



Arboricultural Impact Assessment Report

Site location:

Parramatta West Public
School Parramatta NSW

Prepared for: Conrad Gargett Ancher
Mortlock Woolley

Prepared by: Jack Williams
Urban Arbor Pty Ltd
Date Prepared: 22 June 2018
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Table of Contents

1. EXECUTIVE SUMMARY	3
2. INTRODUCTION	4
3. SCOPE OF THE REPORT	4
4. LIMITATIONS	4
5. METHODOLOGY	6
6. SITE LOCATION AND BRIEF DESCRIPTION	7
7. GENERAL INFORMATION IN RELATION TO PROTECTING TREES ON DEVELOPMENT SITES.....	7
8. OBSERVATIONS	8
9. ASSESSEMENT OF CONSTRUCTION IMPACTS	9
10. CONCLUSIONS	19
11. RECOMMENDATIONS	20
12. TREE PROTECTION REQUIREMENTS	22
13. CONSTRUCTION HOLD POINTS FOR TREE PROTECTION	28
14. BIBLIOGRAPHY/REFERENCES	29
15. LIST OF APPENDICES	30

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Report on trees at: Parramatta West Public School, Parramatta, NSW.

Prepared for: Conrad Gargett Ancher Mortlock Woolley

Prepared by: Jack Williams, Urban Arbor Pty Ltd, sales@urbanarbor.com.au, (02) 8004 2802.

Date of prepared: 22 June 2018.

1. EXECUTIVE SUMMARY

- 1.1 This report identifies the proposed development impact at the subject site to ninety-four (94) trees located either inside or adjoining the site.
- 1.2 Several site plans have been included in appendix 1, where the canopy spread, TPZ and SRZ have been overlaid onto site plans. The following site plans are included in appendix 1;
 - Appendix 1A: Existing Site Plan
 - Appendix 1BN: Proposed Site Plan North
 - Appendix 1BS: Proposed Site Plan South
 - Appendix 1C: Tree Protection Plan
- 1.3 Thirty-three (33) trees have been recommended for removal, including tree 40, 41, 42, 43, 46, 47, 49, 50, 51, 52, 53, 55, 56, 57, 58, 66, 67, 68, 71, 74, 75, 76, 77, 78, 79, 80, 81, 87, 88, 91, 92, 93 and 94. Fourteen (14) of these trees are higher value retention value category A trees, including tree 42, 43, 55, 56, 57, 58, 71, 74, 75, 76, 78, 79, 81 and 87. The other Nineteen (19) trees recommended for removal are lower value category Z retention value trees, including tree 40, 41, 46, 47, 49, 50, 51, 52, 53, 66, 67, 68, 77, 80, 88, 91, 92, 93, 94.
- 1.4 All other trees assessed can be retained in a viable condition and must be protected in accordance with AS4970-2009 for the duration of the development, details of which are provided in section 12. Tree 32, 35, 38, 39, 44, 45, 48, 54, 73, 83, 86 and 90 will be subject to TPZ encroachment greater than 10% and therefore have an increased susceptibility to impact from the development if not adequately protected.
- 1.5 To provide a 4 metre wide access road via Crimea Street, at least one additional tree will have to be removed. The preferred is to remove will be tree 22, as it is a low value tree. As the access road will curve between several trees and therefore it should be investigated that the access road will be suitable for use by the vehicle's that will be required to use the access road. The alternative option is to remove tree 26.
- 1.6 Another option that could be to have the vehicle access road via Railway Street, as there is sufficient space between tree 8 and 9 for a 4 metre wide access road with no required tree removal.
- 1.7 The located of the proposed access road has been indicated in appendix 1C. See section 9.4 for detailed discussion of options of the access road.
- 1.8 No services plan has been assessed in this report. Where possible underground services must be located outside the TPZ of trees to be retained. All underground services located inside the TPZ of any tree to be retained must be installed via tree sensitive techniques.
- 1.9 This report does not provide approval for tree removal or pruning works. All recommendations in this report are subject to approval by the relevant authorities and/or tree owners. This report should be submitted as supporting evidence with any tree removal/pruning or development application.

2. INTRODUCTION

- 2.1 Urban Arbor have been instructed by Conrad Gargett Ancher Mortlock Woolley to provide an Arboricultural Impact Assessment Report for a proposed development at the site.
- 2.2 Below is a list of all documents and information provided to Urban Arbor by the client to assist in preparing this report;
- A) Preliminary Demolition, Tree Retention and Removal Plan: Conrad Gargett Ancher Mortlock Woolley, School ID: PW, Project No: 16461, Drawing No. 0002, Revision A, 3 November 2017.
 - B) Landscape Overlay - Sheet 1: Conrad Gargett Ancher Mortlock Woolley, School ID: PW, Project No: 16461, Drawing No. SK03, Revision B, 22 June 2018.
 - C) Landscape Overlay - Sheet 2: Conrad Gargett Ancher Mortlock Woolley, School ID: PW, Project No: 16461, Drawing No. SK04, Revision B, 22 June 2018.
 - D) Landscape Legend & Finishes Schedule: Conrad Gargett Ancher Mortlock Woolley, School ID: PW, Project No: 16461, Drawing No. 0002, Revision A, 12 June 2018.
- 2.3 The tree inspections were carried out by Bryce Claassens of Urban Arbor 7 March 2018 and 9 March 2018. Access was available to the subject site and adjoining public areas only. All tree data contained in this report was collected during the site inspections.

3. SCOPE OF THE REPORT

- 3.1 This report has been undertaken to meet the following objectives.
- 2.1.1 Conduct a visual assessment of all significant trees located within 5m of development works from ground level.
 - 2.1.2 Determine the trees estimated contribution years and remaining, useful life expectancy and award the trees a retention value.
 - 2.1.3 Provide an assessment of the potential impact the proposed development is likely to cause to the condition of the subject trees in accordance with AS4970 Protection of trees on development sites (2009).
 - 2.1.4 Recommend a suitable location for site compound access (One-way access with 4 metre width) via Crimea Street, including recommendations for tree management.
 - 2.1.5 Specify tree protection measures for trees to be retained in accordance with AS4970-2009.

4. LIMITATIONS

- 4.1 The observations and recommendations are based on the site inspections identified in the introduction (section 1) and the access available at the time of inspection. Findings of this report are based on the observations and site conditions at the time inspection.
- 4.2 All of the observations were carried out from ground level and none of the surrounding surfaces were lifted or removed during the inspection. No tests were carried out to the subject trees or surrounding area during the inspection.
- 4.1 Root decay can sometimes be present with no visual indication above ground. It is also impossible to know the extent of any root damage caused by mechanical damage such as underground root cutting during the installation of services without undertaking detailed root investigation. Any form of tree failure due to these activities is beyond the scope of this assessment.
- 4.2 The report reflects the subject tree(s) as found on the day of inspection. Any changes to the growing environment of the subject tree, or tree management works beyond those recommended in this report may alter the findings of the report. There is no warranty, expressed or implied, that problems or deficiencies relating to the subject tree, or subject site may not arise in the future.
- 4.3 Tree identification is based on accessible visual characteristics at the time of inspection. As key identifying features are not always available the accuracy of identification is not guaranteed. Where tree species is unknown, it is indicated with an *spp.*
- 4.4 All diagrams, plans and photographs included in this report are visual aids only, and are not to scale unless otherwise indicated.
- 4.5 Urban Arbor neither guarantees, nor is it responsible for, the accuracy of information provided by others that is contained within this report.
- 4.6 While an assessment of the subject trees estimated useful life expectancy is included in this report, no specific tree risk assessment has been undertaken for any of trees at the site.
- 4.7 The ultimate safety of any tree cannot be categorically guaranteed. Even trees apparently free of defects can collapse or partially collapse in extreme weather conditions. Trees are dynamic, biological entities subject to changes in their environment, the presence of pathogens and the effects of ageing. These factors reinforce the need for regular inspections. It is generally accepted that hazards can only be identified from distinct defects or from other failure-prone characteristics of a tree or its locality.
- 4.8 Alteration of this report invalidates the entire report.

