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Project No: USYD/ETP/17 Report No: USYD/ETPSSDA/AIA/C

# ARBORICULTURAL IMPACT ASSESSMENT TREE PROTECTION SPECIFICATION

**Engineering & Technology Precinct – Stage 1 (SSDA)**  
**University of Sydney**

Prepared for: LAING O'ROURKE

5<sup>th</sup> December 2018

Revision C

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## 1.0 INTRODUCTION

### 1.1 Background

1.1.1 This Arboricultural Impact Assessment Report and Tree Protection Specification was prepared for Laing O'Rourke, on behalf of the the University of Sydney, in relation to the proposed Engineering and Technology Precinct – Stage 1 project. The purpose of this Report is to undertake a Visual Tree Assessment<sup>1</sup> (VTA), determine the impact of the proposed works on the trees, and where appropriate, recommend the use of tree sensitive construction methods and tree protection measures to minimise adverse impacts.

1.1.2 It should be noted that the removal Trees 467-477, 481-488, 626-630, 632, 633, 853, 895, 911, 911A, 911B, 912 and 913 have been addressed in a previous REF for the site.

1.1.3 In preparing this report, the author is aware of and has taken into account the objectives of the City of Sydney's *Sydney Local Environmental Plan 2012, Development Control Plan 2012 (Section 3.5 Urban Ecology)*, University of Sydney's *Tree Management Plan (2016)*, *Australian Standard 4970 Protection of Trees on Development Sites (2009)*, *Australian Standard 4373 Pruning of Amenity Trees (2007)*, *Australian Standard 2303 Tree Stock for Landscape Use (2015)* and *Safe Work Australia Guide for Managing Risks of Tree Trimming and Removal Work (2016)*.

Refer to Methodology (**Appendix 1**)

1.1.4 This Report utilises the University's Tree Management Inventory Database (ArborPlan) numbering system.

1.1.5 This impact assessment is based on an assessment of the following supplied documentation/plans only:

- Tree Protection Plan – prepared by T.C.L, dated 25.10.2018
- Grading Plan 01 Southern Courtyard – prepared by T.C.L, dated 03.12.18
- Grading Plan 01 Southern Courtyard – prepared by T.C.L, dated 03.12.18
- Grading Plan 02 Northern Courtyard – prepared by T.C.L, dated 03.12.18
- Surfaces Plan 01 Southern Courtyard – prepared by T.C.L, dated 03.12.18
- Surfaces Plan 02 Northern Courtyard – prepared by T.C.L, dated 03.12.18
- Sections 01 & 02 – prepared by T.C.L, dated 03.12.18
- General Arrangement Plan New Loading Dock) – prepared by Cox, 11.10.18

Refer to Plans (**Appendix 2**)

## 2.0 RESULTS

### 2.1 The Site

2.1.1 The site is located within the University of Sydney's Darlington Campus and contains the existing Electrical Engineering Building. The site is bound by Blackwattle Creek Lane to the north, Maze Crescent to the west and the P.N.R Building to the south. The Mechanical Engineering Building, Engineering Link Building and the Rose Street Building border the site on the eastern boundary.

2.1.2 The site contains a number of landscape areas which include hardscape and turf areas, and shrub and tree plantings.

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<sup>1</sup> Mattheck & Breloer (2003)

## 2.2 The Proposal

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2.2.1 The supplied plans show the works include:

- Demolition of existing structures and pavements
- Construction of a new twelve (12) storey building including new loading dock
- Associated works and landscaping

## 2.3 The Trees

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2.3.1 Forty-five (45) trees/groups of trees were assessed using the Visual Tree Assessment<sup>2</sup> (VTA) criteria and notes, and comprise of locally indigenous, Australian native and exotic species such as *Angophora costata* (Sydney Red Gum), *Syzygium smithii* cvs (Lillypilly cultivars), *Grevillea robusta* (Silky Oak), *Lophostemon confertus* (Brush Box), *Archontophoenix cunninghamii* (Bangalow Palm), *Platanus* spp. (Plane Tree) and *Jacaranda mimosifolia* (Jacaranda).

2.3.2 Trees 483 and 912 *Syzygium smithii* var. *minor* (Lillypilly cvs), Trees 626-630 *Tristaniopsis laurina* (Water Gum), and Trees 911, 911A and 911B *Grevillea* 'Moonlight' (*Grevillea* cvs) are not covered by the controls within the *Sydney Development Control Plan 2012 (Section 3.5 Urban Ecology)* due to their size.<sup>3</sup>

2.3.3 None of the trees are listed on the *City of Sydney Register of Significant Trees 2013*.<sup>4</sup>

2.3.4 None of the trees are listed as high value or significant trees within *University of Sydney Tree Management Plan 2016*.<sup>5</sup>

2.3.5 A search of the BioNet Atlas of NSW Wildlife Database was undertaken in July 2017. No individual threatened tree species listed within this database for the area were identified during the current field investigations of the site.<sup>6</sup> In addition, an ecological assessment of the University was conducted in 2013 and determined that no threatened flora species or threatened ecological communities exist on the Camperdown and Darlington Campuses.<sup>7</sup> The ecological significance and habitat value of the trees has not been assessed and is beyond the scope of this report.

2.3.6 As required by Clause 2.3.2 of *Australian Standard 4970 Protection of Trees on Development Sites (2009)*, each of the trees assessed has been allocated a Retention Value. The Retention Value is based on the trees' Useful Life Expectancy and Landscape Significance with consideration to their health, structural condition and site suitability. The Retention Values do not take into account any proposed development works and are not a schedule for tree retention or removal. The trees have been allocated one of the following Retention Values:

- Priority for Retention
- Consider for Retention
- Consider for Removal
- Priority for Removal

Refer to Tree Assessment Schedule (**Appendix 3**)

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<sup>2</sup> Mattheck & Breloer (2003)

<sup>3</sup> City of Sydney (2012)

<sup>4</sup> City of Sydney (2013)

<sup>5</sup> TreeiQ (2016)

<sup>6</sup> NSW Office of Environment and Heritage (2011)

<sup>7</sup> Australian Museum Consulting (2013)



## 3.0 ARBORICULTURAL IMPACT ASSESSMENT

### 3.1 Trees to be removed

- 3.1.1 Trees 634-639 have been identified as *Archontophoenix cunninghamii* (Bangalow Palm) and are located within a circular garden area to the east of the site. These trees have been allocated a moderate Landscape Significance and a Retention Value of *Consider for Retention*. The supplied plans show Trees 634-639 are to be removed as part of the proposed landscape treatment.
- 3.1.2 Trees 557 and 902 have been identified as *Callistemon viminalis* (Weeping Bottlebrush). Tree 558 has been identified as *Syzygium smithii* cvs (Lillypilly cultivars) and Tree 903 has been identified as *Banksia serrata* (Old Man Banksia). The trees are located within a garden bed between the Mechanical Engineering Building and the Engineering Link Building. These trees have been allocated a low Landscape Significance and a Retention Value of *Consider for Removal*. The supplied plans show Trees 557, 558, 902 and 903 are to be removed to accommodate the proposed loading dock.
- 3.1.3 In addition to the above, the supplied plans show that Trees 467-477, 481-488, 626-630, 632, 633, 853, 895, 911, 911A, 911B, 912 and 913 are to be removed as part of the proposed development. These trees have been addressed in a previous REF for the site.

