HRHS - REF 1

ARBORICULTURE IMPACT ASSESSMENT

Aaron Bath
ASSURANCE TREES | 80 HORNS CROSSING ROAD, VACY, NSW, 2421

13 APRIL 2024

Contents

Record of Revisions/Issues		
Revisions #	Date	Comments
Draft version 1	22 August 2022	
Draft version 2	25 August 2022	
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Revision 6	8 April 2024	
Revision 6.1	13 April 2024	

1. Summary

1.1. All trees that may be impacted by the REF 1 proposed works have been assessed and listed for either retention or removal in this report.

1.2. 34 trees have been determined to be removed due to the building footprint, level changes and earthworks, or services associated with the REF 1 works.

1.3. 48 Trees can be retained and Tree Protection to be implemented during construction. *Appendix F* lists all protection methodology required.

2. Overview

2.1. **Consultant Details**

Company: Assurance Trees Pty Ltd

ABN: 87 158 399 350

Consulting Arborist: Aaron Bath

Mobile: (+61) 434523566

Email: aaron@assurancetrees.com.au

2.2. **Client Details**

Entity: Richard Crookes Constructions Pty Ltd

Contact: Dylan Cross

Mobile: 0429 777 807

Email: CrossD@richardcrookes.com.au

2.3. **Site Details**

Site Name: Hunter River High School

Site Address: 36 Elkin Ave, Heatherbrae NSW 2324

Deposited Plan: Lot 1, DP120189 & DP540114 & DP579025

Map of Site: *Appendix B*

2.4. **Description of Proposal**

This report has been prepared in relation to the proposed development of Hunter River High School located at 36 Elkin Avenue, Heatherbrae. This report has been prepared to support the REF 1 proposed works, for the construction of a new administration building, student learning hub and provision of essential services.

2.5. **Scope of Report**

Assurance Trees have been engaged by the client to investigate the impacts of the proposed Ref 1 works on existing trees at the above site address with a view to maximise retention. This report includes:

- All relevant tree data for all potentially impacted trees including Tree Protection Zones (TPZ) and Structural Root Zones (SRZ) measurements.
- Tree Removal and Retention Plans.
- Tree Retention Value (TRV) for all trees impacted by the works.
- Specify the method of tree protection during construction that will be required for any trees that can be retained.

3. Documentation

3.1. **Client Provided Documents**

The client representative has provided the following documentation that has been used in the preparation of this report:

- *REF 1 Architectural Plans by EJE (27th March 2024)*
- *Landscape plan 3 by Terras Landscaping (12th March 2024)*

4. Methodology

4.1. **Site Inspection**

4.1.1. A site inspection for the latest REF 1 plans was completed by Aaron Bath on 3rd April 2024.

4.1.2. Original tree data and locations were completed on 15th and 16th of August 2022 by Aaron Bath. As the trees onsite are mature a reassessment is not required to update the tree data.

4.1.3. All trees within the REF 1 area have been recorded. Relevant data has been captured for all trees such as species, height, Diameter at Breast Height (DBH), stem diameter at ground level, canopy spread, condition, landscape significance, sustainability, retention value, images, and any relevant comments.

4.1.4. Tree locations have been collected on a mobile device using Trimble software. Location accuracy is sub 1m with the utilisation of an R1 Receiver.

4.1.5. DBH and stem diameter have been estimated with reference to a diameter tape if required. Heights and canopy spread have also been estimated and referenced with a clinometer and laser distance device.

4.1.6. Critical distances have been measured onsite with a tape measure or laser measure.

4.1.7. Visual inspection only conducted on all trees. No aerial inspections have been conducted.

5. Tree Removals

5.1. Trees requiring removal to facilitate the REF 1 works have been shown on the Tree Removal and Retention Plans in *Appendix B* and the Table in *Appendix A*. Trees shown as blue in table 1 and maps are to be removed.

5.2. A total of 34 trees require removal for the REF 1 proposal and the associated civil and service works.

6. Tree Retention

6.1. Trees to be retained have been listed in *Table 1*, *Appendix A*.

6.2. A total of 48 trees can be retained with various and appropriate protection measures implemented during construction.

6.3. Tree Removal and Retention Maps (*Appendix B*) show the trees to be retained under the REF 1 approval pathway and is colour coded with *Appendix A* for easy reference.

6.4. Trees shown to be retained must be protected in accordance with *AS4970-2009 Protection of Trees on Development Sites* and the guidelines in *Appendix F*.

6.5. Existing school fencing is appropriate for use as tree protection fencing for trees located around the bus drop off zone. Trees 8 to 25.

6.6. Any earthworks conducted inside the SRZ of a retained tree must be directly supervised by the project arborist. SRZ's and TPZ's have been calculated and listed in *Appendix A* as a radius from the centre of the trunk of each tree. This will assist in calculating locations of exclusion fencing and for the project arborist to calculate any incursions into the TPZ that may require the supervision of a project arborist.

6.7. Tree protection fencing may be removed to facilitate access or works when required but must be under the guidance and approval of the project arborist.

6.8. Trees 170 to 176 must be closely monitored during construction of the support hub and associated level changes that will extend into the TPZ of some of these trees. The required retaining walls along the pathways will need to be constructed in a way that limits root disturbance to allow for successful tree retention.

6.9. Some pruning may be required to remove branches that are in the way of scaffolding, cranes etc. If this is required pruning should be a maximum of 10% of the canopy volume. This pruning should be conducted by a qualified arborist to the standard of *AS4373 Pruning of Amenity Trees*.

6.10. Any encroachment into a TPZ as per radius listed in *table 1*, that is greater then 10% must be approved by the project arborist.

6.11. Any encroachment into a TPZ as per radius listed in *table 1*, that is greater than 30% must be monitored by the project arborist.

6.12. Any encroachment into a SRZ as per radius listed in *table 1* must be monitored by the project arborist.

References

Bond, J., 2012. *Urban Tree Health.* s.l.:Urban Forest Analytics LLC.

Draper, D. & Richards, P., 2009. *Dictionary for Managing Trees in Urban Environments.* s.l.:CSIRO.

Julian Dunster, T. S. N. M. S. L., 2013. *Tree Risk Assessment Manual.* Champaign, Illinois: International Society of Arboriculture.

Standards Australia, 2007. *AS 4373 Pruning of Amenity Trees,* Sydney: Standards Australia.

Standards Australia, 2009. *AS 4970 Protection of Trees on Development Sites,* Sydney: Standards Australia.

Trowbridge, P. & Bassuk, N., 2004. *Trees in the Urban Landscape.* Hoboken: John Wiley & Sons.

Watson, G. & Neely, D., 1995. *Trees and Building Sites.* Champaign: International Society of Arboriculture.

Appendix A - Tree Data

Table 1

Site Tree ID	Species	Common Name	Height (m)	Canopy Spread (m)	DBH (mm)	Stem Diameter at ground (mm)	Condition	Landscape Significance	Sustainability	Retention Value	TPZ (radial)	SRZ (radial)	Canopy Area (m2)	Outcome	Comments	Pathway
1	Callitris sp.	Cypress Pine	5-10	5	200	230	Good	Low - 5	15 - 40 years	Low	2.4	1.8	20	Retain		
2	Jacaranda mimosifolia	Jacaranda	10-15	9	600	600	Fair	Low - 5	15 - 40 years	Low	7.2	2.7	64	Retain		
3	Jacaranda mimosifolia	Jacaranda	10-15	10	500	500	Fair	Low - 5	15 - 40 years	Low	6	2.5	79	Retain		
4	Platanus × acerifolia	London plane	5-10	6	400	450	Poor	Low - 5	Less 5 years	Very Low	4.8	2.4	28	Retain		
8	Jacaranda mimosifolia	Jacaranda	10-15	13	600	650	Good	Moderate - 4	15 - 40 years	Moderate	7.2	2.8	133	Retain		
9	Jacaranda mimosifolia	Jacaranda	10-15	13	600	600	Good	Moderate - 4	15 - 40 years	Moderate	7.2	2.7	133	Retain		
10	Jacaranda mimosifolia	Jacaranda	10-15	8	250	300	Fair	Low - 5	15 - 40 years	Low	3	2	50	Retain		
11	Jacaranda mimosifolia	Jacaranda	10-15	12	500	450	Fair	Moderate - 4	5 - 15 years	Low	6	2.4	113	Retain		
12	Jacaranda mimosifolia	Jacaranda	10-15	12	550	550	Fair	Moderate - 4	15 - 40 years	Moderate	6.6	2.6	113	Retain		
13	Jacaranda mimosifolia	Jacaranda	10-15	15	600	650	Good	Moderate - 4	15 - 40 years	Moderate	7.2	2.8	177	Retain		
14	Jacaranda mimosifolia	Jacaranda	10-15	13	500	500	Fair	Moderate - 4	15 - 40 years	Moderate	6	2.5	133	Retain		
15	Jacaranda mimosifolia	Jacaranda	10-15	15	500	500	Good	Moderate - 4	15 - 40 years	Moderate	6	2.5	177	Retain		
16	Jacaranda mimosifolia	Jacaranda	5-10	8	500	550	Fair	Low - 5	5 - 15 years	Low	6	2.6	50	Retain		
17	Jacaranda mimosifolia	Jacaranda	10-15	13	650	650	Poor	Low - 5	5 - 15 years	Low	7.8	2.8	133	Retain		
18	Jacaranda mimosifolia	Jacaranda	10-15	14	650	700	Good	Moderate - 4	15 - 40 years	Moderate	7.8	2.8	154	Retain		
19	Jacaranda mimosifolia	Jacaranda	10-15	16	950	1000	Good	Moderate - 4	15 - 40 years	Moderate	11.4	3.3	201	Retain		
20	Jacaranda mimosifolia	Jacaranda	10-15	8	350	400	Fair	Low - 5	5 - 15 years	Low	4.2	2.3	50	Retain		
21	Jacaranda mimosifolia	Jacaranda	10-15	15	600	600	Good	Moderate - 4	15 - 40 years	Moderate	7.2	2.7	177	Retain		
22	Jacaranda mimosifolia	Jacaranda	5-10	10	350	350	Good	Low - 5	5 - 15 years	Low	4.2	2.1	79	Retain		
23	Jacaranda mimosifolia	Jacaranda	5-10	8	300	350	Fair	Low - 5	5 - 15 years	Low	3.6	2.1	50	Retain		
24	Jacaranda mimosifolia	Jacaranda	5-10	15	550	500	Good	Moderate - 4	15 - 40 years	Moderate	6.6	2.5	177	Retain		
25	Ulmus parvifolia	Chinese elm	5-10	9	250	300	Good	Low - 5	15 - 40 years	Low	3	2	64	Retain		
26	Eucalyptus microcorys	Tallowwood	5-10	5	250	300	Good	Low - 5	15 - 40 years	Low	3	2	20	Retain	Koala feed tree	
27	Corymbia maculata	Spotted Gum	5-10	4	300	300	Poor	Low - 5	Less 5 years	Very Low	3.6	2	13	Retain		

