HUGH
THE ARBORIST

Arboricultural Impact Assessment

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1. INTRODUCTION

1.1 This report has been commissioned by Walsh Architects on behalf of the client M. Isa to present data from an Arboricultural survey carried out at 1, 5, 5A and 7 Gladys Avenue, Frenchs Forest NSW.

Table 1: Documents used for the assessment

Title	Author	Date	Reference on document
Survey Plan	Bee and Lethbridge	9/11/2015	19805A
Architectural Plan Set	Walsh Architects	14/2/2023	See schedule below

NUMBER	SHEET NAME	REVISION
DA000	COVER PAGE	6
DA010	EXISTING SITE PLAN	6
DA021	SITE ANALYSIS - SHEET 1	4
DA022	SITE ANALYSIS - SHEET 2	4
DA060	DEMOLITION PLAN	4
DA070	PROPOSED SITE PLAN	6
DA081	PROPOSED PERSPECTIVES	2
DA082	PROPOSED PERSPECTIVES	2
DA083	PROPOSED PERSPECTIVES	2
DA084	PROPOSED PERSPECTIVES	2
DA100	BASEMENT PLAN	7
DA101	GROUND FLOOR PLAN	7
DA102	LEVEL 1 PLAN	7
DA103	LEVEL 2 PLAN	7
DA104	ROOF PLAN	6
DA200	SECTIONS - SHEET 1	3
DA201	SECTIONS - SHEET 2	3
DA202	SECTIONS - SHEET 3	3
DA203	SECTIONS - SHEET 4	3
DA300	ELEVATIONS - SHEET 1	3
DA301	ELEVATIONS - SHEET 2	2
DA302	ELEVATIONS - SHEET 3	3
DA303	ELEVATIONS - SHEET 4	2
DA400	AREA CALCULATIONS	6
DA500	SHADOW DIAGRAMS - 9AM JUNE 21ST	6
DA501	SHADOW DIAGRAMS - 12PM JUNE 21ST	6
DA502	SHADOW DIAGRAMS - 3PM JUNE 21ST	6
DA600	VIEWS FROM SUN - JUNE 21ST	6
DA601	VIEWS FROM SUN - JUNE 21ST	6
DA602	VIEWS FROM SUN - JUNE 21ST	6
DA700	13m HEIGHT PLANE	6
DA801	ADAPTABLE TYPE 1	2
DA802	ADAPTABLE TYPE 2	2

1.2 The site inspection was carried out on 10th August 2022. Access was available to the subject site and adjoining public areas only. All tree data was collected during this assessment.

1.3 The weather at the time of the assessment was clear with average visibility.

2. SCOPE OF THE REPORT

2.1 This report has been undertaken to meet the following objectives.

2.1.1 Conduct a visual assessment from ground level of trees located on and adjoining the site as identified on the plans provided.

2.1.2 For the purpose of this report, a tree is taken to have a height equal to or greater than 5 metres.

2.1.3 Determine the trees estimated contribution years and remaining, useful life expectancy and award the trees a retention value.

2.1.4 Provide an assessment of the impact the proposed development is likely to have on condition of the subject trees in accordance with AS4970 Protection of trees on development sites (2009).

2.1.5 Provide pragmatic recommendations for the management of trees and mitigation of construction impacts on protected trees.

2.1.6 The assessment of the potential works shown on Lot 3 is outside the scope of this assessment.

3. LIMITATIONS

3.1 All of the observations were carried out from ground level. The accuracy of the assessment of the subject trees structural condition and health is limited to the visibility of the tree at the time of inspection.

3.2 The tree inspections were visual from ground level only. No soil or tissue testing was carried out as part of the tree inspection. None of the surrounding surfaces adjacent to trees were lifted or removed during the tree inspections.

3.3 Root decay can sometimes be present with no visual indication above ground. It is also impossible to know the extent of any root damage caused by mechanical damage such as underground root cutting during the installation of services without undertaking detailed root investigation. Any form of tree failure due to these activities is beyond the scope of this assessment.

3.4 The report reflects the subject tree(s) as found on the day of inspection. Any changes to the growing environment of the subject tree, or tree management works beyond those recommended in this report may alter the findings of the report. There is no warranty, expressed or implied, that problems or deficiencies relating to the subject tree, or subject site may not arise in the future.

3.5 Tree identification is based on accessible visual characteristics at the time of inspection. As key identifying features are not always available the accuracy of identification is not guaranteed. Where tree species is unknown, it is indicated with a spp.

3.6 All diagrams, plans and photographs included in this report are visual aids only and are not to scale unless otherwise indicated.

3.7 Hugh The Arborist neither guarantees, nor is responsible for, the accuracy of information provided by others that is contained within this report.

3.8 While an assessment of the subject trees estimated useful life expectancy is included in this report, no specific tree risk assessment has been undertaken for any of trees at the site.

3.9 The ultimate safety of any tree cannot be categorically guaranteed. Even trees apparently free of defects can collapse or partially collapse in extreme weather conditions. Trees are dynamic, biological entities subject to changes in their environment, the presence of pathogens and the effects of ageing. These factors reinforce the need for regular inspections. It is generally accepted that hazards can only be identified from distinct defects or from other failure-prone characteristics of a tree or its locality.

3.10 Alteration of this report invalidates the entire report.

4. METHODOLOGY

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

- 4.1.1 Tree common name
- 4.1.2 Tree botanical name
- 4.1.3 Tree age class
- 4.1.4 DBH (Trunk/Stem diameter at breast height/1.4m above ground level) - millimetres
- 4.1.5 Estimated height - metres
- 4.1.6 Estimated crown spread (Radius of crown) - metres
- 4.1.7 Health
- 4.1.8 Structural condition
- 4.1.9 Amenity value
- 4.1.10 Estimated remaining contribution years (SULE)[1]
- 4.1.11 Retention value (Tree AZ)[2]
- 4.1.12 Notes/comments

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

4.3 Tree diameter was measured using a DBH tape or in some cases estimated. All other measurements were estimations unless otherwise stated. The other tools used during the assessment were a Leica DistoD410 digital laser tape.

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

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

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

[2] Barrell Tree Consultancy, *Tree AZ version 10.10-ANZ*, http://www.treeaz.com/.

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

5. SITE LOCATION & BRIEF DESCRIPTION OF DEVELOPMENT WORKS ASSESSED

5.1 The site is located in the suburb of Frenchs Forest of the Northern Beaches LGA, this assessment has been carried out in accordance with the following legislation and policy.

5.1.1 Warringah Local Environmental Plan (LEP) 2011

5.1.2 Warringah Development Control Plan (DCP) 2011

5.1.3 State Environmental Planning Policy (Biodiversity and Conservation)

5.2 Four sites have been assessed as part of this report. Numbers 1, 5, 5A and 7 Gladys Avenue are the subject sites. The sites are largely flat and heavily lined with trees throughout. The trees within the individual sites are predominantly native upper canopy species with a mixed native and non-native understory.

5.3 None of the sites have been identified as a Heritage Items or a Heritage Conservation Area. The sites have not been identified as containing high levels of biodiversity or containing remnant vegetation according to Councils online mapping tool.[4]

5.4 All four sites are currently occupied by residential dwellings and amenity garden areas which are largely overgrown.

[4] https://nb-icongis.azurewebsites.net/index.html

Image 1: Site Locations [5]

[5] https://www.google.com/maps/

6. OBSERVATIONS AND GENERAL INFORMATION IN RELATION TO PROTECTING TREES ON DEVELOPMENT SITES

6.1 **Tree information**: Details of each individual tree assessed, including the observations taken during the site inspection, can be found in the tree inspection schedule in appendix 2, where the indicative tree protection zone (TPZ) and Structural Root Zone (SRZ) has been calculated for each of the subject trees. The TPZ and SRZ should be measured in radius from the centre of the trunk. Each of the subject trees have been awarded a retention value based on the observations using the Tree AZ method. Tree AZ is used to identify higher value trees worthy of being a constraint to development and lower value trees that should generally not be a constraint to the development. The Tree AZ categories sheet (Barrell Tree Consultancy) has been included in appendix 3 to assist with understanding the retention values. The retention value that has been allocated to the subject trees in this report is not definitive and should only be used as a guideline.

6.2 **Site Plan:** In appendix 1 three site plans have been prepared, where the tree information including canopy spread, TPZ and SRZ have been overlaid onto the site plans. The following plans are included in appendix 1.

- Appendix 1: Existing Site Plan
- Appendix 1A: Proposed Basement Plan
- Appendix 1B: Proposed Ground Floor Plan

6.3 **Tree protection zone (TPZ):** The TPZ is the principle means of protecting trees on development sites and is an area required to maintain the viability of trees during development. It is commonly observed that tree roots will extend significantly further than the indicative TPZ, however the TPZ is an area identified in AS4970-2009 to be the area where root loss or disturbance will generally impact the viability of the tree. The TPZ is identified as a restricted area to prevent damage to trees either above or below ground during a development. Where trees are intended to be retained proposed developments must provide an adequate TPZ around trees. The TPZ is set aside for the tree's root zone, trunk and crown and it is essential for the stability and longevity of the tree. The TPZ also incorporates the SRZ (see below for more information about the SRZ). The TPZ is calculated by multiplying the DBH by twelve, with the exception of palms, other monocots, cycads and tree ferns, the TPZ of which have been calculated at one metre outside the crown projection.

6.4 **Structural Root Zone (SRZ):** This is the area around the base of a tree required for the tree's stability in the ground. An area larger than the SRZ always needs to be maintained to preserve a viable tree. The SRZ is calculated using the following formula: (DAB x 50) $^{0.42}$ x 0.64. There are several factors that can vary the SRZ which include height, crown area, soil type and soil moisture. It can also be influenced by other factors such as natural or built structures. Generally, work within the SRZ should be avoided. Soil level changes should also generally be avoided inside the SRZ of trees to be retained. Palms, other monocots, cycads and tree ferns do not have an SRZ. See the appendices for more information about the SRZ.

