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28 January 2020

Arboricultural Impact Assessment

Tree Protection Plan and Specification

DA2019/1287

Concrete Driveway + Crossover and Vehicle Hardstand

Lot 1 in DP 566102

2 Cooleena Road

ELANORA HEIGHTS NSW 2101



Figure 1 The site, 2 Cooleena Road, corner of Powder Works Road Elanora Heights

Prepared for;

Tabian White

C/- Lyle Marshall & Partners Pty Ltd

Suite 31, 401 Pacific Highway

ARTARMON NSW 2064

Prepared by;

Cheryl MacKay

Level 5 Consulting Arboriculturist

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1. Introduction/Background

Mr. Tabian White is proposing alterations and additions to his existing dwelling including construction of a New Garage and Driveway and Conversion of the Existing Garage into a Detached Secondary Dwelling at 2 Cooleena Road Elanora Heights.

The proposed internal concrete driveway with associated walling and crossover from Cooleena Road will impact on one (1) street tree and several site trees.

Northern Beaches Council requires additional information as part of the development application regarding the impact of the proposal on retainable trees.

Tabian White has commissioned MacKay Tree Management to assess all trees that will be impacted by the driveway proposal.

Assessment finds that three (3) trees have environmental heritage significance and are to be retained and protected. Another three (3) tree have moderate environmental significance, one of which is located within the driveway footprint. The six (6) trees are the subject trees of this report.

The purpose of this report is to undertake a Visual Tree Assessment¹ (VTA), determine the trees' retention values, determine the impact of the proposed driveway works on the trees, and where appropriate, recommend the use of tree sensitive construction methods to minimise adverse impacts.

The report does not address the proposed alterations and additions to other areas of the site.

This report and any works recommended herein are to form part of the Development Application to Northern Beaches Council.

2. Assessment Methods

A visual tree assessment (VTA) was carried out from the ground by a Level 5 Consulting Arborist on 21 January 2020.

Tree height and age was estimated and Diameter at Breast Height (D.B.H.) was measured 1.4 metres (m.) above ground.

Tree Protection Zones and Protection Methods are referenced from Standard® AS 4970 - 2009 Protection of Trees on Development Sites.²

Syagrus romanzoffianum (Cocos Palms) are established throughout the site. The site is not listed as a Heritage Conservation Area or a Heritage Item. The palms are exempt from Northern Beaches Tree Management Controls and can be removed without council consent.

The report has relied upon the following plans and documents;

Plan/Document	Designer	Drawing No.	Date
Survey indicating Details & Levels	Geomat Engineering Pty Ltd	17027-01DSrev0	13/04/2017
Architectural / Engineering Drawings Driveway & Retaining Walls	Lyle Marshall & Partners Pty Ltd	5171-1-19-00 – 5171-1-19-07	11/11/2019 B 16/01/2020
Landscape and Stormwater Drainage Plans were not available at the time of assessment.			

3. Planning Controls

In preparing this report the author is aware of and has taken into account the provisions of;

Northern Beaches Council (Former Pittwater) Development Control Plan 2017 (DCP), Appendices 9, 16, 17, 18 and 19; WEEDS Exempt Species List; Pittwater LEP 2014, Schedule 5 Environmental Heritage.

State Environment Planning Policy (SEPP) (Vegetation in Non-Rural Areas) 2017,

Biosecurity Act 2015^{3, 4} - General Biosecurity Duty - Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure risk is prevented, eliminated or minimised, so far as is reasonably practicable.

4 Observations

4.1 The Site

The subject site is located on the northern side of Cooleena Road within the Environmental Living area of Elanora Heights.

The site is triangular in shape and is located along the intersection between Cooleena and Powderworks Road. It measures 713.9 m² and has a gradual crossfall toward Cooleena Road.



Figure 2 Aerial Image of the Site – Nearmap 2019, viewed 23/01/2020.

4.2 The Proposal

The proposal seeks consent for Alterations and Additions to the Existing Dwelling including Construction of a New Garage and Driveway and Conversion of the Existing Garage into a Detached Secondary Dwelling.

Associated Landscaping works will include demolition of existing small garden beds and garden edges and construction of retaining walls.

4.3 The Trees

Six (6) trees were assessed using a VTA method and for Environmental Significance as per Pittwater LEP 2014, Schedule 5 Environmental Heritage.

