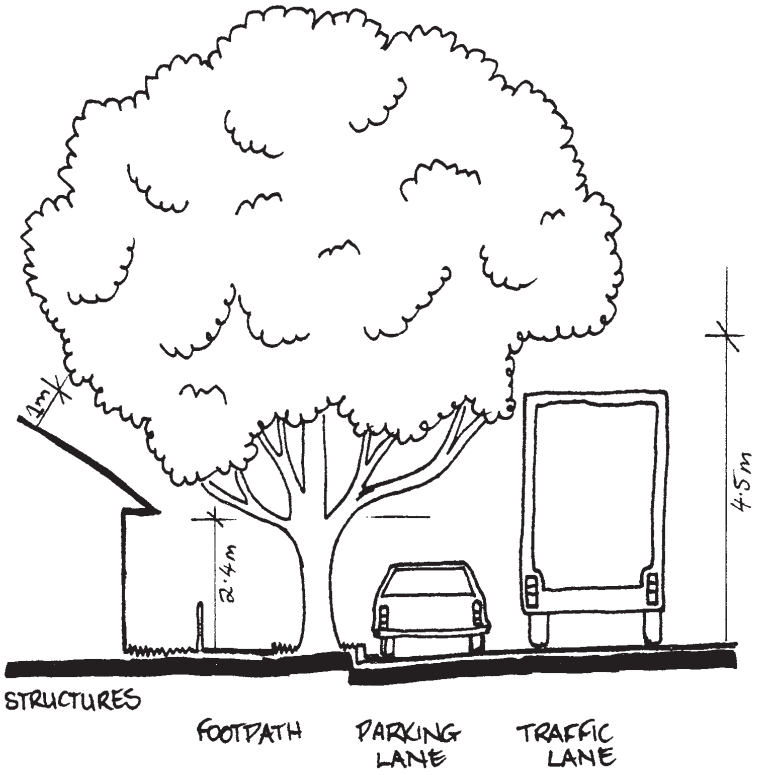
- Formative Pruning – Selective removal of specific branches on young and developing trees to enhance form and improve structure or to directionally shape the young tree.
- Remedial Pruning – to prolong the life of damaged trees. This will only be carried out here the tree is of high amenity or heritage value and the required ongoing maintenance can be justified.

Target Safety Clearances

- Crown Lifting – Removal of lower branches to achieve target clearances as follows:
  - Over footpaths 2.4m
  - On major arterial roads 4.5m over all lanes
  - On local roads 2.4m over parking lanes and 4.5m over trafficable lanes
- Around buildings and structures 1m clearance or less if branches are thick and unlikely to move during wind

NB – these clearances can only be achieved incrementally as the trees mature. Industry practice is to maintain branches on at least two thirds of the height of the tree and to not remove more than 25% of a tree's foliage in any one pruning event.

Target Safety Clearances



Privately Owned Trees

Council will generally not carry out any work on privately owned trees other than in the following situations:

Council requires property owners to maintain clearances for public access along designated footpaths. Where Council is notified of private vegetation overhanging public land and hindering pedestrian access, a notice will be sent to the property owner requesting that they prune the offending branches back to the boundary to provide footpath clearance to a height of 2.4m. If this work is not carried out within the given timeframe, Council will issue a legal order to the property owner to prune back the vegetation for pedestrian and/or vehicle access. If the work is still not carried out Council may engage contractors to perform the work and bill the property owner.

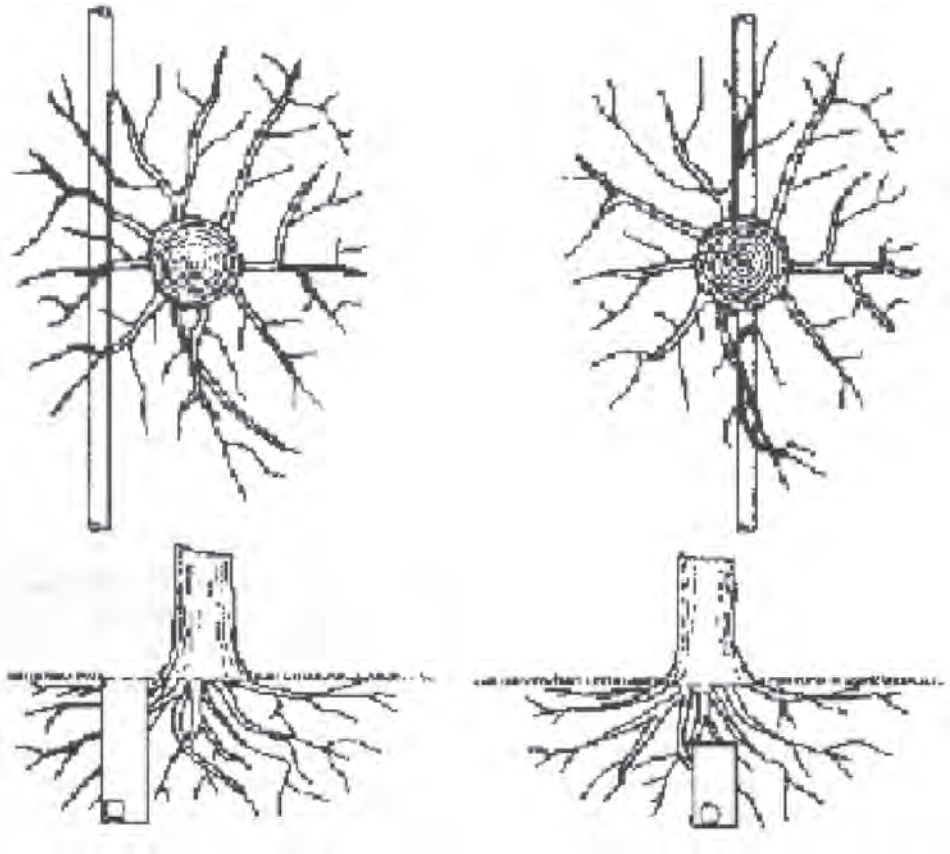
Where roots from a privately owned tree are interfering with public footpaths and pruning is required to facilitate repairs, Council will engage a suitably qualified person to carry out such pruning work. If the path cannot be repaired without compromising the structural integrity of the tree, and there are no other pavement repair alternatives, negotiations will be entered into with the tree's legal owners regarding its removal and replacement. Council may carry out this work where a benefit will be gained by the community.

Root Pruning

North Sydney Council acknowledges that root protection is one of the most critical issues affecting both the health and safety of a tree. Council staff routinely carry out pruning of small diameter roots to facilitate pavement repairs, however to protect staff from unseen hazards (such as underground gas or electricity services), and to limit Council's exposure to liability (for damage to underground services or instability of tree after pruning), Council will generally engage the services of non-destructive investigation techniques such as high pressure water sucker truck or air spade. This equipment allows Council's arborists to accurately expose root systems and assess root pruning feasibility prior to any cutting.

Council arborists conduct thorough investigations prior to undertaking root pruning.

Where pipes or other services must be laid through the root zone of a tree, Council will encourage the use of tunnel boring techniques. As can be seen from the diagram, far less roots are severed by tunnelling beneath the tree than trenching beside the tree.



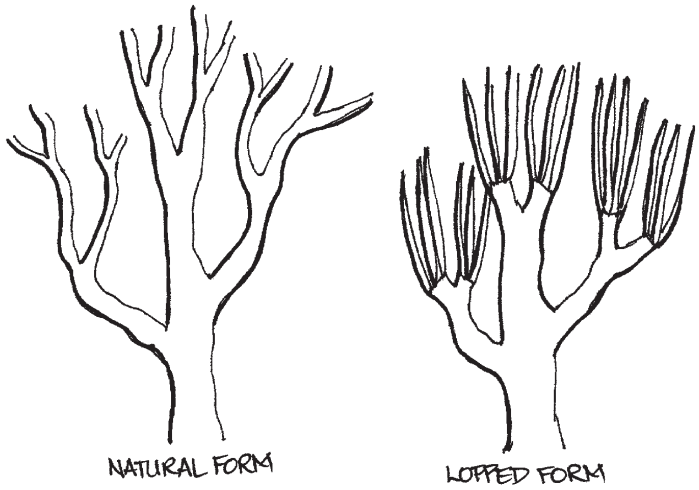
Cosmetic Pruning

Other pruning practices which are not essential to public safety or the health of the tree and are carried out purely for cosmetic purposes will generally not be carried by Council. These include:

- canopy reduction pruning
- shaping
- thinning or pruning to improve scenic views

Council policy with regard to cosmetic pruning of trees on public land, allows residents to make application to the Tree Preservation Officer to carry out such work at their own expense. Permission may be granted where such work will not compromise the health, safety, integrity or longevity of the tree or adversely affect amenity.

- A Tree Management Order permit will be issued with conditions as follows: All work must be carried out by a qualified arborist (minimum level 3) and must be done in accordance with Australian Standard AS4373. Council must be notified of the proposed company/arborist and work date at least 7 days prior to the work taking place. A copy of Council's letter of consent/permit must be displayed in a prominent location on or near the tree for the duration of work.



The above diagram demonstrates the difference between natural and lopped growth. New growth is much thicker, much faster growing, and often weakly attached. For these reasons Canopy reduction is not encouraged.

Selective pruning or thinning can achieve much longer lasting view improvements without compromising the natural integrity of the tree.

Resident Requests

Council regularly receives requests from residents to prune or remove street trees. To ensure that maintenance cycles are not unduly disrupted, the following procedure will be followed:

- If the matter has been described as urgent or emergency work, the situation will be inspected and reported upon as soon as possible (within 24 hours) and appropriate action taken.
- All other requests will be inspected and reported upon within 14 days of receipt.
- Requests will be prioritised as either high priority or general maintenance.
- High Priority issues will be attended to within 28 days.
- General Maintenance requests will be filed, to be carried out during scheduled area maintenance.
- Applicants of General Maintenance requests will be advised of the approximate time frame for the work to be completed. (Currently it takes approximately 18 months to complete a maintenance cycle).
- Subject to Council approval, applicants who wish to have the work completed sooner than this, may do so by engaging a qualified arborist at their own expense.

Pest and Disease Control

Council endeavours to plant species that are hardy and resistant to pests and diseases but there are many older plantings worthy of special care and there are also new pests and diseases entering Australia and causing problems with established tree populations eg the Dutch Elm disease that destroyed much of Melbourne's tree canopy some years ago.

Council's arborists remain up to date on current best practice and have trained in the use of new products and equipment to maintain North Sydney's street tree population in healthy condition. Examples include an injection programme used on Council's 900+ Chinese Tallowwoods (*Sapium sebiferum*) that were suffering from extreme scale insect infestations. This same technology has been used on other high-amenity trees.

Council will not necessarily treat every tree that is affected by pests or disease. The application of pesticides or insecticides is a last resort and is only undertaken on high value or high amenity trees where there are no other alternatives. Many trees suffer periodic insect infestations or seasonal disease but the long term health of the tree is

not dramatically affected. Eg Powdery Mildew on Crepe Myrtles during summers with high humidity; this species is deciduous, shedding affected foliage in autumn and growing a fresh new canopy each spring.

Tree injection on Sydney Red Gum (Angophora costata), a high-value, native, habitat species affected by fungal disease.

2.4.2 Planting of new trees

The North Sydney Council Street Tree Database indicates that there are 1470 trees with life expectancies of less than 5 years. This means that a minimum of 295 new trees must be planted each year to maintain existing street tree numbers. These figures do not take into consideration those trees that are inappropriate for their location (e.g. too large and causing infrastructure damage) and those trees that have a reasonable life expectancy, but are not performing an appropriate function (e.g. misshapen/lacking canopy due to power line pruning).

Council will endeavour to allocate adequate funding and resources to plant at least 350 new trees per annum and will follow the principles below when identifying locations, choosing species, installing trees and providing establishment care. Council will use the Site Analysis Checklist (see appendices) to ensure all relevant issues are considered when identifying locations for new trees.

New trees are afforded protection through good tree pit design.

Location

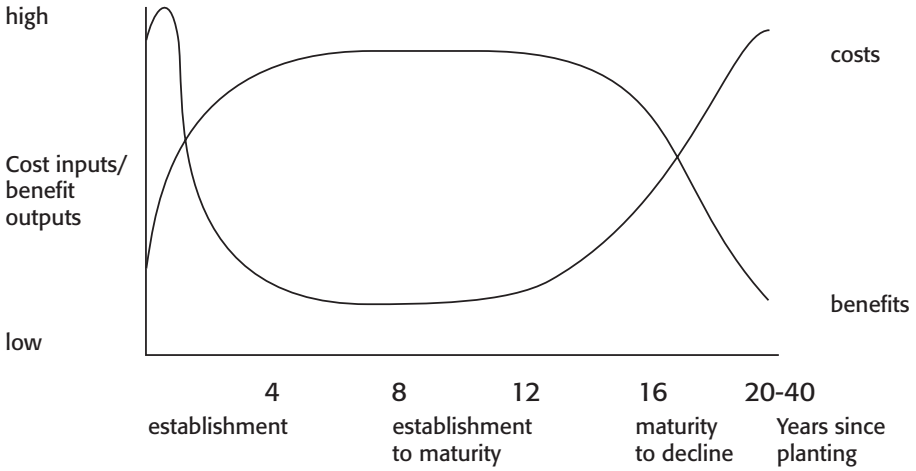
A proposed tree site must provide adequate space for the chosen tree to survive in the long term. New trees will be planted in locations where they will make positive contributions to the amenity of an area, and will not adversely affect adjacent properties, services or structures. For example, through effective tree spacing, solar access can be maintained to adjacent properties and where appropriate, scenic views maintained.

Species Selection

Council will carefully evaluate the site to determine the constraints and the desired function of the tree. The species chosen will either reflect the character of the area where appropriate, or create a sense of identity, and should not pose any threat to the health or safety of the community or its associated infrastructure.

Horticultural characteristics that will be considered when selecting a street tree species will include: fruit\flower\seed drop, suckering, root vigour, structural soundness, weed potential, poisonous or allergic qualities, foliage density, whether the tree is evergreen or deciduous, and appropriate habit and form.

The longevity and maintenance requirements of the species will also be considered. It is often thought to be of more benefit to the community to choose very long lived species. However in an urban environment growing conditions are generally difficult and development pressures often see areas significantly redeveloped every 30 years: sometimes less. In light of this, it may be more cost effective to plan for a 20-40 year life expectancy, choose a faster growing low maintenance species, and budget for regular replacement trees.



