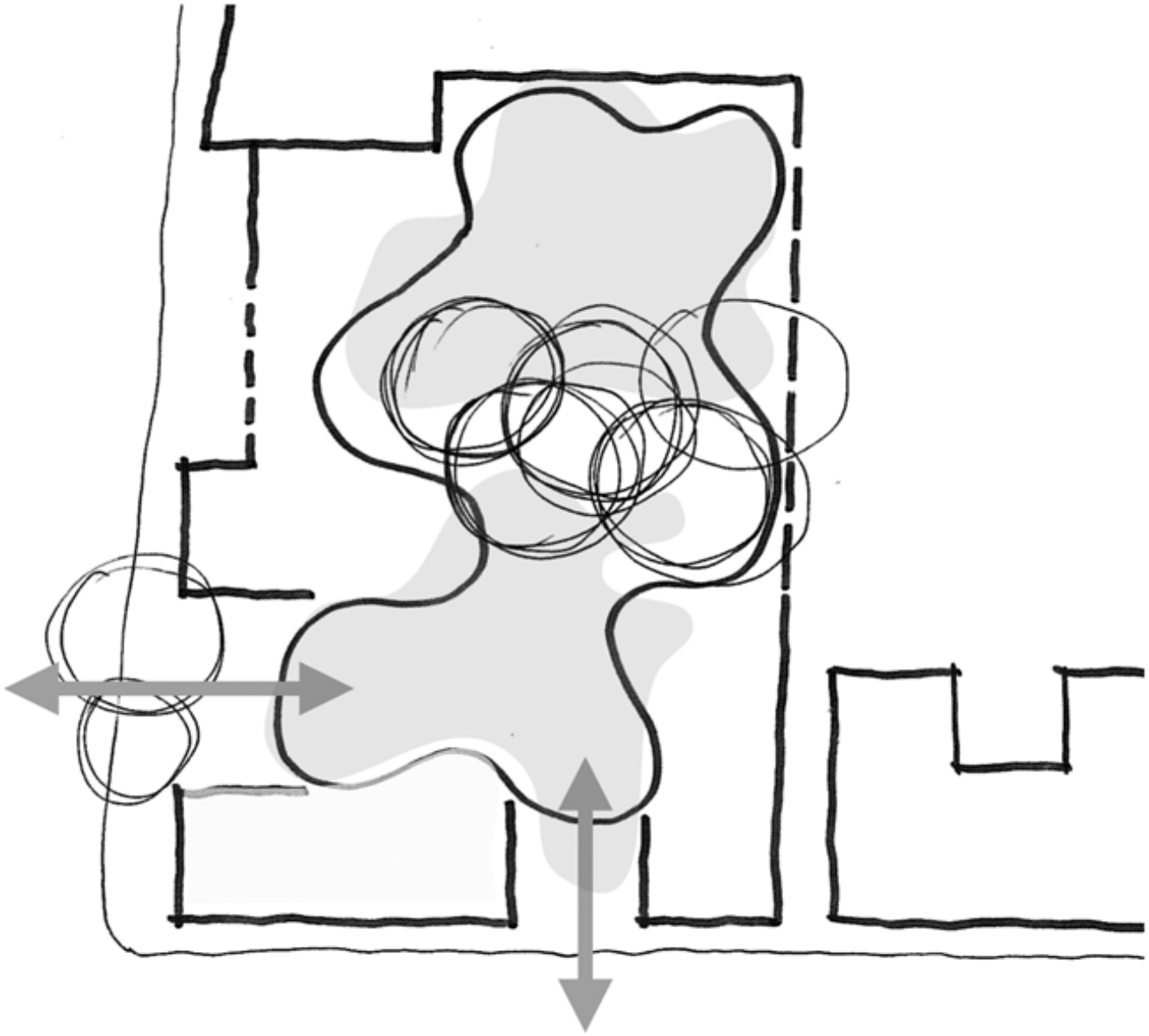
DARLINGTON PUBLIC SCHOOL REDEVELOPMENT

Appendix CC — Arborist Report

SSD-9914

Prepared by Moore Trees

For NSW Department of Education



Moore Trees
Arboricultural Services

ABN 90887347745

Arboricultural Report

for SSDA

Darlington Public School
Chippendale NSW 2008
May 2020

FINAL

Member 2020

Prepared for: Darlington Public School
c/o Mace Australia Pty Ltd

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Summary

This report has been compiled for Mace Australia Pty Limited on behalf of Darlington Public School. The report concerns a proposed development works for Darlington Public School, Chippendale NSW 2008. This Arborist Report refers to forty six (46) trees. This Report has been prepared for this Development that is State Significant Development (SSD), identified in the State and Regional Development SEPP.

For the purpose of this report Trees 20-25, 33-46, 49 and 51 will be part of a separate development application to renovate the existing ball court area and as such these trees are not detailed in this report.

Based on the plans trees to retain are numbered as; 6, 12, 13, 14, 15, 18, 56-68. Trees within the building footprint to be removed are numbered as; 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 16, 17, 19, 26-32, 47, 48, 50, 52, 53, 54, 55.

The design levels around Tree 12 are very tight as it is surrounded by an existing brick wall and sandstone steps. Any new wall around these trees is likely to require additional excavation to allow for drainage. The landscape design is working to retain existing levels and allowing for the construction of new accessible footpath however further consultation may be required in relation Trees 12-15 to achieve this.

Trees 6, 18 and 12-15 will require tree protection fencing as specified in Section 5.2 of this report. The specifications for a TPZ are in Section 5.4 of this report.

Trees 56-68 will require trunk protection as specified in Section 5.3 of this report. This trunk protection will be required due to the proximity of heavy equipment operating near these trees.

In general, Darlington Public School has a healthy tree population in terms of quantity of trees and tree health. There are no trees that were assessed as being at risk of imminent failure however some minor scattered dead wood was noted.

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VERSION CONTROL

Date of Issue	Details
24th March 2020	Draft 1 issued
5th April 2020	Draft 2 issued
8TH May 2020	Draft 3 issued updated re. T12
8th May 2020	Final version issued

1 INTRODUCTION

1.1 This report has been conducted to assess the health and condition of forty six (46) trees located at Darlington Public School, Golden Grove St, Chippendale NSW 2008. This report has been prepared for Mace Australia Pty Limited on behalf of Darlington Public School as required for a State Significant Development Application (SSDA) at this site.

For the purpose of this report Trees 20-25, 33-46, 49 and 51 will be part of a separate development application to renovate the existing ball court area and as such these trees are not detailed in this report. The purpose of this report is to collect the appropriate tree related data on the subject trees and to provide advice and recommendations to the design and possible construction alternatives to aid against any adverse impacts on the subject trees' health where required.

The subject trees were assessed for their health and condition. Also included in this report are tree protection measures that will help retain and ensure that the long term health of the trees to be retained are not adversely affected by the proposed development in the future.

The following data was collected for each tree:

1) A site plan locating all trees over three (3) metres in height, including all street trees.
2) All trees were assessed for Safe Useful Life Expectancy (SULE), health and amenity value.
3) Genus and species identification of each tree.
4) Impact of the proposed development on each tree.
5) The Tree Protection Zone (TPZ) calculated for each tree.

Also noted for the purpose of this report were:

- Health and Vigour; using foliage colour and size, extension growth, presence of deadwood, dieback and epicormic growth throughout the tree.
- Structural condition using visible evidence of bulges, cracks, leans and previous pruning.

- Age rating; Over-mature (>80% life expectancy), Mature (20-80% life expectancy), Young, Sapling (<20% life expectancy).

1.2 Documents and information provided: For this Arborist Report I have been provided with the Architectural + Landscape plans by Fjmt Studio. The plan showed the buildings and existing trees on the site and proposed development.

1.3 Location: The site is located at Darlington Public School, known as Lot 592 in DP 752049 and Lot 100 in DP 623500. The proposed development site from herein will be referred to as "the Site".

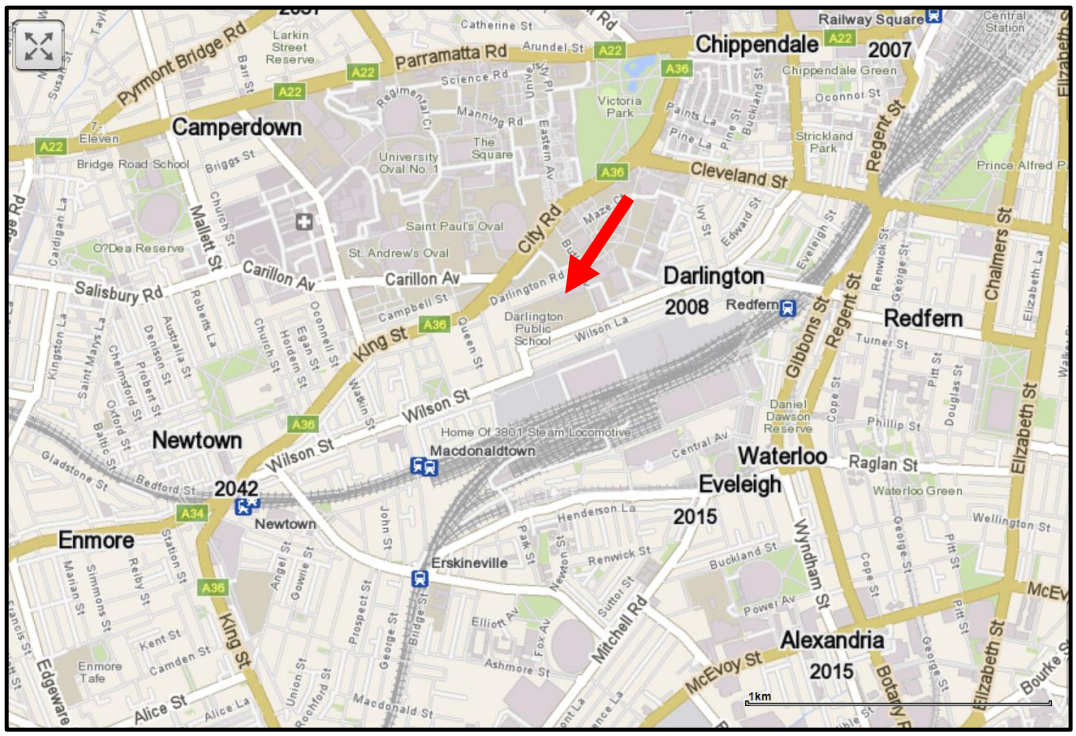


Diagram 1: Location of subject site, Darlington Public School (Red arrow) (whereis.com.au, 2020)

2 METHODOLOGY

2.1 To record the health and condition of the trees, a Visual Tree Assessment (VTA) was undertaken on the subject trees on 15th October 2018. This method of tree evaluation is adapted from Matheny and Clark, 1994 and is recognised by The International Society of Arboriculture. Individual tree assessments are listed in Appendix 2 of this report. All inspections were undertaken from the ground. No diagnostic devices were used on these trees.