6.5 **Minor encroachment into TPZ:** Sometimes encroachment into the TPZ is unavoidable. Encroachment includes but is not limited to activities such as excavation, compacted fill and machine trenching. Minor encroachment of up to 10% of the overall TPZ area is normally considered acceptable, providing there is space adjacent to the TPZ for the tree to compensate and the tree is displaying adequate vigour/health to tolerate changes to its growing environment.

6.6 **Major encroachment into TPZ:** Where encroachment of more than 10% of the overall TPZ area is proposed the project Arborist must investigate and demonstrate that the tree will remain in a viable condition. In some cases, tree sensitive construction methods such as pier and beam footings, suspended slabs, or cantilevered sections, can be utilised to allow additional encroachment into the TPZ by bridging over roots and minimising root disturbance. Major encroachment is only possible if it can be undertaken without severing significant size roots, or if it can be demonstrated that significant roots will not be impacted. Root investigations may be required to identify roots that will be impacted during major TPZ encroachment.

7. ASSESSMENT OF CONSTRUCTION IMPACTS

7.1 **Table 2:** In the table below the impact of the proposed development has been assessed.

Tree ID	Species	Retention value	TPZ radius (m)	SRZ radius (m)	TPZ encroachment	Discussion/ Conclusion	Recommendation
1	*Eucalyptus punctata*	A1	6.0	2.7	Minor	The proposed basement will encroach into the Tree Protection Zone by up to 8% which is a minor encroachment and is unlikely to significantly impact the tree. The assessment of the potential works on Lot 3 is outside the scope of this assessment.	Retain and protect
2	*Eucalyptus tereticornis*	A1	6.0	2.7	Minor	The proposed brick boundary wall will encroach into the Tree Protection Zone by up to 6% which is a minor encroachment and is unlikely to significantly impact the tree. The assessment of the potential works on Lot 3 is outside the scope of this assessment.	Retain and protect
3	*Aracastrum romanzoffianum*	Z3	4.0	NA	Major	The proposed brick boundary wall will conflict with the trunk. The species is listed as exempt from protection in the LGA and is proposed to be removed.	Remove
4	*Lophostemon confertus*	A1	6.0	2.6	Minor	The proposed brick boundary wall and waste room will encroach into the Tree Protection Zone by less than 10% with no encroachment into the Structural Root Zone which is a minor encroachment and of low impact. Landscaping has been proposed between the boundary and the wall which will not significantly increase the impact providing it is carried out using tree sensitive methods. The recommendations section.	Tree sensitive construction required
5	*Lophostemon confertus*	A1	6.0	2.6	Minor	Tree located on council verge and will be subject to less than 10% encroachment into the Tree Protection Zone with none in the Structural Root Zone. The proposed landscaping is also assessed as of low impact providing it is carried out using tree sensitive methods.	Retain and protect
6	*Lophostemon confertus*	Z1	0.6	1.5	None	No encroachment proposed.	Retain and protect
7	*Angophora costata*	A1	4.7	2.3	Major	The proposed driveway ramp will encroach into the Tree Protection Zone by up to 13.4% with no encroachment into the Structural Root Zone which is a major	Remove

Tree ID	Species	Retention value	TPZ radius (m)	SRZ radius (m)	TPZ encroachment	Discussion/ Conclusion	Recommendation
						encroachment. The ramp will require excavating and the 13.4% is taken to be a loss of TPZ. In addition to the ramp, a paling fence is proposed to transect throughout the Structural Root Zone and landscaping is proposed throughout the entire TPZ area including the demolition of the existing driveway also within the TPZ. The combined encroachment through change to the trees growing environment and root loss throughout the TPZ is likely to significantly impact the tree irrespective of tree sensitive methods of construction.	
8	*Eucalyptus tereticornis*	A1	7.2	2.9	Major	The proposed driveway ramp will encroach into the Tree Protection Zone and the Structural Root Zone by up to 27.5%. This is a major encroachment that is likely to cause the tree to decline or become unstable as a result of root severance. The assessment of the potential works on Lot 3 is outside the scope of this assessment.	Remove
9	*Eucalyptus punctata*	A1	9.6	3.1	Major	The proposed driveway ramp will encroach into the Tree Protection Zone and the Structural Root Zone by up to 36.2%. This is a major encroachment that is likely to cause the tree to decline or become unstable as a result of root severance. The assessment of the potential works on Lot 3 is outside the scope of this assessment.	Remove
10	*Corymbia maculata*	A1	11.9	3.3	Major	The proposed driveway ramp will encroach into the Tree Protection Zone and the Structural Root Zone by up to 40%. This is a major encroachment that is likely to cause the tree to decline or become unstable as a result of root severance. The assessment of the potential works on Lot 3 is outside the scope of this assessment.	Remove

Tree ID	Species	Retention value	TPZ radius (m)	SRZ radius (m)	TPZ encroachment	Discussion/ Conclusion	Recommendation
11	*Melaleuca styphelioides*	A1	6.0	2.7	Footprint	Tree located within the footprint of the proposed driveway.	Remove
12	*Melaleuca styphelioides*	A2	2.8	2.0	Footprint	Tree located within the footprint of the proposed driveway.	Remove
13	*Melaleuca styphelioides*	Z10	4.6	2.3	Footprint	Tree located within the footprint of the proposed footpath.	Remove
14	*Eucalyptus resinifera*	A1	6.6	2.7	Footprint	Tree located within the footprint of the proposed footpath.	Remove
15	*Angophora costata*	A1	9.4	3.4	Footprint	Tree located within the footprint of the proposed waste management area.	Remove
16	*Citharexylum spinosum*	A1	3.5	2.1	Major	The proposed boundary fence will encroach into the tree protection Zone and the Structural Root Zone by up to 32%. This is a major encroachment that has the potential to cause the tree to decline or become unstable. If the tree is to be retained in a viable condition, the fence must be installed via tree sensitive construction specified in section 8.2 of the report.	Tree sensitive construction
17	*Citharexylum spinosum*	A2	4.4	2.4	Major	The proposed stairs will encroach into the Tree Protection Zone by less than 5% and is of negligible impacts as an independent component. The proposed boundary fence will encroach into the tree protection Zone and the Structural Root Zone by up to 30%. This is a major encroachment that has the potential to cause the tree to decline or become unstable. If the tree is to be retained in a viable condition, the fence must be installed via tree sensitive construction specified in section 8.2 of the report.	Tree sensitive construction

Tree ID	Species	Retention value	TPZ radius (m)	SRZ radius (m)	TPZ encroachment	Discussion/ Conclusion	Recommendation
18	*Liquidambar styraciflua*	Z3	16.8	3.8	Major	The trunk of the tree is in conflict with the proposed boundary fence and will be subject to high major encroachment from the basement. The tree is proposed to be removed as part of the works. The species is listed as exempt from protection in the LGA.	Remove
19	*Corymbia ficifolia*	Z4	1.1	1.5	None	No encroachment proposed. Tree located on Council verge. The tree has been assessed as in decline and is only retainable in the short term	Retain and protect
20	*Magnolia grandiflora*	Z1	1.1	1.5	Major	Up to 50% encroachment into the Tree Protection Zone and the Structural Root Zone from the proposed retaining wall. This is a major encroachment that is likely to impact the health and stability of the tree.	Remove
21	*Grevillea robusta*	Z10	8.4	3.0	Major	The combined encroachment from the proposed stormwater tank, waste management area and hard surfacing will encroach into the Tree Protection Zone by up to 23%. The proposed works will require excavation and root severance which is likely to cause the tree to decline in health. The tree was assessed as a category Z10 tree and is not considered worthy of retention.	Remove
22	*Jacaranda mimosifolia*	Z3	2.0	1.8	Footprint	Tree located within the footprint of the proposed waste management area.	Remove
23	*Jacaranda mimosifolia*	Z3	2.0	1.8	Major	The proposed stormwater tank will encroach into the Tree Protection Zone and the Structural Root Zone by up to 12% which is a major encroachment. Severance of significant roots in the SRZ may impact the health and stability of the tree.	Remove
24	*Eucalyptus robusta*	A2	4.7	2.3	Footprint	Tree located within the footprint of the proposed stormwater tank.	Remove

Tree ID	Species	Retention value	TPZ radius (m)	SRZ radius (m)	TPZ encroachment	Discussion/ Conclusion	Recommendation
25	*Macadamia tetrophylla*	A1	3.4	2.0	Footprint	Tree located within the footprint of the proposed stormwater tank.	Remove
26	*Brachychiton acerifolius*	Z3	4.2	2.3	Footprint	Tree located within the footprint of the proposed stormwater tank.	Remove
27	*Brachychiton acerifolius*	Z3	2.2	1.7	Footprint	Tree located within the footprint of the proposed waste management area.	Remove
28	*Pinus patula*	Z3	7.0	2.8	Footprint	Tree located within the footprint of the proposed stormwater tank.	Remove
29	*Melaleuca styphelioides*	A1	4.1	2.3	Footprint	Tree located within the footprint of the proposed stormwater tank.	Remove
30	*Corymbia citriodora*	A1	5.4	2.5	Major	The proposed retaining wall and up to 1.8 meter level change will encroach into the Tree Protection Zone and the Structural Root Zone by up to 24%. This is a major encroachment that is likely to cause the tree to decline or become unstable in the event of the severance of significant tree roots.	Remove
31	*Corymbia citriodora*	A1	4.9	2.4	Footprint	Tree located within the footprint of the proposed stormwater tank.	Remove
32	*Corymbia citriodora*	A1	5.6	2.4	Major	The proposed basement will encroach into the Tree Protection Zone and the Structural Root Zone by up to 26%. The proposed retaining wall and level change will further encroach into the TPZ area rendering the combined encroachment up to 50% of the TPZ and the SRZ. This is a major encroachment that is likely to cause the tree to decline or become unstable.	Remove