### 3.2 Trees to be retained

- 3.2.1 Tree 493 has been identified as *Platanus occidentalis* (American Sycamore) and is located within a garden bed adjacent to Maze Crescent. This tree has been allocated a high Landscape Significance and a Retention Value of *Priority for Retention*.
- 3.2.2 The supplied plans show Tree 493 is to be retained as part of the proposed landscape treatment. Pavements, stairs, retaining walls and a ramp are proposed within the Tree Protection Zone (TPZ) and represent a *Major Encroachment* as defined by *Australian Standard 4970 Protection of Trees on Development Sites 2009 (AS-4970)*. Clause 3.3.4 of AS-4970 outlines that design factors and tree sensitive construction methods should be considered when determining the potential impact of the encroachment.
- 3.2.3 **Recommendations:** The following tree sensitive methods should be used within the TPZ to minimise to adverse impacts.
- **Demolition Works:** Demolition works within the TPZ should be supervised by the Project Arborist and utilise tree sensitive methods. Structures and pavements should be demolished in small sections and removed by hand. Demolition machinery/equipment should not contact any part of the tree. Several structures to be demolished are located tree's Structural Root Zone (SRZ). Structures within an SRZ can contribute to tree stability by providing ballast to the rootplate or acting as a stop to the overturning of the rootplate. If possible, existing underground structures and sub-base materials should be left in situ and reused.
  - **Pavement Installation:** The supplied plans show new pavements (including sub-base materials) within the TPZ are to be installed at or slightly above existing grade. New pavements should utilise existing sub-base layers where possible. If required, surfaces and sub-base materials should be thinned above roots (>25mmØ) as determined by the Project Arborist (with appropriate root protection installed). Where significant roots (as determined by the Project Arborist) are present in existing sub-base layers, and surfaces and sub-base materials cannot be thinned, finished pavement levels should be raised slightly to enable the retention of these roots.

- Landscape Structures: The retaining walls, ramp and stairs (and other structures as required) within the TPZ should be supported on piered footings (with all other parts of the structures positioned above existing ground levels). Excavation for the pier holes should be undertaken using tree sensitive methods. Pier hole locations should be flexible to enable the retention of roots (>25mmØ) as determined by the Project Arborist.
- Drainage: Drainage should be designed around roots (>25mmØ) as determined by the Project Arborist.
- Landscape Levels: Existing levels within the proposed garden bed in which the tree is located should be maintained. Other than the installation of soil conditioners to a maximum depth of 50mm above the existing soil profile, excavation and installation of imported soil mixes should be excluded from the TPZ.
- Landscape Planting: The installation of plants within the TPZ should be undertaken using hand tools and roots (>25mmØ) should be protected. No mechanical cultivation/ripping of soils should be undertaken within the TPZ.
- Underground Services: Underground services should be located outside of the TPZ. Where this is not possible, services should be installed using tree sensitive excavation (hand/hydrovac etc) methods with the services located around/below roots (>25mmØ) as determined by the Project Arborist. Excavation using compact machinery fitted with a flat bladed bucket is permissible where approved by the Project Arborist. Excavation using compact machinery should be undertaken in small increments, guided by a spotter who is to look for and prevent damage to roots (>25mmØ).

Alternatively, boring methods may be used for underground service installation where the obvert level (highest interior level of pipe) is greater than 1000mm below existing grade. Excavations for starting and receiving pits for boring equipment should be located outside of the TPZ or located to avoid roots (>25mmØ) as determined by the Project Arborist. OSD tanks (where required) should be located outside of the TPZ.

- 3.2.4 Tree 625 has been identified as *Lophostemon confertus* (Brush Box) and is located adjacent to Blackwattle Creek Lane. This tree has been allocated a moderate Landscape Significance and a Retention Value of *Consider for Retention*.
- 3.2.5 The supplied plans show Tree 625 is to be retained as part of the proposed landscape treatment. Pavements, stairs, retaining walls and a ramp are proposed within the TPZ and represent a *Major Encroachment* as defined by AS-4970.
- 3.2.6 **Recommendations**: The following tree sensitive methods should be used within the TPZ to minimise to adverse impacts.
- Demolition Works: Demolition works within TPZ should be supervised by the Project Arborist and utilise tree sensitive methods. Structures and pavements should be demolished in small sections and removed by hand. Demolition machinery/equipment should not contact any part of the tree. Several structures to be demolished are located within the tree's SRZ. Structures within an SRZ can contribute to tree stability by providing ballast to the rootplate or acting as a stop to the overturning of the rootplate. If possible, existing underground structures and sub-base materials should be left in situ and reused.

- Pavement Installation: The supplied plans show proposed finished pavement levels to the south of the tree are slightly lower than existing. Finished pavement levels within the TPZ should allow for a certain amount of flexibility to minimise root impacts. Pavements (including sub base materials) should be installed at or above existing grade to and utilise existing sub base materials (where possible) to eliminate the requirement for excavation of an area greater than 10% of the TPZ or inside the SRZ. Alternatively, existing sub base/ground levels within the TPZ may be lowered in small increments using hand tools to expose surface roots. Where significant roots (as determined by the Project Arborist) are present, finished pavement levels should be raised to enable the retention of these roots.
- Landscape Structures: The retaining walls, stairs and ramp (and other structures as required) within the TPZ should be supported on piered footings (with all other parts of the structures positioned above existing ground levels). Excavation for the pier holes should be undertaken using tree sensitive methods. Pier hole locations should be flexible to enable the retention of roots (>25mmØ) as determined by the Project Arborist.
- Drainage: Drainage should be designed around roots (>25mmØ) as determined by the Project Arborist.
- Landscape Levels: Existing levels within the proposed garden bed in which the tree is located should be maintained. Other than the installation of soil conditioners to a maximum depth of 50mm above the existing soil profile, excavation and installation of imported soil mixes should be excluded from the TPZ.
- Landscape Planting: The installation of plants within the TPZ should be undertaken using hand tools and roots (>25mmØ) should be protected. No mechanical cultivation/ripping of soils should be undertaken within the TPZ.
- Underground Services: Underground services should be located outside of the TPZ. Where this is not possible, services should be installed using tree sensitive excavation (hand/hydrovac etc) methods with the services located around/below roots (>25mmØ) as determined by the Project Arborist. Excavation using compact machinery fitted with a flat bladed bucket is permissible where approved by the Project Arborist. Excavation using compact machinery should be undertaken in small increments, guided by a spotter who is to look for and prevent damage to roots (>25mmØ).

Alternatively, boring methods may be used for underground service installation where the obvert level (highest interior level of pipe) is greater than 1000mm below existing grade. Excavations for starting and receiving pits for boring equipment should be located outside of the TPZ or located to avoid roots (>25mmØ) as determined by the Project Arborist. OSD tanks (where required) should be located outside of the TPZ.

### 3.3 Replacement Planting

- 3.3.1 The supplied plans show that forty-four (44) replacement trees are to be planted as part of the proposed development. This includes the planting of eight (8) *Archcontophoenix cunninghamii* (Bangalow Palm) into the new eastern courtyard. *Archcontophoenix cunninghamii* (Bangalow Palm) is a food source for Grey Headed Flying Foxes which are known to occur in the vicinity.

- 3.3.2 The supplied plans show the eight (8) *Archcontophoenix cunninghamii* (Bangalow Palm) are to be planted on structure which will limit the available soil volumes for root growth. However, the raised planter in which the trees are to be installed is a single, continuous structure (incorporating sub-surface drainage) running around three (3) sides of the Eastern Courtyard and ranges from 450mm in height at the front of the planter to approximately 800mm in height at the rear. The raised planter should provide adequate soil volumes for the establishment and long-term growth of the *Archcontophoenix cunninghamii* (Bangalow Palm). The palms should be positioned centrally within the planter to ensure adequate soil depth is provided to the front of the trees' rootballs.
- 3.3.3 The supplied plans show new trees to be planted in paved areas will be installed into Stratacell™ vaults. The vaults are to be excavated and installed into the existing soil profile allowing root spread into the wider growing environment. Stratacell™ vaults can be designed to be load bearing which may allow the sub-base layer between the concrete pavement and underlying cells to be minimised. If possible, the sub-base layer shown in Planting Detail 08 should be minimised to increase gaseous exchange.
- 3.3.4 Current Arboricultural research indicates that for tree vaults and pits, a dual horizon soil profile which more closely resembles that found in most natural environments may be preferable.<sup>8</sup> These profiles should consist of a low organic matter content soil below 250-300mm in depth to avoid the onset of anaerobic conditions and shrinkage of soil volumes over time due to the breakdown of organic matter. An A and B type artificial soil profile should be installed in all planters/planting pits. The A horizon should comprise of a proprietary soil mix containing no greater than 10% composted organic matter. The B horizon should comprise an 80/20 sand/screened topsoil blend.
- 3.3.5 Replacement tree planting should be supplied in accordance with *Australian Standard 2303 (2015) Tree Stock for Landscape Use* and the University of Sydney's *Tree Management Plan (2016)*.