2.2 The State Environmental Planning Policy (Vegetation in Non Rural Areas) must be referred to for the proposed removal of trees/vegetation. 21.1 The SEPP applies to vegetation in non – rural areas declared by the SCC, DCP chapter. Refer to the SEPP for the relevant LEP 2013 zones the SEPP applies to. Trees or other vegetation declared in this DCP chapter require a tree management permit if it is sought to ringbark, cut down, top, lop, remove, injure or wilfully destroy them. In this DCP a tree is declared if it meets any one or more of the following criteria:

(a). is 3 metres or more in height

(b). has a trunk circumference of 30 cm or more at natural ground level

(c). has a branch spread of three (3) metres or more

(d). Is a hollow bearing tree (has cavities in trunk or branches, which can be used by native animals for foraging, shelter, roosting and nesting).

This Report is based on AS4970, the specifications and calculations within it.

2.3 **Height:** The heights and distances within this report have been measured with a Bosch DLE 50 laser measure.

2.4 **Tree Protection Zones (TPZ):** The TPZ is the principal means of protecting trees on development sites. The TPZ is a combination of the root area and crown area requiring protection. It is an area isolated from construction disturbance, so that the tree remains viable. TPZ's have been calculated for each tree. The TPZ calculation is based on the Australian Standard *Protection of trees on development sites,* AS 4970, 2009.

2.5 **Structural Root Zone (SRZ)**: The SRZ is a specified distance measured from the trunk that is set aside for the protection of tree roots, both structural and fibrous. The woody root growth and soil cohesion in this area are necessary to hold the tree upright. The TPZ and SRZ are measured as a radial measurement from the trunk. No roots should be severed within the SRZ area. A detailed methodology on the TPZ and SRZ calculations can be found in Appendix 4. The TPZ and SRZ distances are listed in the Tree Schedule (Appendix 2).

2.6 **Safe Useful Life Expectancy (SULE)**: The subject trees were assessed for a Safe Useful Life Expectancy (SULE). The SULE rating for each tree can be seen the Tree Assessment Schedule (Appendix 2). A detailed explanation of SULE can be found in Appendix 3.

2.7 **Tree Significance & Retention Value:** The Tree Significance & Retention Value used in this report is known as the Significance of a Tree, Assessment Rating System or STARS© system created by the Australian Institute of Consulting Arboriculturists (IACA). This system allows a rating system utilising structured qualitative criteria to assist in determining the retention value for a tree. To assist this process all definitions for terms used in the *Tree Significance - Assessment Criteria* and *Tree Retention Value - Priority Matrix*, are taken from the IACA Dictionary for Managing Trees in Urban Environments (Draper and Richards 2009). The system uses a scale of *High, Medium and Low significance* in the landscape. Once the landscape significance of an individual tree has been defined, the retention value can be determined. The Retention Value is selected between *High, Medium, Low and Priority for removal.* The Matrix can be seen in Appendix 4.

2.8 **Tree Retention Value Plans:** All trees have been allocated a Tree Retention Value. These values have been applied to the colour coded plans in Appendix 1. No trees assessed for this project were allocated the value of *Priority for removal.*

2.9 **Plans provided:** General Arrangement Plan (sheet number 2051), Landscape Plan (8001) and Tree Management Plan (8003) undertaken by Fjmt marked project code DTPS / 2051 Revision 3 dated 28/04/2020.

3 RELEVANT BACKGROUND INFORMATION

3.1 Darlington Public School is located in Chippendale in Sydney. Darlington Public School is an inner city school servicing the suburbs of Chippendale, Darlington, Redfern and Waterloo. The school has been built following World War 2 (Diagram 2) however the school's trees are well established, with some being almost twenty (20) metres in height and spread.

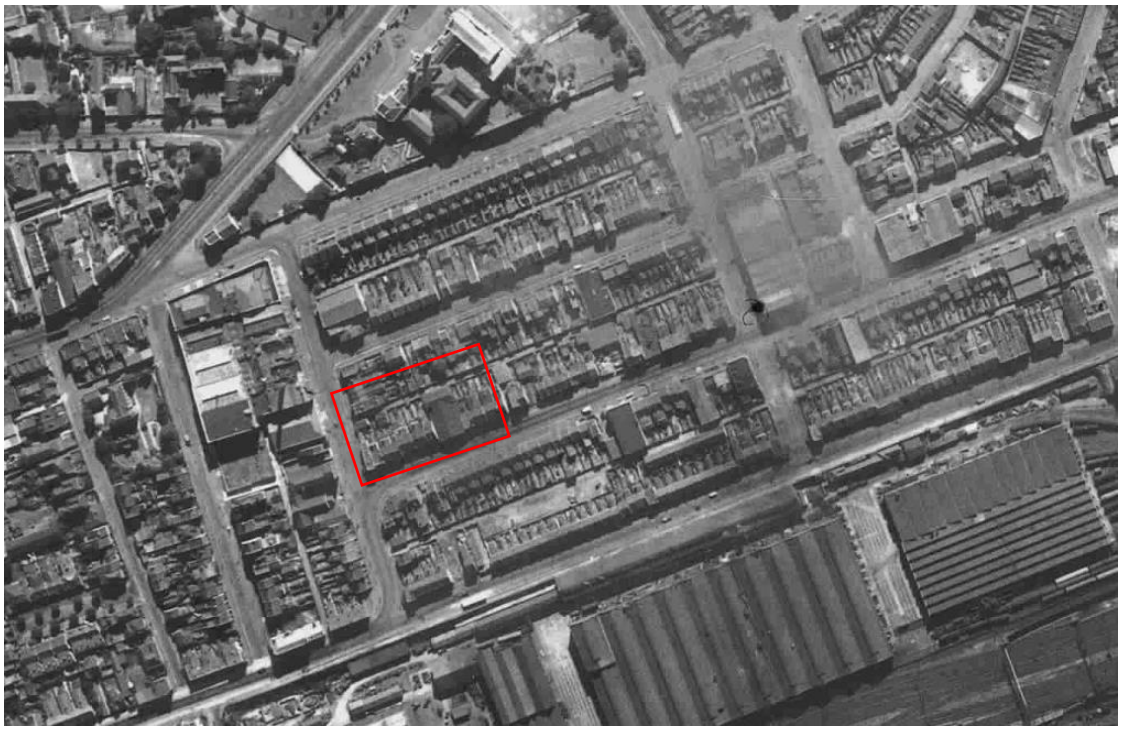


Diagram 2: The site as seen in 1943, devoid of trees (RTA From the skies, 2007).

3.2 **Environmental Significance**: Tree Management Controls in City of Sydney's Development Control Plan (DCP) provide the legislative tool for the protection of all trees located within the City of Sydney.

As outlined in Sydney Development Control Plan 2012, Section 3 – General Provisions this applies to trees that:

(a) have a height of five (5) metres or more; or

(b) have a canopy spread of over five (5) metres; or

(c) have a trunk diameter of more than three hundred (300) millimetres, measured at ground level; or

(d) is listed in the Register of Significant Trees.

It should be noted that the Local Environmental Plan 2012, Part 5 Clause 5.9 Preservation of trees or vegetation has now been repelled.

3.3 **Illegal tree removal:** Damaging or removing trees can result in heavy fines. Local Government does have the authority to issue on the spot fines known as penalty infringement notices (PINS) starting from $3,000 or can elect to have a potential tree damaging incident addressed in the Local Court. Recent cases, for example, include two (2) mature trees removed for development (Sutherland Shire Council (SSC) v Palamara, 2008) costing $4,500 in fines and $5,000 in court costs. SSC v El-Hage, 2010 concerning illegal tree removal of a single tree costing $31,500 in fines and $5,000 in costs. Poisoning trees can also incur substantial fines (SSC v Hill) resulted in a single tree fine that totalled $14,000 plus a $10,000 bond for a replacement tree. All of the above cases resulted in a criminal conviction for the guilty parties.

3.4 **The Site Trees:** The site was inspected on 15th October 2018. Each tree has been given a unique number for this site and can be viewed on the Tree Location Plan (Appendix 1). All site trees have been tagged to correspond with the Tree Location Plan.

