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ARBORICULTURAL IMPACT ASSESSMENT

7, 9 & 11 Bent Street
GOSFORD NSW 2250

requested by

Bent Street Investments Pty Ltd

prepared by

Russell Kingdom
Qualified AQF5 Arboriculturist

19/11/2018

Principal: Russell Kingdom
Fully Insured: Public Liability $20M, Professional Indemnity $5M & Personal Accident.
Advanced Treescape Consulting is committed to providing a safe working environment for its employees in accordance with The Occupational Health & Safety Act NSW 2000.

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1.0 Proposal

Bent Street Investments Pty Ltd has commissioned Advanced Treescape Consulting to prepare an Arboricultural Impact Assessment at 7, 9 & 11 Bent Street, Gosford. This site is in the Central Coast Council Local Government Area where there is a Tree Preservation Order in force.

It is proposed to build a residential flat development (diamond apartments) and RFS Turning Head.

The subject site was inspected on 28/01/2016. The plans supplied are from ADG Architects, Drawing No. DA 02, Issue 11, dated 09/11/2018 *and* Alan Bardsley, Registered Surveyors; Drawing No. 360013; dated 17/10/2015. The site plan in Appendix 1 and Appendix 1a illustrate the location of all surveyed trees.

This assessment has been carried out by Russell Kingdom: Diploma in Arboriculture (AQF5), Graduate Diploma of Horticulture (AQF8) - Australian Qualification Framework (AQF)[i] (Department of Education and Training, Australian Government) (see Appendix 12).

2.0 Scope of Report

- Assess the trees on site.
- Assess the impact of the proposed development on the trees.
- Identify trees to be retained and those that require removal to facilitate the proposed development plans (including RFS Turning Head).
- Make recommendations to ensure the impact on the retained trees is acceptable and complies with AS 4970-2009 Protection of trees on development sites (Australian Standard®, 2009).

3.0 Site Inspection

The site comprises of two developed blocks, one undeveloped residential block and to the east an area of undeveloped reserve land manage by Central Coast Council. The land slopes from east to the west.

The site has few trees on it, except for the southern boundary. The reserve land has many remnant native trees.

The soil texture was observed to be Erina soils[1]. *Erina soil limitations are* mass movement (localised), high soil erosion hazard, foundation hazard (localised), localised high run-on, seasonal waterlogging of footslopes and strongly acidic soils of low fertility.

Drainage characteristics are considered to be good.

3.1 Site Assessment

- The microclimate is considered good as all trees appear to have reached their genetic potential.
- There are no re-reflected heat load issues.
- There are no sunlight level issues.
- There is no irrigation visible on the site.
- The site is exposed to all winds.

[1] (Murphy, 1993)

4.0 Method of Assessment

An objective visual inspection was made from the ground of the health and condition of the trees based on the Levels of Visual Assessment method (Appendix 5a) – 'Level 2: Basic Assessment Process' (Dunster, et al., 2013) as well as the *Visual Tree Assessment* (VTA) technique described by Mattheck and Breloer (Mattheck, et al., 1994) (Appendix 5b). The Tree Schedule (Appendix 3) was based upon:

- Estimation of tree heights by Silva Clino Master/Heightmeter™ plus visual estimates of canopy spreads.
- Distances of trees, etc. are measured using a Leica Disto™ D2 Laser Distance Meter.
- All photographs that appear in this report are unaltered originals which were taken during site inspection (see Appendix 2).
- Hazard ratings for all trees (see Appendix 3: Tree Schedule) refer to Failure Potential, Size of Defective Part & Target Rating = Hazard Rating is out of 12.
- Significance Rating.
- Calculation of Tree Protection Zones (TPZ) and Structural Root Zones (SRZ) using AS 4970-2009 *Protection of trees on development sites* (Australian Standard®, 2009) (see Appendix 6 and 7).
- Any additions, mark-ups and/or calculations to plans included in this report have been made using Bluebeam® Revu®[2].
- The application of TPZs and SRZs using AS 4970-2009 Protection of trees on development sites (Australian Standard®, 2009) (see Appendix 8 and 9).
- Glossary (see Appendix 11).
- Trees were numbered with aluminium tags for easy identification.

It should be noted that this objective assessment and related VTA assessments are based upon health and condition that were observed at the time of inspection.

The recommendations of this report regarding retention, works or removal are based upon Safe & Useful Life Expectancy (SULE – see Appendix 10) and hazard ratings being applied.

This information has guided the conclusions in this report.

5.0 Tree Schedule

Appendix 3 summarises existing trees upon the site in terms of species, height and canopy spread, structural condition, health, hazard rating and SULE.

Appendix 4 provides explanations of abbreviations and assessment criteria.

The trees contained within the Tree Schedule (see Appendix 3) range from having short to long SULEs. These trees also have a broad range of hazard ratings which limits the retention of such trees within development sites.

[2] http://www.bluebeam.com

5.1 Assessment of VTA, Impact & Tree Protection Measures required by Proposed Plans

Accepted tree management practices recommend removal of trees where SULE ratings are 3 (or listed as dead), and/or where hazard ratings are high [where ratings adapted from Matheny and Clark range from low=3 to dangerous=12] (Matheny, et al., 1994). A detailed explanation of SULE ratings is provided in Appendix 10. Height/Diameter Ratio should not exceed 1:30 (Mattheck, et al., 1994).

The trees contained within the Tree Schedule (see Appendix 3: Tree Schedule) range from having short to long SULEs. These trees also have a broad range of hazard ratings which limits the retention of such trees within development sites.

Appendix 4 provides explanations of abbreviations and assessment criteria.

Tree Protection Zones for each of the trees that are assessed to be retained and protected are highlighted in yellow in the Tree Schedule (Appendix 3). It should be noted that distance stated is a radius, not a diameter. AS 4970-2009 Protection of trees on development sites (Australian Standard®, 2009) states that an intrusion of the TPZ of less than 10% is considered minor. No intrusion into the TPZ is to exceed 20% of total TPZ area.

Note that:

1. **= VTA Assessment**
2. **= Impact of proposed plan**
3. **= TPZ Measures**

Tree 1: *Casuarina glauca* (Swamp Oak)

1. This street tree passes the VTA. This street tree has been topped and has power lines overhead. It is in good health and fair structural condition. It is suitable to be considered for retention.
2. This street tree has a full TPZ of 3.2m, with an SRZ of 2.0m. The proposed plans will not impact this tree. Retain and protect.
3. TPZ fence is required as per Appendix 8.

Tree 2: *Lagerstroemia indica* (Crepe Myrtle)

1. This tree fails the VTA (refer to Appendix 3 for details). It is not suitable to be considered for retention.
2. N/A.
3. N/A.

Tree 3: *Callistemon viminalis* (Weeping Bottlebrush)

1. This tree fails the VTA (refer to Appendix 3 for details). It is not suitable to be considered for retention.
2. N/A.
3. N/A.

Tree 4: *Banksia integrifolia* (Coast Banksia)

1. This tree fails the VTA (refer to Appendix 3 for details). It is not suitable to be considered for retention.
2. N/A.
3. N/A.

Tree 5: *Eucalyptus punctata* (Grey Gum)

1. This street tree passes the VTA. It is in good health and fair structural condition. This street tree has an inclusive main fork union and surface roots (SRZ). It is suitable to be considered for retention.
2. This street tree has a full TPZ of 4.4m, with an SRZ of 2.9m. Retain and protect.
3. TPZ fence is required as per Appendix 8.

Tree 6: *Acacia longifolia* (Sydney Golden Wattle)

1. This tree has been removed since the proposed site plans were developed.
2. N/A.
3. N/A.

Tree 7: *Allocasuarina littoralis* (Black She-Oak)

1. This tree fails the VTA (refer to Appendix 3 for details). It is not suitable to be considered for retention.
2. N/A.
3. N/A.

Tree 8: *Glochidion ferdinandi* (Cheese Tree)

1. This tree fails the VTA (refer to Appendix 3 for details). It is not suitable to be considered for retention.
2. N/A.
3. N/A.

Tree 9: *Eucalyptus pilularis* (Blackbutt)

1. This tree passes the VTA. It is in good health and structural condition. This tree is on the bank and has a tropism to the west. It is suitable to be considered for retention.
2. This tree has a full TPZ of 4.3m, with an SRZ of 2.3m. This tree is located in or <3m to the proposed development. This is an unacceptable impact. Removal is recommended to facilitate the proposed development.
3. N/A.

Tree 10: *Ficus elastica* (Rubber Tree)

1. This tree fails the VTA (refer to Appendix 3 for details). It is not suitable to be considered for retention. This tree is listed as an exempt species in Central Coast Council's Tree preservation Order (TPO).
2. N/A.
3. N/A.

Tree 11: *Araucaria cunninghamii* (Hoop Pine)

1. This tree passes the VTA. It is in good health and structural condition. It is suitable to be considered for retention.
2. This tree has a full TPZ of 9.4m (277.59m^2), with an SRZ of 3.3m. This tree is in the adjacent block. The centre of its trunk is 3m to the fence. The proposed development will encroach the TPZ of this tree by 18.9m^2 (6.81%). This is a low level, acceptable impact. Retain and protect.
3. The site boundary fence will provide adequate protection.

Tree 12: *G. ferdinandi* (Cheese Tree)

1. This tree fails the VTA (refer to Appendix 3 for details). It is not suitable to be considered for retention.
2. N/A.
3. N/A.

Tree 13: *G. ferdinandi* (Cheese Tree)

1. This tree passes the VTA. It is in good health and fair structural condition. This tree has an inclusive main fork union. It is suitable to be considered for retention.
2. This tree has a full TPZ of 5.4m, with an SRZ of 2.7m. This tree is located in or <3m to the proposed development. This is an unacceptable impact. Removal is recommended to facilitate the proposed development.
3. N/A.

Tree 14: *G. ferdinandi* (Cheese Tree)

1. This tree passes the VTA. It is in good health and fair structural condition. This tree has multiple branch attachments, some small dead wood and has been lopped. It is suitable to be considered for retention.
2. This tree has a full TPZ of 5.5m, with an SRZ of 2.4m. Removal is recommended to facilitate the proposed development.
3. N/A.

Tree 15: *G. ferdinandi* (Cheese Tree)

1. This tree passes the VTA. It is in good health and fair structural condition. This tree has inclusive main fork unions. It is suitable to be considered for retention.
2. This tree has a full TPZ of 2.0m, with an SRZ of 2.1m. This tree is located in or <3m to the proposed development. Removal is recommended to facilitate the proposed development.
3. N/A.

Tree 16: *Cupressus macrocarpa* (Monterey Cypress)

1. This tree fails the VTA. It is in poor health and fair structural condition.
2. This tree has a full TPZ of 3.6m, with an SRZ of 2.3m. This tree is located within the adjacent site, 1.5m to the boundary. The full TPZ of this tree will not be impacted by the proposed development. Retain and protect.
3. The site boundary fence will provide adequate protection.

Tree 17: *C. macrocarpa* (Monterey Cypress)

1. This tree fails the VTA. It is in poor health and fair structural condition.
2. This tree has a full TPZ of 3.6m, with an SRZ of 2.3m. This tree is located within the adjacent site, 1.5m to the boundary. The full TPZ of this tree will not be impacted by the proposed development. Retain and protect.
3. The site boundary fence will provide adequate protection.

Tree 18: *C. macrocarpa* (Monterey Cypress)

1. This tree fails the VTA. It is in poor health and fair structural condition.
2. This tree has a full TPZ of 7.2m, with an SRZ of 3.3m. This tree is located within the adjacent site, 1.5m to the boundary. The full TPZ of this tree will not be impacted by the proposed development. Retain and protect.
3. The site boundary fence will provide adequate protection.

Tree 19: *E. pilularis* (Blackbutt)

1. This tree passes the VTA. It is in good health and structural condition. It is suitable to be considered for retention.
2. This tree has a full TPZ of 4.8m, with an SRZ of 2.7m. This tree is located within the adjacent site, 4m to the boundary. The full TPZ of this tree will not be impacted by the proposed development. Retain and protect.
3. The site boundary fence will provide adequate protection.

Tree 20: *Cinnamomum camphora* (Camphor Laurel)

1. This tree passes the VTA. It is in good health and structural condition. It is suitable to be considered for retention.
2. This tree has a full TPZ of 4.2m, with an SRZ of 2.4m. This tree is listed as an exempt species in Central Coast Council's TPO. Removal is recommended.
3. N/A.

Tree 21: GROUP OF 6 *Erythrina crista-galli* (Common Coral Tree)

1. These trees fail the VTA (refer to Appendix 3 for details).
2. These trees are located within the reserve to the east of the site. This species is listed as exempt in Central Coast Council's Development Control Plan. Removal is recommended.
3. N/A.

Tree 22: *E. pilularis* (Blackbutt)

1. This fails the VTA. It is in poor health and structural condition. This tree has a dead crown, no habitat, is on rocks and has an exposed root plate. It is not suitable to be considered for retention.
2. This tree has a full TPZ of 7.2m, with an SRZ of 3.3m. It is located within the reserve to the east of the site. Removal is recommended.
3. N/A.

Tree 23: *E. pilularis* (Blackbutt)

1. This tree fails the VTA. This tree is dead but is in fair structural condition. This tree is located within the reserve to the east.
2. This tree has a full TPZ of 5.4m, with an SRZ of 2.7m. It is located within the reserve to the east of the site. Removal is recommended.
3. N/A.

Tree 24: *Angophora floribunda* (Rough-barked Apple)

1. This tree passes the VTA. It is in good health and structural condition. This tree has a tropism to the east. It is suitable to be considered for retention.
2. This tree has a full TPZ of 3.4m, with an SRZ of 2.1m. It is located within the reserve to the east of the site. There will be a <10% impact on the full TPZ of this tree from the proposed development. This is an acceptable intrusion. Retain and protect.
3. This tree should be fenced during landscape works within the reserve.

Tree 25: *E. pilularis* (Blackbutt)

1. This tree passes the VTA. It is in good health and structural condition. This tree has some small deadwood present. It is suitable to be considered for retention.
2. This tree has a full TPZ of 13.2m, with an SRZ of 3.6m. This tree is located within the proposed road. Removal is required to facilitate the proposed development plans.
3. N/A.

Tree 26: *E. pilularis* (Blackbutt)

1. This tree passes the VTA. It is in good health and structural condition. This tree has some small deadwood present. It is suitable to be considered for retention.
2. This tree has a full TPZ of 9.0m, with an SRZ of 3.3m. This tree is located within the proposed roadway. Removal is required to facilitate the proposed development plans.
3. N/A.

Tree 27: *A. floribunda* (Rough-barked Apple)

1. This tree has been removed since the proposed site plans were developed.
2. N/A.
3. N/A.

Tree 28: *A. floribunda* (Rough-barked Apple)

1. This tree passes the VTA. It is in good health and structural condition. This tree is located within the proposed building footprint. It is suitable to be considered for retention.
2. This tree has a full TPZ of 2.4m, with an SRZ of 2.0m. Removal is required to facilitate the proposed development plans.
3. N/A.

Tree 29: *Eucalyptus paniculata* (Grey Ironbark)

1. This tree passes the VTA. It is in good health and structural condition. This tree has forest architecture. It is suitable to be considered for retention.
2. This tree has a full TPZ of 3.4m, with an SRZ of 2.1m. It is located within the reserve to the east of the site. There will be a >10% intrusion into the full TPZ of this tree from the proposed development. This is an unacceptable impact. Removal is required to facilitate the proposed development plans.
3. N/A.

Tree 30: *Angophora costata* (Smooth-barked Apple)

1. This tree passes the VTA. It is in good health and structural condition. This tree has a 5° trunk lean to the south-west. It is suitable to be considered for retention.
2. This tree has a full TPZ of 2.9m, with an SRZ of 2.1m. It is located within the reserve to the east of the site. There will be a >10% intrusion into the full TPZ of this tree from the proposed development. This is an unacceptable impact. Removal is required to facilitate the proposed development plans.
3. N/A.

Tree 31: *Eucalyptus botryoides* (Bangalay)

1. This tree passes the VTA. It is in good health and structural condition. It is suitable to be considered for retention.
2. This tree has a full TPZ of 2.6m, with an SRZ of 2.0m. It is located within the reserve to the east of the site. There will be a >10% intrusion into the full TPZ of this tree from the proposed development. This is an unacceptable impact. Removal is required to facilitate the proposed development plans.
3. N/A.

Tree 32: *A. littoralis* (Black She-Oak)

1. This tree passes the VTA. It is in fair health and good structural condition. This tree has a sparse canopy. It is suitable to be considered for retention.
2. This tree has a full TPZ of 3.6m, with an SRZ of 2.1m. It is located within the reserve to the east of the site. Retain and protect.
3. This tree should be fenced during landscape works within the reserve.

Tree 33: *E. pilularis* (Blackbutt)

1. This tree passes the VTA. It is in good health and structural condition. This tree has an inclusive main fork union. It is suitable to be considered for retention.
2. This tree has a full TPZ of 4.2m, with an SRZ of 2.4m. This tree is located within the proposed building footprint. Removal is required to facilitate the proposed development plans.
3. N/A.

Tree 34: *A. costata* (Smooth-barked Apple)

1. This tree passes the VTA. It is in good health and structural condition. It is located within the reserve to the east of the site. It is suitable to be considered for retention.
2. This tree has a full TPZ of 2.6m, with an SRZ of 2.0m. Removal is required to facilitate the proposed development plans.
3. N/A.

Tree 35: *E. pilularis* (Blackbutt)

1. This tree passes the VTA. It is in good health and structural condition.It is suitable to be considered for retention.
2. This tree has a full TPZ of 2.4m, with an SRZ of 2.0m. It is located within the reserve to the east of the site. The full TPZ of this tree will not be impacted by the proposed development. Retain and protect.
3. This tree should be fenced during landscape works within the reserve.

Tree 36: *E. pilularis* (Blackbutt)

1. This tree passes the VTA. It is in good health and structural condition.It is suitable to be considered for retention.
2. This tree has a full TPZ of 3.0m, with an SRZ of 2.1m. It is located within the reserve to the east of the site. The full TPZ of this tree will not be impacted by the proposed development. Retain and protect.
3. This tree should be fenced during landscape works within the reserve.

Tree 37: *E. pilularis* (Blackbutt)

1. This tree passes the VTA. It is in good health and structural condition. It is suitable to be considered for retention.
2. This tree has a full TPZ of 3.1m, with an SRZ of 2.3m. It is located within the reserve to the east of the site. The full TPZ of this tree will not be impacted by the proposed development. Retain and protect.
3. This tree should be fenced during landscape works within the reserve.

Tree 38: *E. pilularis* (Blackbutt)

1. This tree passes the VTA. It is in good health and structural condition. It is suitable to be considered for retention.
2. This tree has a full TPZ of 3.0m, with an SRZ of 2.1m. It is located within the reserve to the east of the site. The full TPZ of this tree will not be impacted by the proposed development. Retain and protect.
3. This tree should be fenced during landscape works within the reserve.

