Moore Trees
Arboricultural Services

ABN 90887347745

Arboricultural Impact Assessment Report

DARLINGTON PUBLIC SCHOOL
October 2020
FINAL

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VERSION CONTROL

Date of Issue	Details
23 October 2020	Version 1 issued
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10 November 2020	Final issued
24 November 2020	Final issue updated for retain if possible, based on DPIE SSD Conditions

1 INTRODUCTION

1.1 This Arboricultural Impact Assessment (AIA) has been conducted to assess impacts to the subject trees at Darlington Public School, Golden Grove St, Chippendale NSW 2008 (Diagram 1). This Report has been prepared for the proposed development works as a submission through two separate approval processes being State Significant Development (SSD), identified in the State and Regional Development SEPP, and the Local Council Development Application (DA) process.

This Report has been prepared for Darlington Public School c/o Mace Australia Pty Limited as specified by the Department of Planning Industry & Environment in their letter dated 2/10/2020, requesting an Arboricultural Impact Assessment Report for the entire site to determine the cumulative impact of all tree removal proposed. This Report has been prepared by a qualified AQF Level 5 Consulting Arborist, and the report has been prepared referencing AS4970.

1.2 The purpose of this report is to collect the appropriate tree related data on the subject trees and to provide advice on the categorization of the site trees in order to assist in potential design layouts.

1.3 This AIA follows the requirements for Consulting Arborists reporting to CoS as detailed in 8.2.1 *Arboricultural Impact Assessment Report* of Schedule 8 of the Sydney Development Control Plan 2012.

1.4 This report also contains the following information for this Impact Assessment requirement:-

a) Reviewing the Architectural Drawings and assessing the potential impact of the proposed development on existing trees to be retained, including assessment of any proposed incursions to the canopy and/or root zone;
b) Advising the client if further investigations, such as root investigations or internal diagnostic testing is required;
c) Recommending modifications to the design or construction methods where appropriate to minimise adverse impact on trees considered worthy of retention including recommended setbacks or other measures to avoid adverse impacts;

d) Preparing a plan showing the trees to be removed and retained together with their respective identification number based on the site survey;

e) Providing generic recommendations for tree protection measures to ensure the retention of healthy trees as appropriate ; and

1.5 The site: The subject site is known as Darlington Public School, Golden Grove St, Chippendale NSW 2008 (Diagram 1). The site area, including tree numbering, can be seen in the Tree Impact Plan (Appendix 1). 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)

1.6 Documents and information provided: Tree Retention Study undertaken by Fjmt marked Rev 1 dated 8/10/2020; Architectural Masterplan Report by Fjmt Studio for SSDA; and Tree Management Plan by Fjmt Studio, reference sheet #8200 Rev 02 dated 21/5/2020. This AIA Report has been assessed against these plans.

1.7 **The Site trees:** The appropriate tree related data was collected on the subject trees concerning their health and condition. This tree data for the site trees can be seen in Appendix 2 (Tree Health and Condition Schedule). The subject trees were also part of a categorization process that rated them into a high, medium or low retention rating.

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). As noted by IACA, this system is a free to use system by Arboriculturists, as at the date of this report. 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.*

All of the site trees are protected under Clause 3.5.3 Tree Management (CoS DCP 2012).

1.8 **The Proposed Works:** The proposed works entail expanding the school's capacity for increased student numbers in the catchment area. The proposed works include demolition of all existing buildings and construction of multi-story buildings, a new ball court and landscaping throughout the school property.

2 METHODOLOGY

2.1 To record the health and condition of the trees, an initial Visual Tree Assessment (VTA) was undertaken on the subject trees on the 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 in tabulated format. All inspections were undertaken from the ground. No diagnostic devices were used on these trees.

2.2 **Tree Protection Zone (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 the site trees. The TPZ calculation is based on the Australian Standard *Protection of trees on development sites,* AS 4970, 2009. The Tree Protection Zones are shown in the *Tree Impact Plan* (Appendix 1)

2.3 **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. SRZ areas are also shown in Tree Impact Plan (Appendix 1). The TPZ and SRZ are measured as a radial measurement from the trunk. No roots should be severed within this area. A detailed methodology on the TPZ and SRZ calculations can be found in Appendix 5.

2.4 **Impact Assessment:** The site survey and plans provided by CoS were assessed for the following:

- Reduced Level (R.L.) at base of any site tree.
- Incursions into the Tree Protection Zone (TPZ).
- Assessment of the likely impact of the works.
- Possible remediation opportunities.
- Overall canopy loss based on assessment of aerial photography.

2.5 **Terms:** The following terms have been used in this report and due the extent of various disciplines involved on a project of this size; basic terminologies have been used as described below;

***Foot print*:** The term footprint will relate to any proposed structure located above Ground Level (GL) that may potentially affect the root zone of any tree or tree itself. The structure may be as small as a rubbish bin or as large as an area of paving.

***Excavation*:** This includes trenching, trenching and batters, footings for walls, trenching for services, pipes, lighting telecommunications.

***Hand dug*:** Excavation to occur by hand so as not to damage or sever any roots associated with nearby trees. In general, the Project Arborist inspects or supervises this work.

***TPZ encroachments*:** 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. Any encroachment greater than 10% is considered a major encroachment. In this instance the Project Arborist is required to demonstrate that the tree would still remain viable due to the >10% encroachment.

2.6 **Report limitations:** This report does not constitute a Tree Protection Plan. Once the designs have been finalised, in conjunction with the findings of this report, a final site specific Tree Protection Plan can then be produced.

3 TREE IMPACTS

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.