#### 4.0 CONCLUSION

- 4.1 Forty-five (45) trees/groups of trees were assessed and comprise of locally indigenous, Australian native and exotic species.
- 4.2 The supplied plans show the works include demolition of existing structures and pavements, construction of a new twelve (12) storey building, associated works and landscaping.
- 4.3 The supplied plans show that forty-three (43) trees are proposed for removal; ten (10) trees (Trees 557, 558, 634, 635, 636, 637, 638, 639, 902 & 903) within the SSDA and thirty (33) (Trees 467-477, 481-488, 626-630, 632, 633, 853, 895, 911, 911A, 911B, 912 & 913) as part of a previous REF for the site.
- 4.4 The supplied plans show that two (2) trees (Trees 493 and 625) are to be retained as part of the proposed landscape treatment. Works are proposed within their TPZ areas and represent *Major Encroachments* as defined by AS-4970. Tree sensitive design, demolition and construction methods as outlined in Sections 3.2.3 and 3.2.6 will be required to minimise the impact of works on the trees. These methods should be confirmed as feasible by the relevant project consultants (i.e architect, landscape architect, engineer etc) and may require flexibility at the time of construction. The trees to be retained should be protected in accordance within Tree Protection Specification (**Appendix 5**).
- 4.5 The supplied plans show that forty-four (44) replacement trees are to be planted as part of the proposed development. Replacement planting should be supplied in accordance with *Australian Standard 2303 (2015) Tree Stock for Landscape Use* and the University of Sydney's *Tree Management Plan (2016)*.

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<sup>8</sup> SESL (2013)

## 5.0 LIMITATIONS & DISCLAIMER

TreeiQ takes care to obtain information from reliable sources. However, TreeiQ can neither guarantee nor be responsible for the accuracy of information provided by others. Plans, diagrams, graphs and photographs in this Arboricultural Report are visual aids only and are not necessarily to scale. This Report provides recommendations relating to tree management only. Advice should be sought from appropriately qualified consultants regarding design/construction/ecological/heritage etc issues.

This Report has been prepared for exclusive use by the client. This Report shall not be used by others or for any other reason outside its intended target or without the prior written consent of TreeiQ. Unauthorised alteration or separate use of any section of the Report invalidates the Report.

Many factors may contribute to tree failure and cannot always be predicted. TreeiQ takes care to accurately assess tree health and structural condition. However, a tree's internal structural condition may not always correlate to visible external indicators. There is no warranty or guarantee, expressed or implied that problems or deficiencies regarding the trees or site may not arise in the future. Information contained in this report covers only the trees assessed and reflects the condition of the trees at the time of inspection. Additional information regarding the methodology used in the preparation of this Report is attached as Appendix 1. A comprehensive tree risk assessment and management plan for the trees is beyond the scope of this Report.

Reference should be made to any relevant legislation including Tree Management Controls. All recommendations contained within this Report are subject to approval from the relevant Consent Authority.

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## 6.0 BIBLIOGRAPHY & REFERENCES

Australian Museum Consulting (2013), *University of Sydney Ecological Assessment*

Barrell (1995), 'Pre-development Tree Assessments', in *Trees & Building Sites, Proceedings of an International Conference Held in the Interest of Developing a Scientific Basis for Managing Trees in Proximity to Buildings*, International Society of Arboriculture, Illinois, USA, pp. 132-142

City of Sydney (2013) *Development Control Plan*

[www.cityofsydney.nsw.gov.au/development/planning-controls/development-control-plans](http://www.cityofsydney.nsw.gov.au/development/planning-controls/development-control-plans)

City of Sydney (2013) *Register of Significant Trees*

[http://www.cityofsydney.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0007/143395/130617\\_EC\\_ITEM05\\_ATTACHMENTC4.PDF](http://www.cityofsydney.nsw.gov.au/__data/assets/pdf_file/0007/143395/130617_EC_ITEM05_ATTACHMENTC4.PDF)

Mattheck & Breloer (2003), *The Body Language of Trees: A Handbook for Failure Analysis*, The Stationary Office, London

NSW Office of Environment and Heritage's Atlas of NSW Wildlife (2011), *BioNet Atlas of NSW Wildlife*

SESL (2013), *Soils for Tree Transplanting*

[www.sesl.com.au/uploads/articles/Soils\\_for\\_Tree\\_Transplanting.pdf](http://www.sesl.com.au/uploads/articles/Soils_for_Tree_Transplanting.pdf) (accessed 01.10.13)

Standards Australia (2009), *Protection of Trees on Development Sites AS-4970*

Standards Australia (2007), *Pruning of Amenity Trees AS-4373*

TreeiQ (2016), *University of Sydney Tree Management Plan*





## Appendix 1: Methodology

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- 1.1 Site Inspection:** This report was determined as a result of a comprehensive site during October 2017. The comments and recommendations in this report are based on findings from this site inspection.
- 1.2 Visual Tree Assessment (VTA):** The subject tree(s) was assessed using the Visual Tree Assessment criteria and notes as described in *The Body Language of Trees – A Handbook for Failure Analysis*.<sup>9</sup> The inspection was limited to a visual examination of the subject tree(s) from ground level only. No internal diagnostic testing was undertaken as part of this assessment. Trees outside the subject site were assessed from the property boundaries only.
- 1.3 Tree Dimensions:** The dimensions of the subject tree(s) are approximate only.
- 1.4 Tree Locations:** The location of the subject tree(s) was determined from the supplied plans.
- 1.5 Trees & Development:** Tree Protection Zones, Tree Protection Measures and Sensitive Construction Methods for the subject tree were based on methods outlined in *Australian Standard 4970-2009 Protection of Trees on Development Sites*.

The *Tree Protection Zone* (TPZ) is described in AS-4970 as 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.

The *Structural Root Zone* (SRZ) is described in AS-4970 as the area around the base of a tree required for the tree's stability in the ground. Severance of structural roots within the SRZ is not recommended as it may lead to the destabilisation and/or demise of the tree.

In some cases it may be possible to encroach into or make variations to the theoretical TPZ. A *Minor Encroachment* is less than 10% of the area of the TPZ and is outside the SRZ. The area lost to this encroachment should be compensated for elsewhere and contiguous with the TPZ. A *Major Encroachment* is greater than 10% of the TPZ or inside the SRZ. In this situation the Project Arborist must demonstrate that the tree would remain viable. This may require root investigation by non-destructive methods or the use of sensitive construction methods.

- 1.6 Tree Health:** The health of the subject tree(s) was determined by assessing:
- I. Foliage size and colour
  - II. Pest and disease infestation
  - III. Extension growth
  - IV. Crown density
  - V. Deadwood size and volume
  - VI. Presence of epicormic growth
- 1.7 Tree Structural Condition:** The structural condition of the subject tree(s) was assessed by:
- I. Assessment of branching structure  
(i.e co-dominant/bark inclusions, crossing branches, branch taper, terminal loading, previous branch failures)
  - II. Visible evidence of structural defects or instability  
(i.e root plate movement, wounds, decay, cavities, fungal brackets, adaptive growth)
  - III. Evidence of previous pruning or physical damage  
(root severance/damage, lopping, flush-cutting, lions tailing, mechanical damage)
- 1.8 Useful Life Expectancy (ULE):** The ULE is an estimate of the longevity of the subject tree(s) in its growing environment. The ULE is modified where necessary to take in consideration tree(s) health, structural condition and site suitability. The tree(s) has been allocated one of the following ULE categories (Modified from Barrell, 2001):
- I. 40 years +
  - II. 15-40 years
  - III. 5-15 years
  - IV. Less than 5 years

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<sup>9</sup> Mattheck & Breloer (2003)

- 1.9 Landscape Significance:** Landscape Significance was determined by assessing the combination of the cultural, environmental and aesthetic values of the subject tree(s). Whilst these values are subjective, a rating of high, moderate, low or insignificant has been allocated to the tree(s). This provides a relative value of the tree's Landscape Significance which may aid in determining its Retention Value. If the tree(s) can be categorized into more than one value, the higher value has been allocated.

