

PRELIMINARY ARBORICULTURAL REPORT

Prepared for

BIOSIS PTY LTD

Project & Site Address

Bradfield Precinct, Bringelly

Badgerys Creek Road, Bringelly, NSW 2556

Prepared by

Owen Meekins

Graduate Certificate of Arboriculture (AQF Level 8), LLB.



Preface

Individually and collectively urban and peri-urban trees have been around for generations, but only recently have they become valued for providing more than aesthetic and recreational values. People around the world now regard trees and other vegetation as critical urban infrastructure – as important to how a suburb functions as roads or public transport and particularly vital to the health and wellbeing of communities. The benefits of urban forests span environmental, economic, cultural and political domains.

- *Environmental: The urban and peri urban forest is the ‘engine room’ for urban ecosystems. Trees take in water, nutrients and carbon dioxide and process them through photosynthesis and transpiration, transforming them into clean air, oxygen, shade and habitat.*
- *Community: Urban forests have many positive impacts for the community by forming shared points of reference within the urban environment and allowing daily interaction with nature.*
- *Economic: Urban Forest benefits that can be quantified in dollar terms span a range of industries and disciplines including health, engineering, planning, sustainability, geology and real estate industries. Bringing these together to form a solid economic business case for urban forests is a powerful tool for decision makers, as most infrastructure and design decisions are based on economic cost benefit analysis.*



Table of Contents

1	Executive Summary	1
2	Introduction	2
3	Background	2
3.1	Limitations	3
3.2	Report References	3
4	Site Location & Observations	3
5	Arboricultural Methodology	4
5.1	Visual Tree Assessment.....	4
5.2	Visual Tree Assessment Parameters	5
6	Tree Locations	7
6.1	Arboricultural Findings.....	7
6.2	Tree Locations.....	8
7	Arboricultural Discussion	14
7.1	Biodiversity considerations	14
7.2	Tree Removal.....	15
7.3	Age diversity and Planting opportunities	15
7.4	Future Development	16
8	Summary Data.....	17
9	Visual Tree Assessment Data	18
10	References	35
11	Glossary.....	36
12	Appendix	39
12.1	Visual Tree Assessment Methodology	39
12.2	Plant Health Care	39
12.3	Descriptors: Age, Vitality & Structure	40
12.4	Descriptors: Estimated Life Expectancy (ELE).....	42
12.5	IACA Significance of Tree, Assessment Rating System (STARS)	43
12.6	Additional Landscape Significance Considerations.....	44
12.7	Assumptions and Limiting Conditions.....	47
12.8	AGS Quality Control	48

1 Executive Summary

Active Green Services Pty Ltd (AGS) has been engaged by Biosis Pty Ltd to prepare a Preliminary Arboricultural Report with regards to the current vitality and retention value of the tree population growing in a mapped area at Lot 10 DP 1235662 Badgerys Creek Road, Bringelly NSW.

Hence, on the 10th and 11th of March 2022 one hundred and ninety-three (193) individual Visual Tree Assessments (VTA) were carried out in the abovementioned area by a suitably qualified (AQF Level 5) arborist from AGS.

The following Report and its recommendations are based on these species-specific/site-specific tree assessments which includes tree age, dimensions, estimated life expectancy, vitality, ecophysiology, biomechanics, landscape significance, pedology and tree retention value *in situ*. For ease of identification all the subject trees have been GPS located, aerial mapped, photographed and individually numbered with a physical tree tag. The detail supporting this summary table follows.

Summary Data Table

Retention Value	Trees	Description
 High	10	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 AS 4970 <i>Protection of trees on development sites</i> . Tree sensitive construction measures must be implemented (i.e., pier and beam cantilever, porous paving, Structural Confinement Cells) if works are to proceed within the TPZ and the tree is to remain viable.
 Medium	84	These trees may be retained and protected. These are considered less critical; however, their retention should remain a priority, with removal considered only if adversely affecting the proposed building/works and all other alternatives have been considered and exhausted.
 Low	69	These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.
 Remove	30	These trees are considered hazardous, or in irreversible decline, or weeds* and should be removed irrespective of development.
Total	193	

* Listed 'Weed Species' per NSW Department of Primary Industries.

3.1 Limitations

- i. All arboricultural reasonings that have been discussed and provided are based on extensive empirical arboricultural knowledge, the internationally recognised Visual Tree Assessment (VTA) methodology (Mattheck and Breloer, 1994), (Matheny and Clark, 1998), the recognised *Institute of Australian Consulting Arboriculturists (IACA) Significance of a Tree, Assessment Rating System (STARS)*, and *Standards Australia AS 4970-2009 Protection of trees on development sites*.
- ii. Whilst this arboricultural assessment is thorough it should be noted that trees are dynamic living organisms exposed to both unforeseeable biotic and abiotic variables which on occasion can be harsh and severe. Therefore, this arboricultural assessment will consider on the balance of probabilities the most likely outcome(s) as opposed to those which could, may or fancifully occur.

3.2 Report References

- i. As a progressive arboricultural company AGS keeps abreast of research data relating to all aspects of arboriculture and urban forestry. Hence the following arboricultural observations, reasonings, conclusions and recommendations are founded on industry standards and extensive empirical arboricultural knowledge. The science-based arboricultural survey methodologies and references used can be found in the Appendix.
- ii. Please note that additional educational material has been appended to promote the urban and peri urban forest through understanding, knowledge and current best management practice.

4 Site Location & Observations

- i. As per Keylan Consulting - Bradfield First Building EIS, SSD 25452459 (November 2021).

"The land generally slopes from high points in the north-west to low points in the east and south-east along Thompsons Creek. The highest point of the site is located at the western end of the access handle near Badgerys Creek Road, with the lowest point adjacent to Thompsons Creek in the eastern edge of the site. The site is generally cleared of vegetation with small stands of native vegetation along the western edge of the site and within the Thompsons Creek riparian corridor. There are no existing buildings within the site.

The site's current surrounding context is characterised by rural and rural-residential land uses. The area to the east and south-east of Thompsons Creek comprises a series of large lot rural residential properties accessed from Kelvin Park Drive which typically comprise single detached dwellings with small-scale rural or lifestyle uses. Further to the east and north-east is the suburb of Rossmore which includes a mix of intensive agricultural uses such as greenhouses and poultry farming. The site and surrounding development will be transformed throughout the next 10 years as described in the Western Sydney Aerotropolis Plan 2020 (WSAP 2020). WSAP 2020 indicates how the surrounding Western Parklands City will be supported through a strong mix of compatible land uses, blue and green infrastructure upgrades and associated transport infrastructure."



Image 2: Geographical location

5 Arboricultural Methodology

5.1 Visual Tree Assessment

- i. Visual Tree Assessments (VTA) consistent with modern arboricultural practices (Mattheck and Breloer, 1994) were conducted by a suitably qualified and experienced (AQF Level 5) AGS arborist on the subject tree population on the 10th and 11th of March 2022. These assessments were carried out at ground level and therefore classified as *Level 2: Basic Assessments* (Dunster et al., 2013). The VTA method is an internationally used and acknowledged method for tree inspection. (Please refer to the Appendix for a more detailed description of this methodology).
- ii. The tools used onsite to gather the necessary VTA data were a nylon percussion hammer, mobile phone, and an I-pad. Tree height and canopy spread were recorded using a digital laser range finder (Nikon Forestry Pro). The trunk diameter and DBH height measurements were made by using a forestry DBH measuring tape. No dendrological diagnostics, soil analysis, tissue sampling and/or geological investigations were carried out at that time.
- iii. For ease of identification the subject trees were GPS located, aerial mapped, photographed and physically tree tagged. A CSV File containing this data can be supplied upon request.

5.2 Visual Tree Assessment Parameters

- i. The following information outlines the basic parameters used to assess the subject tree(s). These parameters relate to the Tree Assessment data in tables below. The definitions of the following descriptors are expanded upon in the Appendix.

Tree Vitality: is categorised through a visual determination using:

- leaf, twig or needle size, shape, and colour
- seasonal growth rates
- reaction wood development
- foliage density
- foliage coverage throughout the crown
- branch-tip dieback
- typical branch senescence.

For example, a tree assessed to have an average or fair vitality rating would generally have irregular [minor] leaf or needle shape and/or colour and/or size; and/or irregular [minor] foliage density, distribution and/or average growth indicators and/or some tip dieback.

Branch Architecture: is a general evaluation of the branch union formation, weight balance, growth formation and foliage loss (that may affect branch weight and/or mass damping). This assessment is derived from the typical structure of the species and its typical branch formation.

Rootzone & Pedology: visually assesses the general soil vitality, porosity, soil compaction and growth impediments. For example, growing environments with a high percentage of impervious seal and/or compaction are likely to be categorised as poor, notwithstanding the vitality of the tree.

Impediments: (rootzone and canopy) are structures that impede or suppress normal tree development and/or function. This can include hard and/or impervious surfaces within the rootzone, or powerlines and other structures within and/or adjacent to the canopy.

Trunk Form: assesses the flare at the base, taper, decay and cavities, formation of multi-stems that develop near or at ground level, girdling roots and growing angles.

Tree Form: is an indication of crown shape. Crown shapes are influenced by their surroundings, light availability and branch loss, which can have varying impacts on their symmetry. The trees have generally been assessed on their individual crown shape, however, as the tree may be growing within a group environment, this could lead to the individual shape being assessed further down the scale. Although a poor rating may be attributed to the tree, the tree's contribution to the setting may be high through association within the group canopy. This can be generally recognised through the Crown Class rating.

Crown Class Rating: provides an indication on the tree's relationship with the surrounding tree environment. The categories used include Dominant, Codominant, Intermediate, Suppressed and Open grown, as shown in the below diagram.

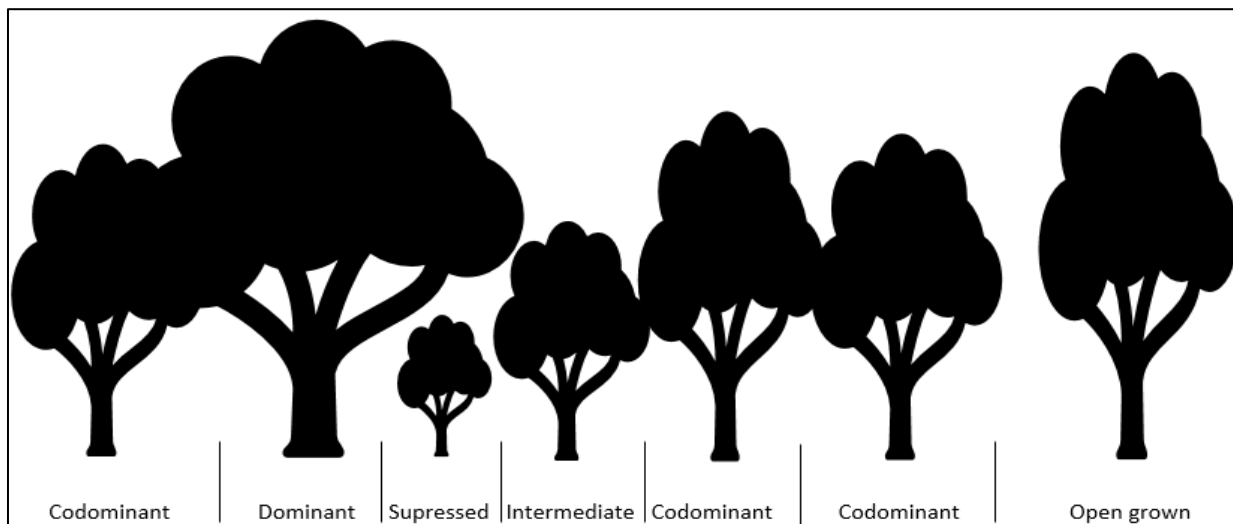


Image 3: Indicative Crown Class

Function: assesses the pragmatic usefulness of the tree *in situ*. For example, does the tree contribute to soil retention on the side of a bank? The provision of stormwater attenuation? The amenity of the site, the provisions of microclimates/cooling during summer months and contribution to wildlife (roosting, perching and habitat). This is weighed up against any negative issues the tree(s) may be causing, for example: conflict and damage to structures, the value of the structure is considered, the tree's growing location – is it the correct tree for the setting's use.