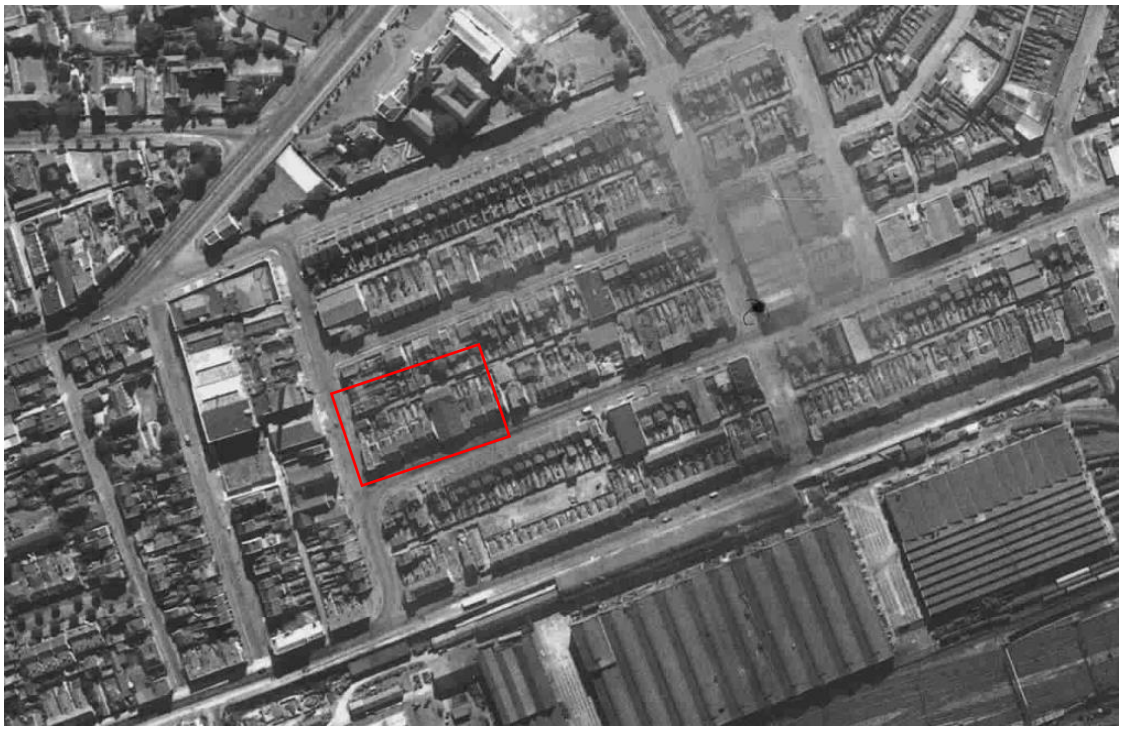


Diagram 2: The site as seen in 1943, devoid of trees (RTA From the skies, 2007).

3.2 **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 Impact Plan (Appendix 1).

3.3 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 that provide extensive canopy cover to the site (Plate 2).

Plate 1: Image showing Trees 1 and 2. Working around a mature tree such as this will be difficult in terms of canopy impacts and root disturbance. P. Vezgoff

Plate 2: Image showing one of the larger mature specimens, Tree 53. P. Vezgoff

3.4 Trees 7-15 are located within the central playground area (Plate 3). Although not great specimens individually, they do work well as a group providing canopy cover and good aesthetic value to the rear area.

Plate 3: Image showing Trees 7-15 central to the playground area. The area not facing the camera consists of a low retaining wall. P. Vezgoff

3.5 Trees 20, 21, 47 and 48 are some of the larger trees on site being some twenty (20) metres in height (Plate 4). 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 zones were free of any ground heaving, or lifting. Ideally an aerial inspection should occur to fully determine the condition of the main branch unions if they were to be retained.

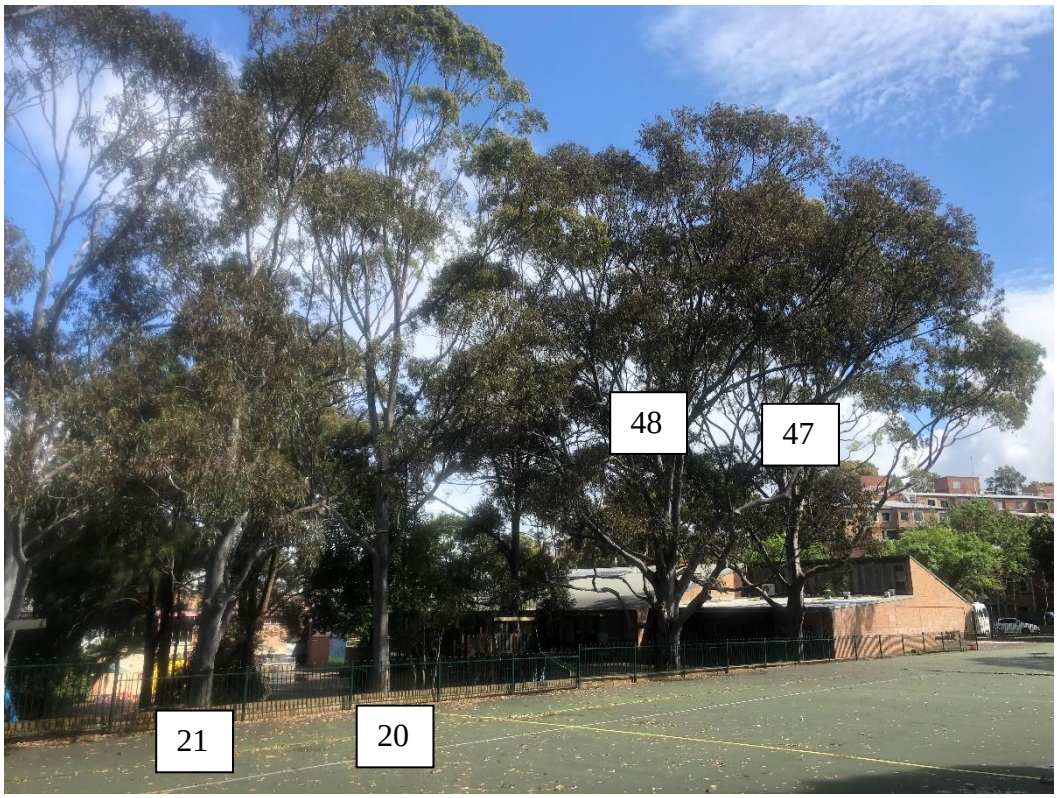


Plate 4: Image showing Trees 21, 20. P. Vezgoff

3.6 Trees 26-31 (Plate 5) 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 5: Image showing Trees 26-31. P. Vezgoff

3.7 Trees 32-39 are growing along the northern boundary fence (Plate 6). These are a mixed group of large mature *Eucalyptus* specimens but competing with some exotic specimens (Liquidambar) that have been planted between and under the large *Eucalyptus* specimens. These trees are also tightly grouped specimens that have a restricted root space and are covered with asphalt and playground rubberised matting up to the trunks. Varied levels are present as these trees have been planted on a stepped area (Plate 7).