Landscape Significance	Description
Very High	The subject tree is listed as a Heritage Item under the <i>Local Environmental Plan</i> with a local or state level of significance.
	The subject tree is listed on Council's Significant Tree Register or is considered to meet the criteria for significance assessment of trees and/or landscapes by a suitably qualified professional. The criteria are based on general principles outlines in the Burra Charter and on criteria from the Register of the National Estate.
	The subject tree is a remnant tree.
High	The subject tree creates a 'sense of place' or is considered 'landmark' tree.
	The subject tree is of local, cultural or historical importance or is widely known.
	The subject tree has been identified by a suitably qualified professional as a species scheduled as a Threatened or Vulnerable Species or forms part of an Endangered Ecological Community associated with the subject site, as defined under the provisions of the <i>Threatened Species Conservation Act 1995 (NSW)</i> or the <i>Environmental Protection and Biodiversity Conservation Act 1999</i> .
	The subject tree is known to provide habitat to a threatened species.
	The subject tree is an excellent representative of the species in terms of aesthetic value.
	The subject tree is of significant size, scale or makes a significant contribution to the canopy cover of the locality.
	The subject tree forms part of the curtilage of a heritage item with a known or documented association with that item.
Moderate	The subject tree makes a positive contribution to the visual character or amenity of the area.
	The subject tree provides a specific function such as screening or minimising the scale of a building.
	The subject tree has a known habitat value.
	The subject tree is a good representative of the species in terms of aesthetic value.
Low	The subject tree is an environmental pest species or is exempt under the provisions of the local Council's Tree Management Controls
	The subject tree makes little or no contribution to the amenity of the locality.
	The subject tree is a poor representative of the species in terms of aesthetic value.
Insignificant	The subject tree is declared a Noxious Weed under the Noxious Weeds Act

- 1.10 Retention Value:** Retention Value was based on the subject tree's Useful Life Expectancy and Landscape Significance. The Retention Value was modified where necessary to take in consideration the subject tree's health, structural condition and site suitability. The subject tree(s) has been allocated one of the following Retention Values:

- I. Priority for Retention
- II. Consider for Retention
- III. Consider for Removal
- IV. Priority for Removal

ULE		Landscape Significance			
	Very High	High	Moderate	Low	Insignificant
40 years +	Priority for Retention	Priority for Retention		Consider for Removal	Priority for Removal
15-40 years		Priority for Retention	Consider for Retention		
5-15 years		Consider for Retention			
Less than 5 years	Consider for Removal	Priority for Removal			

The above table has been modified from the Footprint Green Tree Significance and Retention Value Matrix.





REVISIONS		
No.	Description	Date
1	Issue for Client Review	15/01/2018
2	Issue for Client Review	15/01/2018
3	Issue for Client Review	15/01/2018
4	Issue for Client Review	15/01/2018
5	Issue for Client Review	15/01/2018
6	Issue for Client Review	15/01/2018
7	Issue for Client Review	15/01/2018
8	Issue for Client Review	15/01/2018
9	Issue for Client Review	15/01/2018
10	Issue for Client Review	15/01/2018
11	Issue for Client Review	15/01/2018
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13	Issue for Client Review	15/01/2018
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Legend

Existing Tree

To be removed in accordance with Specification & Project Architect's instruction

Existing Tree

To be retained in accordance with Specification & Project Architect's instruction

Tree Protection Zone

(Temporary Fence Extent)

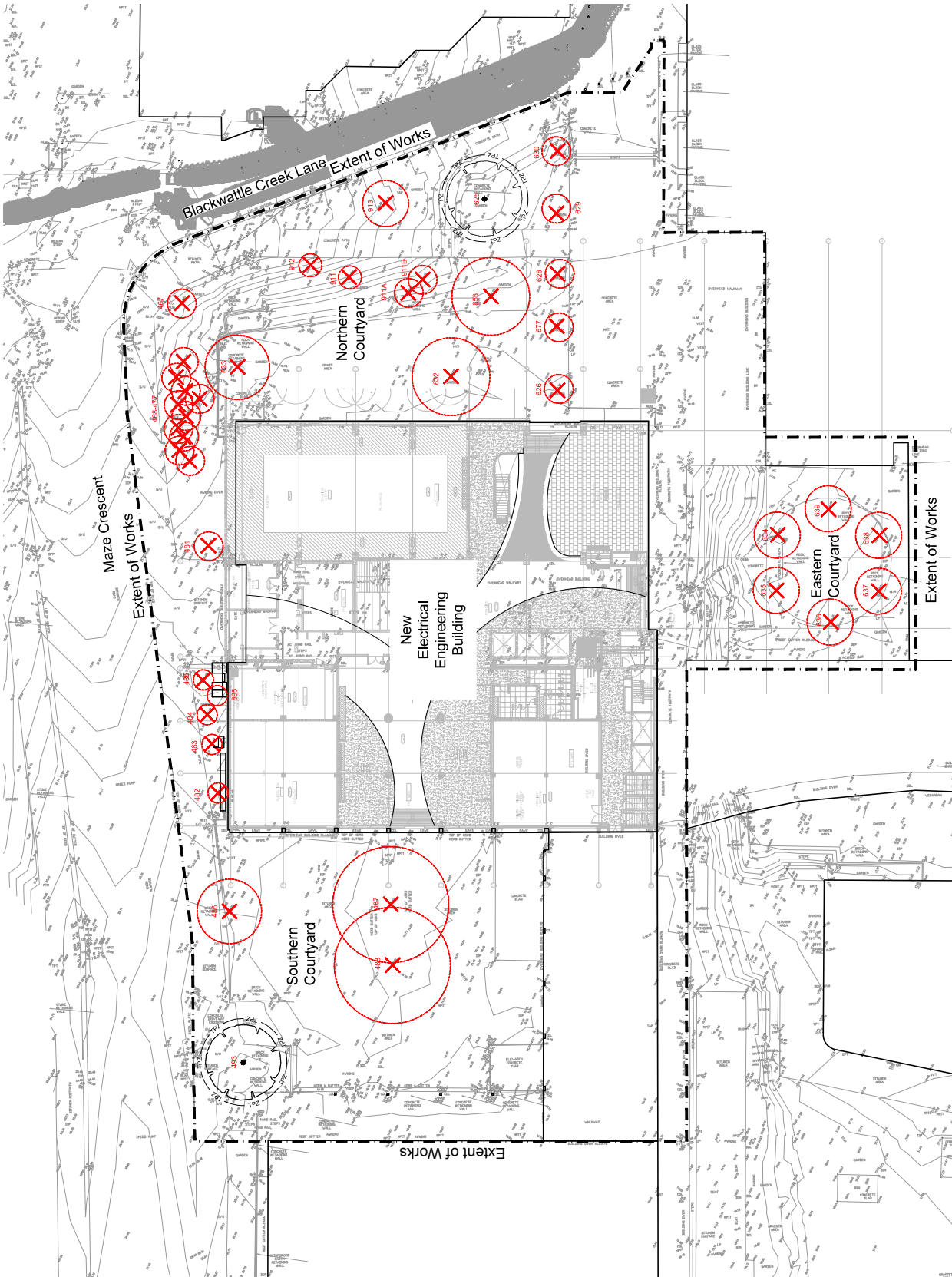
NOTE

Understand any work on existing trees to be retained & within TPZ with caution in accordance with Specification & Project Architect's instructions.

Confirm all trees to be retained with the client and TCI onsite before site preparation & prior to any construction around the trees.

Demolition Plans refer Civil Engineer's and Architect's documentation. Confirm the extent of any existing trees prior to any demolition works.

Protect any existing items to be retained and make-good as required.