Landscape Significance: assesses the landscape significance of the subject tree *in situ* which is determined by the combination of Social, Amenity, Environmental and Heritage factors. This criterion considers the appropriateness and value of the tree in the setting, any cultural and/or heritage significance and general ornamental value. In a group setting, it assesses the tree's value to the group and the adverse effects to the amenity of the group if the tree were to be removed. For example, the removal of a small, suppressed tree from a group setting may have a negligible adverse effect on the group's amenity value, therefore it is likely to be assessed as 'Little value' (Very Poor). The assessment criteria are provided in table form in the Appendix. (This criterion has been used in conjunction with the below mentioned Significance of a Tree, Assessment Rating System (STARS)).

Estimated Life Expectancy: An Estimated Life Expectancy (ELE) rating was determined by using the adapted Safe Useful Life Expectancy (SULE) and Tree AZ methodologies (Barrell. 1996, 2000). The aim of these two systems is to convert what amounts to a relatively complex Arboricultural assessment into a few broad categories that are more logically understood. An ELE rating provides an estimate of a tree's expected remaining lifespan after considering the current condition, vigour, and vitality of the subject tree(s) *in situ*. Ultimately the main aim is the establishment of a tree Retention Value. The objective of a ELE assessment is to contribute to the relative value of individual trees for the purpose of informing future management options. This calculated ELE rating will be inserted into the above-mentioned STARS Matrix (please refer to the Appendix section for further information).

Retention Value: Significance of a Tree, Assessment Rating System (STARS) provides the Retention Value of a tree and/or group of trees by balancing a combination of environmental, cultural, physical, amenity and social values. The landscape significance of a tree is an essential criterion to establish the

importance that a particular tree may have on a 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. A tree retention assessment has been undertaken in accordance with the *Institute of Australian Consulting Arboriculturalists (IACA) Significance of a Tree, Assessment Rating System (STARS)*. The system uses a scale of *High, Medium, and Low* significance in the landscape. Once the landscape significance of a tree has been defined, the Retention Value can be determined congruent with the trees' abovementioned Estimated Life Expectancy (ELE). Further details and the assessment criteria are in the Appendix.

6 Tree Locations

6.1 Arboricultural Findings

- i. Please find below the aerial sub maps with the indicative locations of the assessed tree population. All of the one hundred and ninety-three (193) trees were arboriculturally assessed and then judiciously assigned a cogent Retention Value per the Institute of Australian Consulting Arboriculturists *Significance of a Tree, Assessment Rating System (STARS)*. For convenience the calculated Retention Value of the aerially mapped trees is colour-coded per the *(STARS) Tree Retention Value Priority Matrix*. (These categories and the indicia are listed in the Appendix).
- ii. As abovementioned, additional Landscape Significance considerations were also factored into the adjudged Retention Value. These considerations included the combination of discernible Social, Amenity, Environmental and Heritage elements. (These categories and the indicia are listed in the Appendix).
- iii. No visible evidence was found to suggest that any of the subject trees are being regularly used by endangered wildlife considered to be a part of a threatened species or ecological community, and nor is it offering any wildlife habitat opportunities for the same communities.
- iv. A CSV File with the plotted GPS locations, tabled tree assessment data and photographs can be supplied upon request.

6.2 Tree Locations



0 10 20 40 m

Legend

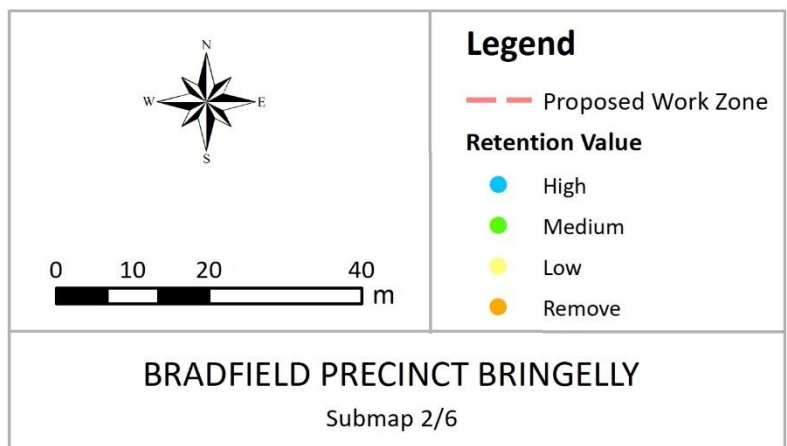
— Proposed Work Zone

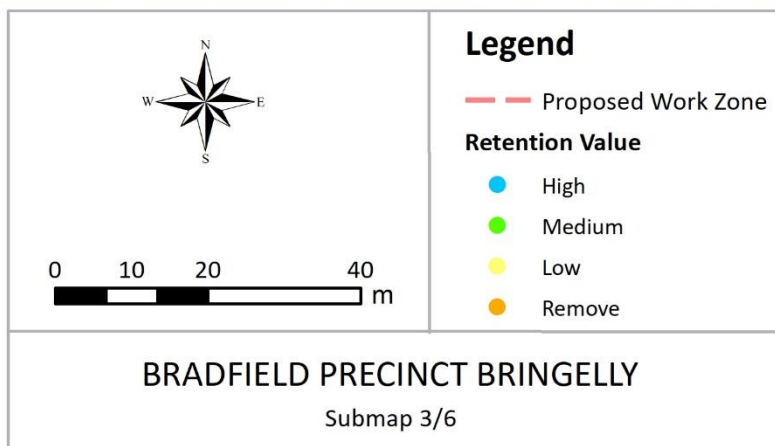
Retention Value

- High
- Medium
- Low
- Remove

BRADFIELD PRECINCT BRINGELLY

Submap 1/6







Legend

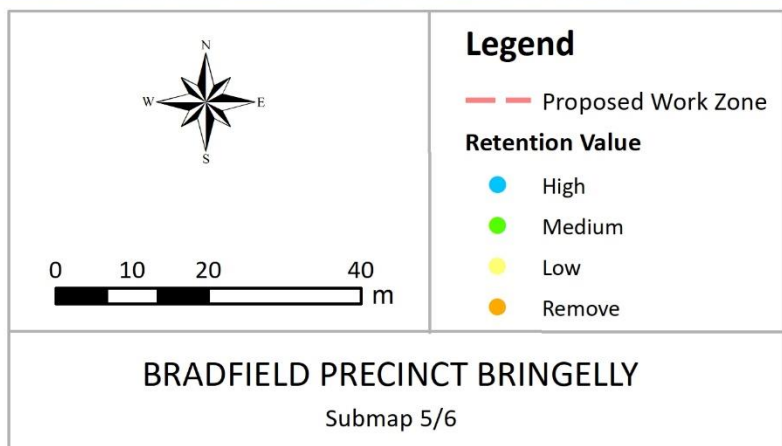
— Proposed Work Zone

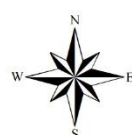
Retention Value

- High
- Medium
- Low
- Remove

BRADFIELD PRECINCT BRINGELLY

Submap 4/6





Legend

— Proposed Work Zone

Retention Value

- High
- Medium
- Low
- Remove

BRADFIELD PRECINCT BRINGELLY

Submap 6/6

7 Arboricultural Discussion

7.1 Biodiversity considerations

- i. The subject tree population scores 'poorly' with regards to species diversity as 94.3% of the trees are in the Myrtaceae family, which is intrinsically unfavourable (Santamour, 1990). Trees are dynamic living organisms and are therefore susceptible to development impact (direct and/or indirect), pests, diseases and climate change (biotic and/or abiotic). One of the important components to create and maintain a healthy and sustainable urban tree population is to maintain biodiversity. A high level of biodiversity within an urban forest is desirable because it boosts an ecosystems productivity, sustainability, climate resilience and overall vitality. Some species of tree may also be better at providing specific urban forest benefits due to intrinsic (morphological and physiological) and temporal (seasonal) characteristics. (Schwab, 2009).
- ii. Thus, to optimise the multiple benefits of the urban forest, it is essential to have vegetation diversity. A broader diversity of urban trees can guard against the risk of large-scale devastation by pests and large-scale replacements due to ageing or environmental changes. To achieve a resilient urban forest, it is recommended that urban tree planning should follow the 10-20-30 rule for planting diversity. The 'rule of thumb' suggests an urban tree population should include no more than 10% of any one species, 20% of any one genus, and 30% of any family. Following this rule can result in a more biologically diverse planting (Santamour, 1990).

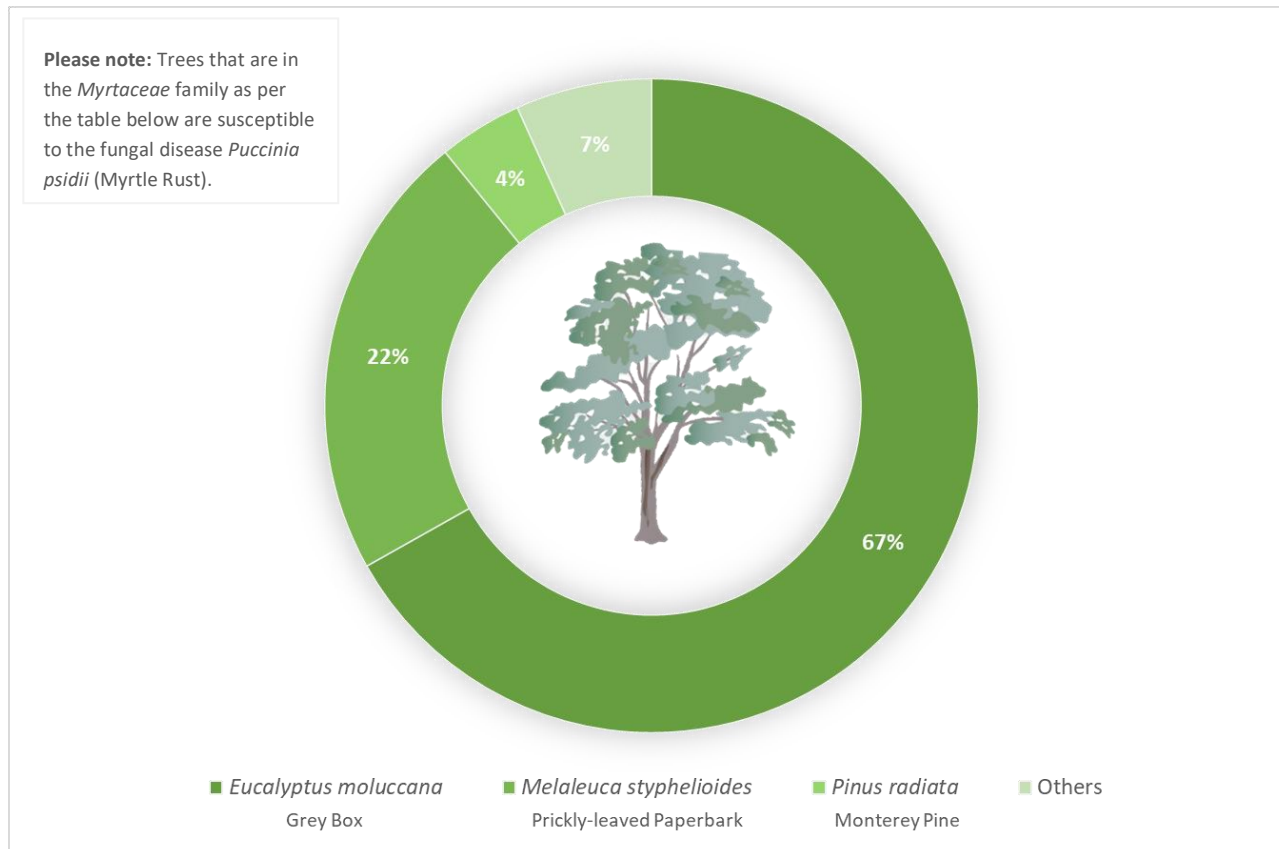


Image 4: Species Biodiversity

Table 1: Family Biodiversity

Family	Botanical Name	Common Name	Tree Population
Myrtaceae	<i>Eucalyptus moluccana</i>	Grey Box	129
	<i>Melaleuca styphelioides</i>	Prickly-leaved Paperbark	43
	<i>Corymbia maculata</i>	Spotted Gum	2
	<i>Eucalyptus fibrosa</i>	Broad-leaved Ironbark	2
	<i>Eucalyptus tereticornis</i>	Forest Red Gum	2
	<i>Callistemon citrinus</i>	Crimson Bottlebrush	1
	<i>Eucalyptus botryoides</i>	Southern Mahogany	1
	<i>Eucalyptus punctata</i>	Grey Gum	1
	<i>Syzygium smithii</i>	Lilly Pilly	1
Pinaceae	<i>Pinus radiata</i>	Monterey Pine	8
Cupressaceae	<i>Cupressocyparis x leylandii</i>	Leyland Cypress	1
Oleaceae	<i>Olea europaea</i>	Olive	1
Proteaceae	<i>Grevillea robusta</i>	Silky Oak	1
TOTAL			193