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28	Jacaranda mimosifolia	Jacaranda	5-10	12	450	450	Fair	Moderate - 4	15 - 40 years	Moderate	5.4	2.4	113	Retain		
29	Jacaranda mimosifolia	Jacaranda	5-10	6	250	300	Fair	Low - 5	15 - 40 years	Low	3	2	28	Retain		
30	Jacaranda mimosifolia	Jacaranda	5-10	9	300	350	Fair	Low - 5	15 - 40 years	Low	3.6	2.1	64	Retain		
31	Jacaranda mimosifolia	Jacaranda	5-10	8	200	250	Fair	Low - 5	15 - 40 years	Low	2.4	1.8	50	Retain		
32	Jacaranda mimosifolia	Jacaranda	5-10	8	200	250	Fair	Low - 5	15 - 40 years	Low	2.4	1.8	50	Retain		
33	Jacaranda mimosifolia	Jacaranda	5-10	10	200	200	Poor	Low - 5	Less 5 years	Very Low	2.4	1.7	79	Retain		
34	Jacaranda mimosifolia	Jacaranda	5-10	5	250	250	Fair	Low - 5	5 - 15 years	Low	3	1.8	20	Retain		
35	Jacaranda mimosifolia	Jacaranda	5-10	11	350	400	Good	Low - 5	15 - 40 years	Low	4.2	2.3	95	Retain		
36	Jacaranda mimosifolia	Jacaranda	5-10	6	250	300	Good	Low - 5	15 - 40 years	Low	3	2	28	Retain		
37	Jacaranda mimosifolia	Jacaranda	5-10	9	300	350	Good	Low - 5	15 - 40 years	Low	3.6	2.1	64	Retain		
38	Jacaranda mimosifolia	Jacaranda	5-10	12	40	400	Good	Moderate - 4	15 - 40 years	Moderate	0.48	2.3	113	Retain		
39	Jacaranda mimosifolia	Jacaranda	5-10	10	350	400	Good	Moderate - 4	15 - 40 years	Moderate	4.2	2.3	79	Retain		
40	Jacaranda mimosifolia	Jacaranda	5-10	13	350	350	Good	Moderate - 4	15 - 40 years	Moderate	4.2	2.1	133	Retain		
41	Jacaranda mimosifolia	Jacaranda	10-15	8	500	500	Poor	Low - 5	Less 5 years	Very Low	6	2.5	50	Removal		Ref 1
42	Jacaranda mimosifolia	Jacaranda	5-10	6	200	250	Poor	Low - 5	Less 5 years	Very Low	2.4	1.8	28	Removal		Ref 1
43	Jacaranda mimosifolia	Jacaranda	5-10	9	300	350	Fair	Low - 5	15 - 40 years	Low	3.6	2.1	64	Removal		Ref 1
44	Jacaranda mimosifolia	Jacaranda	5-10	10	400	400	Good	Low - 5	15 - 40 years	Low	4.8	2.3	79	Removal		Ref 1
45	Jacaranda mimosifolia	Jacaranda	5-10	8	250	250	Fair	Low - 5	5 - 15 years	Low	3	1.8	50	Removal		Ref 1
46	Jacaranda mimosifolia	Jacaranda	10-15	12	450	450	Good	Moderate - 4	15 - 40 years	Moderate	5.4	2.4	113	Removal		Ref 1
47	Jacaranda mimosifolia	Jacaranda	10-15	11	650	650	Good	Moderate - 4	15 - 40 years	Moderate	7.8	2.8	95	Removal		Ref 1
48	Jacaranda mimosifolia	Jacaranda	5-10	7	300	300	Good	Low - 5	15 - 40 years	Low	3.6	2	38	Removal		Ref 1
49	Jacaranda mimosifolia	Jacaranda	5-10	9	350	350	Good	Low - 5	15 - 40 years	Low	4.2	2.1	64	Retain		
50	Jacaranda mimosifolia	Jacaranda	5-10	12	300	300	Fair	Low - 5	15 - 40 years	Low	3.6	2	113	Retain		
51	Lophostemon confertus	Brushbox	10-15	10	450	600	Excellent	Moderate - 4	Greater 40 years	Moderate	5.4	2.7	79	Retain		
56	Jacaranda mimosifolia	Jacaranda	10-15	15	650	750	Good	Moderate - 4	15 - 40 years	Moderate	7.8	2.9	177	Retain		

Site Tree ID	Species	Common Name	Height (m)	Canopy Spread (m)	DBH (mm)	Stem Diameter at ground (mm)	Condition	Landscape Significance	Sustainability	Retention Value	TPZ (radial)	SRZ (radial)	Canopy Area (m2)	Outcome	Comments	Pathway
57	Jacaranda mimosifolia	Jacaranda	10-15	10	350	350	Fair	Low - 5	5 - 15 years	Low	4.2	2.1	79	Removal		Ref 1
58	Jacaranda mimosifolia	Jacaranda	10-15	13	450	500	Good	Moderate - 4	15 - 40 years	Moderate	5.4	2.5	133	Removal		Ref 1
59	Jacaranda mimosifolia	Jacaranda	10-15	12	350	400	Good	Moderate - 4	15 - 40 years	Moderate	4.2	2.3	113	Removal		Ref 1
60	Syzygium Australe	Lilly pilly	5-10	7	400	450	Good	Low - 5	15 - 40 years	Low	4.8	2.4	38	Removal		Ref 1
61	Syzygium Australe	Lilly pilly	5-10	6	300	350	Poor	Low - 5	Less 5 years	Very Low	3.6	2.1	28	Removal		Ref 1
62	Syzygium Australe	Lilly pilly	5-10	7	250	350	Fair	Low - 5	15 - 40 years	Low	3	2.1	38	Removal		Ref 1
63	Syzygium Australe	Lilly pilly	0-5	4	200	250	Good	Low - 5	15 - 40 years	Low	2.4	1.8	13	Removal		Ref 1
64	Syzygium Australe	Lilly pilly	5-10	10	350	450	Good	Low - 5	15 - 40 years	Low	4.2	2.4	79	Removal		Ref 1
65	Syzygium Australe	Lilly pilly	5-10	5	150	150	Fair	Low - 5	Less 5 years	Very Low	1.8	1.5	20	Removal		Ref 1
66	Syzygium Australe	Lilly pilly	15-20	12	600	650	Excellent	Moderate - 4	Greater 40 years	Moderate	7.2	2.8	113	Removal		Ref 1
67	Syzygium Australe	Lilly pilly	15-20	9	350	450	Good	Moderate - 4	Greater 40 years	Moderate	4.2	2.4	64	Removal		Ref 1
68	Jacaranda mimosifolia	Jacaranda	10-15	12	500	600	Fair	Moderate - 4	15 - 40 years	Moderate	6	2.7	113	Removal		Ref 1
69	Jacaranda mimosifolia	Jacaranda	5-10	7	200	250	Poor	Low - 5	Less 5 years	Very Low	2.4	1.8	38	Removal		Ref 1
70	Jacaranda mimosifolia	Jacaranda	10-15	8	450	500	Fair	Moderate - 4	5 - 15 years	Low	5.4	2.5	50	Removal		Ref 1
71	Jacaranda mimosifolia	Jacaranda	10-15	13	500	550	Good	Moderate - 4	15 - 40 years	Moderate	6	2.6	133	Removal		Ref 1
72	Jacaranda mimosifolia	Jacaranda	15-20	15	700	750	Good	Moderate - 4	15 - 40 years	Moderate	8.4	2.9	177	Removal		Ref 1
73	Jacaranda mimosifolia	Jacaranda	10-15	10	400	600	Good	Moderate - 4	15 - 40 years	Moderate	4.8	2.7	79	Removal		Ref 1
74	Syzygium Australe	Lilly pilly	5-10	6	300	350	Good	Moderate - 4	15 - 40 years	Moderate	3.6	2.1	28	Removal		Ref 1
75	Jacaranda mimosifolia	Jacaranda	15-20	16	900	1000	Good	Moderate - 4	15 - 40 years	Moderate	10.8	3.3	201	Removal		Ref 1
77	Syzygium Australe	Lilly pilly	5-10	5	200	250	Fair	Low - 5	15 - 40 years	Low	2.4	1.8	20	Removal		Ref 1
164	Lophostemon confertus	Brushbox	10-15	9	500	700	Good	Moderate - 4	Greater 40 years	Moderate	6	2.8	64	Removal	Block Z	Ref 1
165	Lophostemon confertus	Brushbox	5-10	7	450	500	Fair	Moderate - 4	15 - 40 years	Moderate	5.4	2.5	38	Removal	Block Z	Ref 1
166	Lophostemon confertus	Brushbox	5-10	8	350	500	Fair	Low - 5	5 - 15 years	Low	4.2	2.5	50	Removal	Block Z	Ref 1
167	Lophostemon confertus	Brushbox	10-15	11	700	850	Good	Moderate - 4	Greater 40 years	Moderate	8.4	3.1	95	Removal	Block Z	Ref 1
168	Lophostemon confertus	Brushbox	5-10	9	350	450	Poor	Very Low - 6	Less 5 years	Very Low	4.2	2.4	64	Removal	Block Z	Ref 1

