Vertical

Tree Management & Consultancy

Arboricultural Assessment and Tree Protection Plan

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

Site: 3-5 Kelloway Avenue, Camden, NSW 2570

Within: Camden Council

Date of Inspection: 12 September 2022

Version: 3.0

Prepared by:

Vertical Tree Management & Consultancy

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QTRA – Quantified Tree Risk Assessment

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1 Introduction / Aims/ Objectives:

1.1 Introduction

This Arboricultural Impact Assessment version 3.0 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 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 Lot 17 & 18 DP219782, 3-5 Kelloway Ave, Camden, NSW 2570. The location will be referred to as the site from here within. The site is located within the Camden 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 Camden Council (CC) local government area, the site is Zoned R2 Low Density Residential. The parcel of land is approximately 1200 m^2. The site 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. The vegetation on the site appeared to be somewhat neglected with little or no maintenance observed. Other vegetation was observed on the site however does not form part of the report as it does not fulfill the criteria of being a tree under the definition.

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 3-5 Kelloway Ave, Camden, NSW 2570. Sixmaps, accessed 12 September 2022.

Table 1: Outline of site control measures listed on the land 3-5 Kelloway Ave, Camden, NSW 2570.

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		X

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:

- Anderson Environmental Pty Ltd, Preliminary Treeaz Assessment of Tree Health and Longevity (SULE), Version 1, Job No 2393, 30 December 2020

2.3 Tree Numbering System

A tree numbering system was assigned to the trees indicated in Appendix A.

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 3-5 Kelloway Ave, Camden, NSW 2570.

#	Botanic name	Common Name	Height (m)	Width (m)	DBH (mm)	DGL	TPZ	SRZ	Age Class	Health	Condition	Amenity	Retention Value	Notes
1	*Eucalyptus macorhyncha*	Small leafed stringy bark	18	10	50	60	6	2.7	Mature	Poor	Poor	Low	Low	Located in the right neighbouring property. Lower trunk with significant occluded bark. *Phellinus robusta* fruiting body is a likely failure point. Large diameter branch overhanging the site at ~ 6m from ground level. The tree will have a major incursion ~40% from the adjacent driveway that necessitates removal.
2	*Nandina domestica*	Sacred Bamboo	3	3	8	10	1.5	1.5	Mature	Good	Good	Low	Low	Small shrub with low landscape significance. A major incursion ~40% from the adjacent driveway that necessitates removal.
3	*Casuarina cunninghamiana*	River Oak	15	6	39	46	4.68	2.4	Mature	Good	Good	Medium	Medium	Good form and health. Minor dead limbs. Crown lifted to six meters from ground level. Trees have single stem with significant taper into the apex. The tree will have a major incursion ~35% from the adjacent driveway that necessitates removal.

#	Botanic name	Common Name	Height (m)	Width (m)	DBH (mm)	DGL	TPZ	SRZ	Age Class	Health	Condition	Amenity	Retention Value	Notes
4	*Grevillea robusta*	Silky Oak	18	8	68	68	8.16	2.9	Mature	Good	Poor	Medium	Low	A codominant tree from ground level with tight included compression fork that are included. Potential failure point. The tree will have a major incursion ~100% from the adjacent driveway, pedestrian access and services that necessitates removal.
5	*Viburnum tinus*	Laurustinus	3	7	15	20	1.8	1.7	Mature	Good	Good	High	High	A large shrub found on the front right side of the property. The tree has full foliage and a high landscape significance. A major incursion of ~100% from the adjacent landscape works will necessitates removal of the tree.
6	*Leptospermum polygalifolium*	Tantoon	4	4	14	16	1.68	1.6	Mature	Fair	Fair	Low	Low	Exempt under the local development control. A major incursion ~100% from the adjacent driveway that necessitate removal.
7	*Callistemon citrinus*	Lemon-scented Bottlebrush	5	7	20	22	2.4	1.8	Mature	Good	Good	Medium	Medium	Good form and health. Coppiced trunk typical for species, setback from the boundary fence in the rear neighbouring property.
8	*Eucalyptus crebra*	Narrow-leaved Ironbark	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Previously removed.