Significant trees are trees that;

Contribute substantially, either individually or as a component of a tree group, to the landscape character, amenity, cultural values or biodiversity of their locality. (Generally trees with a girth greater than 500mm and a canopy spread of 6 metres radius would be considered significant).

As required by Clause 2.3.2 of AS 4970 each assessed tree has been allocated a Retention Value. The Retention Value is based on the tree's Useful Life Expectancy and Landscape Significance with consideration to its health, structural condition and site suitability.

The Retention Values do not take into account any proposed development works and are not a schedule for tree retention or removal. The trees have been allocated one of the following Retention Values: Priority for Retention, Consider for Retention, Consider for Removal or Priority for Removal.

Tree 1 *Angophora costata* (Smooth Barked Gum), Tree 2 *Corymbia gummifera* (Red Bloodwood) and Tree 3 *Angophora costata* (Smooth Barked Gum) are classed as Significant and have Priority for Retention.

Tree 4 *Glochidion ferdinandi* (Cheese Tree), Tree 5 and Tree 6 *Syzygium 'Cascade'* (Cascade Lilly Pilly) trees have medium significance. Refer to Tree Survey (Appendix 1).

No neighbouring trees are impacted.

5. Arboricultural Impact Assessment

5.1 Trees Impacted by Driveway, Crossover and Hardstand

Table 1 Trees to Be Removed		
Tree No	Scientific/Common Name	Comments and TPZ Encroachments
4	<i>Glochidion ferdinandi</i> (Cheese Tree)	The supplied plans show Tree 4 will need to be removed to accommodate the proposed driveway. The tree is in fair health and has fair structural stability. It is a small tree that can be replaced with the same species in a suitable location.

5.2 Tree to Be Retained

Tree 1 *Angophora costata* (Smooth Barked Gum), Tree 2 *Corymbia gummifera* (Red Bloodwood) and Tree 3 *Angophora costata* (Smooth Barked Gum) are classed as Significant and have priority for retention.

Tree 4 *Glochidion ferdinandi* (Cheese Tree), Tree 5 and Tree 6 *Syzygium 'Cascade'* (Cascade Lilly Pilly) have medium significance and are not impacted.

Supplied Plans show the Cooleena Road driveway crossover is proposed within a small area of the TPZ of Tree 1 *Angophora costata* (Smooth Barked Gum).

The extent of works represents Minor Encroachment as defined by Australian Standard 4970 (2009) *Protection of Trees on Development Sites*.

A Minor Encroachment is less than 10% of the area of the TPZ and is outside the SRZ. The area lost to this encroachment should be compensated for elsewhere and contiguous with the TPZ.

The supplied plans show the driveway, vehicle hardstand and retaining walls are proposed within the TPZ and SRZ areas of Tree 2 *Corymbia gummifera* (Red Bloodwood) and Tree 3 *Angophora costata* (Smooth Barked Gum).

The extent of works represents Major Encroachments as defined by Australian Standard 4970 (2009) *Protection of Trees on Development Sites*, and accounts for approximately 35 – 40% of the TPZ of Tree 2 and 30% of Tree 3, with a small area of the hardstand with retaining wall encroaching into the trees' SRZs.

A Major Encroachment is greater than 10% of the TPZ or inside the SRZ. In this situation a Project Arborist must demonstrate that the tree would remain viable. This may require root investigation by non-destructive methods or the use of sensitive construction methods.

In some cases it may be possible to encroach into or make variations to the theoretical TPZ.

Clause 3.3.2 of AS4970 outlines that in the majority of cases the area lost to encroachment is on one side of the canopies only, and the encroachment is compensated for elsewhere and contiguous with the TPZs.

With consideration to encroachment within the TPZs and SRZs, the proposal has been designed and engineered using elevated construction.

The driveway is a reinforced concrete suspended slab on bored piers at approximately 2 metre spacings. The retain walls

The pier locations are to be hand augered, under arborist supervision, and if tree roots greater than 40mm Ø are encountered, the piers will be relocated to prevent damage to the roots.