Site Tree ID	Species	Common Name	Height (m)	Canopy Spread (m)	DBH (mm)	Stem Diameter at ground (mm)	Condition	Landscape Significance	Sustainability	Retention Value	TPZ (radial)	SRZ (radial)	Canopy Area (m2)	Outcome	Comments	Pathway
169	Pinus pinea	Stone pine	15-20	16	900	1050	Excellent	High - 3	Greater 40 years	High	10.8	3.4	201	Removal	Block Z	Ref 1
170	Cinnamomum camphora	Camphor laurel	15-20	15	700	1100	Excellent	Insignificant - 7	Greater 40 years	Very Low	8.4	3.4	177	Retain		
171	Pinus pinea	Stone pine	15-20	12	650	950	Excellent	High - 3	Greater 40 years	High	7.8	3.2	113	Retain		
172	Pinus pinea	Stone pine	15-20	15	700	1000	Excellent	High - 3	Greater 40 years	High	8.4	3.3	177	Retain		
173	Pinus pinea	Stone pine	15-20	14	850	1200	Excellent	High - 3	Greater 40 years	High	10.2	3.6	154	Retain		
174	Pinus pinea	Stone pine	15-20	11	550	700	Excellent	High - 3	Greater 40 years	High	6.6	2.8	95	Retain		
175	Pinus pinea	Stone pine	15-20	11	600	800	Excellent	High - 3	Greater 40 years	High	7.2	3	95	Retain		
176	Pinus pinea	Stone pine	15-20	10	700	900	Excellent	High - 3	Greater 40 years	High	8.4	3.2	79	Retain		

Appendix B – Maps

Figure 1 – REF 1, Tree Assessment Area

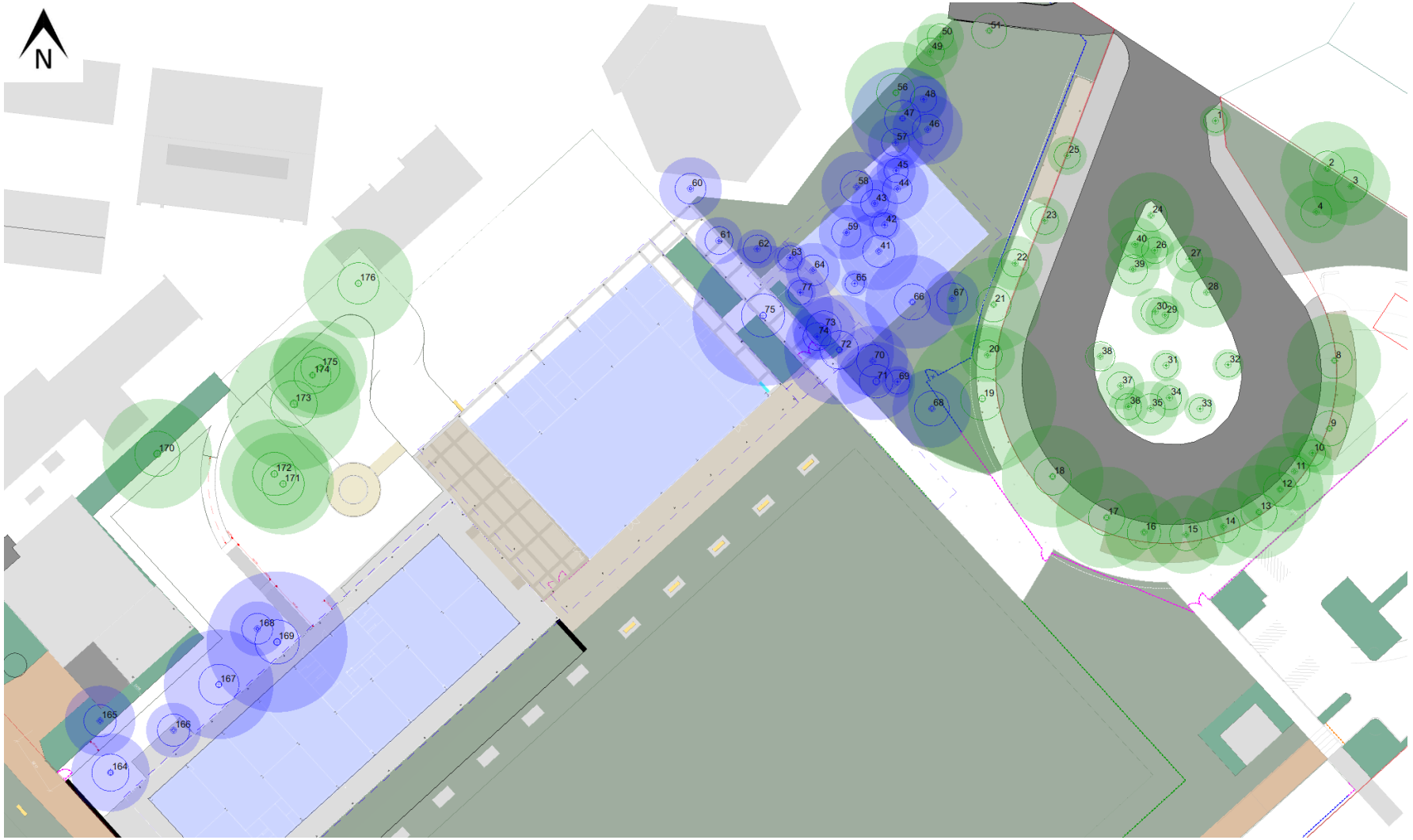

Figure 2 - Tree Removal and Retention Plan (REF1).

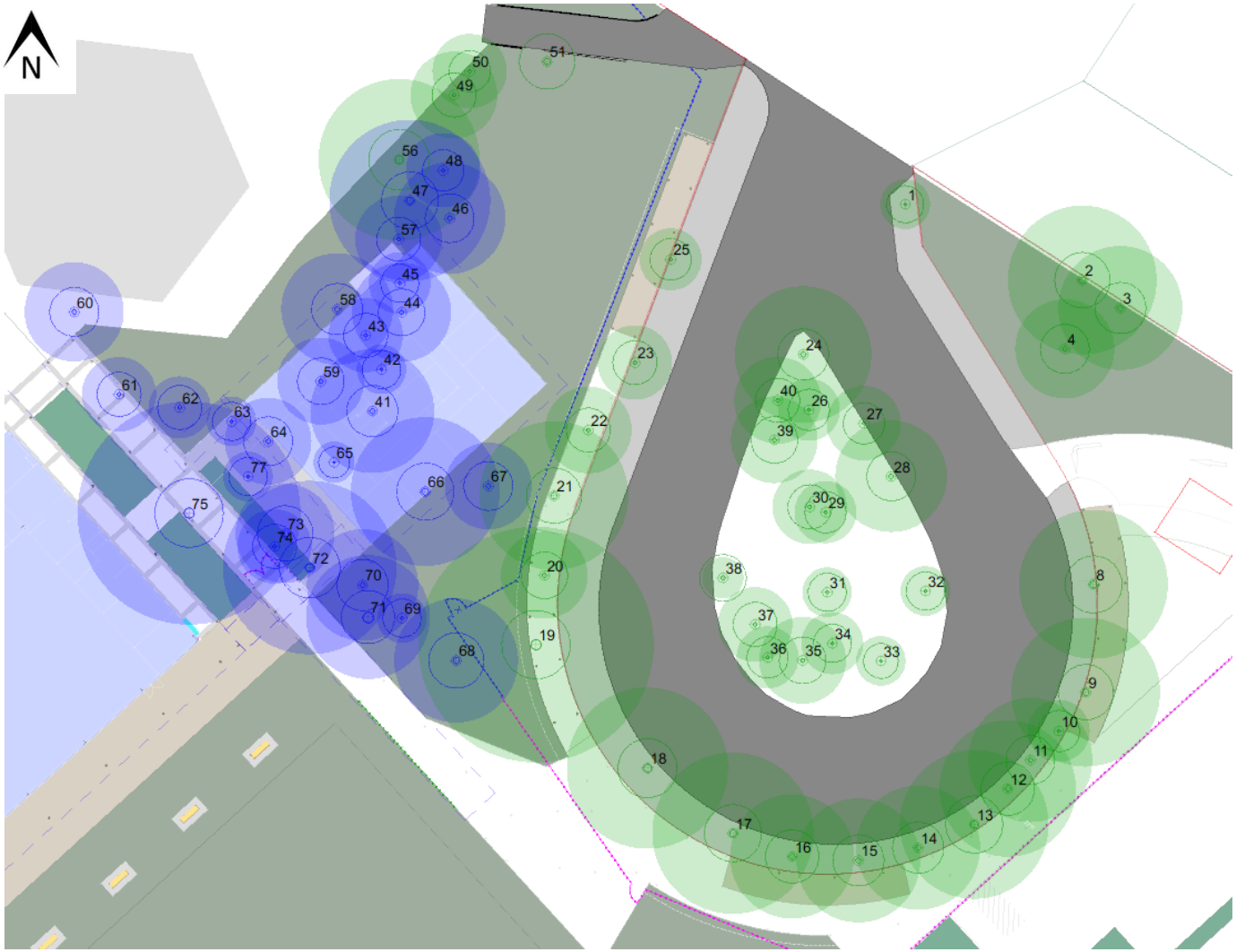

Figure 3 - Admin Building (Blue Removal, Green Retain)