3.8 Under these larger more dominant native specimens are Trees 40-43 that are Liquidambar *(Liquidambar styraciflua)* and a single *Cupresses* specimen. These trees can be seen in Plate 7. Now suppressed, these trees will not reach maturity and as such are not long term viable specimens.

Plate 6: Image showing Trees 32-39. P. Vezgoff

Plate 7: Image showing surface condition of Trees 32-39. P. Vezgoff

3.9 Trees 44-46 (Plate 8) are growing along the eastern boundary fence. These trees are younger specimens in excellent health and condition and provide a good screen between two properties. The majority of the root zones of these trees is covered with hard surface.

Plate 8: Image showing Trees 44-46. P. Vezgoff

3.10 Although this area of Sydney may be high in sand content, that would normally encourage deeper root systems, this 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 9).

Plate 9: Image showing surface roots from Tree 20. P. Vezgoff

3.11 Trees 47 and 48 are some of the larger trees on site being over some twenty (20) metres 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.

3.12 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 in this Report as it is a large street tree near the site.

3.13 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 3.

Significance Scale	**1 (High)**	**2 (Medium)**	**3 (Low)**
Tree No.	4-8, 13-15, 17-22, 24, 33-39, 44-48, 53, 58-62, 68.	1, 2, 9-12, 16, 25, 49-52, 54-57, 63-67.	23, 26-32, 40-43.

3.14 **Impacts:** Impacts to the site trees, due to the designs, can be seen in the *Tree Impact Plan* (Appendix 1). The building footprint has been overlaid with the site trees and their TPZ and SRZ distances. The incursion impacts have been divided into two categories being deep excavations such as footings, and the second being more surface excavations that will alter levels within the TPZ area. It should be noted there are no service diagrams at this stage. Trenching for services is often overlooked and needs to be considered for the final impacts to the site trees.

3.15 Based on the plans provided, trees that are possible to retain are numbered as; 6, 12, 13, 14, 15, 17, 18, 19, 35-39, 44-46, and (street trees) 56-68. Trees within the building footprint will suffer too greater incursion into the TPZ areas and as such are proposed to be removed are numbered as; 1, 2, 7, 8, 16, 20-34, 40-43, 47-55. Trees that should be possible to retain if design alterations can be made are numbered as 4, 5, 9, 10 and 11. The impacts for each tree can be seen in Table 2 (Individual Tree Impacts).

3.16 Trees 20-25 are located within the sports court footprint and Trees 49, 50 and 51 are located within an area required to be resumed for the levelling of the sports court area. Trees 34, 40-43 are smaller suppressed specimens of *Liquidambar* interplanted between the *Eucalyptus* specimens that will never reach their full potential. Provided the existing steps along Trees 33, 35-39, and the small wall along Trees 44-46 can be retained, or at least no excavations beyond these trees, then these trees could be successfully retained. The deck area proposed in this location should be possible to be constructed provided excavations are sympathetic to the TPZ areas. As seen in the Tree Impact Plan, the TPZ distances are within the sports court works area however the roots from these trees will have been restricted in radial growth due to these steps and footings currently present. Any roots under the sports court area should be reasonably deep and provided the existing finished levels can be maintained impacts to these trees will be minimal.

3.17 The design levels around Tree 12 are very tight as it is surrounded by an existing brick wall and sandstone steps (Plate 10). Any new wall around this tree 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.

Plate 10: Trees 9, 10, 11 and 12. P. Vezgoff

3.18 **Structural Root Zones (SRZ) breach:** Based on the proposed plans, there are no deep incursions to SRZ areas (except for where a tree is within a building footprint) however there is the removal of turf, mulch and hard surfaces below some of the site trees which, if not undertaken correctly, could damage the main stems and basal areas of the trees. The TPZ areas of Trees 6 and 18 will have only minor surface works occur within the top one hundred (100) millimetres.

3.19 **Tree Protection Zone (TPZ) breach:** The TPZ distances are breached on Trees 1-12 for soft landscaping but also hard landscaping being a brick garden edge and also clay paving. TPZ encroachments for Trees 7-12 are all approximately <10%. This area is currently turf and mulch (Plate 2). Trees 1 and 2 cannot be retained due to the levels between the street and internal garden area that are required.

3.20 If these works are not undertaken correctly it could damage the main stems and basal areas of the aforementioned trees. TPZ encroachments can be seen in the Tree Impact Plan (Appendix 1). Where the trees are located within a building foot print the tree has been listed to be removed. Where the tree has level changes within the TPZ there may be options to alter designs in order to retain the more significant specimens. Some following options could be applied to determine root locations during the construction process.

For works within TPZ areas that require level changes the following methodologies must be applied;

3.20.1 Mechanised excavation: A flat bucket attachment on the excavator can be used within the TPZ areas to locate roots provided levels are reduced by small increments so as not to damage any roots found. Should any roots >40mm be located, hand excavation will follow. This is to ensure that no roots within the TPZ are to be cut or damaged that are >40mm in diameter. A spotter must be present to ensure machinery does not hit any of the trees and to monitor the excavation depths.

