



Vertical Tree Management & Consultancy

Arboricultural Assessment and Tree Protection Plan

Commissioned by: Land and Housing Corporation / Department of Planning and Environment

Site: 189 Riverside Drive, Airds 2560

Within: Campbelltown City Council

Date of Inspection: 12 September 2022

Version: 1.2

Prepared by:

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QTRA – Quantified Tree Risk Assessment

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Table of Contents

1	INTRODUCTION / AIMS/ OBJECTIVES:	1
1.1	INTRODUCTION	1
1.2	AIMS	1
1.3	OBJECTIVES	1
1.4	THE SITE	2
2	METHODOLOGY:	3
2.1	SITE INSPECTION	3
2.2	PLANS PROVIDED	3
2.3	TREE NUMBERING SYSTEM	4
2.4	TREE PROTECTION ZONE (TPZ)	4
2.5	STRUCTURAL ROOT ZONE (SRZ)	4
2.6	AMENDMENTS	4
2.7	INCURSIONS	4
2.8	DESTABILISATION	4
2.9	PLANS AND RETENTION VALUE	4
2.10	TREE PROTECTION & SPECIFICATION	5
2.11	ASSUMPTIONS	5
3	TREE ASSESSMENT DATA	6
4	TREE PROTECTION ZONE & STRUCTURAL ROOT ZONE	15
4.1	TREE PROTECTION ZONE (TPZ)	15
4.2	MINOR ENCROACHMENT	15
4.3	MAJOR ENCROACHMENT	15
4.4	STRUCTURAL ROOT ZONE (SRZ)	15
4.5	VARIATIONS OF THE TPZ	16
5	DISCUSSION	18
6	RECOMMENDATIONS	19
6.1	TREES IDENTIFIED FOR REMOVAL	19
6.2	TREES IDENTIFIED TO BE RETAINED	19
6.3	RECOMMENDATIONS FOR TREES IDENTIFIED IN ALLOTMENT 84 DP 609357.	19
6.4	TREE 25 <i>EUCALYPTUS TERETICORNIS</i>	19
6.5	TREES IDENTIFIED FOR REMOVAL AT 84 DP 609357	20

6.6	TREES IDENTIFIED TO BE RETAINED AT 84 DP 609357	20
7	<u>STANDARDS</u>	<u>21</u>
7.1	OWNERS/BUILDERS RESPONSIBILITIES	21
7.2	TREE RELATED WORKS	21
7.3	THE SITE ARBORIST (VERTICAL TREE MANAGEMENT & CONSULTANCY)	21
7.4	CERTIFICATION OF WORKS	21
7.5	THE SITE ARBORIST	21
7.6	CONSENT FOR WORKS	21
8	<u>TREE PROTECTION INFORMATION & SPECIFICATIONS</u>	<u>22</u>
8.1	SPECIFICATION	23
8.1.1	TREE PROTECTION ZONES (TPZ)	23
8.1.2	TREE PROTECTION FENCING	23
8.1.3	TREE PROTECTION - BOARDING	23
8.1.4	TREE PROTECTION - RUMBLE BOARDS OR TRAC MATS	23
8.1.5	ACTIVITIES	23
8.1.6	MAINTENANCE OF THE TREE PROTECTION ZONES	23
8.1.7	ADEQUATE SIGNS	24
8.1.8	ALTERATIONS	24
8.1.9	ROOT PRUNING	24
8.1.10	TRENCHING AND BORING UNDERGROUND SERVICES	24
8.1.11	TREE PRUNING	24
8.1.12	HOLD POINTS	24
GLOSSARY:		<u>34</u>

Figures

FIGURE 1. AERIAL PHOTO OF THE SITE 189 RIVERSIDE DR, AIRDS, NSW 2560. SIXMAPS, ACCESSED 12 SEPTEMBER 2022.	2
FIGURE 2. LOW MEDIUM AND HIGH IMPACT ZONES IN REFERENCE TO THE TREE	16
FIGURE 3. STRUCTURAL ROOT ZONE THE AREA REQUIRED FOR TREE STABILITY	16
FIGURE 4. STORMWATER AND DRAINAGE PLAN SHOWS THERE WILL MINIMAL DISTURBANCE TO THE TREES IN THE ADJACENT ALLOTMENT 84 DP 609357	17
FIGURE 5. ORIGINAL NUMBERING CONVENTION - ANDERSON ENVIRONMENT PRELIMINARY IMPACT ASSESSMENT REPORT 5 JANUARY 2021.	27

Tables

TABLE 1: OUTLINE OF SITE CONTROL MEASURES LISTED ON THE LAND 189 RIVERSIDE DR, AIRDS, NSW 2560.	2
TABLE 2. TREE ASSESSMENT DATA FOR TREES LOCATED IN 189 RIVERSIDE DR, AIRDS, NSW 2560.	6
TABLE 3 - TREES IDENTIFIED FOR REMOVAL AT 189 RIVERSIDE DR, AIRDS, NSW 2560.	19
TABLE 4 - TREES IDENTIFIED TO BE RETAINED 189 RIVERSIDE DR, AIRDS, NSW 2560.	19
TABLE 5. TREES IDENTIFIED FOR REMOVAL AT ALLOTMENT 84 DP 609357.	20
TABLE 6. TREES IDENTIFIED FOR RETENTION AT ALLOTMENT 84 DP 609357.	20
TABLE 7. TREE RETENTION VALUE – PRIORITY MATRIX	31

Appendices

APPENDIX A - TREE ASSESSMENT DATA 189 RIVERSIDE DR, AIRDS, NSW 2560	26
APPENDIX B - TREE ASSESSMENT TABLE EXPLANATORY NOTES THYER TREE VALUATION METHOD (1996)	28
APPENDIX C - IACA SIGNIFICANCE OF A TREE, ASSESSMENT RATING SYSTEM (STARS) © (IACA2010) ©	29
APPENDIX D - TREE PROTECTION	32
APPENDIX E – TPZ & SRZ INCURSION TABLE	33

1 Introduction / Aims/ Objectives:

1.1 Introduction

This Arboricultural Impact Assessment version 1.0 has been prepared by Vertical Tree Management and Consultancy, Derek Arnaiz for the client, Land and Housing Corporation / Department of Planning and Environment. The report shall assess the existing viability of the site trees, consider the retention value and risk assessment as viewed on the day of the inspection. An assessment will be in relation to the design and construction of the boarding house dwellings and associated infrastructure.

The trees within the site have been assessed and given a retention value rating. Trees with low retention value should be removed. Tree with a medium retention value may be removed for the benefit of the outcome and trees with high retention values should be retained where possible.

The trees are located at allotment 1216 DP1183302, 189 Riverside Dr, Airds, NSW 2560. Directly adjacent allotment 84 DP 609357 a triangle shaped land has also been assessed. Collectively, the location will be referred to as the site from here within. The site is located within the Campbelltown City Council local government area and is subject to the relevant local government and legislative framework.

1.2 Aims

This report shall assess the site trees and advise on acceptable setback distances and impacts within the Tree Protection Zones:

- Methodology used in tree evaluation, retention value and Tree Protection zones & Structural Root Zones, p3.
- Tree data table with retention values p4.
- A scale plan showing the location of the trees on the subject site, Appendix A.
- Allocation of a number to each tree, p4 and Appendix A.
- Provide canopy spread and diameter at breast height and at ground level of each tree, p4.
- Indicate the tree retention values, Tree Protection Zone (TPZ), Structural Root Zone (SRZ) and assessment of the developable environment, p4.

1.3 Objectives

- Assess the condition of the trees.
- Determine the impact of development on the site trees.
- Provide recommendation for management and protection strategies for site trees.

1.4 The site

Located in the Campbelltown City Council (CCC) local government area, the site is Zoned R2 Low Density Residential. Trees within the site to be developed into boarding houses allotment 1216 DP1183302 has been identified to have non-specific vegetation schedule throughout. This is consistent with urban plantings of the modern era where native and exotic species have been used. However, the site does contain weed species. The vegetation on the site appeared to be somewhat neglected with little or no maintenance observed. Directly adjacent allotment 84 DP 609357 a triangle shaped land has also native vegetation that is consistent of the original vegetation community. The site is largely unmanaged, and tree are consistent with bushland trees.