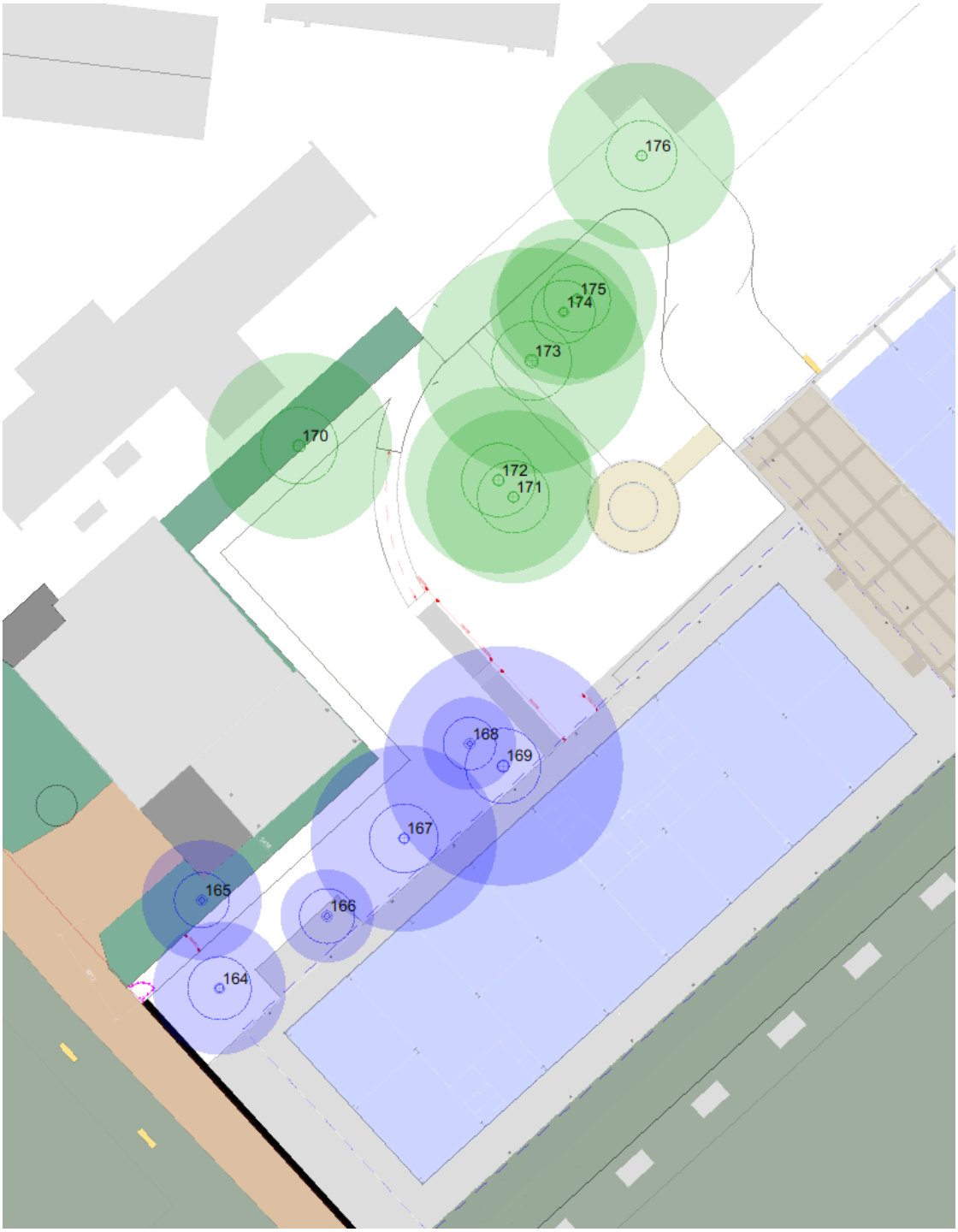

Figure 4 – Support Hub (Blue Removal, Green Retain)

Appendix C – Site Images

Figure 5 - Trees 170 to 176 to be retained and protected.

Figure 6 - Trees requiring removal for Block X and associated earthworks.

Figure 7 - Trees in footprint of X Block to be removed.

Figure 8 - Trees to be retained (1 - 4).

Figure 9 - Trees 8 - 14 around existing drop zone to be protected and retained.

Figure 10 - Trees 12 to 17 to be retained around drop zone.

Figure 11 - Trees 16 (dieback) to 19 to be retained.

Figure 12 - Trees 19 to 25 (excluding 24)

Figure 13 - All trees on inside of fence to be remove for Block X and associated works.

Figure 14 - Tree 56 near X Block to be retained and protected during construction.

Appendix D – Determining Tree Retention Values

The following steps are a standardised approach for assessing the retention values of trees. This approach is based on the *British Standard BS5837-2012: Trees in Relation to Design, Demolition and Construction*.

Step 1 – Assess tree sustainability

- Greater than 40 years
- From 15 to 40 years
- From 5 to 15 years
- Less than 5 years
- Dead or hazardous

IMPORTANT: Sustainability must only be assessed by a person with a minimum qualification of AQF 5 in Horticulture (Arboriculture).

Step 2 – Determine landscape significance rating

The level of landscape significance is determined using the following key criteria as a guide:

1. SIGNIFICANT
The tree is listed as a Heritage Item with a local, state or national level of significance; or
The tree forms part of the curtilage of a heritage item (building /structure/artefact as defined in the LEP 2013, and has a known or documented association with that item; or
Aboriginal cultural artefact, evidence by identifiable markings or other documentary evidence; or
The tree is a commemorative planting relating to an important historical event; or
The tree is scheduled as a Threatened Species, or is a key indicator species of an Endangered Ecological Community as defined under the *Threatened Species Conservation Act 1995 (NSW)* or the *Environmental Protection and Biodiversity Conservation Act 1999*; or
The tree is an endemic 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; or
A remnant tree in existence prior to development of the local area; or
The tree has a very large live crown size* greater than 200m² with normal to dense foliage cover, is visually prominent in the landscape, exhibits good form and habit typical of the species and 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; or
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 style or era of landscape design associated with the original development of the site; or

The tree is a locally-indigenous species and representative of the original vegetation of the area and the tree is located within a key wildlife corridor or has known wildlife habitat value; or is uncommon in cultivation; and
Visible from surrounding properties, the street or other thoroughfares (including waterways); and
The tree has a very large live crown size* exceeding 200m²; a crown density exceeding 70% Crown Cover (normal-dense), good form and branching habit, good representative of the species or is aesthetically distinctive and makes a positive contribution to the visual character and amenity of the area.
3. HIGH
The tree has a suspected historical association with a heritage item or landscape supported by anecdotal evidence or based on knowledge of similar sites, tree age, etc; or
The tree is a locally-indigenous species and representative of the original vegetation of the area; and
The tree is beneficial for native wildlife; or
The tree has a large live crown size* exceeding 100m²; and
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% Crown Cover (normal); and
The subject tree is visible from surrounding properties and makes a fair/neutral contribution to the amenity of the property/visual character of the area.
4. MODERATE
The tree has a medium live crown size* exceeding 40m²; and
The tree is a fair representative of the species, exhibiting fair form and habit, moderate distortion or suppression with a crown density of more than 50% Crown Cover (thinning to normal); and
The tree makes a fair contribution to the visual character and amenity of the area; and
The tree is visible from surrounding properties. Not visually prominent – view may be partially obscured by other vegetation or built forms, or
The tree has no known or suspected historical value or association.
5. LOW
The tree has a small live crown size* of less than 40m² and can be replaced within the short term with new tree planting; or
The tree is a poor representative of the species, poor form and habit with significant distortion or canopy suppression, with a crown density of less than 50% Crown Cover (sparse); and
The tree is not visible from surrounding properties (obscured by other trees or built forms) and makes a negligible contribution to the amenity of the property/surrounding properties, or
detracts from the visual character of the area.
6. VERY LOW
The tree is listed as an undesirable species as listed by Council; and
The tree has no heritage importance or value, no known or suspected historical association.
7. INSIGNIFICANT
The tree is a declared noxious weed under the *Noxious Weeds Act (NSW) 1993* or is an undesirable species by the local Council.

Step 3 – Weigh sustainability and landscape significance

Weigh the sustainability and landscape significance to arrive at a retention value. These two independently assessed elements have a relationship with one another. The health, condition and longevity of a tree increases or diminishes depending on its level of intactness, quality, and potential longevity.

Once there is a measure of a tree's sustainability and landscape significance, these two factors can be weighed up using the Tree Retention Value Table which categorises the tree according to its suitability or desirability for retention.

	Landscape Significance Reading						
Tree Sustainability	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Greater than 40 years	**High Retention Value**						
15 to 40 years			**Moderate**				
5 to 15 years				**Low**			
Less than 5 years					**Very Low Retention Value**		
Dead or hazardous							

Modified by A. Morton from: Couston, Mark and Howden, Melanie (2001) Tree Retention Values Table Footprint Green Pty Ltd, Sydney Australia.

Appendix E - Calculating TPZ and SRZ Values

Tree Protection Zone (TPZ)

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

Determining the TPZ

The radius of the TPZ is calculated for each tree by multiplying its DBH × 12.

TPZ = DBH × 12
Where DBH = trunk diameter measured at 1.4 m above ground

Radius is measured from the centre of the stem at ground level.
A TPZ should not be less than 2 m nor greater than 15 m (except where crown protection is required).
The TPZ of palms, other monocots, cycads and tree ferns should not be less than 1 m outside the crown projection.

Variations to the TPZ

It may be possible to encroach into or make variations to the standard TPZ. Encroachment includes excavation, compacted fill and machine trenching.

Minor Encroachments

If the proposed encroachment is less than 10% of the area of the TPZ and is outside the SRZ, detailed root investigations should not be required. The area lost to this encroachment should be compensated for elsewhere and contiguous with the TPZ. Variations must be made by the project arborist considering relevant factors.