5. METHODOLOGY

5.1 The following information was collected during the assessment of the subject tree(s).

- 5.1.1 Tree common name
- 5.1.2 Tree botanical name
- 5.1.3 Tree age class
- 5.1.4 DBH (Trunk/Stem diameter at breast height/1.4m above ground level) - millimetres.
- 5.1.5 Estimated height - metres
- 5.1.6 Estimated crown spread (diameter of crown) - metres
- 5.1.7 Health
- 5.1.8 Structural condition
- 5.1.9 Amenity value
- 5.1.10 Estimated remaining contribution years (SULE)¹
- 5.1.11 Retention value (Tree AZ)²
- 5.1.12 Notes/comments

5.2 An assessment of the trees condition was made using the visual tree assessment (VTA) model (Mattheck & Breloer, 1994).³

5.3 Tree diameter was measured using a DBH tape or in some cases estimated. Tree height and tree canopy spread was measured with a clinometer or in some cases estimated. All other measurements were estimations unless otherwise stated. The other tool used during the assessment was a digital camera.

5.4 All DBH measurements, tree protection zones, and structural root zones were calculated in accordance with methods set out in AS4970 Protection of trees on development sites (2009) ⁴ and in some cases estimated. See appendices for information.

5.5 Details of how the observations in this report have been assessed are listed in the appendices.

¹ Barrell Tree Consultancy, *SULE: Its use and status into the New Millennium*, TreeAZ/03/2001, <http://www.treeaz.com/>.

² Barrell Tree Consultancy, *Tree AZ version 10.04-ANZ*, <http://www.treeaz.com/>.

³ Mattheck, C. & Breloer, H., *The body language of trees - A handbook for failure analysis*, The Stationary Office, London, England (1994).

⁴ Council Of Standards Australia, *AS4970 Protection of trees on development sites* (2009).

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6. SITE LOCATION AND BRIEF DESCRIPTION

- 6.1 The site is located in the suburb of Parramatta West, New South Wales, which is located within the Cumberland Local Government Area (LGA) and all trees at the site are subject to protection under the Holroyd Local Environmental Plan (LEP) 2013⁵ and Development Control Plan (DCP) 2013.⁶ The area of the site assessed in this report is not located inside a Heritage Conservation Area or forms part of a heritage item or listed as environmental heritage in the LEP heritage maps.⁷ None of the area where the trees are located is identified as containing biodiversity.

7. GENERAL INFORMATION IN RELATION TO PROTECTING TREES ON DEVELOPMENT SITES

- 7.1 **Tree protection zone (TPZ):** The TPZ is the principle means of protecting trees on development sites and is an area required to maintain the viability of trees during development. It is commonly observed that tree roots will extend significant further than the indicative TPZ, however the TPZ is an area identified AS4970-2009 to be extent where root loss or disturbance will generally not impact the viability of the tree. The TPZ is identified as a restricted area to prevent damage to trees either above or below ground during a development. Where trees are intended to be retained proposed developments must provide an adequate TPZ around trees. The TPZ is set aside for the tree's root zone, trunk and crown and it is essential for the stability and longevity of the tree. The tree protection also incorporates the SRZ (see below for more information about the SRZ). The TPZ of palms, other monocots, cycads and tree ferns has been calculated at one metre outside the crown projection. In the appendices, additional information has been included about the TPZ including information about calculating the TPZ and examples of TPZ encroachment.
- 7.2 **Structural Root Zone (SRZ):** This is the area around the base of a tree required for the trees stability in the ground. An area larger than the SRZ always needs to be maintained to preserve a viable tree. There are several factors that can vary the SRZ which include height, crown area, soil type and soil moisture. It can also be influenced by other factors such as natural or built structures. Generally work within the SRZ should be avoided. Soil level changes should also generally be avoided inside the SRZ of trees to be retained. Palms, other monocots, cycads and tree ferns do not have an SRZ. See appendices for more information about the SRZ.

⁵ Holroyd Local Environmental Plan 2013, <https://legislation.nsw.gov.au/#/view/EPL/2013/139/historical2016-01-08/full>.

⁶ Holroyd Development Control Plan 2013, <https://www.cumberland.nsw.gov.au/development/policies-plans-controls/development-control-plan>, accessed 19 March 2018.

⁷ Holroyd LEP Heritage map - Sheet HER_008, https://www.legislation.nsw.gov.au/maps/3d617c8b-1c5b-6a54-ffa4-f97b517af85a/3950_COM_HER_008_010_20130218.pdf, accessed 19 March 2018.

- 7.3 Minor encroachment into TPZ:** Sometimes encroachment into the TPZ is unavoidable. Encroachment includes but is not limited to activities such as excavation, compacted fill and machine trenching. Minor encroachment of up to 10% of the overall TPZ area is normally considered acceptable, providing there is space adjacent to the TPZ for the tree to compensate and the tree is displaying adequate vigour/health to tolerate changes to its growing environment.
- 7.4 Major encroachment into TPZ:** Where encroachment of more than 10% of the overall TPZ area is proposed the project Arborist must investigate and demonstrate that the tree will remain in a viable condition. In some cases, tree sensitive construction methods such as pier and beam footings, suspended slabs, or cantilevered sections, can be utilised to allow additional encroachment into the TPZ by bridging over roots and minimising root disturbance. Major encroachment is only possible if it can be undertaken without severing significant size roots, or if it can be demonstrated that significant roots will not be impacted. Root investigations may be required to identify roots that will be impacted during major TPZ encroachment.

8. OBSERVATIONS

- 8.1 Tree information:** Details of each individual tree assessed, including the observations taken during the site inspection can be found in the tree inspection schedule in appendix 2, where the indicative tree protection zone (TPZ) for the subject trees has been calculated. The TPZ and SRZ should be measured in radius from the centre of the trunk. The subject trees have been awarded a retention value based on the observations during the site inspection. The system used to award the retention value is Tree AZ. Tree AZ is used to identify higher value trees worthy of being a constraint to development and lower value trees that should generally not be a constraint to the development. The Tree AZ categories sheet (Barrell Tree Consultancy) has been included in the appendices to assist with understanding the retention values. The retention value that has been allocated to the subject trees in this report is not definitive and should only be used as a guideline. This information has been summarised below.
- 8.2 Site plan:** Several site plans have been included in appendix 1, where the canopy spread, TPZ and SRZ have been overlaid onto site plans. The following site plans are included in appendix 1;
- Appendix 1A: Existing Site Plan
 - Appendix 1BN: Proposed Site Plan North
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 - Appendix 1C: Tree Protection Plan

9. ASSESSEMENT OF CONSTRUCTION IMPACTS

9.1 Table 1: The table below includes a discussion of the development impact to trees assessed in this report. TPZ encroachment percentages are based on new structures (i.e. buildings, retaining walls and significant level changes) and hard surfaces only. Soft landscape areas, such as amenity turf and planting areas, have been assessed as minor TPZ encroachment only. Specifications for tree sensitive measures for all proposed development works are included in section 10.