A summary of the control checks for the land can be seen below in Table 1. Information within has been gained from NSW Government e Planning Spatial viewer website 12 September 2022.



Figure 1. Aerial photo of the site 189 Riverside Dr, Airs, NSW 2560. Sixmaps, accessed 12 September 2022.

Table 1: Outline of site control measures listed on the land 189 Riverside Dr, Airs, NSW 2560.

Planning Control	Conditioned	Not Conditioned
Zoning	R2 Low Density Residential	
Heritage Listed Property		X
Heritage Conservation Area		X
Terrestrial Biodiversity (CEEC-EEC)		X
Bush Fire Prone Land	Vegetation Buffer	

2 Methodology:

2.1 Site Inspection

Site inspection was undertaken by the author on the 12 September 2022.

2.2 Plans Provided

Assessment of potential impacts on the trees in the immediate vicinity of the development site was based on various PDF plans supplied by the client and include the following:

- BCA Vision, Design Compliance Assessment, Issue 2, 12 May 2022
- NatHERS, Cert No 0008089860, 26 Sept 2022
- Building Sustainability Index, Basix Report, 7 Oct 2022
- Lindsay Perry Access, Access Report, 13 Oct 2022
- Certification of Design Compliance, Cert of Landscape, 24 Oct 2022
- NSW, Architect's Certificate of Building Design Compliance, 25 Nov 2022

Crawford Architects, Issue 13, Nov 2022

- Ground Floor Plan - Dwg No A200

Crawford Architects, Issue 10, Nov 2022

- Cover Sheet Plan - Dwg No A001
- Site Analysis Plan – Dwg No A002, Issue 8
- Tree Analysis Plan – Dwg No A003, Issue 6
- Deep Soil & Cos Areas Analysis, Dwg No A015, Issue 6
- Existing Site Survey – Dwg No A100, Issue 6
- Site Plan – Dwg No A101, Issue 6
- First Floor Plan – Dwg No A201
- Roof Plan – Dwg No A202, Issue 8
- Cut & Fill Plan – Dwg No A203, Issue 4
- Existing & Proposed Street Views – Dwg No A300, Issue 7
- Elevations 1 – 4 – Dwg No A301, Issue 9
- Sections A & B – Dwg No A310, Issue 6
- 3D Views & Finishes Schedule – Dwg No A500, Issue 7

- Room Type Schedule – Dwg No A501, Issue 4
- Solar Access Ground Floor Plan – Dwg No A510, Issue 6
- Solar Access First Floor Plan – Dwg No A511, Issue 6
- Shadow Diagrams – Dwg No A520, Issue 6
- Stormwater Site Drainage Layout Plan – Sheet C01, Rev E
- Electrical & Hydraulic Services, Rev 5, Nov 2022
- Landscape Plans
- Notification Plans, Nov 2022

2.3 Tree Numbering System

A tree numbering system was assigned to the trees in an earlier tree assessment report. The author has followed the same numbering.

2.4 Tree Protection Zone (TPZ)

TPZ was calculated using the Australian standard AS4970 - “Protection of Trees on Development Sites” formula.

2.5 Structural Root Zone (SRZ)

SRZ was calculated using the Australian standard AS4970 - “Protection of Trees on Development Sites” formula.

2.6 Amendments

Recommendations for amendments to the proposed development were based on Australian Standards for AS 4970 - 2009 “Protection of Trees on Development Sites”.

2.7 Incursions

Allowable incursions to Tree Protection Zones were based on Australian Standards for AS 4970 2009 “Protection of Trees on Development Sites” and the author’s extensive experience with trees on development sites.

2.8 Destabilisation

Potential destabilization from root severance within the Structural root Zone (SRZ) based on data compiled from findings of Matheck (1994).

2.9 Plans and retention value

Plans showing canopy, retention value, Tree Protection Zone and Structural Root zone and tree protection device locations indicated in Appendix A.

2.10 Tree protection & specification

Tree protection & specification in accordance with AS4970-2009.

2.11 Assumptions

1. The information provided is accurate and true to the conditions of the site.
2. The information provided has been ground truth or has been otherwise stated.
3. The techniques for excavation, construction boring and dismantling are in keeping with traditional methods unless otherwise stated.

3 Tree Assessment Data

Table 2. Tree Assessment Data for trees located in 189 Riverside Dr, Airds, NSW 2560.

#	Botanic Name	Common Name	Height	Width	DBH	DGL	TPZ	SRZ	Age Class	Health	Condition	Amenity	Retention Value	Notes	Action
Trees within the development area DP 1183302															
1	<i>Eucalyptus macrorhyncha</i>	Red Stringybark	18	11	74	77	8.88	3	Mature	Poor	Poor	Low	Low	Main trunk lopped, fungal bodies present, decay canopy over neighbouring property. Removal is necessitated given the condition of the tree. In addition, there will be a major 30% incursion from the site works.	Remove
2	<i>Casuarina sp</i>	sheaok	7	7	~35	~35	4.2	2.2	Mature	Fair	Fair	Med	Med	Located in the neighbouring property the tree has climbing ivy, and leaf growth limited. This tree is unlikely to flourish and appears to be incorrectly located. The tree will have minor incursion from the site development. The hardy species is anticipated to have no adverse impact.	Retain

#	Botanic Name	Common Name	Height	Width	DBH	DGL	TPZ	SRZ	Age Class	Health	Condition	Amenity	Retention Value	Notes	Action
3	<i>Eucalyptus crebra</i>	Narrow-leaved Ironbark	10	7	40	55	4.8	2.6	Semi Mature	Fair	Fair	High	High	Located adjacent to the front of the boundary, the tree has 5 stems at ground level with fair attachment to the tree. An assessment of various works adjacent to the tree have found there is a major incursion into the TPZ from the driveway and other subterranean infrastructure.	Remove
3a	<i>Jacaranda mimosafolia</i>	Jacaranda	6	8	50	55	6	2.6	Mature	Fair	Fair	Med	Med	The tree has climbing ivy, and leaf growth is limited. Works include a major incursion of 22% from works that includes the SSRZ. Removal of the tree is necessitated.	Remove

#	Botanic Name	Common Name	Height	Width	DBH	DGL	TPZ	SRZ	Age Class	Health	Condition	Amenity	Retention Value	Notes	Action
Trees Located within allotment 84 DP 609357															
4	<i>Acacia parramattensis</i>	Parramatta Wattle	7	6	10	13	1.5	1.5	Mature	Poor	Poor	Low	Low	Short-lived species. In advanced decline. It has borers and die back.	Remove
5	<i>Eucalyptus amplifolia</i>	Cabbage Gum	8	5	20	24	2.4	1.9	Semi Mature	Good	Fair	Med	Med	Good health and fair condition. The tree has an occlusion at 3m.	Retain
6	<i>Eucalyptus amplifolia</i>	Cabbage Gum	5	5	14	16	1.68	1.6	Mature	Good	Poor	Low	Low	Leader is broken. It has poor long term retention potential.	Retain
7	<i>Acacia parramattensis</i>	Parramatta Wattle	6	6	14	15	1.68	1.5	Mature	Poor	Poor	Low	Low	Short-lived species in advanced decline. It has borers and die back.	Remove
8	<i>Eucalyptus crebra</i>	Narrow-leaved Ironbark	18	9	56	61	6.72	2.7	Mature	Good	Good	High	High	Good form and health. Dominant tree in the landscape. Basal flaring has been noted.	Retain

#	Botanic Name	Common Name	Height	Width	DBH	DGL	TPZ	SRZ	Age Class	Health	Condition	Amenity	Retention Value	Notes	Action
9	<i>Eucalyptus crebra</i>	Narrow-leaved Ironbark	7	5	12	14	1.5	1.5	Juvenile	Fair	Fair	Med	Med	Supressed tree This tree is unlikely to flourish.	Retain
10	<i>Eucalyptus tereticornis</i>	Forest Red Gum	15	4	21	24	2.52	1.9	Mature	Fair	Poor	Med	Med	A supressed tree with tight compression forks and included union of the main stem from near to ground level.	Retain
11	<i>Eucalyptus tereticornis</i>	Forest Red Gum	20	7	32	40	3.84	2.3	Mature	Fair	Fair	Med	Med	The tree is in good health and condition with sound branch attachment.	Retain
12	<i>Eucalyptus tereticornis</i>	Forest Red Gum	25	11	60	64	7.2	2.8	Mature	Fair	Poor	Med	Med	A dominant tree in the landscape, which has tight compression forks originating at two meters from ground level with opposing dominant stems.	Retain
13	<i>Acacia parramattensis</i>	Parramatta Wattle												Fallen	
14	<i>Eucalyptus tereticornis</i>	Forest Red Gum	17	10	22	25	2.64	1.9	Mature	Poor	Poor	Low	Low	A mature tree with noted previous branch failure and poorly attached epicormic branches leaning over the adjacent building.	Remove