5.3 Construction Impacts – Trees to Be Retained

Table 2 Trees to be Retained and Protected				
Tree	Scientific/Common Name	TPZ	SRZ	Impacts of the Proposal
1	<i>Angophora costata</i> (Smooth Barked Gum)	2.5 m.	1.9 m.	Street tree with shallow root system and exposed root plate on eastern, driveway crossover side. Negligible TPZ impact, SRZ not impacted. Level of impact tolerable considering limited root spread to the east given the site conditions.
2	<i>Corymbia gummifera</i> (Red Bloodwood)	5.2 m.	2.5 m.	Encroachment into approximately 35 – 40 % of the TPZ and 20% of SRZ. Hand digging for driveway and retaining wall piers required to prevent damage to roots sensitive to disturbance. Elevated concrete slab will allow water movement and penetration to root zone.
3	<i>Angophora costata</i> (Smooth Barked Gum),	6.8 m.	2.8 m.	Encroachment into approximately 30% of the TPZ and 20% of SRZ. Hand digging for driveway and retaining wall piers required to prevent damage to roots sensitive to disturbance. Elevated concrete slab will allow water movement and penetration to root zone.

5.4 Tree Pruning

Canopies overhanging the driveway will not be impacted. No pruning other than removal of deadwood as per AS4373 (2007) *Pruning of Amenity Trees* required

6. Summary and Conclusions

The supplied plans show Tree 4 *Glochidion ferdinandi* (Cheese Tree) requires removal to accommodate the driveway proposal.

The tree can be replaced with the same or similar species as part of site landscaping works.

Tree 1 *Angophora costata* (Smooth Barked Gum), Tree 2 *Corymbia gummifera* (Red Bloodwood) and Tree 3 *Angophora costata* (Smooth Barked Gum) are classed as Significant and have priority for retention.

Tree 1 *Angophora costata* (Smooth Barked Gum) is a street tree with an exposed root plate on the eastern, driveway crossover side. There is negligible TPZ impact, and the SRZ is not impacted. The tree can be safely retained.

Tree 2 *Corymbia gummifera* (Red Bloodwood) and Tree 3 *Angophora costata* (Smooth Barked Gum) have major encroachment into their TPZ and encroachment into their SRZs.

As outlined in AS 4970, Section 3.2.9 hand digging for driveway and retaining wall piers will be undertaken, under arborist supervision to prevent damage to roots sensitive to disturbance. The elevated concrete slab will allow water movement and penetration to root zone.

Trunk protection will be provided and the trees will be protected in accordance with the Tree Protection Plan/ Specification, page 9.


Cheryl MacKay

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Founding Member I.A.C.A (ACM0062003), I.S.A (Member 200984) & L.G.T.R.A.
Level 5 Qualified and Practising Arborist/Horticulturist since 1995
Qualified Tree Risk Assessor (TRAQ 2016, QTRA 2018, VALID 2018)

Appendix 1 Tree Survey DA2019/1287 2 Cooleena Road ELANORA HEIGHTS Significant Site trees with High Retention Values 									
Tree No.	Genus/species Common Name	Height Spread	D.B.H. mm	Age	Crown Form Condition	Vigour	STARS Sign.	Retention Value	Observations/ Condition of Trees
1	<i>Angophora costata</i> Smooth Barked Apple	12 8	210	M	Codominant Asymmetrical	Normal	High	Priority for Retention	Street tree with a severely crooked trunk which appears structurally stable. Exposed root crown, developed above rock outcrops in shallow soil.
2	<i>Corymbia gummifera</i> Red Bloodwood	16 10	450	M	Codominant Asymmetrical	Normal	High	Priority for Retention	Well established tree with good form and good overall condition. No obvious defects. Heritage environmental significance.
3	<i>Angophora costata</i> Smooth Barked Apple	16 16	570	M	Codominant Asymmetrical	Normal	High	Priority for Retention	Significant tree with good condition and heritage environmental significance. High retention value.
4	<i>Glochidion ferdinandi</i> Cheese Tree	6 - 7 6	150 150	M	Intermediate Symmetrical	Average	Medium	Consider Retention	Small tree with codominant and included limbs from the base. Not retainable as part of the proposal. Can be replaced with a better specimen.
5	<i>Syzygium</i> "Cascade" Cascade Lilly Pilly	4 3	150 @ 1.2 m.	M	Codominant Asymmetrical	Normal	Medium	Consider Retention	Small, shrubby trees established on the western boundary. Can be pruned to retain a screening canopy and better form in their current location. Good condition, medium environmental significance.
6	<i>Syzygium</i> "Cascade" Cascade Lilly Pilly	4 3	150 @ 1.2 m.	M	Codominant Asymmetrical	Normal	Medium	Consider Retention	