7.2 Tree Removal

- i. It is recommended that to offset canopy loss any proactive tree removal is carried out in conjunction with considered Compensatory Replanting. Tree removal should not always be considered a negative issue. Retention for retention's sake is a pointless activity if there is not a high possibility that the tree will not only survive but will be viable in the longer term (Hitchmough, 1994). Tree removal offers the opportunity to replant and is always strongly recommended in order to maintain a 'no net' canopy losses. A no net loss is achieved by undertaking compensatory planting and can be calculated per a recognised Tree Valuation Method which takes into consideration the abovementioned tree biodiversity findings and arboricultural reasonings. A list of recommended tree species can be found on the Camden City Council website -

<https://www.camden.nsw.gov.au/assets/pdfs/Environment/Trees/Tree-and-Landscape-Species-List-Appendix-1-Tree-Management-Policy.pdf>

7.3 Age diversity and Planting opportunities

- i. Whilst carrying out the tree audit it became apparent that age diversity within the subject tree population is lacking and therefore of concern. A robust urban forest needs age diversity with species of varying life spans and growth rates. A uniform age profile makes it likely that many trees will decline

and senesce at the same time. Like all living things, trees decline in health as they age. Trees that are in poor health are not as effective at providing environmental benefits and can also pose foreseeable risk to person and/or property. If a tree's health is not expected to improve, arguably it should be removed from the landscape to enable a new tree(s) to be planted (Barrell, 1993 & 2009).

- ii. However, this geographical location in Badgerys Creek Road does provide an abundance of opportunities for both compensatory and new tree stock plantings.

Table 2: Tree Age Class

Age Class	Tree Population	Percentage
Mature	120	62.2%
Semi-mature	73	37.8%
Young	0	0%
Other (Senescent)	0	0%

7.4 Future Development

- i. Trees grow in a delicate balance with their environment and any changes to that balance must be minimized if the tree is to remain healthy and fulfil its potential. It is rarely possible to repair stressed and injured trees, so damage needs to be avoided during all stages of development and construction.
- ii. Recent research both clinical and empirical has shown that healthy trees such as these usually remain in good health when best management practice guidelines and arboricultural standards are adhered to on development sites per *AS4970-2009 Protection of trees on development sites* whilst under the guidance of a suitably qualified arborist. Thus, for trees to be retained and their requirements met, procedures must be in place to protect trees at every stage of the development process. This should be considered at the earliest planning stage of any outdoor event and/or design of a development project where trees are involved.
- iii. Therefore, it is strongly recommended that an Arboricultural Impact Assessment which includes a Tree Protection Plan pursuant to *AS4970-2009 Protection of trees on development sites* is formulated and adopted pre-development. This will guide earthworks around retained trees located on the proposed work site through the formulation and implementation of best management practice tree protection methodologies.

8 Summary Data

Table 3: Summary Data Table per (STARS) Tree Retention Value - Priority Matrix

Retention Value	Trees	Description
 High	10	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 <i>Australian Standard AS4970-2009 Protection of trees on development sites</i> . Tree sensitive construction measures must be implemented (i.e., pier and beam cantilever, porous paving, Structural Confinement Cells) if works are to proceed within the TPZ and the tree is to remain viable.
 Medium	84	These trees may be retained and protected. These are considered less critical; however, their retention should remain a priority with removal considered only if adversely affecting the proposed building/works and all other alternatives have been considered and exhausted.
 Low	69	These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.
 Remove	30	These trees are considered hazardous, or in irreversible decline, or weeds* and should be removed irrespective of development.
Total	193	

* 'Weed Species' per NSW Department of Primary Industries.

9 Visual Tree Assessment Data

Table 4: Visual Tree Assessment Data (11/03/2022). Full details of the abovementioned descriptors and arboricultural methodologies used can be found in the Appendix section of this document.

No.	Tree Tag	Botanical & Common Name	Age Class	Height (m)	Canopy Spread (m)	DBH (m)	DRC (m)	SRZ (m)	TPZ (m)	Structure	Vitality	ELE	Retention Value
1	1725	<i>Pinus radiata</i> Monterey Pine	Mature	13	EW:7 NS:7	0.73	1.18	8.76	3.55	Fair	Fair	Medium	Medium
2	1726	<i>Pinus radiata</i> Monterey Pine	Mature	12	EW:7 NS:8	0.77	0.98	9.24	3.28	Fair	Good	Medium	High
3	1727	<i>Pinus radiata</i> Monterey Pine	Mature	10	EW:7 NS:7	0.72	1.20	8.64	3.57	Fair	Good	Long	High
4	1728	<i>Pinus radiata</i> Monterey Pine	Mature	12	EW:7 NS:7	0.55	0.76	6.60	2.95	Fair	Poor	Short	Low
5	1729	<i>Pinus radiata</i> Monterey Pine	Mature	9	EW:10 NS:10	0.74	1.14	8.88	3.50	Fair	Good	Long	High
6	1730	<i>Pinus radiata</i> Monterey Pine	Mature	13	EW:6 NS:9	0.49	0.80	5.88	3.01	Fair	Fair	Medium	Medium
7	1731	<i>Pinus radiata</i> Monterey Pine	Mature	15	EW:7 NS:8	0.55	1.09	6.60	3.43	Good	Good	Long	High
8	1732	<i>Pinus radiata</i> Monterey Pine	Mature	15	EW:7 NS:8	0.53	0.97	6.36	3.27	Fair	Poor	Short	Low
9	1733	<i>Eucalyptus tereticornis</i> Forest Red Gum	Mature	9	EW:10 NS:11	0.62	0.92	7.44	3.20	Fair	Poor	Short	Low
10	1734	<i>Cupressocyparis x leylandii</i> Leyland Cypress	Mature	9	EW:6 NS:4	0.38	0.50	4.56	2.47	Poor	Dead	Dead	Remove
11	1735	<i>Olea europaea</i> Olive	Semi Mature	6	EW:5 NS:5	0.09	0.12	2.00	1.50	Poor	Good	Long	Remove

No.	Tree Tag	Botanical & Common Name	Age Class	Height (m)	Canopy Spread (m)	DBH (m)	DRC (m)	SRZ (m)	TPZ (m)	Structure	Vitality	ELE	Retention Value
12	1737	<i>Eucalyptus tereticornis</i> Forest Red Gum	Mature	23	EW:14 NS:12	0.91	1.12	10.92	3.47	Fair	Good	Long	 High
13	1438	<i>Corymbia maculata</i> Spotted Gum	Mature	20	EW:8 NS:10	0.83	1.80	9.96	4.24	Fair	Fair	Long	 High
14	1739	<i>Corymbia maculata</i> Spotted Gum	Semi Mature	9	EW:4 NS:4	0.16	0.21	2.00	1.72	Fair	Fair	Medium	 Medium
15	1440	<i>Callistemon citrinus</i> Crimson Bottlebrush	Mature	5	EW:5 NS:4	0.42	0.50	5.04	2.47	Poor	Poor	Short	 Low
16	1798	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	7	EW:6 NS:4	0.21	0.27	2.52	1.91	Fair	Fair	Medium	 Medium
17	1799	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	7	EW:6 NS:4	0.15	0.21	2.00	1.72	Fair	Fair	Medium	 Medium
18	1741	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	9	EW:6 NS:6	0.26	0.40	3.12	2.25	Fair	Good	Medium	 Medium
19	1742	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	8	EW:6 NS:4	0.22	0.30	2.64	2.00	Fair	Good	Medium	 Medium
20	1743	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	8	EW:6 NS:4	0.22	0.30	2.64	2.00	Fair	Poor	Short	 Low
21	1744	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	7	EW:3 NS:3	0.10	0.12	2.00	1.50	Fair	Very Poor	Short	 Low
22	1745	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	9	EW:3 NS:3	0.22	0.28	2.64	1.94	Hazardous	Dead	Dead	 Remove
23	1746	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	9	EW:3 NS:3	0.12	0.15	2.00	1.50	Fair	Very Poor	Short	 Low

No.	Tree Tag	Botanical & Common Name	Age Class	Height (m)	Canopy Spread (m)	DBH (m)	DRC (m)	SRZ (m)	TPZ (m)	Structure	Vitality	ELE	Retention Value
24	1747	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	9	EW:3 NS:3	0.15	0.22	2.00	1.75	Fair	Fair	Medium	Medium
25	1753	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	9	EW:6 NS:8	0.15	0.22	2.00	1.75	Fair	Fair	Medium	Medium
26	1748	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	9	EW:2 NS:2	0.30	0.32	3.60	2.05	Poor	Dead	Dead	Remove
27	1749	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	8	EW:6 NS:4	0.14	0.18	2.00	1.61	Fair	Good	Medium	Medium
28	1750	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	9	EW:3 NS:3	0.18	0.19	2.16	1.65	Poor	Dead	Dead	Remove
29	1751	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	9	EW:3 NS:3	0.18	0.19	2.16	1.65	Poor	Dead	Dead	Remove
30	1752	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	9	EW:3 NS:3	0.16	0.16	2.00	1.53	Poor	Very Poor	Short	Low
31	1754	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	7	EW:3 NS:3	0.10	0.14	2.00	1.50	Fair	Fair	Medium	Medium
32	1755	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	9	EW:5 NS:5	0.38	0.44	4.56	2.34	Very Poor	Very Poor	Short	Low
33	1756	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	10	EW:3 NS:3	0.21	0.26	2.52	1.88	Poor	Poor	Medium	Low
34	1757	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	6	EW:4 NS:2	0.10	0.12	2.00	1.50	Fair	Fair	Medium	Low
35	1758	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	11	EW:7 NS:7	0.34	0.47	4.08	2.41	Fair	Poor	Medium	Medium

No.	Tree Tag	Botanical & Common Name	Age Class	Height (m)	Canopy Spread (m)	DBH (m)	DRC (m)	SRZ (m)	TPZ (m)	Structure	Vitality	ELE	Retention Value
36	1759	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	9	EW:3 NS:3	0.10	0.16	2.00	1.53	Poor	Dead	Dead	 Remove
37	1760	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	7	EW:3 NS:2	0.10	0.12	2.00	1.50	Fair	Fair	Medium	 Low
38	1761	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	13	EW:5 NS:5	0.29	0.40	3.48	2.25	Poor	Fair	Dead	 Remove
39	1762	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	9	EW:1 NS:1	0.12	0.16	2.00	1.53	Very Poor	Dead	Dead	 Remove
40	1763	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	9	EW:2 NS:2	0.20	0.25	2.40	1.85	Very Poor	Dead	Dead	 Remove
41	1764	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	9	EW:2 NS:2	0.25	0.30	3.00	2.00	Very Poor	Dead	Dead	 Remove
42	1765	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	7	EW:4 NS:4	0.10	0.12	2.00	1.50	Fair	Fair	Medium	 Medium
43	1766	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	9	EW:2 NS:5	0.24	0.29	2.88	1.97	Very Poor	Very Poor	Short	 Low
44	1767	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	6	EW:3 NS:5	0.10	0.12	2.00	1.50	Fair	Fair	Medium	 Low
45	1769	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	7	EW:2 NS:2	0.13	0.15	2.00	1.50	Very Poor	Dead	Dead	 Remove
46	1768	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	12	EW:6 NS:6	0.38	0.44	4.56	2.34	Very Poor	Dead	Dead	 Remove
47	1770	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	13	EW:3 NS:5	0.26	0.32	3.12	2.05	Poor	Poor	Short	 Low