#	Botanic Name	Common Name	Height	Width	DBH	DGL	TPZ	SRZ	Age Class	Health	Condition	Amenity	Retention Value	Notes	Action
14 A	<i>Eucalyptus tereticornis</i>	Forest Red Gum	10	4	25	26			Semi mature	Fair	Fair	Med	Med	A suppressed tree with sound structure and good branch attachment.	Retain
15	<i>Eucalyptus fibrosa</i>	Broad-leaved Ironbark	21	7	44	47	5.28	2.5	Mature	Good	Fair	High	High	Vertical winding at 14 meters down to approximately five meters which could be associated with previous lightning strike.	Retain
16	<i>Eucalyptus crebra</i>	Narrow-leaved Ironbark	8	4	16	18	1.92	1.7	Juvenile	Fair	Fair	Med	med	Supressed tree that is unlikely to flourish.	Retain
17	<i>Eucalyptus crebra</i>	Narrow-leaved Ironbark	6	4	13	16	1.6	1.6	Juvenile	Poor	Poor	Low	Low	Supressed tree with occluded bark in mid-level fork. This is a potential failure point. Crowded by adjacent trees	Retain
18	<i>Eucalyptus amplifolia</i>	Cabbage Gum	15	6	19	24	2.28	1.9	Semi Mature	Good	Fair	Med	Med	The tree is in good form and health. Supressed tree. Located under an adjacent dominant tree A single stem tree with sound branch attachment.	Retain

#	Botanic Name	Common Name	Height	Width	DBH	DGL	TPZ	SRZ	Age Class	Health	Condition	Amenity	Retention Value	Notes	Action
19	<i>Eucalyptus crebra</i>	Narrow-leaved Ironbark	12	5	16	15	1.92	1.5	Juvenile	Good	Good	Low	Low	Good form and health. Slightly crowded by neighbouring trees but not impacting growth.	Retain
20	<i>Eucalyptus fibrosa</i>	Broad-leaved Ironbark	18	16	68	73	8.16	2.9	Mature	Fair	Fair	High	High	Dominant tree with an occluded bark union mid-level fork.	Retain
21	<i>Eucalyptus crebra</i>	Narrow-leaved Ironbark	6	3	11	12	1.5	1.5	Mature	Poor	Poor	Med	Med	Supressed tree.	Retain
22	<i>Acacia parramattensis</i>	Parramatta Wattle	4	6	7	11	1.5	1.5	Mature	Fair	Fair	Med	med	Short-lived species, unsuitable for long term retention. Borer is present on the tree. Appears to be beginning of the tree's decline.	Retain
23	<i>Eucalyptus crebra</i>	Narrow-leaved Ironbark	15	9	18	21	2.16	1.8	Mature	Fair	Fair	High	High	Co-dominant stems near to ground level. The dominant stem has some wounding. It has sound branch attachment. A tree to be retained.	Retain

#	Botanic Name	Common Name	Height	Width	DBH	DGL	TPZ	SRZ	Age Class	Health	Condition	Amenity	Retention Value	Notes	Action
24	<i>Eucalyptus amplifolia</i>	Cabbage Gum	16	7	24	30	2.88	2	Mature	Good	Good	High	High	Good form and health.	Retain
25	<i>Eucalyptus tereticornis</i>	Forest Red Gum	25	16	87	86	10.4 4	3.2	Mature	Poor	Poor	High	High	A large dominant tree located on the corner of the intersection. Recent soil disturbance adjacent to the tree appears to include some fill and possibly some excavation adjacent to the tree. At 1.5 meters from ground level there is significant swelling in the level of the trunk associated with swelling. It is a large fungal fruiting body for <i>Phellinus robusta</i> . Wounding is also attached to the lower 1st order branches overhanging the road. The tree has several areas with lesions and fissures. Located on the opposite side of the tree is a second fungal fruiting body. Single stem to six meters from ground level. The tree	Further investigation required. The tree is in a high traffic area with noted areas for further investigation. Internal testing (tomograph) Required

#	Botanic Name	Common Name	Height	Width	DBH	DGL	TPZ	SRZ	Age Class	Health	Condition	Amenity	Retention Value	Notes	Action
														bifurcates into dominant scaffold branches. Other branches have good attachment. The tree has a very high landscape significance however further testing and pruning to mitigate risk will be required.	
26	<i>Eucalyptus amplifolia</i>	Cabbage Gum	7	4	15	18	1.8	1.7	Mature	Poor	Poor	Med	Low	Occluded bark in mid-level fork. This is a potential failure point.	Retain
27	<i>Eucalyptus tereticornis</i>	Forest Red Gum	8	6	18	22	2.16	1.8	Mature	Fair	Fair	High	High	One leader is broken. The tree is crowded by neighbouring trees resulting in a pronounced lean.	Retain
28	<i>Eucalyptus tereticornis</i>	Forest Red Gum	18	10	40	42	4.8	2.3	Mature	Poor	Poor	High	High	Multiple forks in main trunk with occluded bark. Exposed dead limb and weeping indicating potential internal rot.	Retain
29	<i>Eucalyptus amplifolia</i>	Cabbage Gum	8	6	17	20	2.04	1.7	Mature	Fair	Fair	High	High	Crowded by neighbours resulting in a pronounced lean.	Retain

#	Botanic Name	Common Name	Height	Width	DBH	DGL	TPZ	SRZ	Age Class	Health	Condition	Amenity	Retention Value	Notes	Action
30	<i>Eucalyptus crebra</i>	Narrow-leaved Ironbark	20	8	34	38	4.08	2.3	Mature	Good	Good	High	High	Good form and health.	Retain

*DBH – Diameter at Breast Height; **DGL – Diameter at Ground Level ***TPZ – Tree Protection Zone; ^SRZ – Structural Root Zone, ~ Approximately. Appendix B – Explanatory notes

4 Tree Protection Zone & Structural Root Zone

4.1 Tree Protection Zone (TPZ)

The TPZ is the principal means of protecting trees on development sites. The TPZ is a combination of the root area and crown area requiring protection. It is an area isolated from construction disturbance, so that the tree remains viable.

The TPZ is calculated using the Australian standard AS4970 - "Protection of Trees on Development Sites" formula. Development encroachments are referred to as: 1) No impact (0%) incursion; 2) Low impact (<10%) of minor consequence; 3) Medium impact (<20%) incursion where the project arborist is to demonstrate the tree(s) remain viable by tree sensitive construction techniques; and 4) High level impact (>20%) where design changes or further information is required to manage tree vitality.

4.2 Minor Encroachment

If the proposed encroachment is less than 10% of the area of the TPZ and is outside the SRZ, Detailed root investigations should not be required. Variations can only be made by an AQF5 Consulting Arborist (Project Arborist).

4.3 Major Encroachment

If the proposed encroachment is greater than 10% of the TPZ or inside the SRZ, the project arborist must demonstrate that the tree(s) would remain viable. this may require root investigation by non-destructive methods and consideration of relevant factors listed in AS4970 Clause 3.3.4.

4.4 Structural Root Zone (SRZ)

The SRZ is the area required for tree stability. A larger area is required to maintain a viable tree. The SRZ only needs to be calculated when major encroachment into a TPZ is proposed. The SRZ calculated using the Australian standard AS4970 - "Protection of Trees on Development Sites" formula. Excavation within the structural root zone should be avoided. In the event this cannot be avoided the site arborist (AQF level 5) must be present. Excavation must be non-destructive such as hand excavation or Airspade® or other.

The trees identified to have a major incursion within the calculated TPZ or SRZ by excavations, disturbance or soil fill will require an assessment of the impact to the tree. The incursion must be assessed and determined in accordance with AS4970 "Protection of Trees on Development Sites". Trees with major incursions may be adversely impacted with long term health and stability problems. Identification of work within the TPZ or SRZ will allow the site Arborist to recommend alternative solutions where possible.