3.20.2 Hand excavation: Hand excavation will ensure that no roots within the SRZ are to be cut or damaged that are >40mm in diameter around Trees such as 6, 12, 17, 18 and 19.

3.20.3 Hydrovac: When undertaking hydro-vacuum excavation the water pressure shall be calibrated so as to not damage, remove bark, or sever roots over 30mm in diameter. Canopy clearance will require assessment based on the size truck that will be supplied. Depending on the location of storage bays and site sheds it may be possible to park the truck off the street provide canopy clearance is available. The truck should also be kept out of the TPZ areas and not parked within any TPZ area for the duration of the works. No roots >30mm within the SRZ are to be cut or damaged. The Project Arborist shall supervise these works. This option could be used for the decking piers below Trees 33-39 and 44-46.

3.21 Drainage works: With regards to drainage, the majority of the site is porous due to the installation of garden areas and soft fall areas however final assessment of lines will need to be assessed in relation to any TPZ areas.

3.22 Planting within TPZ areas: The design requires planting within TPZ areas. No mechanised cultivation of any TPZ area shall occur, only hand tools shall be used. Should any roots from trees be found that are >40mm in diameter, the plant should be moved so no roots are required to be severed.

3.23 Removal of existing turf: Any existing turf within the TPZ areas of the trees to be removed shall be removed by hand and not by mechanical means around a five hundred (500) millimetre radius around each tree. Soil and mulch should also be removed by hand within this five hundred (500) millimetre radius. A flat bucket excavator may be used across the rest of the site however a spotter must be present due to the tight working area.

3.24 Removal of hard surfaces: Any existing hard surfaces to be removed within the TPZ areas of the trees to be retained shall be removed by hand and not by mechanical means around a five hundred (500) millimetre radius around each tree. Soil and mulch should also be removed by hand within this five hundred (500) millimetre radius. A flat bucket excavator may be used across the rest of the site however a spotter must be present due to the tight working area.

3.25 Furniture installation: The installation of seating, rubbish bins and new signage will require minor excavations. Any roots found forty (40) millimetres in diameter or less than, may be cleanly severed with a sharp saw. Any root found >40mm, the Project Arborist shall be contacted for further advice if the landscape item cannot be moved to avoid the root.

3.26 Canopy loss: The impacts to the site trees have been assessed based on the client's plans and Section 3.5 – *Urban Ecology* of Sydney DCP 2012. Section 2 states;

Provide at least 15% canopy coverage of a site within 10 years from the completion of development.

The DCP also states in Section 3.5.1 (a) ;

Protect existing habitat features within and adjacent to development sites.

The current design shows large mature trees in good health and condition being removed however this would appear to be due to the significant increase in internal building space that is required for the design scope.

3.27 The following calculations were made based on Google Earth polygon shape layers, note these calculations are approximate only. The total area for the site is 7663 square metres. The total area of existing canopy cover for the site is 3706 square metres. The total area of canopy proposed to be removed is 2250 square metres. The remaining canopy cover will be 1456 square metres (Table 1 and Diagram 3). As a percentage, the remaining canopy cover for the site will be 19% of the existing vegetation.

Item	**Area**	**Percentage of canopy cover for the site**	**Percentage of current canopy cover for the site**
Total area of site (m^2)	7663 m^2	3706 m^2	48%
Total area of canopy cover removed (m^2)	2250 m^2	29%	60%
Total area of canopy cover retained (m^2)	1456 m^2	19%	40%

Table 1: Tree canopy cover percentages.

Diagram 3: Image showing the proposed trees to be removed (red) and the trees that will be retained (green) (Google earth 2020).

Table 2: Individual Tree Impacts – Darlington Public School

Tree	Species	TPZ (m)	SRZ (m)	Probable outcome	Impact issue	Incursion to TPZ	Incursion to SRZ
1	Broad leaved paperbark (Melaleuca quinquenervia)	5.4	2.4	Remove	Changes to existing levels and new accessible pedestrian entry from the road verge.	100%	100%
2	Broad leaved paperbark (Melaleuca quinquenervia)	5.4	2.4	Remove		100%	100%
4	Cabbage tree palm (Livistona australis)	6	2.6	Retain if possible	Changes to levels to create astroturf kick about zone. Woody roots have grown into the concrete surface so trying to retain these trees may only create unstable specimens. These trees have been growing in a restricted root area and will not have the typical broad spreading root plate of a normal tree.	100%	100%
5	Swamp mahogany (Eucalyptus robusta)	4.8	2.4	Retain if possible		100%	100%
6	Brushbox (Lophostemon confertus)	4.8	2.4	**RETAIN**		12%	0
7	Coastal banksia (Banksia integrifolia)	4.2	2.3	Remove	Changes to levels to create new accessible entry path	100%	100%
8	Swamp mahogany (Eucalyptus robusta)	4.2	2.3	Remove	Changes to levels to create new accessible entry path	100%	100%
9	River she oak (Casuarina cunninghamiana)	6	2.6	Retain if possible		100%	100%
10	River she oak (Casuarina cunninghamiana)	2.4	1.9	Retain if possible		100%	100%
11	River she oak (Casuarina cunninghamiana)	2.4	1.9	Retain if possible	Changes to levels to create new accessible entry path Located in the path of new accessible entry path	100%	100%
12	River she oak (Casuarina cunninghamiana	6	2.6	**RETAIN**	These trees have been growing in a restricted root area and will not have the typical broad spreading root plate of a normal tree. These trees form part of a group of 4 and will have grafted root zones. Incursion minor.	10%	
13 14 15	Tallowwood (Eucalyptus microcorys)	5.4	2.5	**RETAIN**		<15%	
16	Firewheel tree (Stenocarpus sinuatus)	0.8	1.1	Remove	Changes to levels to create Astroturf kick about zone. Correct grading required to ensure safe usage of space.	100%	100%
17	Illawarra flame tree (Brachychiton acerifolius)	4.2	2.3	**RETAIN**	Tree to be incorporated into garden area.	<10%	0
18	Lemon-scented gum tree (Corymbia citriodora)	5.4	2.5	**RETAIN**	Tree to be incorporated into garden area.	<10%	0