#	Botanic name	Common Name	Height (m)	Width (m)	DBH (mm)	DGL	TPZ	SRZ	Age Class	Health	Condition	Amenity	Retention Value	Notes
9	*Callistemon citrinus*	Lemon-scented Bottlebrush	6	8	20	22	2.4	1.8	Mature	Good	Good	Medium	Medium	Good form and health. Coppiced trunk typical for species. The tree is setback from the boundary in the rear neighbouring property.
10	*Eucalyptus tenella*	Small-leaved Stringybark	20	14	116/113	115	15	3.6	Mature	Fair	Poor	High	High	A mature street tree located on the left side of the property. A single stem to approximately 500mm from ground level into two dominant stems. Dieback in the lower canopy of the tree requiring pruning to mitigate risk. The upper canopy of the tree appears to be in good health and vigour. Tree has been heavily lopped in the past and will need to be managed by the local government authority. Works will include an incursion of ~14%. Tree protection measures will be required.
11	*Callistemon citrinus*	Lemon-scented Bottlebrush	4	4	12	11	1.5	1.5	Mature	Fair	Fair	Low	Low	A small tree beyond its useful landscape intent.
12	*Cupressus sp.*	Cypress	3	3	10	11	1.5	1.5	Mature	Fair	Fair	Low	Low	A small tree beyond its useful landscape intent.

#	Botanic name	Common Name	Height (m)	Width (m)	DBH (mm)	DGL	TPZ	SRZ	Age Class	Health	Condition	Amenity	Retention Value	Notes
13	*Cupressus sp.*	Cypress	6	3	12	12	1.5	1.5	Mature	Fair	Fair	Low	Low	A small tree located adjacent to the front boundary.
14	*Callistemon citrinus*	Lemon-scented Bottlebrush	4	6	12	14	1.5	1.5	Mature	Fair	Fair	Low	Low	A small tree located adjacent to the front boundary.
15	*Cupressus sp.*	Cypress	4	4	10	13	1.5	1.5	Mature	Poor	Poor	Low	Low	A small tree located adjacent to the front boundary.
16	*Robinia pseudoacacia*	Black Locust	9	9	30	39	3.6	2.3	Mature	Good	Fair	Fair	Medium	A single stem tree to 500mm from ground level with tri-dominant stems. Listed as not recommended in Council Tree Management. There will be a major incursion from landscape works that necessitates the removal of the tree.
17	*Schinus molle*	Peppercorn Tree	N/A	N/A	N/A	N/A	4.6	N/A	N/A	N/A	N/A	N/A	N/A	Removed prior to inspection.
18	*Eucalyptus scoparia*	Wallangarra White Gum	N/A	N/A	N/A	N/A	4.6	N/A	N/A	N/A	N/A	N/A	N/A	Removed prior to inspection.

#	Botanic name	Common Name	Height (m)	Width (m)	DBH (mm)	DGL	TPZ	SRZ	Age Class	Health	Condition	Amenity	Retention Value	Notes
19	*Cinnomomum camphora*	Camphor Laurel	15	15	50	47	6	2.4	Mature	Good	Good	Medium	High	A major incursion of 100% from the adjacent building footprint which will necessitate removal.