THE UNIVERSITY OF SYDNEY ETP STAGE 1

Electrical Engineering Building

University of Sydney, NSW 2008

Drawing Title

Tree Protection Plan

Document Control Status

70% DETAILED DESIGN

Project Number

20151205

Coordinate

NSW

Project Architect

TCL

Project Engineer

GP

Drawing Number

K33-TCL-LAS-DRG-00100

Drawn

GP

Checked

GP

Date

15/01/2018

Revision

01

North

North



Appendix 3: Tree Assessment Schedule

Tree No.	Species	DBH (mm)	Height (m)	Radial Crown Spread (m)	Health Rating	Structural Rating	Comments	ULE (years)	L/Significance	Retention Value	Radial TPZ (m)	Radial SRZ (m)	Implication	Stage
467	<i>Angophora costata</i> (Sydney Red Gum)	300	6	4	Fair	Good	Crown density 25-50%. Small (<25mm) diameter deadwood in moderate volumes. Small (<25mm) epicormic growth in moderate volumes.	5-15	Moderate	Consider for Retention	3.6	2	Remove.	REF
468	<i>Syzygium smithii</i> cvs (Lillipilly cultivars)	200 150	8	2	Good	Fair	Co-dominant inclusion. Branch inclusion/s, minor.	15-40	Low	Consider for Removal	3	1.9	Remove.	REF
469	<i>Syzygium smithii</i> cvs (Lillipilly cultivars)	200 150 100	8	3	Good	Good	Branch inclusion/s, minor. Partially suppressed.	15-40	Low	Consider for Removal	3.6	2	Remove.	REF
470	<i>Syzygium smithii</i> cvs (Lillipilly cultivars)	150	7	2	Good	Good	Partially suppressed.	15-40	Low	Consider for Removal	2	1.5	Remove.	REF
471	<i>Syzygium smithii</i> cvs (Lillipilly cultivars)	100x2	7	2	Good	Good	Partially suppressed. Crown density 75-100%.	15-40	Low	Consider for Removal	2	1.5	Remove.	REF
472	<i>Syzygium smithii</i> cvs (Lillipilly cultivars)	150	7	2	Good	Good	Partially suppressed.	15-40	Low	Consider for Removal	2	1.5	Remove.	REF
473	<i>Syzygium smithii</i> cvs (Lillipilly cultivars)	150	7	2	Good	Good	Partially suppressed.	15-40	Low	Consider for Removal	2	1.5	Remove.	REF
474	<i>Syzygium smithii</i> cvs (Lillipilly cultivars)	100 50	6	2	Fair	Good	Heavily suppressed.	5-15	Low	Consider for Removal	2	1.5	Remove.	REF

Tree No.	Species	DBH (mm)	Height (m)	Radial Crown Spread (m)	Health Rating	Structural Rating	Comments	ULE (years)	L/Significance	Retention Value	Radial TPZ (m)	Radial SRZ (m)	Implication	Stage
475	<i>Syzygium smithii</i> cvs (Lillipilly cultivars)	150 50	7	2	Good	Good	Partially suppressed.	15-40	Low	Consider for Removal	2	1.5	Remove.	REF
476	<i>Syzygium smithii</i> cvs (Lillipilly cultivars)	200	7	2	Good	Good	Partially suppressed.	15-40	Low	Consider for Removal	2.4	1.7	Remove.	REF
477	<i>Syzygium smithii</i> cvs (Lillipilly cultivars)	150x2 100	7	2	Good	Good		15-40	Low	Consider for Removal	2.4	1.7	Remove.	REF
481	<i>Syzygium smithii</i> cvs (Lillipilly cultivars)	200 150	7	3	Good	Good	Co-dominant inclusion smaller diameter branch could be reduced.	15-40	Low	Consider for Removal	3	1.9	Remove.	REF
482	<i>Syzygium smithii</i> cvs (Lillipilly cultivars)	75x2 50x2	4	2	Good	Good		15-40	Low	Consider for Removal	2	1.5	Remove.	REF
483	<i>Syzygium smithii</i> cvs (Lillipilly cultivars)	150 50	6	2	Good	Good		15-40	Low	Consider for Removal	2.4	1.7	Remove.	REF
484	<i>Syzygium smithii</i> cvs (Lillipilly cultivars)	150	5	2	Good	Good	Small (<25mm) diameter deadwood in low volumes.	15-40	Low	Consider for Removal	2	1.5	Remove.	REF
485	<i>Syzygium smithii</i> cvs (Lillipilly cultivars)	150	5	2	Good	Good	Small (<25mm) diameter deadwood in low volumes.	15-40	Low	Consider for Removal	2	1.5	Remove.	REF
486	<i>Grevillea robusta</i> (Silky Oak)	400	9	5	Poor	Fair	Senescent. Small (<25mm), medium (25-75mm) & large (>75mm) diameter deadwood in moderate volumes. Crown density 25-50%.	<5	Moderate	Priority for Removal	4.8	2.3	Remove.	REF

Tree No.	Species	DBH (mm)	Height (m)	Radial Crown Spread (m)	Health Rating	Structural Rating	Comments	ULE (years)	L/Significance	Retention Value	Radial TPZ (m)	Radial SRZ (m)	Implication	Stage
487	<i>Platanus occidentalis</i> (American Sycamore)	700	22	8	Good	Good	Phototropic lean, slight. Small (<25mm) diameter deadwood in low volumes.	15-40	High	Priority for Retention	8.4	2.9	Remove.	REF
488	<i>Platanus xacerifolia</i> (London Plane)	600	20	8	Good	Good	Partially suppressed. Small (<25mm) epicormic growth in low volumes. Small (<25mm) diameter deadwood in low volumes.	15-40	High	Priority for Retention	7.2	2.7	Remove.	REF
493	<i>Platanus occidentalis</i> (American Sycamore)	800	20	9	Good	Good	Small (<25mm) diameter deadwood in low volumes.	15-40	High	Priority for Retention	9.6	3.1	Retain. Major encroachment, landscape works.	SSDA
557	<i>Callistemon viminalis</i> (Weeping Bottlebrush)	400	14	5	Good	Good	Wounds, no visible signs of decay.	15-40	Low	Consider for Removal	4.8	2.3	Remove.	SSDA
558	<i>Syzygium smithii</i> cvs (Lillypilly cultivars)	200	13	4	Good	Good	Minor trunk wound, early stages of decay. Small (<25mm) epicormic growth in moderate volumes.	15-40	Low	Consider for Removal	2.4	1.7	Remove.	SSDA
625	<i>Lophostemon confertus</i> (Brush Box)	500	12	4	Good	Good	Lopped at 2m crown comprises mature epicormic growth. Small (<25mm) diameter deadwood in low volumes.	15-40	Moderate	Consider for Retention	6	2.5	Retain. Major encroachment, landscape works.	SSDA
626	<i>Tristaniopsis laurina</i> (Water Gum)	100 50	4	2	Good	Good		15-40	Low	Consider for Removal	2	1.5	Remove.	REF
627	<i>Tristaniopsis laurina</i> (Water Gum)	100x2	3	2	Fair	Good	Crown density 25-50%. Small (<25mm) epicormic growth in moderate volumes.	5-15	Low	Consider for Removal	2	1.5	Remove.	REF