Major Encroachments

If the proposed encroachment is greater than 10% of the TPZ or inside the SRZ, the project arborist must demonstrate that the tree(s) would remain viable.
The area lost to this encroachment should be compensated for elsewhere and contiguous with the TPZ. This may require root investigation by non-destructive methods and consideration of relevant factors.

Structural Root Zone (SRZ)

The SRZ is the area required for tree stability. A larger area is required to maintain a viable tree.
The SRZ only needs to be calculated when major encroachment into a TPZ is proposed.
There are many factors that affect the size of the SRZ (e.g. tree height, crown area, soil type, soil moisture). The SRZ may also be influenced by natural or built structures, such as rocks and footings. An indicative SRZ radius can be determined from the trunk diameter

measured immediately above the root buttress using the following formula. Root investigation may provide more information on the extent of these roots.

SRZ radius = (D × 50)0.42 × 0.64

Where D = trunk diameter, in m, measured above the root buttress

NOTE: The SRZ for trees with trunk diameters less than 0.15 m will be 1.5 m

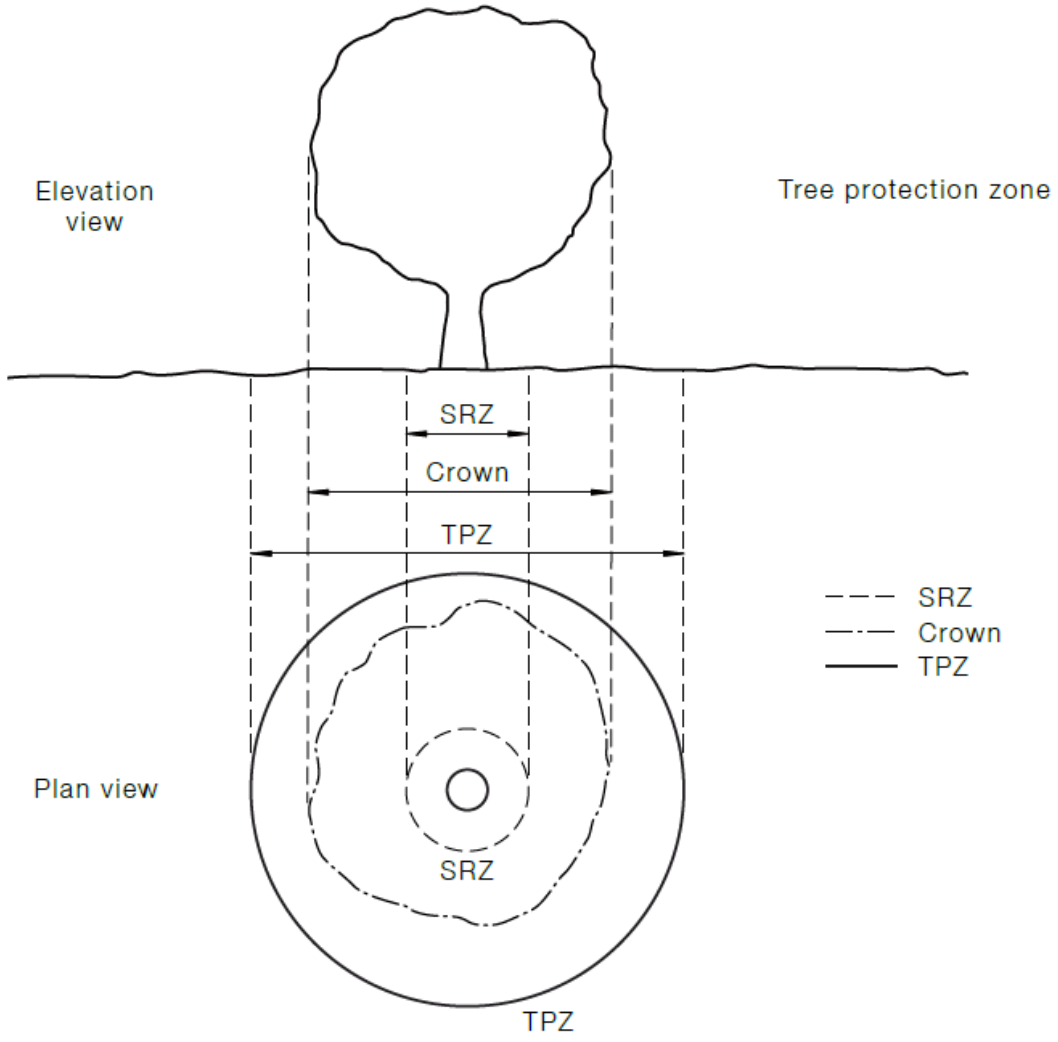

Figure 15 - TPZ and SRZ Diagram

Appendix F – Protection Measures

Below are the specifications for protection measures from *AS4970 Protection of Trees on Development Sites*.

Tree protection measures include a range of activities and structures. Structures are used to identify and isolate the TPZ.
The TPZ is a restricted area usually delineated by protective fencing (or use of an existing structure such as an existing fence or wall). It is installed prior to site establishment and retained intact until completion of the works.
Some works and activities within the TPZ may be authorized by the determining authority. These must be supervised by the project arborist. Any additional encroachment that becomes necessary as the site works progress must be reviewed by the project arborist and be acceptable to the determining authority before being carried out.
Approved tree removal and pruning should be carried out before the installation of tree protection measures.

Activities Restricted Within the TPZ
Activities generally excluded from the TPZ include but are not limited to—

7. machine excavation including trenching;
8. excavation for silt fencing;
9. cultivation;
10. storage;
11. preparation of chemicals, including preparation of cement products;
12. parking of vehicles and plant;
13. refuelling;
14. dumping of waste;
15. wash down and cleaning of equipment;
16. placement of fill;
17. lighting of fires;
18. soil level changes;
19. temporary or permanent installation of utilities and signs, and
20. physical damage to the tree.

Protective Fencing
Fencing should be erected before any machinery or materials are brought onto the site and before the commencement of works including demolition. Once erected, protective fencing must not be removed or altered without approval by the project arborist. The TPZ should be secured to restrict access.

AS 4687 specifies applicable fencing requirements. Shade cloth or similar should be attached to reduce the transport of dust, other particulate matter and liquids into the protected area.
Fence posts and supports should have a diameter greater than 20 mm and be located clear of roots. Existing perimeter fencing and other structures may be suitable as part of the protective fencing.

Signs
Signs identifying the TPZ should be placed around the edge of the TPZ and be visible from within the development site (see image below).

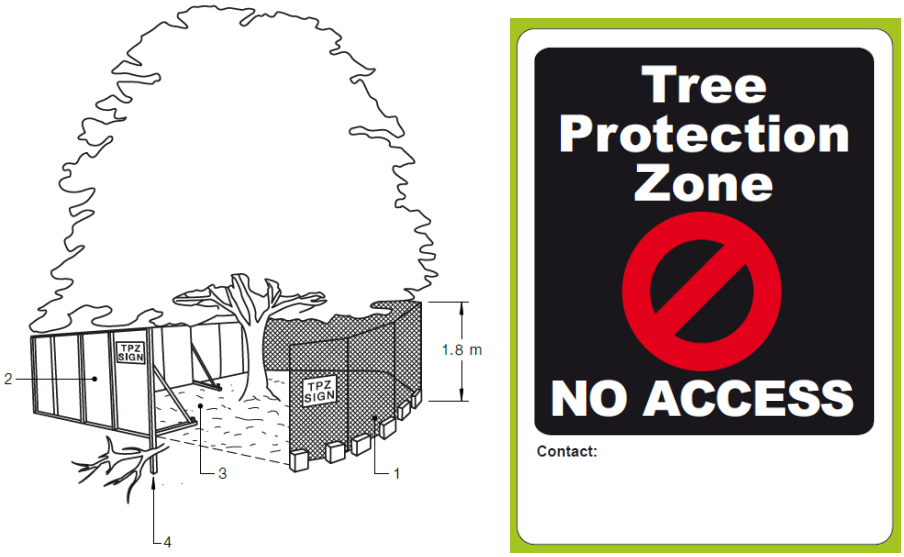

Figure 16 - Tree Protection Zone fencing example and example of a sign format

Other Protection Measures

When tree protection fencing cannot be installed or requires temporary removal, other tree protection measures should be used, including those set out below.

Trunk and branch protection
Where necessary, install protection to the trunk and branches of trees as shown below.
The materials and positioning of protection are to be specified by the project arborist. A minimum height of 2 m is recommended.
Do not attach temporary powerlines, stays, guys and the like to the tree. Do not drive nails into the trunks or branches.