3.5 The site consists of several buildings connected by covered walkways. Playground areas are located throughout the site with specimen trees located in some protected courtyard areas (Plate 1). Some of these courtyard specimens are large mature specimens and potentially are nearing over-maturity such as Tree 3.

Plate 1: Image showing Tree 3. This tree has signs of drought stress however recent rainfall may extend its life expectancy. Working around a mature tree such as this will be difficult in terms of canopy impacts and root disturbance. P. Vezgoff

3.6 Trees 7-15 are within the central playground area (Plate 2). Although not great specimens individually, they do work well as a group providing canopy cover and good aesthetic value to the rear area.

Plate 2: Image showing Trees 7-15 central to the playground area. The area not facing the camera consists of a low retaining wall. P. Vezgoff

3.7 Trees 26-31 (Plate 3) are tightly grouped specimens that have a restricted root space and are covered with asphalt and playground rubberised matting up to the trunks. These trees are mostly in good health but could be replaced with better specimens. They would not be considered long term specimens.

Plate 3: Image showing Trees 26-31. P. Vezgoff

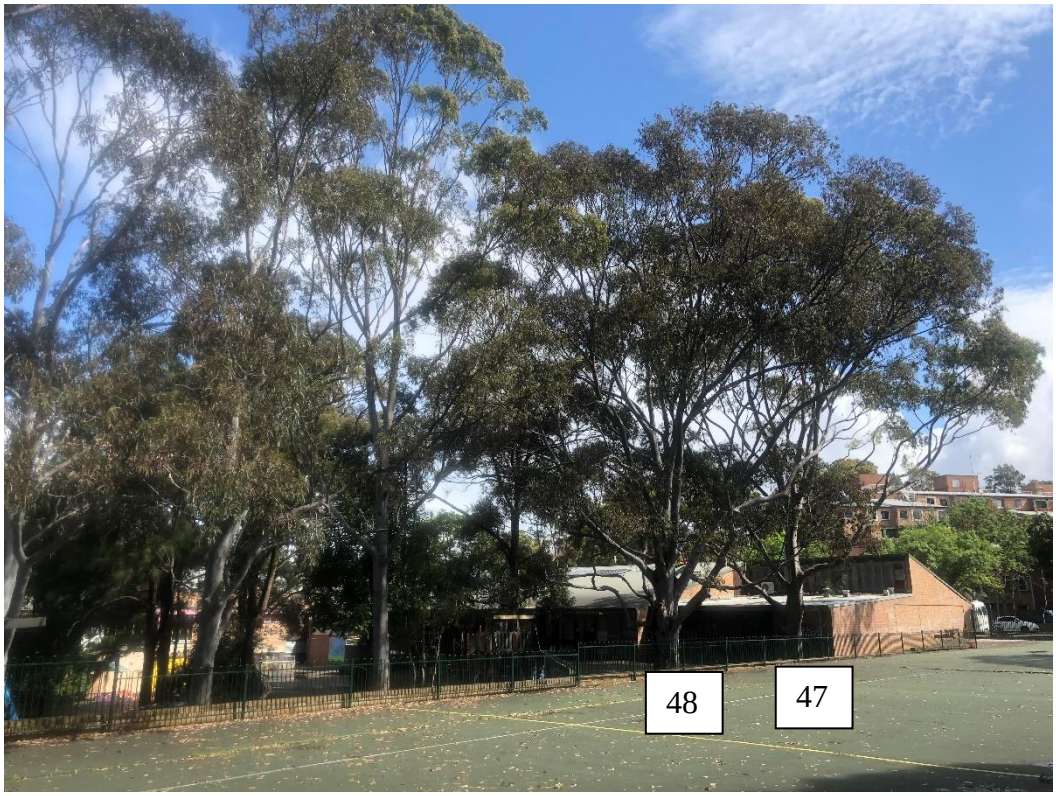


Plate 4: Image showing Trees 48 and 47. P. Vezgoff

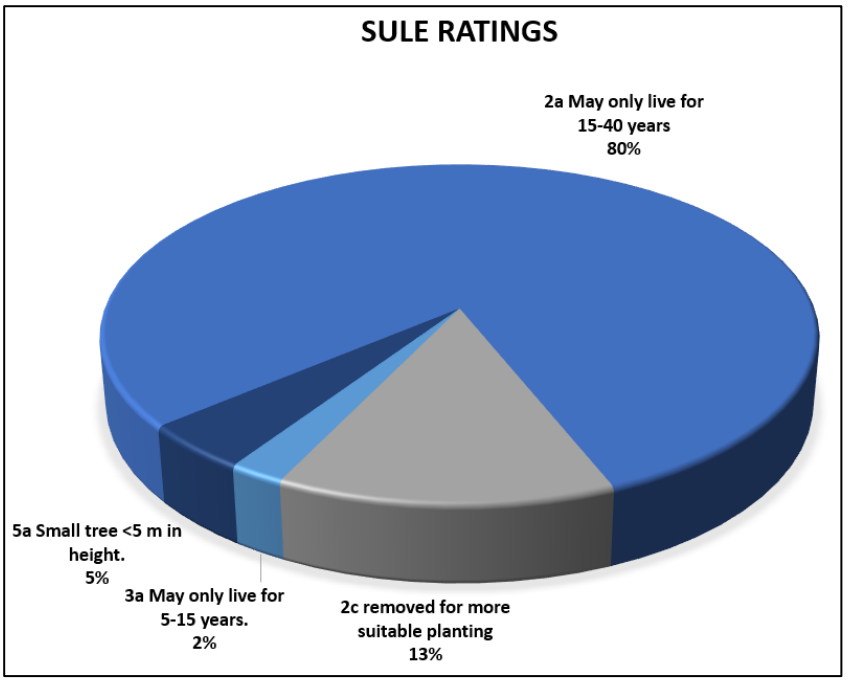
3.8 Trees 47 and 48 (Plate 4) are some of the larger trees on site being some twenty (20) meters in height. Again, the majority of the root zone of these trees is covered with hard surface. These trees have some previous failures which is to be expected from trees of this size and age. These trees were assessed as being in good health and condition. The main trunks, first and second order branches are free of any cracks, splits or fruiting bodies. New extension growth was noted. The basal area and woody root zone were free of any ground heaving, or lifting. Ideally an aerial inspection should occur to fully determine the condition of the main branch unions.

3.9 Although this part of Sydney may be high in sand content that would normally encourage deeper root systems, the site has an uncertain history. Based on Diagram 2, it appears that prior to the school being built there were rows of terrace houses and warehouse structures, so subsoil conditions will be far from natural and would be highly disturbed. This will mean that old footings or foundations that may be subsurface will deflect woody roots keeping them close to the surface such as near Tree 20 (Plate 5).

Plate 5: Image showing surface roots from Tree 20. P. Vezgoff

3.10 Street trees are numbered as Trees 56-59 along Darlington Road. These trees are mostly Sweetgum *(Liquidambar styraciflua)* with a single specimen of Brushbox *(Lophostemon confertus),* being Tree 59. Along Golden Grove Street are Trees 60-68. These species consist of Brushbox *(Lophostemon confertus),* Sweetgum *(Liquidambar styraciflua),* Tallowwood *(Eucalyptus microcorys).* Trees 61 and 68 are two (2) large specimens of Tallowwood. Tree 68 does not show on the Landscape plans however I have included it as it is a large street tree.

3.11 **Safe Useful Life Expectancy (SULE)** is a method of evaluating individual trees. The evaluation is a subjective assessment, not an absolute judgement, because the nature of trees and opinions on trees can vary greatly. SULE assessments are made only by those who are experienced and knowledgeable in tree management. SULE is generally accepted and used world-wide as a method of evaluating trees. Each category has a number of sub-categories. These sub-categories should always be recorded to help future users of the information appreciate the reason for each allocation decision. It is normal to have instances where trees will not fit neatly into a single SULE category. The assessment of the site trees can be seen in Graph 1. In general, the trees were mostly assessed as being in good health. SULE results show that 78% of the site's tree population has a life expectancy of between 15-40 years. Trees that have a short life expectancy or could be readily replaced total 22%.



Graph 1: SULE ratings for the site trees.

3.12 The trees were assessed as below for the Significance of a Tree, Assessment Rating System or STARS©. The STARS© Matrix can be seen in Appendix 4. This rating can be seen in Plan form in Appendix 1.

Significance Scale	**1 (High)**	**2 (Medium)**	**3 (Low)**
Tree No.	1, 2, 4-8, 13-15, 17-19, 47, 48.	3, 9-12, 16, 28, 29, 52, 54, 55-68.	26, 27, 30, 31, 32, 50, 53

3.13 **Impacts:** Based on the plans trees that are possible to retain are numbered as; 6, 18, 12, 13, 14, 15, 18, 56-68. Trees within the building footprint or will suffer too greater incursion into the TPZ areas and as such are proposed to be removed are numbered as; 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 16, 17, 19, 26-32, 47, 48, 50, 52, 53, 54, 55.

3.14 The design levels around Tree 12 are very tight as it is surrounded by an existing brick wall and sandstone steps (Plate 2). Any new wall around these trees is likely to require additional excavation to allow for drainage. The landscape design is working to retain existing levels and allowing for the construction of new accessible footpath however further consultation may be required in relation Trees 12-15 to achieve this.

3.15 The proposed substation on Golden Grove Street may impact on the large Tree 68 (Plate 6). This tree is a large mature Tallowwood *(Eucalyptus microcorys).* This tree is in excellent health and condition. The main trunk, first and second order branches are free of any cracks , splits or fruiting bodies. Old pruning wounds are showing good occlusion, a sign that the tree is photosynthesizing effectively. New extension growth was noted with leaf colour showing good vitality. The tree would be considered to have a 95% live canopy. The basal area and woody root zone were free of any ground heaving, or lifting. Any trenching below this tree will need to be under bored using directional drilling.