Tree 39: *A. floribunda* (Rough-barked Apple)

1. This tree passes the VTA. It is in good health and structural condition. This tree has some small deadwood present. It is suitable to be considered for retention.
2. This tree has a full TPZ of 3.2m, with an SRZ of 2.0m. It is located within the reserve to the east of the site. The full TPZ of this tree will not be impacted by the proposed development. Retain and protect.
3. This tree should be fenced during landscape works within the reserve.

Tree 40: *E. pilularis* (Blackbutt)

1. This tree passes the VTA. It is in good health and structural condition. This tree has forest architecture. It is suitable to be considered for retention.
2. This tree has a full TPZ of 3.0m, with an SRZ of 2.1m. It is located within the reserve to the east of the site. The full TPZ of this tree will not be impacted by the proposed development. Retain and protect.
3. This tree should be fenced during landscape works within the reserve.

Tree 41: *E. pilularis* (Blackbutt)

1. This tree passes the VTA. It is in good health and fair structural condition. This tree has forest architecture. It is suitable to be considered for retention.
2. This tree has a full TPZ of 2.9m, with an SRZ of 2.1m. It is located within the reserve to the east of the site. The full TPZ of this tree will not be impacted by the proposed development. Retain and protect.
3. This tree should be fenced during landscape works within the reserve.

Tree 42: *E. pilularis* (Blackbutt)

1. This tree passes the VTA. It is in good health and fair structural condition. This tree has forest architecture. It is suitable to be considered for retention.
2. This tree has a full TPZ of 2.9m, with an SRZ of 2.1m. It is located within the reserve to the east of the site. The full TPZ of this tree will not be impacted by the proposed development. Retain and protect.
3. This tree should be fenced during landscape works within the reserve.

Tree 43: *E. pilularis* (Blackbutt)

1. This tree passes the VTA. It is in good health and fair structural condition. This tree has forest architecture. It is suitable to be considered for retention.
2. This tree has a full TPZ of 3.4m, with an SRZ of 2.3m. It is located within the reserve to the east of the site. The full TPZ of this tree will not be impacted by the proposed development. Retain and protect.
3. This tree should be fenced during landscape works within the reserve.

Tree 44: *E. pilularis* (Blackbutt)

1. This tree passes the VTA. It is in good health and fair structural condition. This tree has forest architecture. It is suitable to be considered for retention.
2. This tree has a full TPZ of 3.0m, with an SRZ of 2.2m. It is located within the reserve to the east of the site. The full TPZ of this tree will not be impacted by the proposed development. Retain and protect.
3. This tree should be fenced during landscape works within the reserve.

Tree 45: *E. pilularis* (Blackbutt)

1. This tree passes the VTA. It is in good health and fair structural condition. This tree has forest architecture. It is suitable to be considered for retention.
2. This tree has a full TPZ of 2.9m, with an SRZ of 2.1m. It is located within the reserve to the east of the site. The full TPZ of this tree will not be impacted by the proposed development. Retain and protect.
3. This tree should be fenced during landscape works within the reserve.

Tree 46: *E. pilularis* (Blackbutt)

1. This tree passes the VTA. It is in good health and fair structural condition. This tree has forest architecture. It is suitable to be considered for retention.
2. This tree has a full TPZ of 2.6m, with an SRZ of 2.0m. It is located within the reserve to the east of the site. The full TPZ of this tree will not be impacted by the proposed development. Retain and protect.
3. This tree should be fenced during landscape works within the reserve.

Tree 47: *E. pilularis* (Blackbutt)

1. This tree passes the VTA. It is in good health and fair structural condition. This tree has a 5° trunk lean to the north-west, forest architecture and some small deadwood present. It is suitable to be considered for retention.
2. This tree has a full TPZ of 3.1m, with an SRZ of 2.1m. It is located within the reserve to the east of the site. The full TPZ of this tree will not be impacted by the proposed development. Retain and protect.
3. This tree should be fenced during landscape works within the reserve.

Tree 48: *E. pilularis* (Blackbutt)

1. This tree passes the VTA. It is in good health and structural condition. This tree has some large deadwood. It is suitable to be considered for retention.
2. This tree has a full TPZ of 9.6m, with an SRZ of 3.3m. It is located within the reserve to the east of the site. The full TPZ of this tree will not be impacted by the proposed development. Retain and protect.
3. This tree should be fenced during landscape works within the reserve.

Tree 49: *E. pilularis* (Blackbutt)

1. This tree passes the VTA. It is in good health and structural condition. It is located within the reserve to the east of the site. It is suitable to be considered for retention.
2. This tree has a full TPZ of 7.2m, with an SRZ of 3.3m. The full TPZ of this tree will not be impacted by the proposed development. Retain and protect.
3. This tree should be fenced during landscape works within the reserve.

Tree 50: *E. pilularis* (Blackbutt)

1. This tree passes the VTA. It is in good health and structural condition. This tree has a tropism to the west. It is suitable to be considered for retention.
2. This tree has a full TPZ of 7.2m, with an SRZ of 3.2m. It is located within the reserve to the east of the site. The full TPZ of this tree will not be impacted by the proposed development. Retain and protect.
3. This tree should be fenced during landscape works within the reserve.

Tree 51: *E. pilularis* (Blackbutt)

1. This tree passes the VTA. It is in good health and structural condition. This tree has some small deadwood present and epicormic shoots. It is suitable to be considered for retention.
2. This tree has a full TPZ of 6.8m, with an SRZ of 3.7m It is located within the reserve to the east of the site. The full TPZ of this tree will not be impacted by the proposed development. Retain and protect.
3. N/A.

Tree 52: *E. pilularis* (Blackbutt)

1. This tree passes the VTA. It is in good health and structural condition. This tree has some small deadwood present. It is suitable to be considered for retention.
2. This tree has a full TPZ of 5.8m, with an SRZ of 1.8m. This tree is located within the proposed building footprint. Removal is required to facilitate the proposed development plans.
3. N/A.

Tree 53: *E. pilularis* (Blackbutt)

1. This tree passes the VTA. It is in good health and structural condition. This tree has some small deadwood present. It is suitable to be considered for retention.
2. This tree has a full TPZ of 5.4m, with an SRZ of 2.9m. This tree is located within the proposed building footprint. Removal is required to facilitate the proposed development plans.
3. N/A.

Tree 54: *E. botryoides* (Bangalay)

1. This tree passes the VTA. It is in good health and structural condition. This tree has some small deadwood present. It is suitable to be considered for retention.
2. This tree has a full TPZ of 8.9m, with an SRZ of 3.7m. This tree is located within the proposed building footprint. Removal is required to facilitate the proposed development plans.
3. N/A.

Tree 55: *E. pilularis* (Blackbutt)

1. This tree passes the VTA. It is in good health and structural condition. This tree has some small deadwood present. It is suitable to be considered for retention.
2. This tree has a full TPZ of 7.8m, with an SRZ of 3.3m. This tree is located within the proposed building footprint. Removal is required to facilitate the proposed development plans.
3. N/A.

Tree 56: *E. pilularis* (Blackbutt)

1. This tree passes the VTA. It is in good health and structural condition. This tree has some small deadwood present. It is suitable to be considered for retention.
2. This tree has a full TPZ of 9.7m, with an SRZ of 3.7m. This tree is located within the proposed building footprint. Removal is required to facilitate the proposed development plans.
3. N/A.

5.2 Discussion

TREES ASSESSED THAT ARE TO BE REMOVED: .... 2, 3, 4, 7, 8, 9, 10, 12, 13, 14, 15, 20, 21, 22, 23, 25, 26, 28, 29, 30, 31, 33, 34, 52, 53, 54, 55 & 56

STREET TREES TO BE RETAINED AND PROTECTED: ..... 1 & 5.

TREES THAT ARE LOCATED WITHIN THE ADJACENT SITES, THAT ARE TO BE RETAINED & PROTECTED: . ..... 11, 16, 17, 18 & 19.

TREES IN THE RESERVE TO THE EAST OF THE SITE THAT TO BE PROTECTED: .... 24, 32, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 & 51.

TREES IN THE RESERVE TO THE EAST THAT REQUIRE REMOVAL TO FACILITATE THE PROPOSED DEVELOPMENT PLANS:.....22, 23, 29, 30, 31 & 34.

TREES THAT FAIL THE VTA OR ARE EXEMPT SPECIES: ..... 2, 3, 4, 7, 8, 10, 12, 20 & 21.

TREES REMOVED SINCE COMPLETION OF SITE SURVEY: ..... 6 & 27.

The trees on site will need to be removed. There are no habitat sites in any of the trees. These trees are of low to medium significance.

Tree 10 is a *F. elastica* (Rubber Tree) and is listed as an exempt species in Central Coast Council's TPO. Removal is recommended.

Tree 11 is a large *Araucaria cunninghamii* (Hoop Pine). This tree is located 3m to the site boundary. The proposed building (and basement) is located 6m from the boundary. This tree has a full TPZ of 9.4m (277.59m^2), with an SRZ of 3.3m. The centre of its trunk is 3m to the fence. The proposed development will encroach the TPZ of this tree by 18.9m^2 (6.81%). This is a low level, acceptable impact. Retain and protect.

Tree 16, 17 & 18 are over-mature *Cupressus macrocarpa* (Monterey Cypress). These trees are declining but are located 1.5m from the boundary in the adjoining site. The largest TPZ is 6m. The proposed development is outside of the full TPZ of these 3 trees.

The full TPZ of Tree 19 is not impacted by the proposed development.

Tree 20 is a *Cinnamomum camphora* (Camphor Laurel) and is listed as exempt species in Central Coast Council's Tree Preservation Order. Removal is recommended.

Tree 21 is a group of 6 *Erythrina crista-galli* (Common Coral Tree) and is listed as exempt species in Central Coast Council's Tree Preservation Order. Removal is recommended.

Tree 22, 23, 25, 26, 28, 29, 30, 31, 33, 34, 52, 53, 54, 55 and 56 are recommended for removal to facilitate the proposed development.

Tree 32 and 35 - 51 are located within the adjacent reserve and should be fenced during landscape works within the reserve. These trees will not be impacted by the proposed development.

*This site is located within an RFS 10/50 zone (see Appendix 3a).

5.3 Tree Significance (Appendix 5)

The trees on site are of low to medium significance.

The trees in the adjoining site, the reserve and the street trees are of high significance.

6.0 Tree Protection Plan

for 7, 9 & 11 Bent Street, GOSFORD NSW 2250

a) Project Arborist (AQF5)

A project arborist (AQF5) is to be engaged to supervise implementation of works for the duration of construction.

b) Induction for Tree Protection

All workers entering the site involved in construction must be advised of the tree protection measures and specifications outlined within this report during the site induction. This is to be verbally acknowledged and signed off before the commencement of works.

c) Identify Further Potential Impacts on Trees by Proposed Plans

- It would be preferable that no fill soils be used in any TPZ unless approved by Central Coast Council.
- Soil cuts should be kept to a minimum near any TPZ unless approved by Central Coast Council.
- Services should not be in or run through any TPZ unless approved by Central Coast Council.
- Site Office/Toilet, etc., are not to be in any TPZ unless approved by Central Coast Council.
- Materials are to be stored away from any TPZ unless approved by Central Coast Council.
- Aeration of the soil is managed by the TPZ fencing.
- An area is to be set aside for tradespeople to wash down equipment away from any TPZ. The location of the wash down point should be approved by Consultant Arboriculturist unless approved by Central Coast Council.

d) Tree Protection Zones using AS 4970-2009 Protection of trees on development sites (Australian Standard®, 2009)

DBH – Diameter at Breast Height (1.4 metres)
DGL – Diameter at Ground Level
TPZ = DBH (stem) x 12 (radius)
SRZ radius = $(D \times 50)^{0.42} \times 0.64$

See Appendix 6 and Appendix 7
Refer to the Tree Schedule in clause 5.0 'Assessment of VTA, Impact & Tree Protection Measures' required by Proposed Plans' for TPZ and SRZ details

* Minimum TPZ is 2 metres – Maximum TPZ is 15 metres | # Minimum SRZ is 1.5 metres

e) Tree Protection Works

- TPZ fences are to be erected around the retained trees (Tree 1, 5, 16, 17, 18, 32 & 35 - 51) before construction commences (see Appendix 9).
- The distance from the tree trunk to the TPZ fence is specified in Appendix 3: Tree Schedule and highlighted (retained trees). N.B: This is a radius, not diameter.
- The TPZ fence is to be constructed of two (2) metres high temporary chain wire fencing. This is preferable to star pickets as it would require them to be hammered into the ground which could damage roots. This action will greatly reduce the stress on the trees. The TPZ fence should be left in place until the landscaping phase of construction begins.
- TPZ signage as per Appendix 8 to be attached to TPZ fencing.
- Tree 32 & 35 - 51 are located within the adjacent reserve and should be fenced during landscape works within the reserve.

f) Tree Works

- All tree work is to be carried out by a suitably qualified and insured Arborist (AQF3).
- Any crown reduction/management works required must comply with AS 4373-2007 Pruning of amenity trees (Australian Standard®, 2007).

7.0 Tree Protection Stages

a) Works Prior to Demolition

- All trees within the site are to be marked for Removal or Protection (retention).
- TPZ fencing to be erected around retained trees as per Appendix 9 prior to any works commencing.
- TPZ fencing is to be inspected by the Project Arborist (AQF5) and a letter certifying compliance is to be sent to the Principal Certifying Authority.

b) Works During Demolition

- Tree removal works can be carried out during demolition by a suitably qualified and insured Arborist (AQF3).
- All TPZ fencing is to be retained during works.

c) Excavation/Earthworks

There will be earthworks to level the site. Any tree roots encountered within the works area need to be correctly terminated by the Project Arborist (AQF5), which is cut by a hand saw and not smashed off with an excavator bucket. Correctly terminating a root will ensure that the tree roots do not suffer from decay.

d) Construction Works

TPZ fencing to remain in place during construction.

e) Landscaping Phase

- The TPZ fencing may be removed during the Landscaping Phase.
- All trees removed should, where practicable, be replaced at the landscaping phase as part of the proposed Development Application (DA).
- At the landscaping phase, the retained trees must only have tube stock plants planted with the structural root zone (SRZ). No additional (fill) soil is to be added within the TPZ of any retained tree.
- The Project Arborist (AQF5) should supervise planting with TPZ areas of retained trees.

8.0 Conclusions

The proposed works will require the removal of 28 trees. Of these trees, 16 are of high significance and located in the reserve to the east.

Trees on the adjoining sites will not be impacted, and the trees contained within the reserve to the east will be enhanced with the proposed landscaping works.

9.0 Recommendations

Implement all recommendations contained in Clauses 5.1, 5.2, 6.0 & 7.0.

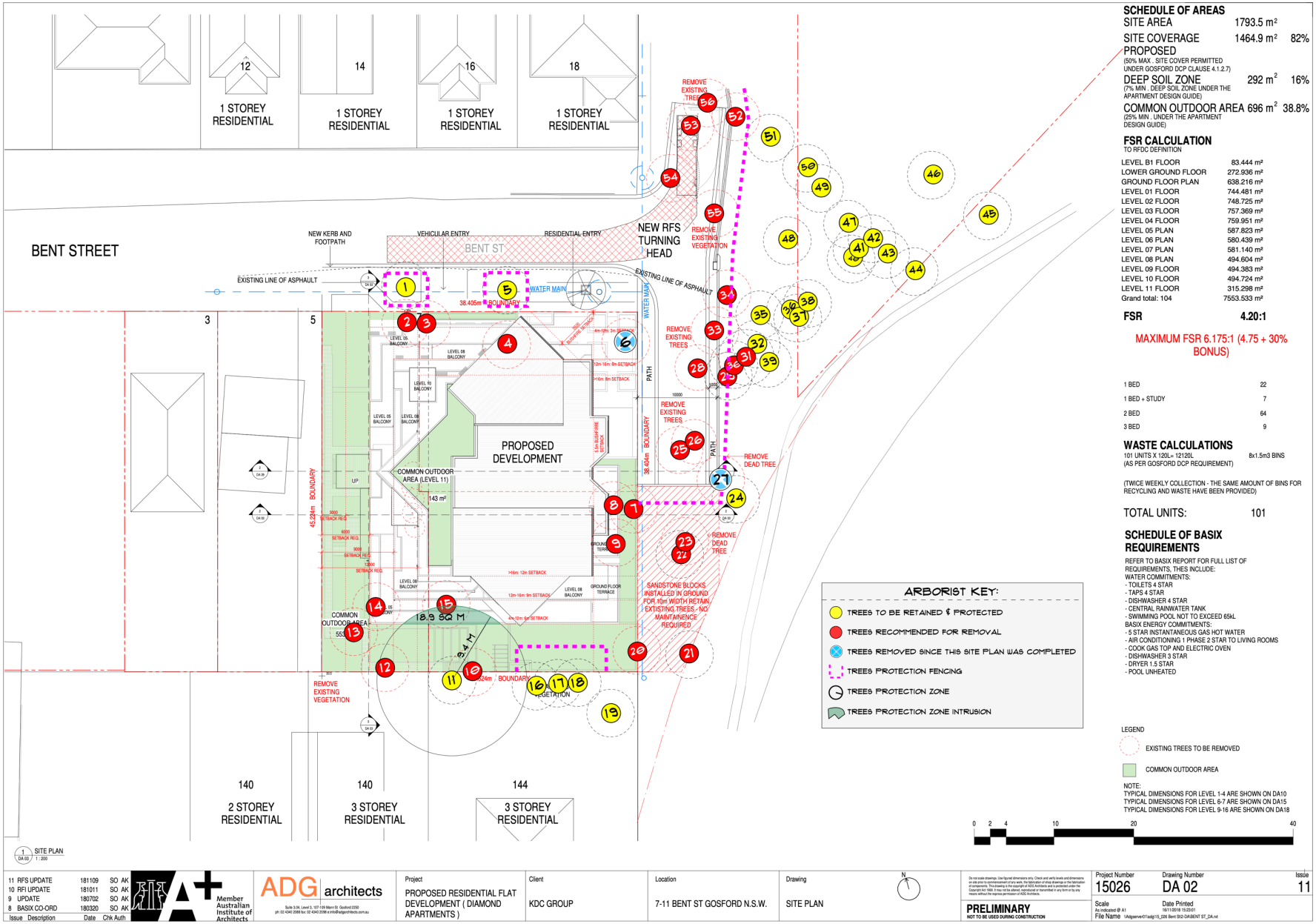
Reason: These recommendations have been developed in accordance with AS 4970-2009 (Australian Standard®, 2009) to reduce the impact of the proposed development on the retained trees.

The trees to be removed have been assessed as being unsuitable to be considered for retention or they have an unacceptable impact from the proposed development.