Hypothetical tree replacement model. Source: Hitchmaugh (1994)

Studies have revealed that it takes approximately 9-18 years for a tree to give back an equivalent $ value of benefits to its initial planting and establishment cost. The length of time before reaching maturity and starting to decline is dependent on the species of tree and some longer lived species may give many more years of benefits. The above diagram is purely to demonstrate the theory.

Planting and Establishment

The manner in which a tree is planted, and the early maintenance practices, can have a major impact on the long term viability of that tree. Appropriate planting specifications are necessary to provide clear definition of the desired planting details and techniques. Because there is a wide range of planting situations in the North Sydney area, planting specifications have been developed that are specific to the needs of each.

The various planting specifications include:

- Paved commercial districts
- Tree sites with metal grates
- Tree sites with rubber undersurfacing
- Tree sites with decomposed granite undersurfacing
- Raised / containerised plantings
- Residential districts
- Turf verges
- Traffic devices such as kerb blisters

Well designed traffic control measures such as kerb blisters provide opportunities for tree planting to help combat the urban heat island effect of surrounding hard surfaces.

Raised garden beds in Willoughby Rd Crows Nest provide solid buffers between pedestrians and roads and create intimate, sheltered outdoor eating and pedestrian spaces.

New technology is providing opportunities to give trees better growing conditions and infrastructure more protection in highly urbanised settings such as the Burlington St CBD bus stop upgrade in Crows Nest.

In addition to specifications for the physical planting of the trees, maintenance specifications also ensure the new trees survive. Once trees have been planted, watering, mulching, pruning and monitoring for pests, diseases and physical damage are all required for their successful establishment.

The involvement of local residents during the establishment phase can significantly increase tree survival rates and provide a greater sense of wardship over the trees (which can often result in a reduction in antisocial behaviour such as vandalism). Council will develop a simple flyer advising residents how to assist in the establishment of new trees planted outside of their property. This flyer will encourage residents to contact council and advise of their level of involvement so that where residents are carrying out watering or other tasks, Council can redirect in-house staff to other areas of need, maximising efficiency of the division.

2.5 RISK MANAGEMENT

North Sydney Council has embraced the principles of risk management as detailed in the Statewide Manual for Management of Trees and Tree Roots 2013 in the development of this Street Tree Strategy. Since the first North Sydney Street Tree Strategy was adopted in 1997, Council has:

- **conducted a comprehensive survey of the existing resource** (recording species, size, condition and location). Comprehensive audits have been conducted in 1999, 2008 and 2013.

During the most recent audit, risk assessments were conducted on each tree.

The Risk Score Method that has been adopted is from Ellison (2005) and has the following elements.

- Probability of failure (PF)
- Size of part likely to fail (FS)
- Target occupancy (TO)

The Ellison Risk Score methodology is probabilistic and the lower the value the higher the risk. The risk score is presented as a numeric value however it is properly expressed as a fraction e.g. Risk Score = 344 indicates that the predicted event has a 1/344 chance of occurrence. 1/1 indicates that an event is certain to occur and 1/10 000 000 indicates that it is extraordinarily unlikely. The three factors are multiplied to arrive at a Risk of Harm (ROH) according to the equation: ROH = 1/(PF × FS × TO)

- **reviewed the maintenance and management practices of this resource** (including staff, equipment, methods and maintenance cycles)
- **assessed the availability and allocation of financial resources**
- **developed pro-active inspection cycles and maintenance programs** that make the most effective use of the available resources (both physical and financial)

Council acknowledges the common interactions and impacts between trees and structures and has endeavoured to incorporate appropriate abatement strategies into day to day practice. The principle of continuous cover arboriculture allows for the selective removal of potentially hazardous trees with minimum loss of amenity.

The Streetscape Enhancement program provides a mechanism for proactively replacing ageing avenues (through interplanting programs) before they become hazardous, and the established inspection and maintenance cycles allow for timely identification and abatement of hazards: from carrying out of formative pruning on young trees through to removal of weakened branches or clearance for pedestrian or vehicular access.

2.5.1 Nuisance Issues

To ensure effective use of available funds, Council must identify those issues that constitute a genuine risk and differentiate them from minor nuisance matters. Where a genuine hazard or risk is identified, Council will follow adopted procedures to determine and implement the most appropriate course of action.

Council will generally not remove trees purely on the grounds of minor nuisance issues unless visual significance and amenity value of the tree are very low and there are several nuisance issues being created by the tree. Consideration will be given to the number of nuisance issues, degree of nuisance, frequency of associated maintenance and difficulty of associated maintenance for an average person. The higher the visual or amenity significance of a tree, the less weight nuisance issues will carry.

Council acknowledges that it is the intrinsic nature of trees to shed leaves, bark, sticks, flowers, fruit and exudate as part of their normal life cycle and that these issues will not constitute justification for tree removal. The following table provides guidelines as to those issues that North Sydney Council considers to be genuine hazards as opposed to minor nuisances. Generally Council will encourage remedial actions rather than tree removal. A list of abatement options as detailed in the Statewide Manual for Tree and Root Management 2013 can be found in Section 4.0 appendices.

Nuisance	Genuine Risk or Hazard
Tree roots penetrating aged terracotta pipes. It should be noted that removal of the tree does not fix the hole in the pipe and even if the offending tree is removed, it is likely that other vegetation (including shrubs) will capitalise on the opportunity.	Lifting and cracking water pipes or sewer pipes. Remedial options include: replacing pipe with pvc (using tunnel boring method if structural roots would be cut by trenching), relocating pipe further from the tree.
Cracking non-structural elements such as paths, driveways, etc	Lifting by more than 20mm of footpaths in high pedestrian traffic areas. Remedial options include: using mortar or other fill to smooth over lifted slab, grinding down of the raised slab, selective root pruning, relaying pavement in more flexible material such as wet pour rubber, loose gravel etc., relaying pavement with hinged expansion joint, root pruning
Non-structural cracking of elements such as garden walls, fences, retaining walls	Cracking of retaining walls or fences to such a degree that failure of wall or fence is imminent and poses a hazard to persons Remedial options include: replacing wall or fence with more appropriate structure, e.g. using pier and beam footings
Overhanging and shading lawns and gardens	Physically contacting roofs or structures Remedial options include: selective pruning
Overhanging Clothesline or Car parking space and allowing bird droppings onto clothes/car Remedial options include: relocate clothesline, choose alternate parking space, put cover over clothesline or car	Allergy causing species that is affecting the health of an individual (medical report required, verifying that individual is more allergic to this particular tree than any other common urban tree species). Remedial Options include: Pruning before flowers/ pollen are produced

Obstructing scenic views While it is not appropriate to remove a tree to improve views, it is often possible to carry out selective thinning where such work will not compromise the health, safety or species integrity of the tree	Obstructing vehicular or pedestrian access or visibility in a manner that significantly hinders safety Remedial options include: selective pruning,
Shedding leaves, flowers, fruits, twigs etc Regular clearing of roof gutters should be considered routine home maintenance. Prevailing winds mean that even residential properties with no trees, will receive leaves in their gutters.	Shedding limbs (history of limb failure will be evident in the tree crown, through the presence of scars & old stubs) Options include: Thinning of crown, improvement of growing conditions by watering and fertilising.
Obstructing advertising or other non-essential signage Council has no obligation to prune trees for visibility of this type of signage and sign owners should consider trees (and future growth) when positioning such signs	Obstructing traffic signs, traffic lights or other signs essential to public safety Remedial Options include: selective pruning or relocation of sign

Footpath realignment around a significant Fig tree in St Leonards Park allows room for roots to grow without creating trip hazards in the new footpath.

2.5.2 Liability Issues

Liability Assessment Principles

With reference to section 42 of the Civil Liability Act 2002, when considering its duty of care for tree management, Council assumes that:

(a) It is limited by the financial and other resources that are reasonably available for the purpose;

(b) The general allocation of those resources is not open to challenge;

(c) Performance requirements are determined by reference to the broad range of Council's activities and not merely to tree management; and

(d) It may rely on evidence of its compliance with the general procedures and applicable standards for the exercise of its functions as evidence of the proper exercise of its functions in assessing or defending claims related to trees.

Branch or Whole Tree Failures

The extent of damage caused by trees during storms and other extreme events is kept to a minimum in North Sydney due to the formative pruning done on young trees and the ongoing monitoring and maintenance to prune and remove any potentially hazardous limbs on mature trees. Given the number of trees in the North Sydney area, the percentage that fail during storm events is extremely low.

There are also occasions where branches or whole trees fall during fair weather. This is generally unforeseeable and may be due to internal structural damage or decay which cannot be detected during routine visual inspections. Property damage that occurs due to unforeseeable failures or during storm events is not a liability for Council.

Incident forms have been produced and are used by Council tree staff and rangers to record all relevant information when attending tree or branch failure calls. This includes information regarding tree species, growing location, general condition and weather conditions at the time of failure. Council's provision of emergency services and the collection of information does not constitute an admission of liability or responsibility on the part of Council.

Root Damage

The management of tree root systems in North Sydney is a complex issue. Roots are difficult to see and their behaviour in heavily developed urban areas is hard to predict. As North Sydney is one of the older metropolitan areas, there is much underground infrastructure that is nearing the end of its realistic asset life. Modern products have been developed that are far superior to the old terracotta pipe systems and new trenchless laying technology is becoming more common.

Council recognises that tree roots in pipes can be very inconvenient for the householder, however roots in the pipe are generally an indication of the age and condition of the pipe. Pipe maintenance is the responsibility of the property owner, not Council. If a blockage occurs and the property owner suspects that a Council owned tree is involved, Council's Risk Manager should be notified in the first instance. Where it is proven (if necessary by way of root analysis – at the expense of the applicant) that the roots causing a blockage are from a public tree, Council's arborists and Risk Manager will assess the situation. The property owner should provide a plumbers report to Council indicating:

- Type of pipes & approximate age
- Depth of pipes
- Map showing location of pipes in relation to the tree(s) with approx distances
- Location of blockage
- Remedial options e.g.
    - Clear pipes on regular basis
    - Replace pipes with pvc (indicate whether trenching or tunnelling)
    - Relocate pipes
- Estimated costs

A property owner is legally responsible for any service lines (stormwater or sewer) emanating from that property until the point where they join the relevant authority's mains, regardless of whose land they travel under. Council is not legally required to repair or contribute to the cost of repair of such lines just because they travel under public land. Where roots from a Council tree are impacting on a service, Council will endeavour to negotiate an appropriate outcome and if it is deemed necessary, may choose to remove the tree at no cost to the property owner.

Damage during maintenance activities

Tree pruning is recognised as a high risk procedure and while Council's maintenance teams adhere to strict SafeWork NSW and Work Health and Safety (WHS) guidelines, there are occasions where property damage is incurred. Due to the high demand for parking in the North Sydney area, Council staff often have to work in close proximity to privately owned vehicles even though procedures are in place to request vehicle owners to find alternative parking on given dates. 'Tree Works' signs are posted on parking signs advising date of proposed works, and barricades and 'No Stopping' signs are placed in the vicinity of the relevant tree(s) approximately 2 days prior to proposed works.

If any property damage occurs due to the actions of Council staff, details will be recorded on an incident report form and Council will endeavour to contact the legal owner. Generally a notice will be left on the damaged property (i.e. on the windshield of the vehicle or in the letterbox of the house) should a related claim be received, it will be forwarded to Council's Risk Manager for assessment.

Unauthorised nature strip planting

Council has a number of programs to encourage community participation in open space beautification and management (e.g. Streets Alive & Bushcare). These programs ensure that any works or activities are carried out in accordance with Council policies and that identified objectives are set and achieved. Community members are provided with training and guidance and are supplied with quality plants and materials. There are however instances where community members undertake planting work outside of these programs and this can lead to potential problems. Council is generally responsible (and may be liable) for all trees growing in the nature strips.

For this reason, unauthorised planting of street trees by residents is discouraged. Where a resident has planted trees without prior Council approval, the site will be inspected by a Parks Department officer to ensure that the planting is:

- of a suitable species that is compatible with the surrounding streetscape,
- a good quality specimen,
- in a suitable location,
- planted to Council standards.

Where a tree does not meet these criteria, the resident may be asked to remove the tree. If the resident does not comply, the tree may be removed by Council and used or disposed of as seen fit.

Unauthorised fixtures on street trees

Council will not permit the installation of fixtures such as fairy lights, Christmas lights, banners, signs, posters or the like, to street trees unless prior consent is obtained from Council. Such fixtures can affect the health and safety of tree workers and/or adversely affect the health and longevity of the tree. If a person or organisation wishes to install such fixtures, an application must be made to the Director of Open Space & Environmental Services, detailing the proposal (purpose, products, fixing methods, duration etc) and the benefits they will give to the community. Permanent fixtures will not be permitted.

Where Council has been notified of unauthorised installations, the relevant party will be requested to remove the fixtures and if they do not comply, Council staff or contractors will remove them and dispose of them as seen fit.

2.6 COMMUNITY CONSULTATION

Removal or non-removal of trees from nature strips and parks is potentially the greatest cause of conflict in the management of the Council's trees. Understandably, residents become very attached to a tree that has been living and growing near their home for many years. North Sydney Council will assume that every tree, no matter how insignificant it may appear, has some value to someone.

Unfortunately, it sometimes becomes necessary to remove trees, either because of a problem with the tree itself, or to facilitate development or installation of infrastructure. Experience has shown that the concern associated with the removal of trees can be minimised through proper consultation with customers. Council has several formalised procedures for community consultation with regard to tree work. To ensure that the community is appropriately notified, Public Notices will be fixed to all trees that are to be removed and the following processes will be undertaken for the various levels of tree work.

Significant Tree Work

Residents are informed when significant tree work is programmed to occur in their local area. Significant tree work includes:

- work which may require residents to make alternative parking arrangements
- tree removals

Where tree work requires residents to make alternative parking arrangements, a standard notice will be posted in the vicinity of the tree, detailing date of proposed work. Where trees are to be removed, residents will be notified by a public notice on the tree(s) and/or a letterbox drop and advised of the reasons for removal and the replacement proposal. The extent of notification is in direct proportion to the visual significance of the tree(s), and will generally be done one week, but not less than two days, prior to the work being carried out, giving residents an opportunity to call Council for more information. If the tree is dead, this notification may not necessarily be conducted.