Plate 6: Image showing Tree 68 (Red arrow). P. Vezgoff

4 RECOMMENDATIONS

4.1 A Project Arborist should be appointed to oversee the arboricultural related works for the project. The Project Arborist should be used for arboricultural certification services and also used as a point of contact should any questions arise during design process for this project. As specified in AS 4970, 2009, a Project Arborist is a person with a minimum Australian Qualification Framework (AQF) level 5 Diploma of Arboriculture or Horticulture qualification.

4.2 **Trees 6, 18 and 12-15** will require tree protection fencing as specified in Section 5.2 of this report. The specifications for a TPZ are in Section 5.4 of this report. The design levels around Tree 12 are very tight as it is surrounded by an existing brick wall and sandstone steps. The landscape design is working to retain existing levels and allowing for the construction of new accessible footpath however further consultation may be required in relation Trees 12-15 to achieve this.

4.3 **Trees 56-67** will require trunk protection as specified in Section 5.3 of this report. This trunk protection will be required due to the proximity of heavy equipment operating near these trees. It is important to protect the bark on trees. Bark is a very effective barrier that helps to protect trees from pest, disease and decay pathogens.

4.4 Based on the plans trees to retain are numbered as; 6, 12, 13, 14, 15, 18, 56-68. Trees within the building footprint to be removed are numbered as; 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 16, 17, 19, 26-32, 47, 48, 50, 52, 53, 54, 55.

4.5 Trees 60 and 61 will require a degree of canopy pruning to allow for the two new structures. These branches should be reduced back so as to maintain the canopy of the trees (ie, no lopping or 'flat topping'). Pruning points should be no greater than 50mm in diameter. This pruning is known as selective pruning and can be read about in more detail in the Australian Standard for the Pruning of Amenity Trees (AS 4373) 2007. The Project Arborist should supervise these works. This pruning should also be clearly shown on construction plans.

4.6 In general, Darlington Public School has a healthy tree population in terms of quantity of trees and tree health. There are no trees that were assessed as being at risk of imminent failure however some minor scattered dead wood was noted.

4.7 Trees are dynamic living organisms that provide a broad, extensive range of benefits. Whilst Moore Trees has used the most recent in industry standards with regards to tree health and risk assessment the advice and recommendations in this report are limited to twelve (12) months after which all reasonability regarding the site trees is that of the School.

4.8 The Australian Standard *Protection of trees on development sites,* (AS 4970) recommends no more than 10% encroachment unless the TPZ can be compensated elsewhere and contiguous with the TPZ. Provided the portion (of TPZ incursion) of footings across the root zone can be bridged via the use of pier and beam construction this would allow design to comply with AS4970. Ultimately the site trees will require further assessment once plans and designs are initiated.

5 TREE PROTECTION

5.1 Trees to be protected: Trees 6, 18 and 12-15, will required to be required to be fenced for protection. All fencing shall be installed as specified in Section 5.2 (Tree Protection – Implementation of Tree Protection Zone). Indicative locations of the fencing are shown in the Tree Protection Plan (Appendix 1).

5.2 Implementation of Tree Protection Zone: All tree protection works should be carried out before the start of demolition or building work. It is recommended that chain mesh fencing with a minimum height of 1.8 metres be erected as shown in the Tree Protection Plan (Appendix 1). Specifications for this fencing are shown in Tree Protection Fencing Specifications (Appendix 6).

5.3 Individual trunk protection: Trees 56-68 will require trunk protection. This is achieved by attaching lengths of timber (75mm x 50mm x 2000mm) fastened around the trunk. Geotextile fabric or carpet underlay shall be wrapped around the trunk prior to the timbers being attached. These timbers are to be fastened with hoop iron strapping and not attached directly into the bark of the tree. These timbers are only to be removed when all construction is complete.

5.4 The Tree Protection Zone (TPZ) and Structural Root Zone (SRZ): The TPZ is implemented to ensure the protection of the trunk and branches of the subject tree. The TPZ is based on the Diameter at Breast Height (DBH) of the tree. The SRZ is also a radial measurement from the trunk used to protect and restrict damage to the roots of the tree.

The Tree Protection Zone (TPZ) and Structural Root Zone (SRZ) have been measured from the centre of the trunk. TPZ and SRZ distances are all listed in the Tree Schedule (Appendix 2). The following activities shall be avoided within the TPZ and SRZ of the trees to be retained;

- Erecting site sheds or portable toilets.

- Trenching, ripping or cultivation of soil (with the exception of approved foundations and underground services).
- Soil level changes or fill material (pier and beam or suspended slab construction are acceptable).
- Storage of building materials.
- Disposal of waste materials, solid or liquid.

5.5 Tree Damage: If the retained trees are damaged a qualified Arborist should be contacted as soon as possible. The Arborist will recommend remedial action so as to reduce any long term adverse effect on the tree's health.

5.6 Signage: It is recommended that tree protection signage is attached to the tree protection fencing. A sample sign has been attached in Appendix 7. This sign may be copied and laminated then attached to any TPZ fencing.

5.7 Root Pruning: If approved excavations are required within a TPZ this excavation shall be done by hand to expose any roots. Any roots under fifty (50) millimetres in diameter may be pruned cleanly with a sharp saw. Tree root systems are essential for the health and stability of the tree. The Project Arborist should be contacted if roots greater than 50mm are encountered where a design solution cannot be resolved so as not to sever any roots greater than 50mm in diameter.

5.8 Arborist Certification: It is recommended that the contractor supply the Principal Certifying Authority with certification from the Project Arborist three (3) times during the construction phase of the development in order to verify that retained trees have been correctly retained and protected as per the conditions of consent and Arborist's recommendations. The certification is to be conducted by a Qualified Consulting Arborist with AQF level 5 qualifications that has current membership with either Arboriculture Australia (AA) or Institute of Australian Consulting Arboriculturists (IACA). Arborist certification is recommended:

(1) Before the commencement of demolition or construction to confirm the fencing has been installed;

(2) At mid point of the construction phase to inspect exposed roots from the excavations;

(3) At completion of the construction phase.

If you have any questions in relation to this report please contact me.

Paul Vezgoff
Consulting Arborist
Dip Arb (Dist), Arb III, Hort cert, AA, ISA

5th May 2020

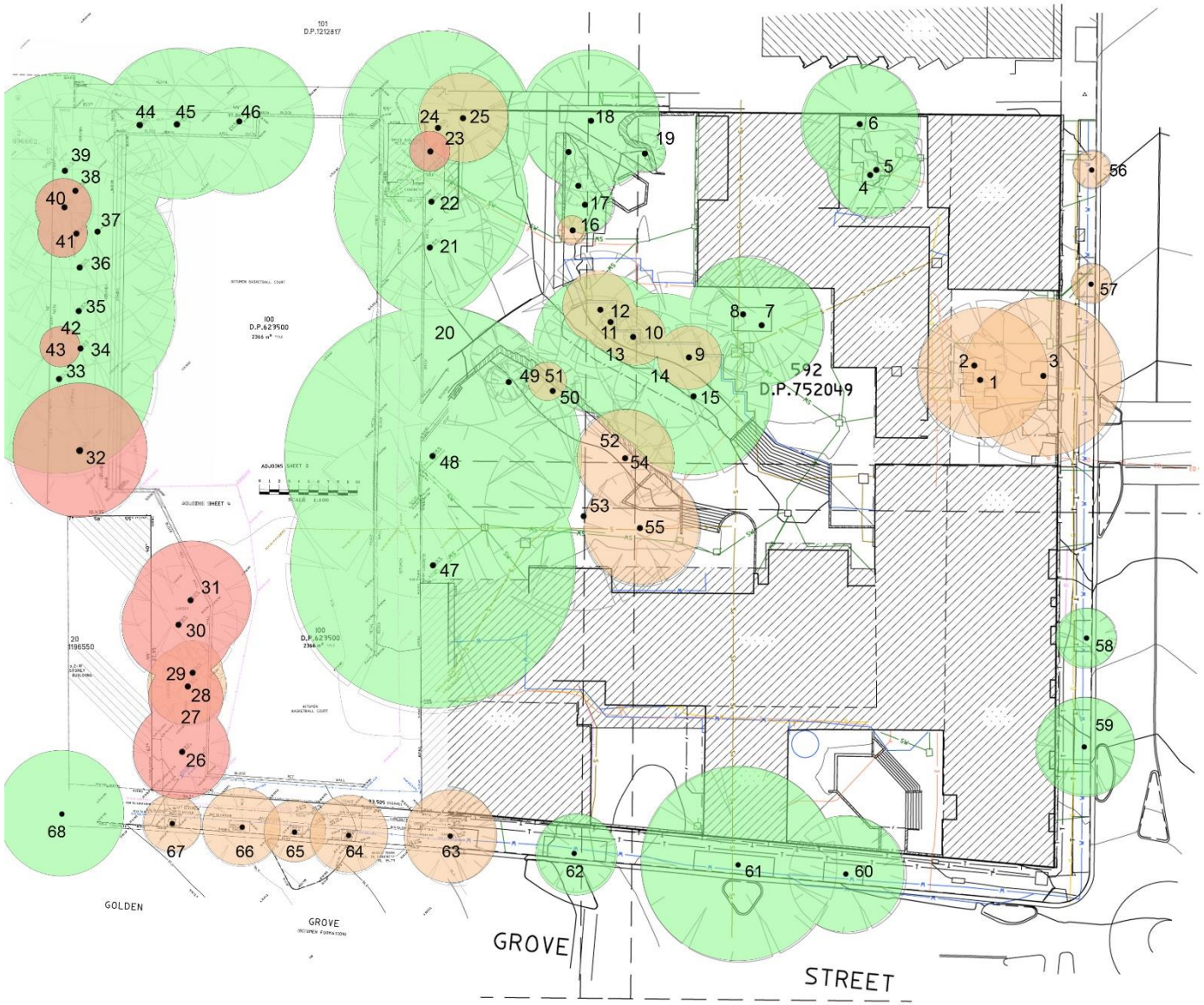
Appendix 1

Plan 1

Tree Location Plan
&
Retention Values

Plan 2

Tree Protection Plan



Tree Retention Values

MOORE TREES

Moore Trees

Plan 1

High

Medium

Low

Note: The tree condition plan is seperate to the SULE categories that have been allocated to the site trees.