Tree ID	Species	Retention value	TPZ radius (m)	SRZ radius (m)	TPZ encroachment	Discussion/ Conclusion	Recommendation
33	*Corymbia citriodora*	A1	3.0	2.0	Footprint	Tree located within the footprint of the proposed building.	Remove
34	*Corymbia citriodora*	A2	2.2	1.7	Major	The proposed building will encroach into the Tree Protection Zone and the Structural Root Zone by up to 22.2% which is a major encroachment and likely to cause the tree to decline or become unstable.	Remove
35	*Angophora costata*	Z10	5.2	2.4	Footprint	Tree located within the footprint of the proposed building.	Remove
36	*Livistona australis*	A1	3.0	NA	Footprint	Tree located within the footprint of the proposed building.	Remove
37	*Callitris Spp.*	A1	2.0	1.6	Footprint	Tree located within the footprint of the proposed building.	Remove
38	*Brachychiton acerifolius*	Z3	4.2	2.3	Footprint	Tree located within the footprint of the proposed building.	Remove
39	*Archontophoenix cunninghamiana*	Z3	3.0	NA	Major	Up to 30% encroachment into the Tree Protection Zone from the proposed retaining wall and level change. While it is likely the palm can be retained it is a species exempt from protection in the LGA and is proposed to be removed as part of the development works.	Remove
40	*Cyathea cooperii*	A1	3.0	NA	Major	Up to 40% encroachment into the Tree Protection Zone from the proposed retaining wall, Stairs and level change. The proposal is inclusive of the trees removal however the species does tolerate transplanting readily if it is required to be retained.	Remove

Tree ID	Species	Retention value	TPZ radius (m)	SRZ radius (m)	TPZ encroachment	Discussion/ Conclusion	Recommendation
41	*Schefflera actinophylla*	Z3	3.7	2.4	Footprint	Tree located within the footprint of the proposed basement.	Remove
42	*Podocarpus elatus*	A1	1.6	1.5	Footprint	Tree located within the footprint of the proposed basement.	Remove
43	*Cyathea australe*	Z2	3.0	NA	Footprint	Tree located within the footprint of the proposed basement.	Remove
44	*Cyathea australe*	Z2	3.0	NA	Footprint	Tree located within the footprint of the proposed basement.	Remove
45	*Cyathea australe*	A1	3.0	NA	Footprint	Tree located within the footprint of the proposed basement.	Remove
46	*Archontophoenix cunninghamiana*	Z3	3.0	NA	Footprint	Tree located within the footprint of the proposed basement.	Remove
47	*Brachychiton acerifolius*	Z3	3.6	2.1	Footprint	Tree located within the footprint of the proposed basement.	Remove
48	*Chamaecyparis lawsoniana*	Z3	2.2	1.7	Footprint	Tree located within the footprint of the proposed basement.	Remove
49	*Angophora costata*	A1	7.2	2.7	Footprint	Tree located within the footprint of the proposed basement.	Remove
50	*Archontophoenix cunninghamiana*	A1	3.0	NA	Footprint	Tree located within the footprint of the proposed basement.	Remove

Tree ID	Species	Retention value	TPZ radius (m)	SRZ radius (m)	TPZ encroachment	Discussion/ Conclusion	Recommendation
51	*Eucalyptus resinifera*	A1	10.2	3.2	Major	The proposed basement will encroach into the Tree Protection Zone and the Structural Root Zone by up to 45%. This is a major encroachment which is likely to cause the tree to decline or become unstable as a result of root severance. The assessment of the potential works on Lot 3 is outside the scope of this assessment.	Remove
52	*Acer palmatum*	A1	3.6	2.1	Major	The proposed basement will encroach into the Tree Protection Zone and the Structural Root Zone by up to 30%. This is a major encroachment which is likely to cause the tree to decline or become unstable as a result of root severance.	Remove
G1	*Syzigium australe*	Z1	0.6	1.5	Footprint	Row of trees are proposed to be removed as part of the development works. The trees are considered to be easily replaceable within the short term and not a material constraint to development.	Remove
53	*Ulmus Spp.*	Z1	2.2	1.7	Footprint	Tree located within the footprint of the proposed basement.	Remove
54	*Cupressus macrocarpa*	Z3	2.6	1.8	Footprint	Tree located within the footprint of the proposed basement.	Remove
55	*Cupressus macrocarpa*	Z3	2.6	1.8	Major	The proposed basement will encroach into the Tree Protection Zone and the Structural Root Zone on two sides by a total of up to 50%. This is an unsustainable level of impact and may cause the tree to decline or become unstable through root loss.	Remove

Tree ID	Species	Retention value	TPZ radius (m)	SRZ radius (m)	TPZ encroachment	Discussion/ Conclusion	Recommendation
56	*Lophostemon confertus*	A1	6.4	2.5	Major	The proposed basement will encroach into the Tree Protection Zone and the Structural Root Zone by more than 50%. This is a major encroachment which is likely to cause the tree to decline or become unstable as a result of root severance.	Remove
57	*Liquidambar styraciflua*	Z3	9.6	3.2	Footprint	Tree located within the footprint of the proposed basement.	Remove
58	*Lophostemon confertus*	A1	6.1	2.6	Major	The proposed basement will encroach into the Tree Protection Zone by up to 18% and will require root severance. In addition, landscaping and hard surfacing have been proposed within more than 50% of the Tree Protection Zone and the Structural Root Zone. While tree sensitive design may reduce the level of impact of landscaping the combined root loss and changes to the trees growing environment is likely to significantly impact the tree in the long term.	Remove
59	*Eucalyptus resinifera*	Z4	6.1	2.6	None	No encroachment proposed.	Retain and protect
60	*Araucaria heterophylla*	A1	6.6	2.7	None	No encroachment proposed.	Retain and protect
61	*Acmena smithii*	A1	5.4	2.5	Minor	Less than 10% of the Tree Protection Zone extends within the subject site. The proposed encroachment consists of landscaping and hard surfaces. This is a minor encroachment and is unlikely to significantly impact the tree.	Retain and protect
62	*Angophora costata*	A1	4.9	2.3	None	No encroachment proposed.	Retain and protect

Tree ID	Species	Retention value	TPZ radius (m)	SRZ radius (m)	TPZ encroachment	Discussion/ Conclusion	Recommendation
63	*Angophora costata*	A2	3.7	2.0	None	No encroachment proposed.	Retain and protect
64	*Eucalyptus resinifera*	A1	7.2	2.8	None	No encroachment proposed.	Retain and protect

8. CONCLUSIONS

8.1 **Table 3:** Summary of the impact to trees during the development.

Impact	Reason	Category A	Category Z	Total
		A	Z	
Trees to be removed	Building/landscape construction, new surfacing and/or proximity, condition or re-landscaping	7, 8, 9, 10, 11, 12, 14, 15, 24, 25, 29, 30, 31, 32, 33, 34, 36, 37, 40, 42, 45, 49, 50, 51, 52, 56, 58	3, 13, 18, 20, 21, 22, 23, 26, 27, 28, 35, 38, 39, 41, 43, 44, 46, 47, 48, G1, 53, 54, 55, 57	**50 and one group**
Trees to be retained	Removal of existing surfacing/structures and/or installation of new surfacing/structures or no encroachment	1, 5, 2, 16, 17, 60, 61, 62, 63, 64	6,19,59	**13**
Trees requiring design modifications, root mapping or tree sensitive design	Removal of existing surfacing/structures and/or installation of new surfacing/structures	4	None	**1**

8.2 **Tree Sensitive Construction Specification:** To ensure that trees identified for retention are not adversely impacted by the construction, it must be demonstrated the following design and construction specifications can be implemented within the TPZ of the trees. If the construction cannot be completed in accordance with these specifications, the trees may not be viable for retention.

8.2.1 **Tree sensitive Fencing trees 16 and 17:** Any proposed fencing within the TPZ of the trees must be installed using the tree sensitive method of post and rail type construction. To ensure the trees are not significantly impacted by the works, all post holes must be excavated manually. The post location must be flexible to avoid the severance of significant roots 40mm and greater in diameter. No posts are to be located within the SRZ or root investigations will be required to determine the post location. All rails/horizontal materials are to be located on or above existing soil grades. This will allow for the majority of the root system to be retained between the posts, minimising root loss.

9. RECOMMENDATIONS

9.1 This report assesses the impact of a proposed development at the site to sixty four individual trees and one group of trees located on and adjoining the site.

9.2 A total of fifty trees will be removed as part of the development works. Of these, 23 and Group 1 are assessed as category Z trees. The remaining 27 trees are category A trees.

9.3 Thirteen trees consisting of three category Z trees and ten category A trees will be retained and protected.

9.4 Two retained trees (T16 and T17) will require tree sensitive construction methods specified in section 8.2.

9.5 One tree to be retained (T4) will require tree sensitive landscaping techniques to minimise impacts and is detailed in the section below.

9.6 **Landscaping** within the Tree Protection Zone of tree 4 has been assessed as of minor encroachment where the proposed plans do not show retaining walls. The landscaping works can be managed without significantly impacting the trees providing the works are carried out in accordance with section 10.10 of this report.