Tree ID	Botanical Name	Retention Value	TPZ Radius (m)	TPZ area (m ²)	SRZ Radius (m)	TPZ encroachment	Discussion/ Conclusion	Recommendation
1	<i>Eucalyptus sideroxylon</i>	A1	6.1	116.9	2.5	Minor	All encroachment into TPZ from amenity turf, planting and concrete edging only. The concrete edging should be located no lower than 100mm below existing soil grades in TPZ.	Retain and protect
2	<i>Eucalyptus nicholii</i>	A2	6.7	141.0	2.6	Minor	New amenity planting area in TPZ only.	Retain and protect
3	<i>Corymbia maculata</i>	A1	2.4	18.1	1.8	None	No proposed development works in the TPZ.	Retain and protect
4	<i>Corymbia maculata</i>	A1	3.4	36.3	2.1	None	No proposed development works in the TPZ.	Retain and protect
5	<i>Corymbia maculata</i>	A1	4.0	50.3	2.2	None	No proposed development works in the TPZ.	Retain and protect
6	<i>Corymbia maculata</i>	A2	4.9	75.4	2.5	None	No proposed development works in the TPZ.	Retain and protect
7	<i>Liquidamber styraciflua</i>	Z5	3.0	28.3	2.1	None	No proposed development works in the TPZ.	Retain and protect
8	<i>Liquidamber styraciflua</i>	Z9	4.6	66.5	2.5	None	No proposed development works in the TPZ.	Retain and protect
9	<i>Eucalyptus microcorys</i>	A1	6.6	136.8	2.7	None	No proposed development works in the TPZ.	Retain and protect
10	<i>Eucalyptus nicholii</i>	Z9	5.6	98.5	2.5	None	No proposed development works in the TPZ.	Retain and protect

11	<i>Eucalyptus racemosa</i>	A1	6.6	136.8	2.6	None	No proposed development works in the TPZ.	Retain and protect
12	<i>Corymbia maculata</i>	A1	3.6	40.7	2.1	None	No proposed development works in the TPZ.	Retain and protect
13	<i>Agonis flexuosa</i>	Z4	4.2	55.4	2.3	None	No proposed development works in the TPZ.	Retain and protect
14	<i>Eucalyptus cinerea</i>	A2	11.2	394.1	3.4	None	No proposed development works in the TPZ.	Retain and protect
15	<i>Agonis flexuosa</i>	Z1	2.5	19.6	1.8	None	No proposed development works in the TPZ.	Retain and protect
16	<i>Corymbia maculata</i>	A1	3.6	40.7	2.1	None	No proposed development works in the TPZ.	Retain and protect
17	<i>Eucalyptus creba</i>	A1	4.0	50.3	2.2	None	No proposed development works in the TPZ.	Retain and protect
18	<i>Corymbia maculata</i>	A1	3.4	36.3	2.0	None	No proposed development works in the TPZ.	Retain and protect
19	<i>Corymbia maculata</i>	A1	2.9	26.4	2.0	None	No proposed development works in the TPZ.	Retain and protect
20	<i>Eucalyptus nicholii</i>	A1	6.8	145.3	2.8	None	No proposed development works in the TPZ.	Retain and protect
21	<i>Callistemon viminalis</i>	A1	3.5	38.5	2.3	None	No proposed development works in the TPZ.	Retain and protect
22	<i>Eucalyptus spp</i>	Z10	3.1	30.2	2.1	None	No proposed development works in the TPZ. To be removed if proposed preferred vehicle access is adopted.	Retain and protect
23	<i>Eucalyptus nicholii</i>	A2	5.4	91.6	2.5	None	No proposed development works in the TPZ.	Retain and protect
24	<i>Eucalyptus microcorys</i>	A1	6.4	128.7	2.7	None	No proposed development works in the TPZ.	Retain and protect
25	<i>Eucalyptus microcorys</i>	A2	7.9	196.1	2.9	None	No proposed development works in the TPZ.	Retain and protect
26	<i>Eucalyptus sideroxylon</i>	A1	5.2	84.9	2.5	None	No proposed development works in the TPZ. To be removed if proposed alternative vehicle access is adopted.	Retain and protect
27	<i>Eucalyptus microcorys</i>	A1	4.7	69.4	2.5	None	No proposed development works in the TPZ.	Retain and protect
28	<i>Eucalyptus sideroxylon</i>	A2	7.4	172.0	2.8	None	No proposed development works in the TPZ.	Retain and protect

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29	<i>Eucalyptus microcorys</i>	A1	5.8	105.7	2.6	None	No proposed development works in the TPZ.	Retain and protect
30	<i>Eucalyptus microcorys</i>	A1	6.1	116.9	2.6	None	No proposed development works in the TPZ.	Retain and protect
31	<i>Corymbia maculata</i>	Z4	2.0	12.6	1.5	Minor	New amenity turf only in TPZ.	Retain and protect
32	<i>Corymbia maculata</i>	A1	5.2	84.9	2.5	Major	A proposed ramp encroaches into the TPZ by 6%, which will not significantly impact the tree. Concrete edging for the amenity planting area encroaches into the TPZ by an additional 10%, this should be located no lower than 150mm below existing soil grades in TPZ. All other encroachment from amenity turf and planting areas only, which will not significantly impact the tree.	Retain and protect
33	<i>Eucalyptus spp</i>	Z4	5.6	98.5	2.5	Minor	Proposed ramp and concrete edging encroach into the TPZ by less than 5%. Otherwise new amenity turf only in TPZ.	Retain and protect
34	<i>Cinnamomum camphora</i>	Z4	7.8	191.1	3.1	Minor	New amenity turf only in TPZ.	Retain and protect
35	<i>Lophostemon confertus</i>	Z1	2.0	12.6	1.5	Minor	New amenity turf only in TPZ.	Retain and protect
36	<i>Lophostemon confertus</i>	A1	2.2	15.2	1.8	Minor	Proposed ramp encroaches into the TPZ by less than 10%. All other encroachment into TPZ from amenity turf, planting and concrete edging only. The concrete edging should be located no lower than 100mm below existing soil grades in TPZ.	Retain and protect
37	<i>Corymbia citriodora</i>	A1	2.4	18.1	1.8	None	No encroachment into the TPZ.	Retain and protect
38	<i>Lophostemon confertus</i>	Z1	2.0	12.6	1.5	Minor	Proposed ramp encroaches into the TPZ by less than 10%. All other encroachment into TPZ from amenity planting only.	Retain and protect
39	<i>Eucalyptus creba</i>	A2	4.2	55.4	2.2	Major	Proposed ramp encroaches into the TPZ by approximately 16% but not into the SRZ. This will not significantly impact the tree. All other encroachment into TPZ from amenity planting only.	Retain and protect
40	<i>Eucalyptus spp</i>	Z5	5.2	84.9	2.6	Footprint	Trunk within footprint of new hard surfacing.	Remove
41	<i>Corymbia maculata</i>	Z4	2.0	12.6	1.7	Footprint	Trunk within footprint of new hard surfacing.	Remove
42	<i>Corymbia citriodora</i>	A1	2.3	16.6	1.7	Footprint	Trunk within footprint of new hard surfacing.	Remove
43	<i>Corymbia citriodora</i>	A1	2.2	15.2	1.7	Footprint	Trunk within footprint of new hard surfacing.	Remove