***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.

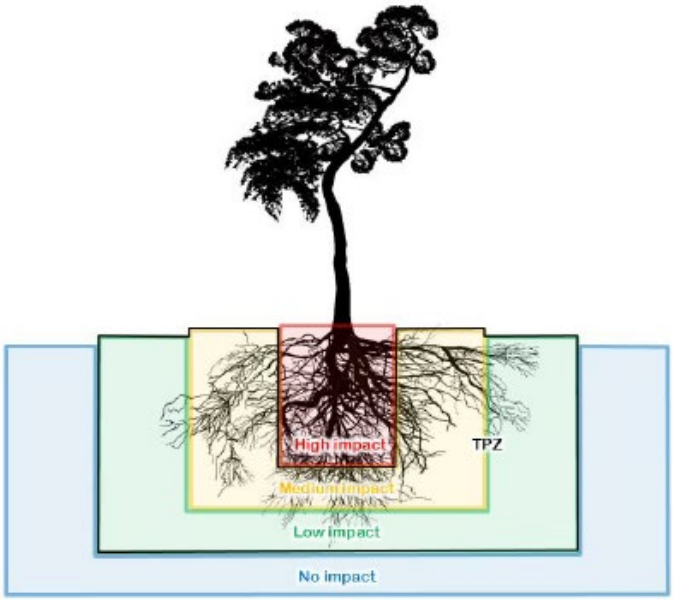

Figure 2. Low medium and high impact zones in reference to the tree

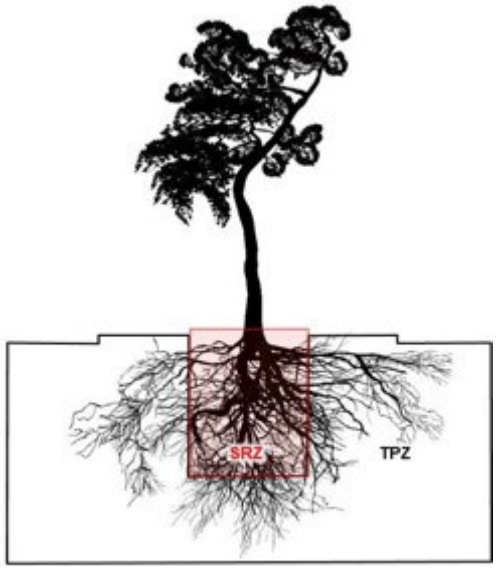

Figure 3. Structural root Zone the area required for tree stability

Table 3 – Tree Protection Zone (TPZ) & Structural Root Zone (SRZ) Incursion Calculations Table 3-5 Kelloway Ave, Camden, NSW 2570.

Tree Number	Incursion Percentage TPZ	SRZ	Action	Notes
1 *Eucalyptus macorhyncha*	~40%	0%	Remove.	Located in the rear neighbouring property. Significant structural defects that warrant removal. Additional impact from the development site.
2 *Nandina domestica*	100%	100%	Remove.	The incursion necessitates the removal of the tree.
3 *Casuarina cunninghamiana*	100%	100%	Remove.	The incursion will necessitate the removal of the tree.
4 *Grevillea robusta*	100%	100%	Remove.	The incursion will necessitate the removal of the tree.
5 *Viburnum tinus*	100%	100%	Remove.	The incursion will necessitate the removal of the tree.
6 *Leptospermum polygalifolium*	100%	100%	Remove.	The incursion will necessitate the removal of the tree.
7 *Callistemon citrinus*	0%	0%	Retain.	Located in the rear neighbouring property. No action required.
9 *Callistemon citrinus*	0%	0%	Retain.	Located in the rear neighbouring property. No action required.
10 *Eucalyptus tenella*	~14%	0%	Retain and protect.	Medium incursion.
11 *Callistemon citrinus*	0%	0%	Remove.	Low retention value tree with low amenity.
12 *Cupressus* sp.	0%	0%	Remove.	Low retention value tree with low amenity.
13 *Cupressus* sp.	0%	0%	Retain	Tree protection required
14 *Callistemon citrinus*	0%	0%	Retain	Tree protection required

Tree Number	Incursion Percentage TPZ	SRZ	Action	Notes
15 *Cupressus* sp.	0%	0%	Retain	Tree protection required
16 *Robinia pseudoacacia*	100%	100%	Remove.	The incursion will necessitate the removal of the tree.
19 *Cinnomomum camphora*	100%	100%	Remove.	The incursion will necessitate the removal of the tree.

5 Discussion

Vertical Tree management & consultancy have undertaken a site inspection retrospectively, 20 months after the initial arboricultural report had been completed by Anderson Environmental Preliminary Tree assessment of tree health and longevity Report, dated 23 December 2020 and 30 December 2020. At the time of the inspection, there were notable site variations that include demolition of the site dwellings and the removal of three (3) trees. The table below and Appendix A show that the trees are not present. Further to this observation reference is made to table 4 stating the poor health and condition of 2 of the trees. The table indicates that Trees 8, 17 & 18 were not present on the site during VTMC inspection. These trees have been removed from the assessment.

Table 4 - Trees identified for removal at 3-5 Kelloway Ave, Camden, NSW 2570. Not present at the time of the inspection

#	Species	Action
8	*Eucalyptus crebra*	Previously Removed
17	*Schinus molle*	Previously Removed
18	*Eucalyptus scoparia*	Previously Removed

Table 5 - 3-5 Kelloway Ave, Camden, NSW 2570. The extract from the report Anderson Environmental Version 1, dated 30 December 2020.