9.7 **Underground Services:** No services plan has been assessed as part of this report.AS4970 Protection of trees on development sites (2009) recommends that all underground services located inside the TPZ of any tree to be retained should be installed via tree sensitive techniques. This should include either directional drilling methods or manual excavations to minimise the impact to trees identified for retention.

If directional drilling is proposed, section 4.5.5 of AS4970-2009 says that 'The directional drilling bore should be at least 600 mm deep. The project Arborist should assess the likely impacts of boring and bore pits on retained trees'.6

If manual excavations are proposed, all excavations for the services should be carried out manually under the supervision of the project Arborist (minimum qualification AQF 5). Manual excavation may include the use of pneumatic and hydraulic tools, high-pressure air or a combination of high-pressure water and a vacuum device. All roots greater than 40mm in diameter should be retained in the service trench. The service pipe should then be threaded below the retained roots where practical. Roots greater than 40mm within the alignment of the service pipe should only be severed/pruned under the approval of the project Arborist. All root pruning should be in accordance with AS4373 Pruning of amenity trees (2007).

Open trenching in the SRZ of trees can be impractical without impacting significant roots, as often dense root growth is present in the SRZ. Open trenching should therefore be avoided in the SRZ. It is recommended that any section of pipe that is located in the SRZ of trees to be retained is installed via sub-surface boring/directional drilling methods only. The feasibility of sub-surface boring/directional drilling will need to be investigated by a sub-surface boring/directional drilling specialist. The project Arborist should provide advice and supervise excavations for bore pits, which must be carried out manually if located within the TPZ. The top of the pipe must be at least 600mm below the existing soil grade. The location of bore pits should be flexible in the TPZ to avoid significant roots, the project Arborist should assess and advise in writing the impact of any significant root severance to the condition of the tree.

9.8 This report does not provide approval for tree removal or pruning works. All recommendations in this report are subject to approval by the relevant authorities and/or tree owners. This report should be submitted as supporting evidence with any tree removal/pruning or development application.

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

10. ARBORICULTURAL WORK METHOD STATEMENT (AMS) AND TREE PROTECTION REQUIREMENTS

10.1 **Use of this report:** All contractors must be made aware of the tree protection requirements prior to commencing works at the site and be provided a copy of this report.

10.2 **Project Arborist:** Prior to any works commencing at the site a project Arborist should be appointed. The project Arborist should be qualified to a minimum AQF level 5 and/or equivalent qualifications and experience and should assist with any development issues relating to trees that may arise. If at any time it is not feasible to carryout works in accordance with this, an alternative must be agreed in writing with the project Arborist.

10.3 **Tree work:** All tree work must be carried out by a qualified and experienced Arborist with a minimum of AQF level 3 in arboriculture, in accordance with NSW Work Cover Code of Practice for the Amenity Tree Industry (1998) and AS4373 Pruning of amenity trees (2007).

10.4 **Initial site meeting/on-going regular inspections:** The project Arborist is to hold a pre-construction site meeting with principal contractor to discuss methods and importance of tree protection measures and resolve any issues in relation to tree protection that may arise. In accordance with AS4970-2009, the project Arborist should carryout regular site inspections to ensure works are carried out in accordance with this document throughout the development process. I recommend regular site inspections on a frequency based on the longevity of the project; this is to be agreed in the initial meeting.

10.5 **Site Specific Tree Protection Recommendations:**

Table 4: Protection Requirements: See appendix 1A for indicative fencing location. See section 10.6 for specifications of tree protection.

Tree Number	Protection Specification
All retained trees	- It is recommended that a site specific tree protection plan be prepared in conjunction with the construction management plan.

10.6 **Tree protection Specifications:** See section 10.5 for site/tree specific requirements. It is the responsibility of the principal contractor to install tree protection prior to works commencing at the site (prior to demolition works) and to ensure that the tree protection remains in adequate condition for the duration of the development. The tree protection must not be moved without prior agreement of the project Arborist. The project Arborist must inspect that the tree protection has been installed in accordance with this document and AS4970-2009 prior to works commencing.

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

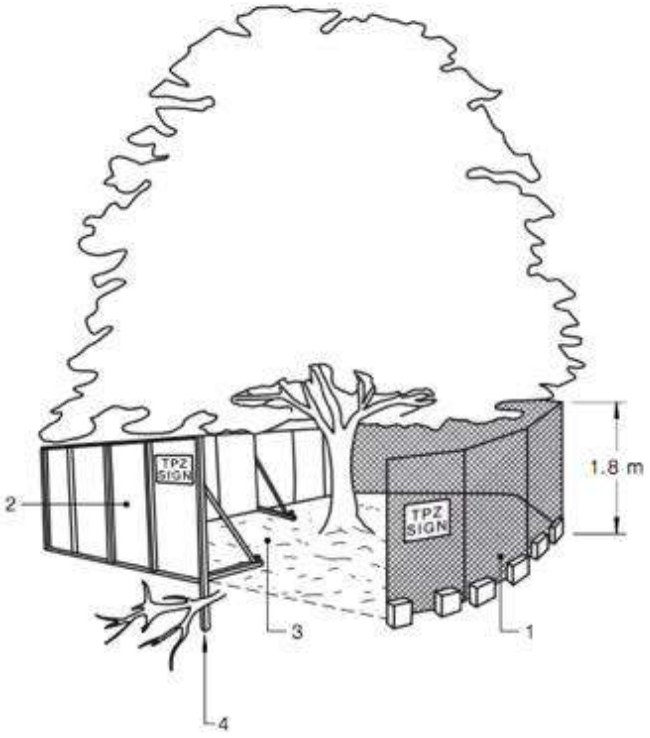
10.8 **TPZ signage:** Tree protection signage is to be attached to the protective fencing, displayed in a prominent position and the sign repeated at 10 metres intervals or closer where the fence changes direction. Each sign shall contain in a clearly legible form, the following information:

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

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

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

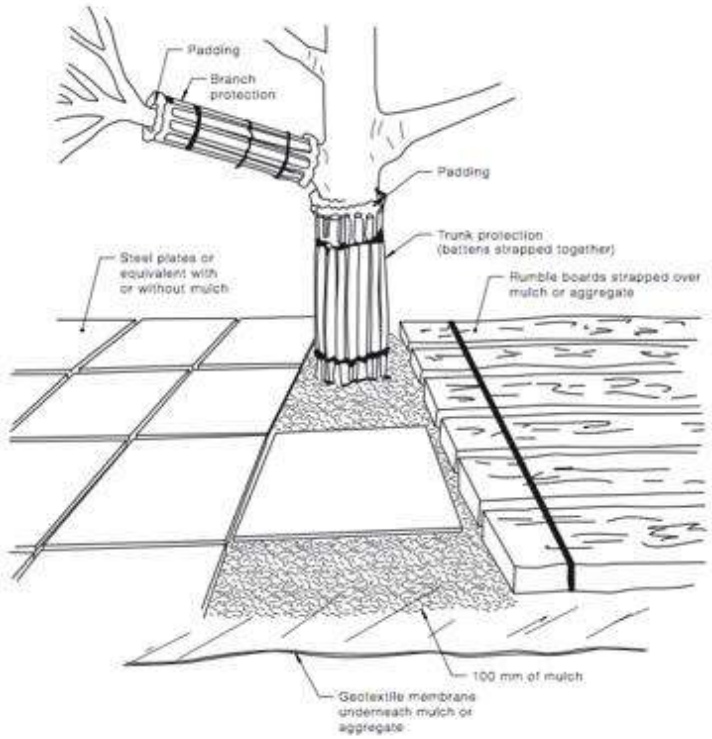
10.11 **Ground Protection:** Ground protection is required to protect the underlying soil structure and root system in areas where it is not practical to restrict access to whole TPZ, while allowing space for construction. Ground protection must consist of good quality composted wood chip/leaf mulch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



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

An image from AS4970-2009,[7] with example tree protection.

[7] Council of Standards Australia, *AS4970 Protection of trees on development sites* (2009), page 16.



NOTES:

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

An image from AS4970-2009,[8] with example tree protection.

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

A) Machine excavation.
B) Ripping or cultivation of soil.
C) Storage of spoil, soil or any such materials
D) Preparation of chemicals, including preparation of cement products.
E) Refueling.
F) Dumping of waste.

[8] Council of Standards Australia, *AS4970 Protection of trees on development sites* (2009), page 17.

G) Wash down and cleaning of equipment.
H) Placement of fill.
I) Lighting of fires.
J) Soil level changes.
K) Any physical damage to the crown, trunk, or root system.
L) Parking of vehicles.

10.13 **Demolition:** The demolition of all existing structures inside or directly adjacent to the TPZ of trees to be retained must be undertaken in consultation with the project Arborist. Any machinery is to work from inside the footprint of the existing structures or outside the TPZ, reaching in to minimise soil disturbance and compaction. If it is not feasible to locate demolition machinery outside the TPZ of trees to be retained, ground protection will be required. The demolition should be undertaken inwards into the footprint of the existing structures, sometimes referred to as the 'top down, pull back' method.

10.14 **Excavations:** The project Arborist must supervise and certify that all excavations and root pruning are in accordance with AS4373-2007 and AS4970-2009. For continuous strip footings, first manual excavation is required along the edge of the structures closest to the subject trees. Manual excavation should be a depth of 1 metre (or to unfavourable root growth conditions such as bed rock or heavy clay, if agreed by project Arborist). Next roots must be pruned back in accordance with AS4373-2007. After all root pruning is completed, machine excavation is permitted within the footprint of the structure. For tree sensitive footings, such as pier and beam, all excavations inside the TPZ must be manual. Manual excavation may include the use of pneumatic and hydraulic tools, high-pressure air or a combination of high-pressure water and a vacuum device. No pruning of roots greater 30mm in diameter is to be carried out without approval of the project arborist. All pruning of roots greater than 10mm in diameter must be carried out by a qualified Arborist/Horticulturalist with a minimum AQF level 3. Root pruning is to be a clean cut with a sharp tool in accordance with AS4373 Pruning of amenity trees (2007).[9] The tree root is to be pruned back to a branch root if possible. Make a clean cut and leave as small a wound as possible.