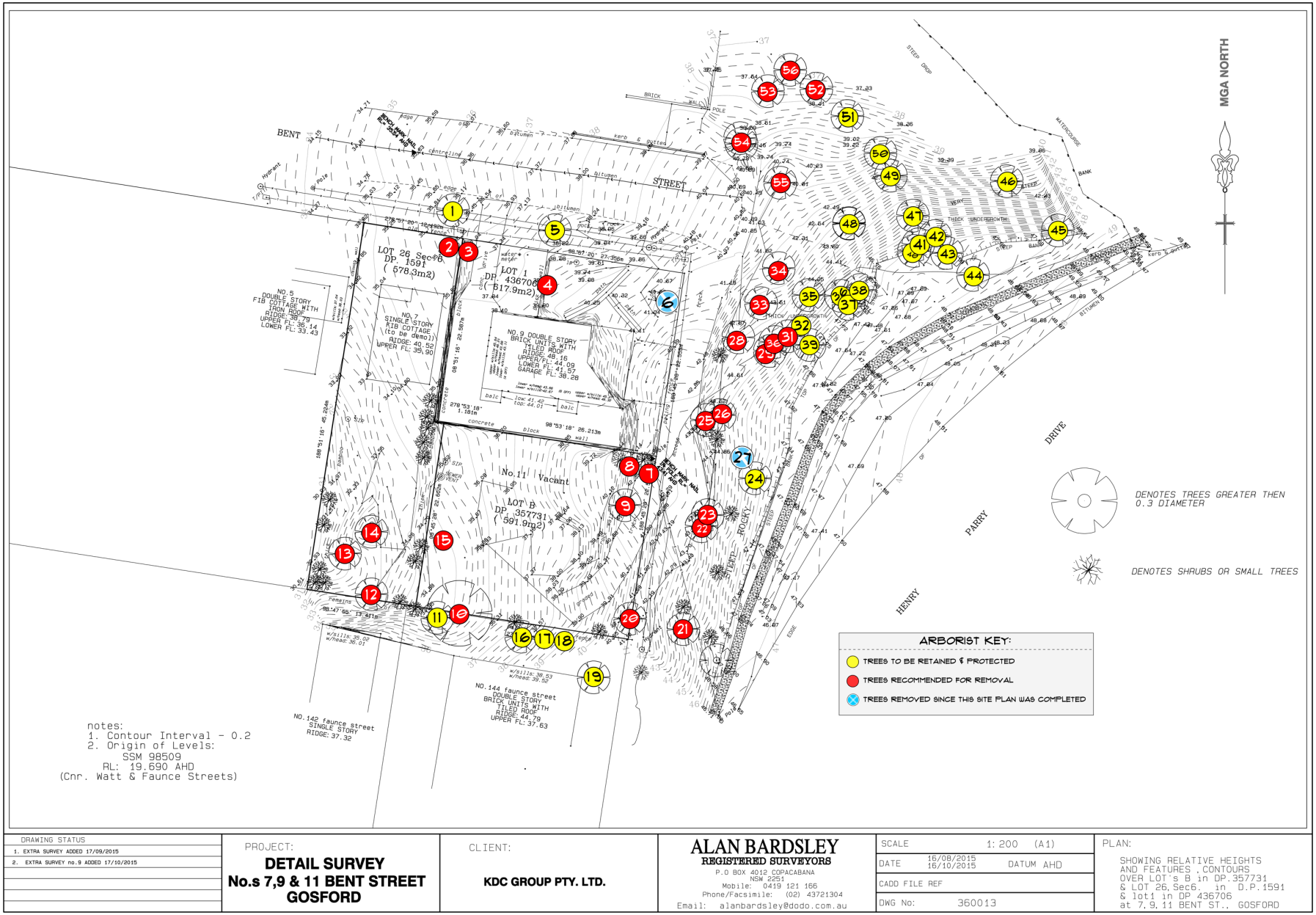
Russell Kingdom
Arboriculturist & Horticulturist

MIACA MAIH MAA
Diploma of Arboriculture (AQF5) | Graduate Diploma of Horticulture (AQF8)

Appendix 1: Site Plan with Trees and Proposed Development



Appendix 1a: Site Plan with Trees and Existing Development



DRAWING STATUS	PROJECT:	CLIENT:			
1. EXTRA SURVEY ADDED 17/09/2015 2. EXTRA SURVEY no.9 ADDED 17/10/2015	**DETAIL SURVEY No.s 7,9 & 11 BENT STREET GOSFORD**	**KDC GROUP PTY. LTD.**	**ALAN BARDSLEY REGISTERED SURVEYORS** P.O BOX 4012 COPACABANA NSW 2251 Mobile: 0419 121 166 Phone/Facsimile: (02) 43721304 Email: alanbardsley@dodo.com.au	SCALE 1:200 (A1) DATE 16/08/2015 16/10/2015 DATUM AHD CADD FILE REF DWG No: 360013	PLAN: SHOWING RELATIVE HEIGHTS AND FEATURES . CONTOURS OVER LOT's B in DP.357731 & LOT 26, Sec6. in D.P.1591 & lot1 in DP 436706 at 7, 9, 11 BENT ST., GOSFORD

Appendix 2: Photographs

Figure 1: Subject trees.

Figure 2: Subject trees.

Figure 3: Subject trees.

Figure 4: Subject trees.

Figure 5: Subject trees.

Figure 6: Subject trees.

Figure 7: Subject trees.

Figure 8: Subject trees.

Figure 9: Subject trees.

Figure 10: Subject trees.

Appendix 3: Tree Schedule

ABBREVIATIONS: m-metres, **mm**-millimetres, **DBH**-trunk diameter @ 1.4m, **DGL**-trunk diameter at ground level, **VP**-very poor, **P**-poor, **F**-fair, **G**-good, **VG**-very good, **CD**-co-dominant trunk, **TD**-tri-dominant trunk, **QD**-4x trunk, **TL**-trunk lean, **TW**-trunk wound, **Insp**-inspect, **L**-longicorns, **E**-epicormics, **K**-Kino, **FA**-forest architecture, **FR**-Forest Remnant, **dw**-deadwood small, **DW**-deadwood large, **TDB**-tip dieback, **PFS**-previous failure site, **RFS**-recent failure site, **BEW**-branch end weight, **MTU**-multi tree union, **MFU**-main fork union, **IFU**-inclusive fork union, **IMFU**-inclusive main fork union, **IMBU**-inclusive main branch union, **MBA**-Multiple branch attachments, **FB**-fruiting body, **BF**-bracket fungus, **U/C**-under canopy, **Decl**-declining, **B**-borers, **PD**-parrot damage, **LD**-leaf damage, **CMP**-chewing mouth piece, **RW**-reaction wood, **H/D**-Height/Diameter ratio test (Mattheck, et al., 1994), **J**-juvenile, **YM**-young mature, **SM**-semi mature, **M**-mature, **OM**-over mature, **HFP**-high failure potential, **D**-dangerous, **VD**-very dangerous, **X**-no room to grow/unsuitable, **H**-habitat, **HB**-habitat box, **REC**-recommendation, **S**-save, **R**-remove, **T**-transplant, **C**-council determination, **W**-work needed to be carried out, **mon**-monitor, **TPO**-tree preservation order, **HV**-high voltage, **PL**-power lines, **VTA**-visual tree assessment, **Hazard Rating-3**=low hazard ~ **12**=dangerous, **N/A**-not applicable, **SULE**-Safe & Useful Life Expectancy.

TREE NO.	SPECIES	HEIGHT (m)	DBH (mm)	DGL (mm)	RADIUS OF FULL TPZ (m)	RADIUS OF FULL SRZ (m)	HEALTH/VIGOUR	STRUCTURAL CONDITION	CANOPY SPREAD (M) N S E W	AGE CLASS	VTA	HAZARD RATING (3 - 12)	SULE	COMMENTS	REC
1	*Casuarina glauca* (Swamp Oak)	6	CD 180 200 (270)	300	3.2	2.0	G	F	2 radial	M	Pass	3	2B	Street tree. PL overhead, topped.	S
2	*Lagerstroemia indica* (Crepe Myrtle)	8	Multi >20x <80 (360)	600	4.3	2.7	G	P	2 radial	M	Fail	4	3B	Ornamental tree, lopped.	R
3	*Callistemon viminalis* (Weeping Bottlebrush)	6	Multi 5x<150 (340)	500	4.1	2.5	F	P	3 2 1 1	M	Fail	4	3B	On wall, lopped.	R
4	*Banksia integrifolia* (Coast Banksia)	4	CD 80 150 (170)	300	2.0	2.0	F	P	2 - 1 -	M	Fail	5	3B	On retaining wall, topped.	R
5	*Eucalyptus punctata* (Grey Gum)	5	CD 2x260 (370)	700	4.4	2.9	G	F	4 radial	M	Pass	4	2B	Street tree. IMFU, surface roots (SRZ).	S
6	*Acacia longifolia* (Sydney Golden Wattle)	6	180	240	2.2	1.8	VP	F	2 radial	M	Fail	5	4A	Sparse canopy, Decl. This tree has been removed since the attached site plans were developed.	N/A
7	*Allocasuarina littoralis* (Black She-Oak)	8	QD 4x<150 (300)	400	2.0	2.3	F	P	2 radial	M	Fail	5	3B	On bank, topped.	R

ABBREVIATIONS: m-metres, **mm**-millimetres, **DBH**-trunk diameter @ 1.4m, **DGL**-trunk diameter at ground level, **VP**-very poor, **P**-poor, **F**-fair, **G**-good, **VG**-very good, **CD**-co-dominant trunk, **TD**-tri-dominant trunk, **QD**-4x trunk, **TL**-trunk lean, **TW**-trunk wound, **Insp**-inspect, **L**-longicorns, **E**-epicormics, **K**-Kino, **FA**-forest architecture, **FR**-Forest Remnant, **dw**-deadwood small, **DW**-deadwood large, **TDB**-tip dieback, **PFS**-previous failure site, **RFS**-recent failure site, **BEW**-branch end weight, **MTU**-multi tree union, **MFU**-main fork union, **IFU**-inclusive fork union, **IMFU**-inclusive main fork union, **IMBU**-inclusive main branch union, **MBA**-Multiple branch attachments, **FB**-fruiting body, **BF**-bracket fungus, **U/C**-under canopy, **Decl**-declining, **B**-borers, **PD**-parrot damage, **LD**-leaf damage, **CMP**-chewing mouth piece, **RW**-reaction wood, **H/D**-Height/Diameter ratio test (Mattheck, et al., 1994), **J**-juvenile, **YM**-young mature, **SM**-semi mature, **M**-mature, **OM**-over mature, **HFP**-high failure potential, **D**-dangerous, **VD**-very dangerous, **X**-no room to grow/unsuitable, **H**-habitat, **HB**-habitat box, **REC**-recommendation, **S**-save, **R**-remove, **T**-transplant, **C**-council determination, **W**-work needed to be carried out, **mon**-monitor, **TPO**-tree preservation order, **HV**-high voltage, **PL**-power lines, **VTA**-visual tree assessment, **Hazard Rating**-**3**=low hazard ~ **12**=dangerous, **N/A**-not applicable, **SULE**-Safe & Useful Life Expectancy.

TREE NO.	SPECIES	HEIGHT (m)	DBH (mm)	DGL (mm)	RADIUS OF FULL TPZ (m)	RADIUS OF FULL SRZ (m)	HEALTH/VIGOUR	STRUCTURAL CONDITION	CANOPY SPREAD (M) N S E W	AGE CLASS	VTA	HAZARD RATING (3 - 12)	SULE	COMMENTS	REC
8	*Glochidion ferdinandi* (Cheese Tree)	6	QD 4x<150 (300)	450	3.6	2.4	F	P	4 4 2 4	M	Fail	5	3B	On bank, decay in trunk.	R
9	*Eucalyptus pilularis* (Blackbutt)	15	360	400	4.3	2.3	G	G	2 3 2 4	YM	Pass	4	2B	On bank, tropism to the west.	R
10	*Ficus elastica* (Rubber Tree)	20	700	1400	8.4	3.8	G	F	10 6 10 10	M	Fail	6	3B	Listed as an exempt species in Gosford City Council's Tree Preservation Order, lopped.	R
11	*Araucaria cunninghamii* (Hoop Pine)	25	780	1000	9.4	3.3	G	G	8 radial	VM	Pass	5	2B	In adjacent block, centre of trunk (COT) 3m to fence.	S
12	*G. ferdinandi* (Cheese Tree)	14	1000	1400	12.4	3.8	F	P	10 2 8 8	OM	Fail	6	3B	Crown reduced to the south, PFSs, dw, E.	R
13	*G. ferdinandi* (Cheese Tree)	12	450	600	5.4	2.7	G	F	8 radial	VM	Pass	5	2B	IMFU.	R
14	*G. ferdinandi* (Cheese Tree)	12	CD 300 350 (460)	450	5.5	2.4	G	F	6 2 1 2	VM	Pass	4	2B	dw, lopped, MBAs.	R
15	*G. ferdinandi* (Cheese Tree)	10	CD 80 150 (170)	350	2.0	2.1	G	F	3 1 2 -	M	Pass	4	2B	IMFUs.	R
16	*Cupressus macrocarpa* (Monterey Cypress)	15	300	400	3.6	2.3	P	F	4 4 1 1	OM	Fail	5	3B	In adjacent site, COT 1.5m to boundary, Decl, IFUs.	S
17	*C. macrocarpa* (Monterey Cypress)	14	300	400	3.6	2.3	P	F	1 radial	OM	Fail	5	3B	In adjacent site, COT 1.5m to boundary, Decl, IFUs.	S

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TREE NO.	SPECIES	HEIGHT (m)	DBH (mm)	DGL (mm)	RADIUS OF FULL TPZ (m)	RADIUS OF FULL SRZ (m)	HEALTH/VIGOUR	STRUCTURAL CONDITION	CANOPY SPREAD (M) N S E W	AGE CLASS	VTA	HAZARD RATING (3 - 12)	SULE	COMMENTS	REC
18	*C. macrocarpa* (Monterey Cypress)	15	QD 4x<300 (600)	1000	7.2	3.3	P	F	3 2 4 1	OM	Fail	5	3B	In adjacent site, COT 1.5m to boundary, Decl, IFUs.	S
19	*E. pilularis* (Blackbutt)	18	400	600	4.8	2.7	G	G	6 radial	M	Pass	4	2B	In adjacent site, 4m to boundary.	S
20	*Cinnamomum camphora* (Camphor Laurel)	14	350	480	4.2	2.4	G	G	4 radial	YM	Pass	4	3B	Listed as an exempt species in Gosford City Council's Tree Preservation Order.	R
21	GROUP OF 6x *Erythrina crista-galli* (Common Coral Tree)	12	<300	<400	3.6	2.3	G	G	6 radial	M	Fail	4	3B	Listed as an exempt species in Gosford City Council's Tree Preservation Order.	R
22	*E. pilularis* (Blackbutt)	21	600	1000	7.2	3.3	F	F	6 4 6 8	M	Pass	4	2B	Crown dead, DW, No H, on rocks, exposed root plate, in building footprint.	R
23	*E. pilularis* (Blackbutt)	20	450	600	5.4	2.7	Dead	F	2 radial	Dead	Fail	8	4A	Dead.	R
24	*Angophora floribunda* (Rough-barked Apple)	14	280	350	3.4	2.1	G	G	3 2 6 2	YM	Pass	4	2B	Tropism to the east. <10% intrusion into TPZ. Acceptable impact.	S
25	*E. pilularis* (Blackbutt)	26	1100	1200	13.2	3.6	G	G	10 8 4 10	VM	Pass	5	2B	dw, in building footprint.	R
26	*E. pilularis* (Blackbutt)	26	750	980	9.0	3.3	G	G	8 10 12 4	VM	Pass	5	2B	dw, in building footprint.	R
27	*A. floribunda* (Rough-barked Apple)	10	160	250	2.0	1.9	G	G	2 radial	YM	Pass	4	2B	This tree has been removed since the attached site plans were developed.	N/A
28	*A. floribunda* (Rough-barked Apple)	10	200	300	2.4	2.0	G	G	2 1 - 2	M	Pass	4	2B		R

ABBREVIATIONS: m-metres, **mm**-millimetres, **DBH**-trunk diameter @ 1.4m, **DGL**-trunk diameter at ground level, **VP**-very poor, **P**-poor, **F**-fair, **G**-good, **VG**-very good, **CD**-co-dominant trunk, **TD**-tri-dominant trunk, **QD**-4x trunk, **TL**-trunk lean, **TW**-trunk wound, **Insp**-inspect, **L**-longicorns, **E**-epicormics, **K**-Kino, **FA**-forest architecture, **FR**-Forest Remnant, **dw**-deadwood small, **DW**-deadwood large, **TDB**-tip dieback, **PFS**-previous failure site, **RFS**-recent failure site, **BEW**-branch end weight, **MTU**-multi tree union, **MFU**-main fork union, **IFU**-inclusive fork union, **IMFU**-inclusive main fork union, **IMBU**-inclusive main branch union, **MBA**-Multiple branch attachments, **FB**-fruiting body, **BF**-bracket fungus, **U/C**-under canopy, **Decl**-declining, **B**-borers, **PD**-parrot damage, **LD**-leaf damage, **CMP**-chewing mouth piece, **RW**-reaction wood, **H/D**-Height/Diameter ratio test (Mattheck, et al., 1994), **J**-juvenile, **YM**-young mature, **SM**-semi mature, **M**-mature, **OM**-over mature, **HFP**-high failure potential, **D**-dangerous, **VD**-very dangerous, **X**-no room to grow/unsuitable, **H**-habitat, **HB**-habitat box, **REC**-recommendation, **S**-save, **R**-remove, **T**-transplant, **C**-council determination, **W**-work needed to be carried out, **mon**-monitor, **TPO**-tree preservation order, **HV**-high voltage, **PL**-power lines, **VTA**-visual tree assessment, **Hazard Rating**-**3**=low hazard ~ **12**=dangerous, **N/A**-not applicable, **SULE**-Safe & Useful Life Expectancy.