Tree	Species	TPZ (m)	SRZ (m)	Probable outcome	Impact issue	Incursion to TPZ	Incursion to SRZ
19	Bangalow palm (Archontophoenix cunninghamiana)	2.2	1.6	**RETAIN**		<10%	0
20	Lemon-scented gum tree (Corymbia citriodora)	7.2	2.6	Remove	Changes to levels to create astroturf kick about zone	100%	100%
21	Sydney blue gum (Eucalyptus saligna)	7.2	2.8	Remove		100%	100%
22	Sydney blue gum (Eucalyptus saligna)	7.2	2.8	Remove		100%	100%
23	Sydney blue gum (Eucalyptus saligna), Lopped poor	2.4	1.6	Remove		100%	100%
24	Spotted gum (Corymbia maculata)	9.6	3.1	Remove		100%	100%
25	Lone Pine (Pinus brutia)	6	2.6	Remove		100%	100%
26	Kaffir plum (Harpephyllum caffrum)	4.8	2.4	Remove	Located within building footprint	100%	100%
27	Kaffir plum (Harpephyllum caffrum)	4.2	2.3	Remove	Located within building footprint	100%	100%
28	River she oak (Casuarina cunninghamiana)	3	2.1	Remove	Located within building footprint	100%	100%
29	Black bean (Castanospermum australe)	1.2	1.2	Remove	Located within building footprint	100%	100%
30	Kaffir plum (Harpephyllum caffrum)	4.8	2.4	Remove	Located within building footprint	100%	100%
31	Willow gum (Eucalyptus scoparia)	5.4	2.4	Remove	Located within building footprint	100%	100%
32	Mulberry (Morus nigra)	5.4	2.6	Remove	Tree consists of codominant stems and has decay forming between these stems. Level changes will also occur in this area for landscaping. Species is exempt from the Tree Preservation Order and is <10m tall.	90%	-
33	Sydney blue gum (Eucalyptus saligna)	6	2.6	Remove	In order to provide an accessible connection for wheelchair access, the existing steps need to be demolished and a new ramp constructed -	50%	50%
34	Sydney blue gum (Eucalyptus saligna)	2.4	1.9	Remove	Located within building footprint. Tree has asymmetrical lean to the south.	40%	-

Tree	Species	TPZ (m)	SRZ (m)	Probable outcome	Impact issue	Incursion to TPZ	Incursion to SRZ
35	Sydney blue gum (Eucalyptus saligna)	6	2.6	**RETAIN**	TPZ Partially within TPZ area	27%	0
36	Sydney blue gum (Eucalyptus saligna)	6	2.6	**RETAIN**	TPZ Partially within TPZ area	25%	0
37	Sydney blue gum (Eucalyptus saligna)	6	2.6	**RETAIN**	TPZ Partially within TPZ area	23%	0
38	Sydney blue gum (Eucalyptus saligna)	6	2.6	**RETAIN**	TPZ Partially within TPZ area	23%	0
39	Sydney blue gum (Eucalyptus saligna)	6	2.6	**RETAIN**	TPZ Partially within TPZ area	13%	0
40	Liquidambar (Liquidambar styraciflua)	2.2	1.6	Remove	Poor suppressed specimen will not reach full potential. Remove to improve space	0%	0%
41	Liquidambar (Liquidambar styraciflua)	2.2	1.6	Remove	Poor suppressed specimen will not reach full potential. Remove to improve space	0%	0%
42	Liquidambar (Liquidambar styraciflua)	2.4	1.9	Remove	Poor suppressed specimen will not reach full potential. Remove to improve space	0%	0%
43	Cupresses sp.	1.8	1.6	Remove	Tree consists of codominant stems and has decay forming between these stems. Level changes will also occur in this area for landscaping. Species is exempt from the Tree Preservation Order and is <10m tall.	0%	0%
44	Sydney blue gum (Eucalyptus saligna)	3	2.1	**RETAIN**	Although classed as a major incursion to the TPZ most of this incursion is raised decking that could be constructed sympathetically to reduce root damage.	7%	0
45	Sydney blue gum (Eucalyptus saligna)	5.4	2.5	**RETAIN**	Although classed as a major incursion to the TPZ most of this incursion is raised decking that could be constructed sympathetically to reduce root damage.	22%	0
46	Spotted gum (Corymbia maculata)	6.6	2.7	**RETAIN**	Although classed as a major incursion to the TPZ most of this incursion is raised decking that could be constructed sympathetically to reduce root damage.	21%	0
47	Spotted gum (Corymbia maculata)	14.4	3.6	Remove	Total incursion to the TPZ and SRZ areas due to a	100%	100%

Tree	Species	TPZ (m)	SRZ (m)	Probable outcome	Impact issue	Incursion to TPZ	Incursion to SRZ
48	Sydney blue gum (Eucalyptus saligna)	13.2	3.5	Remove	combination of building and landscape level changes. Large mature trees already growing on various levels.	100%	100%
49	Broad leaved paperbark (Melaleuca quinquenervia)	3	2.1	Remove		100%	100%
50	Illawarra flame tree (Brachychiton acerifolius)	2.4	1.9	Remove		100%	100%
50	Illawarra flame tree (Brachychiton acerifolius)	2.4	1.9	Remove		100%	100%
51	Hymenosporum flavum	1.2	1.3	Remove		100%	100%
52	Unknown	2.4	1.9	Remove		100%	100%
53	Tallowwood (Eucalyptus microcorys)	10.8	3.3	Remove		100%	100%
54	Trident maple (Acer sp)	1.2	1.3	Remove		100%	100%
55	Water gum (Tristaniopsis laurina)	3	2.1	Remove		100%	100%
56-68	Mixed Street tree specimens			**RETAIN**	No TPZ or SRZ incursions however no service plans have been provided. Council will not allow removal of street trees. Tree 61 will require canopy reduction pruning for the new building.		