[9] Council of Standards Australia, *AS 4373 Pruning of amenity trees* (2007) page 18

10.15 **Landscaping:** All landscaping works within the TPZ of trees to be retained are to be undertaken in consultation with a consulting Arborist to minimize the impact to trees. General guidance is provided below to minimise the impact of new landscaping to trees to be retained.

- Level changes should be minimised. The existing ground levels within the landscape areas should not be lowered by more than 50mm or increased by more 100mm without assessment by a consulting Arborist.
- New retaining walls should be avoided. Where new retaining walls are proposed inside the TPZ of trees to be retained, they should be constructed from tree sensitive material, such as timber sleepers, that require minimal footings/excavations. If brick retaining walls are proposed inside the TPZ, considerer pier and beam type footings to bridge significant roots that are critical to the trees condition. Retaining walls must be located outside the SRZ and sleepers/beams located above existing soil grades.
- New footpaths and hard surfaces should be minimised, as they can limit the availability of water, nutrients and air to the trees root system. Where they are proposed, they should be constructed on or above existing soil grades to minimise root disturbance and consider using a permeable surface. Footpath should be located outside the SRZ.
- Where fill/sub base is used inside the TPZ, fill material should be a coarse granular material that does not restrict the flow of water and air to the root system below. This type of material will also reduce the impact of soil compaction during construction.
- The location of new plantings inside the TPZ of trees to be retained should be flexible to avoid unnecessary damage to tree roots greater than 30mm in diameter.

10.16 **Sediment and Contamination:** All contamination run off from the development such as but not limited to concrete, sediment and toxic wastes must be prevented from entering the TPZ at all times.

10.17 **Tree Wounding/Injury:** Any wounding or injury that occurs to a tree during the construction process will require the project Arborist to be contacted for an assessment of the injury and provide mitigation/remediation advice. It is generally accepted that trees may take many years to decline and eventually die from root damage. All repair work is to be carried out by the project Arborist, at the contractor's expense.

10.18 **Completion of Development Works:** After all construction works are complete the project Arborist should assess that the subject trees have been retained in the same condition and vigour. If changes to condition are identified the project Arborist should provide recommendations for remediation.

11. HOLD POINTS

11.1 **Hold Points:** Below is a sequence of hold points requiring project Arborist certification throughout the development process**.** It provides a list of hold points that must be checked and certified. All certifications must be provided in written format upon completion of the development. The final certification must include details of any instructions for remediation undertaken during the development.

Hold Point	Stage	Responsibility	Certification	Complete Y/N and date
Project Arborist to hold pre construction site meeting with principal contractor to discuss methods and importance of tree protection measures and resolve any issues in relation to feasibility of tree protection requirements that may arise.	Prior to work commencing.	Principle contractor	Project Arborist	
Project Arborist to assess and certify that tree protection has been installed in accordance with section 10 and AS4970-2009 prior to works commencing at site.	Prior to development work commencing.	Principle contractor	Project Arborist	
In accordance with AS4970-2009 the project arborist should carryout regular site inspections to ensure works are carried out in accordance with the recommendations. I recommend site inspections on a monthly frequency.	Ongoing throughout the development	Principle contractor	Project Arborist	

Project Arborist to supervise all manual excavations and demolition inside the TPZ of any tree to be retained.	Construction	Principle contractor	Project Arborist	
Project Arborist to certify that all pruning of roots greater than 30mm in diameter has been carried out in accordance with AS4373-2007. All root pruning must be carried out by a qualified Arborist/Horticulturalist with a minimum AQF level 3.	Construction	Principle contractor	Project Arborist	
Project Arborist to certify that all underground services including storm water inside TPZ of any tree to be retained have been installed in accordance with AS4970-2009.	Construction	Principle contractor	Project Arborist	
Project arborist to approve relocation of tree protection for landscaping. All landscaping works within the TPZ of trees to be retained are to be undertaken in consultation with the project Arborist to minimize the impact to trees.	Landscape	Principle contractor	Project Arborist	
After all construction works are complete the project Arborist should assess that the subject trees have been retained in the same condition and vigor and authorize the removal of protective fencing. If changes to condition are identified the project Arborist should provide recommendations for remediation.	Upon completion of construction	Principle contractor	Project Arborist	
Any wounding or injury that occurs to a tree during the demolition/construction process will require the project arborist to be contacted for an assessment of the injury and provide mitigation/remediation advice. All remediation work is to be carried out by the project arborist, at the contractor's expense.	Ongoing throughout the development	Principle contractor	Project Arborist	

12. BIBLIOGRAPHY/REFERENCES

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- Kogarah Local Environmental Plan (KLEP) 2012 (Former Controls)
- Kogarah Development Control Plan (KDCP) 2013 (Former Controls)
- Part B2 KDCP 2013, Tree Management and Green web (Former Controls)

13. LIST OF APPENDICES

The following are included in the appendices:
Appendix 1 - Existing Site Plan
Appendix 1A - Proposed Basement Plan
Appendix 1B – Proposed ground Floor Plan
Appendix 2 - Tree inspection schedule
Appendix 3 – Health
Appendix 4 – Amenity Value
Appendix 5 – Age Class
Appendix 6 – Structural Condition
Appendix 7 – SULE Categories
Appendix 8 – Retention Values
Appendix 9 – Trees AZ
Appendix 10 – TPZ Encroachment
Appendix 11 – Hugh Millington CV.

Hugh Millington

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ISA Tree Risk Assessment Qualification
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SCALE : 1 : 200 @ A1
DATE : 12/08/2022
MAP FILENAME : Appendix 1 - Tree Location Plan

HUGH THE ARBORIST

Prepared by Hugh Millington

Tree Crown
Tree Protection Zone
Structural Root Zone
0
30m
GLADYS
AVENUE
FRENCHS
FOREST
ROAD
TOTAL SITE AREA
6694m²
BENCH MARK
S.S.M. 43156
RL. 160.41 A.H.D
ONE & TWO STOREY SEMI-DETACHED BRICK HOUSE TILE ROOF No. 126A
TWO STOREY SEMI-DETACHED BRICK HOUSE TILE ROOF No. 126B
BRICK COTTAGE TILE ROOF No. 1
BRICK COTTAGE TILE & METAL ROOF No. 124
TIMBER CLAD COTTAGE ON BRICK FOUNDATIONS METAL ROOF No. 3
ONE & TWO STOREY CLAD HOUSE METAL ROOF No. 5
ONE & TWO STOREY BRICK & CLAD HOUSE TILE ROOF No. 5A
BRICK COTTAGE METAL ROOF No. 7
BRICK COTTAGE TILE ROOF No. 122
TIMBER CLAD COTTAGE METAL ROOF No. 128
BLOCK GARAGE METAL ROOF
TIMBER GARAGE METAL ROOF
CARPORT METAL ROOF
BRICK HOUSE TILE ROOF
T1 T2 T3 T4 T5 T6 T7 T8 T9 T10 T11 T12 T13 T14 T15 T16 T17 T18 T19 T20
T21 T22 T23 T24 T25 T26 T27 T28 T29 T30 T31 T32 T33 T34 T35 T36 T37 T38 T39 T40
T41 T42 T43 T44 T45 T46 T47 T48 T49 T50 T51 T52 T53 T54 T55 T56 T57 T58 T59 T60
T61 T62 T63 T64

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SCALE : 1 : 150 @ A1	DATE : 17/02/2023
MAP FILENAME : Appendix 1B - Proposed Ground Floor Plan	

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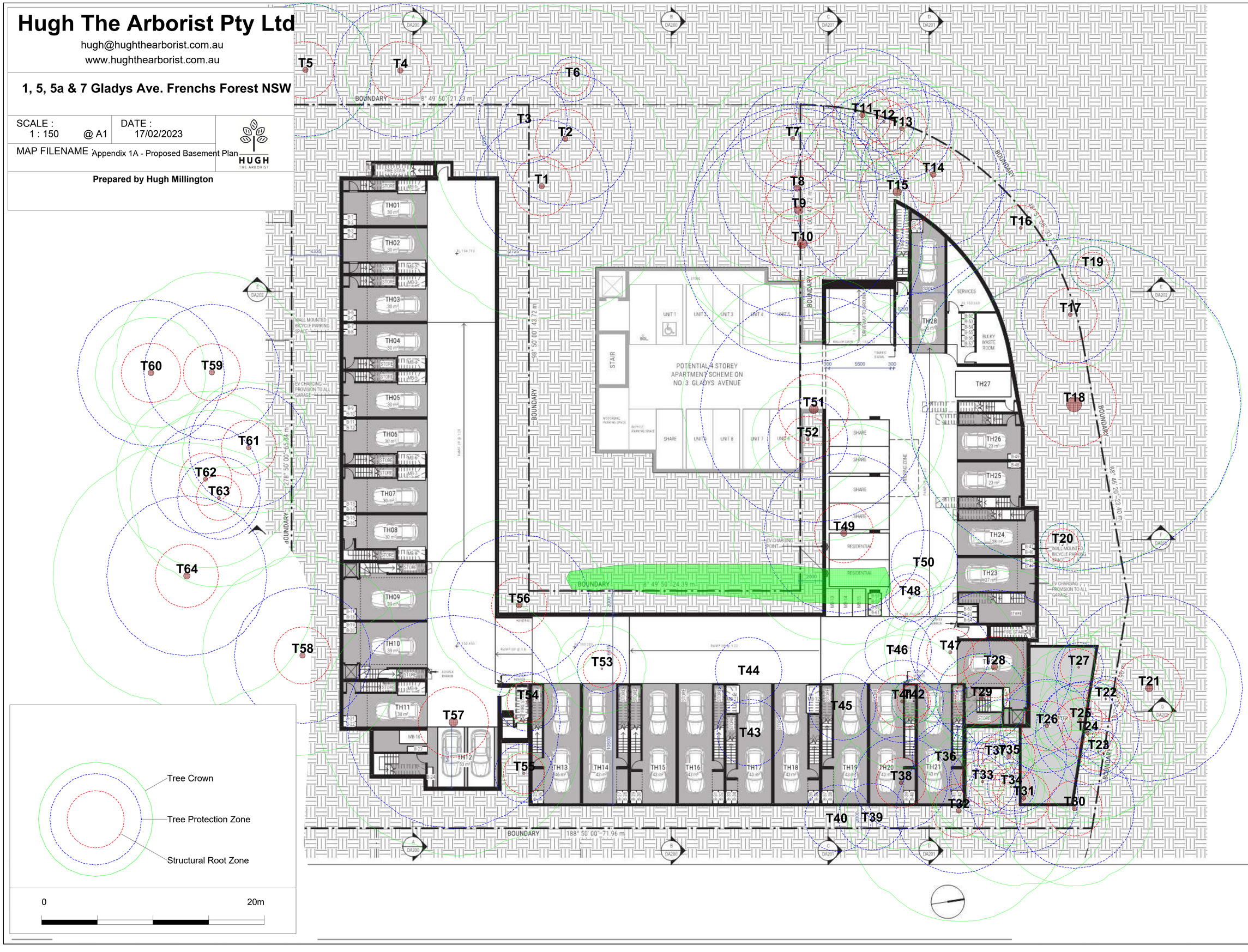
SCALE :	DATE :
1 : 150 @ A1	17/02/2023