TREE NO.	SPECIES	HEIGHT (m)	DBH (mm)	DGL (mm)	RADIUS OF FULL TPZ (m)	RADIUS OF FULL SRZ (m)	HEALTH/VIGOUR	STRUCTURAL CONDITION	CANOPY SPREAD (M) N S E W	AGE CLASS	VTA	HAZARD RATING (3 - 12)	SULE	COMMENTS	REC
29	*Eucalyptus paniculata* (Grey Ironbark)	16	280	360	3.4	2.1	G	G	2 radial	YM	Pass	4	2B	FA. >10% intrusion into TPZ from proposed development. This is an unacceptable impact.	R
30	*Angophora costata* (Smooth-barked Apple)	14	240	320	2.9	2.1	G	G	1 2 - 2	YM	Pass	4	2B	5° TL to the south-west. >10% intrusion into TPZ from proposed development. This is an unacceptable impact.	R
31	*Eucalyptus botryoides* (Bangalay)	14	220	290	2.6	2.0	G	G	2 1 - 1	M	Pass	4	2B	>10% intrusion into TPZ from proposed development. This is an unacceptable impact.	R
32	*A. littoralis* (Black She-Oak)	12	300	360	3.6	2.1	F	G	1 1 2 -	M	Pass	4	2B	Sparse canopy.	S
33	*E. pilularis* (Blackbutt)	16	CD 2x250 (350)	450	4.2	2.4	G	G	2 2 2 6	YM	Pass	4	2B	IMFU.	R
34	*A. costata* (Smooth-barked Apple)	14	220	300	2.6	2.0	G	G	4 1 1 4	YM	Pass	3	2B		R
35	*E. pilularis* (Blackbutt)	16	200	300	2.4	2.0	G	G	2 radial	YM	Pass	3	2B		S
36	*E. pilularis* (Blackbutt)	16	250	340	3.0	2.1	G	G	2 radial	YM	Pass	4	2B		S
37	*E. pilularis* (Blackbutt)	16	260	400	3.1	2.3	G	G	2 radial	YM	Pass	4	2B		S
38	*E. pilularis* (Blackbutt)	16	250	360	3.0	2.1	G	G	2 radial	YM	Pass	4	2B		S
39	*A. floribunda* (Rough-barked Apple)	10	CD 120 240 (270)	300	3.2	2.0	G	G	2 radial	M	Pass	3	2B	Vine, dw.	S

ABBREVIATIONS: m-metres, **mm**-millimetres, **DBH**-trunk diameter @ 1.4m, **DGL**-trunk diameter at ground level, **VP**-very poor, **P**-poor, **F**-fair, **G**-good, **VG**-very good, **CD**-co-dominant trunk, **TD**-tri-dominant trunk, **QD**-4x trunk, **TL**-trunk lean, **TW**-trunk wound, **Insp**-inspect, **L**-longicorns, **E**-epicormics, **K**-Kino, **FA**-forest architecture, **FR**-Forest Remnant, **dw**-deadwood small, **DW**-deadwood large, **TDB**-tip dieback, **PFS**-previous failure site, **RFS**-recent failure site, **BEW**-branch end weight, **MTU**-multi tree union, **MFU**-main fork union, **IFU**-inclusive fork union, **IMFU**-inclusive main fork union, **IMBU**-inclusive main branch union, **MBA**-Multiple branch attachments, **FB**-fruiting body, **BF**-bracket fungus, **U/C**-under canopy, **Decl**-declining, **B**-borers, **PD**-parrot damage, **LD**-leaf damage, **CMP**-chewing mouth piece, **RW**-reaction wood, **H/D**-Height/Diameter ratio test (Mattheck, et al., 1994), **J**-juvenile, **YM**-young mature, **SM**-semi mature, **M**-mature, **OM**-over mature, **HFP**-high failure potential, **D**-dangerous, **VD**-very dangerous, **X**-no room to grow/unsuitable, **H**-habitat, **HB**-habitat box, **REC**-recommendation, **S**-save, **R**-remove, **T**-transplant, **C**-council determination, **W**-work needed to be carried out, **mon**-monitor, **TPO**-tree preservation order, **HV**-high voltage, **PL**-power lines, **VTA**-visual tree assessment, **Hazard Rating**-**3**=low hazard ~ **12**=dangerous, **N/A**-not applicable, **SULE**-Safe & Useful Life Expectancy.

TREE NO.	SPECIES	HEIGHT (m)	DBH (mm)	DGL (mm)	RADIUS OF FULL TPZ (m)	RADIUS OF FULL SRZ (m)	HEALTH/VIGOUR	STRUCTURAL CONDITION	CANOPY SPREAD (M) N S E W	AGE CLASS	VTA	HAZARD RATING (3 - 12)	SULE	COMMENTS	REC
40	*E. pilularis* (Blackbutt)	16	250	350	3.0	2.1	G	G	2 radial	YM	Pass	3	2B	FA.	S
41	*E. pilularis* (Blackbutt)	18	240	340	2.9	2.1	G	F	2 radial	YM	Pass	4	2B	FA.	S
42	*E. pilularis* (Blackbutt)	18	240	340	2.9	2.1	G	F	2 radial	YM	Pass	4	2B	FA.	S
43	*E. pilularis* (Blackbutt)	18	280	400	3.4	2.3	G	F	2 radial	YM	Pass	4	2B	FA.	S
44	*E. pilularis* (Blackbutt)	18	CD 120 220 (250)	380	3.0	2.2	G	F	2 radial	YM	Pass	4	2B	FA.	S
45	*E. pilularis* (Blackbutt)	18	240	340	2.9	2.1	G	F	2 radial	YM	Pass	4	2B	FA.	S
46	*E. pilularis* (Blackbutt)	18	220	300	2.6	2.0	G	F	2 radial	YM	Pass	4	2B	FA.	S
47	*E. pilularis* (Blackbutt)	18	260	350	3.1	2.1	G	F	2 - - 2	YM	Pass	4	2B	5°TL to the north-west, FA, dw.	S
48	*E. pilularis* (Blackbutt)	18	800	1000	9.6	3.3	G	G	6 radial	M	Pass	4	2B	DW.	S
49	*E. pilularis* (Blackbutt)	24	600	980	7.2	3.3	G	G	8 radial	M	Pass	4	2B		S
50	*E. pilularis* (Blackbutt)	24	600	950	7.2	3.2	G	G	6 6 8 4	M	Pass	4	2B	Tropism to the west.	S

ABBREVIATIONS: m-metres, **mm**-millimetres, **DBH**-trunk diameter @ 1.4m, **DGL**-trunk diameter at ground level, **VP**-very poor, **P**-poor, **F**-fair, **G**-good, **VG**-very good, **CD**-co-dominant trunk, **TD**-tri-dominant trunk, **QD**-4x trunk, **TL**-trunk lean, **TW**-trunk wound, **Insp**-inspect, **L**-longicorns, **E**-epicormics, **K**-Kino, **FA**-forest architecture, **FR**-Forest Remnant, **dw**-deadwood small, **DW**-deadwood large, **TDB**-tip dieback, **PFS**-previous failure site, **RFS**-recent failure site, **BEW**-branch end weight, **MTU**-multi tree union, **MFU**-main fork union, **IFU**-inclusive fork union, **IMFU**-inclusive main fork union, **IMBU**-inclusive main branch union, **MBA**-Multiple branch attachments, **FB**-fruiting body, **BF**-bracket fungus, **U/C**-under canopy, **Decl**-declining, **B**-borers, **PD**-parrot damage, **LD**-leaf damage, **CMP**-chewing mouth piece, **RW**-reaction wood, **H/D**-Height/Diameter ratio test (Mattheck, et al., 1994), **J**-juvenile, **YM**-young mature, **SM**-semi mature, **M**-mature, **OM**-over mature, **HFP**-high failure potential, **D**-dangerous, **VD**-very dangerous, **X**-no room to grow/unsuitable, **H**-habitat, **HB**-habitat box, **REC**-recommendation, **S**-save, **R**-remove, **T**-transplant, **C**-council determination, **W**-work needed to be carried out, **mon**-monitor, **TPO**-tree preservation order, **HV**-high voltage, **PL**-power lines, **VTA**-visual tree assessment, **Hazard Rating**-**3**=low hazard ~ **12**=dangerous, **N/A**-not applicable, **SULE**-Safe & Useful Life Expectancy.

TREE NO.	SPECIES	HEIGHT (m)	DBH (mm)	DGL (mm)	RADIUS OF FULL TPZ (m)	RADIUS OF FULL SRZ (m)	HEALTH/VIGOUR	STRUCTURAL CONDITION	CANOPY SPREAD (M) N S E W	AGE CLASS	VTA	HAZARD RATING (3 - 12)	SULE	COMMENTS	REC
51	*E. pilularis* (Blackbutt)	24	CD 2x400 (570)	1300	6.8	3.7	G	G	6 radial	M	Pass	4	2B	dw, E.	S
52	*E. pilularis* (Blackbutt)	24	480	240	5.8	1.8	G	G	6 radial	M	Pass	4	2B	dw, in proposed building footprint.	R
53	*E. pilularis* (Blackbutt)	25	450	700	5.4	2.9	G	G	5 2 2 5	M	Pass	4	2B	dw, in proposed building footprint.	R
54	*E. botryoides* (Bangalay)	25	CD 440 600 (740)	1300	8.9	3.7	G	G	8 4 4 8	M	Pass	4	2B	dw, in proposed building footprint.	R
55	*E. pilularis* (Blackbutt)	25	650	1000	7.8	3.3	G	G	8 radial	M	Pass	4	2B	dw, in proposed building footprint.	R
56	*E. pilularis* (Blackbutt)	26	TD 400 480 520 (810)	1300	9.7	3.7	G	G	8 radial	M	Pass	4	2B	dw, in proposed building footprint.	R

*Appendix 3a: NSW Rural Fire Service 10/50 Vegetation Clearing Entitlement**

**Sourced from the NSW Rural Fire Service website.*

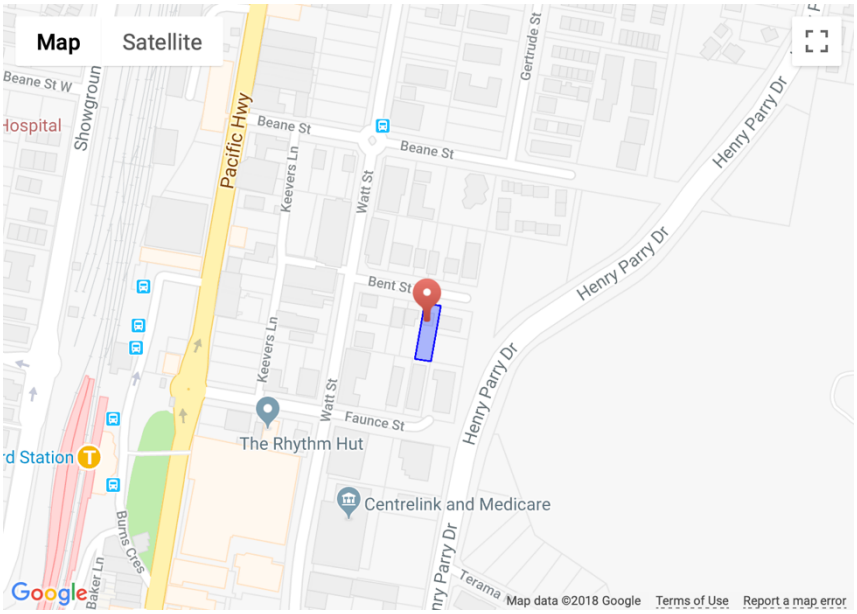


Figure 11: Showing 7 Bent Street, Gosford is in an approved RFS 10/50 Vegetation Entitlement Clearing Area.

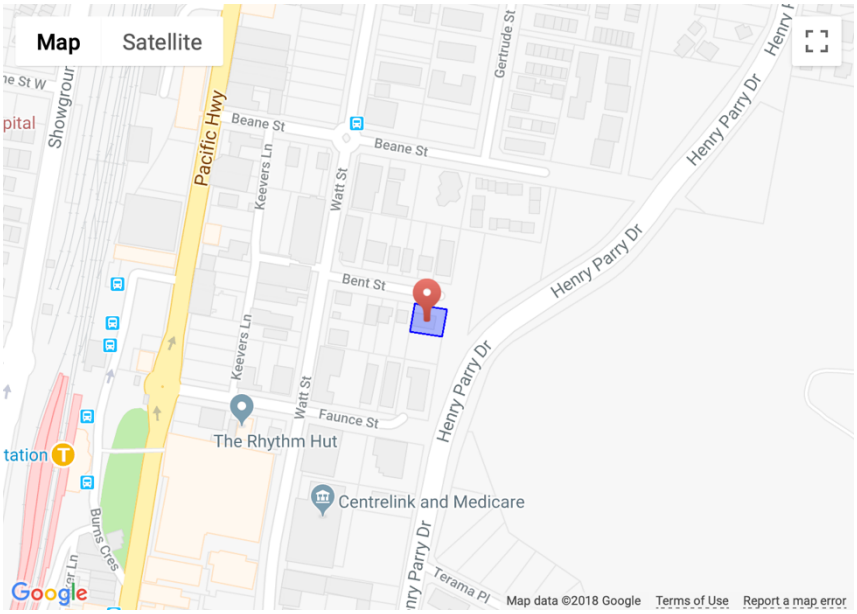


Figure 12: Showing 9 Bent Street, Gosford is in an approved RFS 10/50 Vegetation Entitlement Clearing Area.

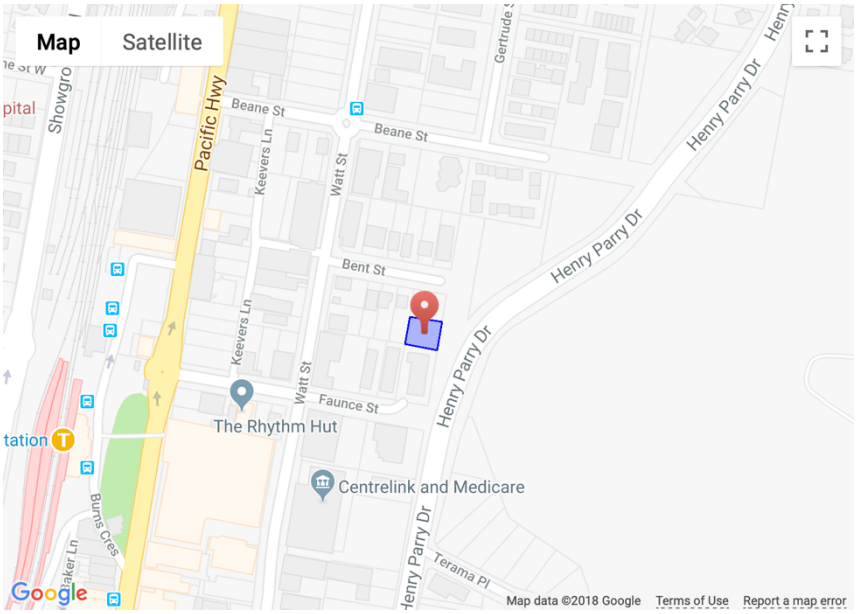


Figure 13: Showing 11 Bent Street, Gosford is in an approved RFS 10/50 Vegetation Entitlement Clearing Area.

Your 10/50 search result

You have conducted a search of the 10/50 online tool for the land identified in the map above. This search result is valid for the date the search was conducted.

Please retain a copy of this search result for your records as evidence the 10/50 rules were applicable to your clearing on the day you undertook the clearing.

The parcel of land you have selected is located in a designated 10/50 vegetation entitlement clearing area. You must read the 10/50 Code of Practice carefully to ensure that you are only clearing in accordance with the 10/50 Code. For more information see our frequently asked questions.

You may only clear vegetation in accordance with the 10/50 Code, including (but not limited to the following conditions):

- You may not remove trees (or prune more than 25% of the original canopy) on slopes greater than 18 degrees except in accordance with conditions identified in a Geotechnical Engineer Assessment Report undertaken for that purpose.
- Mangroves and salt marsh may not be cleared. For more information refer to the Department of Primary Industries fact sheets on Mangroves and Coastal saltmarsh.
- The clearing of vegetation including trees is not allowed within 10 metres of a river that is 2 metres or more in width between the highest opposite banks, or within 10 metres of a lake. Lake and river are as defined in the 10/50 Code.
- Clearing under this 10/50 Code cannot be inconsistent with any of the legal obligations identified under Clause 7.8 of the 10/50 Code.
- Herbicides may only be used in accordance with the conditions under Clause 7.4 of the 10/50 Code.
- Landowners have a duty of care to avoid cruelty and harm to native, introduced or domestic animals when clearing trees and vegetation in accordance with the 10/50 Code. It is important that landowners are aware that clearing of trees and vegetation under the 10/50 Code can result in harm to native animals and loss of their natural habitat. Landowners who clear trees and vegetation under the 10/50 Code are not exempt from prosecution under the *National Parks and Wildlife Act 1974* for harm to protected fauna, or for deliberate cruelty to animals under the *Prevention of Cruelty to Animals Act 1979*. Operating in accordance with the 10/50 Code does not absolve the landowner from their responsibility for avoiding harm to protected fauna or deliberate cruelty to animals. Note: 'protected fauna' is as defined in the *National Parks and Wildlife Act 1974*.
- If you witness any displaced, orphaned or injured wildlife you should contact the Office of Environment and Heritage, or licensed fauna rehabilitation group for assistance. Visit the Office of Environment and Heritage for further advice and the full list of licensed providers.
- Landowners have a duty of care in the appropriate management of soil erosion and landslip risks when clearing trees and vegetation under the 10/50 Code. Landowners who clear trees and vegetation under the 10/50 Code are not exempt from liability. For example, action may be pursued by a party that suffers as a result of a landslip due to actions taken on your land. It is the responsibility of landowners to seek expert advice in relation to these matters. The conditions below have been put in place to assist landowners in the management of vegetation but operating in accordance with these conditions does not absolve the landowner from their responsibility for landslip and erosion issues. To manage soil erosion and landslip risks:
  - there is to be no disturbance of the soil,
  - vegetation must not be removed below the soil surface
  - all topsoil must remain on the soil surface,
  - retain a protective ground cover on the soil surface, and
  - the use of graders, ploughs, bulldozers (or other types of heavy machinery that are designed to break the soil surface such as excavators) to clear land under this 10/50 Code is not permitted.

The 10/50 Code was created to give land owners stronger protection against bush fires and was developed by the Government in response to community concerns after devastating bush fires in 2013.

The NSW RFS provides extensive information and resources to assist people interested in preparing their homes and families against the risk of bush fires. Try some of the useful links below for more information:

Appendix 4: Notes on Tree Assessment

Key	Criteria	Comments
Tree No	Must relate to the number on your site diagram	
Species	Botanical name and common name of Tree	
Diameter of trunk	DBH Diameter at Breast Height (1.4 metres) DGL Diameter at Ground Level	
Height	In metres	
Spread	Average diameter of canopy in metres	
Crown Condition	Overall vigour and vitality 0 Dead 1 Severe decline (<20% canopy; major dead wood) 2 Declining (20-60% canopy density; twig and branch dieback) 3 Average/low vigour (60-90% canopy density; twig dieback) 4 Good (90-100% crown cover; little or no dieback or other problems) 5 Excellent (100% crown cover, no deadwood or other problems)	This requires knowledge of species.
Age class	Y Young = recently planted SM Semi-mature (< 20% of life expectancy) M Mature (20-80% of life expectancy) OM Over-mature (> 80% of life expectancy)	
Special Significance	A Aboriginal C Commemorative Ha Habitat Hi Historic M Memorial R Rare U Unique form O Other	This may require specialist knowledge.
Services/adjacent structures	Bs Bus stop Bu Building within 3m HVo High voltage open-wire construction HVb High Voltage bundled (ABC) LVo Low Voltage open-wire construction LVb Low Voltage bundled (ABC) Na No services above Nb No services below ground Si Signage Sl Street light T Transmission lines (>33KV) U Underground services O Other	More than one of these may apply.
Defects	B Borers C Cavity D Decay dw Deadwood E Epicormics FA Forest Architecture H/D Height/Diameter ratio I Inclusions L Lopped LDCMP Leaf damage by chewing mouthpiece insects M Mistletoe/Parasites MBA Multiple Branch Attachments PD Parrot Damage PFS Previous Failure Sites S Splits/cracks T Termites TL Trunk Lean TW Trunk Wound O Other	More than one of these may apply. H/D if ratio is higher than 50:1 then tree is defective (Mattheck, et al., 1994).