Tree No.	Species	DBH (mm)	Height (m)	Radial Crown Spread (m)	Health Rating	Structural Rating	Comments	ULE (years)	L/Significance	Retention Value	Radial TPZ (m)	Radial SRZ (m)	Implication	Stage
628	<i>Tristaniaopsis laurina</i> (Water Gum)	100x250	4	2	Good	Good		15-40	Low	Consider for Removal	2	1.5	Remove.	REF
629	<i>Tristaniaopsis laurina</i> (Water Gum)	100 50	4	2	Good	Good		15-40	Low	Consider for Removal	2	1.5	Remove.	REF
630	<i>Tristaniaopsis laurina</i> (Water Gum)	100x250x2	4	2	Good	Good		15-40	Low	Consider for Removal	2	1.5	Remove.	REF
632	<i>Tristaniaopsis laurina</i> (Water Gum)	300	6	4	Good	Good	Crown density 75-100%. Small (<25mm) diameter deadwood in low volumes.	15-40	Moderate	Consider for Retention	3.6	2	Remove.	REF
633	<i>Eucalyptus microcorys</i> (Tallowwood)	450	14	6	Good	Good	Small (<25mm) & medium (25-75mm) diameter deadwood in low volumes.	15-40	Moderate	Consider for Retention	5.4	2.4	Remove.	REF
634	<i>Archcontophoenix cunninghamii</i> (Bangalow Palm)	250	12	2	Good	Good		15-40	Moderate	Consider for Retention	3	n/a	Remove.	SSDA
635	<i>Archcontophoenix cunninghamii</i> (Bangalow Palm)	250	12	2	Good	Good		15-40	Moderate	Consider for Retention	3	n/a	Remove.	SSDA
636	<i>Archcontophoenix cunninghamii</i> (Bangalow Palm)	250	12	2	Good	Good		15-40	Moderate	Consider for Retention	3	n/a	Remove.	SSDA
637	<i>Archcontophoenix cunninghamii</i> (Bangalow Palm)	250	12	2	Good	Good		15-40	Moderate	Consider for Retention	3	n/a	Remove.	SSDA

Tree No.	Species	DBH (mm)	Height (m)	Radial Crown Spread (m)	Health Rating	Structural Rating	Comments	ULE (years)	L/Significance	Retention Value	Radial TPZ (m)	Radial SRZ (m)	Implication	Stage
638	<i>Archontophoenix cunninghamii</i> (Bangalow Palm)	250	12	2	Good	Good		15-40	Moderate	Consider for Retention	3	n/a	Remove.	SSDA
639	<i>Archontophoenix cunninghamii</i> (Bangalow Palm)	250	12	2	Good	Good		15-40	Moderate	Consider for Retention	3	n/a	Remove.	SSDA
853	<i>Ficus macrophylla</i> (Moreton Bay Fig)	250	6	4	Good	Good		15-40	Moderate	Consider for Retention	3	1.9	Remove.	REF
895	<i>Melaleuca</i> sp.	75 100	5	4	Fair	Good	Heavily suppressed. Medium (25-75mm) diameter deadwood in moderate volumes.	5-15	Low	Consider for Removal	2	1.5	Remove.	REF
902	<i>Callistemon viminalis</i> (Weeping Bottlebrush)	100	7	4	Fair	Good	Heavily suppressed. Phototropic lean, moderate.	5-15	Low	Consider for Removal	2	1.5	Remove	SSDA
903	<i>Banksia serrata</i> (Old Man Banksia)	200	10	2	Good	Good	Crown contact with adjacent building.	5-15	Low	Consider for Removal	2.4	1.7	Remove.	SSDA
911	<i>Grevillea</i> 'Moonlight' (Grevillea cvs)	200 100x2	4	4	Good	Good	Small (<25mm) diameter deadwood in low volumes.	5-15	Low	Consider for Removal	3	1.9	Remove.	REF
911A	<i>Grevillea</i> 'Moonlight' (Grevillea cvs)	200 100x2	4	4	Good	Good	Small (<25mm) diameter deadwood in low volumes.	5-15	Low	Consider for Removal	3	1.9	Remove.	REF
911B	<i>Grevillea</i> 'Moonlight' (Grevillea cvs)	200 100x2	4	4	Good	Good	Small (<25mm) diameter deadwood in low volumes.	5-15	Low	Consider for Removal	3	1.9	Remove.	REF



Tree No.	Species	DBH (mm)	Height (m)	Radial Crown Spread (m)	Health Rating	Structural Rating	Comments	ULE (years)	L/Significance	Retention Value	Radial TPZ (m)	Radial SRZ (m)	Implication	Stage
912	<i>Syzygium smithii</i> cvs (Lillypilly cultivars)	250 @grade	3	3	Good	Good	Group of 4.	15-40	Low	Consider for Removal	3	1.9	Remove.	REF
913	<i>Jacaranda mimosifolia</i> (Jacaranda)	250 200	6	5	Good	Good	Small (<25mm) epicormic growth in moderate volumes. Memorial tree.	15-40	Moderate	Consider for Retention	3.6	2	Remove.	REF

#### Appendix 4: Plates



Plate 1: Showing Tree 486



Plate 2: Showing Trees 487 & 488



Plate 3: Showing Tree 853





Plate 4: Showing Trees 634-639

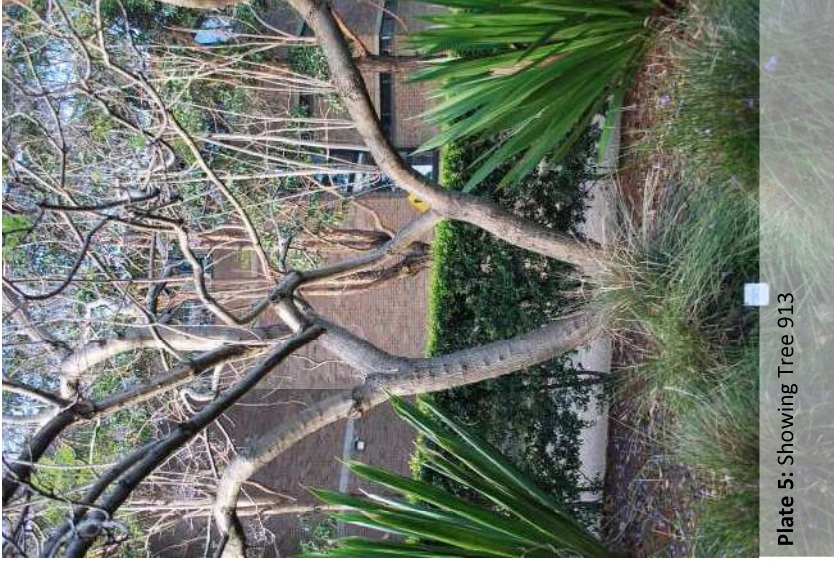


Plate 5: Showing Tree 913

## Appendix 5: Tree Protection Specification

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### 1.0 Appointment of Project Arborist

A Project Arborist shall be engaged prior the commencement of work on-site and monitor compliance with the protection measures. The Project Arborist shall inspect the tree protection measures and Compliance Certification shall be prepared by the Project Arborist for review by the Principal Certifying Authority prior to the release of the Compliance Certificate.

The Project Arborist shall have a minimum qualification equivalent (using the Australian Qualifications Framework) of NSW TAFE Certificate Level 5 or above in Arboriculture.

### 1.1 Compliance

Contractors and site workers shall receive a copy of these specifications a minimum of 3 working days prior to commencing work on-site. Contractors and site workers undertaking works within the Tree Protection Zone shall sign the site log confirming they have read and understand these specifications, prior to undertaking works on-site.

The Project Arborist shall undertake regular site inspections and certify that the works are being undertaken in accordance with this specification.

Compliance Documentation shall be prepared by the Project Arborist following each site inspection. The Compliance Documentation shall include documentary evidence of compliance with the tree protection measures and methods as outlined within this Specification. Upon the completion of the works, a final assessment of the trees shall be undertaken by the Project Arborist and future recommended management strategies implemented as required.

### 1.2 Tree & Vegetation Removal

The trees to be removed shall be removed prior to the establishment of the tree protection measures. Tree removal works shall be undertaken in accordance with the *Safe Work Australia Guide for Managing Risks of Tree Trimming and Removal Work (2016)*.

Tree and vegetation removal shall not damage the trees to be retained.

### 1.3 Tree Protection Zone

The trees to be retained shall be protected prior and during construction from activities that may result in an adverse effect on their health or structural condition. The area within the Tree Protection Zone (TPZ) shall exclude the following activities, unless otherwise stated:

- Modification of existing soil levels, excavations, trenching or movement of rock
- Mechanical removal of vegetation
- Storage of materials, plant or equipment or erection of site sheds
- Affixing of signage or hoarding to the trees
- Preparation of building materials, refuelling or disposal of waste materials and chemicals
- Lighting fires
- Movement of pedestrian or vehicular traffic
- Temporary or permanent location of services, or the works required for their installation
- Any other activities that may cause damage to the tree

NOTE: If access, encroachment or incursion into the TPZ is deemed essential, prior authorisation is required by the Project Arborist.