Appendix 2

References

1. A Visual Tree Assessment (VTA) is a systematic method of identifying tree characteristics and hazard potential recognised by The International Society of Arboriculture. Journal of Arboriculture, Vol. 22, No. 6, November 1996.
2. Standards Australia 2009, *Australian Standard 4970 Protection of trees on development sites*, Standards Australia, Sydney, Australia.
3. Biosecurity Act 2015, Department of Agriculture, Updated 1 March 2019.
Cocos palm is not a prohibited or restricted invasive plant under the Biosecurity Act 2014. However, by law, everyone has a general biosecurity obligation (GBO) to take reasonable and practical steps to minimise the risks associated with invasive plants and animals under their control.
4. Biodiversity Conservation Act 2016 No 63 Current version for 28 June 2019 to date (accessed 30 June 2019 at 12:08)

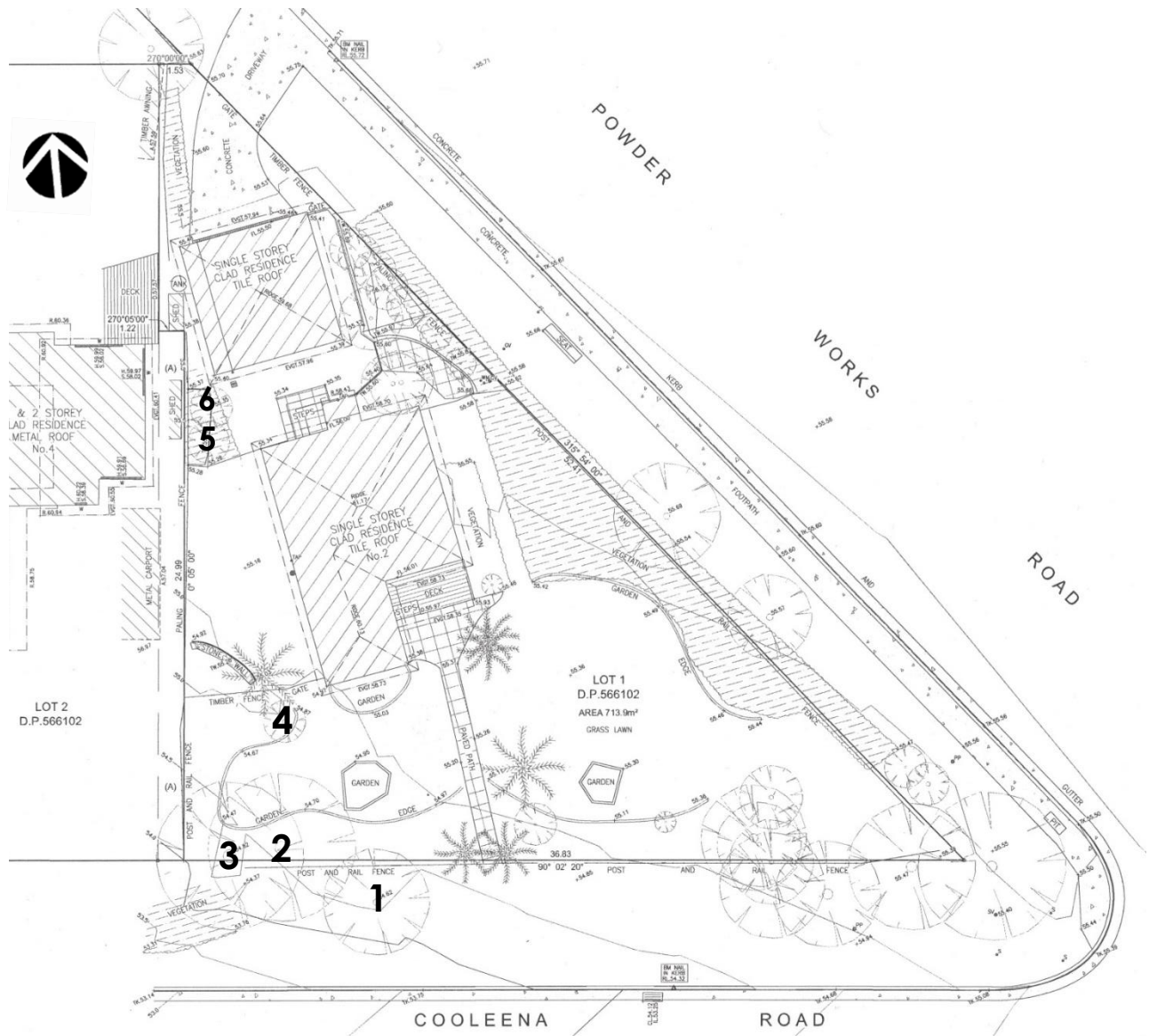
Appendix 3

Plan 1 Site Plan

2 Cooleena Road Elanora Heights

Indicating Tree Locations -

Canopies are indicative – Not to Scale



Appendix 4

Plan 2 Tree Protection Plan

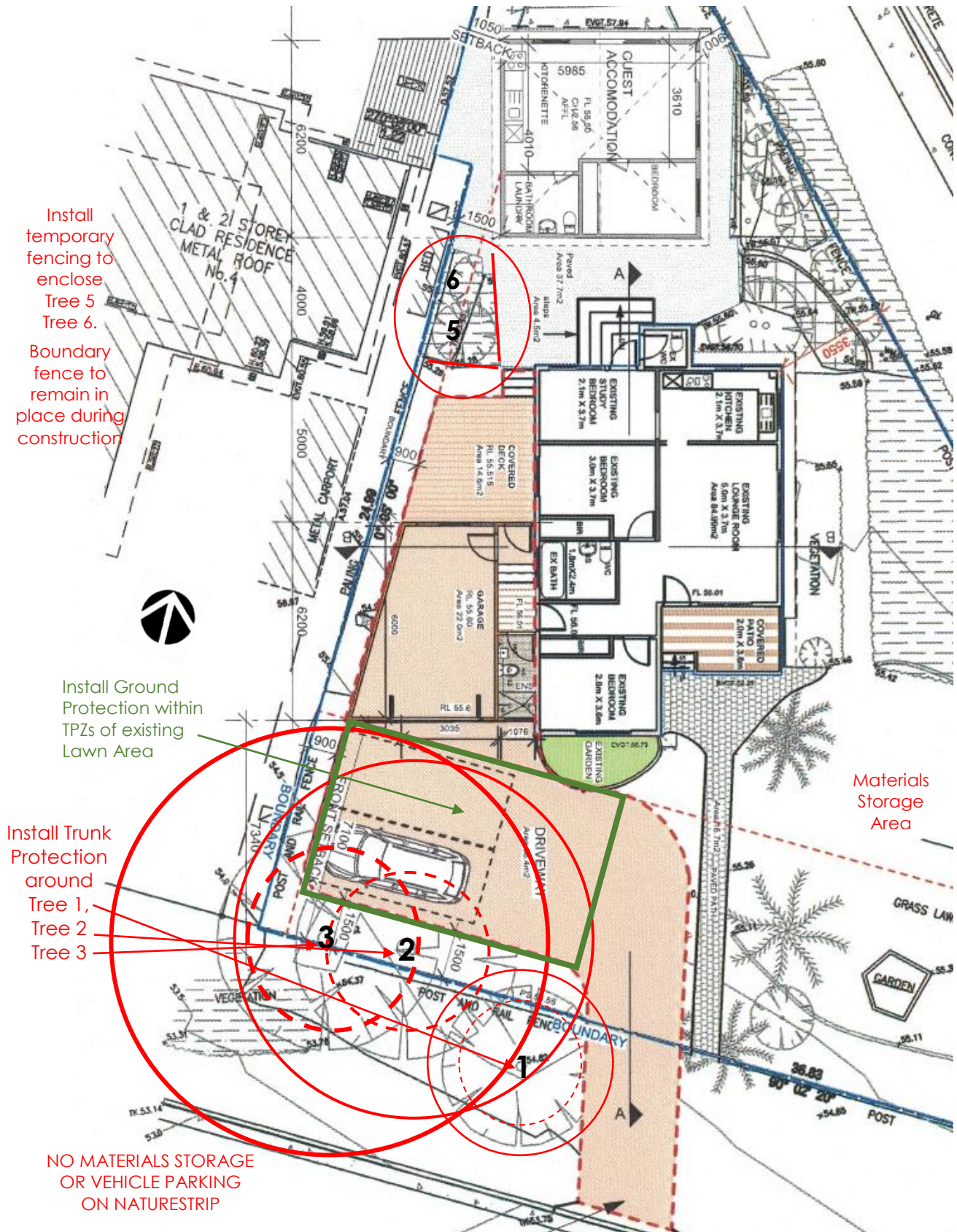
2 Cooleena Road Elanora Heights

Driveway and Hardstand Retained and Protected Trees

Indicative TPZ

SRZ

TPZ Fencing – No Go Zone



Appendix 5

Tree Protection Specification

Appointment of Project Arborist

A Project Arborist shall be engaged prior the commencement of any works on-site and monitor compliance with the protection measures.