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44	<i>Eucalyptus sideroxylon</i>	A2	5.5	95.0	2.5	Major	Stairs and new hard surfacing encroach into the TPZ by 17% but not into the SRZ. To minimise the impact of the new paving, it should be constructed above existing soil grades into the TPZ. The construction platform will also encroach into the TPZ by a further 8%, however the soil level is to be increased for the platform and should not significantly impact the tree. All other encroachment into TPZ from amenity turf and concrete edging only. The concrete edging should be located no lower than 100mm below existing soil grades in TPZ.	Retain and protect
45	<i>Eucalyptus spp</i>	Z4	6.2	120.8	2.7	Major	New hard surfacing will also into the TPZ by less than 10%, which will not significantly impact the tree. The construction platform will also encroach into the TPZ by a further 10%, however the soil level is to be increased for the platform and should not significantly impact the tree. All other encroachment into TPZ from amenity turf and concrete edging only. The concrete edging should be located no lower than 100mm below existing soil grades in TPZ.	Retain and protect
46	<i>Lophostemon confertus</i>	Z1	2.0	12.6	1.6	Major	Trunk within construction platform.	Remove
47	<i>Lophostemon confertus</i>	Z1	2.0	12.6	1.6	Footprint	Tree within footprint of new hard surfacing.	Remove
48	<i>Grevillea robusta</i>	A1	4.8	72.4	2.4	Major	New paving and a retaining wall will encroach into the TPZ by less than 10%, which will not significantly impact the tree. Minor level changes for construction platform in TPZ will not significantly impact tree. The concrete edging should be located no lower than 100mm below existing soil grades in TPZ. All other encroachment into TPZ from amenity planting areas only.	Retain and protect
49	<i>Acer negundo</i>	Z3	3.3	34.2	2.1	Footprint	Trunk located within footprint of hard surfacing and seating area.	Remove
50	<i>Lophostemon confertus</i>	Z1	2.0	12.6	1.6	Footprint	Tree within footprint of new hard surfacing.	Remove
51	<i>Lophostemon confertus</i>	Z5	2.0	12.6	1.6	Major	New paving will encroach into TPZ by 25% and significantly into the SRZ. Tree in poor condition and should be removed for arboricultural management purposes.	Remove
52	<i>Lophostemon confertus</i>	ZZ5	2.0	12.6	1.7	Footprint	Trunk located within footprint of building platform, where significant level changes are proposed.	Remove

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53	<i>Acer negundo</i>	Z3	2.6	21.2	1.8	Footprint	Trunk located within footprint of seating area.	Remove
54	<i>Fraxinus raywood</i>	A1	5.4	91.6	2.5	Major	The swale encroaches into the TPZ by 12%, which will not significantly impact the condition of the tree. All other encroachment from new amenity planting area only in TPZ.	Retain and protect
55	<i>Casuarina cunninghamiana</i>	A1	3.6	40.7	2.1	Footprint	Trunk located within footprint of proposed hard surfacing.	Remove
56	<i>Casuarina cunninghamiana</i>	A1	4.3	58.1	2.3	Footprint	Trunk located within footprint of proposed hard surfacing.	Remove
57	<i>Casuarina cunninghamiana</i>	A1	2.3	16.6	1.8	Footprint	Trunk located within footprint of proposed hard surfacing.	Remove
58	<i>Casuarina cunninghamiana</i>	A1	5.6	98.5	2.6	Footprint	Trunk located within footprint of proposed hard surfacing and seating area.	Remove
59	<i>Casuarina cunninghamiana</i>	Z1	2.0	12.6	1.5	Minor	New amenity planting area only in TPZ.	Retain and protect
60	<i>Casuarina cunninghamiana</i>	A1	4.9	75.4	2.5	Minor	Level changes for the construction platform, a retaining wall and new hard surfacing will encroach into the TPZ by less than 10%. All other encroachment from new amenity planting area only in TPZ.	Retain and protect
61	<i>Casuarina glauca</i>	A1	4.3	58.1	2.3	Minor	New amenity planting area only in TPZ.	Retain and protect
62	<i>Casuarina glauca</i>	A1	4.1	52.8	2.3	Minor	New amenity planting area only in TPZ.	Retain and protect
63	<i>Casuarina glauca</i>	A1	3.7	43.0	2.2	Minor	New amenity planting area only in TPZ.	Retain and protect
64	<i>Eucalyptus creba</i>	A1	4.7	69.4	2.4	Minor	New amenity planting area only in TPZ.	Retain and protect
65	<i>Eucalyptus creba</i>	A1	3.7	43.0	2.2	Minor	New amenity planting area only in TPZ.	Retain and protect
66	<i>Melaleuca quinquenervia</i>	Z1	2.2	15.2	1.7	Major	The soil level around the trunk is proposed to be lowered by approximately 1m and the tree will not be viable for retention.	Remove
67	<i>Melia azedarach</i>	Z5	2.9	26.4	1.9	Major	The soil level around the trunk is proposed to be lowered by approximately 1m and the tree will not be viable for retention.	Remove
68	<i>Melia azedarach</i>	Z1	2.0	12.6	1.5	Major	The soil level around the trunk is proposed to be lowered by approximately 1m and the tree will not be viable for retention.	Remove
69	<i>Eucalyptus sideroxylon</i>	A1	3.8	45.4	2.3	Minor	New amenity planting area only in TPZ.	Retain and protect
70	<i>Eucalyptus sideroxylon</i>	A1	5.6	98.5	2.5	Minor	New amenity planting area only in TPZ.	Retain and protect

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71	<i>Eucalyptus sideroxylon</i>	A2	4.9	75.4	2.5	Major	The soil level will be lowered by 1.4m in approximately 40% of the TPZ and inside the SRZ for the proposed construction platform. The tree will be unstable if retained.	Remove
72	<i>Eucalyptus sideroxylon</i>	A1	5.5	95.0	2.6	Minor	New amenity planting area only in TPZ.	Retain and protect
73	<i>Eucalyptus sideroxylon</i>	A1	3.7	43.0	2.2	Major	A retaining wall encroaches into the TPZ by 12% but not into the SRZ, which will not significantly impact the tree. All other encroachment from new amenity planting area only in TPZ.	Retain and protect
74	<i>Eucalyptus sideroxylon</i>	A2	4.6	66.5	2.4	Major	A retaining wall and stairs encroach into the TPZ by 40% and significantly into the SRZ. Cut of more than 1m is proposed within the encroachment area. The tree will be unstable if retained.	Remove
75	<i>Eucalyptus sideroxylon</i>	A2	4.8	72.4	2.4	Footprint	Trunk is located within footprint of retaining wall and directly adjacent to new stairs.	Remove
76	<i>Eucalyptus sideroxylon</i>	A1	5.9	109.4	2.6	Footprint	Trunk is within footprint of proposed stairs.	Remove
77	<i>Eucalyptus sideroxylon</i>	Z5	6.0	113.1	2.7	Footprint	Trunk is within footprint of proposed stairs.	Remove
78	<i>Corymbia maculata</i>	A1	3.7	43.0	2.1	Major	A retaining wall encroaches into the TPZ by 28% and significantly into the SRZ. Cut of 400mm is proposed within the encroachment area. The stability and health of the tree is likely to be impacted if the tree is retained.	Remove
79	<i>Corymbia maculata</i>	A1	4.9	75.4	2.5	Major	A retaining wall encroaches into the TPZ by 31% and significantly into the SRZ. Cut of 400mm is proposed within the encroachment area. The stability and health of the tree is likely to be impacted if the tree is retained.	Remove
80	<i>Eucalyptus sideroxylon</i>	Z1	2.2	15.2	1.8	Footprint	Trunk is within the footprint of the proposed building.	Remove
81	<i>Eucalyptus microcorys</i>	A1	6.1	116.9	2.8	Footprint	Trunk is within the footprint of the proposed building.	Remove
82	<i>Callistemon viminalis</i>	Z1	2.3	16.6	1.7	None	No proposed development works in the TPZ.	Retain and protect
83	<i>Corymbia maculata</i>	A2	8.0	201.1	3.0	Major	Two retaining walls encroach into the TPZ by 13% but not into the SRZ, which will not significantly impact the tree. All other encroachment into TPZ are from amenity turf, planting and concrete edging only. The concrete edging should be installed at no lower than 100mm below existing soil grades in TPZ.	Retain and protect
84	<i>Eucalyptus spp</i>	A1	2.8	24.6	2.0	Minor	Concrete edging should be constructed above soil grades in SRZ. All other encroachment from new amenity turf and planting areas only in TPZ.	Retain and protect
85	<i>Eucalyptus microcorys</i>	A1	3.2	32.2	2.0	Minor	Hard surfacing encroaches into the TPZ by less than 10%. All other encroachment from new amenity turf only in TPZ.	Retain and protect