No.	Tree Tag	Botanical & Common Name	Age Class	Height (m)	Canopy Spread (m)	DBH (m)	DRC (m)	SRZ (m)	TPZ (m)	Structure	Vitality	ELE	Retention Value
48	1771	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	12	EW:5 NS:5	0.29	0.35	3.48	2.13	Very Poor	Very Poor	Short	Low
49	1772	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	7	EW:3 NS:3	0.12	0.18	2.00	1.61	Fair	Poor	Short	Low
50	1773	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	14	EW:8 NS:6	0.44	0.53	5.28	2.53	Fair	Fair	Medium	Medium
51	1774	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	7	EW:3 NS:6	0.13	0.20	2.00	1.68	Fair	Fair	Medium	Low
52	1775	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	8	EW:3 NS:3	0.10	0.13	2.00	1.50	Fair	Poor	Short	Low
53	1776	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	8	EW:2 NS:2	0.10	0.13	2.00	1.50	Poor	Dead	Dead	Remove
54	1777	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	10	EW:3 NS:3	0.20	0.23	2.40	1.79	Poor	Very Poor	Short	Low
55	1778	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	10	EW:2 NS:2	0.23	0.24	2.76	1.82	Poor	Dead	Dead	Remove
56	1779	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	13	EW:4 NS:4	0.24	0.32	2.88	2.05	Poor	Very Poor	Short	Low
57	1780	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	13	EW:3 NS:3	0.26	0.30	3.12	2.00	Poor	Dead	Dead	Remove
58	1781	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	14	EW:7 NS:8	0.37	0.37	4.44	2.18	Fair	Poor	Short	Low
59	1782	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	11	EW:2 NS:2	0.19	0.20	2.28	1.68	Poor	Very Poor	Short	Low

No.	Tree Tag	Botanical & Common Name	Age Class	Height (m)	Canopy Spread (m)	DBH (m)	DRC (m)	SRZ (m)	TPZ (m)	Structure	Vitality	ELE	Retention Value
60	1783	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	13	EW:7 NS:7	0.35	0.37	4.20	2.18	Poor	Very Poor	Short	 Low
61	1784	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	9	EW:4 NS:7	0.21	0.40	2.52	2.25	Fair	Fair	Medium	 Medium
62	1785	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	9	EW:4 NS:7	0.21	0.40	2.52	2.25	Fair	Fair	Medium	 Medium
63	1786	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	10	EW:7 NS:7	0.29	0.32	3.48	2.05	Fair	Poor	Medium	 Low
64	1787	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	9	EW:4 NS:7	0.21	0.36	2.52	2.15	Fair	Fair	Medium	 Medium
65	1788	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	7	EW:4 NS:4	0.14	0.19	2.00	1.65	Fair	Fair	Medium	 Low
66	1789	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	13	EW:5 NS:6	0.24	0.29	2.88	1.97	Fair	Fair	Medium	 Medium
67	1790	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	13	EW:6 NS:7	0.24	0.29	2.88	1.97	Fair	Fair	Medium	 Medium
68	1791	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	13	EW:5 NS:6	0.24	0.29	2.88	1.97	Poor	Very Poor	Short	 Low
69	1702	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	13	EW:5 NS:6	0.30	0.41	3.60	2.28	Fair	Fair	Medium	 Medium
70	1793	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	6	EW:3 NS:3	0.10	0.13	2.00	1.50	Fair	Fair	Medium	 Low
71	1794	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	6	EW:3 NS:3	0.10	0.13	2.00	1.50	Fair	Fair	Medium	 Low

No.	Tree Tag	Botanical & Common Name	Age Class	Height (m)	Canopy Spread (m)	DBH (m)	DRC (m)	SRZ (m)	TPZ (m)	Structure	Vitality	ELE	Retention Value
72	1795	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	10	EW:8 NS:5	0.33	0.49	3.96	2.45	Fair	Fair	Medium	■ Medium
73	1796	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	10	EW:8 NS:3	0.22	0.30	2.64	2.00	Fair	Fair	Medium	■ Medium
74	1797	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	10	EW:6 NS:7	0.28	0.34	3.36	2.10	Fair	Fair	Medium	■ Medium
75	1800	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	6	EW:4 NS:4	0.12	0.14	2.00	1.50	Fair	Good	Long	■ Medium
76	1801	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	10	EW:8 NS:8	0.46	0.52	5.52	2.51	Poor	Very Poor	Short	■ Low
77	1802	<i>Eucalyptus moluccana</i> Grey Box	Mature	14	EW:6 NS:7	0.76	0.90	9.12	3.17	Fair	Fair	Long	■ High
78	1803	<i>Eucalyptus moluccana</i> Grey Box	Mature	14	EW:6 NS:7	0.85	0.76	10.20	2.95	Fair	Poor	Medium	■ Medium
79	1736	<i>Syzygium smithii</i> Lilly Pilly	Mature	5	EW:8 NS:9	0.46	0.63	5.52	2.73	Poor	Good	Medium	■ Medium
80	1810	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	7	EW:4 NS:4	0.12	0.14	2.00	1.50	Fair	Fair	Medium	■ Medium
81	1809	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	8	EW:4 NS:4	0.16	0.19	2.00	1.65	Fair	Fair	Medium	■ Medium
82	1808	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	8	EW:4 NS:4	0.16	0.19	2.00	1.65	Fair	Fair	Medium	■ Medium
83	1806	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	8	EW:4 NS:4	0.12	0.13	2.00	1.50	Fair	Fair	Medium	■ Medium

No.	Tree Tag	Botanical & Common Name	Age Class	Height (m)	Canopy Spread (m)	DBH (m)	DRC (m)	SRZ (m)	TPZ (m)	Structure	Vitality	ELE	Retention Value
84	1807	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	8	EW:4 NS:4	0.16	0.19	2.00	1.65	Fair	Fair	Medium	Medium
85	1805	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	8	EW:4 NS:4	0.16	0.19	2.00	1.65	Fair	Fair	Medium	Medium
86	1804	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	8	EW:4 NS:4	0.15	0.17	2.00	1.57	Fair	Fair	Medium	Medium
87	1811	<i>Eucalyptus moluccana</i> Grey Box	Mature	12	EW:9 NS:9	0.53	0.50	6.36	2.47	Fair	Fair	Long	Medium
88	1812	<i>Eucalyptus moluccana</i> Grey Box	Mature	12	EW:9 NS:9	0.48	0.52	5.76	2.51	Fair	Poor	Long	Medium
89	1813	<i>Eucalyptus moluccana</i> Grey Box	Mature	12	EW:8 NS:7	0.42	0.45	5.04	2.37	Fair	Fair	Long	Medium
90	1814	<i>Eucalyptus moluccana</i> Grey Box	Mature	9	EW:9 NS:9	0.21	0.22	2.52	1.75	Fair	Poor	Short	Low
91	1815	<i>Eucalyptus moluccana</i> Grey Box	Mature	9	EW:7 NS:7	0.33	0.42	3.96	2.30	Poor	Dead	Dead	Remove
92	1817	<i>Eucalyptus moluccana</i> Grey Box	Mature	11	EW:9 NS:9	0.50	0.67	6.00	2.80	Fair	Poor	Medium	Medium
93	1816	<i>Grevillea robusta</i> Silky Oak	Semi Mature	6	EW:3 NS:3	0.13	0.14	2.00	1.50	Good	Good	Long	Medium
94	1818	<i>Eucalyptus moluccana</i> Grey Box	Mature	12	EW:9 NS:10	0.47	0.56	5.64	2.59	Fair	Fair	Long	Medium
95	1819	<i>Eucalyptus moluccana</i> Grey Box	Mature	12	EW:8 NS:8	0.47	0.56	5.64	2.59	Fair	Fair	Long	Medium

No.	Tree Tag	Botanical & Common Name	Age Class	Height (m)	Canopy Spread (m)	DBH (m)	DRC (m)	SRZ (m)	TPZ (m)	Structure	Vitality	ELE	Retention Value
96	1820	<i>Eucalyptus moluccana</i> Grey Box	Mature	12	EW:9 NS:10	0.50	0.51	6.00	2.49	Fair	Fair	Long	Medium
97	1821	<i>Eucalyptus moluccana</i> Grey Box	Mature	13	EW:6 NS:6	0.35	0.42	4.20	2.30	Fair	Fair	Long	Medium
98	1823	<i>Eucalyptus moluccana</i> Grey Box	Mature	13	EW:9 NS:8	0.45	0.52	5.40	2.51	Fair	Fair	Long	Medium
99	1824	<i>Eucalyptus moluccana</i> Grey Box	Mature	12	EW:8 NS:8	0.35	0.40	4.20	2.25	Fair	Fair	Long	Medium
100	1822	<i>Eucalyptus moluccana</i> Grey Box	Mature	12	EW:4 NS:4	0.25	0.26	3.00	1.88	Fair	Fair	Long	Medium
101	1825	<i>Eucalyptus moluccana</i> Grey Box	Mature	12	EW:3 NS:3	0.27	0.30	3.24	2.00	Poor	Dead	Dead	Remove
102	1826	<i>Eucalyptus moluccana</i> Grey Box	Mature	13	EW:6 NS:7	0.30	0.38	3.60	2.20	Fair	Fair	Long	Medium
103	1827	<i>Eucalyptus moluccana</i> Grey Box	Mature	12	EW:4 NS:6	0.25	0.30	3.00	2.00	Fair	Fair	Long	Medium
104	1828	<i>Eucalyptus moluccana</i> Grey Box	Mature	14	EW:7 NS:6	0.26	0.35	3.12	2.13	Fair	Fair	Long	Medium
105	1829	<i>Eucalyptus moluccana</i> Grey Box	Mature	12	EW:5 NS:5	0.27	0.30	3.24	2.00	Fair	Fair	Long	Medium
106	1830	<i>Eucalyptus moluccana</i> Grey Box	Mature	12	EW:7 NS:7	0.28	0.30	3.36	2.00	Fair	Poor	Long	Low
107	1831	<i>Eucalyptus moluccana</i> Grey Box	Mature	12	EW:3 NS:3	0.16	0.20	2.00	1.68	Fair	Fair	Long	Medium