Key	Criteria	Comments
Root zone	C Compaction D Damaged/wounded roots (e.g. by mowers) E Exposed roots Ga Tree in garden bed Gi Girdled roots Gr Grass Kb Kerb close to tree L+ Raised soil level L- Lowered soil level M Mulched Pa Paving/concrete/bitumen Pr Roots pruned O Other	More than one of these may apply.
Failure Potential	Identifies the most likely failure and rates the likelihood that the structural defect(s) will result in failure within the inspection period. 1. Low – defects are minor (e.g. dieback of twigs, small wounds with good wound wood development) 2. Medium – defects are present and obvious (e.g. cavity encompassing 10-25% of the circumference of the trunk) 3. High – numerous and or significant defects present (e.g. cavity encompassing 30-50% of the circumference of the trunk, major bark inclusions) 4. Severe – defects are very severe (e.g. heart rot fruiting bodies, cavity encompassing more than 50% of the trunk)	This requires specialist knowledge.
Size of defective part	Rates the size of the part most likely to fail. The larger the part that fails, the greater the potential for damage. 1. Most likely failure less than 150mm in diameter 2. Most likely failure 150-450mm in diameter 3. Most likely failure 450-750mm in diameter 4. Most likely failure more than 750mm in diameter	
Target Rating*	Rates the use and occupancy of the area that would be struck by the defective part. 1. Occasional use (e.g. jogging/cycle track) 2. Intermittent use (e.g. picnic area, day use parking) 3. Frequent use, secondary structure (e.g. seasonal camping area, storage facilities) 4. Constant use, structures (e.g. year-round use for a number of hours each day, residences)	
Hazard rating*	Failure potential + size of part + target rating Add each of the above sections for a number out of 12	The final number identifies the degree of risk. The next step is to determine a management strategy. A rating in this column does not condemn a tree but may indicate the need for more investigation and a risk management strategy.

Appendix 5: Significance of a Tree, Assessment Rating System (STARS) (IACA)

In the development of this document IACA acknowledges the contribution and original concept of the Footprint Green Tree Significance & Retention Value Matrix, developed by Footprint Green Pty Ltd in June 2001.

The landscape significance of a tree is an essential criterion to establish the importance that a particular tree may have on a site. However, rating the significance of a tree becomes subjective and difficult to ascertain in a consistent and repetitive fashion due to assessor bias. It is, therefore, necessary to have a rating system utilising structured qualitative criteria to assist in determining the retention value for a tree. To assist this process all definitions for terms used in the Tree Significance - Assessment Criteria and Tree Retention Value - Priority Matrix, are taken from the IACA 'Dictionary for Managing Trees in Urban Environments' (Draper, et al., 2009).

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

TREE SIGNIFICANCE - ASSESSMENT CRITERIA

1. **High Significance in landscape**
   - The tree is in good condition, or normal vigour and form typical of the species,
   - The tree is a remnant or is a planted locally indigenous specimen and/or is rare or uncommon in the local area or of botanical interest or of grand age.
   - The tree is listed as a Heritage Item, Threatened Species or part of a Threatened Community or listed on council's significant tree register.
   - The tree is visually prominent and visible from a considerable distance when viewed from most directions within the landscape by bulk and scale and makes a positive contribution to the local amenity.
   - The tree has been influenced by historic figures, events or part of the heritage development of the place.
   - The tree supports social and cultural sentiments or spiritual associations, reflected by the broader population or community group or has commemorative values. (ICOMOS)
   - The growing environment supports the tree to its full dimensions above and below ground without conflict or constraint.

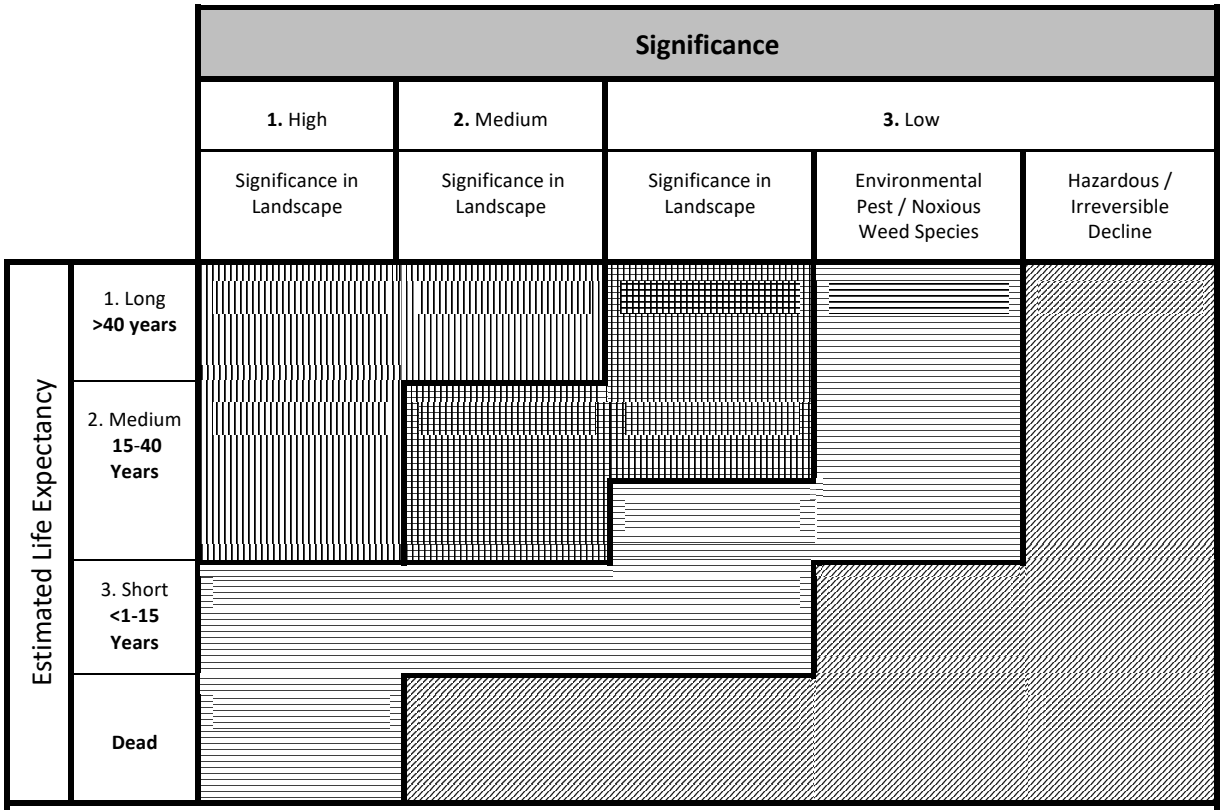
2. **Medium Significance in landscape**
   - The tree is in fair-good condition, or normal or low vigour and form typical or atypical of the species.
   - The tree is a planted locally indigenous or a common species with its taxa readily planted in the local area.
   - The tree is visible from surrounding properties, although not visually prominent as partially obstructed by other vegetation or buildings when viewed from the street.
   - The tree provides a fair contribution to the visual character and amenity of the area.
   - The tree is moderately constrained by above or below ground influences of the built environment to reach full dimensions.

3. **Low Significance in landscape**
   - The tree is in fair-poor condition, or normal or low vigour and form typical or atypical of the species,
   - The tree is not visible or is partly from surrounding properties as obstructed by other vegetation or buildings.
   - The tree provides a minor contribution or has a negative impact on the visual character and amenity of the area.
   - The tree is severely constrained by above or below ground by influences of the built environment and therefore will not reach full dimensions; the tree is inappropriate to the site conditions.
   - The tree is listed as exempt under the provisions of the local Council Tree Preservation Order.
   - The tree has a wound or defect that has the potential to become structurally unsound.

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

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

TABLE 1.0 TREE RETENTION VALUE - PRIORITY MATRIX.



Legend for Matrix Assessment

	Priority for Retention (High) - These trees are considered important for retention and should be retained and protected. Design modification or relocation of building/s should be considered to accommodate the setbacks as detailed in Table 2. Special construction works must be implemented e.g. pier and beam, etc if works are to proceed within the Tree Protection Zone.
	Consider for Retention (Medium) - These trees may be retained and protected. These are considered less critical; however, their retention should remain a priority with removal considered only if adversely affecting the proposed building/works and all other alternatives have been considered and exhausted.
	Consider for Removal (Low) – These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.
	Priority for Removal – These trees are considered hazardous, or in irreversible decline, or weeds and should be removed irrespective of development.

Appendix 5a: Levels of Visual Assessment

The following Visual Assessment information is from 'Tree Risk Assessment Manual', published by International Society of Arboriculture (Dunster, et al., 2013).

The level of assessment used in this report is specified in '4.0 Method of Assessment' (Page 4).

LEVEL I: LIMITED VISUAL ASSESSMENT PROCESS

- Identify the location and/or selection criteria of trees to be assessed.
- Determine the most efficient route for assessing large populations of trees and documenting the route taken.
- Assess the tree(s) of concern from the defined perspective (for example, walk-by, drive-by).
- Record information about the tree as specified in the scope of work (for example, significant defects or other conditions of concern), and identify locations of trees that need a higher level of assessment and/or prompt action.
- Evaluate the risk of trees that meet the selection criteria (a risk rating is optional).
- Submit a report indicating risk level and mitigation options and/or recommendations.

LEVEL 2: BASIC ASSESSMENT PROCESS

- Locate and identify the tree or trees to be assessed.
- Determine the targets and target zone for the tree or branches of concern.
- Review site history, conditions, and species failure profile.
- Assess potential loads on the tree and its parts.
- Assess general tree health.
- Inspect the tree visually—using binoculars, mallet, probes, or shovels, as desired by the arborist or as specified in the scope of work.
- Record observations of site conditions, defects, and outward signs of possible internal defects and response growth.
- If necessary, recommend an advanced assessment.
- Analyse data to determine the likelihood and consequences of failure in order to evaluate the degree of risk.
- Develop mitigation options and estimate residual risk for each option.
- Develop and submit the report/documentation, including, when appropriate, advice on reinspection intervals.

LEVEL 3: ADVANCED TECHNIQUES

There are many techniques that can be considered for advanced risk assessment. *Some situations may be assessed with several techniques. Advanced assessment techniques include the following:

- Aerial inspection and evaluation of structural defects in branches
  - Visual inspection; Decay testing; Load testing.
- Detailed target analysis
- Detailed site evaluation
- Decay testing
  - Increment boring; Drilling with small-diameter bit; Resistance-recording drilling; Single-path sonic (stress) wave; Sonic tomography; Electrical impedance tomography; Radiation (radar, X-ray, and gamma ray)
- Health evaluation
  - Tree ring analysis (in temperate trees); Shoot length measurement; Detailed health/vigour analysis; Starch assessment
- Storm/wind load analysis
  - Detailed assessment of tree exposure and protection; Computer-based estimations according to engineering standards; Wind reaction monitoring over a defined interval
- Measuring and assessing the change in trunk lean
- Load testing
  - Hand pull; Measured static pull

*Inclusion of specific techniques in this list should not be considered an endorsement of the use of that technique.

Appendix 5b: Visual Tree Assessment

The Visual Tree Assessment (VTA) methods as described in 'The Body Language of Trees. A Handbook for Failure Analysis. Research for Amenity Trees' by Mattheck and Breloer (Mattheck, et al., 1994) is used in association with the International Society of Arboriculture's guidelines in this report.

196 THE BODY LANGUAGE OF TREES

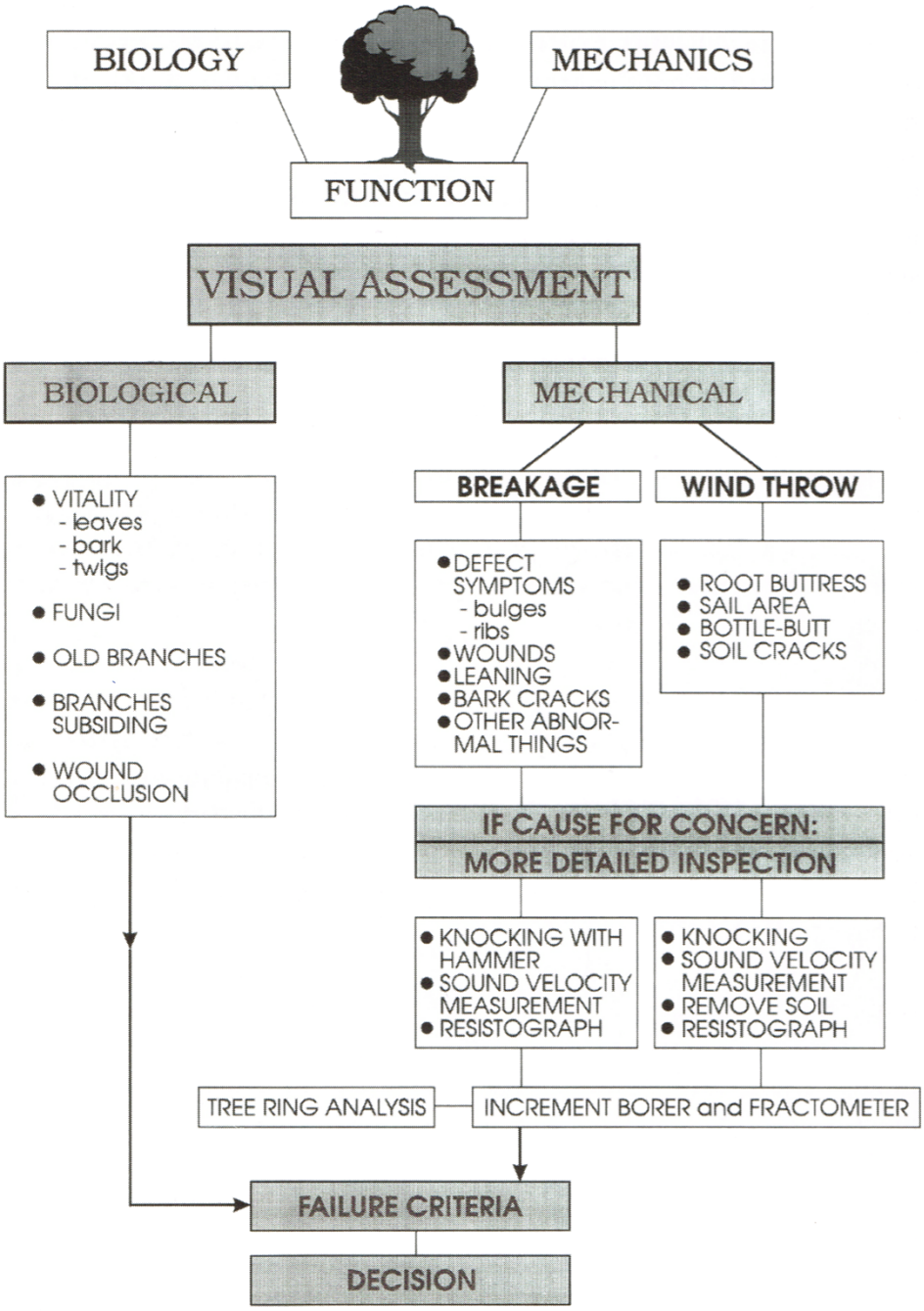


Fig 120. The Visual Tree Assessment (VTA) procedure for assessing trees. As the suspicion increases that defects are present, the examination becomes more thorough and searching.

Appendix 6: Extract from AS 4970-2009 Protection of trees on development sites (Australian Standard®, 2009), Section 3: Determining the Tree Protection Zones of the Selected Trees, 3.1 Tree Protection Zone (TPZ)

3.1 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) (refer to Clause 3.3.5)."

3.2 DETERMINING THE TPZ

TPZ for Single Trunked Trees

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

TPZ = DBH x 12

TPZ for Multiple Trunked Trees

The radius of the TPZ for multiple-trunked trees is calculated using the following formula:

$\sqrt{(DBH_1)^2+(DBH_2)^2+(DBH_3)^2}$ = total DBH x 12

DBH = trunk diameter measured at 1.4 metres above ground.

Radius is measured from the centre of the stem at ground level.

A TPZ should not be less than 2 metres nor greater than 15 metres (except where crown protection is required).

The TPZ of palms, other monocots, cycads and tree ferns should not be less than 1 metre outside the crown projection.

AS 4970-2009
Refer to page 14 "FIGURE 2 INDICATIVE TREE PROTECTION ZONE" & page 24 "Appendix A – DIAMETER AT BREAST HEIGHT (DBH) (Informative)" in AS 4970-2009 Protection of trees on development sites (Australian Standard®, 2009) **for more information.**

Appendix 7: Extract from AS 4970-2009 Protection of trees on development sites (Australian Standard®, 2009), Section 3: Determining the Protection Zones of the Selected Trees, 3.3.5 Structural Root Zone (SRZ)

3.3.5 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 a 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 = $(D \times 50)^{0.42} \times 0.64$

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."

AS 4970-2009

Refer to page 13 "FIGURE 1 STRUCTURAL ROOT ZONE CALCULATION" in AS 4970-2009 Protection of trees on development sites (Australian Standard®, 2009) **for more information.**

TABLE 2.0 TPZ AND SRZ TABLE

DBH for TPZ (mm)	DGL for SRZ (mm)	TPZ (m)	SRZ (m)	DBH for TPZ (mm)	DGL for SRZ (mm)	TPZ (m)	SRZ (m)	DBH for TPZ (mm)	DGL for SRZ (mm)	TPZ (m)	SRZ (m)
100	100	2.0	1.5	500	500	6.0	2.5	900	900	10.8	3.2
110	110	2.0	1.5	510	510	6.1	2.5	910	910	10.9	3.2
120	120	2.0	1.5	520	520	6.2	2.5	920	920	11.0	3.2
130	130	2.0	1.5	530	530	6.4	2.5	930	930	11.2	3.2
140	140	2.0	1.5	540	540	6.5	2.6	940	940	11.3	3.2
150	150	2.0	1.5	550	550	6.6	2.6	950	950	11.4	3.2
160	160	2.0	1.5	560	560	6.7	2.6	960	960	11.5	3.3
170	170	2.0	1.6	570	570	6.8	2.6	970	970	11.6	3.3
180	180	2.2	1.6	580	580	7.0	2.6	980	980	11.8	3.3
190	190	2.3	1.7	590	590	7.1	2.7	990	990	11.9	3.3
200	200	2.4	1.7	600	600	7.2	2.7	1000	1000	12.0	3.3
210	210	2.5	1.7	610	610	7.3	2.7	1010	1010	12.1	3.3
220	220	2.6	1.8	620	620	7.4	2.7	1020	1020	12.2	3.3
230	230	2.8	1.8	630	630	7.6	2.7	1030	1030	12.4	3.4
240	240	2.9	1.8	640	640	7.7	2.7	1040	1040	12.5	3.4
250	250	3.0	1.9	650	650	7.8	2.8	1050	1050	12.6	3.4
260	260	3.1	1.9	660	660	7.9	2.8	1060	1060	12.7	3.4
270	270	3.2	1.9	670	670	8.0	2.8	1070	1070	12.8	3.4
280	280	3.4	1.9	680	680	8.2	2.8	1080	1080	13.0	3.4
290	290	3.5	2.0	690	690	8.3	2.8	1090	1090	13.1	3.4
300	300	3.6	2.0	700	700	8.4	2.9	1100	1100	13.2	3.4
310	310	3.7	2.0	710	710	8.5	2.9	1110	1110	13.3	3.5
320	320	3.8	2.1	720	720	8.6	2.9	1120	1120	13.4	3.5
330	330	4.0	2.1	730	730	8.8	2.9	1130	1130	13.6	3.5
340	340	4.1	2.1	740	740	8.9	2.9	1140	1140	13.7	3.5
350	350	4.2	2.1	750	750	9.0	2.9	1150	1150	13.8	3.5
360	360	4.3	2.1	760	760	9.1	3.0	1160	1160	13.9	3.5
370	370	4.4	2.2	770	770	9.2	3.0	1170	1170	14.0	3.5
380	380	4.6	2.2	780	780	9.4	3.0	1180	1180	14.2	3.6
390	390	4.7	2.2	790	790	9.5	3.0	1190	1190	14.3	3.6
400	400	4.8	2.3	800	800	9.6	3.0	1200	1200	14.4	3.6
410	410	4.9	2.3	810	810	9.7	3.0	1210	1210	14.5	3.6
420	420	5.0	2.3	820	820	9.8	3.0	1220	1220	14.6	3.6
430	430	5.2	2.3	830	830	10.0	3.1	1230	1230	14.8	3.6
440	440	5.3	2.3	840	840	10.1	3.1	1240	1240	14.9	3.6
450	450	5.4	2.4	850	850	10.2	3.1	1250	1250	15.0	3.6
460	460	5.5	2.4	860	860	10.3	3.1				
470	470	5.6	2.4	870	870	10.4	3.1				
480	480	5.8	2.4	880	880	10.6	3.1				
490	490	5.9	2.5	890	890	10.7	3.2				

Appendix 8: Tree Protection Zones – Standard Procedure

1.0 TREE PROTECTION ZONES - STANDARD PROCEDURE

1.1 The Protective fencing where required may delineate the ***TPZ*** and should be located as determined by the project Arborist either in accordance with the specific Council's guidelines or if no guidelines are given by the Council then using AS 4970-2009 Protection of trees on development sites (Australian Standard®, 2009), Section 4, 4.3. *"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 must be secured to restrict access. AS 4687 Temporary fencing and hoardings 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 20mm and be located clear of roots. Existing perimeter fencing and other structures may be suitable as part of the protective fencing."*

Figure 03 Protective fencing shows examples of such fencing.