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86	<i>Eucalyptus microcorys</i>	A1	4.1	52.8	2.3	Major	Proposed hard surfacing encroaches into the TPZ by approximately 19%, the levels indicate that existing levels will not be significantly modified in the TPZ, therefore the impact to the tree will be acceptable.	Retain and protect
87	<i>Lophostemon confertus</i>	A1	2.7	22.9	1.9	Footprint	Trunk is within footprint of new hard surfacing.	Remove
88	<i>Lophostemon confertus</i>	Z9	2.3	16.6	1.8	Major	New paving/seating will encroach into the TPZ by 10% and also into the SRZ. The construction platform encroaches into the TPZ by 15% and into the SRZ, where the soil grade is to be lowered. The tree may be unstable if retained.	Remove
89	<i>Tristaniopsis laurina</i>	Z1	3.0	28.3	1.8	Minor	New amenity turf only in TPZ.	Retain and protect
90	<i>Corymbia torelliana</i>	A1	5.8	105.7	2.6	Major	New hard surfacing will encroach into the TPZ by 20%, but not into the SRZ. The proposed levels indicate that these structures will be constructed 250mm above existing grades, therefore the impact will be acceptable. All other encroachment into TPZ from amenity turf only.	Retain and protect
91	<i>Lophostemon confertus</i>	Z1	2.0	12.6	1.8	Major	The trunk located directly adjacent to a proposed ramp. Low value tree, recommend removing and replacing tree.	Remove
92	<i>Lophostemon confertus</i>	Z1	2.0	12.6	1.7	Footprint	The trunk is within the footprint of a proposed ramp.	Remove
93	<i>Corymbia maculata</i>	Z9	2.8	24.6	2.0	Footprint	The trunk is within the footprint of a proposed ramp.	Remove
94	<i>Corymbia maculata</i>	Z1	2.0	12.6	1.8	Footprint	The trunk is within the footprint of a proposed ramp.	Remove

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9.2 General Landscaping Requirements

New landscaping is proposed inside the TPZ of the majority of the trees at the site. If the trees are to be retained in a viable condition, the landscaping must be undertaken in a tree sensitive method to ensure trees are not adversely impacted by the landscape construction.

- 9.2.1 **Structural Root Zone:** This is the area of structural woody roots around the base of trunk required for tree stability. No roots greater than 30mm inside the SRZ should be severed or damaged, unless the impact of the root pruning has been assessed and approved by the project Arborist.
- 9.2.2 **Soil Grades:** Existing soil grades inside the TPZ of trees to should not be significantly altered, to minimise impact to the trees root system. The existing soil grades inside the TPZ must not be lowered by more than 50mm, as this could result in removing significant fibrous root mass, impacting the trees health and vigour. Where soil grades must be lowered by more than 50mm, consultation is required from the project Arborist to assess the impact to the individual tree(s). Soil level increases should also be minimised, as this can restrict the availability of water, nutrients and air to root system below. Soil level must not be increased by more than 100mm inside the TPZ, unless assessed and approved by the project Arborist.
- 9.2.3 **Soil compaction:** As described in AS4970-2009, apart from the actual removal of roots during excavation or trenching, soil compaction is one of the major causes of root damage on development sites. Compaction is defined as the loss of large pore spaces (macropores) within the soil with a net loss of total pore space. Macropores are essential for the exchange of gases between the soil air and the atmosphere (aeration) and the removal of excess water from the soil (drainage). Soil compaction must be minimised during the development works.
- 9.2.4 **Demolition/Removal of existing hard surfaces/structures:** The demolition of all existing structures inside or directly adjacent to the TPZ of trees to be retained must be undertaken in consultation with the project Arborist. Any machinery is to work from inside the footprint of the existing structures/hard surface or outside the TPZ, reaching in to minimise soil disturbance and compaction. If it is not feasible to locate demolition machinery outside the TPZ of trees to be retained, ground protection will be required. The lowest layers of sub base of are to be carefully removed in maximum 50mm to minimise potential damage to the underlying root system. Existing turf must be removed manually inside the TPZ.
- 9.2.5 **Soil preparation:** Any cultivation of soil inside the TPZ of trees to be retained in preparation for laying turf/grass/plants must be undertaken manually. The soil should be carefully forked through, and approximately 20% organic matter introduced to improve soil condition. Roots greater than 30mm in diameter should be retained. After any existing hard surfaces are and sub based are removed, good quality top soil free of contaminants should be used to fill in the excavated area and bring flush with surrounding levels within new landscape areas. Soil must be imported and spread manually, when the underlying soil conditions are dry to avoid compaction of the soil profile.

9.2.6 Sub base Materials: Where sub base is used inside the TPZ of trees to be retained, sub base material should be a coarse aggregate/granular material that does not restrict the flow of water and air to the root system below. A layer of permeable geotextile fabric should be placed over the soil surface, between the soil and lowest level of sub base. Where hard surfaces are being replaced with new hard surfacing, the lowest layers of sub base should be retained and re used to avoid unnecessary root disturbance.

9.3 Site Specific Landscaping Specifications

- 9.3.1 New Paving/Decorative Gravel/Hard Surfaces: To ensure that tree root systems are not significantly impacted, all new hard surfaces should be constructed on or above existing soil grades. If the new hard surface is replacing an existing hard surface, the existing sub base should be retained where possible to minimise root disturbance. Compaction of lowest sub base materials must be minimised, as this can cause soil compaction and impact the health of trees. Sub base must be in accordance with section 9.2.6.
- 9.3.2 Concrete Edging: new concrete edging is proposed in the TPZ and SRZ of trees to be retained. To minimise the impact to the trees root system, the concrete edging should be located no lower than 100mm below existing soil grades unless approved by the project Arborist.
- 9.3.3 Turf Cells/Amenity Grass: Soil preparation must be in accordance with section 9.2.5. Roots greater than 30mm in diameter should be retained. Water saving crystals must not be used in the TPZ of trees to be retained, as these can draw moisture from tree roots and damage the trees health.
- 9.3.4 Amenity Planting Areas: The location of new plantings inside the TPZ of trees to be retained should be flexible to avoid unnecessary damage to tree roots greater than 30mm in diameter. Any replacement trees must be selected in accordance with AS2303-2015 Tree stock for landscape use. Soil preparation in accordance with section 9.2.5.
- 9.3.5 Drainage pipes/Underground services: Where possible underground services and drainage pipes should be located outside the TPZ of trees to be retained. Where this is not possible, they must be installed via tree sensitive techniques. This should include either directional drilling methods or manual excavations to minimise the impact to trees identified for retention. Section 4.5.5 of AS4970-2009 says that 'The directional drilling bore should be at least 600 mm deep. The project Arborist should assess the likely impacts of boring and bore pits on retained trees. For manual excavation of trenches the project Arborist should advise on roots to be retained and should monitor the works'.⁸ Roots greater than 30mm should be retained and the pipe threaded above/below the roots to allow for their retention.