4.5 Variations of the TPZ

It may be possible to encroach into or make variations to the standard TPZ. Encroachment includes excavation, compacted fill, and machine trenching. Encroachment into the tree protection zone (TPZ) is sometimes unavoidable. Any loss of TPZ compensated for elsewhere.

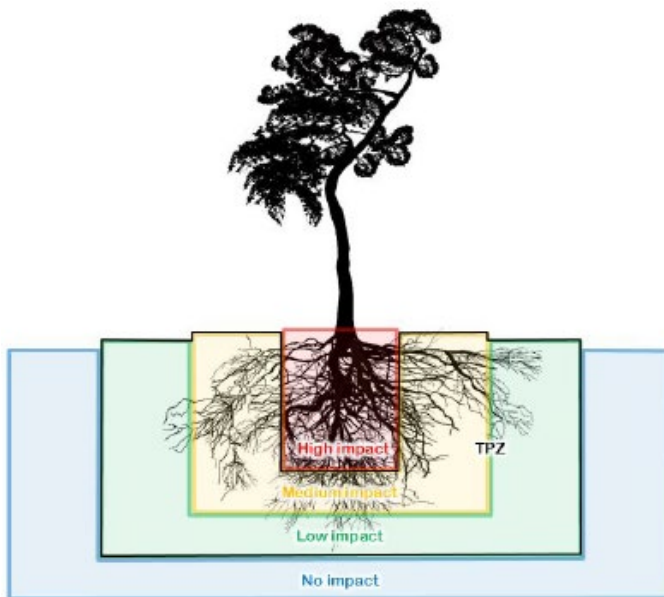


Figure 2. Low medium and high impact zones in reference to the tree

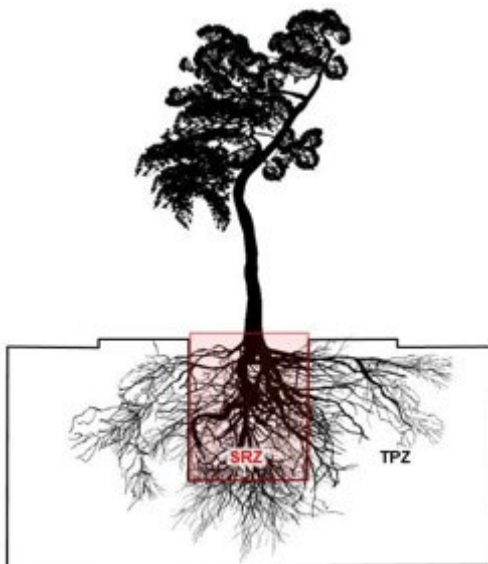
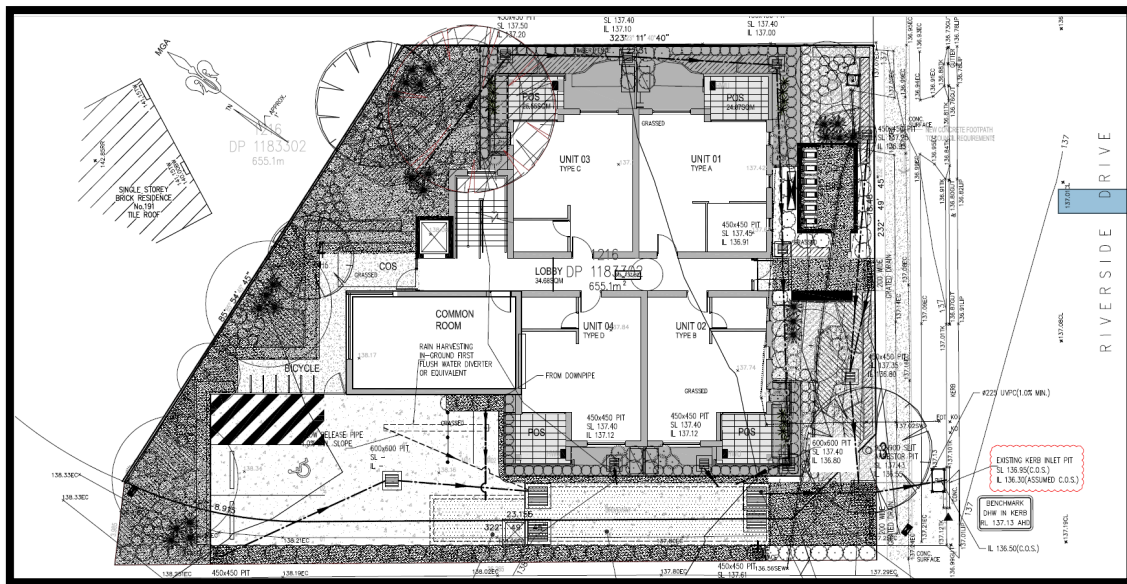


Figure 3. Structural root Zone the area required for tree stability



5 Discussion

A tree numbering system was assigned to the trees in an earlier tree assessment report. The author has followed the same numbering. Trees within the boarding houses development site (allotment 1216 DP1183302, 189 Riverside Dr. Airds) have been identified to have non-specific vegetation throughout. The site is largely unmanaged, and trees are generally in poor to medium condition. The assessment included trees that will be impacted by the development. Trees 1,3,3a, to be removed due to major incursion into the TPZ & SRZ from works that will adversely impact the tree's vitality.

Directly adjacent to allotment 84 DP 609357 a triangle shaped land has also native vegetation that is consistent of the original vegetation community. The vegetation on the site was somewhat neglected with little or no maintenance observed. This is consistent with "bushland" trees.

Within the site:

Trees 4 & 7 - *Acacia parramattensis* is a short-lived species. The trees are in advanced decline with borers and significant die back. Removal is recommended.

Tree 14 - *Eucalyptus tereticornis* - A mature tree with noted previous branch failure and poorly attached epicormic branches leaning over the adjacent building. Removal is recommended.

Tree 25 - *Eucalyptus tereticornis* - A large dominant tree located on the corner of the intersection. Recent soil disturbance adjacent to the tree appears to include some fill and possibly some excavation adjacent to the tree. At 1.5 meters from ground level there is significant swelling in the trunk. The swelling is associated with a large fungal fruiting body of *Phellinus robusta*. Wounding is also attached to the lower 1st order branches overhanging the road. The tree has several areas with lesions and fissures. Located on the opposite side of the tree, a second fungal fruiting body has been noted. The tree is single stemmed to six meters from ground level and tree bifurcates into dominant scaffold branches. Other branches have good attachment. The tree has a very high landscape significance however further testing and pruning to mitigate risk will be required. Further investigation is required. The tree is in a high traffic area with noted areas for further investigation. Internal testing (tomograph) is required.

6 Recommendations

The assessment of the trees was carried out over 2 separate allotments and the following recommendation have been separated as per the locations.

The assessment of the trees within the development area allotment 1216 DP1183302, 189 Riverside Drive Airs was Inclusive is the consolidation of the closure of the adjoining laneway.

The following trees have been identified in allotment 1216 DP1183302, 189 Riverside Drive Airs

6.1 Trees identified for removal

Table 3 - Trees identified for removal at 189 Riverside Dr, Airs, NSW 2560.

#	Botanic name	Action
1	<i>Eucalyptus macrorhyncha</i>	Remove
3	<i>Eucalyptus crebra</i>	Remove
3a	<i>Jacaranda mimosifolia</i>	Remove

6.2 Trees identified to be retained

Table 4 - Trees identified to be retained 189 Riverside Dr, Airs, NSW 2560.

#	Botanic name	Action
2	<i>Casuarina sp</i>	Retain

6.3 Recommendations for trees identified in allotment 84 DP 609357.

Works on the adjacent site will have minimal impact to the trees located on the subject allotment. The setback distance of the trees from the adjacent land and footpath area is sufficient to support the trees. Furthermore, tree roots have accommodated for the footprint of the footpath. The demolition of the foot path shall be done by hand where close to the tree (5m). All tree roots must remain in situ unaffected. the works must be undertaken under the supervision of the site arborist (AQF level 5).

6.4 Tree 25 *Eucalyptus tereticornis*

The tree is in a high traffic area with noted areas for further investigation. Internal testing (tomograph) will calculate the decayed or changing wood compared to sound. Thereafter the correct management strategy can be applied.