Ground protection
If temporary access for machinery is required within the TPZ ground protection measures will be required. The purpose of ground protection is to prevent root damage and soil compaction within the TPZ. Measures may include a permeable membrane such as geotextile fabric beneath a layer of mulch or crushed rock below rumble boards as per figure below. These measures may be applied to root zones beyond the TPZ

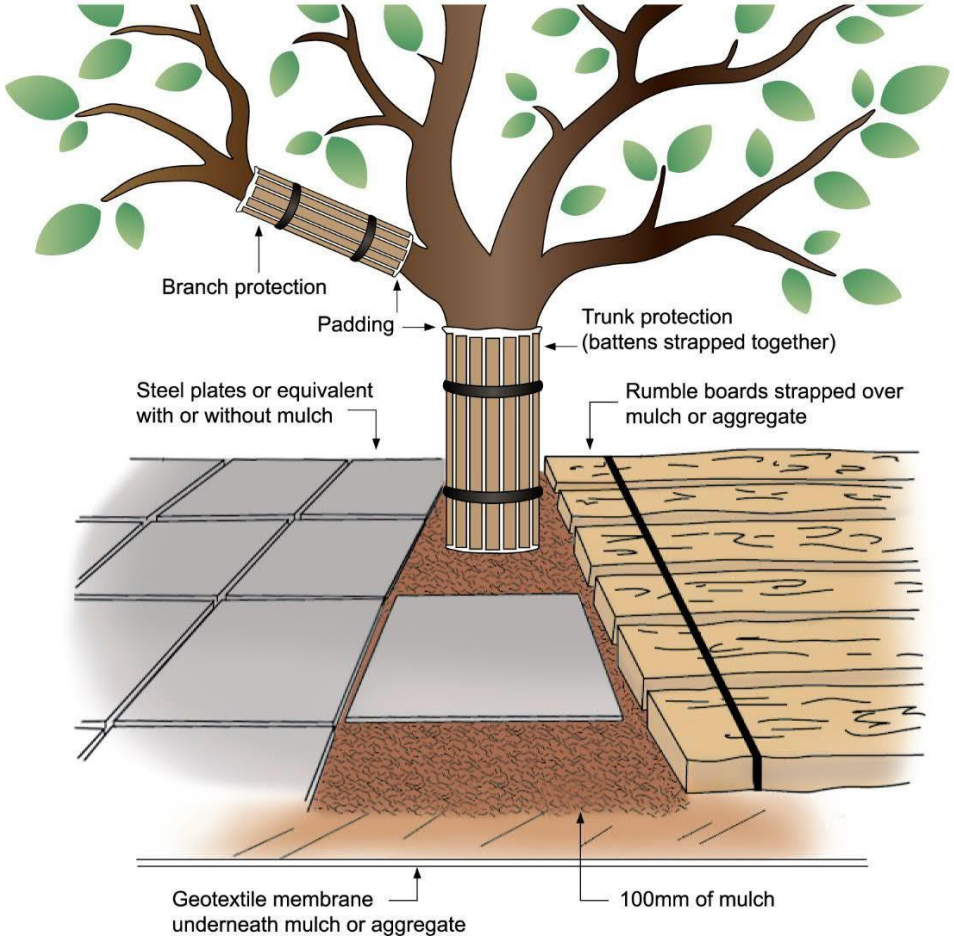

Figure 17 - Tree Protection Measures if fencing cannot be maintained or must be removed

Root protection during works within the TPZ

Some approved works within the TPZ, such as regrading, installation of piers or landscaping may have the potential to damage roots.

If the grade is to be raised the material should be coarser or more porous than the underlying material. Depth and compaction should be minimized.

Manual excavation should be carried out under the supervision of the project arborist to identify roots critical to tree stability. Relocation or redesign of works may be required.

Where the project arborist identifies roots to be pruned within or at the outer edge of the TPZ, they should be pruned with a final cut to undamaged wood. Pruning cuts should be made with sharp tools such as secateurs, pruners, handsaws or chainsaws. Pruning wounds should not be treated with dressings or paints. It is not acceptable for large roots within the TPZ to be 'pruned' with machinery such as backhoes or excavators.

Where roots within the TPZ are exposed by excavation, temporary root protection should be installed to prevent them drying out. This may include jute mesh or hessian sheeting as multiple layers over exposed roots and excavated soil profile, extending to the full depth of the root zone. Root protection sheeting should be pegged in place and kept moist during the period that the root zone is exposed.

Other excavation works in proximity to trees, including landscape works such as paving, irrigation and planting can adversely affect root systems. Seek advice from the project arborist.

Installing underground services within TPZ

All services should be routed outside the TPZ. If underground services must be routed within the TPZ, they should be installed by directional drilling or in manually excavated trenches. The directional drilling bore should be at least 600 mm deep. The project arborist should assess the likely impacts of boring and bore pits on retained trees. For manual excavation of trenches the project arborist should advise on roots to be retained and should monitor the works. Manual excavation may include the use of pneumatic and hydraulic tools.

Scaffolding

Where scaffolding is required, it should be erected outside the TPZ. Where it is essential for scaffolding to be erected within the TPZ, branch removal should be minimized. This can be achieved by designing scaffolding to avoid branches or tying back branches. Where pruning is unavoidable it must be specified by the project arborist in accordance with AS 4373. Ground below the scaffolding should be protected by boarding (e.g. scaffold board or plywood sheeting) as shown in Figure 5. Where access is required, a board walk, or other surface material should be installed to minimize soil compaction. Boarding should be placed over a layer of mulch and impervious sheeting to prevent soil contamination. The boarding should be left in place until the scaffolding is removed. Image below shows an example of appropriate scaffolding setup with a TPZ.

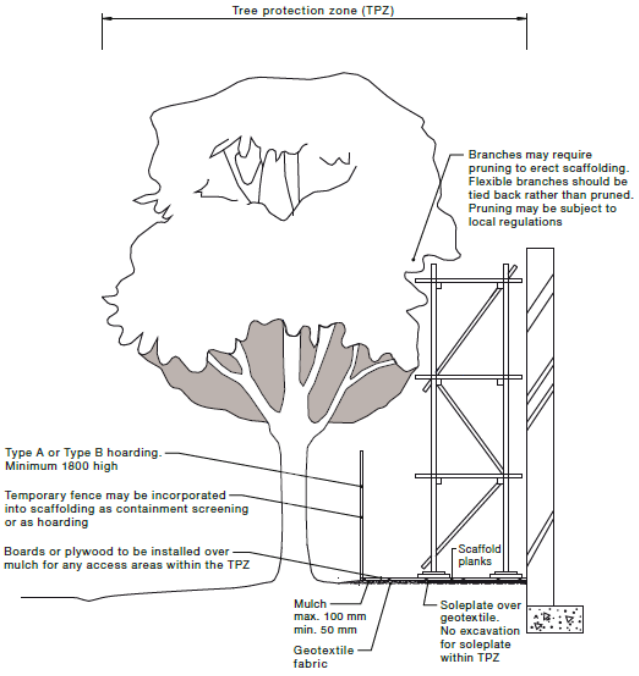

Figure 18 - Scaffolding Setup Example

Mulching

The area within the TPZ should be mulched. The mulch must be maintained to a depth of 50–100 mm using material that complies with AS 4454. Where the existing landscape within the TPZ is to remain unaltered (e.g. garden beds or turf) mulch may not be required.

Watering
Soil moisture levels should be regularly monitored by the project arborist. Temporary irrigation or watering may be required within the TPZ. An above-ground irrigation system should be installed and maintained by a competent individual.

Weed Removal
All weeds should be removed by hand without soil disturbance or should be controlled with appropriate use of herbicide.

Appendix G – Contractor Guidelines/Standards

Below is the recommended guidelines and standards for a Tree Service Provider that is engaged to conduct arboricultural works on a site, including tree removal, pruning, grinding and all other services relating to trees:

Supervisor Qualifications and Experience - All tree work must be supervised by a company/individual holding a minimum qualification level of AQF3 in Arboriculture. All work conducted on the site must be supervised by an individual holding this qualification, as a minimum, and they must remain onsite for the entire duration of the works.

Worker Qualifications – All tree pruning, and tree removal onsite must be conducted by workers holding a minimum qualification level of AQF2 in Arboriculture and supervised by the above supervisor. All workers feeding chippers, conducting stump grinding and operating machinery must be clearly competent to perform the task and supervised by the above supervisor.

SEQ Management System – The contractor must have a documented Safety Management Plan, Environmental Management Plan and it is recommended that they also have a Quality Management Plan.

Insurances – The contractor engaged should have public liability cover for a minimum value of $20 million and hold the appropriate workers compensation policy for any employees working on site, with WIC code 952520. Any company providing consulting services such as a project arborist, must have a Professional Indemnity Policy for over $2 million.

Minimum Industry Standards – The minimum Industry Standards published by Arboriculture Australia must be the minimum standards of the contractor in the way works are performed onsite and the safety procedures followed. The contractor must be able to demonstrate that they have access to these standards. These standards can be purchased at https://trees.org.au/education/minimum-industry-standards

Australian Standards – All pruning is to be in accordance with AS4373 *Pruning of Amenity Trees.*

Environmental Standards - Mulch from all native tree removal should be retained onsite for use within the school grounds if possible. If not possible, the mulch should be taken to an approved recycling facility to be solarised. This is a requirement under the *Mulch Order 2016* enforced by the EPA.

Appendix H – Common Management Activities

Pruning – Trees require pruning for a variety of reasons:

- Pruning of the lower limbs of a tree to allow for clearance for maintenance, pedestrians, buildings, services, line of sight for traffic and appearance.
- Reduction of the height of a tree can be achieved to a certain extent through pruning. The extent to which this can be done is determined by the species, age, shape, previous pruning and appearance requirements
- Thinning of branches to improve appearance, allow light penetration or reduce wind load
- Structural Pruning is completed when a tree is forming a defect such as a V shaped codominant branch union. Structural pruning is a critical maintenance activity for urban trees to achieve maximum safe useful life expectancy.
- Remedial Pruning is completed in response to an identified problem with the tree. This may be a pest, disease or root disturbance from a development.
- Deadwood Removal is one of the most common pruning activities undertaken during the life of a tree. It involves the cutting out of dead branches that are likely to fall.

All tree pruning should be carried out in accordance with *AS4373 Pruning of Amenity Trees* and the superior *MIS308 Tree Pruning.*

Tree Removal – trees can be removed in four ways. The method chosen will depend on the location and condition of the tree, contractor's equipment, experience, and the client's requirements. The four methods are:

- Cutting down from the ground. Also called felling or falling the tree. The tree is then processed through a machine called a mulcher or woodchipper that reduces the wood and leaves to a product called leaf mulch. Depending on the size of the machinery used, the larger wood may be removed off site in separate trucks or cut up and fed through the machine.
- Accessing and removing the tree in pieces, this can involve rigging the pieces so to allow them to be lowered to the ground in a controlled manner. The 2 most common access methods are climbing the tree or using an EWP (cherry picker) to move around the tree to conduct the work.
- Accessing the tree and removal of pieces with a crane or helicopter. This involves lifting the pieces up and out of the area.
- Using machinery to push the tree over and process with large machinery.