4 TREE PROTECTION MEASURES

4.1 Based on the plans provided, trees that are possible to retain are numbered as 6, 12, 13, 14, 15, 17, 18, 19, 35-39, 44-46,, and (street trees) 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, 7, 8, 16, 20-34, 40-43, 47-55. Trees that should be possible to retain if design alterations can be made are numbered as 4, 5, 9, 10 and 11

4.2 This project will require a site specific Tree Protection Plan and specification once designs have been finalised. Regular site inspections shall also be specified in order to ensure that the contractor implements the recommendations of this Report and the Tree Protection Plan and associated specifications.

4.3 **Fencing:** Trees to be retained will require tree protection fencing as specified in the Australian Standard *Protection of trees on development sites,* AS 4970, 2009. 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 is installed. TPZ fencing locations shall be shown on demolition plans. The specifications for a TPZ are in Section 4.5 of this report.

4.4 **Trunk Protection:** This trunk protection will be required due to the proximity of heavy equipment operating near trees to be retained. 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. 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.

4.5 **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) shall be measured from the centre of the trunk, as a radial measurement. 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.

4.6 Trees 60 and 61 will require a degree of canopy pruning to allow for the two (2) new building 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. It is likely that City of Sydney may want to undertake this pruning themselves.

4.7 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 designs to comply with AS4970. Ultimately the site trees will require further assessment once plans and designs progress and have been agreed upon.

4.8 Building material storage: Areas on the site shall have to be set aside for the exclusive use of:

- Construction access points / roads
- Position of site sheds and latrines and temporary services
- Storage of materials

Any area set aside for the stockpiling of soil and waste shall have the appropriate erosion control measures around this area as specified by an engineer. These erosion control measures shall be monitored and maintained regularly throughout the construction period of the site. These measures are to restrict any waste material entering the TPZ areas of the trees to be retained.

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

23rd November 2020

www.mooretrees.com.au

Appendix 1

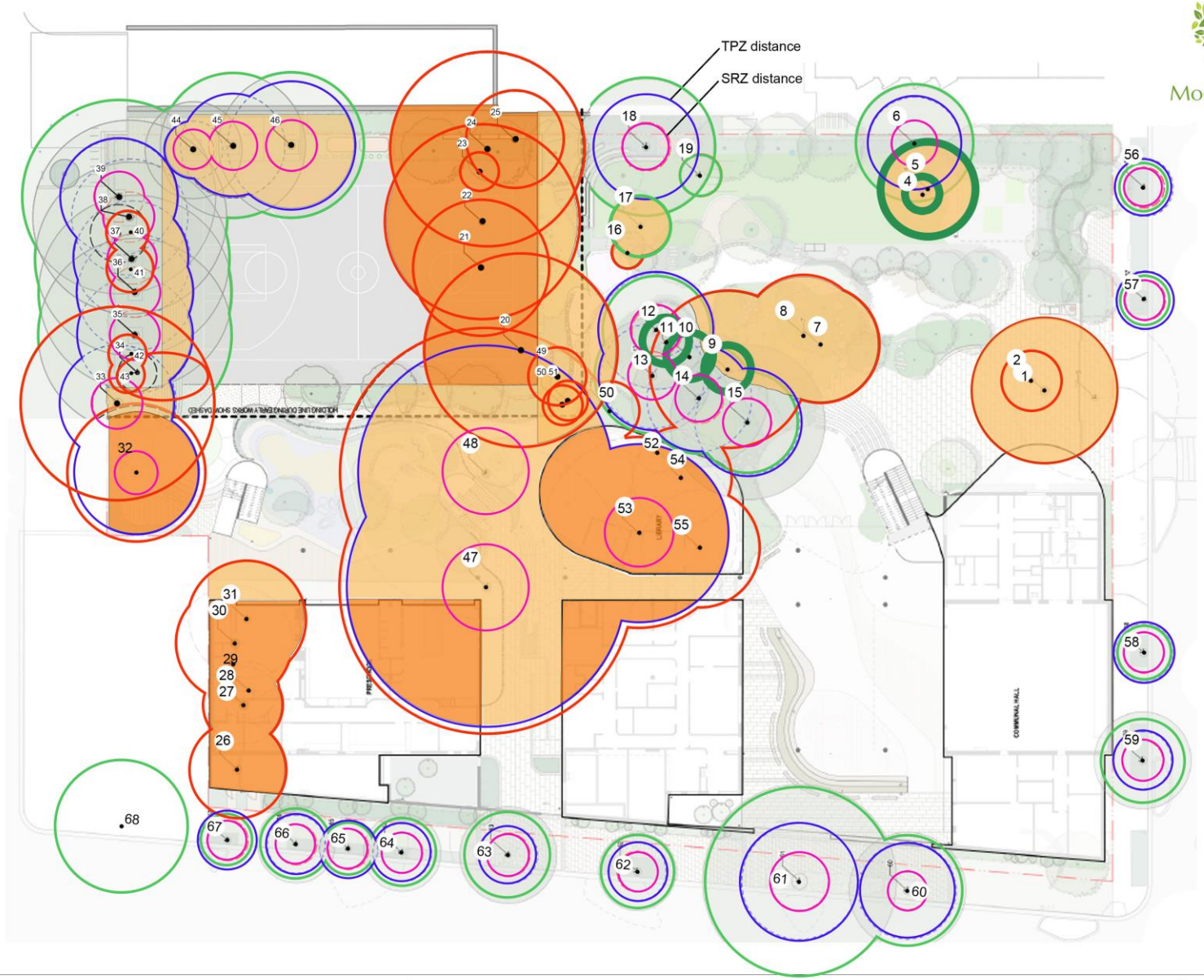
Tree Impact Plan

Impact Assessment

TPZ and SRZ encroachments

Impact Assessment

Moore Trees



Tree should be possible to retain

Tree unlikely to tolerate TPZ incursions.