### 1.4 Tree Protection Fencing

TPZ fencing shall be installed at the perimeter of the Tree Protection Zone. Refer to Tree Assessment Schedule (**Appendix 3**). Fencing set back distances may be reduced for demolition/construction access with approval from the Project Arborist and where ground protection is installed to the unfenced areas of the TPZ. The exact location of the fencing shall be confirmed through consultation between the Head Contractor/Project Manager and the Project Arborist prior to the commencement of works.

As a minimum, the Tree Protection Fence shall consist of 1.8m high wire mesh panels supported by concrete feet. Panels shall be fastened together and supported to prevent sideways movement. The tree shall not be damaged during the installation of the Tree Protection Fencing. Refer to Typical Tree Protection Details (3) (**Appendix 6**).

#### 1.5 Site Management

Materials, waste storage, and temporary services shall not be located within the TPZ.

#### 1.6 Scaffolding

Where possible, scaffolding shall not be located within the TPZ. Scaffolding shall not be in contact with the tree. As necessary, this shall be achieved by erecting scaffolding around branches. Branches shall be tied back and protected as deemed necessary by the Project Arborist. Refer to Typical Tree Protection Details (5) (**Appendix 6**).

#### 1.7 Works within the Tree Protection Zones

In some cases, works within the TPZ may be authorised by the determining authority. **These works shall be supervised by the Project Arborist.** When undertaking works within the TPZ, care should be taken to avoid damage to the tree's root system, trunks and lower branches.

If roots (>25mm $\varnothing$ ) are encountered during the demolition, excavation and construction works, these roots must be retained in an undamaged condition and advice sought from the Project Arborist. Adjustment of final levels and design shall remain flexible to enable the retention of roots (>25mm $\varnothing$ ) where deemed necessary by the Project Arborist.

#### 1.8 Ground Protection

Where deemed necessary by the Project Arborist, machinery movements shall be restricted to areas of existing pavement or from areas of temporary ground protection such as ground mats or steel road plates. Refer to Typical Tree Protection Details (3) (**Appendix 6**).

#### 1.9 Trunk Protection

Trunk protection shall be installed as deemed necessary by the Project Arborist. Trunk protection shall be installed by wrapping padding (either carpet underlay or 10mm thick jute geotextile mat) around the trunk and first order branches to a minimum height of 2m. Timber battens (90 x 45mm) spaced at 150mm centres shall be strapped together and placed over the padding. Timber battens must not be fixed to the trees. Refer to Typical Tree Protection Details (3) (**Appendix 6**).

Branch protection shall be installed as deemed necessary by the Project Arborist.

#### 1.10 Structure & Pavement Demolition

Demolition of existing structures/pavement within the TPZ shall be supervised by the Project Arborist. Machinery is to be excluded from the TPZ unless operating from the existing slabs, pavements or areas of ground protection (refer to Section 1.8). Machinery should not contact the tree's roots, trunk, branches and crown.

The existing pavement shall be carefully lifted to minimise damage to the existing sub-base and to prevent damage to tree roots. Wherever possible, the existing sub-base material shall remain in-situ. Machinery shall work backwards out of the TPZ to ensure machinery remains on un-demolished sections of pavement at all times.

Structures below grade shall be retained to minimise disturbance to the tree's roots. Where this is not possible structures shall be shattered prior to removal with a hand-operated pneumatic/electric breaker. Where the Project Arborist determines that the tree is using underground elements (i.e footings, pipes, rocks etc.) for support, these structures shall be left in-situ.

If roots (>25mm $\varnothing$ ) are encountered during the demolition works, these roots must be retained in an undamaged condition and advice sought from the Project Arborist. Exposed roots shall be protected from direct sunlight, drying out and extremes of temperature by covering with a 10mm thick jute geotextile fabric. The geotextile fabric shall be kept in a damp condition at all times.

#### **1.11 Pavement Installation**

New pavements (including sub-base materials) within TPZ areas shall be installed above or at existing grade. Pavement sub-base layers shall either be thinned or finished pavement levels modified as required to enable the retention of roots (>25mmØ) as deemed necessary by the Project Arborist.

#### **1.12 Footings within the TPZ**

Footings installation within TPZ areas shall be supervised by the Project Arborist. Other than for the isolated piers/posts all other parts of the structure shall be installed above grade.

Drilling/piling machinery shall be excluded from the TPZ unless operating from an area where ground protection has been installed (refer to Section 1.8) or from the existing slabs or pavements. Drilling/piling machinery shall be of a suitable size to not damage the trees' roots, trunk, branches and crown. Machinery shall work in conjunction with an observer to ensure that adequate clearance from trees is maintained at all times.

#### **1.13 Underground Services**

Underground service installation within the TPZ shall be supervised by the Project Arborist.

The installation of underground services shall be located outside of the TPZ. Where this is not possible, they shall be installed using tree sensitive excavation methods (hand/hydrovac/airspade) with the services installed around/below roots (>25mmØ, or as determined by the Project Arborist). Excavation using compact machinery (<3.5t) fitted with a flat bladed bucket is permissible where approved by the Project Arborist. Excavation using compact machinery should be undertaken in small increments, guided by a spotter who is to look for and prevent damage to roots (>25mmØ).

Alternatively, boring methods may be used for underground service installation where the obvert level (highest interior level of pipe) is greater than 1000mm below existing grade. Excavations for starting and receiving pits for boring equipment should be located outside of the TPZ areas or located to avoid roots (>25mmØ) as deemed necessary by the Project Arborist. OSD tanks (where required) should be located outside of the TPZ areas.

#### **1.14 Excavations, Root Protection & Root Pruning**

All excavation works (including root investigations) within TPZ areas shall supervised by the Project Arborist and utilise tree sensitive methods (hand/hydrovac/airspade). Excavation using compact machinery (<3.5t) fitted with a flat bladed bucket is permissible where approved by the Project Arborist. Excavation using compact machinery should be undertaken in small increments, guided by a spotter who is to look for and prevent damage to roots (>25mmØ).

Exposed roots shall be protected from direct sunlight, drying out and extremes of temperature by covering with a 10mm thick jute mat, followed by a layer of plastic membrane. Coverings shall be weighted to secure them in place. The mat shall be kept in a damp condition at all times.