Date:	26.04.2019
Drawn:	P.Vezgoff
Site Address:	Darlington Public School Darlington NSW

Tree protection plan

Moore Trees

Plan 2

Tree to be retained

6,12, 13, 14, 15, 18, 56-68

Tree to be removed

1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 16 17, 19, 26-32, 47, 48, 50, 52, 53 54, 55

Fence. Implementation of tree protection zone (TPZ). All tree protection works should be carried out before the start of demolition or building works. It is recommended that chain mesh fencing with a minimum height of 1.8 metres be errected

Trunk protection. Lengths of timber (75mm x 50mm x 2000) shall be fastened to the trunk or overhead branches that are greater than 80mm in diameter. These timbers are to be fastened with hoop iron strapping and not fixed directly onto the trunk of the tree.

Date:	05.05.2020
Drawn:	P.Vezgoff
Site Address:	Darlington Public School Darlington NSW

Appendix 2

Tree health & condition assessment schedule

TREE HEALTH AND CONDITION ASSESSMENT SCHEDULE – Darlington Public School Tree Data

Tree	Species	Height (m)	Spread (m)	DBH (m)	Live canopy %	Defects	SULE	Condition	Age	Comments	TPZ (m)	SRZ (m)
1	Broad leaved paperbark (Melaleuca quinquenervia)	14	5	0.45	95	No visual defects	2a May only live for 15-40 years	Good	Mature	With garden rockery	5.4	2.4
2	Broad leaved paperbark (Melaleuca quinquenervia)	14	5	0.45	95	No visual defects	2a May only live for 15-40 years	Good	Mature	With garden rockery	5.4	2.4
3	Small leafed pepper mint (Eucalyptus nicholii)	17	7	0.55	80	No visual defects	2a May only live for 15-40 years	Fair	Mature	Signs of drought stress	6.6	2.6
4	Cabbage tree palm (Livistona australis)	15	3	0.5	95	No visual defects	2a May only live for 15-40 years	Good	Mature	Fibrous root mass at base. Spines at base	6	2.6
5	Swamp mahogany (Eucalyptus robusta)	14	6	0.4	92	No visual defects	2a May only live for 15-40 years	Good	Mature		4.8	2.4
6	Brushbox (Lophostemon confertus)	14	6	0.4	92	No visual defects	2a May only live for 15-40 years	Good	Mature		4.8	2.4
7	Coastal banksia (Banksia integrifolia)	8	3	0.35	90	No visual defects	2a May only live for 15-40 years	Good	Mature	Within paved area. Sewer pit at base	4.2	2.3
8	Swamp mahogany (Eucalyptus robusta)	8	4	0.35	90	No visual defects	2a May only live for 15-40 years	Good	Mature	Within paved area. Sewer pit at base	4.2	2.3
9	River she oak (Casuarina cunninghamiana)	15	5	0.5	95	No visual defects	2a May only live for 15-40 years	Good	Mature		6	2.6
10	River she oak (Casuarina cunninghamiana)	9	2.5	0.2	95	No visual defects	2a May only live for 15-40 years	Good	Mature		2.4	1.9
11	River she oak (Casuarina cunninghamiana)	9	2.5	0.2	95	No visual defects	2a May only live for 15-40 years	Good	Mature		2.4	1.9
12	River she oak (Casuarina cunninghamiana)	15	5	0.5	95	No visual defects	2a May only live for 15-40 years	Good	Mature		6	2.6
13	Tallowwood (Eucalyptus microcorys)	19	7	0.45	95	No visual defects	2a May only live for 15-40 years	Good	Mature	Part of a row of three	5.4	2.5

Tree	Species	Height (m)	Spread (m)	DBH (m)	Live canopy %	Defects	SULE	Condition	Age	Comments	TPZ (m)	SRZ (m)
14	Tallowwood (Eucalyptus microcorys)	19	7	0.45	95	Dead wood >50mm	2a May only live for 15-40 years	Good	Mature	Part of a row of three . 100mm section of dead wood over path	5.4	2.5
15	Tallowwood (Eucalyptus microcorys)	19	7	0.45	95	No visual defects	2a May only live for 15-40 years	Good	Mature	Part of a row of three	5.4	2.5
16	Firewheel tree (Stenocarpus sinuatus)	5	1	0.07	100	No visual defects	5a Small tree <5 m in height.	Good	Mature		0.8	1.1
17	Illawarra flame tree (Brachychiton acerifolius)	7	4	0.35	95	No visual defects	2a May only live for 15-40 years	Good	Mature		4.2	2.3
18	Lemon-scented gum tree (Corymbia citriodora)	17	6	0.45	92	No visual defects	2a May only live for 15-40 years	Good	Mature	Minor mechanical wound at base	5.4	2.5
19	Bangalow palm (Archontophoenix cunninghamiana)	6	3	0.18	100	No visual defects	2a May only live for 15-40 years	Good	Mature		2.2	1.6
26	Kaffir plum (Harpephyllum caffrum)	10	5	0.4	92	No visual defects	2c removed for more suitable planting	Good	Mature		4.8	2.4
27	Kaffir plum (Harpephyllum caffrum)	10	3	0.35	92	No visual defects	2c removed for more suitable planting	Good	Mature		4.2	2.3
28	River she oak (Casuarina cunninghamiana)	12	3	0.25	70	No visual defects	3a May only live for 5-15 years.	Poor	Mature	Decline	3	2.1
29	Black bean (Castanospermum australe)	6	2	0.1	90	No visual defects	5a Small tree <5 m in height.	Good	Mature		1.2	1.2
30	Kaffir plum (Harpephyllum caffrum)	10	5	0.4	92	No visual defects	2c removed for more suitable planting	Good	Mature		4.8	2.4
31	Willow gum (Eucalyptus scoparia)	16	7	0.45	90	No visual defects	2a May only live for 15-40 years	Fair	Mature		5.4	2.4
32	Mulberry (Morus nigra)	6	7	0.45	95	Included codom stems	2c removed for more suitable planting	Fair	Mature	Codominant stems with partial decay occurring between the two main stem's	5.4	2.6

Tree	Species	Height (m)	Spread (m)	DBH (m)	Live canopy %	Defects	SULE	Condition	Age	Comments	TPZ (m)	SRZ (m)
47	Spotted gum (Corymbia maculata)	21	11	1.2	95	No visual defects	2a May only live for 15-40 years	Good	Mature		14.4	3.6
48	Sydney blue gum (Eucalyptus saligna)	21	11	1.1	95	No visual defects	2a May only live for 15-40 years	Good	Mature		13.2	3.5
50	Illawarra flame tree (Brachychiton acerifolius)	7	4	0.2	95	No visual defects	2a May only live for 15-40 years	Good	Mature		2.4	1.9
52	Unknown	6	4	0.2	95	No visual defects	2c removed for more suitable planting	Good	Mature		2.4	1.9
53	Tallowwood (Eucalyptus microcorys)	21	11	0.9	95	Dead wood <50mm	2a May only live for 15-40 years	Good	Mature	Soft fall around base	10.8	3.3
54	Trident maple (Acer sp)	6	2.5	0.1	100	No visual defects	2c removed for more suitable planting	Good	Mature		1.2	1.3
55	Water gum (Tristaniopsis laurina)	6	3	0.25	95	No visual defects	2a May only live for 15-40 years	Good	Mature		3	2.1
56	Sweetgum (Liquidambar styraciflua)	6	2.5	.25	95	No visual defects	2a May only live for 15-40 years	Good	Mature		3	2.1
57	Sweetgum (Liquidambar styraciflua)	6	2.5	.25	95	No visual defects	2a May only live for 15-40 years	Good	Mature		3	2.1
58	Sweetgum (Liquidambar styraciflua)	6	2.5	.25	95	No visual defects	2a May only live for 15-40 years	Good	Mature		3	2.1
59	Brushbox (Lophostemon confertus)	9	4	.3	95	No visual defects	2a May only live for 15-40 years	Good	Mature		3	2.1
60	Tallowwood (Eucalyptus microcorys)	14	5	.4	95	No visual defects	2a May only live for 15-40 years	Good	Mature		5	2
61	Tallowwood (Eucalyptus microcorys)	19	8	.5	95	No visual defects	2a May only live for 15-40 years	Good	Mature		6	3
62	Evergreen Ash (Fraxinus griffithii)	6	3	.2	95	No visual defects	2a May only live for 15-40 years	Good	Mature		3	2.1
63	Evergreen Ash (Fraxinus griffithii)	6	3	.2	95	No visual defects	2a May only live for 15-40 years	Good	Mature		3	2.1

Tree	Species	Height (m)	Spread (m)	DBH (m)	Live canopy %	Defects	SULE	Condition	Age	Comments	TPZ (m)	SRZ (m)
64	Brushbox (Lophostemon confertus)	7	3	.2	95	No visual defects	2a May only live for 15-40 years	Good	Mature		3	2.1
65	Brushbox (Lophostemon confertus)	7	3	.2	95	No visual defects	2a May only live for 15-40 years	Good	Mature		3	2.1
66	Evergreen Ash (Fraxinus griffithii)	6	3	.2	95	No visual defects	2a May only live for 15-40 years	Good	Mature		3	2.1
67	Evergreen Ash (Fraxinus griffithii)	6	3	.2	95	No visual defects	2a May only live for 15-40 years	Good	Mature		3	2.1
68	Tallowwood (Eucalyptus microcorys)	22	9	.9	95	No visual defects	2a May only live for 15-40 years	Excellent	Mature		6	3

KEY

Tree No: Relates to the number allocated to each tree for the Tree Protection Plan.