MAP FILENAME Appendix 1A - Proposed Basement Plan

HUGH THE ARBORIST

Prepared by Hugh Millington



Appendix 2 - Tree Inspection Schedule

Tree ID	Common Name	Botanical Name	Age Class	Height (m)	Canopy Spread Radius (m)	Stem 1 (mm)	Stem 2 (mm)	Stem 3	Stem 4	Stem 5	Stem 6	DBH (mm)	DAB (mm)	Health	Structure	Amenity Value	SULE	Retention Value	TPZ Radius (m)	SRZ Radius (m)	Notes
1	Grey Gum	*Eucalyptus punctata*	Mature	19	12	500						500	600	Good	Good	High	1. Long	A1	6.0	2.7	Neighbors tree. Estimated and inaccessible.
2	Forest Red Gum	*Eucalyptus tereticornis*	Mature	19	12	500						500	600	Good	Good	High	1. Long	A1	6.0	2.7	As above
3	Cocos Palm	*Aracastrum romanzoffianum*	Mature	10	3	210						210	0	Good	Good	Low	1. Long	Z3	4.0	NA	
4	Queensland Brushbox	*Lophostemon confertus*	Mature	11	5	500						500	580	Good	Good	High	1. Long	A1	6.0	2.6	Street tree compaction
5	Queensland Brushbox	*Lophostemon confertus*	Mature	11	6	500						500	550	Good	Good	High	1. Long	A1	6.0	2.6	Street tree
6	Queensland Brushbox	*Lophostemon confertus*	Newly Planted	3	1	50						50	70	Good	Good	Medium	1. Long	Z1	0.6	1.5	Street tree.
7	Sydney Red Gum	*Angophora costata*	Semi-mature	9	7	390						390	410	Good	Good	High	1. Long	A1	4.7	2.3	
8	Forest Red Gum	*Eucalyptus tereticornis*	Mature	18	9	600						600	750	Good	Good	High	1. Long	A1	7.2	2.9	Neighbors tree 500 higher rl
9	Grey Gum	*Eucalyptus punctata*	Mature	20	12	800						800	880	Good	Good	High	1. Long	A1	9.6	3.1	
10	Spotted Gum	*Corymbia maculata*	Mature	20	10	990						990	1000	Good	Good	High	1. Long	A1	11.9	3.3	
11	Prickly Leaved Paperbark	*Melaleuca styphelioides*	Mature	12	5	500						500	600	Good	Good	High	1. Long	A1	6.0	2.7	
12	Prickly Leaved Paperbark	*Melaleuca styphelioides*	Semi-mature	9	4	230						230	300	Good	Fair	Medium	2. Medium	A2	2.8	2.0	Suppressed
13	Prickly Leaved Paperbark	*Melaleuca styphelioides*	Mature	10	5	380						380	400	Good	Poor	Low	3. Short	Z10	4.6	2.3	Included stems possibly partially failed.
14	Red Mahogany	*Eucalyptus resinifera*	Mature	10	8	550						550	600	Good	Good	High	1. Long	A1	6.6	2.7	
15	Sydney Red Gum	*Angophora costata*	Mature	16	13	640	450					782	1100	Good	Good	High	1. Long	A1	9.4	3.4	
16	Fiddlewood	*Citharexylum spinosum*	Mature	10	5	290						290	320	Good	Good	Medium	1. Long	A1	3.5	2.1	
17	Fiddlewood	*Citharexylum spinosum*	Mature	8	5	200	200	120	200			367	480	Good	Fair	Medium	2. Medium	A2	4.4	2.4	Included unions near base. On gas meter.
18	Sweetgum	*Liquidamber styraciflua*	Mature	18	15	1400						1400	1400	Good	Good	Low	1. Long	Z3	16.8	3.8	
19	Red Flowering Gum	*Corymbia ficifolia*	Young	4	2	90						90	100	Poor	Poor	Low	4. Remove	Z4	1.1	1.5	
20	Southern Magnolia	*Magnolia grandiflora*	Semi-mature	5	2	90						90	100	Good	Good	Low	1. Long	Z1	1.1	1.5	Insignificant.
21	Silky Oak	*Grevillea robusta*	Mature	16	7	700						700	780	Fair	Poor	Low	3. Short	Z10	8.4	3.0	Street tree poor branch structure.
22	Blue Jacaranda	*Jacaranda mimosifolia*	Semi-mature	8	6	120	120					170	220	Good	Poor	Low	2. Medium	Z3	2.0	1.8	
23	Blue Jacaranda	*Jacaranda mimosifolia*	Semi-mature	8	6	120	120					170	220	Good	Poor	Low	2. Medium	Z3	2.0	1.8	
24	Swamp Mahogany	*Eucalyptus robusta*	Semi-mature	15	8	390						390	420	Good	Fair	Medium	2. Medium	A2	4.7	2.3	
25	Macadamia	*Macadamia tetrophylla*	Mature	9	4	160	230					280	300	Good	Good	Medium	1. Long	A1	3.4	2.0	
26	Illawarra Flame	*Brachychiton acerifolius*	Semi-mature	10	4	350						350	400	Good	Good	Low	1. Long	Z3	4.2	2.3	
27	Illawarra Flame	*Brachychiton acerifolius*	Semi-mature	7	3	150	110					186	200	Good	Good	Low	1. Long	Z3	2.2	1.7	
28	Mexican Pine	*Pinus patula*	Mature	16	9	580						580	650	Fair	Good	Low	1. Long	Z3	7.0	2.8	
29	Prickly Leaved Paperbark	*Melaleuca styphelioides*	Mature	12	4	340						340	440	Good	Good	High	1. Long	A1	4.1	2.3	
30	Lemon Scented Gum	*Corymbia citriodora*	Semi-mature	15	7	450						450	510	Good	Good	High	1. Long	A1	5.4	2.5	
31	Lemon Scented Gum	*Corymbia citriodora*	Semi-mature	16	8	410						410	450	Good	Good	High	1. Long	A1	4.9	2.4	
32	Lemon Scented Gum	*Corymbia citriodora*	Semi-mature	16	10	470						470	470	Good	Good	High	1. Long	A1	5.6	2.4	
33	Lemon Scented Gum	*Corymbia citriodora*	Young	10	5	250						250	310	Good	Good	High	1. Long	A1	3.0	2.0	Not on survey
34	Lemon Scented Gum	*Corymbia citriodora*	Young	9	3	180						180	200	Good	Fair	Medium	2. Medium	A2	2.2	1.7	Suppressed.
35	Sydney Red Gum	*Angophora costata*	Semi-mature	13	8	330	280					433	450	Fair	Fair	Low	3. Short	Z10	5.2	2.4	Bark wounds and lesions throughout. Leggy form.
36	Cabbage Palm	*Livistona australis*	Mature	13	2	420						420	0	Good	Good	High	1. Long	A1	3.0	NA	
37	Callitris Spp.	*Callitris Spp.*	Semi-mature	10	3	170						170	190	Good	Good	Medium	1. Long	A1	2.0	1.6	
38	Illawarra Flame	*Brachychiton acerifolius*	Mature	9	6	350						350	400	Good	Good	Low	1. Long	Z3	4.2	2.3	
39	Bangalow Palm	*Archontophoenix cunninghamiana*	Mature	9	2	200						200	0	Good	Good	Low	1. Long	Z3	3.0	NA	6 palms.
40	Coinspot Tree Fern	*Cyathea cooperii*	Mature	5	3	80						80	0	Good	Good	High	1. Long	A1	3.0	NA	
41	Umbrella	*Schefflera actinophylla*	Mature	10	6	310						310	450	Good	Good	Low	1. Long	Z3	3.7	2.4	
42	Brown Pine	*Podocarpus elatus*	Young	7	2	130						130	150	Good	Good	Medium	1. Long	A1	1.6	1.5	
43	Rough Tree Fern	*Cyathea australe*	Mature	7	2	130						130	0	Good	Good	Medium	1. Long	Z2	3.0	NA	Proximity
44	Rough Tree Fern	*Cyathea australe*	Mature	4	2	180						180	0	Good	Good	Medium	1. Long	Z2	3.0	NA	Rough proxy
45	Rough Tree Fern	*Cyathea australe*	Mature	5	2	200						200	0	Good	Good	Medium	1. Long	A1	3.0	NA	Rough
46	Bangalow Palm	*Archontophoenix cunninghamiana*	Mature	10	3	200						200	0	Good	Good	Low	1. Long	Z3	3.0	NA	Cluster of 4
47	Illawarra Flame	*Brachychiton acerifolius*	Mature	10	6	300						300	350	Good	Good	Low	1. Long	Z3	3.6	2.1	Acerigoliuos Or discolor.
48	Lawson Cypress	*Chamaecyparis lawsoniana*	Semi-mature	9	3	180						180	200	Good	Good	Low	1. Long	Z3	2.2	1.7	
49	Sydney Red Gum	*Angophora costata*	Mature	15	10	600						600	600	Good	Good	High	1. Long	A1	7.2	2.7	Estimated.
50	Bangalow Palm	*Archontophoenix cunninghamiana*	Mature	6	2	200						200	0	Good	Good	Low	1. Long	A1	3.0	NA	
51	Red Mahogany	*Eucalyptus resinifera*	Mature	17	12	850						850	900	Good	Good	High	1. Long	A1	10.2	3.2	Estimated base inaccessible
52	Japanese Maple	*Acer palmatum*	Mature	6	5	300						300	320	Good	Good	Medium	1. Long	A1	3.6	2.1	Japanese Estimated
G1	Brush Cherry	*Syzegium australe*	Semi-mature	5	3	50						50	80	Good	Good	Low	1. Long	Z1	0.6	1.5	16 as a hedge. No boundary
53	Elm	*Ulmus Spp.*	Mature	5	4	100	120	100				185	200	Fair	Fair	Low	3. Short	Z1	2.2	1.7	
54	Monterey Cypress	*Cupressus macrocarpa*	Mature	12	2	220						220	250	Good	Good	Low	1. Long	Z3	2.6	1.8	
55	Monterey Cypress	*Cupressus macrocarpa*	Mature	12	2	220						220	250	Good	Good	Low	1. Long	Z3	2.6	1.8	
56	Queensland Brushbox	*Lophostemon confertus*	Mature	13	8	350	400					532	510	Good	Good	High	1. Long	A1	6.4	2.5	
57	Sweetgum	*Liquidambar styraciflua*	Mature	16	12	800						800	900	Good	Good	Low	1. Long	Z3	9.6	3.2	