6.5 Trees identified for removal at 84 DP 609357

Table 5. Trees identified for removal at allotment 84 DP 609357.

Trees Located within DP 609357		
#	Botanic name	Action
4	<i>Acacia parramattensis</i>	Remove
7	<i>Acacia parramattensis</i>	Remove
14	<i>Eucalyptus tereticornis</i>	Remove

6.6 Trees identified to be retained at 84 DP 609357

Table 6. Trees identified for retention at allotment 84 DP 609357.

Trees Located within DP 609357			Trees Located within DP 609357		
#	Botanic name	Action	#	Botanic name	Action
5	<i>Eucalyptus amplifolia</i>	Retain	20	<i>Eucalyptus fibrosa</i>	Retain
6	<i>Eucalyptus amplifolia</i>	Retain	21	<i>Eucalyptus crebra</i>	Retain
8	<i>Eucalyptus crebra</i>	Retain	22	<i>Acacia parramattensis</i>	Retain
9	<i>Eucalyptus crebra</i>	Retain	23	<i>Eucalyptus crebra</i>	Retain
10	<i>Eucalyptus tereticornis</i>	Retain	24	<i>Eucalyptus amplifolia</i>	Retain
11	<i>Eucalyptus tereticornis</i>	Retain	25	<i>Eucalyptus tereticornis</i>	Internal testing Required
12	<i>Eucalyptus tereticornis</i>	Retain	26	<i>Eucalyptus amplifolia</i>	Retain
14A	<i>Eucalyptus tereticornis</i>	Retain	27	<i>Eucalyptus tereticornis</i>	Retain
15	<i>Eucalyptus fibrosa</i>	Retain	28	<i>Eucalyptus tereticornis</i>	Retain
16	<i>Eucalyptus crebra</i>	Retain	29	<i>Eucalyptus amplifolia</i>	Retain
17	<i>Eucalyptus crebra</i>	Retain	30	<i>Eucalyptus crebra</i>	Retain
18	<i>Eucalyptus amplifolia</i>	Retain			
19	<i>Eucalyptus crebra</i>	Retain			

7 Standards

7.1 Owners/builders responsibilities

It is the responsibility of the owner/builder to make this report available to all contractors associated with the development at the site. The following Tree protection Plan, report version one should be adhered to ensure that the trees are viable into the future.

7.2 Tree related works

All tree related work relevant to this report is to be conducted in accordance with:

- The NSW Workcover Code of Practice: Amenity Tree Industry 1998.
- The AS4970-2007 “Protection of Trees on Development Sites”.
- All tree related work must be undertaken by an arborist with an Australian Qualification Framework Level 3 in Arboriculture or above.
- All tree related work carried out in the vicinity of overhead power lines must be undertaken by a qualified arborist with a current Power lines Awareness Certificate.

7.3 The Site Arborist (Vertical Tree Management & Consultancy)

The site arborist will record tree health prior to commencement of construction and provide a Tree Protection Plan setting out tree protection measures, methods and supervision requirements.

7.4 Certification of works

The site arborist will provide certification at three stages of the project, prior, during and at the final stages for the compliance of tree protection measures. Changes to the tree protection will also be recorded as required.

7.5 The Site Arborist

The arborist will oversee work and provide advice for tree work within the tree protection zone and Structural Root Zone. A report will be required for pruning tree roots greater than 40mm in diameter.

7.6 Consent for works

All tree related work must have written consent from the relevant control authority (local Council).

8 Tree Protection Information & Specifications

To achieve the best possible outcome in protecting the relevant trees during the development, compliance with the tree protection measures is crucial in ensuring the long-term success of the site trees.

- The fundamental element for tree protection for this site is tree protection fencing to protect and delineate an area where no development activities occur.
- The trees requiring protection include

#	Botanic name	Action
2	<i>Casuarina sp</i>	Retain

- The Tree protection measures are to be implemented prior to commencement of construction and remain until post construction phases to ensure adequate protection for the retained trees on site, refer to Appendix D.
- The site fencing will delineate the site from the trees located on the neighbouring land allotment 84 DP 609357
- The tree protection must be checked and certified by the site arborist, Vertical Tree Management & Consultancy during and after construction.
- No materials are to be stored within 3m of the neighbouring property trees.
- The effectiveness of the tree protection measures recommended depends on the degree of cooperation between the developer, construction contractor, and the site arborist.

Tree Protection Zone (TPZ) – The TPZ is a combination of the root area and crown area requiring protection. It is an area isolated from construction disturbance, so that the tree remains viable. The TPZ is calculated using the Australian standard AS4970 - “Protection of Trees on Development Sites” formula.

Structural Root Zone (SRZ) – The SRZ only needs to be calculated when major encroachment into a TPZ is proposed. The SRZ is the area required for tree stability. A larger area is required to maintain a viable tree. The SRZ is calculated using the Australian standard AS4970 - “Protection of Trees on Development Sites” formula.

Tree Protection Measures and Recommendations within this report are in accordance with Australian Standard AS4970-2009 “Protection of Trees on Development Sites”.

Tree protection measures are to be implemented prior to commencement of demolition, during construction and post construction phases to ensure adequate protection for the retained trees on site.

8.1 Specification

8.1.1 Tree Protection Zones (TPZ)

TPZ are to be erected prior to any work or machinery entering the site. The TPZ will remain in place until all site works are complete (refer to Appendix A).

8.1.2 Tree Protection Fencing

Shall protect the tree from mechanical damage. Ensure no materials are stored at the base of the trees. It is the site foreman's and owner's responsibility to ensure this area is maintained throughout the development. The Tree Protection Fencing must be checked and Certified by the Site Arborist - Derek Arnaiz, Vertical Tree Management & Consultancy.

8.1.3 Tree Protection - Boarding

Trees, on a development site can be damaged by vehicles, heavy loaders and bobcats during the demolition and construction phase. Trees are easily protected by installing tree protection which usually consists of cordoning off the trees with temporary fencing panels. Where fencing. Is not possible due to site conditions tree protection boarding will prevent mechanical damage

8.1.4 Tree Protection - rumble Boards or trac mats

Soil compaction can be caused by vehicles, heavy loaders and bobcats during the demolition and construction phase. Trees are easily protected by installing tree protection rumble Boards or trac mats which cover the ground frequently used by machinery. This will prevent soil compaction and prevent the tree from declining in health.

8.1.5 Activities

No other activity is to take place within the TPZ. This includes and is not restricted to the following: silt fence excavation, soil level changes, storage of material or waste, run off from wash down, slurry etc., refuelling, parking, and various other activities (refer to AS4970-2009 4.2 pg 15)

8.1.6 Maintenance of the tree protection zones

During construction shall be completed by the site arborist. The site arborist shall make regular checks and maintain the tree protection structures during construction.

8.1.7 Adequate signs

Regarding the delegated areas of “TPZ” shall be clearly visible from within the development site. The area indicates the zone required for protecting trees and all of their parts. The sign shall be made from durable all-weather material and be securely fixed to the outer visible side of the tree protection fencing. The signage shall be visible from all areas of the work site and may include multiple signs.

8.1.8 Alterations

Alteration to the TPZs requires the site arborist approval.

8.1.9 Root pruning

Trees requiring root pruning prior to excavation shall be done under the supervision of the site arborist. Roots equal to 10mm or greater shall require pruning by the site arborist. The root pruning cuts made shall be made at a 90 degree angle and use a clean sharp pruning implement.

8.1.10 Trenching and boring underground services

Trenching and boring within the TPZ shall be done under the supervision of the site arborist. Where possible all services should be routed outside the minimum set back distance. Where this is not possible the underground service should be installed by directional drilling at a depth of no less than 600mm or use manual excavation techniques. When the Structural Root Zone is affected the project arborist must demonstrate that the tree(s) would remain viable.

8.1.11 Tree pruning

Tree pruning, crown lifting, crown reduction, branch removal shall be carried out by an arborist with minimal qualification of certificate 3 (Australian Qualification Framework AQF Level 2) in arboriculture.

8.1.12 Hold points

Requiring certification by the site arborist include:

- Installation of tree protection and signage.
- Excavation within TPZ/SRZ.
- Various unforeseen changes in the field.
- Mid construction
- Completion of construction works.