Where the work is of an urgent nature, for example during storms or where there is imminent danger, it is usually not possible to carry out this notification procedure and alternatively, residents may telephone Council to receive advice. It should be noted that the community notification procedure for tree removal is a matter of courtesy. For both safety and liability reasons, once a tree has been identified as requiring removal (for public safety reasons) by Council's arborists, the tree should be removed. Council will carefully consider the feasibility of all management options before deciding to remove a tree.

Where trees are of high visual or historic significance Council will investigate all feasible alternatives prior to making a decision to remove a tree.

In the case of installing new trees on an individual basis, these are generally in response to requests from residents and as such, the affected resident is already aware of the proposal. Community consultation regarding the removal or planting of large numbers of trees is covered in the following section on the Streetscape Enhancement Program.

Streetscape Enhancement Program

The North Sydney Streetscape Enhancement Program is a flexible tool that can evolve as land use and community needs change. The main objective of the program is to maximise the number and appropriateness of street trees in North Sydney. The Streetscape Enhancement Program provides a set of criteria to highlight those streets in need of planting or replanting in the short term. Criteria includes:

- Streets where there are currently very few trees but appropriate planting space is available
- Streets where residents have requested planting and there is an identified need
- Streets where existing trees have a life expectancy of less than 5 years
- Streets where existing trees are inappropriate and may pose a risk to health or safety, or will mature to a size which is incompatible with the site
- Streets where existing trees are disfigured due to wire clearing work and are not performing the desired functions

Huntington St, Crows Nest had no trees at all prior to the streetscape enhancement program. These Crepe Myrtles (Lagerstroemia indica) were planted in 2006.

Once the streets requiring attention have been identified, they are prioritised, and individual replanting programs, or streetscape solutions developed for each. This involves thorough site assessment, investigation of possible future works, and consultation with the community. The result is a Street Masterplan, which details the following:

- planting species
- approximate spacing and layout
- appropriate planting specification
- approximate costs
- method of implementation (staged/immediate)

Community consultation methods will vary according to the site and the adjacent land use. These methods may include:

- notification and explanation of Council's intent
- invitation to participate in a survey
- public meeting or site meeting
- public display

In residential areas the usual practice is to carry out a survey of property owners. Where there is more than one species that is appropriate for the site, property owners may be asked to indicate their preferred species from a short list developed by Parks Department staff and the most popular species will be planted as an avenue. They are

also encouraged to make comments with space dedicated to this purpose on the survey return form. Generally where there is a range of species suitable for the site, one of the options offered will be a native species.

A minimum 21 day period is allowed to receive resident responses, and unless Council has specifically instigated the proposal for its own reasons, a minimum 25% response rate from property owners is required for the project to proceed. When responses have been tabulated the results are sent out to all property owners. A majority of respondents must be in favour of the proposal for the project to proceed. Where feasible individual requests are accommodated.

For example where a resident was not in favour of the project, their tree may be retained until the last stage of the project. (by which time all of the new trees are well established and the impact of removal is greatly reduced).

The establishment or maintenance of an avenue of trees or a consistent planting theme can sometimes require Council to plant a tree in a nature strip against the wishes of the customer immediately adjacent. This is a difficult situation that calls for Council to make a judgement regarding the rights of the wider community over the individual resident. When making such a decision, it is borne in mind that a major factor in the survival of a newly planted street tree is the cooperation of the nearest resident. Where a consistent avenue of trees or a strong consistent planting theme exists and a gap in this theme will detrimentally affect the overall streetscape, trees will be planted to fill the gaps despite opposition from adjacent customers. In all other instances, the tree will not be planted. A similar approach will be applied where a property owner has failed to respond to the survey. It will be assumed by Council that no response is an indication of support and trees will be planted/removed in accordance with the street masterplan.

It should be noted that some streets, although highlighted as requiring planting, may not have the capacity to accommodate street trees. Examples of this may be where verges are very narrow or where there are underground services close to the surface. In these situations, other planting options will be investigated. These may include planting in containers, providing trees or encouraging residents to plant on private property or creating a planted median strip.

It should also be noted that some streets highlighted as lacking trees may not require any. An example of this situation is where the planting of trees would detract from the historical context of a street. For example in some of the older streets in North Sydney where the original architecture remains intact, the planting of trees may screen or detract from the architecture and alter the historical character of that street. Decisions to plant in heritage areas will be carefully considered and input may be sought from relevant Council Officers such as the Local Historian at Stanton Library and Council's Conservation Planner, or possibly from external authorities such as the National Trust.

A list of all the streets currently on the streetscape enhancement program is included in Part 4.0 appendices.

Streets Alive Program

The Streets Alive 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 Parks Department and provides a formalised mechanism through which Council offers guidance and funding while residents provide labour and ongoing maintenance.

Streets Alive projects range from small plantings outside an individual property through to the development of whole new parklands (such as the new pocket park on State Rail land at the end of Balfour street), and often involve the planting of street trees.

A new park was created through the Streets Alive program on a vacant lot in Bank St. Photo one 2005, photo two 2016

Mainstreet Program

Council's Mainstreet program is a mechanism that involves all affected stakeholders in the design and implementation of Central Business District improvement works. These projects generally involve such things as lighting upgrades, pavement replacement, footpath widening, service relocations, awning modifications, and hard landscaping such as planter boxes, retaining walls and water features. Mainstreet programs are coordinated by Council's Engineering department, who liaise with other Council departments as necessary.

Staff from the Tree Management Team should be consulted in the initial stages of Mainstreet designs to provide advice on any existing trees. A visual tree inspection will be conducted and comments made on all existing trees on the following basis:

- Trees that should be retained
- Trees of high visual amenity and long safe useful life expectancy
- Comments will be provided regarding Tree Protection Zones and other mechanisms that should be employed to ensure tree survival during and after the works

- Trees that could be retained if desired
- Trees that have reasonable public amenity and have a long safe useful life expectancy with reasonable maintenance or remedial work
- Trees that should be removed
- Trees that are inappropriate, in poor condition or are offering little amenity to the Streetscape

Council's arborists may also be asked to suggest appropriate replacement species or to make comment on any proposed species. A baseplan for the site must be provided and a minimum period of 21 days will be required for the Tree Section to provide the above advice. Mainstreet programs, due to their high cost and high impact on businesses, are generally conducted in stages over an extended period. Mainstreet programs are currently underway in Crows Nest, Cammeray, Cremorne, Neutral Bay, Kirribilli and McMahons Point.

The Main Street program in Neutral Bay has resulted in many new tree planting & general greening opportunities

New Private Developments

North Sydney Council assesses approximately 400-500 development applications per year. This is a decrease on previous figures (700-800) due to new LEP and more complying developments not requiring formal development applications. Since virtually all properties in North Sydney have a street frontage of some sort, there is a high probability that street trees will be impacted by any works of a significant nature. Council's Planning department has a designated Landscape Officer who assesses impacts and imposes protection conditions for both Private and Public trees when a

development application is lodged however for complying developments, street tree assessment is in the hands of the applicant or independent certifier if one is required.

The Landscape Officer uses similar visual inspection and assessment methods as the Tree Management Team for all trees on and around the site and categorises trees as either worthy of retention or suitable for removal and replacement. Where such trees are located in the street, consultation with the Parks Department is undertaken to determine appropriate replacement species. It should be noted that community consultation methods in association with approved developments will differ from those detailed in this document and will be in accordance with Planning department policy.

2.7 ADMINISTRATION

Communication

Effective communication on all management levels is critical to efficient tree management. This includes communication within the Tree Management Team, within the Parks Department, within the whole Council and with Councillors, with external organisations and authorities, and with the community.

To ensure effective communication within the Tree Management Team and the Parks Department, regular staff meetings are held. To facilitate communication within Council, MANEX (management and executive officers) meetings are held on a fortnightly basis. Manex meetings allow information regarding upcoming engineering projects such as footpath replacements, road resheeting and other significant works such as business centre upgrades that may impact on existing trees, to be disseminated to the Tree Section staff with adequate lead time to provide advice on tree protection measures.

The production of policies and strategies which are relevant and effective provide the means of communicating with others outside of the organisation. These policies ensure a satisfactory and accountable service to the community and also ensure consistency across the organisation.

Training

North Sydney Council will strive to ensure that all staff are appropriately trained and have the necessary equipment to safely and efficiently carry out tree maintenance in accordance with industry best practice.

This Street Tree Strategy forms part of the induction package for all new workers involved in tree management.

Record Keeping

North Sydney Council is striving towards a paperless office and one of the major advances in this regard has been new electronic record keeping software. This software provides electronic recording of all relevant incoming and outgoing correspondence; be that in letter, facsimile or email format. It also records all resident requests made by telephone and sets up a task allocation and tracking system for all forms of communication.

In addition to the council-wide record keeping system, the Tree Management Team diaries daily activities and records cyclical maintenance activities in spreadsheet format, allowing for regular assessment of performance against targets.

Street Tree Asset Register (Database)

In accordance with the recommendations of the Statewide Tree and Root Management Manual 2013, Council has a street tree database which includes the location, species, size, approximate age, health and condition of each individual street tree.

While several street tree audits were conducted in the 1990's Council's first comprehensive digital street tree asset management system was developed in 2008. The Street tree database can be accessed as a layer on the Council GIS Mapping system, making it accessible to all divisions of Council.

The street tree database has been developed as a primary management tool and represents a snapshot of all existing street trees. It has been determined to be more cost effective to conduct a reassessment of all street trees every five years than to have existing tree staff updating the information every day or every week (redirecting limited tree staff into the office would have a negative impact on maintenance cycles).

The street tree database only records data essential to operate as a strategic management tool and is not intended to be used as a day to day maintenance record as this only duplicates other record systems already in use across the organisation. Maintenance works and/or resident correspondence are recorded against the property address in alternate digital record keeping systems.

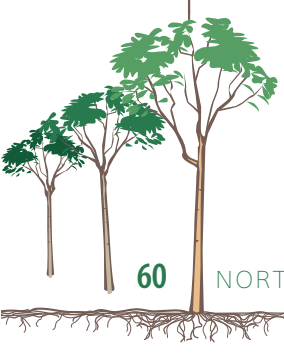
For this reason, the data collected is of a broad nature so that it will remain relevant for a five year period. Information contained in the database includes:

- Tree location; street, house number, planting location,
- Tree species
- Tree dimensions (in metres), both current and mature
- Tree growth stage - immature, semi-mature, mature, senescent
- Tree condition and life expectancy (0-5yrs, 5-10yrs, 10-15yrs & 20+yrs)

- Tree Risk rating
- Site details: overhead wires, service pits, undersurfaces

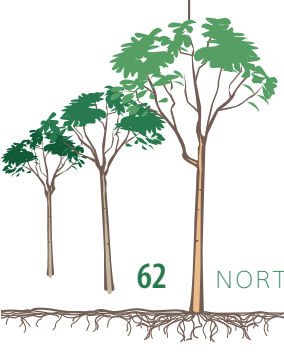
Using the database information, management decisions can be made readily and confidently. For example, by using the database to search for all species known to be susceptible to a particular new pest or disease, an inspection list can quickly be compiled.

By using the database to identify all trees with a short life expectancy and a poor condition rating Council can prepare annual tree replacement or planting programs and identify streets to be added to the streetscape enhancement program.



Part 3

Policy Implementation and Performance Matrix



PLANTING AND ESTABLISHMENT OF NEW TREES

ISSUE	POLICY OBJECTIVE	ACTION	COMMENTS	PRIORITY	PERFORMANCE INDICATOR	REFERENCE
Urban Forest Policy	To achieve the highest level of long term benefit to the community using available funds and resources in the most cost effective manner	Ensure that all removed trees are replaced where appropriate space is available	- privately owned trees and trees located in parks & bushland currently make up the bulk of the urban forest - as development pressures increase, street trees will become a more vital component of the urban forest - As part of the Urban Forest Strategy, Council has measured % cover over land zoned road and is continuing to monitor this to provide an accurate performance measure regarding street trees.	Ongoing	All removed street trees are replaced where appropriate space is available.	Street Tree Strategy 2015 Part xxx Urban Forest Strategy 2011 part xxx
		Plant an appropriate number of new trees to achieve an ideal canopy cover	- The Urban Forest Strategy 2011 details the canopy cover targets for North Sydney. - The overall canopy cover target is 35.5% and the target for over roads is 30%. In 2013 the cover over roads was 20% however the sheer width of the Warringa Freeway has impacted on this calculation with up to 20 lanes in some parts. - Aerial photos used to determine performance to date. In 1997 total canopy cover was 19.5%, in 2001 canopy cover was 24%, in 2008 canopy cover was 34% and in 2014 it was 31%	Ongoing	Canopy cover % meets targets or is increasing	Urban Forest Strategy 2011 part 6.2
		Where appropriate planting locations are not available within the street, consider other planting alternatives to achieve desired canopy cover	- Consideration could be given to containerised street planting or providing trees to residents for planting on private property	Ongoing	Alternative planting options are being implemented where planting is not an option.	
		Plant an appropriate number of new trees each year to maintain or expand upon existing street tree numbers	- database figures indicate that 5.8% of tree population has life expectancy of <5 yrs this means a minimum of 295 trees need to be planted per year for the next 5 years to maintain existing numbers.	Ongoing	350 street trees planted per annum	

PLANTING AND ESTABLISHMENT OF NEW TREES

ISSUE	POLICY OBJECTIVE	ACTION	COMMENTS	PRIORITY	PERFORMANCE INDICATOR	REFERENCE
Continuous Cover Arboriculture	To ensure sustained amenity through the establishment of a range of age classes within the street tree population	Implement staged avenue replenishment in streets where existing trees are nearing the end of their safe useful life expectancy	- so that all trees do not reach senescence and require removal at once, having dramatic effects on local amenity	Ongoing	Sustained amenity maintained Number of avenue replenishment projects undertaken (Streetscape Enhancement Program)	
	Manage Plane trees using Continuous cover principles	Remove Plane trees at that point in time when their maintenance costs outweigh their amenity benefit to the community	i.e. when root systems start to impact on infrastructure.	Ongoing	Reduced incidence of damage to infrastructure	
		Ensure that any tree to be removed has other younger trees planted in vicinity		Ongoing	Amenity Maintained	
New Tree Planting	To ensure that all new trees are appropriately located to maximise benefits to the community and minimise any negative impacts	Use Site Analysis checklist to assess all potential planting locations	- consider access, sight lines, solar access, spacings, mature tree dimensions etc	Ongoing	Number of complaints about negative impacts decreasing	
		Discourage unauthorised nature strip planting by residents	- Council is ultimately responsible (and may be liable) for all plantings on public land - unless they meet all of Council's species, location, and planting criteria, unauthorised plantings will be removed	Ongoing	Number of inappropriate unauthorised plantings decreasing	
	To ensure that all new trees are of a species that is capable of growing to maturity in the chosen location with minimum maintenance inputs	Use site analysis checklist to determine desired function of tree and highlight any growing constraints	- checklist considers aspect, slope, soils, wind, shade etc - consider species diversity. Ideally no one genus should make up more than 10% of the tree population.	Ongoing	Maintenance costs per tree decreasing	