Stump Grinding – this is to remove the stump from the ground entirely or to reduce the height to a certain depth below the ground to allow for the intended use of the area. This task is earthmoving by nature and thus checking for underground services should always be conducted prior to undertaking this activity.

Mulching – this is one of the most beneficial activities that can be completed for the long-term health of the tree. Spreading of a locally sourced, native leaf mulch is the most beneficial type of mulch to be used for your trees. This mulch has a mix of wood and leaf material so breaks down more rapidly, returning nutrients and organic matter into the soil that will improve the health of the tree. Mulch helps retain moisture in the soil by more than

100%. It also improves soil conditions for beneficial fungi, bacteria and worms. It regulates ground temperatures and reduces compaction of soil in trafficable areas. It helps reduce the chances of mechanical damage to the root and trunk from lawn care activities and reduces competition of grasses below the canopy. Mulch should be spread to a thickness of approximately 100mm over the area directly below the canopy. The larger the mulched area, the more beneficial.

Fertilising – this should normally be in the form of organic nutrients such as manure. Adding nutrients to soils can improve the growth rates of trees and the resistance to pests and diseases. It can also increase flowing and fruit production if required.

Supporting – this is normally only undertaken for high value trees in areas of frequent or constant use. It involves the installation of a supporting structure such as a cable or a prop to provide support for a defect of a part of the tree that has partially failed. Tree Support Systems should be installed following the requirements in *MIS310 Tree Support Systems.*

Irrigation – Provision of regular water is critical for tree health, particularly with newly planted and establishing trees.

Root Pruning – Cutting of selected roots by first removing soil then cutting the roots with a sharp blade or tool that provides a clean cut on the root end. Large structural roots should always be cut under the supervision of a AQF5 arborist as these roots may be holding the tree upright.

Stem Injection – This is the practice of injection of a chemical or liquid into the stem of the tree to treat a particular issue. This can be for treatment of sap or leaf sucking bugs, fungi or even bacteria in the soil. This is done either by a high-pressure injection or low-pressure injection tool.

Habitat Creation – This involves the deliberate creation of hollows, cracks, and splits. Installation of artificial boxes, hollow logs and similar into the canopy of suitable trees to provide habitat for a wide range of arboreal dwelling creatures. These practices should follow the guidelines established in the *MIS312 Environmental Arboriculture*.

Appendix I – Limitations and Disclaimer

1. The conclusions and recommendations contained in this report, relate only to the trees that have been inspected, at the time of inspection.
2. The details of this report are specific to the site/tree(s) assessed and may not constitute general advice to be used in other applications.
3. This report and any attachments should be read in its entirety, and no individual part of the report or its attachments should be interpreted without reference to the entire report.
4. The consultant shall not be required to give testimony or attend court for matters pertaining to this report unless a separate contract is arranged to provide expert witness services or the like with a fee payable for these services.
5. Care has been taken when referencing supporting documents or the opinions of others in this report, however no responsibility can be taken for the accuracy or correctness of the information provided by others.
6. It is assumed that all legal information provided by the client pertaining to the ownership of property is correct. The consultant takes no responsibility for any legal matters.
7. This report and any values expressed herein represent the opinion of the consultant and the consultant's fee is not contingent upon the reporting of a specified value, a stipulated result, the occurrence of a subsequent event, nor upon any finding to be reported.
8. Following significant weather events, the condition of a tree onsite may change.
9. Maps, images, and graphics are not necessarily to scale.

Appendix J – Glossary of Terms

Abatement - Reduction in hazard, either by remedial tree works and/or removal of target(s).

Abnormal Lean - Abnormal departure of trunk from the vertical or near vertical position.

Amenity Value - The environmental and landscape benefits of a tree as opposed to its commercial value for timber. Many of these benefits are intangible or difficult to measure.

Arboriculture - The care, cultivation and management of individual trees or groups of trees in the landscape primarily for their amenity value.

Arborist - A specialist in the cultivation and care of trees and shrubs, including tree surgery, tree identification, the diagnosis, treatment, and prevention of tree diseases, and the control of pests.

Basal Flare - The rapid increase in diameter that occurs at the confluence of the trunk and roots, associated with stem and root tissue.

Bifurcation - To divide or fork into two parts, usually equal in size and occurring at a narrow angle.

Bleeding/Sap flow - The exudation of sap/resin from wounds and/or other injuries, may be accompanied by a foul odour.

Bole - The central stem of the tree. Another meaning for trunk.

Bow - The gradual curve of a branch or stem.

Bracket Fungi/Fungal Fruiting Body - Fruiting of spore producing body of wood decay fungi, forming on the external surface of the stem or trunk.

Branch Attachment - The structural linkage of branch to stem.

Branch Collar Wood - which forms around branch attachments, frequently more pronounced below the branch.

Brash Wood Type - of reaction wood which is weaker than normal due to thin cell walls and decreased fibre content; presence increases the likelihood of failure.

Burl - More correctly identified as a Lignotuber (a mass of dormant, tightly arranged buds). It is a generally circular swelling on the main stem or branch; not considered a defect.

Buttress Support - of branch, stem or root; usually associated with exaggerated growth.

Buttress Root - A large woody root located at the base of the trunk (the root crown) which is important to the overall stability of the tree due to its contributions to basal flare.

Buttress Wood - Wood under tension, in a structurally critical portion of a trunk or branch.

Callus - Can be detected within weeks after cells on the edge of a wound die and is produced by the enlargement or increased division of cells adjacent to the edge of cell dieback. Often associated with wound wood development post pruning.

Cambium - A layer of delicate meristematic cells between the inner bark or phloem and the wood or xylem, which produces new phloem on the outside and new xylem on the inside in stems, roots,etc., originating all secondary growth in plants and forming the annual rings of wood.

Canker - A localised area of dead tissue on a stem or branch, caused by fungal or bacterial organisms, characterised by wound wood development on the periphery; may be perennial or annual.

Canopy - Parts of the tree above the trunk, including leaves, and lateral and scaffold branches.

Cavity - An open wound, often characterised by the presence of decay and resulting in a hollow.

CODIT - An acronym for Compartmentalisation of Decay in Trees, this scientific theory was developed by the late Dr. Alex Shigo which now forms the basis of our knowledge of how trees respond to wounding, infection and decay.

Co-dominant Stems - Equal in size and relative importance, usually associated with either the trunks/stems or scaffold limbs/branches in the crown. Not necessarily a structural defect.

Compartmentalisation - Physiological process which creates the chemical and mechanical boundaries that act to limit the spread of disease and decay organisms within trees (see also CODIT).

Compression Wood - Type of reaction wood produced on the underside of branches and leaning trunks.

Coppice - To cut a tree to ground level to stimulate regenerative growth.

Core Drill - A technique involving creating a series of vertical cores within a tree's root zone which can be filled with a variety of materials to stimulate root initiation and growth. Often used on ageing and/or stressed trees.

Crack - Breakage in the stem, involving bark, cambium, and xylem.

Crown - Parts of the tree above the trunk, including leaves, and lateral and scaffold branches (see also Canopy).

Crown Uplift - Pruning technique where lower limbs are removed, thereby raising the overall crown above the ground.

DBH - Diameter of the trunk, measured at breast height i.e. 1.4m from ground level.

Deadwood - Branch or stem wood bearing no live tissues. (Small deadwood <2cm, medium deadwood 2-10cm, large deadwood >10cm).

Deadwooding - The act of removing deadwood from the canopy.

Decay - Process of degradation of woody tissues by fungi and bacteria through decomposition of cellulose and lignin.

Decorticate - To remove bark, rind, or husk.

Decurrent - Referring to crowns which are made up of a system of co-dominant scaffold branches, lacking a central leader.

Defect - Any structural weakness or deformity.

Dehisce - (of a pod or seed vessel, or a cut or wound) Gape or burst open.

Dieback - Death of shoots and branches, generally from tip to base.

Disease/Pathogens - A malfunction in, or destruction of tissues within a living organism, usually excluding mechanical damage; in trees, usually caused by pathogenic micro-organisms.

Dominant - In crown class, trees whose crowns extend above the general stand canopy and are not restricted by adjacent trees.

DRC (Diameter at Root Crown) - The diameter of the very lowest part of the trunk where root buttressing begins and often used to calculate a tree's structural root zone (SRZ).

End Weight - The concentration of excessive foliage toward the branch extremity.

Epicormic Growth - Shoots which result from adventitious or latent buds, generally initiated in times of distress, and are generally poorly attached.

EWP - Elevated Work Platform.

Excessive Thinning - Having relatively little extent from one side of the canopy to the opposite. In relation to pruning; excessive pruning of lateral branches at their point of origin, usually associated with removal of large amounts of live tissue.

Exclude Site Use - Implement control measures to prevent people from entering an area that has the capacity to cause harm or damage i.e. due to hazardous trees.

Fasciation - (or Cresting) Abnormal twig proliferation.

Flush Cut - Pruning technique where both branch and trunk tissue are removed behind the branch collar; considered poor practice.

Frass Bore Dust - Excrement and other debris left by wood boring insects.

Fungal Fruiting Body - (see Bracket Fungi)

Gall - In branches and stems, an abnormal, localised growth, generally seen as a large knob of undifferentiated woody tissues.

Girdling Root - A root or roots which circles and constricts the stem or roots causing death of phloem and/or cambial tissue.

Habitat Prune - (or King Prune) Reducing or removing the crown of a tree and retaining its trunk as a habitat for wildlife.

Hanger - A partially attached (but clearly broken) or unattached branch which remains lodged in the crown.

Hazard - A hazard is an action or item that has the capacity to cause harm or damage, which may be serious.