#	Scientific Name	Common Name	Height (m)	DBH (mm)	Spread (m)	Class	Notes
8	*Eucalyptus crebra*	Narrow-leaved Ironbark	7	200	2	Z4	Numerous dead limbs and sparse foliage. Diseased or senescing.
17	*Schinus molle*	Peppercorn Tree	12	400	8	A1	Coppiced trunk typical for species.
18	*Eucalyptus scoparia*	Wallangarra White Gum	15	400	5	Z4	Numerous dead limbs and sparse foliage. Diseased or senescing.

Most of the trees have been identified to have low – medium retention values identified within the site. These trees have been neglected, poorly maintained and pruned. The poor maintenance regime has adversely impacted the habit and form of the trees. In addition, the amenity and character the trees provide to the site. The landscape plan within the Development submission package addresses the removal of these trees with native vegetation. The proposed landscape adds character and amenity to the site, improves the character and street presence.

The nature of development often requires high retention trees to be removed to meet the objectives of the project. The removal of high retention tree has been kept to a minimum. These have been identified to be one *Viburnum tinus* a shrub that is easily replaced in the landscape with a better suited plant and one camphor Laurel *Cinnomomum camphora* tree. Identified as high priority for its size and presence on the site. Please not this species is a known weed that self-propagates readily. The trees will necessitate removal as they will be subject to significant root zone incursions.

These have been replaced in the landscape plan with suitable tree species. The landscape Planting schedule includes predominately native Australian species that are better suited to the harsh Australian environmental conditions. The canopy forming trees that make a suitable replacement. are Quandong *Elaeocarpus eumundii* and the water gum *Tristaniopsis laurina*. Other trees selected will form a l canopy. Tree 10 is located adjacent to the front of the site within the street verge and unlikely to be adversely impacted by the development. Care and maintenance of the tree is subject to the local government authority.

Three trees listed below have been identified to have high retention value.

Table 6 - 3-5 Kelloway Ave, Camden, NSW 2570. Noted high retention trees.

#	Botanic name	Common Name	Age Class	Retention Value
5	*Viburnum tinus*	Laurustinus	Mature	High
10	*Eucalyptus tenella*	Small-leaved Stringybark	Mature	High
19	*Cinnomomum camphora*	Camphor Laurel	Mature	High

6 Recommendations

6.1 Trees identified for removal

Table 7 - Trees identified for removal at 3-5 Kelloway Ave, Camden, NSW 2570.

Tree Number	Incursion Percentage TPZ	Incursion Percentage TPZ	Action
1 *Eucalyptus macorhyncha*	40%	0%	Remove.
2 *Nandina domestica*	100%	100%	Remove.
3 *Casuarina cunninghamiana*	100%	100%	Remove.
4 *Grevillea robusta*	100%	100%	Remove.
5 *Viburnum tinus*	100%	100%	Remove.
6 *Leptospermum polygalifolium*	100%	100%	Remove.
11 *Callistemon citrinus*	0%	0%	Remove.
12 *Cupressus* sp.	0%	0%	Remove.
16 *Robinia pseudoacacia*	100%	100%	Remove.
19 *Cinnomomum camphora*	100%	100%	Remove.

6.2 Trees identified to be retained

Table 8 - Trees identified to be retained 3-5 Kelloway Ave, Camden, NSW 2570.

Tree Number	Incursion Percentage TPZ	Incursion Percentage TPZ	Action
7 *Callistemon citrinus*	0%	0%	Retain.
9 *Callistemon citrinus*	0%	0%	Retain.
10 *Eucalyptus tenella*	14%	0%	Retain and protect
13 *Cupressus* sp.	0%	0%	Retain and protect
14 *Callistemon citrinus*	0%	0%	Retain and protect
15 *Cupressus* sp.	0%	0%	Retain and protect

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

Tree Number	Action
10 *Eucalyptus tenella*	Retain and protect
13 *Cupressus* sp.	Retain and protect
14 *Callistemon citrinus*	Retain and protect
15 *Cupressus* sp.	Retain and protect