Height: Height of the tree to the nearest metre.

Spread: The average spread of the canopy measured from the trunk.

DBH: Diameter at breast height. An industry standard for measuring trees at 1.4 metres above ground level, this measurement is used to help calculate Tree Protection Zones.

Live Crown Ratio: Percentage of foliage cover for a particular species.

Age Class:	Young:	Recently planted tree	Semi-mature:< 20% of life expectancy
	Mature:	20-90% of life expectancy	Over-mature:>90% of life expectancy

SULE: See SULE methodology in the Appendix 3

Tree Protection Zone (TPZ): The minimum area set aside for the protection of the trees trunk, canopy and root system throughout the construction process. Breaches of the TPZ will be specified in the recommendations section of the report.

Structural Root Zone (SRZ): The SRZ is a specified distance measured from the trunk that is set aside for the protection of the trees roots both structural and fibrous.

Appendix 3

SULE categories (after Barrell, 2001)[1]

SULE Category	Description
Long	*Trees that appeared to be retainable at the time of assessment for more than 40 years with an acceptable level of risk.*
1a	Structurally sound trees located in positions that can accommodate for future growth
1b	Trees that could be made suitable for retention in the long term by remedial tree care.
1c	Trees of special significance that would warrant extraordinary efforts to secure their long term retention.
Medium	*Trees that appeared to be retainable at the time of assessment for 15-40 years with an acceptable level of risk.*
2a	Trees that may only live for 15-40 years
2b	Trees that could live for more than 40 years but may be removed for safety or nuisance reasons
2c	Trees that could live for more than 40 years but may be removed to prevent interference with more suitable individuals or to provide for new planting.
2d	Trees that could be made suitable for retention in the medium term by remedial tree care.
Short	*Trees that appeared to be retainable at the time of assessment for 5-15 years with an acceptable level of risk.*
3a	Trees that may only live for another 5-15 years
3b	Trees that could live for more than 15 years but may be removed for safety or nuisance reasons.
3c	Trees that could live for more than 15 years but may be removed to prevent interference with more suitable individuals or to provide for a new planting.
3d	Trees that require substantial remedial tree care and are only suitable for retention in the short term.
Remove	*Trees that should be removed within the next five years.*
4a	Dead, dying, suppressed or declining trees because of disease or inhospitable conditions.
4b	Dangerous trees because of instability or loss of adjacent trees
4c	Dangerous trees because of structural defects including cavities, decay, included bark, wounds or poor form.
4d	Damaged trees that are clearly not safe to retain.
4e	Trees that could live for more than 5 years but may be removed to prevent interference with more suitable individuals or to provide for a new planting.
4f	Trees that are damaging or may cause damage to existing structures within 5 years.
4g	Trees that will become dangerous after removal of other trees for the reasons given in (a) to (f).
4h	Trees in categories (a) to (g) that have a high wildlife habitat value and, with appropriate treatment, could be retained subject to regular review.
Small	*Small or young trees that can be reliably moved or replaced.*
5a	Small trees less than 5m in height.
5b	Young trees less than 15 years old but over 5m in height.
5c	Formal hedges and trees intended for regular pruning to artificially control growth.

updated 01/04/01)

1 (Barrell, J. (2001) "SULE: Its use and status into the new millennium" in *Management of mature trees*, Proceedings of the 4th NAAA Tree Management Seminar, NAAA, Sydney.

Appendix 4

Tree Significance - Assessment Criteria

1. High Significance in landscape

- The tree is in good condition and good vigour;
- The tree has a form typical for the species;
- The tree is a remnant or is a planted locally indigenous specimen and/or is rare or uncommon in the local area or of botanical interest or of substantial age;
- The tree is listed as a Heritage Item, Threatened Species or part of an Endangered ecological community or listed on Councils significant Tree Register;
- The tree is visually prominent and visible from a considerable distance when viewed from most directions within the landscape due to its size and scale and makes a positive contribution to the local amenity;
- The tree supports social and cultural sentiments or spiritual associations, reflected by the broader population or community group or has commemorative values;
- The tree's growth is unrestricted by above and below ground influences, supporting its ability to reach dimensions typical for the taxa in situ - tree is appropriate to the site conditions.

2. Medium Significance in landscape

- The tree is in fair-good condition and good or low vigour;
- The tree has form typical or atypical of the species;
- The tree is a planted locally indigenous or a common species with its taxa commonly planted in the local area
- The tree is visible from surrounding properties, although not visually prominent as partially obstructed by other vegetation or buildings when viewed from the street,
- The tree provides a fair contribution to the visual character and amenity of the local area,
- The tree's growth is moderately restricted by above or below ground influences, reducing its ability to reach dimensions typical for the taxa in situ.

3. Low Significance in landscape

- The tree is in fair-poor condition and good or low vigour;
- The tree has form atypical of the species;
- The tree is not visible or is partly visible from surrounding properties as obstructed by other vegetation or buildings,
- The tree provides a minor contribution or has a negative impact on the visual character and amenity of the local area,
- The tree is a young specimen which may or may not have reached dimension to be protected by local Tree Preservation orders or similar protection mechanisms and can easily be replaced with a suitable specimen,
- The tree's growth is severely restricted by above or below ground influences, unlikely to reach dimensions typical for the taxa in situ - tree is inappropriate to the site conditions,
- The tree is listed as exempt under the provisions of the local Council Tree Preservation Order or similar protection mechanisms,
- The tree has a wound or defect that has potential to become structurally unsound.

Environmental Pest / Noxious Weed Species

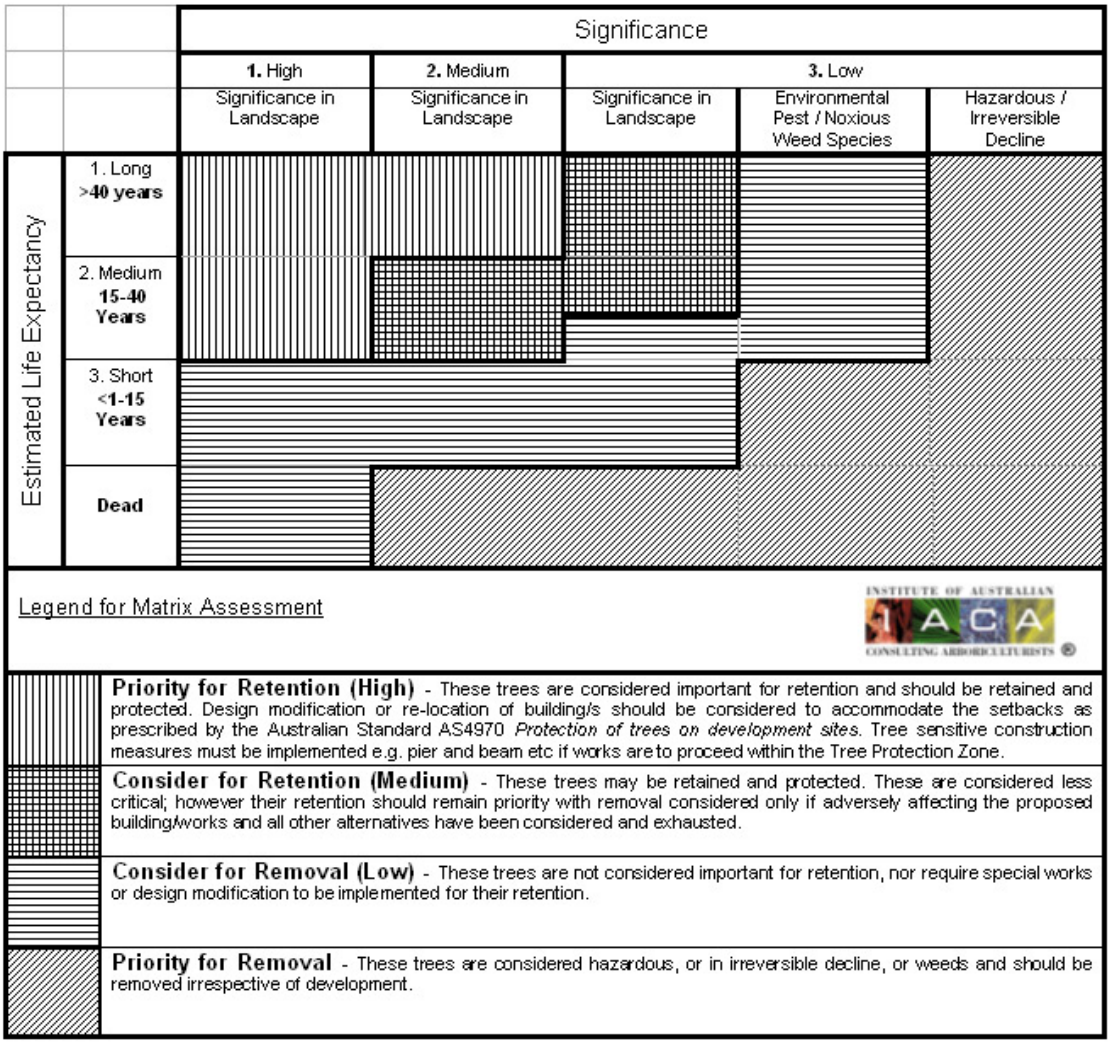
- The tree is an Environmental Pest Species due to its invasiveness or poisonous/ allergenic properties,
- The tree is a declared noxious weed by legislation.