⁸ Council Of Standards Australia, AS 4970 Protection of trees on development sites (2009) page 18.

- 9.1 Recommend a suitable location for site compound access (One-way access with 4 metre width) via Crimea Street, including recommendations for tree management:**
- 9.1.1 The access road at Crimea Street will have to be located somewhere between tree 22-33, as the East section of the site at Crimea Street will access into the proposed building footprint and will not be practical for use after the building construction commences. Tree 22-33 are planted in a row adjacent to the Crimea Street boundary and there is not sufficient space between any of these to provide a 4 metre wide access road, therefore removal of one of the trees will be required to provide access from this area. Tree 22 is the only lower value category Z retention value of these trees. Therefore, if access via Crimea Street is essential, the preferred option is to remove tree 22 for site access only. If this option is selected, the access road will curve between several trees and therefore it should be investigated that the access road will be suitable for use by the vehicle's that will be required to use the access road. The location of the preferred access road has been indicated in appendix 1C.
 - 9.1.2 If this access road location is not considered suitable for use, one of the trees numbered 24-30 will have to be selected for removal to access the site via Crimea Street, which are all higher value trees. Tree 26 is the most suitable of these trees due to reduced overall form. The alternative access road location has been indicated in appendix 1C.
 - 9.1.3 An alternative option that could be investigated in accessing the site is via Railway Street, as there is sufficient space between tree 8 and 9 for a 4 metre wide access road with no required tree removal.
 - 9.1.4 Whichever access road option is selected, adequate tree protection will be required for the TPZ of trees adjacent to the access road. To protect the TPZ of the trees adjacent to the access road, the access road must be constructed in accordance with the ground protection specifications in section 12.6.5. TPZ fencing should be aligned directly adjacent to the access to prevent vehicles encroaching into additional areas of the TPZ of the adjacent trees.

10. CONCLUSIONS

10.1 Table 2: Summary of the impact to trees during the development;

Impact	Reason	Category A	Category Z
		A	Z
Trees to be removed	Building construction, new surfacing and/or proximity, or trees in poor condition.	42, 43, 55, 56, 57, 58, 71, 74, 75, 76, 78, 79, 81, 87 (Fourteen trees)	40, 41, 46, 47, 49, 50, 51, 52, 53, 66, 67, 68, 77, 80, 88, 91, 92, 93, 94 (Nineteen trees)
Retained trees subject to TPZ encroachment greater than 10%	Removal of existing surfacing/structures and/or installation of new surfacing/structures	32, 39, 44, 48, 54, 73, 83, 86, 90 (Nine trees)	35, 38, 45 (Three trees)
Retained trees subject to TPZ encroachment of 10% or less	Removal of existing surfacing/structures and/or installation of new surfacing/structures	1, 2, 3, 4, 5, 6, 9, 11, 12, 14, 16, 17, 18, 19, 20, 21, 23, 24, 25, 26, 27, 28, 29, 30, 36, 37, 60, 61, 62, 63, 64, 65, 69, 70, 72, 84, 85 (Thirty-seven trees)	7, 8, 10, 13, 15, 22, 31, 33, 34, 59, 82, 89 (Twelve trees)

11. RECOMMENDATIONS

- 11.1 This report identifies the proposed development impact at the subject site to ninety-four (94) trees located either inside or adjoining the site.
- 11.2 **Site plan:** Several site plans have been included in appendix 1, where the canopy spread, TPZ and SRZ have been overlaid onto site plans. The following site plans are included in appendix 1;
- Appendix 1A: Existing Site Plan
 - Appendix 1BN: Proposed Site Plan North
 - Appendix 1BS: Proposed Site Plan South
 - Appendix 1C: Tree Protection Plan
- 11.3 Thirty-three (33) trees have been recommended for removal, including tree 40, 41, 42, 43, 46, 47, 49, 50, 51, 52, 53, 55, 56, 57, 58, 66, 67, 68, 71, 74, 75, 76, 77, 78, 79, 80, 81, 87, 88, 91, 92, 93 and 94. Fourteen (14) of these trees are higher value retention value category A trees, including tree 42, 43, 55, 56, 57, 58, 71, 74, 75, 76, 78, 79, 81 and 87. The other Nineteen (19) trees recommended for removal are lower value category Z retention value trees, including tree 40, 41, 46, 47, 49, 50, 51, 52, 53, 66, 67, 68, 77, 80, 88, 91, 92, 93, 94.
- 11.4 All other trees assessed can be retained in a viable condition and must be protected in accordance with AS4970-2009 for the duration of the development, details of which are provided in section 12. Tree 32, 35, 38, 39, 44, 45, 48, 54, 73, 83, 86 and 90 will be subject to TPZ encroachment greater than 10% and therefore have an increased susceptibility to impact from the development if not adequately protected.
- 11.5 To provide a 4 metre wide access road via Crimea Street, at least one additional tree will have to be removed. The preferred is to remove will be tree 22, as it is a low value tree. As the access road will curve between several trees and therefore it should be investigated that the access road will be suitable for use by the vehicle's that will be required to use the access road. The alternative option is to remove tree 26.
- 11.6 Another option that could be to have the vehicle access road via Railway Street, as there is sufficient space between tree 8 and 9 for a 4 metre wide access road with no required tree removal.

- 11.7 No services plan has been assessed in this report. Where possible underground services must be located outside the TPZ of trees to be retained. All underground services located inside the TPZ of any tree to be retained must be installed via tree sensitive techniques. This should include either directional drilling methods or manual excavations to minimise the impact to trees identified for retention. Section 4.5.5 of AS4970-2009 says that 'The directional drilling bore should be at least 600 mm deep. The project Arborist should assess the likely impacts of boring and bore pits on retained trees. For manual excavation of trenches the project Arborist should advise on roots to be retained and should monitor the works'.⁹
- 11.8 This report does not provide approval for tree removal or pruning works. All recommendations in this report are subject to approval by the relevant authorities and/or tree owners. This report should be submitted as supporting evidence with any tree removal/pruning or development application.

⁹ Council Of Standards Australia, *AS 4970 Protection of trees on development sites* (2009) page 18.