PLANTING AND ESTABLISHMENT OF NEW TREES

ISSUE	POLICY OBJECTIVE	ACTION	COMMENTS	PRIORITY	PERFORMANCE INDICATOR	REFERENCE
	To ensure that all new tree planting reflects existing ratios of natives, exotics and deciduous trees to maintain the existing North Sydney Character	Choose species appropriate to the existing character of each street or where no strong character exists, choose a species that creates an appropriate character	- site analysis checklist will highlight existing character - consideration will be given to wildlife corridors & habitat	Ongoing	Existing character and species ratios maintained	
Planting Techniques	To plant trees in the most cost effective manner to ensure their survival, health and longevity	Regularly review the existing planting specifications and amend as appropriate to ensure industry best practice is followed	- planting specifications are used by both Council staff and external contractors - specifications include details on quality of plant stock and planting details - specifications should be updated as new materials and techniques become available such as structural soil cells and the like.	Ongoing	Specifications reviewed regularly in line with Council's Schedule of rates contracts	
		Plant all new trees in accordance with specifications	This refers to both council and contractors	Ongoing	All new trees planted in accordance with Industry Best Practice	
Maintenance and Establishment	To ensure that all new trees are appropriately maintained during their establishment phase to maximise survival rates	Ensure existing maintenance specifications reflect industry best practice	Maintenance specifications should be reviewed occasionally to ensure they reflect current industry best practice	Ongoing	% Survival rates of new trees	
		Maintain all new trees in accordance with specifications		Ongoing	% Survival rates of new trees	
	To encourage and facilitate the involvement of residents in the establishment of new street trees	Encourage residents to participate in Streets Alive projects	- the Streets Alive program allows Council to guide residents through the provision of advice, and appropriate plants and materials - resident involvement generally leads to improved street tree survival rates	Ongoing		

PLANTING AND ESTABLISHMENT OF NEW TREES

ISSUE	POLICY OBJECTIVE	ACTION	COMMENTS	PRIORITY	PERFORMANCE INDICATOR	REFERENCE
		Distribute notices or flyers in letterboxes in the vicinity of new street tree plantings	Flyer outlines how residents can assist in the establishment of new trees near their property & encourages residents to notify Council if they are going to help with establishment - Council staff & resources can then be directed to other locations, improving efficiency of the division - resident involvement fosters a sense of wardship over new trees and can lead to a decrease in antisocial behaviour such as vandalism	MT	Number of residents participating in new tree establishment	
MAINTENANCE OF EXISTING TREES						
Maintenance Pruning	To maintain all of North Sydney's street trees in safe and healthy condition	Conduct regular visual inspections of all street trees in North Sydney	- frequency of inspections will be in accordance with industry best practice and should not exceed 2 years between inspections. - staff who carry out visual inspections must be suitably qualified	Ongoing	All trees are inspected every 18 months	
		Carry out all necessary pruning and/or maintenance activities to ensure health of the tree and safety of persons and property	- pruning will be carried out in accordance with AS4373		All trees are pruned as necessary	
	To maintain adequate safety clearances for pedestrians, vehicles and structures	Carry out all pruning necessary to ensure minimum safety clearances are achieved within the limits of arboriculture best practice	- Council strives to achieve the following clearances: 2.4m over footpaths 4.5m over major roads - these clearances can only be achieved incrementally as trees mature		Minimum clearances achieved as trees reach appropriate level of maturity	

MAINTENANCE OF EXISTING TREES

ISSUE	POLICY OBJECTIVE	ACTION	COMMENTS	PRIORITY	PERFORMANCE INDICATOR	REFERENCE
	To ensure that necessary sight lines are maintained	Prune trees to provide clear sight lines where necessary for vehicles and pedestrians	- sight lines are necessary for traffic lights, traffic signage, pedestrian crossings etc - pruning for advertising and other non-essential signage will not be carried out by Council but may be done by property owner with consent through Section 16 of LEP2013		Necessary sight lines maintained. Number of pruning requests from RTA decreasing	Section 16 of LEP2013
	To carry out formative pruning on all young trees to ensure they develop appropriate form and structure	Prune young trees as required	- pruning will be carried out in accordance with industry best practice and AS4373 - Effective pruning of young trees reduces maintenance requirements on the mature tree		Amount of pruning required on mature trees decreasing	
Wire Clearance	To minimise the impact of wire clearance work on the health and aesthetics of existing street trees	Identify locations where Energy Australia's line clearing work has or will affect the health or aesthetics of existing street trees	- street tree database will assist in identifying locations	Short Term	Number of trees disfigured by wire clearance pruning decreasing	Energy Australia 'Management of vegetation around Power lines'
		Determine abatement strategies appropriate to each location	- in some instances where trees have short life expectancy it maybe appropriate to remove and replace the trees	Ongoing	Number of trees disfigured by wire clearance pruning decreasing	
		Implement street tree replacement programs where appropriate	- The Streetscape Enhancement program provides a means of gradually replacing avenues where existing trees are nearing the end of their safe useful life or where the existing species is inappropriate	Ongoing	Number of trees disfigured by wire clearance pruning decreasing	
Tree Removals	To ensure that decisions to remove trees are based on sound management principles and removals are carried out in such a way as to minimise adverse effects on public amenity	Carry out thorough visual inspection of trees to be removed and where necessary, conduct detailed diagnostic investigations	- visual assessment will be carried out in accordance with industry best practice - external consultants may be used to prepare detailed reports - Specialist investigations such as resistograph or other internal diagnostics may be necessary on significant trees		Trees to be removed thoroughly assessed	

MAINTENANCE OF EXISTING TREES

ISSUE	POLICY OBJECTIVE	ACTION	COMMENTS	PRIORITY	PERFORMANCE INDICATOR	REFERENCE
		Determine management options to safely retain tree and consider financial feasibility of these options in relation to the significance of the tree	- Council has finite resources and the management of aging specimens can be quite expensive. (money spent maintaining a senescent tree may be better spent planting 10 new trees) - High level heritage significance may warrant such expenditure	Ongoing	Maintenance budgets not exceeded	
	To ensure that the community is appropriately notified of impending tree removals	Advise stakeholders of impending tree removals	- notification may not be possible where dangerous trees need to be removed urgently - notification will provide information on why tree is to be removed and what it will be replaced with - once a tree has been assessed by Council arborists as requiring removal, retention will not be possible (for both public safety and liability reasons) - a form letter has been developed to standardise the notification process	Ongoing	Number of enquiries regarding tree removals decreasing	Street Tree Strategy 2.6 Community Consultation
		Distribute notification letter to properties likely to be affected by the tree removal	- extent of letter distribution will be in direct relation to the visual significance of the tree	Ongoing	Notification letters distributed minimum 2 days prior to tree removals unless work is urgent	Street Tree Strategy Appendices – Tree Removal Letter
	To ensure that all trees removed are replaced with an appropriate new tree where-ever there is sufficient space, and that such replacement occurs in a timely and efficient manner.	Use data collected for notification letter to develop a stump grinding list and a tree planting list	- stump grinding list will be forwarded to contractors on a regular basis - tree planting list will detail, number of trees, species of trees, container size of trees and will be used develop order lists for suppliers - tree planting list will also become the watering list once trees are installed		Lists developed	

MAINTENANCE OF EXISTING TREES

ISSUE	POLICY OBJECTIVE	ACTION	COMMENTS	PRIORITY	PERFORMANCE INDICATOR	REFERENCE
		Replacement trees sourced and planted in accordance with season	- it may not be appropriate to immediately replace a removed tree in the middle of summer - the tree planting list will ensure that all trees removed are replaced at the appropriate time of year		Survival rates of replacement trees	
Infrastructure Damage	To ensure all trees, both privately and publicly owned that are negatively impacting on Council infrastructure are appropriately managed	Respond to requests from Council Engineers for arboricultural advice in a timely manner	- Parks dept aims to respond to Engineers requests within 48 hours		Infrastructure damage from trees decreasing	
		Provide arboricultural advice that is in accordance with industry best practice.	- in the past, root pruning has been regularly carried out. - research suggests less root pruning should be done		Infrastructure damage from trees decreasing	
Root Pruning	To ensure that all street trees are maintained in structurally sound condition and any necessary root pruning is carried out in accordance with industry best practice	Investigate all other alternatives prior to root pruning of street trees	- eg Tunnel boring rather than trenching, hinged slabs, slab grinding, flexible pavements	Ongoing	No tree failures due to root loss	Street Tree Strategy 2.4.1 Root Pruning
		Private contractors who specialise in root pruning to be engaged for any pruning of large roots or large amounts of roots		Ongoing	No tree failures due to root loss	
Customer Requests	To respond to customer requests in a timely and efficient manner	All customer requests to be documented	Council has two recording systems: CRM and ECM	Ongoing	Resident requests inspected within 14 days	

MAINTENANCE OF EXISTING TREES

ISSUE	POLICY OBJECTIVE	ACTION	COMMENTS	PRIORITY	PERFORMANCE INDICATOR	REFERENCE
		All resident requests to be inspected, appropriately prioritised and the customer notified of the inspection outcome	- requests to be assessed as either urgent, high priority or general maintenance issues - where the customer has described the matter as urgent it will be inspected within 24 hours - all other requests will be inspected within 14 days and the customer notified of the outcome within 7 days of the inspection.	Ongoing	Urgent requests inspected within 24 hours All other resident requests inspected within 14 days of receipt Customer notified within 7 days of inspection	
		High priority requests to be carried out within target timeframes	- customer requests that have been assessed as high priority to be completed within 28 days of inspection - private contractors may be engaged by Council for expediency	Ongoing	High priority requests completed within 28 days	
	To provide customers with options for general maintenance requests where Council maintenance teams are not scheduled to be in the vicinity for an extended period	Allow customers to engage private contractors at their own expense and advise of this using standard form letter	- A full maintenance cycle takes approx 18 months and represents a proactive management approach. - Attending to general maintenance requests as they are received would have a detrimental affect on these cycles and would represent a return to the less efficient reactive management approach.		18 monthly maintenance cycles achieve Positive Customer feedback	
Cosmetic Pruning	To permit cosmetic pruning of street trees where such pruning will not compromise the health, safety or integrity of the tree or negatively impact on amenity	Issue permits to customers for cosmetic pruning of street trees where appropriate	- applications to be assessed by the TPO - such work to be done by qualified arborists at the applicants expense - such work to be done under Council supervision		No negative impacts on amenity	North Sydney LEP 2010 clause 5.9 Tree and Vegetation Management Street Tree Strategy 2.4.1 Cosmetic Pruning

RISK MANAGEMENT

ISSUE	POLICY OBJECTIVE	ACTION	COMMENTS	PRIORITY	PERFORMANCE INDICATOR	REFERENCE
Proactive Management	To ensure that all of North Sydney's street trees are proactively managed in accordance with industry best practice	Use suitably qualified persons to carry out regular visual inspections of all Street trees in accordance with industry best practice	- Street tree database details the tree resource and its condition - Management plans detail available funds and human resources as well as maintenance targets - training programs ensure staff are suitably qualified		All trees inspected every 18 months	
		Carry out routine maintenance to ensure safety of persons and property	- proactive management and routine maintenance reduces Council's exposure to risk		All trees pruned as necessary	
Nuisance Issues	To distinguish between those issues that are minor nuisance and those that are genuine hazards and deal with customer complaints in a consistent and appropriate way.	Refer to the adopted list of nuisances and genuine hazards and respond to customers in accordance with the appropriate abatement strategy.	- minor nuisances include such things as the shedding of leaves, flowers, twigs, exudate etc - genuine hazards include damage to services & infrastructure		Customer complaints regarding nuisance issues dealt with consistently & efficiently	Street Tree Strategy 2.5.1 Nuisance Issues
		Where genuine hazards are identified, consider all possible abatement actions to remove the hazard and implement the most appropriate action	- removal of a healthy & functional tree should be the last option and should only be carried out where there are no other feasible abatement options		Number of healthy & functional trees removed decreasing	

RISK MANAGEMENT

ISSUE	POLICY OBJECTIVE	ACTION	COMMENTS	PRIORITY	PERFORMANCE INDICATOR	REFERENCE
Property Damage	To provide clear procedures to be followed when property damage has occurred involving Council owned street trees	Staff to use standard incident report forms whenever any street tree related property damage has occurred	- the forms are used by all staff including rangers when recording out of hours incidents - forms record all relevant information about the tree, the site, the incident and the prevailing weather conditions. - forms are forwarded to the Risk manager and filed appropriately - forms are used when Council trees cause damage to council or private property or when Council maintenance practices cause damage to private property.		All relevant data is available to Risk Manager on next working day	Street Tree Strategy Appendices - Tree Incident Report form
		Staff to take all available steps to make contact with the owner of the damaged property and where that person is not contactable, a standard form notice is left.	- e.g.. knocking on door of house - in all instances a form notice will be left for the property owner advising appropriate contact details at Council		Number of complaints about notification process from Property owners	
Tree roots in Pipes	To fully investigate all claims of Council tree roots interfering with pipes to ensure that healthy & functional street trees are retained where-ever possible, whilst achieving appropriate outcomes for affected residents.	Provide customers with a list of all the details to be provided to council to enable a thorough assessment of the claim.	- much of the underground infrastructure in Nth Sydney is nearing the end of its asset life and roots in the line are generally an indication of the deterioration of the pipe - Removal of the tree does not fix the fault in the pipe and other vegetation will quickly capitalise on the access to water and nutrients – Incidents and claims should be brought to the attention of Council's risk manager at the earliest possible opportunity.		List of information required by Council provided to all customers with pipe blockages	Street Tree Strategy Root Damage 2.5.2
		Verify that roots affecting the pipe are from Council owned trees	- root analysis can confirm the species of tree/shrub that has entered the pipe - often there are numerous trees in the vicinity of a property both privately and Council owned		Roots appropriately identified	