- 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 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 pruniung 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 angel 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

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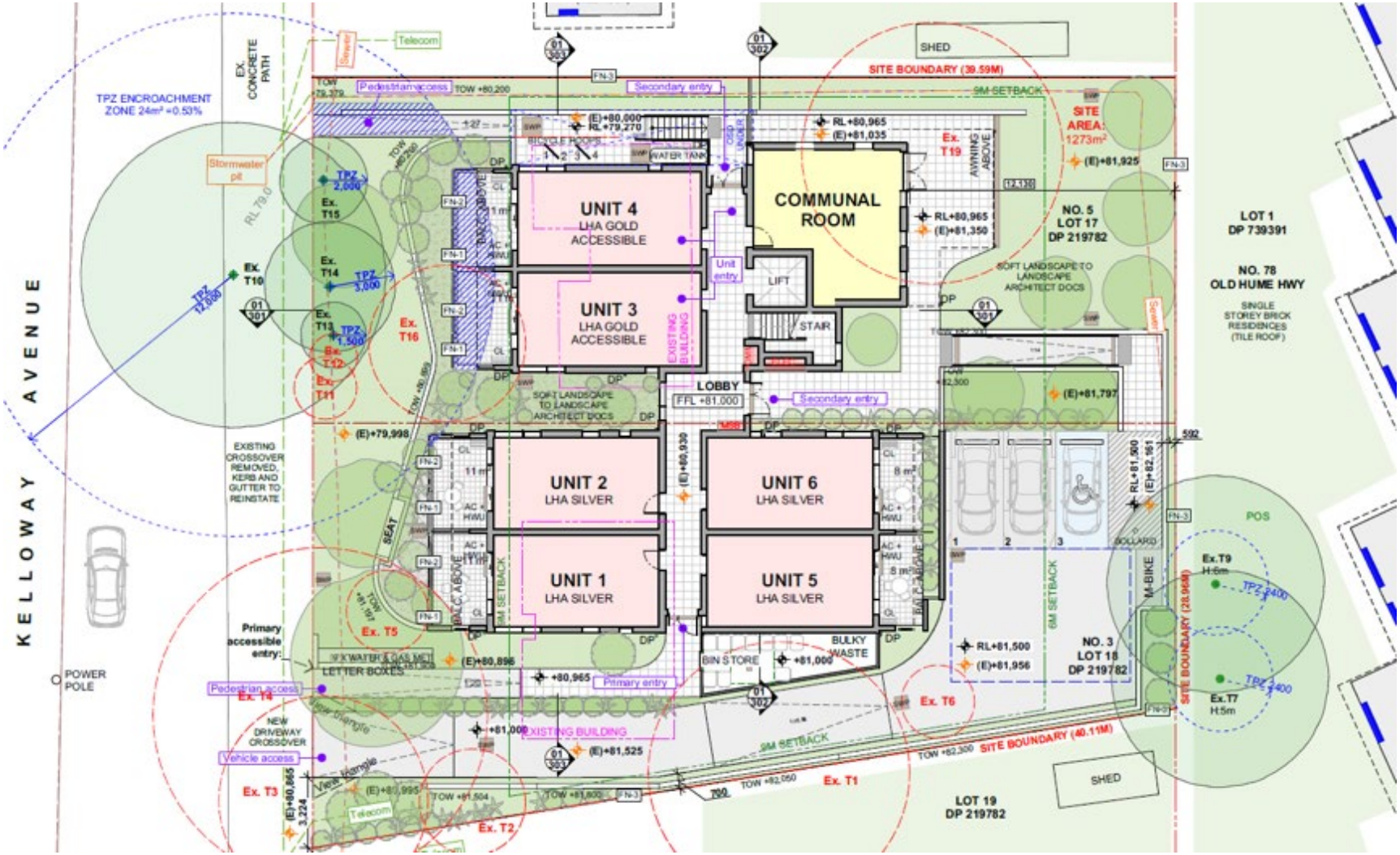
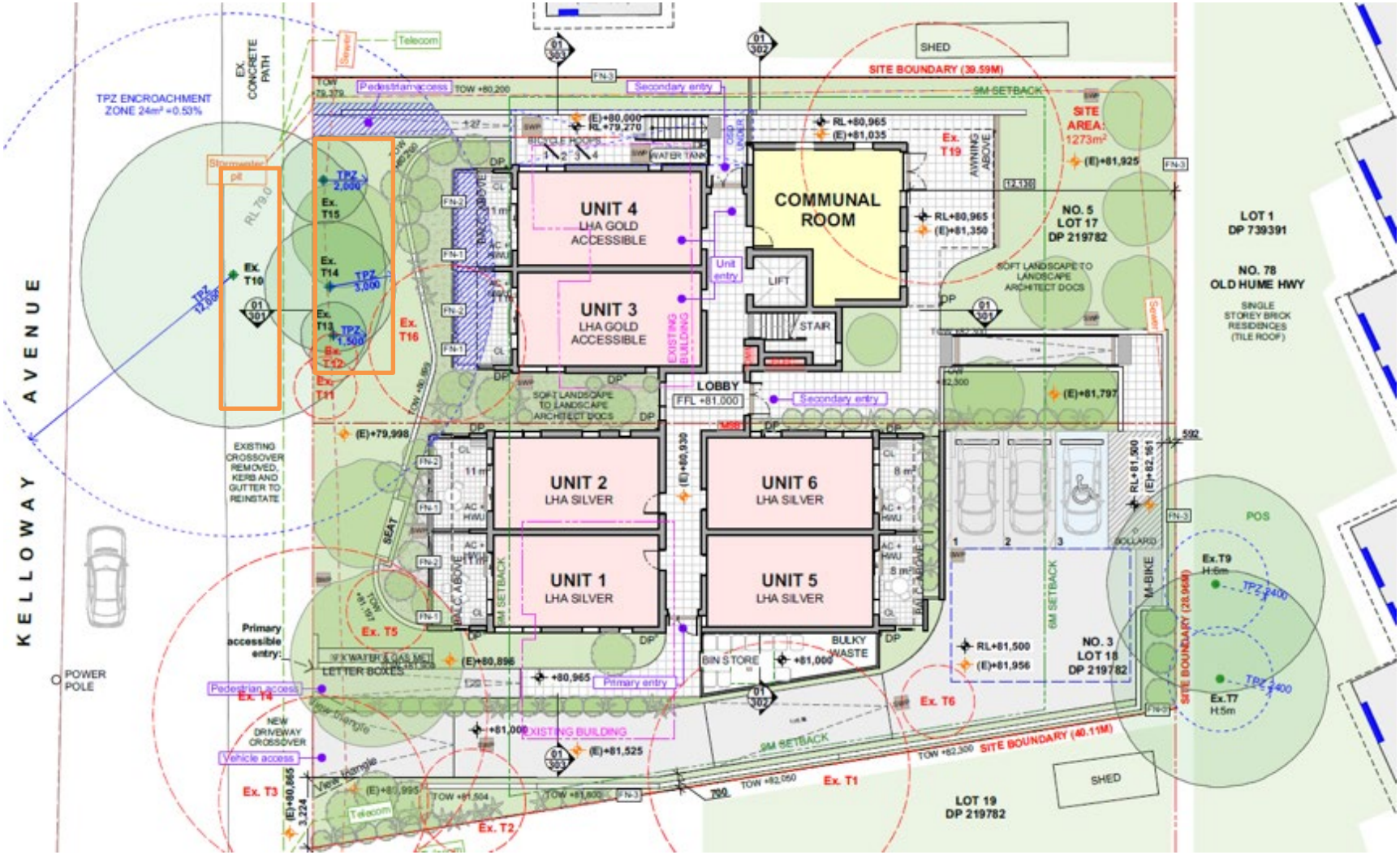
Disclaimer statement. The response of a living tree to its immediate environment is dynamic throughout its entire life cycle due to external influences giving each tree a unique natural variability. A visual tree assessment addresses the external symptoms presented by a tree. This cannot exclude a tree 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.