12. TREE PROTECTION REQUIREMENTS

- 12.1 **Use of this report:** All contractors must be made aware of the tree protection requirements prior to commencing works at the site. This report and a copy of the Tree Protection Plan (Appendix 1C) must also be made available to any contractor prior to works commencing and during any on site operations.
- 12.2 **Project Arborist:** Prior to any works commencing at the site a project Arborist should be appointed. The project Arborist should be qualified to a minimum AQF level 5 and/or equivalent qualifications and experience, and should assist with any development issues relating to trees that may arise. If at any time it is not feasible to carryout works in accordance with this, an alternative must be agreed in writing with the project Arborist.
- 12.3 **Tree work:** All tree work must be carried out by a qualified and experienced Arborist with a minimum of AQF level 2 in arboriculture, in accordance with NSW Work Cover Code of Practice for the Amenity Tree Industry (1998) and AS4373 Pruning of amenity trees (2007). All tree pruning should be carried out in accordance with the local LEP and DCP regulations.
- 12.4 **Initial site meeting/on-going regular inspections:** The project Arborist is to hold a pre-construction site meeting with principle contractor to discuss methods and importance of tree protection measures and resolve any issues in relation to tree protection that may arise. In accordance with AS4970-2009, the project Arborist should carryout regular site inspections to ensure works are carried out in accordance with this document throughout the development process. I recommend site inspections on a monthly frequency.
- 12.5 **Site Specific Tree Protection Recommendations (see appendix 1C for indicative fencing location):**
- 12.5.1 The majority of the trees to be retained at the site are located to each other with overlapping TPZ areas. These trees should have continuous fencing to create a combined TPZ exclusion zone. All tree protection should only be relocated for landscaping under the approval of the project arborist. The tree protection is specified at the following points;
- Tree 1-8, 82-86: Tree protective fencing aligned as close building footprint as practical and at extent of TPZ radius in all other areas (excluding areas of TPZ outside the site). TPZ signage on fencing. Temporary irrigation and mulch in TPZ exclusion zone. Ground protection for any areas of TPZ within construction platform (not including building footprint).
 - Tree 9-20: Tree protective fencing aligned at extent of TPZ radius of each tree (excluding areas of TPZ outside the site) and adjacent to edge of site access road in TPZ of tree 20 and 23. Ground protection for site access road. TPZ signage of fencing. Temporary irrigation and mulch in TPZ exclusion zone.
 - Tree 24-39: Tree protective fencing aligned at extent of TPZ radius of each tree (excluding areas of TPZ outside the site) and adjacent to edge of site

- access road in TPZ of tree 24. Ground protection for site access road. TPZ signage of fencing. Temporary irrigation and mulch in TPZ exclusion zone.
- Tree 44 and 45: Tree protective fencing aligned at edge of building platform and at extent of TPZ radius in all other areas (excluding areas of TPZ outside the site). TPZ signage on fencing. Temporary irrigation and mulch in TPZ exclusion zone. Ground protection for any areas of TPZ within construction platform (not including building footprint).
- Tree 48: Tree protective fencing aligned at edge of building platform and at extent of TPZ radius in all other areas (excluding areas of TPZ outside the site). TPZ fencing within site only. TPZ signage on fencing. Temporary irrigation and mulch in TPZ exclusion zone. Ground protection for any areas of TPZ within construction platform (not including building footprint).
- Tree 54: Tree protective fencing aligned at edge of building platform and at extent of TPZ radius in all other areas (excluding areas of TPZ outside the site). TPZ fencing within site only. TPZ signage on fencing. Temporary irrigation and mulch in TPZ exclusion zone. Ground protection for any areas of TPZ within construction platform (not including building footprint).
- Tree 59-73 (tree 66, 67, 68 and 71 recommended for removal): Tree protective fencing aligned at edge of building platform and at extent of TPZ radius in all other areas (excluding areas of TPZ outside the site). TPZ signage on fencing. Temporary irrigation and mulch in TPZ exclusion zone. Ground protection for any areas of TPZ within construction platform (not including building footprint).
- Tree 89 and 90: Tree protective fencing aligned at edge of building platform and at extent of TPZ radius in all other areas (excluding areas of TPZ outside the site). TPZ signage on fencing. Temporary irrigation and mulch in TPZ exclusion zone. Ground protection for any areas of TPZ within construction platform (not including building footprint).

12.6 Tree Protection Specifications: It is the responsibility of the principle contractor to install tree protection prior to works commencing at the site (prior to demolition works) and to ensure that the tree protection remains in adequate condition for the duration of the development. The tree protection must not be moved without prior agreement of the project Arborist. The project Arborist must inspect that the tree protection has been installed in accordance with this document and AS4970-2009 prior to works commencing.

12.6.1 Protective fencing: Where it is not feasible to install fencing at the specified location due to factors such restricting access to areas of the site or for constructing new structures, an alternative location and protection specification must be agreed with the project Arborist. Where the installation of fencing is unfeasible due to restrictions on space, trunk and branch protection will be required (see below). The protective fencing must be constructed of 1.8 metre 'cyclone chainmesh fence'. The fencing

must only be removed for the landscaping phase and must be authorised by the project Arborist. Any modifications to the fencing locations must be approved by the project Arborist.

12.6.2 TPZ signage: Tree protection signage is to be attached to the protective fencing, displayed in a prominent position and the sign repeated at 10 metres intervals or closer where the fence changes direction. Each sign shall contain in a clearly legible form, the following information:

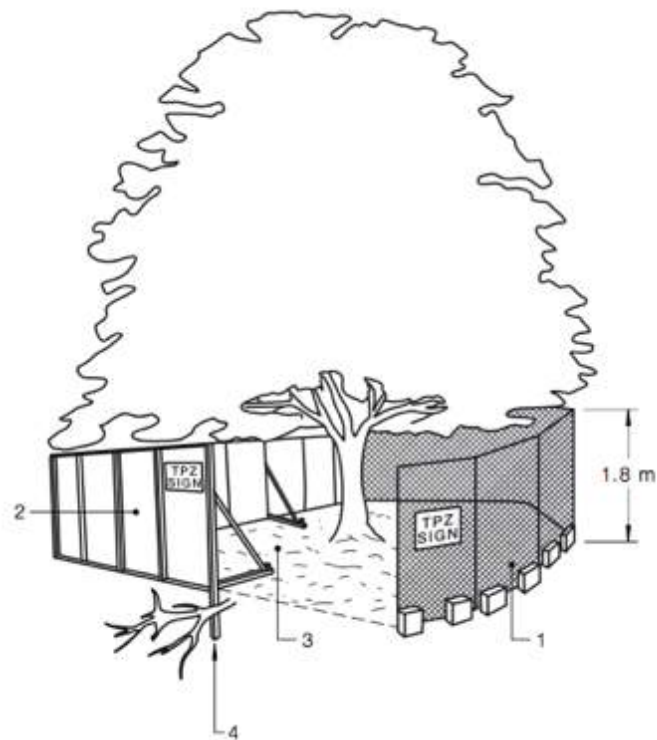
- Tree protection zone/No access.
- This fence has been installed to prevent damage to the tree/s and their growing environment both above and below ground. Do not move fencing or enter TPZ without the agreement of the project Arborist.
- The name, address, and telephone number of the developer/builder and project Arborist

12.6.3 Trunk and Branch Protection: The trunk must be protected by wrapped hessian or similar material to limit damage. Timber planks (50mm x 100mm or similar) should then be placed around tree trunk. The timber planks should be spaced at 100mm intervals, and must be fixed against the trunk with tie wire, or strapping and connections finished or covered to protect pedestrians from injury. The hessian and timber planks must not be fixed to the tree in any instance. The trunk and branch protection shall be installed prior to any work commencing on site and shall be maintained in good condition for the entire development period.

12.6.4 Mulch: Any areas of the TPZ located inside the subject site (only trees to be retained directly adjacent to site works must be mulched to a depth of 75mm with good quality composted wood chip/leaf mulch.

12.6.5 Ground Protection: Ground protection is required to protect the underlying soil structure and root system in areas where it is not practical to restrict access to whole TPZ, while allowing space for construction. Ground protection must consist of good quality composted wood chip/leaf mulch to a depth of between 150-300mm, laid on top of geo textile fabric. If vehicles are to be using the area, additional protection will be required such as rumble boards or track mats to spread the weight of the vehicle and avoid load points. Ground protection is to be specified by the project Arborist as required.

12.6.6 Temporary irrigation: Temporary irrigation should be set up in the TPZ of all trees to be retained, and should distribute water evenly throughout the area of the TPZ. The irrigation should be used for at minimum one hour daily throughout all stages of the development.