RISK MANAGEMENT

ISSUE	POLICY OBJECTIVE	ACTION	COMMENTS	PRIORITY	PERFORMANCE INDICATOR	REFERENCE
		Where the roots emanate from a healthy & functional Council tree, investigate all options to effect repairs whilst retaining the tree	- new technology allows fore-sleeving of old lines without opening large trenches - tunnel boring techniques can be used to install new lines beneath existing trees - new pvc pipes are far less prone to cracking/leaking and subsequent root penetration		Number of healthy street trees removed due to pipe blockages	
		Engage the services of external specialists as appropriate	- This may include reports from technical experts or independent assessors		Number of healthy street trees removed due to pipe blockages	
Claims	To manage all claims for damages relating to Council trees in accordance with Enterprise Risk Management Policy D5-16.	Tree section Arborists to provide technical data as requested by the risk manager, within the limits of their expertise	- Healthy and functional trees to be removed as a last resort after all other abatement strategies have been considered		Arborists consulted on all tree related claims	Enterprise Risk Management Policy D5-16
ADMINISTRATION AND COMMUNICATION						
Communicat-ion within Council	To ensure that all Council works that may impact on existing street trees are carried out in a manner that minimises impacts on existing healthy & functional street trees	Liaise with other divisions of Council that conduct works that may impact on trees to identify projects that will require professional input from the Tree Management Team	- the Tree Management Team should be involved at the earliest possible stage to ensure that designs are considerate of existing vegetation - capital works programs for other divisions of Council to be distributed to the Tree Management Team at the start of each financial year		Damage to trees during 'in-house' projects minimised	Street Tree Strategy 2.8 Commun-ication
			- maintenance programs for engineering section to be forwarded to the Tree Management Team at the start of each financial year - Forward information on new projects arising through MANEX meetings etc onto the Tree Management Team			

ADMINISTRATION & COMMUNICATION

ISSUE	POLICY OBJECTIVE	ACTION	COMMENTS	PRIORITY	PERFORMANCE INDICATOR	REFERENCE
		Provide arboricultural advice to other divisions of Council regarding protection of existing trees during construction and maintenance projects	- Council arborists will conduct preliminary tree assessments prior to finalising designs to ensure that high amenity value trees are successfully retained and protected - Council arborists should be provided with relevant information with adequate lead time to inspect the site and provide advice (minimum 21 days)		Arborists advice provided on all Council projects affecting trees	
		Provide arboricultural services to other divisions to minimise impacts on existing street trees	- e.g., If they are made aware with adequate lead time, Council arborists can carry out crown lifting to allow better access for heavy machinery and reduce the incidence of branch damage.		Arboriculture services provided on Council projects as needed	
	To ensure that all development works with in the North Sydney Council area take into consideration the protection of existing street trees	When assessing development applications Council assessors consider public trees outside of the property to be developed.	- Council's in-house mapping system has a street tree layer that shows species and dimensions of all street trees		Number of street trees protected during development	LEP 2010 DCP 2010
		Make sure that 'complying' developments that do not require DA consent also consider street trees	- All private certifying authorities should be made aware of the need to consider trees outside of the subject property		Independent Certified Asssors identify street trees requiring protection.	
		Develop a digital flyer for distribution to all potential developers and all building and development assessors.	- This includes both council staff, external private certifiers, landscape architects, architects etc - Flyer could also highlight all the benefits of protecting existing mature trees.	MT O	Flyer developed and regularly distributed	

ADMINISTRATION & COMMUNICATION

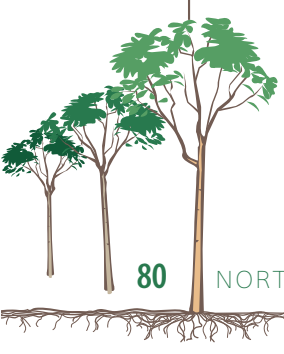
ISSUE	POLICY OBJECTIVE	ACTION	COMMENTS	PRIORITY	PERFORMANCE INDICATOR	REFERENCE
	To ensure that all new trees planted by other divisions of Council are in accordance with the objectives of the Street Tree Strategy and provide maximum long term benefits to the community	Publicise the Street Tree Strategy within Council	- copies of this document to be provided to all divisions of Council that carry out work that may impact on street trees		High level of in-house awareness of Street Tree Strategy	
		Advise other departments in relation to species selection and appropriate planting locations	- the Tree Management Team will become responsible for the long term care of all new street trees and accordingly, should be involved in the species selection process - e.g., Mainstreet programs, CBD strategies		New trees are of appropriate species planted in appropriate locations	
Community consultation	To ensure that the community is aware of the Street Tree Strategy and the objective of the Tree Management Team to provide the highest level of benefits using available resources in the most cost effective manner	Publicise the Street Tree Strategy	- place this document on public exhibition and elicit community comment prior to adoption. - once adopted, provide community access to the Street Tree Strategy - e.g., web based access, copies in Stanton Library etc.		High level of community awareness of the Street Tree Strategy	
		Refer to the Street Tree Strategy in all correspondence relating to trees	- e.g., when responding to community requests and queries		High level of community awareness of the Street Tree Strategy	
	To ensure that the community is Appropriately consulted regarding tree work, tree removals and tree planting	Carry out community consultation in accordance with the Street Tree Strategy	- good community consultation will prevent misinformation and provide the community with an understanding of the complexities of tree management		Number of complaints regarding tree work decreasing	

ADMINISTRATION & COMMUNICATION

ISSUE	POLICY OBJECTIVE	ACTION	COMMENTS	PRIORITY	PERFORMANCE INDICATOR	REFERENCE
Record Keeping	To maintain accurate tree records to ensure that sound management decisions are made	Maintain the North Sydney Street Tree Database with comprehensive data updates every five years	- technological advances allow the database to be improved including GPS locating of individual trees and cross referencing with existing Council mapping systems - aerial photographs allow detailed mapping of % canopy cover		Database records accurately reflect tree population	Street Tree Strategy 2.8 Administ-ration
	To maintain accurate performance records to ensure that Council staff are providing services in accordance with industry best practice and that maintenance targets are being met	Maintain spreadsheets detailing maintenance cycles and timeframes to complete each sector	- some sectors will take longer than others however a complete cycle should be completed within 18 months - accurate performance records are necessary to provide estimate timeframe responses to resident requests		Accurate records maintained	
Staffing & Equipment	to ensure that all staff are appropriately trained and have the necessary equipment to safely and efficiently carry out tree maintenance in accordance with industry best practice	Conduct regular reviews of staff skills and training in relation to position descriptions and key tasks	- staff are encouraged to attend seminars & conferences, as well as to undertake formal training courses.		Staff appropriately trained	
		Conduct regular reviews of existing plant and equipment and upgrade or replace as appropriate	- technological advances in plant and equipment can significantly increase performance & output		Plant & equipment is adequate, cost effective and efficient	

Part 4

APPENDICES



SUMMARY OF AUSTRALIAN STANDARD FOR PRUNING OF AMENITY TREES (AS4373 – 2007)

Summary of Australian Standard AS 4373:2007

(Pruning Amenity Trees, Pruning Types and Suitability Pruning Amenity Trees Pruning Types, Classes and Suitability)

Pruning Type: Crown Maintenance		
Class	Code*	Species Restrictions
General pruning	G	a
Thinning	T	a
Dead wooding	D	a
Selective pruning	S	a
Formative pruning	F	a
Pruning Type: Crown Modification		
Class	Code*	Species Restrictions
Reduction pruning	R	r
Crown lifting	C	a
Pollarding	P	df
Remedial pruning	H	c
Line clearance	L	a

*The code is a symbol to represent the pruning class in the same row of the Table to the left. It is intended to be a useful way of referring to classes of pruning when writing specifications.

Legend	
a	Pruning type is suited to all species
r	Pruning type is restricted to trees with suitable secondary branches
d	Pruning type is suited only to deciduous trees
f	Pruning type is suited only to trees fromatively pruned to achieve the required result
c	Carried out only on demaged, declining or diseased trees

4 CONSIDERATIONS BEFORE PRUNING

Prior to pruning being prescribed or undertaken a thorough inspection of the tree should be carried out by a person competent in arboricultural assessment (minimum AQF Level 3 in arboriculture). This should include an assessment of the tree's health, growth habit, structure, stability and growing environment. The need for pruning should be determined. If pruning is required then the current and subsequent pruning requirements should be specified. Clause 7 covers types of pruning. The tree should not be adversely affected by pruning. The inspection should consider hazards, habitats, species, age, condition, wind loading, location and the timing of the tree's biological processes. The distribution of the foliage and wound size should be considered. The potential impacts of the proposed pruning on the health, structure and amenity of the tree should also be considered.

Notes:

1 Reference should be made to any relevant legislation including planning, heritage and protected species.

2 Tree work is inherently hazardous and should be carried out by a person suitably qualified and experienced in arboriculture (minimum of AQF Level 2 in arboriculture). Work should be performed in accordance with relevant OHS guidelines.

3 The person carrying out the assessment should have a minimum qualification of AQF Level 3 in arboriculture.

4 Trees with hollows or other likely habitat may need further assessment by an ecologist or wildlife specialist.

7 PRUNING CLASSES

7.1 General

Before the selection of a pruning class, the reason for pruning should be carefully considered. The arborist should take into account the points set out in Clause 4. More than one class of pruning may be required for a particular tree. With the exception of pollarding and remedial pruning, all classes are based on the principles of natural target pruning. Types of pruning are described according to the classes listed in Table 1 and defined in Clauses 7.2 and 7.3. Some pruning classes are only applicable to certain tree types. Specific pruning requirements vary between species and location.

7.2 Crown maintenance

7.2.1 General

Crown maintenance is pruning according to the growth habit of the tree. It includes deadwooding, crown thinning, selective pruning and formative pruning as discussed below. It does not reduce the volume of the crown and retains the structure and size of the tree.

7.2.2 Deadwooding (D)

Deadwooding is the removal of dead branches (see Figure 3). The minimum diameter and location of branches to be removed shall be specified.

NOTE: Habitat values should be considered (see Clause 4).

7.2.3 Crown thinning (T)

Crown thinning (see Clause 3.16) reduces canopy density through the removal of lower order branches whilst retaining the main structural branches of the tree. The percentage of the crown to be removed shall be specified. The maximum diameter and location of any branches to be removed should be specified.

Notes:

1 Selective thinning may be carried out to increase light penetration and air movement through the crown, for formative pruning or to restore views. Deadwooding normally forms part of this class of pruning.

2 The percentage of a canopy that can be removed without having a detrimental effect on tree health and vigour is species and age specific (see Clause 4).

3 Thinning should not produce the effect of 'lion's tailing' or 'feathering'.

7.2.4 Selective pruning (S)

Selective pruning (see Clause 3.40) may be used to remove identified branches that are causing a specific problem. These branches shall be specified at the time of assessment.

7.2.5 Formative pruning of young trees (F)

Figure 4 shows a diagrammatical representation of formative pruning of young and developing trees. The aims of formative pruning are—

(a) to enhance form and improve structure, or to directionally shape the young tree;

(b) to reduce the development of structural weaknesses;

(c) as a precursor to more specialized pruning; and

(d) to accommodate site constraints and reduce encroachment on utilities or buildings as the tree grows.

NOTE: With small diameter branches it may be necessary to reduce a branch to a dormant bud.

7.3 Crown modification

7.3.1 General

Crown modification is the pruning that changes the form and habit of the tree. It includes reduction pruning, crown lifting, pollarding and remedial (restorative) pruning. (see Clauses 7.3.2 to 7.3.5).

7.3.2 Reduction pruning (R)

For reduction pruning the ends of branches are removed to internal lateral branches or stems (see Figure 5). The extent of crown or limb reduction shall be specified at the time of assessment.

Notes:

1 The lateral branch to which the final cut is made should be at least one third of the diameter of the branch being reduced at the point of the final cut. This may be difficult to achieve in remedial pruning and line clearance work.

2 Reduction pruning is not lopping or topping.

7.3.3 Crown lifting (C)

Crown lifting is the removal of the lower branches. Clearances shall be specified (For young trees see Clause 6.4). The maximum diameter and location of the branches to be removed should be specified.

7.3.4 Pollarding (P)

Pollarding is a specialized pruning technique that establishes branches ending in a pollard head of buds and vigourous shoots. Trees are cut back to just above the same point every 1 to 3 years resulting in the production of multiple shoots. When removing shoots, pollard heads should not be injured. Cuts should be made as close as possible to the swollen collars that surround each shoot (see Figure 6).

Notes:

1 This pruning process is suited mostly to deciduous trees that have been formatively pruned at an early age and should not be carried out on mature trees that have not been previously pollarded.

2 Pollarding is not lopping, topping or coppicing.

3 Trees pollarded initially and not regularly maintained can become hazardous.

7.3.5 Remedial (restorative) pruning (H)

This type of pruning shall only be carried out on trees which have lost their natural form and structure through storm damage, mechanical damage, vandalism, lopping, dieback or disease. This method is usually only used when all other approaches have failed and replacing the tree is difficult. The purpose of this pruning is to prolong the useful life expectancy of such trees and to reduce their hazard potential. This type of pruning removes damaged, diseased or lopped branches back to undamaged or healthy tissue. The final cut may not necessarily be at the branch collar. The aim is to

induce the production of epicormic shoots from which a new crown is intended to be established. To achieve this, regrowth should be managed by reduction pruning or crown thinning.

Notes:

1 This type of pruning should be done in several stages in an attempt to induce stable and successful regrowth.

2 Consideration should be given to removing dangerous trees.

3 Remedial pruning may create hazards from weak branch attachment. Trees should be carefully monitored.

7.3.6 Line clearance (L)

Line clearance is pruning to maintain clearances around overhead services and is an

application of reduction pruning (see Clause 7.3.2).

Notes:

1 Reference should be made to relevant state legislation for line clearance.

2 Formative pruning should be used to establish a suitable framework (see Clause 7.2.5).

3 The amount to be removed should consider the characteristics of the species, growth rate and response to pruning. The potential impact of the pruning on the health, structure and amenity of the tree should be considered.