Hazardous/Irreversible Decline

- The tree is structurally unsound and/or unstable and is considered potentially dangerous, - The tree is

dead, or is in irreversible decline, or has the potential to fail or collapse in full or part in the immediate to short term.

The tree is to have a minimum of three (3) criteria in a category to be classified in that group.



Legend for Matrix Assessment.

IACA, 2010, IACA Significance of a Tree, Assessment Rating System (STARS), Institute of Australian Consulting Arboriculturists, Australia, **www.iaca.org.au**

Appendix 5

TPZ and SRZ methodology

Determining the Tree Protection Zone (TPZ)

The radium of the TPZ is calculated for each tree by multiplying its DBH x 12.

TPZ = DBH x 12

Where

DBH = trunk diameter measured at 1.4 metres above ground

Radius is measured from the centre of the stem at ground level.

A TPZ should not be less than 2 metres no greater than 15 metres (except where crown protection is required.). Some instances may require variations to the TPZ.

The TPZ of palms, other monocots, cycads and tree ferns should not be less than 1 metre outside the crown projection.

Determining the Structural Root Zone (SRZ)

The SRZ is the area required for tree stability. A larger area is required to maintain a viable tree.

The SRZ only needs to be calculated when major encroachment into a TPZ is proposed.

There are many factors that affect the size of the SRZ (e.g. tree height, crown area, soil type, soil moisture). The SRZ may also be influenced by natural or built structures, such as rocks and footings. An indicative SRZ radius can be determined from the trunk diameter measured immediately above the root buttress using the following formula or Figure 1. Root investigation may provide more information on the extent of these roots.

SRZ radius = $(D \times 50)^{0.42} \times 0.64$

Where

D = trunk diameter, in m, measured above the root buttress

NOTE: The SRZ for trees with trunk diameters less than 0.15m will be 1.5m (see Figure 1).

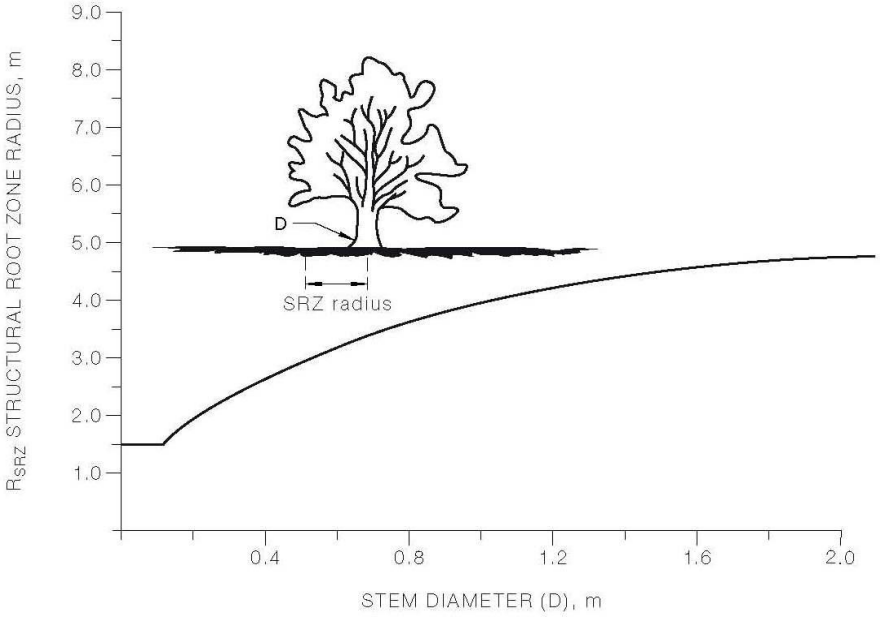


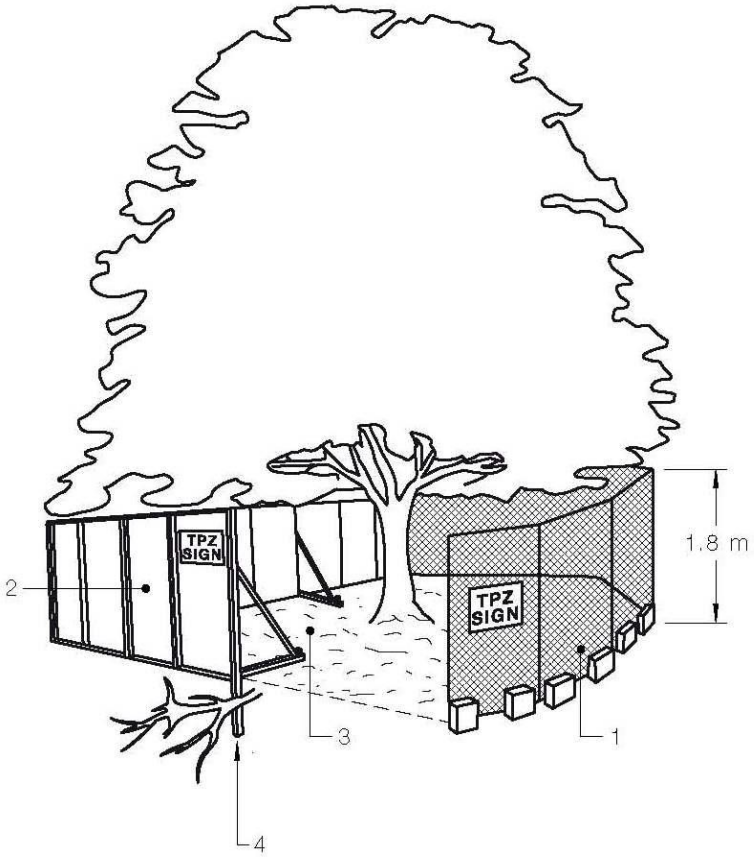
FIGURE 1 - STRUCTURAL ROOT ZONE

Notes:

1 R_{SRZ} is the structural root zone radius.
2 *D* is the stem diameter measured immediately above root buttress.
3 The SRZ for trees less than o.15 metres diameter is 1.5 metres.
4 The SRZ formula and graph do not apply to palms, other monocots, cycads and tree ferns.
5 This does not apply to trees with an asymmetrical root plate.

Appendix 6

Tree protection fencing specifications



LEGEND:

1 Chain wire mesh panels with shade cloth (if required) attached, held in place with concrete feet.
2 Alternative plywood or wooden paling fence panels. This fencing material also prevents building materials or soil entering the TPZ.
3 Mulch installation across surface of TPZ (at the discretion of the project arborist). No excavation, construction activity, grade changes, surface treatment or storage of materials of any kind is permitted within the TPZ.
4 Bracing is permissible within the TPZ. Installation of supports should avoid damaging roots.

Figure 1: Protective fencing as specified in AS 4970, 2009.