No.	Tree Tag	Botanical & Common Name	Age Class	Height (m)	Canopy Spread (m)	DBH (m)	DRC (m)	SRZ (m)	TPZ (m)	Structure	Vitality	ELE	Retention Value
108	1832	<i>Eucalyptus moluccana</i> Grey Box	Mature	12	EW:5 NS:3	0.25	0.30	3.00	2.00	Fair	Fair	Long	 Medium
109	1833	<i>Eucalyptus moluccana</i> Grey Box	Mature	12	EW:2 NS:4	0.30	0.40	3.60	2.25	Fair	Fair	Long	 Medium
110	1834	<i>Eucalyptus moluccana</i> Grey Box	Mature	12	EW:4 NS:4	0.28	0.30	3.36	2.00	Poor	Dead	Dead	 Remove
111	1835	<i>Eucalyptus moluccana</i> Grey Box	Mature	12	EW:4 NS:7	0.31	0.35	3.72	2.13	Fair	Fair	Long	 Medium
112	1836	<i>Eucalyptus moluccana</i> Grey Box	Mature	14	EW:4 NS:8	0.33	0.42	3.96	2.30	Fair	Fair	Long	 Medium
113	1837	<i>Eucalyptus moluccana</i> Grey Box	Mature	14	EW:9 NS:10	0.46	0.52	5.52	2.51	Fair	Fair	Long	 Medium
114	1838	<i>Eucalyptus moluccana</i> Grey Box	Mature	15	EW:10 NS:10	0.49	0.56	5.88	2.59	Fair	Fair	Medium	 Medium
115	1839	<i>Eucalyptus moluccana</i> Grey Box	Mature	14	EW:5 NS:5	0.28	0.30	3.36	2.00	Fair	Fair	Medium	 Medium
116	1840	<i>Eucalyptus moluccana</i> Grey Box	Mature	12	EW:7 NS:7	0.30	0.38	3.60	2.20	Fair	Fair	Medium	 Medium
117	1841	<i>Eucalyptus moluccana</i> Grey Box	Mature	15	EW:10 NS:10	0.98	1.02	11.76	3.34	Fair	Poor	Medium	 Medium
118	1842	<i>Eucalyptus moluccana</i> Grey Box	Mature	15	EW:8 NS:8	0.54	0.60	6.48	2.67	Fair	Fair	Medium	 Medium
119	1843	<i>Eucalyptus moluccana</i> Grey Box	Mature	15	EW:9 NS:9	0.52	0.60	6.24	2.67	Fair	Poor	Medium	 Medium

No.	Tree Tag	Botanical & Common Name	Age Class	Height (m)	Canopy Spread (m)	DBH (m)	DRC (m)	SRZ (m)	TPZ (m)	Structure	Vitality	ELE	Retention Value
120	1844	<i>Eucalyptus moluccana</i> Grey Box	Mature	12	EW:8 NS:8	0.42	0.43	5.04	2.32	Fair	Fair	Long	Medium
121	1845	<i>Eucalyptus moluccana</i> Grey Box	Mature	14	EW:10 NS:10	0.54	0.80	6.48	3.01	Fair	Fair	Medium	Medium
122	1846	<i>Eucalyptus moluccana</i> Grey Box	Mature	16	EW:8 NS:8	0.43	0.50	5.16	2.47	Poor	Dead	Dead	Remove
123	1847	<i>Eucalyptus moluccana</i> Grey Box	Mature	19	EW:9 NS:9	0.59	0.64	7.08	2.74	Fair	Fair	Medium	Medium
124	1848	<i>Eucalyptus moluccana</i> Grey Box	Mature	18	EW:8 NS:9	0.44	0.44	5.28	2.34	Fair	Fair	Medium	Medium
125	1850	<i>Eucalyptus moluccana</i> Grey Box	Mature	20	EW:8 NS:9	0.45	0.48	5.40	2.43	Fair	Fair	Medium	Medium
126	1849	<i>Eucalyptus moluccana</i> Grey Box	Mature	20	EW:7 NS:7	0.35	0.42	4.20	2.30	Fair	Fair	Medium	Medium
127	1851	<i>Eucalyptus moluccana</i> Grey Box	Mature	17	EW:8 NS:6	0.30	0.36	3.60	2.15	Fair	Fair	Medium	Medium
128	1852	<i>Eucalyptus moluccana</i> Grey Box	Mature	15	EW:9 NS:9	0.48	0.54	5.76	2.55	Fair	Poor	Short	Low
129	1854	<i>Eucalyptus moluccana</i> Grey Box	Mature	14	EW:9 NS:9	0.32	0.40	3.84	2.25	Poor	Dead	Dead	Remove
130	1855	<i>Eucalyptus moluccana</i> Grey Box	Mature	14	EW:9 NS:9	0.51	0.60	6.12	2.67	Good	Fair	Medium	Medium
131	1856	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	8	EW:7 NS:7	0.40	0.40	4.80	2.25	Fair	Fair	Medium	Medium

No.	Tree Tag	Botanical & Common Name	Age Class	Height (m)	Canopy Spread (m)	DBH (m)	DRC (m)	SRZ (m)	TPZ (m)	Structure	Vitality	ELE	Retention Value
132	1857	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	7	EW:2 NS:2	0.12	0.15	2.00	1.50	Fair	Fair	Medium	 Low
133	1858	<i>Eucalyptus moluccana</i> Grey Box	Mature	11	EW:6 NS:6	0.27	0.30	3.24	2.00	Fair	Fair	Medium	 Medium
134	1859	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	7	EW:6 NS:6	0.20	0.20	2.40	1.68	Fair	Fair	Medium	 Low
135	1860	<i>Eucalyptus moluccana</i> Grey Box	Mature	14	EW:6 NS:6	0.29	0.36	3.48	2.15	Fair	Fair	Medium	 Medium
136	1861	<i>Eucalyptus moluccana</i> Grey Box	Mature	11	EW:6 NS:6	0.21	0.26	2.52	1.88	Fair	Fair	Medium	 Medium
137	1862	<i>Eucalyptus moluccana</i> Grey Box	Mature	11	EW:5 NS:5	0.27	0.34	3.24	2.10	Poor	Dead	Dead	 Remove
138	1863	<i>Eucalyptus moluccana</i> Grey Box	Mature	14	EW:6 NS:8	0.38	0.40	4.56	2.25	Fair	Poor	Medium	 Medium
139	1864	<i>Eucalyptus moluccana</i> Grey Box	Semi Mature	7	EW:4 NS:4	0.12	0.15	2.00	1.50	Fair	Fair	Medium	 Low
140	1865	<i>Eucalyptus moluccana</i> Grey Box	Mature	13	EW:6 NS:6	0.30	0.30	3.60	2.00	Poor	Dead	Dead	 Remove
141	1866	<i>Eucalyptus moluccana</i> Grey Box	Mature	13	EW:6 NS:6	0.30	0.30	3.60	2.00	Poor	Dead	Dead	 Remove
142	1868	<i>Eucalyptus moluccana</i> Grey Box	Mature	13	EW:6 NS:6	0.27	0.30	3.24	2.00	Poor	Dead	Dead	 Remove
143	1867	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	7	EW:6 NS:6	0.33	0.40	3.96	2.25	Fair	Fair	Medium	 Low

No.	Tree Tag	Botanical & Common Name	Age Class	Height (m)	Canopy Spread (m)	DBH (m)	DRC (m)	SRZ (m)	TPZ (m)	Structure	Vitality	ELE	Retention Value
144	1869	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	7	EW:6 NS:6	0.23	0.30	2.76	2.00	Fair	Fair	Medium	 Low
145	1870	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	7	EW:7 NS:7	0.33	0.45	3.96	2.37	Fair	Fair	Medium	 Low
146	1871	<i>Eucalyptus moluccana</i> Grey Box	Mature	14	EW:4 NS:4	0.19	0.24	2.28	1.82	Poor	Dead	Dead	 Remove
147	1872	<i>Eucalyptus moluccana</i> Grey Box	Mature	14	EW:4 NS:4	0.16	0.20	2.00	1.68	Poor	Dead	Dead	 Remove
148	1873	<i>Eucalyptus moluccana</i> Grey Box	Mature	14	EW:7 NS:7	0.30	0.34	3.60	2.10	Poor	Dead	Dead	 Remove
149	1874	<i>Eucalyptus moluccana</i> Grey Box	Mature	10	EW:6 NS:8	0.32	0.38	3.84	2.20	Fair	Fair	Medium	 Medium
150	1877	<i>Eucalyptus moluccana</i> Grey Box	Mature	13	EW:6 NS:7	0.27	0.30	3.24	2.00	Fair	Fair	Short	 Low
151	1878	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	7	EW:6 NS:6	0.33	0.40	3.96	2.25	Fair	Fair	Medium	 Low
152	1877	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	7	EW:6 NS:6	0.25	0.27	3.00	1.91	Fair	Fair	Medium	 Low
153	1875	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	7	EW:6 NS:6	0.33	0.40	3.96	2.25	Fair	Fair	Medium	 Low
154	1879	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	7	EW:6 NS:6	0.33	0.40	3.96	2.25	Fair	Fair	Medium	 Low
155	1880	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	7	EW:6 NS:6	0.33	0.40	3.96	2.25	Fair	Fair	Medium	 Low

No.	Tree Tag	Botanical & Common Name	Age Class	Height (m)	Canopy Spread (m)	DBH (m)	DRC (m)	SRZ (m)	TPZ (m)	Structure	Vitality	ELE	Retention Value
156	1881	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	7	EW:6 NS:6	0.33	0.60	3.96	2.67	Fair	Fair	Medium	 Low
157	1883	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	7	EW:6 NS:6	0.26	0.45	3.12	2.37	Fair	Fair	Medium	 Low
158	1884	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	7	EW:6 NS:6	0.25	0.64	3.00	2.74	Fair	Fair	Medium	 Low
159	1882	<i>Eucalyptus moluccana</i> Grey Box	Mature	12	EW:6 NS:6	0.35	0.36	4.20	2.15	Poor	Very Poor	Short	 Remove
160	1885	<i>Eucalyptus moluccana</i> Grey Box	Mature	10	EW:8 NS:7	0.20	0.37	2.40	2.18	Fair	Fair	Medium	 Medium
161	1886	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	7	EW:6 NS:6	0.37	0.58	4.44	2.63	Fair	Fair	Medium	 Low
162	1888	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	7	EW:6 NS:6	0.26	0.30	3.12	2.00	Fair	Fair	Medium	 Low
163	1887	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	7	EW:6 NS:6	0.26	0.30	3.12	2.00	Fair	Fair	Medium	 Low
164	1893	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	7	EW:6 NS:5	0.13	0.26	2.00	1.88	Fair	Fair	Medium	 Low
165	1892	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	12	EW:10 NS:10	0.50	0.77	6.00	2.97	Fair	Fair	Medium	 Medium
166	1891	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	12	EW:9 NS:7	0.46	0.49	5.52	2.45	Fair	Fair	Medium	 Medium
167	1890	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	12	EW:8 NS:7	0.33	0.33	3.96	2.08	Fair	Fair	Medium	 Medium

No.	Tree Tag	Botanical & Common Name	Age Class	Height (m)	Canopy Spread (m)	DBH (m)	DRC (m)	SRZ (m)	TPZ (m)	Structure	Vitality	ELE	Retention Value
168	1889	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	12	EW:5 NS:5	0.27	0.38	3.24	2.20	Poor	Fair	Medium	Low
169	1894	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	7	EW:6 NS:5	0.13	0.20	2.00	1.68	Fair	Fair	Medium	Low
170	1895	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	9	EW:8 NS:7	0.44	0.40	5.28	2.25	Fair	Poor	Medium	Low
171	1896	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	9	EW:8 NS:9	0.51	0.54	6.12	2.55	Fair	Fair	Medium	Low
172	1897	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	7	EW:3 NS:3	0.26	0.30	3.12	2.00	Poor	Dead	Dead	Remove
173	1898	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	7	EW:6 NS:5	0.40	0.40	4.80	2.25	Fair	Fair	Medium	Low
174	1899	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	7	EW:9 NS:6	0.37	0.46	4.44	2.39	Fair	Poor	Medium	Low
175	1900	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	7	EW:7 NS:6	0.32	0.37	3.84	2.18	Fair	Fair	Medium	Low
176	1901	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	10	EW:7 NS:8	0.40	0.45	4.80	2.37	Fair	Fair	Medium	Medium
177	1902	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	10	EW:9 NS:8	0.54	0.73	6.48	2.90	Fair	Fair	Medium	Medium
178	1903	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	7	EW:7 NS:6	0.32	0.37	3.84	2.18	Fair	Fair	Medium	Low
179	1904	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	10	EW:7 NS:7	0.32	0.37	3.84	2.18	Fair	Fair	Medium	Medium