Tree to be retained if possible

0 5 10 15 20 25

SCALE 1:250

TPZ distance

SRZ distance

TPZ incursion that involves level changes

Deep excavation through TPZ

Date: 23.11.2020
Drawn: P.Vezgoff
Site Address: Darlington Public School
Darlington NSW

Appendix 2

Tree health & condition assessment schedule

Table 4: TREE FIELD DATA SCHEDULE – Darlington Public School, Chippendale

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
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
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

Tree	Species	Height (m)	Spread (m)	DBH (m)	Live canopy %	Defects	SULE	Condition	Age	Comments	TPZ (m)	SRZ (m)
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
20	Lemon-scented gum tree (Corymbia citriodora)	20	8	0.6	95	Dead wood >50mm	2a May only live for 15-40 years	Good	Mature	Old storm damage noted. Section of dead wood	7.2	2.6
21	Sydney blue gum (Eucalyptus saligna)	20	8	0.6	95	No visual defects	2a May only live for 15-40 years	Good	Mature		7.2	2.8
22	Sydney blue gum (Eucalyptus saligna)	20	8	0.6	95	No visual defects	2a May only live for 15-40 years	Good	Mature		7.2	2.8
23	No Value	5	1	0.2	70	Root damage	2c removed for more suitable planting	Poor	Mature	Lopped for shed roof	2.4	1.6
24	Spotted gum (Corymbia maculata)	21	8	0.8	95	No visual defects	2a May only live for 15-40 years	Good	Mature		9.6	3.1
25	Lone Pine (Pinus brutia)	9	5	0.5	70	No visual defects	2a May only live for 15-40 years	Fair	Mature		6	2.6
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

Tree	Species	Height (m)	Spread (m)	DBH (m)	Live canopy %	Defects	SULE	Condition	Age	Comments	TPZ (m)	SRZ (m)
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 Exempt from TPO	5.4	2.6
33	Sydney blue gum (Eucalyptus saligna)	21	10	0.5	95	No visual defects	2a May only live for 15-40 years	Good	Mature	Soft fall over root zone	6	2.6
34	Sydney blue gum (Eucalyptus saligna)	8	5	0.2	80	No visual defects	2c removed for more suitable planting	Fair	Mature	Asymmetrical canopy to the south suppressed specimen	2.4	1.9
35	Sydney blue gum (Eucalyptus saligna)	21	10	0.5	95	No visual defects	2a May only live for 15-40 years	Good	Mature	Soft fall over root zone	6	2.6
36	Sydney blue gum (Eucalyptus saligna)	21	10	0.5	95	No visual defects	2a May only live for 15-40 years	Good	Mature	Soft fall over root zone	6	2.6
37	Sydney blue gum (Eucalyptus saligna)	21	10	0.5	95	No visual defects	2a May only live for 15-40 years	Good	Mature	Soft fall over root zone	6	2.6
38	Sydney blue gum (Eucalyptus saligna)	21	10	0.5	95	No visual defects	2a May only live for 15-40 years	Good	Mature	Soft fall over root zone	6	2.6
39	Sydney blue gum (Eucalyptus saligna)	21	10	0.5	95	No visual defects	2a May only live for 15-40 years	Good	Mature	Soft fall over root zone	6	2.6
40	Liquidambar (Liquidambar styraciflua)	9	3	0.18	108	No visual defects	2a May only live for 15-40 years	Good	Mature	Suppressed by larger trees	2.2	1.6
41	Liquidambar (Liquidambar styraciflua)	9	3	0.18	108	No visual defects	2a May only live for 15-40 years	Good	Mature	Suppressed by larger trees	2.2	1.6

Tree	Species	Height (m)	Spread (m)	DBH (m)	Live canopy %	Defects	SULE	Condition	Age	Comments	TPZ (m)	SRZ (m)
42	Liquidambar (Liquidambar styraciflua)	9	3	0.2	108	No visual defects	2a May only live for 15-40 years	Good	Mature	Suppressed by larger trees	2.4	1.9
43	Cupresses sp.	7	0.5	0.15	100	No visual defects	2a May only live for 15-40 years	Good	Mature	Suppressed by larger trees	1.8	1.6
44	Sydney blue gum (Eucalyptus saligna)	11	5	0.25	95	No visual defects	2a May only live for 15-40 years	Excellent	Mature	Soft fall over root zone	3	2.1
45	Sydney blue gum (Eucalyptus saligna)	18	8	0.45	95	Dead wood >50mm	2a May only live for 15-40 years	Excellent	Mature	Soft fall over root zone. Sections of dead wood	5.4	2.5
46	Spotted gum (Corymbia maculata)	19	8	0.55	95	No visual defects	2a May only live for 15-40 years	Excellent	Mature		6.6	2.7
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
49	Broad leaved paperbark (Melaleuca quinquenervia)	8	2.5	0.25	90	No visual defects	1a >40 years	Good	Mature	Group of three stems	3	2.1
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
51	Hymenosporum flavum	5	2	0.1	100	No visual defects	5a Small tree <5 m in height.	Good	Mature		1.2	1.3
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

Tree	Species	Height (m)	Spread (m)	DBH (m)	Live canopy %	Defects	SULE	Condition	Age	Comments	TPZ (m)	SRZ (m)
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	Exempt from TPO	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	Exempt from TPO	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	Exempt from TPO	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
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 Plans.

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 tree roots, both structural and fibrous.