Appendix A - Tree Assessment data 3-5 Kelloway Ave, Camden, NSW 2570



Appendix B - Tree protection Plan for trees retained



Appendix C - 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 D - 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.**

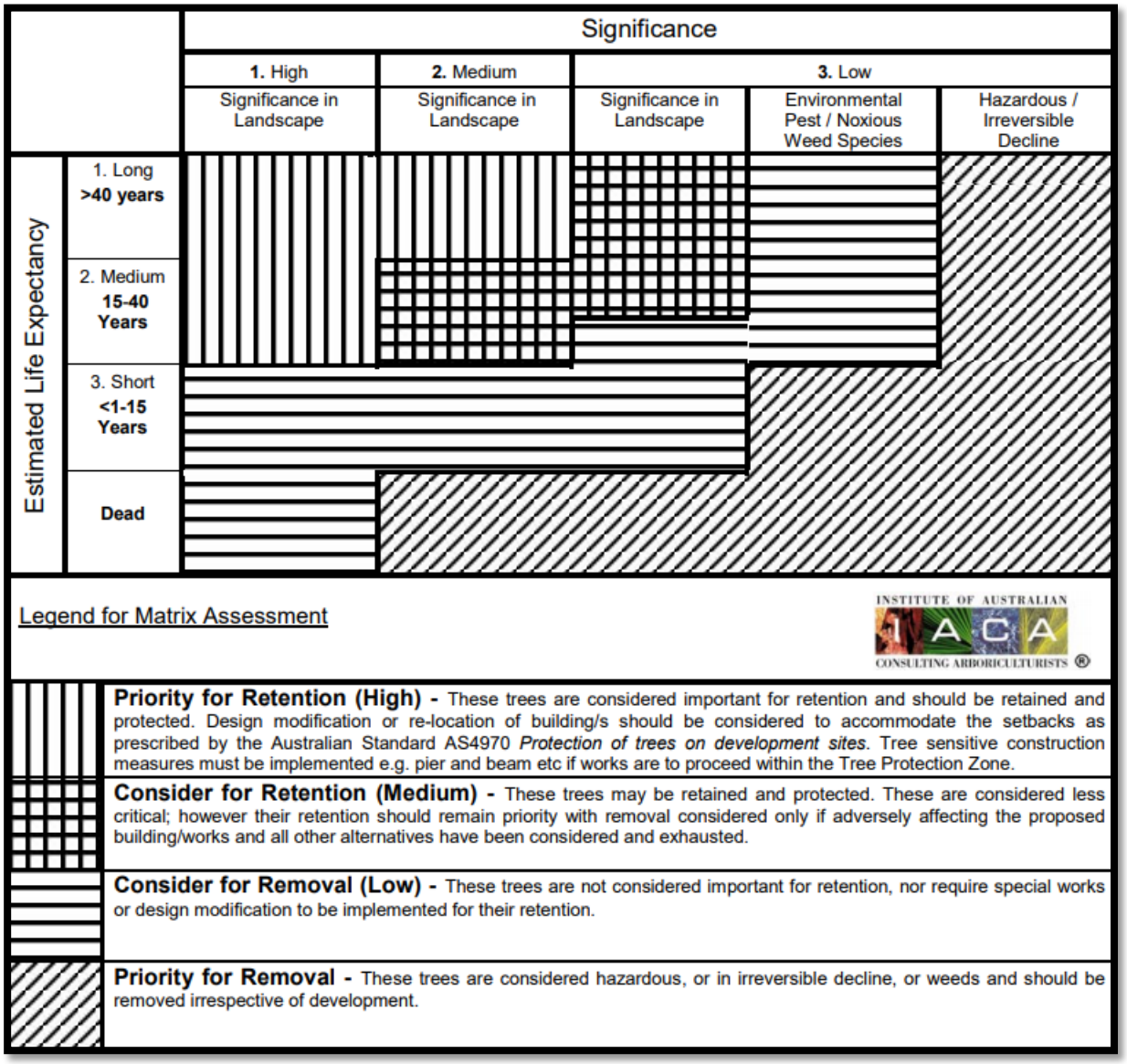
Note: The assessment criteria are for individual trees only, however, can be applied to a monocultural stand in its entirety e.g., hedge.