Derek Arnaiz

Vertical Tree Management & Consultancy
Diploma of Arboriculture, Level 5 consultant,
Diploma of Horticulture,
Quantified Tree Risk Assessment (QTRA) Registered user 5597
Professional Indemnity & Public Liability Insurance HC-ME-SPC-01-144142

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Disclaimer statement. The response of a living tree to its immediate environment is dynamic throughout its entire life cycle due to external influences giving each tree a unique natural variability. A visual tree assessment addresses the external symptoms presented by a tree. This cannot exclude a tree from the potential for failure due to unforeseen circumstances. This report cannot provide a conclusive recommendation regarding any part of a tree root system that is not exposed for visual inspection. Additionally, it cannot not be assumed, that a tree will be safe in all conditions in the future. Appropriate management, assessment, and maintenance aim to mitigate risks to an acceptable level. This report is the opinion, advise or recommendation based on the information supplied by the client or observation of the author.

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Appendix A - Tree Assessment data **189 Riverside Dr, Airds, NSW 2560**

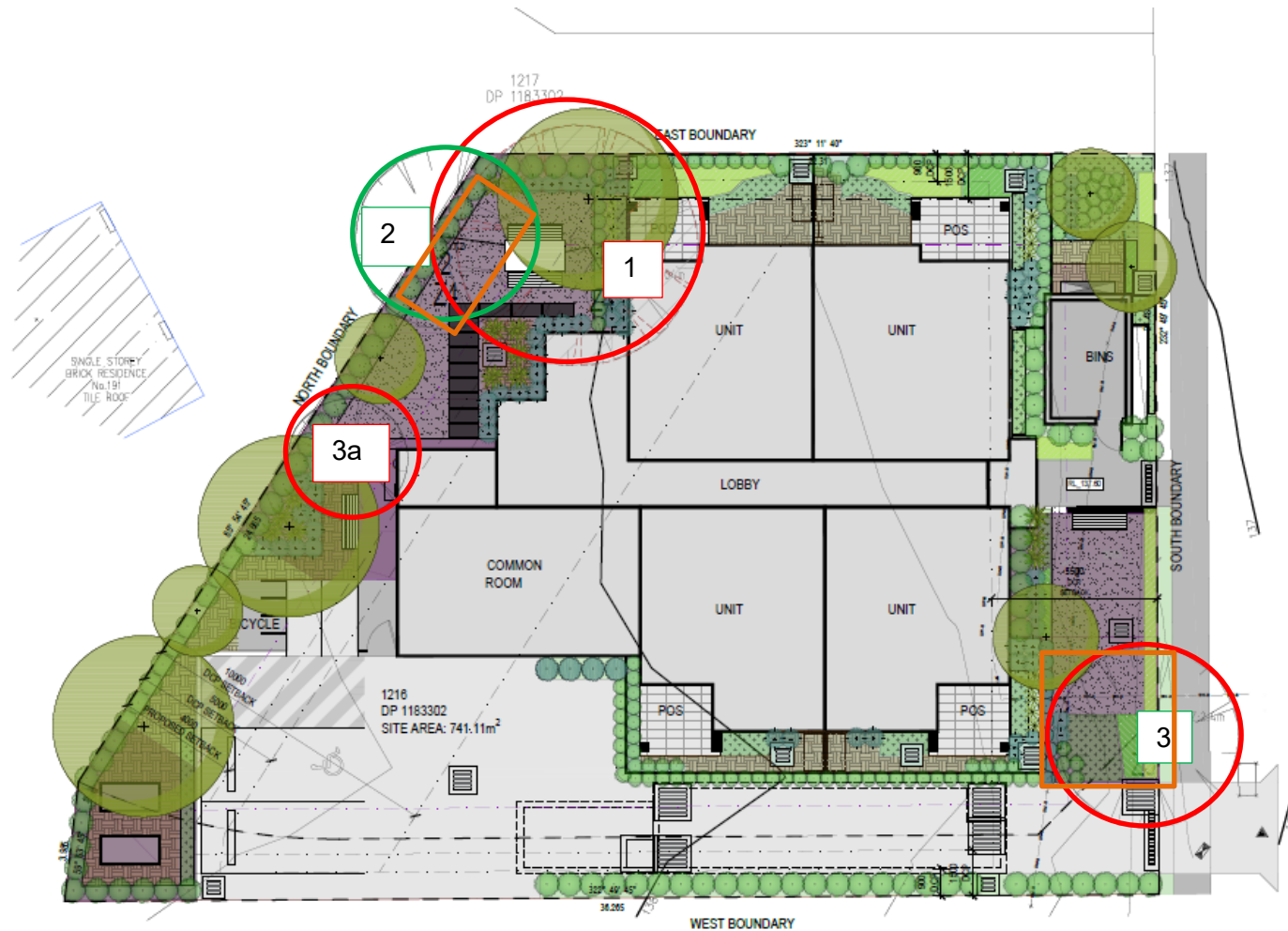


Figure 5. Original Numbering convention - Anderson Environment Preliminary Impact Assessment report 5 January 2021.



Appendix B - TREE ASSESSMENT TABLE EXPLANATORY NOTES Thyer Tree Valuation Method (1996)

AGE CLASS (Modified from *British Standard BS5837-1991*).

Immature (I): Young trees, less than 20% of life expectancy.

Semi-mature (S): Middle aged trees, 20-40% of life expectancy.

Mature (M): Trees between 40-80% of life expectancy.

Over-mature (O): Senescent trees, or those declining irreversibly. Less than 20% of life expectancy.

HEALTH - This evaluates a trees vitality and vigour as indicated by its crown density, leaf size, foliage colour and its ability to withstand wounding, pests, diseases, or changes to the growing environment.

Good: (G) Tree is generally healthy and showing signs of normal vigour and is expected to continue to remain so, provided conditions around the tree required for its survival do not change.

Average: (A) Tree is typical of the species, considering its age, without noticeable decline.

Fair: (F) Tree shows signs of normal vigour but shows some indications of decline due topsets and diseases or changes to its growing environment.

Poor: (P) Tree exhibits symptoms of advanced and irreversible decline due to fungal decay, severe dieback of branch and crown canopy, predation of pests, storm or lightning damage, root damage or instability of the tree and alterations to its growing environment.

STRUCTURAL CONDITION - This refers to the trees form, and growth habit modified by its environment, the state of the trunk and the main structural branches. It includes the presence of defects such as decay, weak branch junctions and other visible abnormalities. Although some trees without defects fail in storms, the presence of any defect will increase the chances of failure.

Good: (G) Trees with a single dominant trunk along which evenly spaced branches are spread. Branches have properly formed collars which provide strong attachment to the trunk and are about 25% of the trunk diameter. Minor structural defects may be present with low failure potential.

Average: (A) Trees which have structural defects and low failure potential.

Fair: (F) Trees with structural defects and medium failure potential, which require monitoring on an annual basis.

Poor: (P) Trees with defects which have failed, or have a high risk of failing soon, and corrective action must be taken as soon as possible.

Appendix C - IACA Significance of a Tree, Assessment Rating System (STARS) © (IACA2010) ©



In the development of this document IACA acknowledges the contribution and original concept of the footprint green tree significance and retention value matrix, developed by Footprint Green Pty Ltd in June 2001.

The landscape significance of a tree is an essential criterion to establish the importance that a particular tree may have on the site. However, rating the significance of a tree becomes subjective and difficult to ascertain in a consistent and repetitive fashion due to assessor bias. It is therefore necessary to have a rating system utilising structured qualitative criteria to assist in determining the retention value for a tree. To assist this process all definitions for terms used in the *Tree Significance - Assessment Criteria* and *Tree Retention Value - Priority Matrix*, are taken from the ACA dictionary for managing trees in urban environments 2009.

This rating system will assist in the planning process for proposed works, above and below ground where trees are to be retained on or adjacent a development site. This system uses a scale of *High*, *Medium*, and *Low* significance in the landscape. Once the landscape significance of an individual tree has been defined, the retention value can be determined.

Tree Significance - Assessment Criteria

1. High Significance in landscape

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

2. Medium Significance in landscape

- The tree is in fair-good condition and good or low vigour,
- The tree has form typical or atypical of the species,
- The tree is a planted locally indigenous or a common species with its taxa commonly planted in the local area,

- The tree is visible from surrounding properties, although not visually prominent as partially obstructed by other vegetation or buildings when viewed from the street,
- The tree provides a fair contribution to the visual character and amenity of the local area,
- The tree's growth is moderately restricted by above or below ground influences, reducing its ability to reach dimensions typical for the taxa *in situ*.