Hydrophobic - Used to describe a soil profile that is difficult to rehydrate as water either pools on it or runs off it. Generally associated with very dry, nutrient-poor soils.

Ilex - A tree or shrub of a genus that includes holly and its relatives.

Inappropriate Location - The tree's present growing environment is not suitable due to its surroundings, such as buildings, car parks etc. in relation to the inherent characteristics of the tree species.

Included Bark - Pattern of development at branch junctions where bark is turned inward rather than pushed out; contrasting with branch bark ridge. Also referred to as Embedded bark. Such a formation generally results in weakened attachment.

Infection - The establishment of parasitic micro-organism in the tissues of a tree.

Irrigation - The watering of land by artificial means to foster plant growth.

Kino - The resin which flows from Eucalypts and its relatives such as Corymbia sp. and

Angophora sp.

Leader - The primary terminal shoot or trunk of a tree.

Lean/Leaning - Departure of trunk from the vertical or near vertical position.

Lerp - A type of Psyllid that commonly predates on many species of Eucalypts and its relatives.

Loading - Refers to the mechanical stresses imposed by the weight, orientation etc. of trees and branches in relation to the site, the architecture of the tree and the weather. The amount of loading upon a tree can be directly influenced by its level of exposure to the prevailing winds.

Lopping - The removal of the crown of a tree, or a major proportion of it. Incorrect pruning method of removing branches to stubs, resulting in poor form and weak branch unions.

Mycorrhiza - A mutual association between certain fungi and the roots of vascular plants often resulting in an increased efficiency in the absorption of mineral nutrients.

Mulch - Material laid down over the rooting area to help conserve soil moisture, supress weeds and regulate soil temperature.

Nutrition - The elements and compounds required to support healthy plant growth, of which at least 17 are known.

Parasitic and semi parasitic plants - Vascular plants such as Mistletoes which infect host plants via the penetration of specialised roots called haustorium to gain access to the host's vascular system for water and mineral nutrients.

Pathogen - (See Disease/Pathogens).

Pests/Pest Insects - Pests such as Wood Borers, Termites, Leaf Beetles, Gumleaf Skeletoniser, Leafblister Sawfly, Lerps or Elm Leaf Beetle that cause tree decline. There are various methods of treatment to remove pests as well as prevent their return.

Phellinus sp. - A genus of bracket forming, wood decaying fungi which occurs in native and exotic species. Whilst the decay associated with this fungus is often localised it has a reputation for being quite destructive.

Phytotoxic - A substance which is toxic to plants.

Phloem - The part of a vascular bundle consisting of sieve tubes, companion cells, parenchyma, and fibres and forming the food-conducting tissue of a plant.

PICUS Sonic Tomograph - A specialised piece of diagnostic equipment generally used to determine the level of internal decay within a branch or trunk using sound waves.

Pollard - The removal of the tree canopy, back to the stem or primary branches. Pollarding may involve the removal of the entire canopy in one year, or may be phased over several years.

Poor Pruning - Pruning techniques (such as lopping) which are undertaken without regard for the tree's natural biology and which can cause decline, decay and potentially lead to part or whole tree failure.

Potenz Hydrogenous (pH) - The measure of soluble Hydrogen ions in a solution which is used to measure its acidity or alkalinity. Affects nutrient availability to plants.

Previous Failures - Denotes a tree has previously had a leader or branches fail. Previous failures can result in wounding if a required action is not attended to (see Wound).

Propagate/Propagation - To reproduce a plant, sexually by means of seed or asexually by cuttings, grafting or divisions, so that it is genetically identical to the parent (true to type).

Pruning - The removal or cutting back of twigs or branches.

Psyllid - A common and diverse group of sap-sucking insects related to whiteflies, aphids, and scales. They are regularly associated with native plants and most species appear to be host specific or confined to a group of closely related plants. Sustained infestations can lead to tree decline if untreated.

Reactive Growth/Reaction Wood - Production of woody tissue in response to altered mechanical loading, often in response to internal defect or decay and loss of strength.

Risk - The likelihood that a hazard will cause harm within a variable period of lime.

Root Collar/Root Crown - The transitional area between the stem/sand roots.

Saprophyte - An organism which obtains its nutrition from dead or decaying organic matter. This term is often associated with fungi and with some groups of vascular plants such as Orchids.

Scaffold Limb - Primary structural branch of the crown.

Senescence - The stage of a tree's life cycle between maturity and death, whereby a tree will naturally decline over several years.

Softfall - An impact absorbing layer that is laid beneath a finished surface

Soil Compaction - Area of compacted soil covering the root system. Affected soil becomes less able to absorb rainfall and water, thus increasing runoff and erosion. Trees have difficulty growing in compacted soil because soil particles are pressed together leaving little space for oxygen and water, which are essential for root growth.

Soil Problems - Soil problems such as compaction, salinity,erosion can cause tree decline and potentially lead to tree failure.

Split - Breakage in stem, affecting bark, cambium and xylem.

SRZ - Structural Root Zone.

Stress - In plant physiology, a condition under which one or more physiological functions are not operating within their optimum range, e.g. A lack of soil moisture, inadequate nutrition or extremes of temperature.

Structural Defect - Internal or external points of weakness which reduce the structural integrity of branches and/or stems or roots. Defects in roots may impact upon tree stability.

Structural Roots - Contribute significantly to the structural support, anchorage and stability of a tree, often found close to the base.

Sucker - A shoot which appears from an underground root.

Suppressed - In crown class, trees which have been heavily shaded by others from above or the side and whose crown development is wholly or partially restricted.

Symbiosis - A mutual association between two organisms whereby the presence of one is beneficial to the other.

Target - Persons or property or other things of value which might be harmed by mechanical failure of the tree or by objects falling from it.

Terminally Reduce - Cutting back/reducing branches from their extremity.

Thinning/Excessive Thinning - Having relatively little extent from one side of the canopy to the other. In relation to pruning; excessive pruning of lateral branches at their point of origin, usually associated with removal of large amounts of live tissue.

TLE - Tree Life Expectancy (see Useful Life Expectancy).

Topping - Synonymous with lopping it is the indiscriminate removal of the crown of a tree, or a major proportion of it. Incorrect pruning method of removing branches to stubs, resulting in poor form and weak branch unions.

TPZ - Tree Protection Zone.

ULE - Useful Life Expectancy refers to an expected period of years that a tree can be retained before its amenity values decline to a point where it may detract from the appearance of the landscape and/or becomes potentially hazardous to people and/or property.

Understorey - Vegetation beneath the main canopy.

VTA - An acronym for Visual Tree Assessment which is the process undertaken when systematically assessing trees for attributes such as their species, health, age, defects and pest or disease infestations.

Wall 4 - A chemical and anatomical barrier formed by the cambium present at the time of wounding, which inhibits the spread of decay into xylem tissue formed after the time

of wounding.

Weak Unions - A stem or branch union which is exhibiting signs of a potential structural weakness through its growth habit and/oras a result of pest and/or disease infestation.

Weed - A plant that is not valued where it is growing and is usually of vigorous growth; especially one that tends to overgrow or suppress desirable plants.

Whorl - The arrangement of foliage or flower parts around a stem whereby they radiate from a single point.

Windthrow - The blowing over of a tree at its roots.

Wound - Any injury which induces a compartmentalisation response.

Wound Wood - Develops from callus tissue or from uninjured vascular cambium at the margins of injuries/wounds that have damaged or exposed the phloem, vascular cambium, or sapwood.

Xylem - A compound tissue in vascular plants that helps provide support and that conducts water and nutrients upward from the roots, consisting of tracheids, vessels, parenchyma cells and woody fibres.

Appendix K – Qualifications and Experience

Between 2006 and 2012 Aaron completed a Carpentry apprenticeship, Certificate 3 in Joinery, Certificate 4 in Building and Construction and obtained a builder's licence in 2010 and started working as a contractor. Working full time in the construction industry on high end residential projects as a contracting site supervisor Aaron was managing teams up to 10 people onsite daily. In 2012 Aaron began training and going to TAFE to complete a Certificate 3 in Arboriculture after being exposed to the industry through Rope Access Work and recreational rock climbing. In 2012 Aaron established Assurance Trees Pty Ltd and continued to work across the Construction Industry and Arboricultural industry simultaneously. In 2016 Aaron completed a Diploma of Arboriculture allowing him to start to complete consulting arborist services to expand his growing company. Over the next few years Aaron continued to build Assurance Trees Pty Ltd and establish himself as a respected and knowledgeable arborist both practically and academically. Aaron led Assurance Trees Pty Ltd to obtain ISO triple certification for Quality (ISO9001), Environment (ISO14001) and Safety (AS4801) in 2018 and continues to improve and generate value.

Since 2016 Aaron has developed his consulting arborist skill set to become a leading provider in the industry throughout the Hunter Region. In combination with his practical experience and understanding of the construction industry Aaron has a reputation of providing excellent solutions for design and construction projects in the field of Arboriculture.

Qualifications:

- Diploma in Arboriculture (2016)
- ISA Tree Risk Assessment Qualification (2016)
- Certificate in Arboriculture (2014)
- NSW Builders Licence (2011) (Supervisor Cert #69092S)
- Certificate 4 in Building and Construction (2010)
- Certificate 3 in Joinery and Carpentry (2009)
- Many other certificates including Cert 3 in Chemical Application, Occupational First Aid, Powerlines Training, Rescue Training, Rail Corridor certificates, EWP tickets, Truck Licences and many other courses and training events.

Experience

- Consulting arborist – Arboriculture impact assessments, risk assessments, expert witness, project arborist, pruning specifications, planting specifications, health reports and many other specialised consulting jobs.
- Trade Arborist – 1000's of tree dismantles, crane work, pruning, shaping, large scale clearing, root investigations, cabling and bracing, injections, and treatments and many other specialised tree work operations.
- Building and Construction – Site supervisor, Carpentry and many other building skills and disciplines.

End of Report