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:

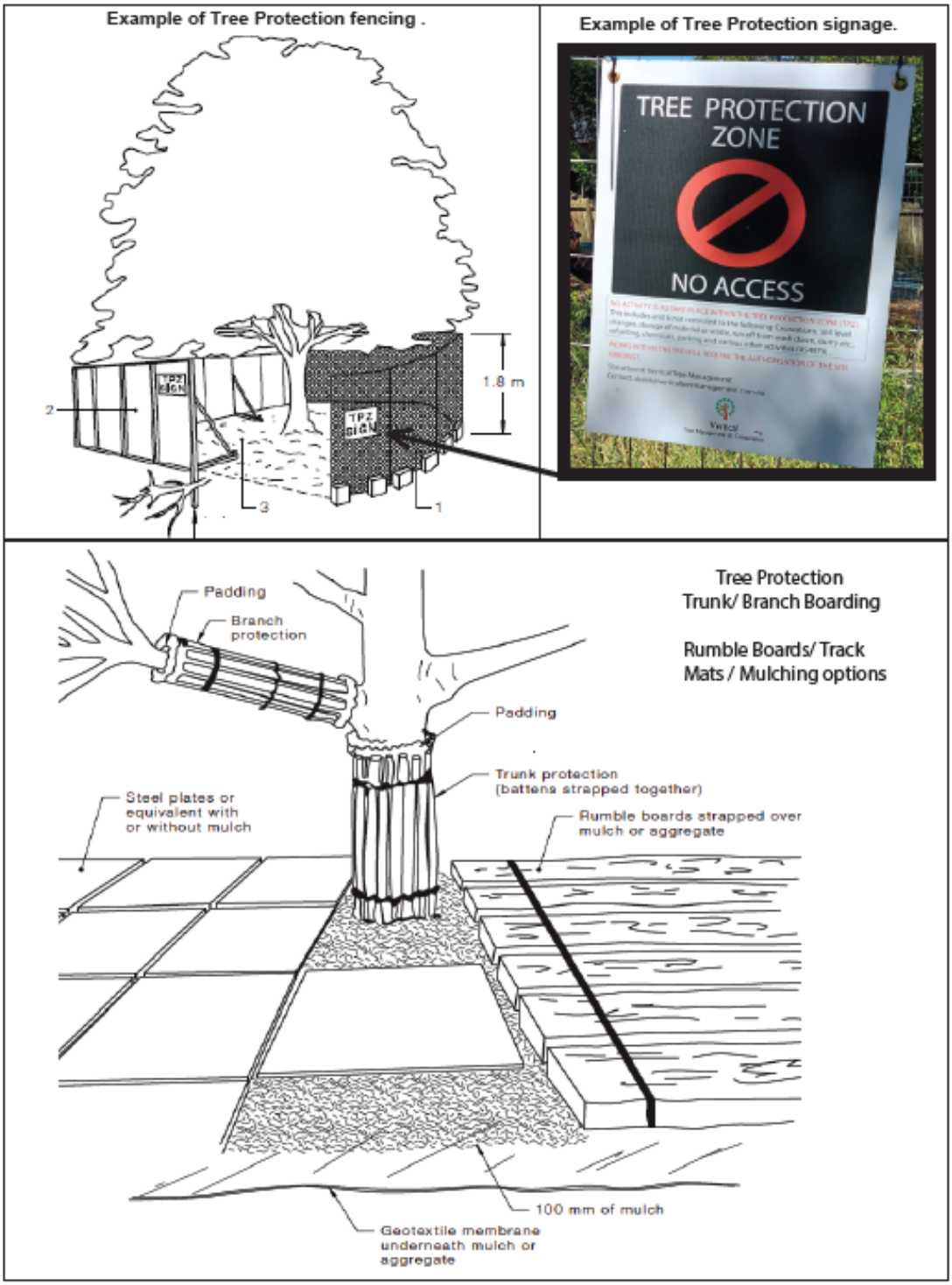
IACA, 2010 IACA significance of a tree assessment rating systems, institute of Australian consulting arborists, Australia www.iaca.org.au

Table 9. Tree Retention Value – Priority Matrix



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

Appendix E - Tree protection



Vertical Tree – Vertical Tree Management & Consultancy

Appendix F – 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%)	• 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%)	• The area lost to this encroachment should be compensated for elsewhere, contiguous with the TPZ. • Tree protection must be installed.
Major encroachment (>10%)	• 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%)	• 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%)	• 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.

Fastigiate - 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.

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

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.