3. Low Significance in landscape

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

Environmental Pest / Noxious Weed Species

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

Hazardous/Irreversible Decline

- The tree is structurally unsound and/or unstable and is considered potentially dangerous,
- The tree is dead, or is in irreversible decline, or has the potential to fail or collapse in full or part in the immediate to short term.

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

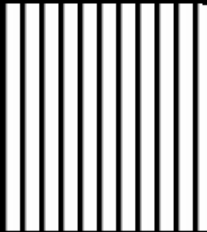
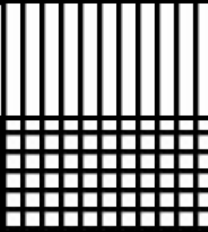
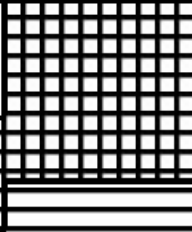
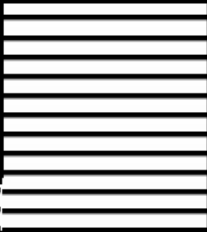

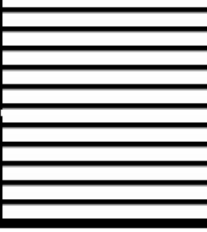




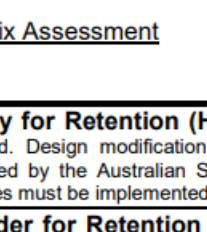
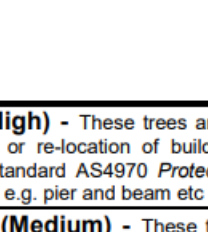
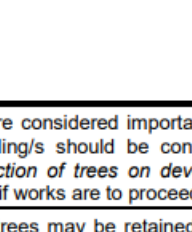
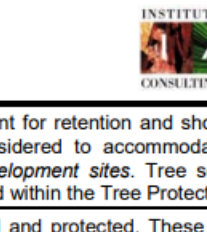
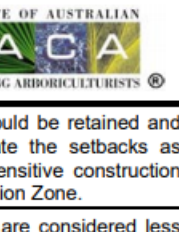
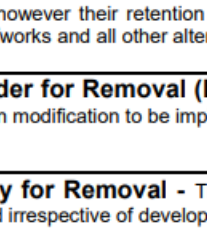
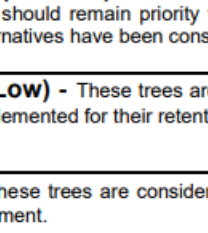
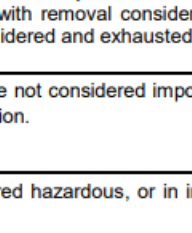
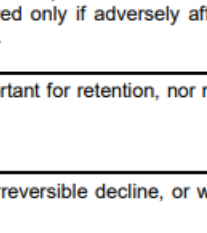
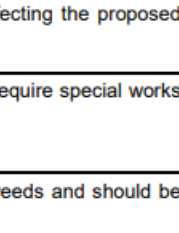
Note: The assessment criteria are for individual trees only, however, can be applied to a monocultural stand in its entirety e.g., hedge.

USE OF THIS DOCUMENT AND REFERENCING


The IACA significance of a tree assessment rating system is free to use, but only in its entirety and must be cited as follows:


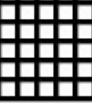
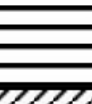

IACA, 2010 IACA significance of a tree assessment rating systems, institute of Australian consulting arborists, Australia www.iaca.org.au

Table 7. Tree Retention Value – Priority Matrix

		Significance				
		1. High	2. Medium	3. Low		
		Significance in Landscape	Significance in Landscape	Significance in Landscape	Environmental Pest / Noxious Weed Species	Hazardous / Irreversible Decline
Estimated Life Expectancy	1. Long >40 years					
	2. Medium 15-40 Years					
	3. Short <1-15 Years					
	Dead					

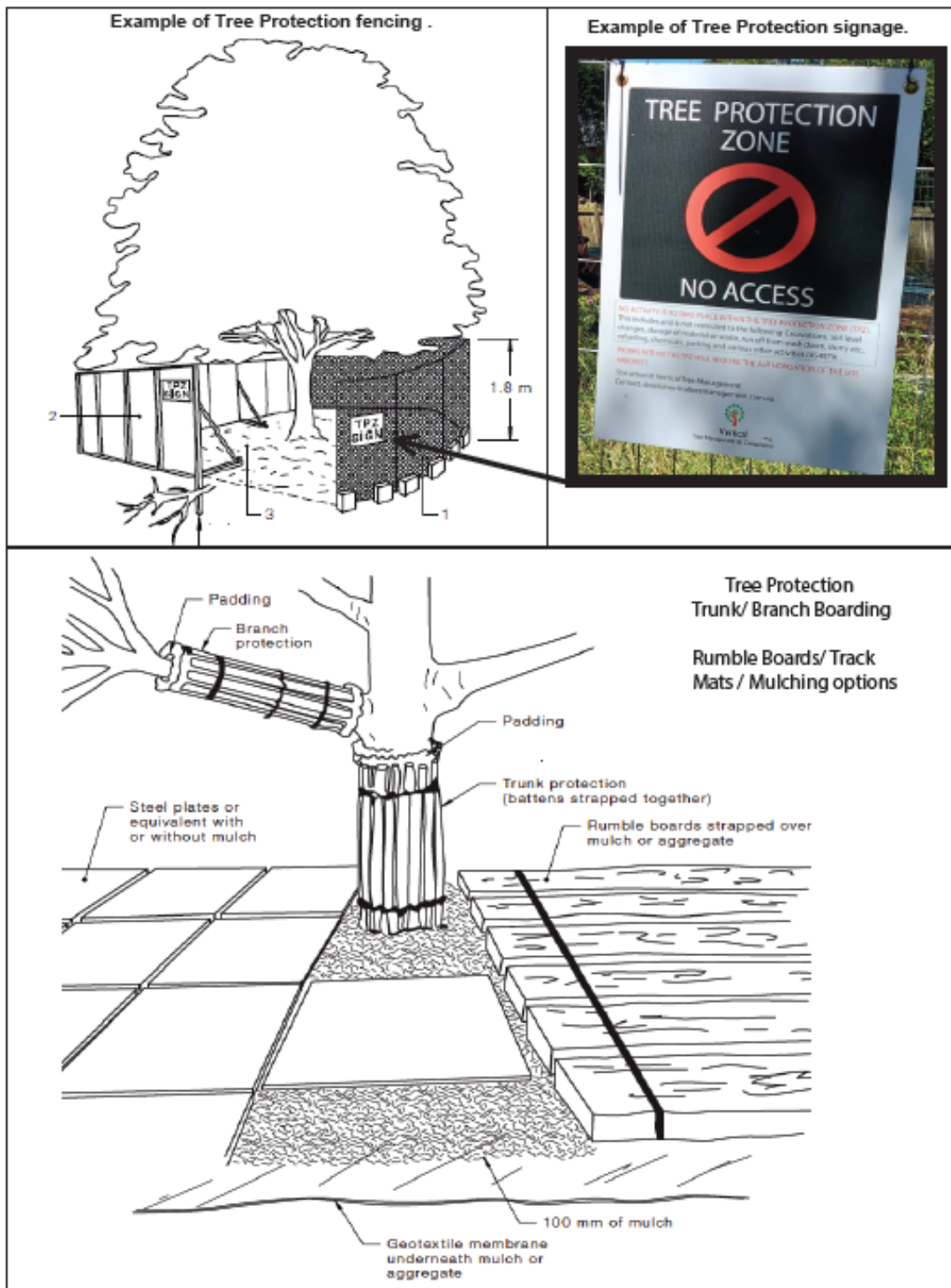
Legend for Matrix Assessment



	Priority for Retention (High) - These trees are considered important for retention and should be retained and protected. Design modification or re-location of building/s should be considered to accommodate the setbacks as prescribed by the Australian Standard AS4970 <i>Protection of trees on development sites</i> . Tree sensitive construction measures must be implemented e.g. pier and beam etc if works are to proceed within the Tree Protection Zone.
	Consider for Retention (Medium) - These trees may be retained and protected. These are considered less critical; however their retention should remain priority with removal considered only if adversely affecting the proposed building/works and all other alternatives have been considered and exhausted.
	Consider for Removal (Low) - These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.
	Priority for Removal - These trees are considered hazardous, or in irreversible decline, or weeds and should be removed irrespective of development.