No.	Tree Tag	Botanical & Common Name	Age Class	Height (m)	Canopy Spread (m)	DBH (m)	DRC (m)	SRZ (m)	TPZ (m)	Structure	Vitality	ELE	Retention Value
180	1905	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	12	EW:7 NS:8	0.40	0.49	4.80	2.45	Fair	Fair	Medium	Medium
181	1906	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	7	EW:4 NS:4	0.21	0.26	2.52	1.88	Fair	Fair	Medium	Low
182	1907	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	9	EW:7 NS:7	0.31	0.40	3.72	2.25	Fair	Fair	Medium	Low
183	1908	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	7	EW:6 NS:9	0.32	0.40	3.84	2.25	Fair	Fair	Medium	Low
184	1909	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	10	EW:7 NS:6	0.31	0.32	3.72	2.05	Fair	Fair	Medium	Low
185	1910	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	10	EW:7 NS:5	0.31	0.33	3.72	2.08	Fair	Fair	Medium	Low
186	1911	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	10	EW:5 NS:2	0.32	0.35	3.84	2.13	Fair	Fair	Medium	Low
187	1912	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	10	EW:6 NS:7	0.32	0.36	3.84	2.15	Fair	Fair	Medium	Low
188	1913	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	7	EW:8 NS:8	0.44	0.46	5.28	2.39	Fair	Fair	Medium	Low
189	1914	<i>Melaleuca styphelioides</i> Prickly-leaved Paperbark	Mature	7	EW:6 NS:6	0.27	0.34	3.24	2.10	Fair	Fair	Medium	Low
190	1915	<i>Eucalyptus fibrosa</i> Broad-leaved Ironbark	Mature	21	EW:15 NS:13	0.78	0.92	9.36	3.20	Fair	Good	Long	High
191	1916	<i>Eucalyptus fibrosa</i> Broad-leaved Ironbark	Semi Mature	7	EW:4 NS:4	0.16	0.19	2.00	1.65	Good	Good	Medium	Medium

No.	Tree Tag	Botanical & Common Name	Age Class	Height (m)	Canopy Spread (m)	DBH (m)	DRC (m)	SRZ (m)	TPZ (m)	Structure	Vitality	ELE	Retention Value
192	1917	<i>Eucalyptus punctata</i> Grey Gum	Mature	22	EW:20 NS:20	1.12	1.15	13.44	3.51	Fair	Fair	Long	High
193	1918	<i>Eucalyptus botryoides</i> Southern Mahogany	Mature	23	EW:26 NS:20	1.39	1.90	15.00	4.33	Fair	Poor	Medium	High

KEY

- **Diameter at Breast Height (DBH) & Diameter above Root Collar (DRC):** per Standards Australia AS4970-2009 Protection of trees on development sites.
- **Tree Protection Zone (TPZ), Structural Root Zone (SRZ) & Encroachment %:** calculated per QAA & ProofSafe Calculators.
- **Canopy Spread:** estimation of canopy spread to the four (4) cardinal points. (North-South) & (East-West).
- **Estimated Life Expectancy (ELE):** adapted per (Barrell, 1996) & (Barrell, 2000).
 - ❖ **Dead/Declining:** 0-5yrs
 - ❖ **Short:** 5-15yrs
 - ❖ **Medium:** 15-40yrs
 - ❖ **Long:** >40yrs
- **Landscape Significance & Retention Value:** Significance of a Tree, Assessment Rating System (STARS), Institute of Australian Consulting Arboriculturists, Australia. (The Retention Value of a tree or group of trees was determined by using a combination of environmental, cultural, physical and social values).
 - ❖ **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 per Standards Australia AS4970-2009. Protection of trees on development sites.
 - ❖ **Medium:** These trees are moderately important for retention. Their removal should only be considered if adversely affecting the proposed building/works and all other alternatives have been considered and exhausted.
 - ❖ **Low:** These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.
 - ❖ **Remove:** These trees are considered hazardous, or in irreversible decline, or weeds and should be removed irrespective of deve

10 References

- Barrell, J.D. (1996). *'Pre-planning Tree Surveys: Safe Useful Life Expectancy (SULE) is the Natural Progression'*. Arboricultural Journal, Vol 17 pp 33-46.
- Barrell, J.D. (2009). *'Tree AZ. Detailed guidance on its use'*. Version 10.10 – ANZ. United Kingdom.
- Breloer, H. and Mattheck, C. (1994), *'The Body Language of Trees: A Handbook for Failure Analysis'*. Stationary Office Books, London, England, UK.
- Boddy, L., and A.D.M Rayner. (1983). 'Origins of Decay in living deciduous trees: The role of moisture content and re-appraisal of the expanded concept of tree decay'. New Phytology 94: 623-641.
- Callow, C., May, P. and Johnstone, D. (2018). *'Tree vitality assessment in urban landscapes'*. Forests. 9(5), 279.
- Draper, D. B and Richards, P.A. (2009). *'Dictionary for Managing Trees in Urban Environments'*. CSIRO Publishing, Victoria, Australia.
- Dobbertin, M. (2005). *'Tree growth as indicator of tree vitality and of tree reaction to environmental stress: a review'*. European Journal of Forest Research 124: 319-333.
- Dunster, J., Smiley, E., Matheny, N. and Lily S. (2013). *'Tree Risk Assessment-Manual'*. International Society of Arboriculture, Champaign, IL.
- Eisner, N., Gilman, E.F. Grabosky, J. and Beeson, R.C. (2002). *'Branch morphology affects compartmentalization of pruning wounds'*. Journal of Arboriculture 28:99-105.
- Gilman, E. and Lily, S. (2002). *'Best Management Practices Tree Pruning'*. International Society of Arboriculture, Champaign IL. Pp 35.
- Harris, R.W., Clark, J.R. and Matheny, N.P. (2004). *'Arboriculture: Integrated management of landscape trees, shrubs and vines, 4th edition'*. Prentice Hall, New Jersey, USA.
- Hendrickson, N., Fraedrich, B. and Smiley, E. (2007). *'Tree Risk Management'*. Bartlett Tree Research Laboratories, Charlotte, North Carolina, USA.
- Hitchmough, J.D. (1994) *'Urban Landscape Management'*. Inkata Press. Australia.
- IACA. (2010). *'Significance of a Tree, Assessment Rating System (STARS)'*. Institute of Australian Consulting Arboriculturists. Australia, www.iaca.org.au
- Jim, C.Y. (2003) *'Protection of urban trees from trenching damage in compact city environments.'* Cities 20, 87-94.
- Kozlowski, T., Kramer, J., and Pallardy, S. G. (1991) *'The Physiological Ecology of Woody Plants'*, Academic Press, San Diego.
- Lily, S., Matheny, N., and Smiley, E. (2017). *'Best Management Practices - Tree Risk Assessment'*. International Society of Arboriculture. Champaign, IL 61826-3129.
- Lonsdale, D. (2010). *'Principles of Tree Hazard Assessment and Management'*. 9th impression, TSO, Norwich.
- Mattheck, C. and Breloer, H. (1994). *'The Body Language of Trees, Research for Amenity Trees No. 4'*. The Stationery Office, London.
- Matheny, N. and Clark, J. (1994). *'A Photographic guide to Hazard Trees in Urban Areas'*. 2nd Edition. Illinois, USA.
- Niklas, K. (1992). *'Plant Biomechanics: An Engineering Approach to Plant Form and Function'*. The University of Chicago Press, Illinois, USA.
- Santamour, F. (1990) *'Trees for Urban Planting: Diversity, Uniformity, and Common Sense'*. Procedures of 7th Conference of Metropolitan Tree Improvement Alliance (METRIA).
- Schwab J C, (2009) *'Planning the Urban Forest: Ecology, Economy and Community Development'*. American Planning Association Planning Advisory Service Report No. 555
- Standards Australia AS 4970-2009 *Protection of Trees on Development Sites*. Standards Australia, Sydney, Australia.
- Standards Australia AS 4373-2007 *Pruning of Amenity Trees*. Standards Australia, Sydney, Australia.
- The University of Melbourne. (2016). *'Burnley Plant Guide'*. The University of Melbourne.
- Watson, G., Hewitt, A., Custic, M. and Lo, M. (2014). *'The Management of Tree Root Systems in Urban and Suburban Settings II: A Review of Strategies to Mitigate Human Impacts'*. Arboriculture & Urban Forestry 2014. 40(5): 249-271.

11 Glossary

The following definitions are stated in the Glossary of Arboricultural Terms, International Society of Arboriculture 2011, unless otherwise stated.

Abiotic: plant ailment caused by non-living, environmental, or man-made agents

Adaptive Growth: or Response Growth is new wood produced in response to damage or loads, which compensates for higher strain (deformation) in marginal fibres; it includes reaction wood (compression & tension) and wound wood.

Age class: Described as Young, Semi-Mature, Mature, Over Mature or Veteran. All these dimensions should be determined by species and site factors.

Barrier Zone: chemically defended tissue formed by the still living cambium, after a tree is wounded or invaded by pathogens to inhibit the spread of decay into new annual growth rings. Wall 4 in CODIT model. Contrast with reaction zone

Bifurcation: Natural division of a branch or stem into two or more stems or parts

Biotic: pertaining to non-human living organism/ biotic agent: a living organism capable of causing disease/ biotic disorder: disorder caused by a living organism.

Bracket: British English term for fruiting body of a decay fungus. See *Conk*.

Chlorosis: is a yellowing of leaf tissue due to a lack of chlorophyll. Possible causes of chlorosis include poor drainage, damaged roots, compacted roots, high alkalinity, and nutrient deficiencies in the plant.

Codominant Structure: Stems or trunks of about the same size originating from the same position from the main stem⁵². When the stem bark ridge turns upward the union is strong; when the ridge turns inward the union is weak, a likely point of failure in storm or windy weather conditions or where increasing weight causes undue stress on the defective union.

CODIT: acronym for Compartmentalisation of Decay/Disease In Trees (refer Compartmentalisation).

Compartmentalisation: Dynamic tree defence process involving protection features that resist the spread of pathogens and decay causing organisms. Natural defence process in trees by which chemical and physical boundaries are created that act to limit the spread of disease and decay organisms.

Compaction: Results from loads or stress forces applied to the soil as well as shear forces. Both foot traffic and vehicle traffic exert both forces on soils. Vehicle traffic may cause significant compaction at depths of 150–200 mm (the area in which most absorbing roots are located). The degree of compaction will depend on weight of vehicles, number of movements, soil moisture levels and clay content. Soil handling, stockpiling, and transporting also tend to lead to the breakdown of soil structure and thus to compaction. Vibration as a result of frequent traffic or adjacent construction activities will also compact soils.

Compression wood: (1) in mechanics, the action of forces to squeeze, crush or push together any material (s) or substance(s): contrast with tension. (2) the ability of an internal combustion engine to contain or pressurized a combustible fuel - air mixture.

Conk: Fruiting body or non-fruiting body (sterile conk) of a fungus. Often associated with decay.

Crown: Portion of the tree consisting of branches and leaves and any part of the trunk from which branches arise.

Crown/Canopy: The main foliage bearing section of the tree, these terms are interchangeable.

Crown damage: The canopy of trees can be directly or indirectly damaged. Incorrect techniques of pruning such as lopping or flush cutting may produce wounds that are susceptible to infection by wood decay organisms. Similarly, mechanical damage to branches by machinery, etc. will also create wounds. Trees automatically respond to wounding and in doing so use stored sugars. Any wound places an additional load on trees that will inevitably be stressed during construction.

Damping: Damping occurs where energy is dissipated. In trees, damping occurs naturally in three main ways with aerodynamic damping of the leaves, internal damping in the wood and root zones, and with mass damping of the branches.

Deadwood: Dead branches within the canopy of tree. Deadwood is a naturally occurring feature of most tree species and comprises dead or decaying branches within the canopy of a tree. Deadwood may have habitat value and require removal only according to the considered risk of its location, i.e. high use pedestrian area or damage to adjacent infrastructure.