1.2 AS 4970-2009 Protection of trees on development sites Section 4, Tree protection measures, 4.2 Activities restricted within the TPZ

"Activities generally excluded from the TPZ included but are not limited to-

(a) Machine excavation including trenching;
(b) Excavation for silt fencing
(c) Cultivation;
(d) Storage;
(e) Preparation of chemicals, including preparation of cement products;
(f) Parking of vehicles and plant;
(g) Refuelling;
(h) Dumping of waste;
(i) Wash down and cleaning of equipment;
(j) Placement of fill;
(k) Lighting of fires;
(l) Soil level changes;
(m) Temporary or permanent installation of utilities and signs, and
(n) Physical damage to the tree."

AS 4970-2009

Refer to page 15 "4.3 PROTECTIVE FENCING" & page 16 "FIGURE 3 PROTECTIVE FENCING" in AS 4970-2009 Protection of trees on development sites (Australian Standard®, 2009) **for more information.**

1.3 Tree Protection signage is to be attached to each ***Tree Protection Zone*** and displayed from within the development site in accordance with AS 4970-2009 Protection of trees on development sites (Australian Standard®, 2009), Section 4.4 – see example below.

Example of Tree Protection Zone signage

1.4 Where a tree is to be retained and a ***Tree Protection Zone*** cannot be adequately established due to restricted access e.g. tree located alongside an access way, the trunk and branches in the lower crown will be protected by wrapping 2 layers of hessian or carpet underfelt around the trunk and branches for a minimum of 2 m or as lower branches permit, then wire or rope secures 90x50x2000mm hardwood battens together around the trunk (do not nail or screw to the trunk or branches). The number of battens to be used is as required to encircle the trunk and the planks are to extend to the base of the tree [AS 4970-2009 Protection of trees on development sites (Australian Standard®, 2009)]– see example below.

Example of Trunk Armour

1.5 If a tree is growing downslope from an excavation, a silt fence located along the contours of the site in the area immediately above the ***Tree Protection Zone*** fencing may need to be installed and regularly maintained to prevent burial and asphyxiation of the roots of the tree. To allow for the maintenance of both fences, the silt fence must be constructed separately to the tree protection fence and the 2 fences must be constructed independently of each other and standalone. To reduce competition with the tree the area within the ***Tree Protection Zone*** is to be kept free of weeds. These are best removed by the application of foliar herbicide with Glyphosate as the active constituent. This is the preferred method rather than removal by the cultivation of the soil within the dripline, to minimise root disturbance to the tree. The removal of woody weeds such as Privet should use the cut and paint method of herbicide application. Weeds are to be controlled within the ***Tree Protection Zone***, for the duration of the project.

1.6 The area of the Tree Protection Zone to be mulched to a depth of 50mm with the organic material being 75% leaf litter and 25% wood, and this being composted material. The depth of mulch and type as indicated, to be maintained for the duration of the project. Where deep excavation will expose the soil profile to drying out the root plate is to be protected by pegging jute matting across the ground surface 2 m back from the edge of the profile and 2 m down the face of the profile and is to be in one continuous sheet or layers up to 5mm thick and overlapped 300mm and pegged. Pegs are to be a minimum length of 200mm and spaced at 500mm increments in a grid pattern. Once installed mulch is to be placed on top of the jute matting previously described.

1.7 No services either temporary or permanent are to be located within the ***Tree Protection Zone***. If services are to be located within the ***Tree Protection Zone***, special details will need to be provided by a qualified Consulting Arboriculturist for the protection of the tree regarding the location of the service/s. Works within the TPZ should be hand dug or tunnelled.

1.8 A tree will not be fertilised during its protection within the ***Tree Protection Zone***, as this may hasten its decline if it were to decline. If a tree is to be fertilised this should be in consultation with a qualified Consulting Arboriculturist.

1.9 In the event of prolonged dry periods, or where a tree has been transplanted, or where excavation nearby, especially up slope, leads to drying out of a soil profile, or modification to ground water flow, or flows across an existing ground surface to the tree and its growing environment; deep root watering thoroughly at least twice a week is to be undertaken to irrigate the tree. The need for such watering is determined readily by observing the dryness of the soil surface within the dripline of the tree by scraping back some mulch. Mulch is to be reinstated afterwards. In the event of disrupted ground or surface water flows to the tree due to excavation, filling or construction, a reticulated irrigation system may be required to be installed within the ***Tree Protection Zone***. If an irrigation system is to be installed, consideration must be given to volume, frequency, and drainage of water delivered, and this should be in consultation with a qualified Consulting Arboriculturist.

AS 4970-2009

Refer to page 17 "4.5.2 Trunk and branch protection", "4.5.3 Ground protection" & "FIGURE 4 EXAMPLES OF TRUNK, BRANCH AND GROUND PROTECTION" in AS 4970-2009 Protection of trees on development sites (Australian Standard®, 2009) **for more information.**

Appendix 9: Tree Protection on Construction Sites

1.0 TREE PROTECTION ON CONSTRUCTION SITES

Note: Individual protection measures to be applied where stated as applicable.

1.1.0 General notes
1.2.0 Cautionary notes for the protection of retained trees
1.3.0 Demolition of built structures - precautions to protect trees
1.4.0 Excavation and construction close to Tree Protection Zones

1.1.0 General notes

1.1.1 The application of any measures for the Protection of trees on development sites is determined by the species characteristics of the subject tree, and the existing physical constraints of the growing environment on site both above and below ground.

1.1.2 This report considers where applicable, AS 4970-2009 Protection of trees on development sites (Australian Standard®, 2009).

1.1.3 This report applies the ***Tree Protection Zone - Standard Procedure*** However, this does not restrict the author from applying additional or alternative conditions where it is deemed appropriate by the author for the Protection of trees on development sites. Such additional or alternative conditions may be founded upon professional judgement based on:

- the experience of the Consulting Arboriculturist
- scientific research
- new technology
- industry best practice
- consideration of the individual tree species and its relative tolerance to development impacts
- the individual or cumulative factors present or proposed to impact upon the growing environment essential for the trees' survival.

1.1.4 Where this report makes reference to the retention of subject trees it is for their incorporation into the landscaping works for the site, and they are to be documented on a Landscape Plan for the site.

1.2.0 Cautionary notes for the protection of retained trees

1.2.1 Installing underground services within TPZ

If an underground utility service is to be located within the area of the TPZ, AS 4970-2009 Protection of trees on development sites (Australian Standard®, 2009), Section 4, 4.5.5 Installing underground services within TPZ provides the following:

"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 600mm deep. The project Arborist should assess the likely impacts of boring and bore pits on retained trees.

For manual excavation 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. Refer Clause 4.5.3."

1.2.1.1 **Location of services Option B** (Driveway Construction)

If a service is to be located within the area of the dripline of a protected tree or within the Tree Protection Zone, and site conditions such as shallow bedrock or if mass rooting has occurred from multiple trees growing in close proximity to each other, the service trench is to be elevated and positioned above natural ground level within the new driveway structure. The existing driveway surface is to be scabbled and a reinforced concrete topping is to be provided with downturned thickened edges constructed under the kerb edging to prevent lateral movement. A suitable subgrade material to manufacturers' recommendations is to be utilised if and where appropriate. Construction is to occur in a manner so as not to cause damage to the subject trees root system. All works to be in accordance with engineers' details.

1.2.2 **Precautions in Respect of Temporary Work**

For Precautions in respect of temporary work, AS 4970-2009 Protection of trees on development sites (Australian Standard®, 2009), Section 4, Tree protection measures, 4.5 Other tree protection measures, provides the following:

"4.5.3 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 4. These measures may be applied to root zones beyond the TPZ."

4.5.6 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 minimised. This can be achieved by designing scaffolding to avoid branches or tying back branches. The ground below the scaffolding should be protected by boarding (e.g. scaffolding board or plywood sheeting) as shown in Figure 5. Where access is required, a boardwalk or other surface material should be installed to minimise 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."

"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 a suitable thickness to prevent soil compaction and root damage."

AS 4970-2009

Refer to page 19 "FIGURE 5 INDICATIVE SCAFFOLDING WITHIN A TPZ" in AS 4970-2009 Protection of trees on development sites (Australian Standard®, 2009) **for more information.**

1.3.0 **Demolition of Built Structures - Precautions to Protect Trees**

1.3.1 **Demolition of Existing Buildings**

The demolition of the buildings should be undertaken with access restricted to the driveway and the building platform for each of the existing buildings, or to areas of the land where no trees are growing within 6m of any tree to be retained. Where access or space for a safe working environment is restricted, or where the area of the 6m setback must be compromised, a 100mm layer of Eucalyptus wood mulch must be laid over the area of encroachment. Where vehicular access is required across the mulch layer further root protection should be provided by laying a temporary pathway over the mulch. The temporary pathway should be constructed of a grated steel material capable of supporting the vehicles used during demolition e.g. similar to ramps used to load vehicles onto the backs of trucks. Trunks of trees are to be protected from vehicular damage as per section 1.2.2 above.

1.3.2 **Demolition of Landscape Structures**

The demolition of walls, driveways retaining walls, paths and pools etc. within 6 m of a tree to be retained should be undertaken manually using hand tools. Where a driveway is to be demolished being of concrete strip or slab type construction, it should be undertaken by working from the end of the driveway closest to the building back towards the street by utilising the driveway as a stable platform to prevent soil compaction. Where a concrete slab driveway passes less than 1 m from the base of a tree and the area beneath the driveway is to be undisturbed and incorporated into the landscape works for the site, the volume of space previously occupied by the driveway must be replaced with local top soil from the site or otherwise a loamy sand, to replace the mass of the concrete on the root plate which may be critical to the ballast and centre of mass for the stability of the tree. If the tree becomes unstable immediately contact the Consultant Arboriculturist.

1.3.3 **Removal of Existing Trees near Trees to be Retained**

Removal of a tree within 6 m of a tree to be retained should be undertaken only by cutting down such a tree without damaging the trees to be retained, and by grinding out its stump. Where possible the structural roots of 20mm diameter or greater of the tree to be cut down should not be removed, minimise soil disturbance and reduce the impact on the roots of any tree to be retained nearby. Where structural roots are to be removed this should be undertaken manually by the use of non-motorized hand tools after the stump has been ground out when such roots are often easier to locate from the site of the stump from which they have been severed.

1.4.0 **Excavation and Construction close to Tree Protection Zones**

1.4.0.1 Where structural woody roots with a diameter of 20mm or greater are to be pruned outside the area of the Tree Protection Zone, they are to be excavated manually first by using hand tools to determine their location. A Water knife or Airknife can be used as a mechanised alternative to locate such structural woody roots. Once located those roots to be severed are to be cut cleanly with a final cut to undamaged woody tissue and this will prevent tearing damage to the roots from excavation equipment which can extend beyond the point of excavation back towards the tree.

1.4.0.2 Where a large vigorous tree is to be retained near to a built structure, and dependent upon its taxa, age class and propensity for its roots system to regenerate, it may be prudent to install a root barrier immediately adjacent to the footing of the new building, or to deepen and strengthen the footings themselves to act as a root barrier, but for such structural advice an appropriately qualified chartered structural engineer should be consulted.

1.4.1 **Root Location and Protection where Structures are to be Positioned near a Retained Tree**

1.4.1.1 If walls or a driveway or other structures are to be constructed near a protected tree, careful excavation is to be undertaken manually by using non-motorized hand tools to determine the location of first order and lower order structural roots with a diameter of 20mm (*structural woody roots*) or greater, without damaging them. Boundary walls or fences should use columns or posts within fill panels, or a wall to be constructed with suspended sections 100mm clear above or beside any structural woody root or further as required, or any new wall to be built only to the depth of that existing. Structural woody roots to be further protected by utilising the construction techniques of pier or bridge footings, or screw piles between or over them with a minimum clearance above or beside of 100mm, or further as required to allow for future and on-going growth.

1.4.1.2 Where a driveway or footpath is to pass by the tree a suspended slab is to be constructed or approved similar, to protect the roots that may be encountered at, near, or above ground, and may be constructed on gap graded fill. Where such a driveway or footpath is to be constructed the edge of the structure closest to the tree is to terminate no closer than 0.5 m from the closest edge of trunk, or further depending on the species and its likely further growth to allow for future development and expansion of the trunk, buttresses, and first order and lower order roots as may be advised by a Consultant Arboriculturist. The side of the driveway closest to a tree is to be edged with a concrete kerb of minimum dimensions of 150 x 150mm, to prevent vehicular collision with the trunk. Here a *Water knife* or an *Airknife* can be used as a mechanised alternative to locate first order and lower order structural woody roots.

1.4.1.3 Alternatively a footpath or driveway may be constructed at ground level without any excavation, removing turf by raking, having sprayed with herbicide first if time permits. Here the path or driveway section is to extend for a distance past the tree equivalent to the lateral spread of the crown of that tree alongside the footpath, or driveway.

1.4.1.4 Watering / Gaseous exchange vents are to be installed in the area of the driveway that passes within the dripline of the tree or the prescribed ***Tree Protection Zone*** area and the number and location are to be determined by a Consultant Arboriculturist and the driveway design approved by a Certified Engineer. Exposed edges of the path are to be concealed with the finished level beside the path equivalent to the top of the path by minimal filling with a sandy soil and turf, or mulch, or a garden bed with minimal cultivation, or other landscape treatments as appropriate. (see image below)

1.4.2 **Root Protection where a Driveway close to a Tree is to be Demolished and a New Driveway Constructed in a Similar Location to a Previous Driveway.**

After demolition of an existing driveway as per 1.3.2, the level of the base for the new driveway should be located at the same existing level as that of the base of the previous driveway and should extend for a distance past the tree equivalent to the lateral spread of the crown of that tree alongside the driveway. To prevent excavation from damaging the existing roots which may be located at, near or above the surface of the soil beneath the base of the previous driveway, the new driveway may need to be raised by constructing it on pier or bridge footings between or over them (see 1.4.2 for minimum clearances), or based on a gap graded fill and the driveway constructed with any exposed edges concealed to the top of the driveway by minimal filling with a sandy soil and turf, or mulch, or a garden bed with

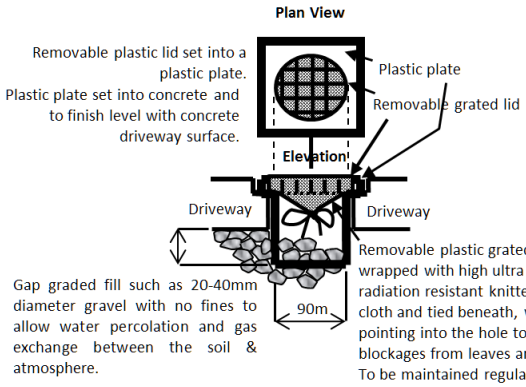
minimal cultivation, or other landscape treatments as appropriate. Where roots have grown to occupy the soil between the concrete strips of a concrete, stone or brick strip driveway, they and the soil may be excavated to the level of the base of the concrete strips, but where such roots have a diameter of 20mm or greater, a Consulting Arboriculturist should be contacted prior to such works being undertaken. Where roots are to be severed, they are to be cut cleanly with a final cut to undamaged woody tissue.

1.4.3 **Root Protection where a Footpath is to be Constructed close to a Tree.**

1.4.3.1 A footpath may be constructed at ground level without any excavation, by first killing with herbicide the plants to be removed from the pathway area, and then removing that plant material by cutting the trunks of woody shrubs to ground level and by raking all other plant material to expose the topsoil surface without organic matter. This will remove the need for physically disturbing the soil and the roots of the tree. The path section is to extend for a distance past each tree equivalent to the lateral spread of the crown of that tree where it extends alongside the footpath.

1.4.3.2 To prevent excavation from damaging the existing roots which may be located at, near, or above the surface of the soil, a gap graded fill as a fill material of a media as appropriate, to a depth of 100mm above the soil surface, or above the top of the root of any tree to be retained, or above the soil surface may be utilised as a base treatment to construct the footpath. Any exposed edges to be concealed to the top of the edges of the footpath and tapering back to the base of the trunk of each tree by minimal filling at each trunk of no greater than 100mm with a sandy soil and turf, or mulch, or a garden bed with minimal cultivation with ground covers, or other landscape treatments as appropriate. A Consultant Arboriculturist should be contacted prior to such works being undertaken or if any structural roots are considered appropriate to be severed being those roots of 20mm diameter or greater.

Irrigation / Gaseous Exchange Vent



NOTE: Such vents can be installed in a grid pattern at 1 per 1 m^2 and their planning and construction utilised in consultation with an appropriate structural or civil engineer.

1.4.4 **Structural Soil to Accommodate Load Bearing Conditions**

A structural soil should only be considered as a new media into which the trees could be planted if the planting was into a new area where the area surrounding was to be load bearing such as a footpath, driveway or road.

1.4.5 **Gap Graded Fill to Accommodate Compacted Sub Grade and Root Growth**

To further protect woody roots with a diameter of 20mm or greater, a gap graded fill with no fines such as gravel 40mm diameter should only be considered as a fill media above existing grade when soil levels are to be increased near existing trees and the roots can utilise the new media to develop on-going and future root growth and provide for gaseous exchange between the soil and the atmosphere.