8 UNACCEPTABLE PRACTICES

8.1 Lopping and topping

Lopping (see Clause 3.31) and topping (see Clause 3.44) are unacceptable practices for the following reasons:

(a) They increase the rate of shoot production and elongation.

(b) The resulting regrowth is weakly attached and becomes prone to failure or collapse.

(c) The stubs may decay.

(d) The natural habit of the tree is destroyed.

(e) They may reduce the lifespan of the tree.

(f) They predispose trees to fungal infections and insect attack.

8.2 Wound painting

In theory, wound dressings or paints are meant to prevent decay, stimulate wound closure and improve the appearance of a wound. Extensive research has shown that there are no wound dressings that prevent decay. Most dressings have no effect on wound closure and some damage tree tissues and may improve conditions for wood decay fungi. The colour and texture of most paints is far from natural. The best practice is to prune to the appropriate positions outlined in this Standard and do not use wound paints. If natural target pruning is followed, the tree's own protective mechanisms will normally provide adequate defence.

8.3 Flush cutting

This is a method of pruning that was quite common for many years, however it is now considered to be unacceptable and detrimental to tree health and structure. This practice that damages or removes the branch collar is unacceptable for the following reasons:

(a) It removes or damages the branch collar and stem tissue. These features define and enclose a range of chemical defences that the tree has in place for the eventual and natural decline of the branch.

(b) A larger wound is created.

(c) The tree uses more energy and relies on stored starch reserves to deal with the wound; this energy is then unavailable for other essential processes.

(d) The exposed wood is prone to decay.

(e) Long term defects such as cavities may eventuate.

NORTH SYDNEY COUNCIL

PRE-PLANTING SITE ANALYSIS CHECKLIST

Location: .....

Inspector's Name: ..... Date: / /

PHYSICAL CONSIDERATIONS

A tick (✔) defines a "Yes" answer

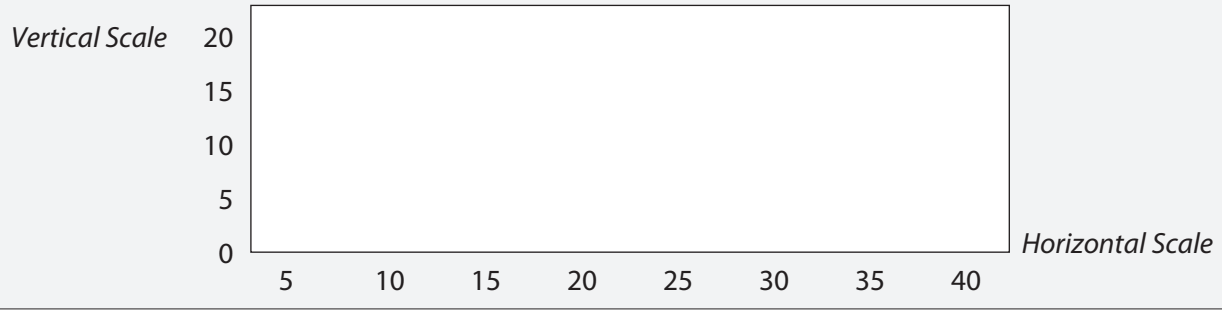
ROAD DETAILS	
Road width	☐ 6 lane ☐ 4 lane ☐ 2 lane ☐ 1 lane
Road type	☐ main arterial ☐ secondary arterial ☐ residential ☐ laneway
Speed limit (km/hr)	
Parking	☐ parallel ☐ angle 45 ☐ angle 90 other .....
Demand for spaces	☐ high ☐ moderate ☐ low time limits (hours) .....
Traffic control devices	☐ lights ☐ roundabout ☐ speed humps ☐ chicanes
Kerbs and gutters	☐ concrete ☐ swale (no kerb)
Driveways	spacings (m) .....

VERGE QUALITIES	
Nature strip and footpaths	Width (m)..... Surface material ☐ turf ☐ concrete ☐ pavers other .....
Overhead Services	☐ electricity mains ☐ service wires ☐ aerial bundled cable other .....
Height above ground (m)	
Signage	☐ roadsigns ☐ traffic lights
Street Furniture	☐ seats ☐ bus shelters ☐ bollards other .....
Underground Services	☐ telephone ☐ electricity ☐ gas ☐ water ☐ sewer ☐ stormwater other .....
Structures	☐ fences ☐ gates and access Potential for root damage .....

SITE DETAILS	
Soils	Subgrade ☐ sandstone ☐ shale ☐ fill other .....
Soils	Topsoil ☐ sand ☐ clay ☐ loam depth (mm) .....
Shading	% of the day in shade
Bushfire issues	Aspect - N, S, E, W ..... Slope ☐ slight ☐ steep Winds ☐ exposed ☐ sheltered ☐ salt laden ☐ dry wind tunnel effects ..... Vegetation ☐ dense ☐ sparse Location ☐ proximity to bushland ☐ high fuel loads
Existing Character	☐ scenic views ☐ natural areas ☐ architectural style or period
Buildings	Purpose ..... Average setback ..... ☐ awnings Redevelopment ☐ likely ☐ unlikely

HORTICULTURAL QUALITIES	
Desired Function	☐ shading ☐ screening ☐ softening ☐ linking habitat/corridor etc .....
Desired characteristics	Tree height (m) ..... Tree spread (m) ..... ☐ evergreen ☐ deciduous Height to first branch ..... Trunk diameter .....
Form	☐ columnar ☐ narrow dome ☐ broad dome ☐ conical ☐ vase shaped
Growth Habit	☐ open ☐ dense ☐ flowers ☐ fruit
Planting Details	Container size ..... ☐ tree furniture Approx number of trees ..... Distance btw trees .....
Spacing and Layout	☐ formal ☐ informal
Consultation	☐ Adjacent Residents ☐ Community groups ☐ Councillors ☐ Other

CROSS SECTIONAL SKETCH OF STREET



Tree Removal Notification Form

Issue	Details to be recorded by assessing arborist	Actions needed
Date of inspection		
Approximate date of removal		Letters distributed by arborists approx 1 week before proposed date of removal
Number of trees to be removed		Letter created by Admin officer
Species of tree to be removed Tree 1		If more than 3 trees to be removed, notify Technical officer for possible inclusion on Streetscape Program
Tree 2		
Tree 3		
Address of tree(s) to be removed – house number, street name, other details (between which streets, or on which corner ie nth east, sth west etc)		- Tree(s) to be added to stump grinding list. - List to be located where staff can tick off trees once they are removed. - Purchase order for stump grinding to be raised by Supervisor - List to be maintained by tree supervisor - Stump grinding to be completed within 14 days of tree removal
Location of tree(s) to be removed – specific details ie growing in nature strip, road shoulder, on embankment, in planter bed etc		
Reason for removal – eg in decline, in poor condition, overcrowded, in way of new development work etc.		
Who will do the work - Council/ Contractors		If contractors, Purchase order to be raised by Parks Supervisor
Replacement species		
If tree is not to be replaced, details of why, eg, insufficient space, inappropriate location for a tree etc.		
If tree is not to be replaced, details of what will be done with tree site eg paved over, grassed over		Tree site closure to be arranged Site to be closed over within 14 days of stump grinding
Number of replacement trees		New trees to be ordered by Supervisor
Container size of replacement tree		

Issue	Details to be recorded by assessing arborist	Actions needed
Location of replacement trees if different from removed tree		
Mature height of replacement tree		
Mature crown width of replacment tree		
Replacement tree is: native / indigenous / exotic / deciduous		
Special feature of replacement tree (reason for choosing it) eg – matches others in the street, attractive flowers, autumn colour, winter sunlight, attracts birds, provides habitat etc		
Location or address where mature example of replacement species can be seen (address in nth sydney or photos in strategy doc?)		
Barricades with notices will be put out the day before work takes place – YES / NO		

TREE REMOVAL NOTIFICATION LETTER

DATE

NAME
STREET
Suburb, state, postcode

Dear Sir or Madam,

RE: Removal of _____ (species) tree growing at _____ (location – house number, street name)

North Sydney Council's Parks Department wishes to advise local residents that the _____ (species) tree growing in _____ (planting location ie – the nature strip, road embankment, park, planter bed etc) at _____ (address – house number, street, between which cross streets on which corner etc) has been scheduled for removal.

This work has been deemed necessary as the tree _____ (reason for removal – is in advanced decline, poor structure, etc).

The tree will be replaced with _____ (quantity) _____ (species). This species grows to approximately _____ (height) by _____ (width) and is a _____ (native / exotic / deciduous) tree that provides _____ (flowers, autumn colours, winter sunlight, attracts birds, matches others in the street etc). Mature examples can be seen at _____ (location of proposed species – eg further along the street or another address from list in Strategy document)

The work is programmed to take place within the next _____ (timeframe) weeks and will be carried out by _____ (council staff / contractors). During the work residents may be required to make alternative parking arrangements. Where this is necessary, baricades will be placed in the street the night before work commences. Resident cooperation in this respect will be greatly appreciated.

Any owner/resident who requires further information should contact Council's Parks Department on 9936 8100.

Yours faithfully

Tree Management Officer, Parks Department

GENERAL TREE MAINTENANCE NOTIFICATION LETTER

DATE

NAME
STREET
Suburb, state, postcode

Dear Name,

RE: Request for maintenance on Street Tree(s) in STREET

North Sydney Council wishes to advise that your request regarding the tree(s) at the above location has been considered. An officer from the Tree Management Team has inspected the tree(s) and advises that the work requested has been classified as GENERAL MAINTENANCE. In accordance with Council's Street Tree Strategy, work of this nature will be programmed to occur during normal scheduled maintenance.

The North Sydney area contains over 16,500 street trees and to ensure effective and efficient tree maintenance, the Council area has been divided into precincts, which are attended to in order. It takes approximately 18 months for staff to complete a maintenance cycle. It is anticipated that staff will attend to your request in approximately _____(Number) months.

If you wish for works to occur prior to the timeframe indicated, then Council policy allows for residents to engage private contractors to carry out the work at their own expense. To pursue this course of action please contact Council's Tree Preservation Officer on 9936 8100. Any work carried out on public trees must be done by a qualified (level 3) Arborist and under Council supervision. Council will need to be notified of the proposed contractor and work date at least 7 days in advance.

Further information on Street Tree Maintenance is available on Council's website at www.northsyney.nsw.gov.au or alternatively contact the Parks Department on 9936 8100.

Yours faithfully

Tree Management Officer, Parks Department

Report on Tree or Branch Failure

ADDRESS _____

INSPECTING OFFICER _____

DATE _____ TIME _____

Notification Details *Brief overview of how and when staff became aware of the incident*

Tree Description *General description: type of tree, location, size. If possible, a* ***photograph of the tree***

Branch Description (or pruning description) *size of branch(es), height of attachment point, diameter of branch, description of how or why damage occured*

Weather Conditions *Brief description of the weather conditions on the day and preceeding days*

Damage Report *Details of damage caused including rego number and vehicle description if a vehicle was involved*

Contact Details *Details of any persons involved in the incident ie, property owner, vehicle owner, witness, contractors*

Attach Photographs to back of this report

STREET TREE REPLACEMENT PROGRAM

STREET	ISSUES	COMMENTS	SPECIES	COMMENCED
Arthur St	- Trees butchered by EA - Harbour Views - Inappropriate species	Mix of Euc citriodora, jacaranda, Euc nicholii, Liquidamber, crepe myrtle under wires. Residents surveyed late 2002	Lagerstroemia indica	Mar 03 by Active
Abbott Street	- btn Palmer & Miller	Vacant spaces between existing Callistemon. Poor condition brushbox to be removed near Norths Club. Planted approx 8 new bottlebrush.	Callistemon Viminalis	Letterbox April 2010
Atchison Street	Btn Zig Zag lane and St Thomas Rest Park	Residential area. Large proportion of vacant sites highlighted in 2008 audit. Notified residents of intention to plant and gave opportunity to decline a tree o/s their property.	Lophostemon confertus, Callistemon viminalis & Photinia x fraseri 'Robusta'	Letterbox drop May 2010
Balls Head Road	- Environmental weeds close to bushland	Replacement of African Olives with mix of Angophora, Bottlebrush, Banksia	Mixed Indigenous	Completed
Bannerman St	- Vacant spaces	Replacement of large trees removed a few years ago, numerous vacant spaces. Many existing trees are just small prunus cerasifera	Proposed Lagerstroemia Indica	Survey done Winter 09
Bank Street	- Vacant spaces - inappropriate species	Lots of Coral trees. Aged & declining trees. No formal survey done. Infill planting with mix of natives	Pittosporum rhombifolium, Banksia integrifolia, Callistemon viminalis	Commenced around 1998
Barry Street	- Poor form under overhead wires. Root damage to infrastructure	Older Sapium sebiferum trees repeatedly 'topped' by Energy contractors	Lagerstroemia indica 'Lipan'	Commenced around 2010
Bay Road	- Vacant spaces	Infill planting between shops and Pacific Hwy	Callistemon Viminalis	Commenced around 2007
Bellevue Street	- Amhurst to freeway - Lack of trees - Aesthetic improvment	Planting of Jacaranda in verges and along centre line of road to match existing planting theme. Underplanting of agapanthus	Jacaranda mimosifolia	1998
Bellevue Street	- Palmer to Amhurst - Tree surrounds damaged & some Jacs in poor condition	Replacement of some trees in consultation with engineers resheeting road surface	Jacaranda mimosifolia	2010
Ben Boyd Lane	- Inappropriate trees - Root damage	Replacement of 9 Evergreen Alders in very narrow verge (1m) causing damage to private and public structures, with Mop Top Robinias to match other side of lane.	Robinia 'Mop Top'	November 2001