Removal of deadwood is generally recommended only where it represents an unacceptable level of hazard. Consideration of the need for deadwood removal should take into account the occupancy of the target zone, i.e. high use pedestrian area or presence of infrastructure, possible damage to the tree during its removal as well as its conservation for habitat value. In some instances, retention of a reduced tree structure for habitat purposes maybe considered appropriate, especially when hollows are present. Further reference: *Principles of Tree Hazard Assessment. Lonsdale, David. TSO, (2009).*

Dead wooding: (Crown cleaning): The removal of dead branches⁶⁰. Recommendation to remove deadwood is for removal of all dead branches within tree canopy > 30mm diameter in trees which overhang pedestrian or vehicular areas and removal of all dead branches within tree canopy > 50mm diameter if trees are located in a Parkland or similar area.

Decay: The process of degradation of woody tissues by micro-organisms.

Desiccation: Severe drying out. Dehydration.

Drip Line: Is the imaginary perimeter line at soil surface level which is directly below the outermost edge of the tree's foliage or canopy.

Estimated Life Expectancy (ELE): Assessed on trees of particular species in the urban environment, including health and structural conditions which may exist.

Epicormic bud: Latent or adventitious bud located at the cambium and concealed by the bark.

Epicormic shoots: Shoots produced from epicormic buds at the cambium of trunks or branches.

Field Capacity: Maximum soil moisture content following the drainage of water due to the force of gravity.

Hollow: is a semi-enclosed cavity which has naturally formed in the trunk or branch of a tree.

Included bark: Inwardly formed bark within the junction of branches or codominant stems.

Kino: Dark red to brown resin-like substance produced by trees in the genera Eucalyptus, Pterocarpus and Butea and related genera. Kino forms in the barrier zones. Large kino veins form in some tree in response to injury and infection.

Leaves: The main function of leaves is photosynthesis, that is, the production of sugars and oxygen. The sugars produced by the leaves (and any other green tissue) are the source of chemical energy for all living cells in the entire plant and as such are essential for the normal functioning and survival of the tree. Anything that directly or indirectly damages the leaves will interfere with photosynthesis.

Non-woody part of tree: 'organs that increase the surface area of vascular plants, thereby capturing more solar energy for photosynthesis'. ... maybe classified as microphylls (usually spine-shaped leaves with a single vein) or megaphylls (leaves with a highly branched vascular system). Needles and leaves are major energy trapping organs of a tree. Flowers are modified leaves as they fit the definition of an organ (*Shigo.2003*).

Macropore: Relatively larger space between soil particles that is usually air-filled and allows for water movement and root penetration. Contrast with micropore.

Mature: Trees are close to their full height and crown size.

Micropore: Space between soil particles that is relatively small and likely to be water filled.

Mortality Spiral: Sequence of stressful events or conditions causing the decline and eventual death of a tree. Once in a mortality spiral trees are more likely to succumb to any further or additional stress factors such as drought, pest infestation or disease. (See definition Stress)

Necrosis: Localised death of tissue in a living organism.

Occlusion (See wound): Shut in or out. Occlusion is the process of trees forming callus and clear wood over wounds.

Over Mature: Associated with crown retrenchment.

Pathogen: A disease-causing organism.

Pipe: Mud filled channel extending upwards from root/ stem zone of tree.

Phototropism: Influence of light on the direction of plant growth. Tendency of plants to grow towards light.

Phloem: Plant vascular tissue that transports photosynthates and growth regulators. Situated on the inside of the bark, just outside the cambium. Is bidirectional (transports up and down). Contrast with xylem.

Photosynthesis: Process in green plants (and in algae and some bacteria) by which light energy is used to form glucose (chemical energy) from water and carbon dioxide.

Reaction wood: Wood forming in leaning or crooked stems or on lower or upper sides of branches as a means of counteracting the effects of gravity. See compression wood and tension wood.

Semi-mature: Trees are between 1/3 and 2/3 of expected mature height.

Shrub: A woody plant similar to a tree except it is usually several-stemmed and smaller than a tree.

Significance: The quality of being worthy of attention; importance.

Stem / Trunk: Organ which supports branches, leaves, flowers and fruit; may also be referred to as 'the trunk'.

Stress: In Plant Health Care, (1) a factor that negatively affects the health of a plant; a factor that stimulates a response. (2) mechanics, a force per unit area.

Stress – acute: Disorder or disease that occurs suddenly and over a short period of time.

Stress – chronic: Disorder or disease occurring over a longer time.

Structural Root Zone (SRZ): The SRZ is the area of the root system (as defined by AS 4970-2009) used for stability, mechanical support, and anchorage of the tree. Severance of structural roots (>50 mm in diameter) within the SRZ is not recommended as it may lead to the destabilisation and/or serious decline of the tree.

Tree: Long lived woody perennial plant greater than (or usually greater than) 3 m in height with one or relatively few main stems or trunks. A tree has 3 major organs – roots, stem and leaves.

Tree Protection Zone (TPZ): *Australian Standard AS 4970-2009 – Protection of trees on development sites* s1.4.7, A specified area above and below ground and at a given distance from the trunk set aside for the protection of a tree's roots and crown to provide for the viability and stability of a tree to be retained where it is potentially subject to damage by development.

Urban forestry: can be described as the science and art of managing trees, forests and natural ecosystems in and around urban communities to maximise the physiological, sociological, economic and aesthetic benefits that trees provide society (Helms, 1998).

Vigour: Ability of a tree to sustain its life processes. The term 'vigour' in this document is synonymous with commonly used terms such as 'health' and 'vitality'. Inherent genetic capacity of a plant to deal with stress. Physical strength and health. A tree with good vigour has the ability to sustain life processes and synonymous with good health.

Visual Tree Inspection (VTA): Is a detailed visual inspection of a tree and surrounding site.

Vitality: Ability of plant to deal effectively with stress.

Watersprouts/ Epicormic growth (Usually multiple shoots): Shoots produced from epicormic buds at the cambium of trunks or branches. Grows 'from the stub ends and only grows from the outermost living tissue layer of that year's growth. They are weakly attached and prone to falling out or being blown off with the risk increasing markedly as they increase in size. When epicormic shoots arise from stub ends that are decaying, the chances of them falling out are significantly greater'.

Wound: An opening that is created when the bark is cut, removed, or injured.

NOTE: Pruning a live branch always creates a wound, even when the cut is properly made.

Xylem: Main water and mineral-conducting (unidirectional, up only) tissue in trees and other plants. Provides structural support. Arises (inward) from the cambium and becomes wood after lignifying. Contrasted with phloem.

Young: Trees have not yet reached 1/3 of their expected mature height. They are generally growing vigorously and have high apical dominance.

Zone of Rapid Taper: The area within 1–2m of the trunk on larger trees is frequently referred to as the 'Zone of Rapid Taper' because structural roots found there often exhibit considerable secondary thickening- not present on roots farther from the trunk (Wilson 1964). Wilson (1964) additionally reviews the development of this zone and its relation to mechanical stability.

12 Appendix

12.1 Visual Tree Assessment Methodology

- i. In 1994 Claus Mattheck introduced a biomechanically based system of Visual Tree Assessment (VTA), the basis of which is the identification of symptoms produced by a tree in reaction to a weak spot, or area of mechanical stress. The VTA is a non-invasive method of examining the vitality and structural condition of individual trees. It has become the standard approach for surveying trees. By visually examining a tree, an arboriculturalist can gather information on the condition of its roots, trunk, main branch structure, crown, buds and leaves to make an assessment and draw conclusions about general condition and vitality. It is a systematic approach, which directs the arboriculturalist through a procedure from biological and routine observations to analysis, using their understanding of failure criteria.
- ii. In any inspection regarding tree vitality or safety, an arborist will look for biological signs, such as undersized leaves, discoloured foliage, dead branches, large or numerous cankers and fungal fruiting bodies. They will be able to recognize the significance of these observations by comparing them with the typical growth patterns and appearance of the tree involved. They will also look at the tree for signs of structural weakness or for a change in growth patterns that may indicate defects. If mechanical weakness is suspected, there may be a need for more investigation using specialist decay detection and measuring equipment such as the Resistograph and/or Sonic Tomograph.
- iii. A nylon percussion hammer was used to take soundings on the stems of the selected tree. Unexpected tonal changes from hammer sounding on the subject tree's stems can indicate that wood decay may be present. No other decay detecting equipment was used as part of the inspection process.
- iv. Other tools used onsite to gather the necessary dendrological data were a measuring tape, mobile phone and I-pad. Total tree height and canopy spread was recorded using a digital laser range finder (Nikon Forestry Pro). The trunk diameter and DBH height measurements were made by using a conventional measuring tape. No soil analysis, tissue sampling and/or geological investigations were carried out at that time.

12.2 Plant Health Care

- i. Plant Health Care (PHC) is a holistic approach to best management practice with regards to urban tree care and the understanding of the various interactions within the environment in which they grow. The core objectives being the management and enhancement of the tree(s) biological, physiological and aesthetic traits whilst maintaining and/or improving the surrounding landscape's appearance.
- ii. As PHC is science-based it involves routine arboricultural monitoring, proactive soil and plant treatments, along with the identification and mitigation of foreseeable arboricultural risks to person, property and/or the environment.
- iii. It is well documented that even minor encroachments due to urban development and pressures can 'stress' a tree, which in turn can result in a reduced useful life expectancy (Matheny & Clark 1998). Therefore, as abovementioned it is strongly recommended that a proactive Plant Health Care Plan is formulated and implemented with regards to development and tree vitality.

12.3 Descriptors: Age, Vitality & Structure

(Per International Society of Arboriculture guidelines)

TREE AGE CLASS

Young Juvenile or recently planted approximately 1-7 years.
Semi-mature Tree actively growing in size and yet to achieve the expected size <i>in situ</i> .
Maturing Tree is approaching the expected size or has reached the expected size <i>in situ</i> .
Senescent Tree is over mature and has started to decline.

TREE VITALITY

Excellent: The tree is demonstrating excellent or exceptional growth. The tree should exhibit a full canopy of foliage and be free of pest and disease problems.
Good: Foliage of tree is entire, with good colour, very little sign of pathogens and of good density. Growth indicators are good i.e. Extension growth of twigs and wound wood development. Minimal or no canopy dieback (deadwood).
Fair: Tree is showing one or more of the following symptoms: <25% dead wood, minor canopy dieback, foliage generally with good colour though some imperfections may be present. Minor pathogen damage present, with growth indicators such as leaf size, canopy density and twig extension growth typical for the species in this location.
Poor: Tree is showing one or more of the following symptoms of decline; >25% deadwood, canopy dieback is observable, discoloured or distorted leaves. Pathogens present, stress symptoms are observable as reduced leaf size, extension growth and canopy density.
Very Poor: The tree appears to be in a state of decline. The tree is not growing to its full capacity. The canopy may be very thin and sparse. A significant volume of deadwood may be present in the canopy and/or pest and disease problems may be causing a severe decline in tree vitality.
Dead or dying: Tree is in severe decline; >55% deadwood, very little foliage, possibly Epicormic shoots and minimal extension growth.
Dead: The tree is completely dead and exhibits no new growth or live tissue.

**Please note that tree vitality cannot be measured directly, hence growth and physiological parameters that indicate tree vitality are used. Health or Vitality of a tree is evidenced by the general appearance of crown density, leaf colour, presence of epicormic shoots, ability to withstand disease invasion including pathogens and presence of dieback in crown at the time of inspection. Vigour may vary according to seasonal weather patterns and rainfall received (Dobbartin, 2005).*

***Tree Condition: The assessment of a tree(s) condition evaluates factors of tree vitality, form and structure. These descriptors of vitality, form and structure attributed to a tree evaluate the individual specimen to what could be reasonably considered by the arborist as typical for that species growing in situ. It is well documented that specific tree species can display inherently poor biomechanics, such as acute branch attachments with included bark, co-dominant leaders and other poor branch and root architecture. Whilst these 'structural defects' may be deemed arboriculturally flawed, they are typical for the species and may not constitute a foreseeable increased risk. These trees may be assigned a 'structural rating' of 'fair-poor' (as opposed to poor) at the arborist's discretion.*

TREE STRUCTURE

Good: Trunk and scaffold branches show good taper and attachment with minor or no structural defects. Tree is a good example of species with well-developed form showing no obvious root problems or pests and diseases.