IACA2010, IACA Significance of a Tree Assessment Rating System (STARS), Institute of Australian Consulting Arborists.
www.iaca.org.au

Appendix D - Tree protection



[Vertical Tree – Vertical Tree Management & Consultancy](#)

Appendix E – TPZ & SRZ Incursion table

	Requirements under AS 4970-2009	Impact	Mitigation measures
No encroachment (0%)	N/A	No impact (0%)	N/A
Minor encroachment (<10%)	<ul style="list-style-type: none"> The area lost to this encroachment should be compensated for elsewhere, contiguous with the TPZ. Detailed root investigations should not be required. 	Low impact (<10%)	<ul style="list-style-type: none"> The area lost to this encroachment should be compensated for elsewhere, contiguous with the TPZ. Tree protection must be installed.
Major encroachment (>10%)	<ul style="list-style-type: none"> The project arborist must demonstrate the tree(s) would remain viable. Root investigation by non-destructive methods may be required. Consideration of relevant factors including: Root location and distribution, tree species, condition, site constraints and design factors. The area lost to this encroachment should be compensated for elsewhere, contiguous with the TPZ. 	Medium impact (<20%)	<ul style="list-style-type: none"> The area lost to this encroachment should be compensated for elsewhere, contiguous with the TPZ. The project arborist will be required to supervise any works within the TPZ. Tree protection must be installed.
		High impact (>20%)	<ul style="list-style-type: none"> The project arborist must demonstrate the tree(s) would remain viable. Non-destructive root investigation will be required for any trees proposed for retention. The project arborist will be required to supervise any works within the TPZ. Tree protection must be installed.

GLOSSARY:

Aerial inspection - a close inspection of the aerial part of a tree, either by elevated work platform (EWP) or by an AQF level 3 arborist (climbing inspection).

Air spade - equipment providing a jet of compressed air to a hand-held device which helps to excavate roots almost non-destructively.

Amenity tree – a tree grown for purposes other than for production.

AS4373-2007 – Current Australian Standard for the Pruning of Amenity Trees.

AQF – Australian Qualification Framework for all educational and training purposes.

Axiom of uniform stress - is a self-optimizing structure because the growth of new wood tends to eliminate any stress concentrations, maintaining a uniform stress distribution.

Bacteria - one of the five kingdoms of living things. Some cause disease, many are decomposers and some are beneficial (such as nitrifying bacteria and those in the gut of animals).

Bark cambium (cork cambium, phellogen) - Layers of meristematic cells on the outer side of the phloem that give rise to the bark.

Branch order - The seedling axis, typically giving rise to the main stem, has a branch order of 0. Branches arising from axillary buds on the seedling axis are first-order branches, branches arising from them are second-order and so on, the shoots at the periphery of the crown having the highest order.

Callus - cells that forms over an injury or scar, that develops from actively dividing plant tissue.

Canker - A discrete area of dead or malformed bark caused by a pathogen.

Canopy - Of a single tree, its crown, emphasizing its spreading and enclosing character. Of a forest, the crowns of the larger trees considered collectively.

Chlorophyll - The pigment in green plants and a kind of bacteria (cyanobacteria) that permits photosynthesis. Chlorophyll is green because it absorbs light most strongly in the blue and red regions of the visible spectrum, reflecting the green.

Compartmentalization - A form of defense in woody plants, in which barriers resistant to invasion by pathogens or wood decay fungi are laid down while the wood is living (sapwood), and which continue to act passively once the wood is incorporated into heartwood.

Deadwood - Dead and decomposing wood including dead trees (whether standing, snapped or fallen), branches of any size, stumps and roots.

Defect - Any feature of a tree that is likely to make it less safe (in the case of a structural defect) or otherwise to reduce its health, longevity, landscape prominence or conservation value for any other reason.

Diameter - Broadly, the width of a cylindrical object like the main stem of a tree.

dbh – the diameter of a stem measured at breast height i.e. 1000mm.

Dip. Arb. – Diploma in Arboriculture.

Drip zone – the area from one edge of the canopy to the other.

Expert witness - Someone capable of giving an expert opinion, to be relied upon in some official or legal process.

Fastigate - A growth habit with branches strongly ascending, like Lombardy poplar. A common ornamental form.

Fibre buckling A local transverse failure in compression of the outer wood of a stem as it sways in a strong wind. The resulting adaptive growth gives rise to a characteristic ring-like bulge around the stem.

First-order branch – a branch which emanates directly from the trunk, in contrast to a scaffold branch, sometimes referred to as a primary branch.

Flush cut - A pruning cut that removes the branch collar and/or part of the branch ridge, slowing the occlusion of the wound.

Footing - A relatively broad base to a foundation to help spread load and improve the stability of a structure.

Fungi (singular 'fungus') - One of the four main groups (kingdoms) of organisms. There are two groups of higher fungi, the Basidiomycetes and Ascomycetes, while other groups are moulds. Many fungi are decomposers, including the relatively specialized wood decay fungi. Some are plant pathogens, some are symbiotic (see mycorrhiza, lichen) and some are cultivated by insects for food (see ambrosia beetle).

Included bark - Areas of bark on adjacent parts of a tree, typically on the inner faces of a narrow fork, which become grown over to occupy part of the internal joint.

Ganoderma spp. - A common wood decay fungus of the selective delignification type, causing root rot and butt rot mainly in broadleaf trees. The fruiting bodies of the fungus are woody brackets, commonly occurring in the flutes between the buttresses of big trees near ground level.

Heartwood - In a branch, main stem or root of sufficient diameter, the non-living inner wood, in contrast to the sapwood in which the xylem parenchyma cells are alive.

Lignin - A constituent of some plant cell walls making them stiff and woody. About 1/3 of the dry weight of wood is lignin.

Lion-tailing - A long branch with a tuft of secondary branches near the tip, a marked form of end loading, either arising naturally or from poor pruning practice.

Mistletoe - A semi-parasite, having green leaves for photosynthesis but growing into the host to obtain water and nutrients.

Mycelium - A network of hyphae making up the vegetative part of a fungus.

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Osmosis - The flow of water across a semi-permeable membrane from a dilute solution to a more concentrated one, as from the soil water into a root cell or from the xylem into a leaf cell.

Quantified tree risk assessment (QTRA) - A refinement of visual tree assessment with emphasis on seeking to quantify the component probabilities of tree risk, particularly the occupancy of the target area, to arrive at an overall numerical or categorical risk.

Root Zone - Area encompassing the tree roots

Scaffold branch – a branch which emanates from a first-order branch, also known as a second-order branch.

Structural defect - A defect in a structure that makes it less able to withstand the forces applied to it.

t/R ratio - In hollow tree stems, the ratio of the thickness of sound wood to the radius. A criterion helpful in evaluating tree risk developed by Mattheck & Breloer (1994)

Tension wood - The kind of reaction wood found in broadleaf trees which is strong in tension and is characterized by a low lignin content.

Tree risk - The risk that a tree causes damage or injury if it (or part of it) suffers structural failure. Tree risk is a composite of several variables: hazard, probability, target value and occupancy.

Urban forest - Trees and other woody vegetation in the built environment considered collectively over an extensive area (eg. the jurisdiction of a local authority).

Vigour – the genetic capacity (potential) of a tree to resist strain. Vigour can be measured by applying a known stimulus [such as a wound] and then measuring the trees response. Vigour cannot be increased. Vigour is classified as either 'normal' or 'low' (Shigo, 1986, p.120).

Vitality – the ability (dynamic) of a tree to adapt to the conditions in which it finds itself. Vitality can be improved by; watering, mulching, fertilizing, aerating etc. (Shigo, 1986, p. 120). For the purpose of this report vitality shall be classified as either low or good.

VTA - Visual Tree Assessment

Windthrow- The fall of a tree in a high wind, with the breakage of the outer roots, so that the tree is uprooted. There are three main modes of windthrow.