Appendix 3

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

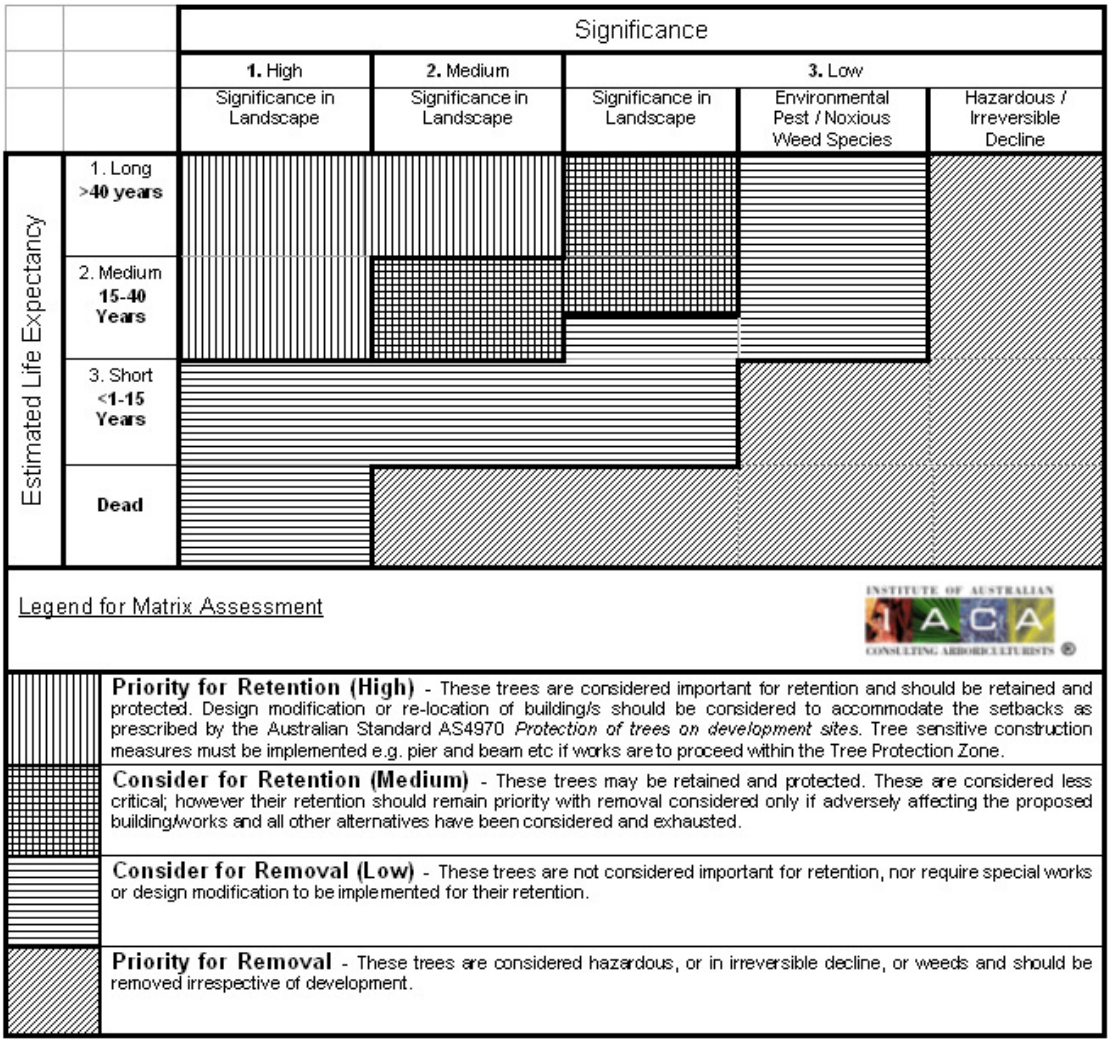
- The tree is an Environmental Pest Species due to its invasiveness or poisonous/ allergenic properties,
- The tree is a declared noxious weed by legislation.

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 4

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.
4b	Dangerous trees because of instability or loss of adjacent trees
4c	Dangerous trees because of structural defects
4d	Damaged trees 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.
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.

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 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).

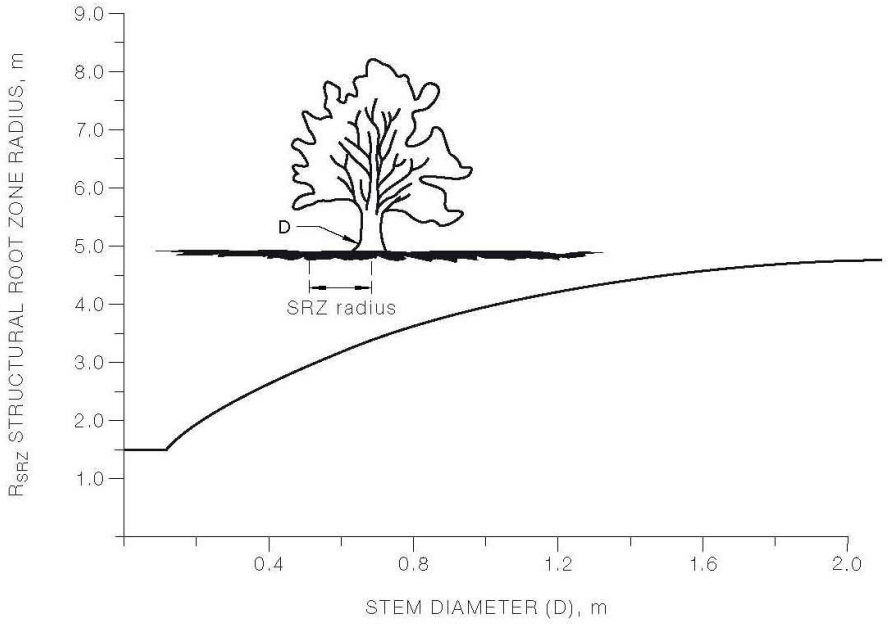


FIGURE 1 - STRUCTURAL ROOT ZONE

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

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 indicated 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 7

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EDUCATION and QUALIFICATIONS

- 2013 / 2018 – 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

INDUSTRY EXPERIENCE

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
August 2005 – February 2008
ACTING COORDINATOR OF TREES MAINTENANCE
June – July 2005, 2006
Responsible for all duties concerning park and street trees. Prioritising work duties, delegation of work and staff supervision.
TEAM LEADER
January 2003 – June 2005
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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, Auckland NZ / Sydney (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).