Fair/Fair-Poor: Tree shows minor structural defects or minor damage to trunk e.g. bark missing, there could be cavities present. Minimal damage to structural roots. Tree could be seen as typical for this species.

Poor/Very Poor: There are major structural defects, damage to trunk or bark missing. Co-dominant stems could be present with likely points of failure. Girdling or damaged roots obvious. Tree is structurally problematic.

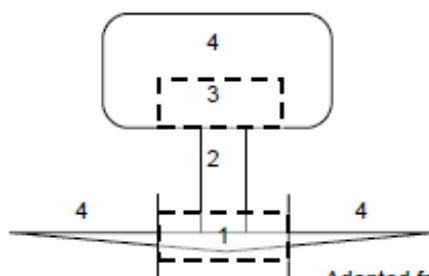
Hazardous: Tree is immediate hazard with potential to fail, this should be rectified as soon as possible.

Tree Structure Matrix

Descriptor	Zone 1 - Root plate & lower stem	Zone 2 - Trunk	Zone 3 - Primary branch support	Zone 4 - Outer crown and roots
Good	No damage, disease or decay; obvious basal flare / stable in ground	No damage, disease or decay; well tapered	Well formed, attached, spaced and tapered	No damage, disease, decay or structural defect
Fair	Minor damage or decay. Basal flare present.	Minor damage or decay	Typically formed, attached, spaced and tapered	Minor damage, disease or decay; minor branch end-weight or over-extension
Fair to Poor	Moderate damage or decay; minimal basal flare	Moderate damage or decay; approaching recognised thresholds	Weak, decayed or with acute branch attachments; previous branch failure evidence	Moderate damage, disease or decay; moderate branch end-weight or over-extension
Poor	Major damage, disease or decay; fungal fruiting bodies present. Excessive lean placing pressure on root plate	Major damage, disease or decay; exceeds recognised thresholds; fungal fruiting bodies present. Acute lean. Stump resprout	Decayed, cavities or has acute branch attachments with included bark; excessive compression flaring; failure likely	Major damage, disease or decay; fungal fruiting bodies present; major branch end-weight or over-extension
Very Poor	Excessive damage, disease or decay; unstable / loose in ground; altered exposure; failure probable	Excessive damage, disease or decay; cavities. Excessive lean. Stump resprout	Decayed, cavities or branch attachments with active split; failure imminent	Excessive damage, disease or decay; excessive branch end-weight or over-extension

Diagram 2: Tree structure zones

1. Root plate & lower stem
2. Trunk
3. Primary branch support
4. Outer crown & roots



Structure ratings will also take into account general tree architecture which considers aspects of stem taper, live crown ratio, branch distribution or crown bias and position such as a tree being suppressed amongst more dominant trees.

12.4 Descriptors: Estimated Life Expectancy (ELE)

The ELE is adapted from (*Barrell, 2001*). The objective of a ELE assessment is to determine the relative value of individual trees for the purpose of informing future management options.

Estimated Life Expectancy – Assessment Criteria			
Dead/Declining	Short	Medium	Long
Trees with a high level of risk that would need removing within the next 5 years. Dead trees. Trees that should be removed within the next 5 years. Dying or suppressed or declining trees through disease or inhospitable conditions. Dangerous trees through instability or recent loss of adjacent trees. Dangerous trees through structural defects including cavities, decay, included bark, wounds or poor form. Damaged trees that considered unsafe to retain. Trees that could live for more than 5 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting. Trees that will become dangerous after removal of other trees for the reasons.	Trees that appear to be retainable with an acceptable level of risk for 5-15 years. Trees that may only live between 5 and 15 more years. Trees that may live for more than 15 years but would be removed to allow the safe development of more suitable individuals. Trees that may live for more than 15 years but would be removed during the course of normal management for safety or nuisance reasons. Storm damaged or defective trees that require substantial remedial work to make safe and are only suitable for retention in the short term.	Trees that appear to be retainable with an acceptable level of risk for 15-40 years. Trees that may only live between 15 and 40 more years. Trees that may live for more than 40 years but would be removed to allow the safe development of more suitable individuals. Trees that may live for more than 40 years but would be removed during the course of normal management for safety or nuisance reasons. Storm damaged or defective trees that require substantial remedial work to make safe and are only suitable for retention in the short term.	Trees that appear to be retainable with an acceptable level of risk for more than 40 years. Structurally sound trees located in positions that can accommodate future growth. Storm damaged or defective trees that could be made suitable for retention in the long term by remedial tree surgery. Trees of special significance for historical, commemorative or rarity reasons that would warrant extraordinary efforts to secure their long-term retention

12.5 IACA Significance of Tree, Assessment Rating System (STARS)

Institute of Australian Consulting Arboriculturists (IACA) Significance of a Tree, Assessment Rating System (STARS): Significance criteria <i>The tree is to have a minimum of 3 criteria in a category to be classified in that group</i>		
Low	Medium	High
The tree is in fair-poor condition and good or low vigour. The tree has form atypical of the species. The tree is not visible or is partly visible from the surrounding properties or 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 dimensions to be protected by local Tree Preservation Orders or similar protection mechanisms and can easily be replaced with a suitable specimen. The tree's growth is severely restricted by above or below ground influences, unlikely to reach dimensions typical for the taxa in situ – tree is inappropriate to the site conditions. The tree is listed as exempt under the provisions of the local Council Tree Preservation Order or similar protection mechanisms. The tree has a wound or defect that has the potential to become structurally unsound. <u>ENVIRONMENTAL PEST/NOXIOUS WEED</u> The tree is an environmental pest species due to its invasiveness and/or poisonous/allergenic, properties/declared noxious weed. <u>HAZARDOUS / IRREVERSIBLE DECLINE</u> The tree is structurally unsound unstable and considered potentially dangerous. The tree is dead or in irreversible decline with the potential to fail/collapse.	The tree is in fair to good condition. 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 Mediumly restricted by above or below ground influences, reducing its ability to reach dimensions typical for the taxa in situ.	The tree is in good condition and good vigour. The tree has a form typical for the species. The tree is a remnant or is a planted locally indigenous specimen and/or is rare or uncommon in the local area or of botanical interest or of substantial age. The tree is listed as a heritage item, threatened species or part of an endangered ecological community or listed on councils' significant/notable 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.

12.6 Additional Landscape Significance Considerations

CATEGORY	HERITAGE VALUE	ECOLOGICAL VALUE	AMENITY VALUE
<i>SIGNIFICANT</i>	*The subject site is listed as a Heritage Item at a local, state or National level of significance or is listed as a Significant/Notable tree. * The subject tree is a Commemorative Planting having been planted by an important historical person(s) or to commemorate an important historical event.	*The subject tree is scheduled as a 'Threatened Species' as defined under the Biodiversity Conservation Act 2016. *The tree is a locally indigenous species, representative of the original vegetation of the area and is known as an important food, shelter or nesting tree for endangered or threatened fauna. *The subject tree is a Remnant Tree, being a tree in existence prior to development of the area.	*The subject tree has a very large live crown size exceeding 100m² with normal to dense foliage cover, is located in a prominent position in the landscape, and exhibits very good form typical of the species. *The subject tree makes a significant contribution to the amenity & visual character of the area by creating a sense of identity. *The tree is visually prominent in view from surrounding areas, being a landmark or visible from a considerable distance.
<i>HIGH</i>	The tree has a strong historical association with a Heritage Item (building/structure/etc) within or adjacent the property and/or exemplifies a particular era or style of landscape design associated with the original development of the site.	The tree is a locally indigenous species, representative of the original vegetation of the area and is a dominant or associated canopy species of an Endangered Ecological Community formerly occurring in the area occupied by the site.	The subject tree has a very large live crown exceeding 60m²; crown density exceeding 70%, very good representative of the species in terms of form & branching habit, is aesthetically distinctive & makes a positive contribution to the visual character & the amenity of value of the area.

MODERATE	The tree has a suspected historical association with a heritage item or landscape supported by anecdotal or visual evidence.	The tree is a locally indigenous species & representative of the original vegetation of the area & the tree is located within a defined Vegetation Link/Wildlife Corridor or has well known habitat value.	A good representative of the species in terms of form & branching habit with minor deviations from normal. Crown density at least 70% (normal); the tree is visible from the street and/or surrounding properties & makes a positive contribution to the visual amenity of the area.
LOW	The subject tree detracts from Heritage values or diminishes the value of a Heritage Item.	The subject tree is possibly scheduled as exempt under the provisions of this Development Control Plan due to its species, or tree can be a nuisance or its position problematic – relative to buildings or other structures.	The subject tree has a small live crown size of less than 25m ² & can be replaced within the short-term (5-10yrs) with new planting.
VERY LOW	The subject tree is causing damage to a Heritage Item.	The subject tree is listed as an Environmental Weed Species in the Local Government Area, being invasive, or is a known nuisance species.	The subject tree is not visible from surrounding properties & has a negative impact on the amenity & visual character of the area. The tree is a poor representative of the species, showing significant deviations from the typical form & branching habit with a crown density of less than 50%.

(STARS) Tree Retention Value - Priority Matrix

Significance of a Tree, Assessment Rating System (STARS), Institute of Australian Consulting Arboriculturists, Australia 2010.

		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					
	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 <i>AS 4970 Protection of trees on development sites</i> . Tree sensitive construction measures must be implemented (pier and beam cantilever, Structural Confinement Cells etc if works are to proceed within the TPZ).					
	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.					

12.7 Assumptions and Limiting Conditions

- 1) Active Green Services Pty Ltd (herein after referred to as AGS) contracts with you on the basis that you promise that all legal information which you provide, including land title and ownership of other property, are correct. AGS is not responsible for verifying or ascertaining any of these issues.
- 2) AGS contracts with you on the basis that your promise that all affected property complies with all applicable statutes and subordinate legislation.
- 3) AGS will take all reasonable care to obtain necessary information from reliable sources and to verify data. However, AGS neither guarantees nor is responsible for the accuracy of information provided by others.
- 4) If, after delivery of this report, you later require a representative of AGS to attend court to give evidence or to assist in the preparation for a hearing because of this report, you must pay an additional hourly fee at our then current rate for expert evidence.
- 5) Alteration of this report invalidates the entire report.
- 6) AGS retains the copyright in this report. Possession of the original or a copy of this report does not give you or anyone else any right of reproduction, publication or use without the written permission of AGS.
- 7) The contents of this report represent the professional opinion of the consultant. AGS consultancy fee for the preparation of this report is in no way contingent upon the consultant reporting a particular conclusion of fact, nor upon the occurrence of a subsequent event.
- 8) Sketches, diagrams, graphs and photographs in this report are intended as visual aids, are not to scale unless stated to be so, and must not be construed as engineering or architectural reports or as surveys.
- 9) Unless expressly stated otherwise:
 - a. The information in this report covers only those items which were examined and reflects the condition of those items at the time of the inspection.
 - b. Our inspection is limited to visual examination of accessible components without dissection, excavation or probing. There is no warranty or guarantee, express or implied, that even if they were not present during our inspection, problems or defects in plants or property examined may not arise in the future.
- 10) This Report supersedes all prior discussions and representations between AGS and the client on the subject.

12.8 AGS Quality Control

Document control

File reference	File type	Modifications	Date
JN 81236	AR	Original document	16/02/2022

Documents reviewed

Date	Title	Author	Company
N/A	N/A	N/A	N/A

Communication register

Date	Type	From	To	Description
N/A	N/A	N/A	N/A	N/A

Review register

Date	File reference	Reviewer	Qualification	Company
17/03/2022	JN 81236 Preliminary Arboricultural Report	I. Dunsmuir	Dip of Arb (AQF 5)	Active Green Services