STREET	ISSUES	COMMENTS	SPECIES	COMMENCED
Ben Boyd Road	- Environmental weeds - Slip hazard on berries. - Aged and declining trees	Replacement of African Olives and other mixed plantings (Camphor, Brushbox, Plane, Paperbark) with Dwarf Evergreen Magnolia	Magnolia grandiflora 'Little Gem'	October 2000 2-3 years to stage two
Benelong Road	- Traffic vision - Poison problems	Replacement of Oleanders. No survey process as being done gradually and no species choice due to existing planting theme.	Agonis flexuosa Tristaniopsis laurina	1995
Berry Street	Pacific Hwy & Edward st - Lack of trees between	Infill planting of Sapiums at residential end near Edward Street	Sapium sebiferum	Complete
Burlington Street	- Lack of trees	Infill planting of Photinia x fraseri Robusta in vacant spaces in street of mixed planting Photinia, Euc etc	Photinia x fraseri 'Robusta'	1997
Burroway Street	- Vacant Spaces - Inappropriate species	Conifers under wires, poor condition jacarandas, Existing trees mixed in species, lots of vacant spaces. Surveyed and poor response and 50/50 in favour. Proposed Photinia		Surveyed 09, residents not in support
Carabella Street	Between Peel & Holbrook	Existing Eucs in decline. Requests from community	Jacaranda mimosifolia	Commenced around 2000
Carlow Street	As above	As above - surveyed again with 88% in favour of staged replacement. Remove 5 and plant 13 in stage one.	Qld Firewheel and Crepe Myrtle	Surveyed again Sept 2011
Clark Road	- Poor cond & form brushbox damaging awnings	Survey done and all trees across front of shops removed (5) and replaced with Crepe Myrtles (11)	Crepe Myrtle Indian Summer 'Biloxi'	Completed by Active Mar 03
Colin Street	- old trees removed & vacant spaces at north end	Survey of adjacent 9 properties only (63-85). Proposed 4 new Watergum & replace existing bitumen with lawn to match rest of street. All those adjacent to proposed tree said no to trees so only the turfing done.	Tristaniopsis laurina	Surveyed December 2010
Cowdroy Avenue	Narrow verge	Opportunity to plant new trees at western end. Residents surveyed. 3 New trees planted.	Lagerstroemia indica 'Lipan'	June 2013
Dennison Street	- Existing trees poor condition and being damaged by trucks	Replacement of growing media in 15 commercial sites. Existing Elaeocarpus being driven over and in poor cond due to construction rubble in tree pits. Installed new timber tree guards	Elaeocarpus reticulates	Completed by Garden Makers June 2008
Earle Street	Between Yound Street & Park Ave - existing bottlebrush in poor condition	Interplanting between existing callistemon citrinus with callistemon viminalis. Notification only.	Callistemon viminalis	Notification Dec 2010
Ellalong Road	from Lodge Road to Wyong Road - Declining trees	Replacement of aged Cheese trees	Jacaranda mimosifolia	September 1998

STREET	ISSUES	COMMENTS	SPECIES	COMMENCED
Ellalong Road	- Declining trees from Lodge to Fifth Avenue - root damage - views	Existing cheese trees (7) are in average condition. Residents surveyed and offered Japanese Maple or Melaleuca bracteata (10)	Acer Palmatum	Completed by Plateau March 2003
Ennis Road	- African Olives creating slip hazard - vacant spaces	2 olives removed and interplanting carried out with species to match streetscape planting in Kirribilli cbd. 2011 Removal of 2 large casuarinas near roundabout due to root damage to pavement	Gleditsia triaconthos Sunburst	June 2004 Further works 2011
		Further works undertaken in ensuing years and in 2010 notification sent out regarding staged replacement of 3 large Casuarina cunninghamianas. Removal of 1 x 15m+ and planting of several gleditsia	Gleditsia triacanthos Sunburst	Dec 2010
Edward Street	- vacant spaces	Infill planting	Sapium sebiferum	Completed
Falcon Street	- Plane tree management	Interplanting of more Planes. Removal of poor, leaning, obstructing Planes. Removal of 11, planting 45. Notification of stage 2 works sent in May 2010.	Platanus Orientalis	Commenced June 2007. Ongoing
Fall Street	- Lack of trees	Interplanting of existing Camellia sasanqua with more of same. Not strong support for trees (views)	Camellia sasanqua	Completed
Fernhurst Avenue	- Inappropriate trees - Root damage occuring - district views	Hills weeping Figs regularly topped to 5m due special agreement with past mayor. Staged replacement with dwarf Lilly Pilly	Syzigium leumanniana	Commenced 1996 Completed
Fifth Avenue	- lack of trees	Infill planting of Photinia, Residents surveyed and concerned about views	Photinia x fraseri Robusta	Commenced 2000
Grasmere Road	- Ben Boyd to Park Avenue - vacant spaces, views	Infill planting between existing Lilipilli & paperbark. Species choice dependent on views. Also have granted permission to last residents at west end to plant citrus & prunus on verge and they will maintain.	Buckinghamia celsissima & Syzigium leumannii	Commenced Sep 2008
Hayes St	- vacant sites & some existing palms in poor cond	Removed & replaced 5 poor condition palms & created 7 new tree sites. New sandstone surrounds. Removed rubber & refurbished growing media. Streets alive program to underplant in tree sites	Howea fosteriana	November 2008
Hazelbank Road	Btn King Street & Ivy Street	Removal of a row of African Olives from along the edge of the park. No replacement as juvenile Planes already planted. Strong support.	Platanus	Completed winter 2000

STREET	ISSUES	COMMENTS	SPECIES	COMMENCED
Hazelbank Road	Btn Ivy Street & Pacific Hwy	Replacement of 6 Planes that had been removed since Feb 08. Proposed installation of 22 new trees (7 of which may affect parking spaces) all into concrete kerbed sites in Road shoulder.	Platanus	Letterbox drop May 2010
Highview Street	- lack of trees - poor cond nicholiis - district views	New species to be determined by survey. Existing plantings of Hibiscus and Euc nicholii to be replaced with Sapium	Sapium sebiferum	Commenced 2002
Holdsworth Street	- lack of trees - district views	Infill planting of Lemon Scented Tea Tree	Leptospermum petersonii	1995 completed
Huntingdon Street	- lack of trees	New tree sites cut into full concrete verges along full length of both sides of street. Choices given but most popular was crepe myrtle	Lagerstroemia indica	Completed Mar 2006
Illiliwa Street	- lack of trees - mix of species with traffic vision issues - resident enthusiasm	Replacement of hibiscus and bottlebrush with peppercorns along verges and along centre line of road. Trees in road with concrete rings and underplanting of Gazania.	Schinus ariera	October 1997
King Street	- inappropriate species - root damage to services & structures	Replacement of Casuarina cunninghamiana in narrow grass verge under power lines with Bottlebrush to match rest of street. Stage 2 done 2002	Callistemon Kings Park Special	May 1999 Next stage 2 years
King George Street	- inappropriate species - pedestrian hazard	Five Casuarina cunninghamiana in narrow full concrete verge on steep sloping pathway. Fruit and needles cause trip hazard. Heritage area	Elaeocarpus reticulatus Ballerina low fruit variety	Completed 02 by Plateau
Miller Street (Lower end btn Blue Street & Lavender Street)	- declining trees - root damage to private & public structures & services	Replacement of aged Camphorlaurels with Blueberry Ash. Survey, report to Council, Public Meeting, another report to Council. 4 trees east side 1999, 4 trees east side Sept 2000, last 2 trees east side Nov 2001, assess and possibly 4 trees west side 2002.	Elaeocarpus reticularus	October 1999
Lithgow Street	- poor form under wires - diseased	Removal and replacement of 14 Chinese Tallow trees in poor condition. Residents surveyed. 18 New trees planted. Mixed species.	Grevillia 'Moonlight' Lagerstroemia indica 'Sioux' and 'Lipan'	October 2015
Lumsden Street	- lack of trees - aesthetics - resident enthusiasm	Planting of mix of medium shrubs with gardens around bases. Resident working bee held under 'Streets Alive' program.	Gordonia axillaris, Brunsfelsia bonodora Camellia sasanqua	Completed with community working bee
Lumsden Street	- vacant sites on upper side	Planting small growing trees on upper footpath. Small sites. 18 trees planted. Notification only	Lagerstoemia indica 'hopi'	October 2014

STREET	ISSUES	COMMENTS	SPECIES	COMMENCED
Lytton Street	- ageing existing trees - vacant spaces	Existing Camphors close to SULE, Residents concerned about loss of trees from the street over past few years and requested more planting	Jacaranda mimosifolia	December 2003
Mackenzie Street	- lack of trees - root damage as above	Replacement of aged Camphorlaurels (5) with Blueberry Ash and many new plantings (appr 25) in vacant spaces. 2 Camphors removed 2000, remaining 3 2009 after reports and councillor inspection	Elaeocarpus reticulatus	Commenced March 2000 Completed 2009
Macpherson Street	- busy street - vacant spaces	Existing Queensland Brushbox. Infill planting	Lophostemon confertus	December 2014
Merlin Street	- inappropriate trees - root damage	Casuarina cunninghamiana planted at property alignment	Callistemon viminalis	November 2007
Milson Road (5-9)	- inappropriate trees significant path damage from roots - vehicular damage from rear to kerb parking	Replacement of 9 poor condition semi mature paperbark under wires. New planting back at property line. Renewed footpath and kerb	Callistemon Kings Park Special	Completed November 2001
Murdoch Street	trees indecline	Ageing nicholiis near Military Road. Rest of street planted with Angophora and Melia. 5 nicholiis removed & 24 Angophoras planted btn Rangers and Military	Angophora costata	Commenced March 2003 by Plateau
Montague Street	- lack of trees - inappropriate trees	Vacant spaces highlighted in 2008 audit. Some African Olives exist but street mostly Callistemon	Callistemon	Commenced winter 2009
Nicholson Street	- lack of trees	Mix of species, large vacant stretches of street and some old declining trees	Jacaranda east side Callistemon west side	Commenced August 2004 by Plateau
Oaks Ave	- lack of trees - inappropriate trees	Mix of Brushbox, blueberry ash, crepe myrtle, camphor, euc fici in various states of decline. Surveyed and proposed mix of Crepe Myrtle, Callery Pear and Lemon scented tea tree to be planted in direct response to residents wishes. Removal of 7 existing poor trees and planting of 37 new trees	Crepe Myrtle, Callery Pear and Lemon Scented Tea Tree	Commenced Winter 2011
Parkes Street	- existing planes mangement issues - vacant spaces	- root damage to adjacent walls & courtyard. Excavation and root pruning not effective - vacant spaces due to earlier removals of large Acacia elatas - issue of street tree removal and new plantings subject of sereral reports to Council early 2009	Lagerstroemia indica	Survey completed May 2009

STREET	ISSUES	COMMENTS	SPECIES	COMMENCED
Plunkett Street	No trees	Narrow full concrete verges but residents keen for trees. Conducted letterbox drop proposing 7 sasanqua camellias. Several objections. Propose to reduce number of trees to just outside those properties that requested them	Camellia sasanqua 'jennifer sussan', 'snow cloud', 'pure silk'	Letterbox drop May 2009
Priory Road	And also Toongarah Road Poor condition trees	Letterbox dropped affected households. Currently mixture of species. Propose mix of Eucs	Eucalyptus ficifolia, Eucalyptus sideroxylon	March 2007 Stage 2 June 2010
Raleigh Street	Trees outgrowing sites Rood damage to infrastructure	Narrow footpath. Chinese Tallow trees outgrowing location. Scale infestation causing declining health. Full replacement	Pyrus calleryana 'Capital'	June 2014
Raymond Road	- narrow full bitumen verges - district views	Replacement of poor condition Euc Citriodora in very narrow verges	Callistemon Kings Park Special	1999
Reynolds Street	Vacant spaces Inappropriate species	Several over-mature Euc nicholii, numerous vacant spaces. Allowed residents to make individual choice of the two species as there was already big variety in street	Callistemon viminalis & Jacaranda mimosifolia	May 2006
Richmond Avenue	Aged & inappropriate mixed species Vacant spaces	Paperbarks, bottlebrush, Olives, Tamarix, Photinia, shrubs. Propose to remove 8 & plant 25. Residents allowed to choose preferred species.	Callistemon viminalis Magnolia soulangiana Photinia robusta 'Glabra'	Surveyed December 2010 Planted autumn 2011
Rocklands Road	Aged & inappropriate mixed species Vacant spaces	Paperbarks, bottlebrush, Olives, Tamarix, Photinia, shrubs. Propose to remove 8 & plant 25. Residents allowed to choose preferred species.	Callistemon viminalis Magnolia soulangiana Photinia robusta 'Glabra'	Surveyed December 2010 Planted Autumn 2011
Rosalind Street	Ageing Paperbarks Root damage	New species determined by survey. Stage 2 done 2003. Approx 3-5 Paperbarks to be removed & replaced each year.	Callistemon Kings Park Special	Commenced April 2002
Ryries Parade	Lack of trees District views	Infill planting in vacant sites, area with extensive views. Stage 2 work done in July 2003 by Plateau (45 camelias)	Camellia Sasanqua Jennifer Susan, Snow Cloud, Pure Silk	February 2000 Next stage 3-5 years
Shellcove Road	Declining trees	Replacement of aged Jacarandas with more of same in road shoulder with concrete rings and agapanthus underplanting	Jacaranda mimosifolia	February 2001 Stage 3 completed 2009
Shellcove Road		Another section of Shellcove between Honda & Billong Street was undertaken in response to community requests as there were no tree. 15 trees planted	Lagerstroemia indica 'Sioux'	October 2015
Sutherland Street	Declining trees Vacant spaces	Propose removal of 9 declining callistemon towards west end and planting 37 new callistemon along length	Callistemon viminalis	Winter 2009

STREET	ISSUES	COMMENTS	SPECIES	COMMENCED
Telopea Street	Vacant spaces	Interplanting between existing Brushbox in road shoulder and prunus, hibiscus, etc in verges. Offered Angoph, Jac or Bbox. Equal votes for each so stick with existing sp.	Lophostemon confertus	July 2007
Toongarah Road	And also Priory Road Poor condition trees	Letterbox dropped affected households. Currently mixture of species. Propose mix of Eucs	Eucalyptus ficifolia, Eucalyptus sideroxylon	March 2007 Stage 2 June 2010
Undercliff Street	Inappropriate trees Root damage District views	Replacement of paperbark and other mixed species in very narrow full bitumen verge with Camellia sasanqua	Camellia sasanqua Snow Cloud, Jennifer Susan, Pure Silk	March 1999
West Street	Declinging Fraxinus	Removal of approx 10 poor fraxinus and replace with mix of trees	Jacaranda, Qld Firewheel, Brushbox	May 2007
Wood Street	Lack of trees District views Inappropriate trees	Interplanting between and removal of poor cond Illawarra flames under power lines	Callistemon salignus	2000
Young Street	Environmental weeds Pedestrian hazard	Gradual replacement of African Olives	Banksia serrata Banksia integrifiloia	Commenced 1995

STREETSCAPE EHANCEMENT PROGRAM

SAMPLE SURVEY LETTER

DATE

NAME
STREET
Suburb, state, postcode

Dear name of addressee

RE: Street Tree Replacement Proposal for Murdoch Street

In accordance with the North Sydney Council Street Tree Strategy, Murdoch Street between Military Road and Rangers Road, has been identified for Street tree replacement work. Murdoch Street has a mixture of plantings ranging from healthy recently planted trees to declining old trees that are nearing the end of their safe useful life.