Appendix 7

Tree protection sign

sign sample

Moore Trees
Tree Consultancy
0411 712 887

Tree Protection Zone

Fence not to be moved without approval from Arborist

Within this fence there is to be

NO

Storage of materials

Trenching or excavation

Washing of tools or equipment

Appendix 8

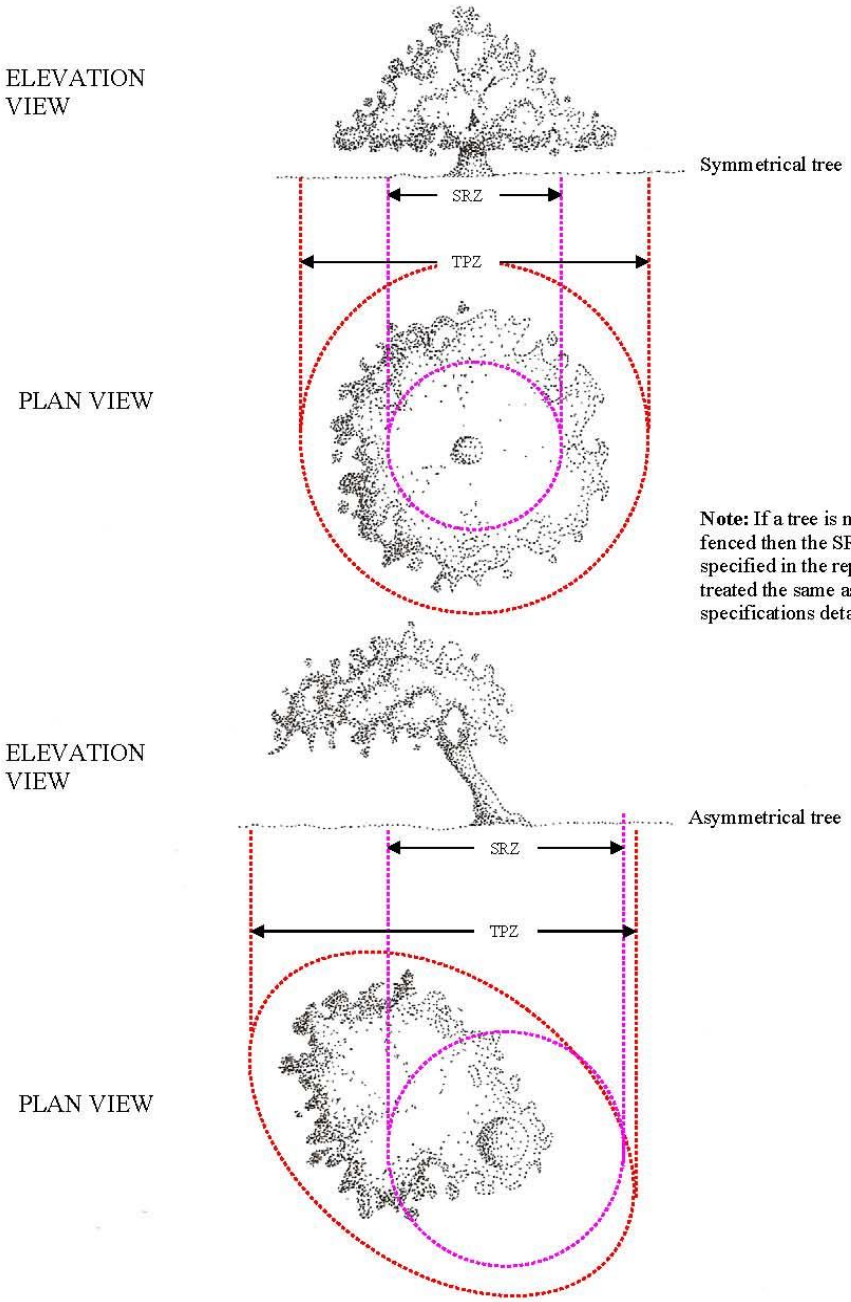


Figure 1: Indicative Tree Protection Zone (TPZ) and Root Protection Zone (SRZ)
Drawn: P. Vezgoff ©

Appendix 9

Tree structure information diagram

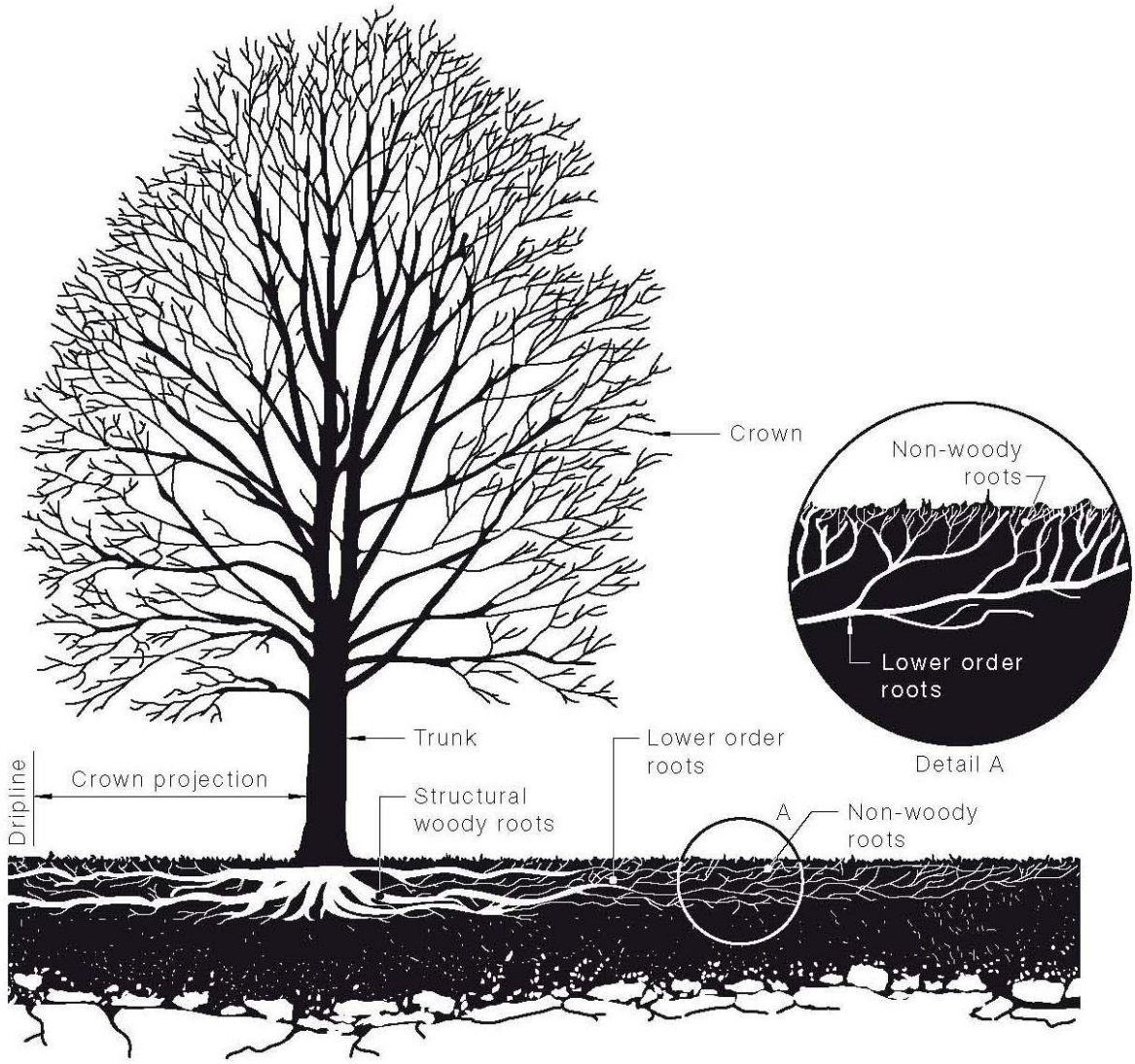


Figure 2: Structure of a tree in a normal growing environment (AS 4970, 2009.).

Appendix 10

Explanatory Notes

- **Mathematical abbreviations:** > = Greater than; < = Less than.

- **Measurements/estimates:** All dimensions are estimates unless otherwise indicated. Less reliable estimated dimensions are indicated with a '?'.

- **Species:** The species identification is based on visual observations and the common English name of what the tree appeared to be is listed first, with the botanical name after in brackets. In some instances, it may be difficult to quickly and accurately identify a particular tree without further detailed investigations. Where there is some doubt of the precise species of tree, it is indicate it with a '?' after the name in order to avoid delay in the production of the report. The botanical name is followed by the abbreviation sp if only the genus is known. The species listed for groups and hedges represent the main component and there may be other minor species not listed.

- **Height:** Height is estimated to the nearest metre.

- **Spread:** The maximum crown spread is visually estimated to the nearest metre from the centre of the trunk to the tips of the live lateral branches.

- **Diameter:** These figures relate to 1.4m above ground level and are recorded in centimetres. If appropriate, diameter is measure with a diameter tape. 'M' indicates trees or shrubs with multiple stems.

- **Estimated Age:** Age is estimated from visual indicators and it should only be taken as a provisional guide. Age estimates often need to be modified based on further information such as historical records or local knowledge.

- **Distance to Structures:** This is estimated to the nearest metre and intended as an indication rather than a precise measurement.

Appendix 11

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- 2013 – ISA TRAQ qualification
- 2007 – Diploma of Arboriculture (AQF Cert V) Ryde TAFE. (Distinction)
- 1997 – Completed Certificate in Crane and Plant Electrical Safety
- 1996 – Attained Tree Surgeon Certificate (AQF Cert II) at Ryde TAFE
- 1990 – Completed two month intensive course on garden design at the Inchbald School of Design, London, United Kingdom
- 1990 – Completed patio, window box and balcony garden design course at Brighton College of Technology, United Kingdom
- 1989 – Awarded the Big Brother Movement Award for Horticulture (a grant by Lady Peggy Pagan to enable horticulture training in the United Kingdom)
- 1989 – Attained Certificate of Horticulture (AQF Cert IV) at Wollongong TAFE

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Moore Trees Arboricultural Services **January 2006 to date**
Tree Consultancy and tree ultrasound. Tree hazard and risk assessment, Arborist development application reports
Tree management plans.

Woollahra Municipal Council **Oct 1995 to February 2008**
ARBORICULTURE TECHNICAL OFFICER
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HORTICULTURALIST
October 1995 – September 2000

Northern Landscape Services **July to Oct 1995**
Tradesman for Landscape Construction business

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CONFERENCES AND WORKSHOPS ATTENDED

- International Society of Arboriculture Conference (Canberra May 2017)
- QTRA Conference, Sydney Australia (November 2016)
- TRAQ Conference, (October 2013/2018)
- International Society of Arboriculture Conference (Brisbane 2008)
- Tree related hazards: recognition and assessment by Dr David Londsdale (Brisbane 2008)
- Tree risk management: requirements for a defensible system by Dr David Londsdale (Brisbane 2008)
- Tree dynamics and wind forces by Ken James (Brisbane 2008)
- Wood decay and fungal strategies by Dr F.W.M.R. Schwarze (Brisbane 2008)
- Tree Disputes in the Land & Environment Court – The Law Society (Sydney 2007)
- Barrell Tree Care Workshop- Trees on construction sites (Sydney 2005).
- Tree Logic Seminar- Urban tree risk management (Sydney 2005)
- Tree Pathology and Wood Decay Seminar presented by Dr F.W.M.R. Schwarze (Sydney 2004)
- Inaugural National Arborist Association of Australia (NAAA) tree management workshop- Assessing hazardous trees and their Safe Useful Life Expectancy (SULE) (Sydney 1997).