Appendix 10: SULE

SULE (an acronym for **Safe** & **Useful Life Expectancy**). There are a number of SULE categories that indicate the safe useful life anticipated for each tree. Factors such as the location, age, condition and health of the tree are significant to determining this rating. Other influences such as the tree's effect on better specimens and the economics of managing the tree successfully in its location are also relevant to SULE (Barrell, 1993 - 2009).

SULE Categories and Subgroups

1 = Long SULE OF > 40 years

A	**B**	**C**
Structurally sound trees located within positions that can accommodate future growth.	Storm damaged or defective trees that could be made suitable for retention in the long term by remedial tree surgery.	Trees of special significance for historical, commemorative or rarity reasons that would warrant extraordinary efforts to secure their long-term retention.

2 = Medium SULE of 15-40 years

A	**B**	**C**	**D**
Trees that may only live between 15 and 40 more years.	Trees that may live for more than 40 years but would be removed to allow the safe development of more suitable individuals.	Trees that may live for more than 40 years but would be removed during the course of normal management for safety or nuisance reasons.	Storm damaged or defective trees that can be made suitable for retention in the medium term by remedial work.

3 = Short SULE of 1-15 years

A	**B**	**C**	**D**
Trees that may only live between 1 and 15 more years.	Trees that may live for more than 15 years but would be removed to allow the safe development of more suitable individuals.	Trees that may live for more than 15 years but would be removed during the course of normal management for safety or nuisance reasons.	Storm damaged or defective trees that require substantial remedial work to make safe, and are only suitable for retention in the short term.

(4) Dead

A	**B**	**C**	**D**	**E**	**F**
Dead trees.	Dying or suppressed and declining trees through disease or inhospitable conditions.	Dangerous trees through instability or recent loss of adjacent trees.	Dangerous trees through structural defects including cavities, decay, included bark, wounds or poor form.	Damaged trees that are considered unsafe to retain.	Trees that will become dangerous after removal of other trees for the reasons given in (a) to (e).

The SULE rating given to any tree in this report assumes that reasonable maintenance will be provided by a qualified Arboriculturist (AQF3) using the correct and acknowledged techniques. Retained trees are to be protected from root damage. Incorrect tree work practices can significantly accelerate tree decline and increase hazard potential.

Appendix 11: Glossary

All Glossary items adapted from Dictionary for Managing Trees in Urban Environments, Institute of Australian Consulting Arboriculturists (IACA) 2009. (Draper, et al., 2009), unless otherwise cited.

AGE OF TREES

Most trees have a stable biomass for the major proportion of their life. The estimation of the age of a tree is based on the knowledge of the expected lifespan of the taxa in situ divided into three distinct stages of measurable biomass, when the exact age of the tree from its date of cultivation or planting is unknown and can be categorized as Young, Mature and Over-mature (British Standard®, 1991) p.13 & (Harris, et al., 2004) p.262.

Young Tree aged less than <20% of life expectancy, in situ.

Mature Tree aged 20-80% of life expectancy, in situ.

Over-mature Tree aged greater than >80% of life expectancy, in situ, or senescent with or without reduced vigour, and declining gradually or rapidly but irreversibly to death.

CONDITION OF TREES

A tree's *crown form* and growth habit, as modified by its *environment* (aspect, suppression by other trees, soils), the *stability* and *viability* of the *root plate*, trunk and structural branches (first [1st] and possibly second [2nd] order branches), including structural defects such as wounds, cavities or hollows, *crooked* trunk or weak trunk/branch junctions and the effects of predation by pests and diseases. These may not be directly connected with *vigour* and it is possible for a tree to be of *normal vigour* but in *poor condition*. The condition can be categorised as *Good Condition*, *Fair Condition*, *Poor Condition* and *Dead*.

Good Condition Tree is of good habit, with crown form not severely restricted for space and light, physically free from the adverse effects of predation by pests and diseases, obvious instability or structural weaknesses, fungal, bacterial or insect infestation and is expected to continue to live in much the same condition as at the time of inspection provided conditions around it for its basic survival do not alter greatly. This may be independent of or contributed to by vigour.

Fair Condition Tree is of good habit or misshapen, a form not severely restricted for space and light, has some physical indication of decline due to the early effects of predation by pests and diseases, fungal, bacterial, or insect infestation, or has suffered physical injury to itself that may be contributing to instability or structural weaknesses, or is faltering due to the modification of the environment essential for its basic survival. Such a tree may recover with remedial works where appropriate, or without intervention may stabilise or improve over time, or in response to the implementation of beneficial changes to its local environment. This may be independent of or contributed to by vigour.

Poor Condition Tree is of good habit or misshapen, a form that may be severely restricted for space and light, exhibits symptoms of advanced and irreversible decline such as fungal, or bacterial infestation, major die-back in the branch and foliage crown, structural deterioration from insect damage e.g. termite infestation, or storm damage or lightning strike, ring barking from borer activity in the trunk, root damage or instability of the tree, or damage from physical wounding impacts or abrasion, or from altered local environmental conditions and has been unable to adapt to such changes and may decline further to death regardless of remedial works or other modifications to the local environment that would normally be sufficient to provide for its basic survival if in good to fair condition. Deterioration physically, often characterised by a gradual and continuous reduction in vigour but may be independent of a change in vigour, but characterised by a proportionate increase in susceptibility to, and predation by pests and diseases against which the tree cannot be sustained. Such conditions may also be evident in trees of advanced senescence due to normal phenological processes, without modifications to the growing environment or physical damage having been inflicted upon the tree. This may be independent of or contributed to by vigour.

Senescent / Moribund The advanced state of decline, dying or nearly dead.

Dead Tree is no longer capable of performing any of the following processes or is exhibiting any of the following symptoms;

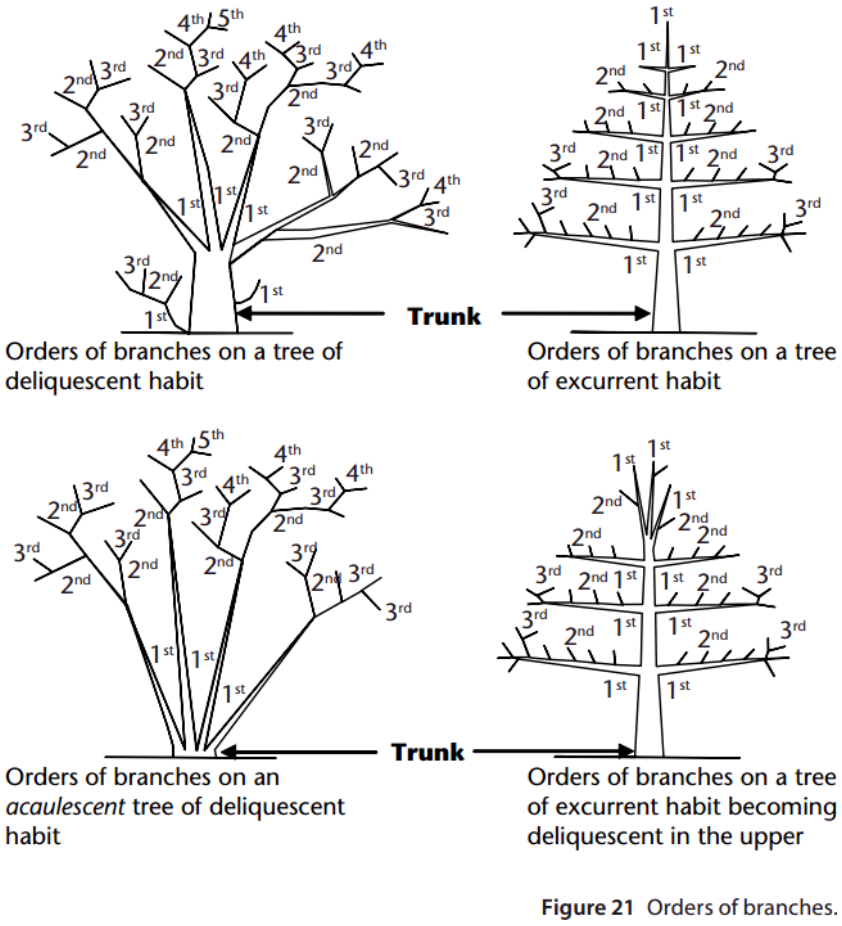
Processes Photosynthesis via its foliage crown (as indicated by the presence of moist, green or other coloured leaves); Osmosis (the ability of the root system to take up water); Turgidity (the ability of the plant to sustain moisture pressure in its cells); Epicormic shoots or epicormic strands in Eucalypts (the production of new shoots as a response to stress, generated from latent or adventitious buds or from a lignotuber);

Symptoms Permanent leaf loss; Permanent wilting (the loss of turgidity which is marked by desiccation of stems leaves and roots); Abscission of the epidermis (bark desiccates and peels off to the beginning of the sapwood).

Removed No longer present, or tree not able to be located or having been cut down and retained on a site or having been taken away from a site prior to site inspection.

BRANCH

An elongated woody structure arising initially from the trunk to support leaves, flowers, fruit and the development of other branches. A branch may itself fork and continue to divide many times as successive orders of branches with the length and taper decreasing incrementally to the outer extremity of the crown. These may develop initially as a gradually tapering continuation of the trunk with minimal division as in a young tree or a tree of excurrent habit, or in a sapling, or may arise where the trunk terminates at or some distance from the root crown, dividing into first order branches to form and support the foliage crown. In an acaulescent tree, branches arise at or near the root crown. Similarly, branches may arise from a sprout mass from damaged roots, branches or trunk.



Orders of branches on a tree of deliquescent habit

Orders of branches on a tree of excurrent habit

Orders of branches on an *acaulescent* tree of deliquescent habit

Orders of branches on a tree of excurrent habit becoming deliquescent in the upper

Figure 21 Orders of branches.

Orders of Branches The marked divisions between successively smaller branches (James, 2003)p. 168, commencing at the initial division where the trunk terminates on a deliquescent tree or from lateral branches on an excurrent tree. Successive branching is generally characterised by a gradual reduction in branch diameters at each division, and each gradation from the trunk can be categorised numerically, e.g. first order, second order, third order etc. (See Figure 21.)

Branch tear out Dislodging of a branch from its point of attachment where it is torn away from the branch collar snapping the branch tail causing a laceration, usually to the underside of the branch union of the branch or trunk to which it was attached forming a tear out wound.

Sudden branch drop The failure and collapse of live, usually horizontal branches, seemingly without any noticeable cause in calm hot, dry weather conditions generally after rain. Theorised to be caused by altered moisture content in the branch disturbing the longitudinal pre-stressing of the wood that normally helps support the load as formed by reaction wood in branches tending to horizontal (Lonsdale, 1999)p. 30, or incipient failure from the lengthening of existing internal cracks as the wood cools (Shigo, 1986) p. 248, or influenced by branch creep under its own weight and by wind (Mattheck, et al., 1994) p. 126, or fractures to vascular rays if pulled at right angles to their longitudinal orientation forming from subsidence cracks (Mattheck, et al., 1994) p. 169, or a combination of these factors. Such branch breakages usually occur at some distance from the branch collar leaving a stub. See also *Branch tear out*.

Canopy

1. Of multiple trees, the convergence, or merging in full or part, of the crowns of two or more trees due to their proximity, or where competition for light and space available in a forest environment is limited as each tree develops forming a continuous layer of foliage.
2. Used as a plural for the crown.
3. Sometimes synonymously used for the crown (USA).

Crown Of an individual tree all the parts arising above the trunk where it terminates by its division forming branches, e.g. the branches leaves, flowers and fruit; or the t amount of foliage supported by t branches. The crown of any tre can be divided vertically into three sections and can be categorised as lower crown, mid crown and upper crown (Figure 8). For a leaning tree these can be divided evenly into crown sections of one-third from the base to apex. The volume of a crown can be categorised as the inner crown, outer crown and outer extremity of the crown.

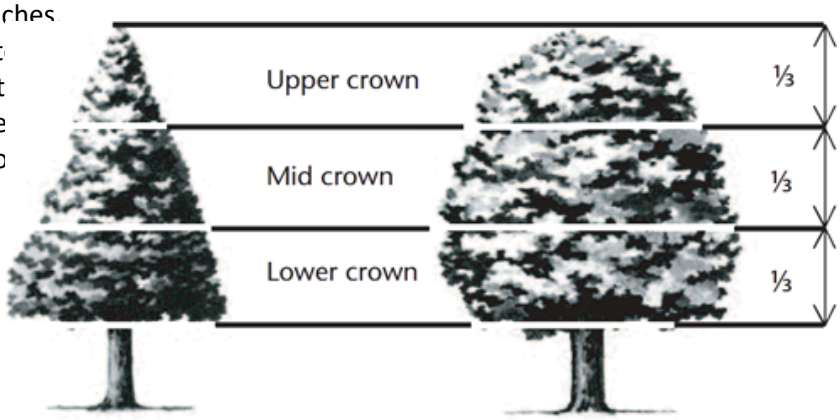


Figure 8 Crown sections.

Lower Crown The proximal or lowest section of a crown when divided vertically into one-third (⅓) increments.

Mid Crown The middle section of a crown when divided vertically into one-third (⅓) increments.

Upper Crown The distal or highest section of a crown when divided vertically into one-third (½) increments.

Crown Projection (CP) Area within the dripline or beneath the lateral extent of the crown (Geiger, 2004) p.2.

Dripline A line formed around the edge of a tree by the lateral extent of the crown. Such a line may be evident on the ground with some trees when exposed soil is displaced by rain shed from the crown.

CROWN FORM OF TREES

The shape of the crown of a tree as influenced by the availability or restriction of space and light, or other contributing factors within its growing environment. Crown Form may be determined for tree shape and habit generally as Dominant, Codominant, Intermediate, Emergent, Forest and Suppressed. The habit and shape of a crown may also be considered qualitatively and can be categorised as Good Form or Poor Form.

Good Form Tree of typical crown shape and habit with proportions representative of the taxa considering constraints such as origin e.g. indigenous or exotic but does not appear to have been adversely influenced in its development by environmental factors in situ such as soil water availability, prevailing wind, or cultural practices such as lopping and competition for space and light.

Poor Form Tree of atypical crown shape and habit with proportions not representative of the species considering constraints and appears to have been adversely influenced in its development by environmental factors in situ such as soil water availability, prevailing wind, cultural practices such as lopping and competition for space and light; causing it to be misshapen or disfigured by disease or vandalism.

Crown Form Codominant Crowns of trees restricted for space and light on one or more sides and receiving light primarily from above e.g. constrained by another tree/s or a building.

Crown Form Dominant Crowns of trees generally not restricted for space and light receiving light from above and all sides.

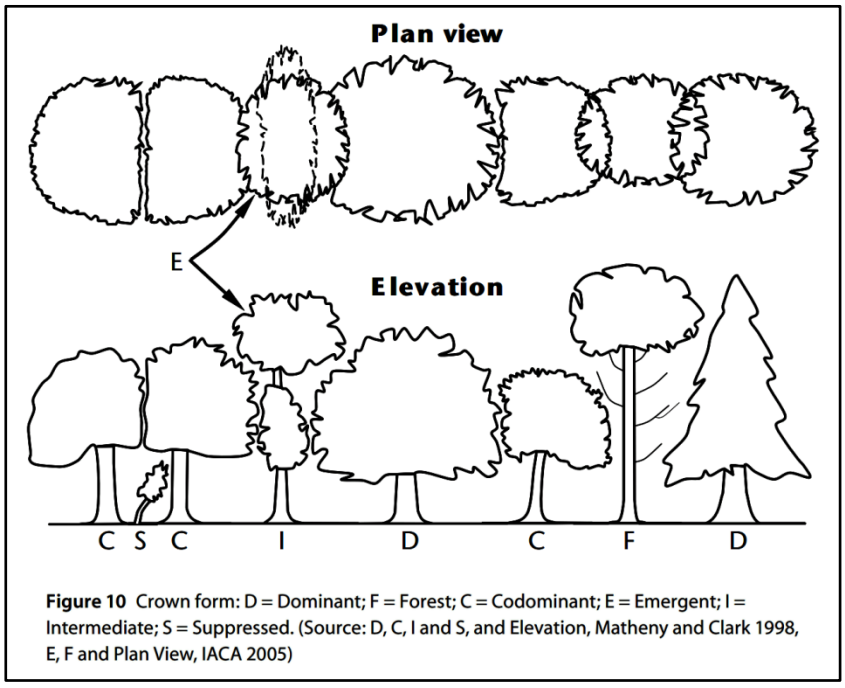


Figure 10 Crown form: D = Dominant; F = Forest; C = Codominant; E = Emergent; I = Intermediate; S = Suppressed. (Source: D, C, I and S, and Elevation, Matheny and Clark 1998, E, F and Plan View, IACA 2005)

Crown Form Emergent Crowns of trees restricted for space on most sides receiving most light from above until the upper crown grows to protrude above the canopy in a stand or forest environment. Such trees may be crown form dominant or transitional from crown form intermediate to crown form forest asserting both apical dominance and axillary dominance once free of constraints for space and light.

Crown Form Forest Crowns of trees restricted for space and light except from above forming tall trees with narrow spreading crowns with foliage restricted generally to the top of the tree. The trunk is usually erect, straight and continuous, tapering gradually, crown often excurrent, with first order branches becoming structural, supporting the live crown concentrated towards the top of the tree, and below this point other first order branches arising radially with each inferior and usually temporary, divergent and ranging from horizontal to ascending, often with internodes exaggerated due to competition for space and light in the lower crown.

Crown Form Intermediate Crowns of trees restricted for space on most sides with light primarily from above and on some sides only.

Crown Form Suppressed Crowns of trees generally not restricted for space but restricted for light by being overtopped by other trees and occupying an understorey position in the canopy and growing slowly.

DEADWOOD

Dead branches within a tree's crown and considered quantitatively as separate to crown cover and can be categorised as Small Deadwood and Large Deadwood according to diameter, length and subsequent risk potential. The amount of dead branches on a tree can be categorised as Low Volume Deadwood, Medium Volume Deadwood and High Volume Deadwood. See also Dieback.

Deadwooding Removing of dead branches by pruning. Such pruning may assist in the prevention of the spread of decay from dieback or for reasons of safety near an identifiable target.

Small Deadwood - dw A dead branch up to 10mm diameter and usually <2 metres long, generally considered of low-risk potential.

Large Deadwood - DW A dead branch >10mm diameter and usually >2 metres long, generally considered of high-risk potential.

DIEBACK

The death of some areas of the crown. Symptoms are leaf drop, bare twigs, dead branches and tree death, respectively. This can be caused by root damage, root disease, bacterial or fungal canker, severe bark damage, intensive grazing by insects, abrupt changes in growth conditions, drought, water-logging or over-maturity. Dieback often implies reduced resistance, stress or decline which may be temporary. Dieback can be categorised as Low Volume Dieback, Medium Volume Dieback and
High Volume Dieback.

High Volume Dieback Where >50% of the crown cover has died.

Medium Volume Dieback Where 10-50% of the crown cover has died.

Low Volume Dieback Where <10% of the crown cover has died. See also Dieback, High Volume Dieback and Medium Volume Dieback.