Appendix 2 - Tree Inspection Schedule

Tree ID	Common Name	Botanical Name	Age Class	Height (m)	Canopy Spread Radius (m)	Stem 1 (mm)	Stem 2 (mm)	Stem 3	Stem 4	Stem 5	Stem 6	DBH (mm)	DAB (mm)	Health	Structure	Amenity Value	SULE	Retention Value	TPZ Radius (m)	SRZ Radius (m)	Notes
58	Queensland Brushbox	*Lophostemon confertus*	Mature	16	9	510						510	550	Good	Good	High	1. Long	A1	6.1	2.6	Estimated from one side.
59	Red Mahogany	*Eucalyptus resinifera*	Mature	16	9	510						510	550	Poor	Fair	Low	3. Short	Z4	6.1	2.6	Declining
60	Norfolk Island Pine	*Araucaria heterophylla*	Mature	18	5	550						550	600	Good	Good	High	1. Long	A1	6.6	2.7	
61	Lilly Pilly	*Acmena smithii*	Mature	11	6	450						450	500	Good	Good	High	1. Long	A1	5.4	2.5	
62	Sydney Red Gum	*Angophora costata*	Semi-mature	12	8	410						410	430	Good	Good	High	1. Long	A1	4.9	2.3	
63	Sydney Red Gum	*Angophora costata*	Semi-mature	12	8	310						310	310	Good	Fair	Medium	2. Medium	A2	3.7	2.0	Suppressed and leggy form.
64	Red Mahogany	*Eucalyptus resinifera*	Mature	18	12	600						600	700	Good	Good	High	1. Long	A1	7.2	2.8	Note all estimated

Tree Species - Botanical name followed by common name in brackets. Where species is unknown it is indicated with an '*spp'.*
Age Class - Over mature (OM), Mature (M), Early mature (EM), Semi mature (SM), Young (Y), Dead (D).
Diameter at Breast Height (DBH) - Measured with a DBH tape or estimated at approximately 1.4m above ground level. Where DBH has been estimated it is indicated with an 'est'.

Diameter Above root Buttresses (DAB): Measured with a DBH tape or estimated above root buttresses (DAB) for calculating the SRZ.
Height - Height from ground level to top of crown. All heights are estimated unless otherwise indicated.
Spread - Radius of crown at widest section. All tree spreads are estimated unless otherwise indicated.
Tree Protection Zone (TPZ) - DBH x 12. Measured in radius from the centre of the trunk. Rounded to nearest 0.1m. For monocots, the TPZ is set at 1 metre outside the crown projection.
Structural Root Zone (SRZ) - (DAB x 50) $^{0.42}$ x 0.64. Measured in radius from the centre of the trunk. Rounded up to nearest 0.1m.
Health - Good/Fair/Poor/Dead
Structure - Good/Fair/Poor
Safe Useful Life Expectancy (SULE) - 1. Long (40+years), 2. Medium (15 - 40 years), 3. Short (5 - 15 years), 4. Remove (under 5 years), 5. Small/young.
Amenity Value - Very High/High/Medium/Low/Very Low.
(x) Indicates the measurement taken for the diameter at tree base above the buttress roots.
(E) Indicates estimated measurements.

Appendix 3 – Assessment of Health

Category	Example condition	Summary
Good	• Crown has good foliage density for species. • Tree shows no or minimal signs of pathogens that are unlikely to have an effect on the health of the tree. • Tree is displaying good vigour and reactive growth development.	• The tree is in above average health and condition and no remedial works are required.
Fair	• The tree may be starting to dieback or have over 25% deadwood. • Tree may have slightly reduced crown density or thinning. • There may be some discolouration of foliage. • Average reactive growth development. • There may be early signs of pathogens which may further deteriorate the health of the tree. • There may be epicormic growth indicating increased levels of stress within the tree.	• The tree is in below average health and condition and may require remedial works to improve the trees health.
Poor	• The may be in decline, have extensive dieback or have over 30% deadwood. • The canopy may be sparse or the leaves may be unusually small for species. • Pathogens or pests are having a significant detrimental effect on the tree health.	• The tree is displaying low levels of health and removal or remedial works may be required.
Dead	• The tree is dead or almost dead.	• The tree should generally be removed.

Appendix 4 Landscape Value

RATING	HERITAGE VALUE	ECOLOGICAL VALUE	AMENITY VALUE
1. SIGNIFICANT	The subject tree is listed as a Heritage Item under the Local Environment Plan (LEP) with a local, state or national level of significance or is listed on Council's Significant Tree Register	The subject tree is scheduled as a Threatened Species as defined under the Threatened Species Conservation Act 1995 (NSW) or the Environmental Protection and Biodiversity Conservation Act 1999	The subject tree has a very large live crown size exceeding 300m² with normal to dense foliage cover, is located in a visually prominent position in the landscape, exhibits very good form and habit typical of the species
	The subject tree forms part of the curtilage of a Heritage Item (building /structure /artefact as defined under the LEP) and has a known or documented association with that item	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 species	The subject tree makes a significant contribution to the amenity and visual character of the area by creating a sense of place or creating a sense of identity
	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 a Remnant Tree, being a tree in existence prior to development of the area	The tree is visually prominent in view from surrounding areas, being a landmark or visible from a considerable distance
2. VERY HIGH	The tree has a strong historical association with a heritage item (building/structure/artefact/garden 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 (EEC) formerly occurring in the area occupied by the site.	The subject tree has a very large live crown size exceeding 200m²; a crown density exceeding 70% (normal-dense), is a very good representative of the species in terms of its form and branching habit or is aesthetically distinctive and makes a positive contribution to the visual character and the amenity of the area
3. HIGH	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 and representative of the original vegetation of the area and the tree is located within a defined Vegetation Link / Wildlife Corridor or has known wildlife habitat value	The subject tree has a large live crown size exceeding 100m²; The tree is a good representative of the species in terms of its form and branching habit with minor deviations from normal (e.g. crown distortion/suppression) with a crown density of at least 70% normal); The subject tree is visible from the street and surrounding properties and makes a positive contribution to the visual character and the amenity of the area
4. MODERATE	The tree has no known or suspected historical association, but does not detract or diminish the value of the item and is sympathetic to the original era of planting.	The subject tree is a non-local native or exotic species that is protected under the provisions of this DCP.	The subject tree has a medium live crown size exceeding 40m²;The tree is a fair representative of the species, exhibiting moderate deviations from typical form (distortion/suppression etc) with a crowndensity of more than 50% (thinning to normal); and The tree is visible from surrounding properties, but is not visually prominent – view may be partially obscured by other vegetation or built forms. The tree makes a fair contribution to the visual character and amenity of the area.
5. LOW	The subject tree detracts from heritage values or diminishes the value of a heritage item	The subject tree is scheduled as exempt (not protected) under the provisions of this DCP due to its species, nuisance or position relative to buildings or other structures.	The subject tree has a small live crown size of less than 40m² and can be replaced within the short term (5-10 years) with new tree planting
6. VERY LOW	The subject tree is causing significant damage to a heritage Item.	The subject tree is listed as an Environment Weed Species in the Local Government Area, being invasive, or is a known nuisance species.	The subject tree is not visible from surrounding properties (visibility obscured) and makes a negligible contribution or has a negative impact on the amenity and visual character of the area. The tree is a poor representative of the species, showing significant deviations from the typical form and branching habit with a crown density of less than 50% (sparse).
7. INSIGNIFICANT	The tree is completely dead and has no visible habitat value	The tree is a declared Noxious Weed under the Noxious Weeds Act (NSW) 1993 within the relevant Local Government Area.	The tree is completely dead and represents a potential hazard.