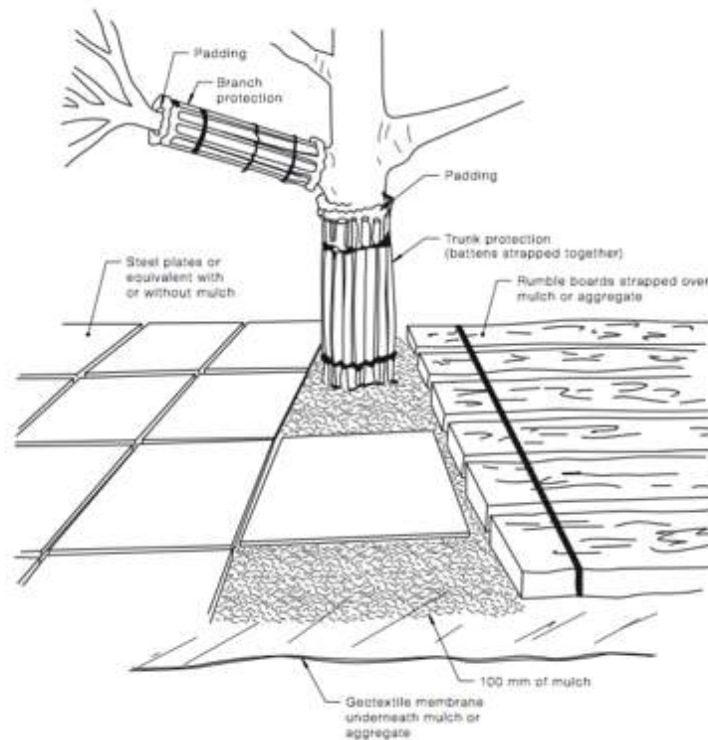


LEGEND:

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

An image from AS4970-2009,¹⁰ with example tree protection.

¹⁰ Council Of Standards Australia, *AS4970 Protection of trees on development sites* (2009), page 16.
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Date of prepared: 22 June 2018.



NOTES:

- 1 For trunk and branch protection use boards and padding that will prevent damage to bark. Boards are to be strapped to trees, not nailed or screwed.
- 2 Rumble boards should be of a suitable thickness to prevent soil compaction and root damage.

An image from AS4970-2009,¹¹ with example tree protection.

12.7 Restricted activities inside TPZ: The following activities must be avoided inside the TPZ of all trees to be retained unless approved by the project Arborist. If at any time these activities cannot be avoided an alternative must be agreed in writing with the project Arborist to minimise the impact to the tree.

- A) Machine excavation.
- B) Ripping or cultivation of soil.
- C) Storage of spoil, soil or any such materials
- D) Preparation of chemicals, including preparation of cement products.
- E) Refueling.
- F) Dumping of waste.
- G) Wash down and cleaning of equipment.
- H) Placement of fill.
- I) Lighting of fires.
- J) Soil level changes.
- K) Any physical damage to the crown, trunk, or root system.
- L) Parking of vehicles.

¹¹ Council Of Standards Australia, *AS4970 Protection of trees on development sites* (2009), page 17.
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- 12.8 Demolition:** The demolition of all existing structures inside or directly adjacent to the TPZ of trees to be retained must be undertaken in consultation with the project Arborist. Any machinery is to work from inside the footprint of the existing structures or outside the TPZ, reaching in to minimise soil disturbance and compaction. If it is not feasible to locate demolition machinery outside the TPZ of trees to be retained, ground protection will be required. The demolition should be undertaken inwards into the footprint of the existing structures, sometimes referred to as the 'top down, pull back' method.
- 12.9 Excavations:** The project Arborist must supervise and certify that all excavations and root pruning are in accordance with AS4373-2007 and AS4970-2009. For continuous strip footings, first manual excavation is required along the edge of the structures closest to the subject trees. Manual excavation should be a depth of 1 metre (or to unfavourable root growth conditions such as bed rock or heavy clay, if agreed by project Arborist). Next roots must be pruned back in accordance with AS4373-2007. After all root pruning is completed, machine excavation is permitted within the footprint of the structure. For tree sensitive footings, such as pier and beam, all excavations inside the TPZ must be manual. Manual excavation may include the use of pneumatic and hydraulic tools, high-pressure air or a combination of high-pressure water and a vacuum device. No pruning of roots greater 30mm in diameter is to be carried out without approval of the project arborist. All pruning of roots greater than 30mm in diameter must be carried out by a qualified Arborist/Horticulturalist with a minimum AQF level 3. Root pruning is to be a clean cut with a sharp tool in accordance with AS4373 Pruning of amenity trees (2007).¹² The tree root is to be pruned back to a branch root if possible. Make a clean cut and leave as small a wound as possible.
- 12.10 Sediment and Contamination:** All contamination run off from the development such as but not limited to concrete, sediment and toxic wastes must be prevented from entering the TPZ at all times.
- 12.11 Tree Wounding/Injury:** Any wounding or injury that occurs to a tree during the construction process will require the project Arborist to be contacted for an assessment of the injury and provide mitigation/remediation advice. It is generally accepted that trees may take many years to decline and eventually die from root damage. All repair work is to be carried out by the project Arborist, at the contractor's expense.
- 12.12 Completion of Development Works:** After all construction works are complete the project Arborist should assess that the subject trees have been retained in the same condition and vigour. If changes to condition are identified the project Arborist should provide recommendations for remediation.

¹² Council Of Standards Australia, AS 4373 *Pruning of amenity trees* (2007) page 18

13. CONSTRUCTION HOLD POINTS FOR TREE PROTECTION

13.1 Hold Points: Below is a sequence of hold points requiring project Arborist certification throughout the development process. It provides a list of hold points that must be checked and certified. All certification must be provided in written format upon completion of the development. The final certification must include details of any instructions for remediation undertaken during the development. The principle contractor should be responsible for implemented all tree protection requirements.

Hold Point	Stage	Date Completed and Signature of Project Arborist Responsible
Project Arborist to hold pre construction site meeting with principle contractor to discuss methods and importance of tree protection measures and resolve any issues in relation to feasibility of tree protection requirements that may arise. Project Arborist to mark all trees approved for removal under DA consent.	Prior to development work commencing	
Project Arborist to assess and certify that tree protection has been installed in accordance with AS4970-2009 prior to works commencing at site.	Prior to development work commencing.	
In accordance with AS4970-2009 the project arborist should carryout regular site inspections to ensure works are carried out in accordance with the recommendations. I recommend site inspections on a monthly frequency.	On-going throughout the development	
The removal of existing structures inside the TPZ of any tree to be retained, such as the existing buildings and hard surfaces must be supervised by the project Arborist.	Demolition	
Project Arborist to supervise all manual excavations and root pruning inside the TPZ of any tree to be retained. Project Arborist to approve all pruning of roots greater than 30mm inside TPZ. All root pruning of roots greater than 30mm in diameter must be carried out by a qualified Arborist/Horticulturalist with a minimum AQF level 3.	Construction	
Project Arborist to certify that all underground services including storm water inside TPZ of any tree to be retained have been installed in accordance with AS4970-2009.	Construction	
Project Arborist to approve relocation of tree protection for landscape construction. All landscaping works within the TPZ of trees to be retained are to be undertaken in consultation with the project Arborist to minimise the impact to trees.	Construction/ Landscape	
After all demolition, construction and landscaping works are complete the project Arborist should assess that the subject trees have been retained in the same condition and vigour. If changes to condition are identified the project Arborist should provide recommendations for remediation.	Upon completion of development	

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