EPICORMIC SHOOTS

Juvenile shoots produced at branches or trunk from epicormic strands in some Eucalypts (Burrows, 2002) pp. 111-131, or sprouts produced from dormant or latent buds concealed beneath the bark in some trees. Production can be triggered by fire, pruning, wounding, or root damage but may also be as a result of stress or decline. Epicormic shoots can be categorised as Low Volume Epicormic Shoots, Medium Volume Epicormic Shoots and High Volume Epicormic Shoots.

High Volume Epicormic Shoots Where >50% of the crown cover is comprised of live epicormic shoots.

Medium Volume Epicormic Shoots Where 10-50% of the crown cover is comprised of live epicormic shoots.

Low Volume Epicormic Shoots Where <10% of the crown cover is comprised of live epicormic shoots.

GENERAL TERMS

Cavity A usually shallow void often localised initiated by a wound and subsequent decay within the trunk, branches or roots, or beneath bark, and may be enclosed or have one or more opening.

Decay The process of degradation of wood by microorganisms (Australian Standard®, 2007) p. 6, and fungus.

Hazard The threat of danger to people or property from a tree or tree part resulting from changes in the physical condition, growing environment, or existing physical attributes of the tree, e.g. included bark, soil erosion, or thorns or poisonous parts, respectively.

Included Bark The bark on the inner side of the branch union or is within a concave crotch that is unable to be lost from the tree and accumulates or is trapped by acutely divergent branches forming a compression fork. The growth of bark at the interface of two or more branches on the inner side of a branch union or in the crotch where each branch forms a branch collar and the collars roll past one another without forming a graft where no one collar is able to subsume the other. The risk of failure is worsened in some taxa where branching is acutely divergent or acutely convergent and ascending or erect.

Hollow A large void initiated by a wound forming a cavity in the trunk, branches or roots and usually increased over time by decay or other contributing factors, e.g. fire, or fauna such as birds or insects e.g. ants or termites. A hollow can be categorised as an Ascending Hollow or a Descending Hollow.

Kino The extractive polyphenols (tannins) formed in veins in the cambial zone as a defence in response to wounding in eucalypts. Often visible as an exudate when the kino veins rupture or are injured (Boland, et al., 2006) p. 691.

Occupancy Rating The frequency of use of a likely target and possibility that people will be present when tree failure or collapse occurs.

Risk The random or potentially foreseeable possibility of an episode causing harm or damage.

Significant Important, weighty or more than ordinary.

Significant Tree A tree considered important, weighty or more than ordinary. Example: due to prominence of location, or in situ, or contribution as a component of the overall landscape for amenity or aesthetic qualities, or curtilage to structures, or importance due to uniqueness of taxa for species, subspecies, variety, crown form, or as an historical or cultural planting, or for age, or substantial dimensions, or habit, or as remnant vegetation, or habitat potential, or a rare or threatened species, or uncommon in cultivation, or of aboriginal cultural importance, or is a commemorative planting.

Structural Root Zone (SRZ) The minimum radial distance around the base of a tree and its root plate required for its stability in the ground against windthrow and applied only to trees with a circular root plate (Mattheck, et al., 1994) pp. 77-87.

Stag-headed Protruding dead branches above the live foliage of the crown as a result of dieback.

Substantial A tree with large dimensions or proportions in relation to its place in the landscape.

Sustainable Retention Index Value (SRIV) A visual tree assessment method to determine a qualitative and numerical rating for the viability of urban trees for development sites and management purposes, based on general tree and landscape assessment criteria using classes of age, condition and vigour. SRIV is for the professional manager of urban trees to consider the tree in situ with an assumed knowledge of the taxon and its growing environment. It is based on the physical attributes of the tree and its response to its environment considering its position in a matrix for age class, vigour class,

condition class and its sustainable retention with regard to the safety of people or damage to property. This also factors the ability to retain the tree with remedial work or beneficial modifications to its growing environment or removal and replacement. SRIV is supplementary to the decision made by a tree management professional as to whether a tree is retained or removed (IACA).

Target People or property likely to be harmed or damaged, respectively, by being struck by a failed or collapsed tree in full or part.

Tree Protection Zone (TPZ) A combination of the root protection zone (RPZ) and crown protection zone (CPZ) as an area around a tree set aside for the protection of a tree and a sufficient proportion of its growing environment above and below ground established prior to demolition or construction and maintained until the completion of works to allow for its viable retention including stability.

Visual Tree Assessment (VTA) A visual inspection of a tree from the ground based on the principle that, when a tree exhibits apparently superfluous material in its shape, this represents repair structures to rectify defects or to reinforce weak areas in accordance with the Axiom of Uniform Stress (Mattheck, et al., 1994) pp. 12-13, 145). Such assessments should only be undertaken by suitably competent practitioners.

LEANING TREES

A tree where the trunk grows or moves away from upright. A lean may occur anywhere along the trunk influenced by a number of contributing factors e.g. genetically predetermined characteristics, competition for space or light, prevailing winds, aspect, slope, or other factors. A leaning tree may maintain a static lean or display an increasingly progressive lean over time and may be hazardous and prone to failure and collapse. The degrees of leaning can be categorised as Slightly Leaning, Moderately Leaning, Severely Leaning and Critically Leaning.

Slightly Leaning A leaning tree where the trunk is growing at an angle within 0°-15° from upright. - Low Risk.

Moderately Leaning A leaning tree where the trunk is growing at an angle within 15°-30° from upright. - Medium Risk.

Severely Leaning A leaning tree where the trunk is growing at an angle within 30°-45° from upright. - High Risk.

Critically Leaning A leaning tree where the trunk is growing at an angle greater than >45° from upright. - Very High Risk.

Progressively Leaning A tree where the degree of leaning appears to be increasing over time. - Lodging.

Static Leaning A leaning tree whose lean appears to have stabilised over time.

SYMMETRY

Balance within a crown, or root plate, above or below the axis of the trunk of branch and foliage, and root distribution respectively and can be categorised as Asymmetrical and Symmetrical.

Asymmetrical Imbalance within a crown, where there is an uneven distribution of branches and the foliage crown or root plate around the vertical axis of the trunk. This may be due to Crown Form Codominant or Crown Form Suppressed as a result of natural restrictions e.g. from buildings, or from competition for space and light with other trees, or from exposure to the wind, or artificially caused by pruning for clearance of roads, buildings or power lines. An example of an expression of this may be, crown asymmetrical, bias to the west.

Symmetrical Balance within a crown, where there is an even distribution of branches and the foliage crown around the vertical axis of the trunk. This usually applies to trees of Crown Form Dominant or Crown Form Forest. An example of an expression of this may be crown symmetrical.

ROOTS

First Order Roots (FOR) Initial woody roots arising from the root crown at the base of the trunk, or as an adventitious root mass for structural support and stability. Woody roots may be buttressed and divided as a marked gradation, gradually tapering and continuous or tapering rapidly at a short distance from the root crown. Depending on soil type these roots may descend initially and not be evident at the root crown or become buried by changes in soil levels. Trees may develop 4-11 (Perry, 1982) pp. 197- 221, or more first order roots which may radiate from the trunk with a relatively even distribution, or be prominent on a particular aspect, dependent upon physical characteristics e.g. leaning trunk, asymmetrical crown; and constraints within the growing environment from topography e.g. slope, soil depth, rocky outcrops, exposure to predominant wind, soil moisture, depth of water table etc.

Orders of Roots The marked divisions between woody roots, commencing at the initial division from the base of the trunk, at the root crown where successive branching is generally characterised by a gradual reduction in root diameters and each gradation from the trunk and can be categorized numerically, e.g. first order roots, second order roots, third order roots etc. Roots may not always be evident at the root crown and this may be dependent on species, age class and the growing environment. Palms at maturity may form an adventitious root mass.

Root Plate The entire root system of a tree generally occupying the top 300-600mm of soil including roots at or above ground and may extend laterally for distances exceeding twice the height of the tree (Perry, 1982) pp. 197-221. Development and extent is dependent on water availability, soil type, soil depth and the physical characteristics of the surrounding landscape.

Root Crown Roots arising at the base of a trunk.

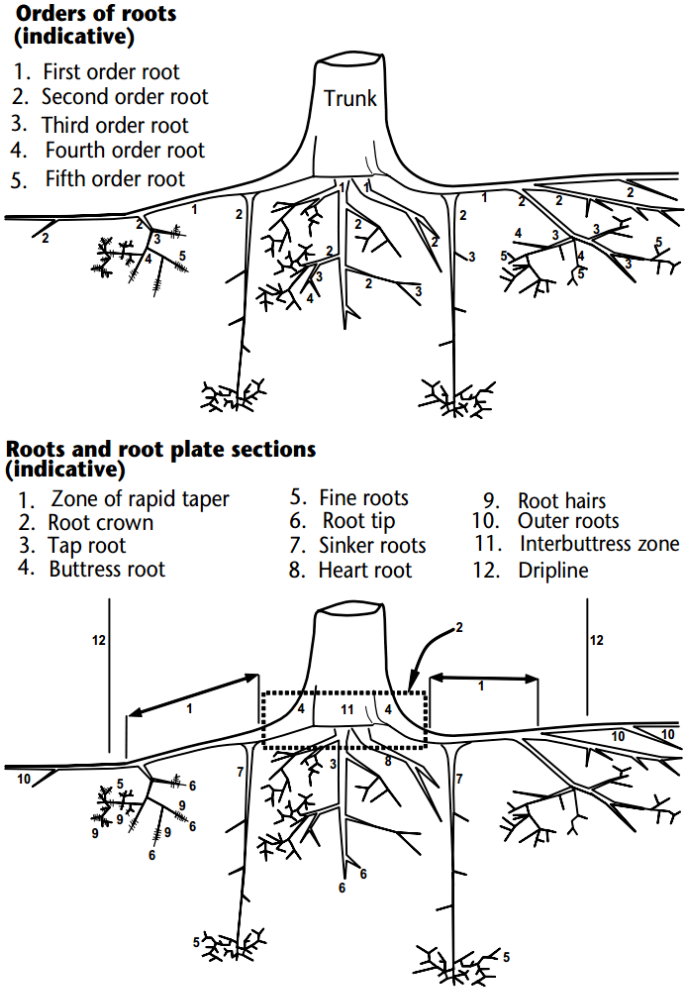


Figure 22 Orders of roots.

Zone of Rapid Taper The area in the root plate where the diameter of structural roots reduces substantially over a short distance from the trunk. Considered to be the minimum radial distance to provide structural support and root plate stability. See also Structural Root Zone (SRZ).

Structural Roots Roots supporting the infrastructure of the root plate providing strength and stability to the tree. Such roots may taper rapidly at short distances from the root crown or become large and woody as with gymnosperms and dicotyledonous angiosperms and are usually 1st and 2nd order roots form an adventitious root mass in monocotyledonous angiosperms (palms). Such roots may be crossed and grafted and are usually contained within the area of crown projection or extend just beyond the dripline.

TRUNK

A single stem extending from the root crown to support or elevate the crown, terminating where it divides into separate stems forming first order branches. A trunk may be evident at or near the ground or be absent in acaulescent trees of deliquescent habit or may be continuous in trees of excurrent habit. The trunk of any caulescent tree can be divided vertically into three (3) sections and can be categorised as Lower Trunk, Mid Trunk and Upper Trunk. For a leaning tree, these may be divided evenly into sections of one-third along the trunk (Figure 28).

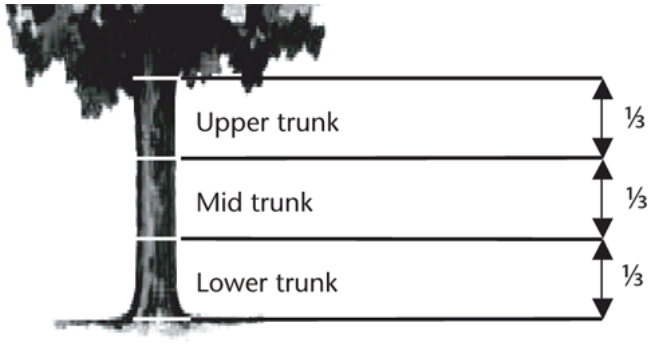


Figure 28 Trunk sections.

Co-Dominant Equal in size and relative importance, usually associated with either trunk/stems or scaffold limbs/branches in the crown; in the context of crown class, trees whose crowns form the bulk of the upper layer of the canopy but which are crowded by adjacent trees (Matheny, et al., 1994).

Diameter at Breast Height (DBH) Measurement of trunk width calculated at a given distance above ground from the base of the tree often measured at 1.4 m. The trunk of a tree is usually not a circle when viewed in cross section, due to the presence of reaction wood or adaptive wood, therefore an average diameter is determined with a diameter tape or by recording the trunk along its narrowest and widest axis, adding the two dimensions together and dividing them by 2 to record an average and allowing the orientation of the longest axis of the trunk to also be recorded. Where a tree is growing on a lean the distance along the top of the trunk is measured to 1.4m and the diameter then recorded from that point perpendicular to the edge of the trunk. Where a leaning trunk is crooked a vertical distance of 1.4m is measured from the ground. Where a tree branches from a trunk that is less than 1.4m above ground, the trunk diameter is recorded perpendicular to the length of the trunk from the point immediately below the base of the flange of the branch collar extending the furthest down the trunk, and the distance of this point above ground recorded as trunk length. Where a tree is located on sloping ground the DBH should be measured at half way along the side of the tree to average out the angle of slope. Where a tree is acaulescent or trunkless branching at or near ground an average diameter is determined by recording the radial extent of the trunk at or near the ground and noting where the measurement was recorded e.g. at ground.

Dominant One of four types of crown class; tree whose crown extends above the height of nearby trees in the stand, receiving light from above and he side

Leader The top most portion of the tree trunk (stem) that is able to grow more than the laterals below. (Harris, et al., 2004)

VIGOUR

The ability of a tree to sustain its life processes. This is independent of the condition of a tree but may impact upon it. Vigour can appear to alter rapidly with change of seasons (seasonality) e.g. dormant, deciduous or semi-deciduous trees. Vigour can be categorised as Normal Vigour, High Vigour, Low Vigour and Dormant Tree Vigour.

Normal Vigour The ability of a tree to maintain and sustain its life processes. This may be evident by the typical growth of leaves, crown cover and crown density, branches, roots and trunk and resistance to predation. This is independent of the condition of a tree but may impact upon it, and especially the ability of a tree to sustain itself against predation.

High Vigour Accelerated growth of a tree due to incidental or deliberate artificial changes to its growing environment that are seemingly beneficial, but may result in premature aging or failure if the favourable conditions cease, or promote prolonged senescence if the favourable conditions remain, eg water from a leaking pipe; water and nutrients from a leaking or disrupted sewer pipe; nutrients from animal waste, a tree growing next to a chicken coop, or a stock feedlot, or a regularly used stockyard; a tree subject to a stringent watering and fertilising program; or some trees may achieve an extended lifespan from continuous pollarding practices over the life of the tree.

Low Vigour Reduced ability of a tree to sustain its life processes. This may be evident by the atypical growth of leaves, reduced crown cover and reduced crown density, branches, roots and trunk, and a deterioration of their functions with reduced resistance to predation. This is independent of the condition of a tree but may impact upon it, and especially the ability of a tree to sustain itself against predation.

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DISCLAIMER

The author and Advanced Treescape Consulting take no responsibility for actions taken and their consequence if contrary to those expert and professional instructions are given as recommendations pertaining to safety. The conclusions and recommendations contained in this report refer to the tree(s) condition on the inspection day. All care has been taken using the most up-to-date Arboricultural information in the preparation of this report. The report is based on a visual inspection only. Tree health and environmental conditions can change irreversibly at any time due to unforeseen circumstances or events. Due to *Myrtaceae* family hybridisation, some tree species are difficult to accurately identify. Unless trees are in full flower identification is only probable.

Appendix 12: Curriculum Vitae

U W S (Hawkesbury)	Graduate Diploma in Horticulture (AQF8) Diploma in Horticulture (AQF5)
Hortus Australia	Diploma of Arboriculture (AQF5) (RTF50203-6522-6/12/2005)
Ryde School of Horticulture	Tree Surgery Arboriculture Techniques
Central Coast Community College	Excel Module 1 and 2 Excel – Advanced
Workcover	OHS General Induction for Construction Work in NSW (CGI00871464SEQ1) St Johns Ambulance First Aid Certificate

CONFERENCE ATTENDANCE & TRAINING

2016	IACA Root Mapping Seminar - Ryde TAFE IACA Report Writing Seminar - Ryde TAFE IML Resistograph® Users Course - Belmont TAFE
2015	Quantified Tree Risk Assessment System - Estimating Probability of Failure Aboriginal Scar Trees: Significance Conservation and Management of Veteran Eucalypts in the Landscape - Griffith University
2012	Australian Institute of Horticulture Inc. - 'Don Burke Field Day' Professional Development Workshop
2011	Institute of Australian Consulting Arboriculturists (IACA) AS 4970 Forum Ecological Consultants Association of NSW - Impacts of Invasive Species
2010	Root Barrier Field Day
2009	Matheny & Clark: Arboriculture
2008	Quantified Tree Risk Assessment System - Principals and Application
2007	Quantified Tree Risk Assessment System - Principals and Application Quantified Tree Risk Assessment System - A Practitioners Guide to Visual Tree Assessment
2006	Barrell Tree A-Z 2 Day Workshop IML Resistograph® F500S Training Course
2005	Urban Tree Forum – Sydney City Council Urban Tree Risk Management – Treelogic DA Workshop Preparing Development Applications for Local Council –AIH Urban Forest – The New Imperative – Parks and Leisure Australia
2004	Visual Tree Assessment Workshop – Professor Doctor Claus Mattheck
2003	Urban Trees - Our Urban Urgency – Parks and Leisure Australia
1999	Tree Hazard Assessment – Parramatta Park – NAAA
1990	Aero Advanced Climbers Seminar NSW

INDUSTRY BACKGROUND

20th June 2001 to present	*Proprietor* **Advanced Treescape Consulting** (formerly known as RJK Consulting)
2002 - 2005	*Part Time Horticulturist* **Acorn/Bushlands Nursery/Aquarium Centre, Erina Heights**
1997 to present	*Consultant* **Horticulturist**
1997 to present	*Public Speaker* **Horticulturist/Arboriculturist Topics**
1997 - 2001	*Part Time Horticulturist* **Flower Power, Glenhaven**
1991 - 1995	*Proprietor* **KAC Peninsula Firewood** Assembled team to clear backlog of firewood
1990 - 1996	*Proprietor/Climber* **Kingdom's Arbor Care** (until its sale)
1986 - 1990	*Tree Worker* **Arbor 2000 Pro-Climb, Sydney**
1972 to present	*Bonsai enthusiast*

BUSINESS ACHIEVEMENT

Finalist in Central Coast Advocate Community Business Awards 2005 for Specialised Business category.

MEMBERSHIPS

- Institute of Australian Consulting Arboriculturists
- Australian Institute of Horticulture
- Arboriculture Australia
- Gosford City Council Tree Protection Committee - Committee Member - August 1998 to June 2004.

[i] Australian Qualification Framework - https://www.aqf.edu.au