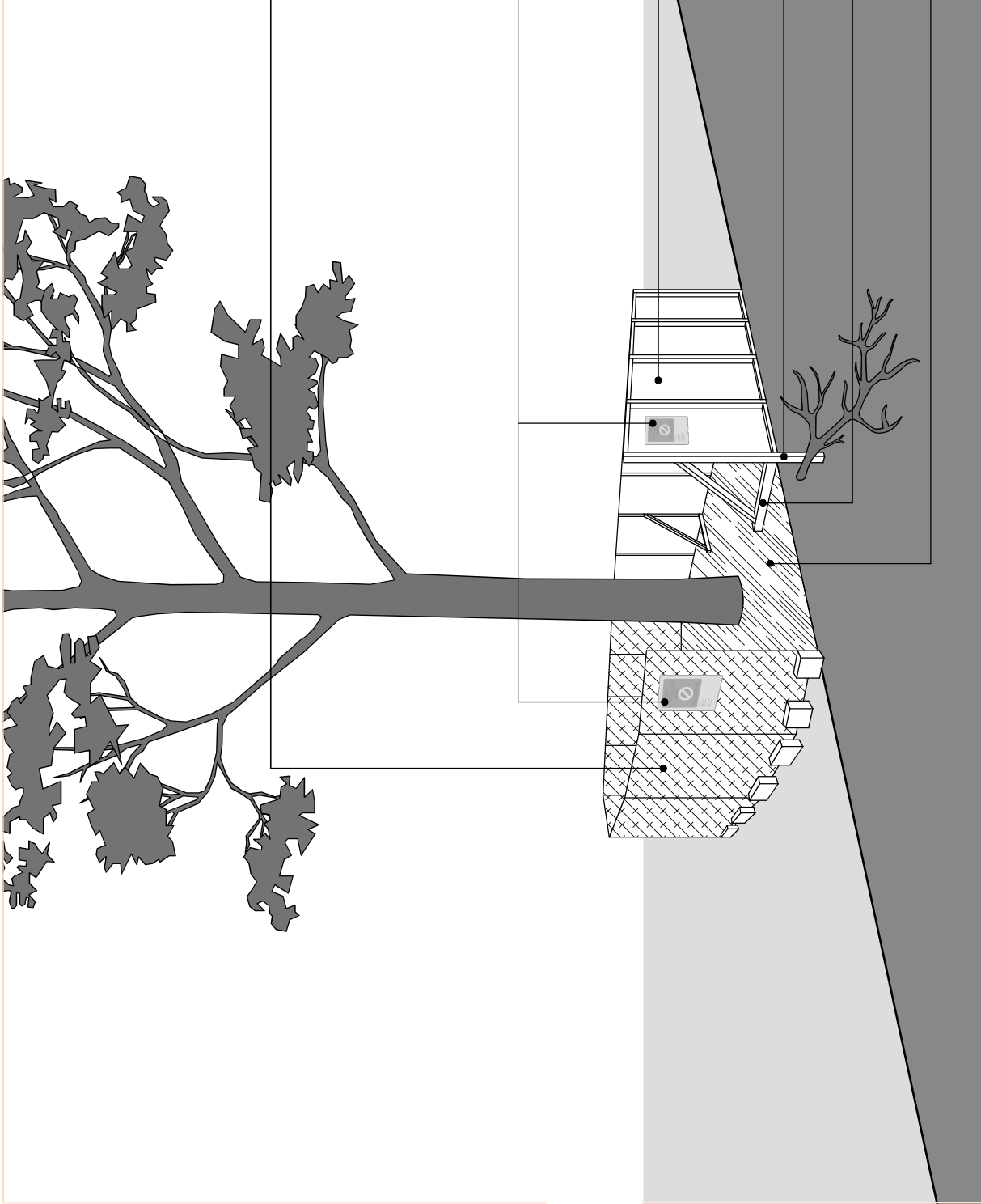
No over-excavation, battering or benching shall be undertaken beyond the footprint of any structure unless approved by the Project Arborist. Tree sensitive excavation and root pruning shall be undertaken along the excavation line prior to the commencement of mechanical excavation to prevent tearing and shattering damage to the roots from excavation equipment.

Roots (>25mmØ) shall be pruned by the Project Arborist only. Roots (<25mmØ) may be pruned by the Principal Contractor. Root pruning shall be undertaken with clean, sharp secateurs or a pruning saw to ensure a smooth wound face, free from tears. Damaged roots shall be pruned behind the damaged tissues with the final cut made to an undamaged part of the root.

#### **1.15 Plant Installation**

Plant installation within the TPZ shall be undertaken using hand tools and roots (>25mmØ) shall be protected. Mechanical augers shall not be used. No mechanical cultivation/ripping of soils shall be undertaken within the TPZ.





**Note:**

No excavation, construction activity, grade changes, surface treatment or storage of materials of any kind is permitted within the TPZ.

**Option 1 - Fencing**

1.8m high chain wire mesh panels with shade cloth attached (if required), held in place with concrete feet.

Tree Protection Zone (TPZ) sign

**Option 2 - Fencing**

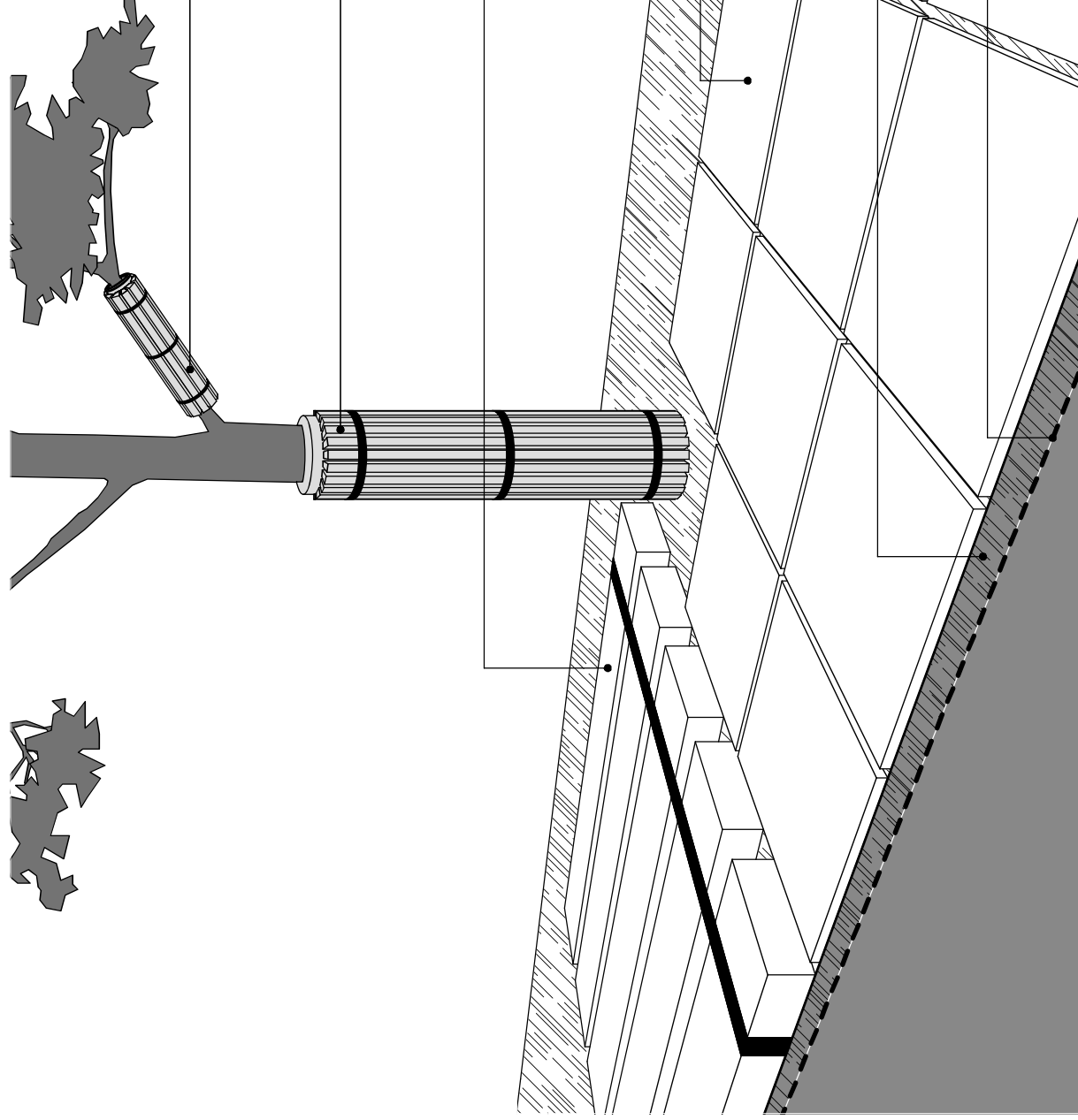
Plywood or wooden panel piling fence. This type of fencing material also prevents building materials or soil entering the TPZ.

Installation of supports should avoid damaging roots.

Bracing is permissible within the TPZ.

Maximum 100mm and minimum 50mm depth mulch or aggregate layer installed across surface of TPZ.





**Branch Protection** - use boards and padding to prevent damage to bark on branch. Boards are to be strapped, not screwed or nailed to the branch.

**Trunk Protection** - use boards and padding to prevent damage to bark (minimum 2m). Boards are to be strapped, not screwed or nailed to the trunk.

**Ground Protection** - use device strapped over mulch or aggregate layer. Ground protection device should be of a suitable thickness to prevent soil compaction and root damage.

Steel plates (or approved equivalent) with or without mulch or aggregate layer below.

Maximum 100mm and minimum 50mm depth mulch or aggregate layer.

Geotextile fabric underneath mulch or aggregate layer.