Ref: *Determining the retention value of trees of development sites,* presentation handouts at TAFE NSW Ryde College, March 2012

Appendix 5 - Age class

Determining the exact age of a tree is difficult without carrying out potentially invasive testing. The age class of the subject tree has been estimated using the definitions below.

Category	Description
Young/Newly planted	• Young or recently planted tree.
Semi Mature	• Up to 20% of the usual life expectancy for the species.
Early mature/Mature	• Between 20% - 80% of the usual life expectancy for the species.
Over mature	• Over 80% of the usual life expectancy for the species.
Dead	• Tree is dead or almost dead.

Appendix 4 - Structural condition

Category	Example condition	Summary
Good	• Branch unions appear to be strong with no sign of defects. • There are no significant cavities. • The tree is unlikely to fail in usual conditions. • The tree has a balanced crown shape and form.	• The tree is considered structurally good with well developed form.
Fair	• The tree may have minor structural defects within the structure of the crown that could potentially develop into more significant defects. • The tree may a cavity that is currently unlikely to fail but may deteriorate in the future. • The tree is an unbalanced shape or leans significantly. • The tree may have minor damage to its roots. • The root plate may have moved in the past but the tree has now compensated for this. • Branches may be rubbing or crossing.	• The identified defects are unlikely cause major failure. • Some branch failure may occur in usual conditions. • Remedial works can be undertaken to alleviate potential defects.
Poor	• The tree has significant structural defects. • Branch unions may be poor or weak. • The tree may have a cavity or cavities with excessive levels of decay that could cause catastrophic failure. • The tree may have root damage or is displaying signs of recent movement. • The tree crown may have poor weight distribution which could cause failure.	• The identified defects are likely to cause either partial or whole failure of the tree.

Appendix 7 - Safe Useful Life Expectancy (SULE), (Barrel, 2001)

A trees safe useful life expectancy is determined by assessing a number of different factors including the health and vitality, estimated age in relation to expected life expectancy for the species, structural defects, and remedial works that could allow retention in the existing situation.

Category	Description
1. Long	Useful life expectancy over 40 years
2. Medium	Useful life expectancy 15 to 40 years
3. Short	Useful life expectancy 5 to 15 years
4. Remove	Useful life expectancy under 5 years
5. Small/Young	Trees that could be transplanted or replaced with similar specimen.
6. Unstable	Tree has become hazardous or structurally unstable.

TreeAZ Categories (Version 10.04-ANZ)

CAUTION: TreeAZ assessments must be carried out by a competent person qualified and experienced in arboriculture. The following category descriptions are designed to be a brief field reference and are not intended to be self-explanatory. They must be read in conjunction with the most current explanations published at www.TreeAZ.com.

Category Z: Unimportant trees not worthy of being a material constraint

Local policy exemptions: Trees that are unsuitable for legal protection for local policy reasons including size, proximity and species	
Z1	Young or insignificant small trees, i.e. below the local size threshold for legal protection, etc
Z2	Too close to a building, i.e. exempt from legal protection because of proximity, etc
Z3	Species that cannot be protected for other reasons, i.e. scheduled noxious weeds, out of character in a setting of acknowledged importance, etc
High risk of death or failure: Trees that are likely to be removed within 10 years because of acute health issues or severe structural failure	
Z4	Dead, dying, diseased or declining
Z5	Severe damage and/or structural defects where a high risk of failure cannot be satisfactorily reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, overgrown and vulnerable to adverse weather conditions, etc
Z6	Instability, i.e. poor anchorage, increased exposure, etc
Excessive nuisance: Trees that are likely to be removed within 10 years because of unacceptable impact on people	
Z7	Excessive, severe and intolerable inconvenience to the extent that a locally recognized court or tribunal would be likely to authorize removal, i.e. dominance, debris, interference, etc
Z8	Excessive, severe and intolerable damage to property to the extent that a locally recognized court or tribunal would be likely to authorize removal, i.e. severe structural damage to surfacing and buildings, etc
Good management: Trees that are likely to be removed within 10 years through responsible management of the tree population	
Z9	Severe damage and/or structural defects where a high risk of failure can be temporarily reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, vulnerable to adverse weather conditions, etc
Z10	Poor condition or location with a low potential for recovery or improvement, i.e. dominated by adjacent trees or buildings, poor architectural framework, etc
Z11	Removal would benefit better adjacent trees, i.e. relieve physical interference, suppression, etc
Z12	Unacceptably expensive to retain, i.e. severe defects requiring excessive levels of maintenance, etc

NOTE: Z trees with a high risk of death/failure (Z4, Z5 & Z6) or causing severe inconvenience (Z7 & Z8) at the time of assessment and need an urgent risk assessment can be designated as ZZ. ZZ trees are likely to be unsuitable for retention and at the bottom of the categorization hierarchy. In contrast, although Z trees are not worthy of influencing new designs, urgent removal is not essential and they could be retained in the short term, if appropriate.

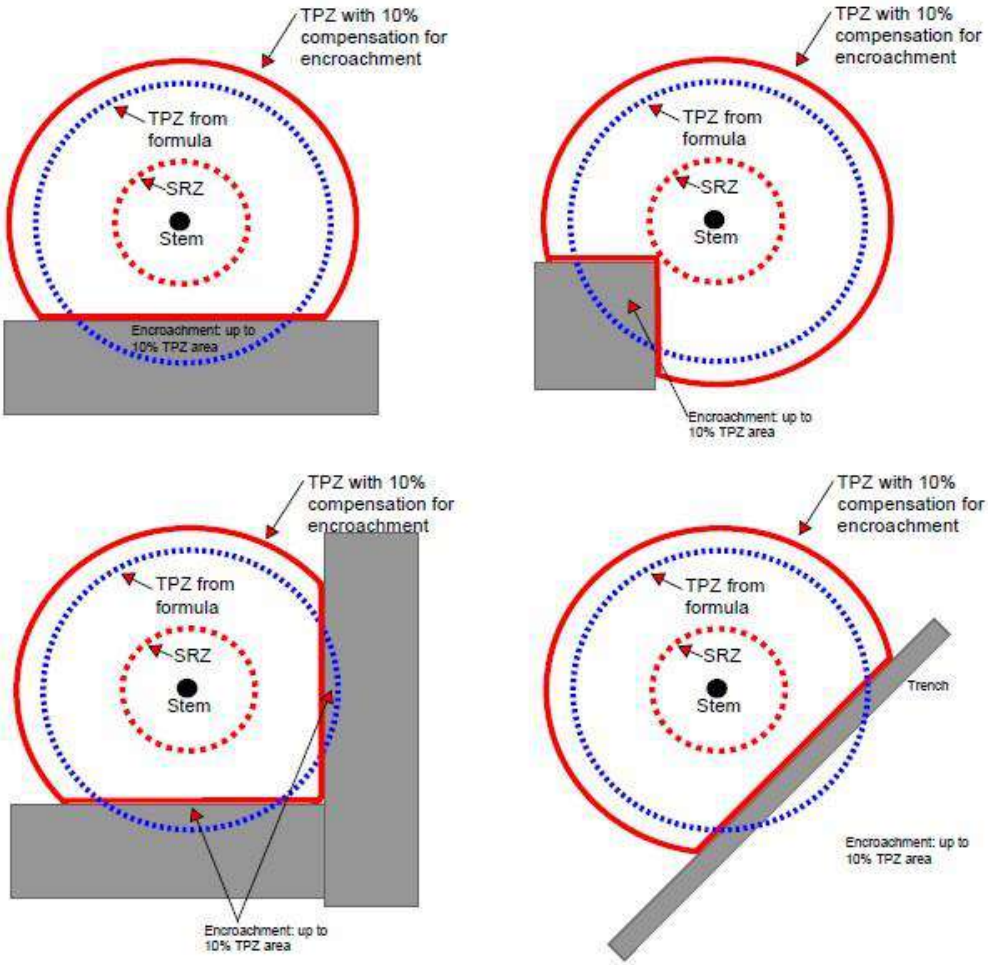
Category A: Important trees suitable for retention for more than 10 years and worthy of being a material constraint

A1	No significant defects and could be retained with minimal remedial care
A2	Minor defects that could be addressed by remedial care and/or work to adjacent trees
A3	Special significance for historical, cultural, commemorative or rarity reasons that would warrant extraordinary efforts to retain for more than 10 years
A4	Trees that may be worthy of legal protection for ecological reasons (Advisory requiring specialist assessment)

NOTE: Category A1 trees that are already large and exceptional, or have the potential to become so with minimal maintenance, can be designated as AA at the discretion of the assessor. Although all A and AA trees are sufficiently important to be material constraints, AA trees are at the top of the categorization hierarchy and should be given the most weight in any selection process.

Appendix 10 – Examples of TPZ Encroachment

Encroachment into the Tree Protection Zone is sometimes unavoidable. The following diagram shows examples of acceptable levels of encroachment and how they may be compensated for by providing additional space contiguous to the TPZ area.



Note: Less than 10% TPZ area and outside SRZ. Any loss of TPZ compensated for elsewhere.