Some years ago, Council commenced planting between the older trees with Angophora costata (Sydney Red Gums) of which there are several very old, heritage listed specimens growing along the front of SCEGGS school . These are proving to be very successful in the street with many of the new trees already flowering well. The proposal is to now remove a number of the older and unhealthier trees, particularly the Eucalyptus nicholiis (Willow Leafed Peppermints) at the Military Road end of the street and replace them where appropriate with more Angophoras (see attached plan).

Angophora costata is indigenous to the North Sydney Council area and is an important tree for local wildlife habitat. In Murdoch Street, this linear planting will contribute to the formation of a wildlife corridor linking the Willoughby Bay Bushland to that of Cremorne Point. Angophora costata grows to between 10-15m tall and it has an open branch structure that allows scenic views to be maintained through the crown.

To gauge community support for this project property owners in Murdoch Street are asked to study the information provided and to fill out and return the attached survey form. Residents will be notified of the survey outcome prior to the work taking place. Any property owner who would like further information about this project should contact Melissa McManus of the Parks Department on 9936 8436 (Tuesdays and Wednesdays).

Yours faithfully

Robert Emerson
Director of Open Space & Environmental Services

NORTH SYDNEY COUNCIL

SURVEY RETURN FORM

TO BE RETURNED TO COUNCIL by Friday August 9, 2002

Name

Address (Murdoch St)

(Please circle preferred response)

I/we agree that the declining Eucalyptus nicholii trees in Murdoch Street should be removed and replaced where appropriate, with Angophora costata

Yes / No

COMMENTS

Return to North Sydney Council (attention Melissa McManus) in one of the following ways:

E-mail; council@northsydney.nsw.gov.au

Mail; PO Box 12, North Sydney, 2059

Facsimile; 9936 8177

Excerpt from NSC DCP 2013 - Section 16 Tree and Vegetation Management

16.2.2 Provisions

Approvals General

P1 Pursuant to Clauses 3.1, 5.9(2) and 5.9AA of NSLEP 2013, Development Consent or a Tree Management Permit **is not required** for removal or pruning any of the following:

(a) non-prescribed trees or vegetation;

(b) trees that are declared to be dead or dying as confirmed by Council in writing;

(c) pruning of deadwood from a tree;

(d) noxious weeds as prescribed by the *Noxious Weeds Act, 1993*, other than mature canopy trees;

(e) trees or vegetation that are being maintained or removed by North Sydney Council staff (or their sub-contractors) on land under Council's ownership or care and control;

(f) trees that have been authorised to be removed or pruned pursuant to a Development Consent issued under the Act, but not prior to the issue of a Construction Certificate relating to that Development Consent;

(g) Cocos Palms (Syagrus romanzoffiana); or

(h) African Olive Trees (Olea Africana);

(i) trees or vegetation located on public land, but only if work is carried out by a person engaged by Council to do such work.

P2 Development Consent or a Tree Management Permit **is required** in accordance with Clause 5.9 of NSLEP 2013 for the removal or pruning of a prescribed tree or vegetation. The **following trees and vegetation are prescribed for the purposes of this DCP:**

(a) Any tree or vegetation on public land, regardless of size;

(b) Any tree or vegetation with a height of 10m, or a crown width of 10m, or a trunk circumference of 1.5m measured at 1m above ground level (existing); or

(c) Any tree that is declared a noxious weed and comprises a mature canopy tree;

(d) Any tree or vegetation more than 5 metre tall on land identified as a heritage item;

(e) Any tree or vegetation that is declared a noxious weed on land identified as a heritage item under cl.5.10 of NSLEP 2013 regardless of size;

P3 Council in determining an application for development consent or a Tree Management Permit under clause 5.9(3) of NSLEP 2013 must have regard to:

(a) the health or condition of the tree or trees, whether the tree is dead or dangerous, proximity to existing or proposed structures, interference with utility services, interference the amenity of any person or property;

(b) necessity for action in order to construct improvements to the property the subject of the application to achieve reasonable development;

(c) effects in the nature of erosion, soil retention or diversion or increases to overland flow;

(d) the number of trees in the surrounding area and the effect on the amenity of that area;

(e) the number of healthy trees that a given parcel of land will support; and

(f) whether the trees or vegetation in question provide habitat for fauna and/or canopy connectivity.

P4 In determining its approval under P2 and P3 Council may request the applicant to submit additional supporting documentation (e.g. an arborist or engineering report) to justify the removal of the tree or vegetation.

P5 Council does not support the removal of trees or vegetation as a result of:

(a) leaf, fruit, flower, bark, cone or twig drop; or

(b) blocked water, sewer or stormwater drainage pipes; or

(c) cracking of driveways, footpaths, paving or fences.

P6 Despite P5 above, Council may consider on merit the removal of trees or vegetation which result in the blocking of water, sewer or stormwater pipes or the cracking of driveways, footpaths and paving if there are no permanent repair solutions available (e.g. where tunnelling or re-sleeving of pipes, or removal of roots is not feasible). Council must not determine an application to which this clause applies, unless it has considered additional supporting documentation (e.g. an aborist or engineering report) supplied by the applicant to justify the removal of the tree or vegetation.

P7 Branches of trees and vegetation located on private property that overhang public footpaths and roadways should be pruned back to the property boundary to a height of 2.4m (8ft) above ground level (existing). Pruning of these trees is the responsibility of the property owner. Where the tree or vegetation to be pruned comprises a prescribed tree or vegetation, Council consent must be obtained prior to pruning.

P8 Where Council approves a development application or a Tree Management Permit in accordance with this Section and cl.5.9 of NSLEP 2013, Council may impose a condition which requires:

(a) the replanting of replacement trees or vegetation on the land the subject of the application; or

(b) where there is insufficient space on the development site:

(i) the replanting of replacement trees or vegetation in a specified location on public land; or

(ii) payment of a fee from the applicant to fund Council's planting of such trees on public land.

Replacement tree species will be specified by Council and will be of a type suitable for the site.

P9 All work must be carried out in accordance with Australian Standard *AS4373-2007: Pruning of Amenity Trees* and Council may condition that the work be carried out by a suitably qualified arborist.

P10 Any development consent or approval issued by Council will be valid for the described work only, provided it is carried out within a 12 month period from the date of issue and may be subject to such conditions as required by Council.

P11 Where a development application is lodged after a Tree Maintenance Permit has been issued but prior to approved tree work taking place, that Permit becomes null and void and application for pruning/removal of the tree(s) or vegetation must be made through the development assessment process.

Approvals for non-essential pruning work

P12 Council may approve a request from the public to prune trees located on private or public land for "cosmetic" or non-essential pruning for such purposes as aesthetics, increased sunlight or views, but only where such pruning:

(a) will not affect the health or integrity of the tree; or

(b) will not have an adverse impact on the streetscape; or

(c) will not have an adverse impact on general safety of the public.

P13 Non-essential pruning work will not be permitted on any vegetation growing on land zoned E2 Environmental Conservation or other public land managed by Council as bushland.

P14 Council will not support applications for tree or vegetation removal for the sole purpose of facilitating solar access to new solar photovoltaic or hot water systems. However, Council may consider applications for pruning trees or vegetation to enable solar access to existing solar photovoltaic or hot water systems to be maintained on a case by case basis, provided the proposed works are carried out in accordance with Australian Standard *AS4373-2007 - Pruning of Amenity Trees*.

Penalties

P15 Pursuant to s.629 of the *Local Government Act 1993*, an on-the-spot fine may be imposed for the injury or unnecessary disturbance of trees and vegetation on public land including road reserves without a lawful Development Consent or Tree Management Permit. This specifically relates to street trees, foreshore reserves, bushland and public open spaces.

P16 Pursuant to s.125 and s.126 of the *EP&A Act*, an on-the-spot fine or court proceedings may be imposed for the injury, unnecessary disturbance or removal of trees and vegetation on private land without a lawful Development Consent or Tree Management Permit.

P17 Breaches of the requirements to P15 and P16 above, may result in prosecution with maximum penalties of $1.1million. Fines may be imposed on the resident, property owner, anyone ordering the work or contractors employed to undertake the works if they do not have a lawful Development Consent or Tree Management Permit.

P18 The resident, applicant, property owner and any contractor involved in the cutting down or pruning of any tree protected by this DCP, must have a copy of the current and valid Tree Management Permit or Development Consent displayed in a publicly accessible location of the site during the undertaking of those works.

P19 Rehabilitation and maintenance of tree vandalism sites is to be carried out in accordance with Council's Tree Vandalism Policy.

Note: *The extent of the penalty that may be imposed is set out within Council's Tree Vandalism Policy.*

Quantified Tree Risk Assessment (as used in NSC Street Tree Audit 2013)

The Risk Score Method that has been used has the following elements:

- Probability of failure (PF)
- Size of part likely to fail (FS)
- Target occupancy (TO)

The Risk Score methodology is probabilistic and the lower the value the higher the risk. The risk score is presented as a numeric value however it is properly expressed as a fraction e.g. Risk Score = 344 indicates that the predicted event has a 1 / 344 chance of occurrence. I/I indicates that an event is certain to occur and 1/10,000,000,000 indicates that it is extraordinarily unlikely. The three factors are multiplied to arrive at a Risk of Harm (ROH) according to the equation:

$ROH = 1/(PF \times FS \times TO)$

An accepted threshold of risk is generally in the order of 1/10,000 and any tree that scores less than 10,000 would be expected to be worked upon within the next 12 months.

Target Presence (Occupancy)

The target presence is attributed to the object that is most likely to be hit / injured / damaged in the event of failure.

For example: If a tree is overhanging a road it is unlikely that the road will become damaged in the event of tree failure, passing vehicles are more likely to be affected. Therefore the Target Rating would be attributed according to the volume and frequency of vehicles on that road. Road type is categorised in the following table.

Target range	Property (repair / replacement cost)	Pedestrian frequency	Vehicular frequency	Probability ratio
1	Very high value >$104,000 - $2,000,000	>36 per hour – constant	>1,305 vehicles @ 110kph >1,617 vehicles @ 80kph >2,335 vehicles @ 50kph	1/1
2	High value >$29,000 - $104,000	> 10 per hour – 36 per hour	1,305 vehicles @ 110kph 1,617 vehicles @ 80kph 2,335 vehicles @ 50kph	1/20
3	Moderate / high value >$2,900 - $29,000	> 1 per hour – 10 per hour	363 vehicles @ 110kph 449 vehicles @ 80kph 649 vehicles @ 50kph	1/72
4	Moderate value >$120 - $2,900	> 1 per day – 1 per hour	363 vehicles @ 110kph 449 vehicles @ 80kph 649 vehicles @ 50kph	1/720
5	Low value >$18 - $120	> 1 per week – 1 per day	1.5 vehicles @ 110kph 1.87 vehicles @ 80kph 2.7 vehicles @ 50kph	1/17 280
6	Very low value ≤$18	≤ 1 per week	None	1/120 960

Where trees exist in several layers of occupancy it is important to consider the probable failure that is likely to occur from the tree in question in determining the appropriate level of occupancy.

For example a tree may exist within a park for which the occupancy may be 4 (> 1 per day to 1 per hour – 1/720) but next to a well used path the occupancy for which might be 2 (10 – 36 per hour – 1/20).

If the likely failure from the tree is away from the path then an occupancy of 4 (> 1 per day to 1 per hour – 1/720) would be appropriate. However if the likely failure is toward the path then the appropriate occupancy would be 2 (10 – 36 per hour – 1/20).

If the likely failure is of dead wood which is evenly distributed throughout the canopy then the higher value would be used.

If there are several possible types of failure with different failure sizes over different occupancy zones around a tree then each should be assessed and the values that will produce the highest risk score should be used.

If there is no obvious potential for failure then the higher occupancy value should be used.

Failure size

The failure size rating is attributed to the branch or trunk that is most likely to cause the most damage under normal conditions over the next 12 months.

Size of failure range	Size of part (mm diameter likely to impact target)	Impact potential
1	> 450 mm	1 / 1
2	> 250 mm – 450 mm	1 / 2
3	> 100 mm – 250 mm	1 / 9
4	> 25 mm – 100 mm	1 / 82
5	≤ 25 mm	1 / 2 500

Probability of failure

Probability of failure	Probability of failure (%)	Probability ratio	Description
1 (Very High)	> 10%	1/1	The structure of the specimen has large and very significant faults and defects. Active failure is often present and branch or trunk failure is imminent. Failure within the next twelve months would appear certain. The probability of failure over the next twelve months is 10 to 100%.
2 (High)	> 1% - 10%	1 / 100	The structure of the specimen has large and significant faults and defects. Branch or trunk failure within the next twelve months would appear likely. The probability of failure over the next twelve months is 1 – 10%.
3 (Moderate)	> 0.1 – 1%	1 / 1000	The structure of the specimen has significant faults and defects. Branch or trunk failure within the next twelve months would appear possible. The probability of failure over the next twelve months is 0.1 – 1%.
4 (Low)	> 0.01% – 0.1%	1 / 10 000	The structure of the specimen has some faults that may result in failure but failure is unlikely. The probability of failure over the next twelve months is 0.01 to 0.1%.
5 (Very low)	> 0.001% - 0.01%	1 / 100 000	The structure of the specimen has some minor faults that may result in failure but failure is very unlikely. The probability of failure over the next twelve months is less than 0.01%.
6 N/A			

Excerpt from Statewide Manual for Tree and Root Management 2013

3.3.3 Hazard Abatement

Once a visual assessment, and if required, a risk assessment has been performed, the appropriate risk management strategy should be determined. Table 3 lists risk management options for existing trees. These options should be reviewed in consultation with a suitably qualified and experienced arborist.

Table 3: 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.
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. 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.
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 AS 4373-2007.
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.
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

Strategy	Description
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 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 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.