The Project Arborist shall inspect the tree protection measures and Compliance Certification shall be prepared by the Project Arborist for review by the Principal Certifying Authority prior to the release of the Compliance Certificate.

The Project Arborist shall have a minimum qualification equivalent (using the Australian Qualifications Framework) of NSW TAFE Certificate Level 5 or above in Arboriculture.

Compliance Documentation

Compliance Documentation shall be prepared by the Project Arborist following each site inspection. The Compliance Documentation shall include documentary evidence of compliance with the tree protection measures and methods as outlined within this Specification. Upon the completion of the works, a final assessment of the trees shall be undertaken by the Project Arborist and future recommended management strategies implemented as required.

Tree and Vegetation Removal

The trees to be removed shall be removed prior to the establishment of the tree protection measures. Tree removal works shall be undertaken in accordance with the Safe Work Australia Guide for Managing Risks of Tree Trimming and Removal Work (2016).

Tree and vegetation removal shall not damage the trees to be retained.

Tree Protection Fencing

Tree 1, Tree 2 Tree 3 require Trunk Wrap Protection.

Provision of tree protection fencing is impractical, trunk protection shall be installed to avoid mechanical damage to trunks.

Specifications for trunk protection are:

- A thick layer of carpet underfelt, geotextile fabric or similar wrapped around the trunk to a minimum height of 2m.
- 1.8m or appropriate lengths of softwood timbers aligned vertically and spaced evenly around the trunk (with a small gap of approximately 50mm between the timbers).
- The timbers must be secured using galvanized hoop strap.
- The timbers shall be wrapped around the trunk but not fixed to the tree, as this will cause injury/damage.

Refer to Typical Tree Protection Device page 11.

Ground Protection

As the TPZ for the driveway is not fenced off, Ground Protection is required until driveway works commence.

The purpose of ground protection is to prevent root damage and soil compaction within the TPZ. Where possible, areas of existing pavement shall be used as ground protection.

Specifications for light traffic access (<3.5 tonne) are:

- Permeable membrane such as geotextile fabric.
- Layer of mulch or crushed rock (at minimum depth of 100mm)

Specifications for heavy traffic access (>3.5 tonne) are:

- Permeable membrane such as geotextile fabric.
- Layer of lightly compacted road base (at minimum depth of 200mm)
- Geotextile fabric shall extend a minimum 300mm beyond the edge of the road base.

- Pedestrian, vehicular and machinery access within the TPZ shall be restricted solely to areas where ground protection has been installed.

Refer to Typical Tree Protection Devices, page 11

Tree Protection Zone Exclusions

The trees to be retained shall be protected prior and during construction from activities that may result in an adverse effect on their health or structural condition.

The area within the Tree Protection Zone (TPZ) shall exclude the following activities, unless otherwise stated:

- Modification of existing soil levels, excavations, trenching or movement of rock
- Mechanical removal of vegetation
- Storage of materials, plant or equipment or erection of site sheds
- Affixing of signage or hoarding to the trees
- Preparation of building materials, refuelling or disposal of waste materials and chemicals
- Lighting fires
- Movement of pedestrian or vehicular traffic
- Temporary or permanent location of services, or the works required for their installation
- Any other activities that may cause damage to the tree.

NOTE: If access, encroachment or incursion into the TPZ is deemed essential, prior authorisation is required from the Project Arborist.

Site Management

Materials, waste storage, and temporary services shall not be located within any TPZ of any site tree.

Structure & Pavement Demolition

Demolition of existing structures/pavement within the TPZ shall be supervised by the Project Arborist. Machinery is to be excluded from the TPZ unless operating from the existing slabs, pavements or areas of ground protection.

Machinery should not contact the tree's roots, trunk, branches and crown.

If roots (>25mmØ) are encountered during the demolition works, these roots must be retained in an undamaged condition and advice sought from the Project Arborist. Exposed roots shall be protected from direct sunlight, drying out and extremes of temperature by covering with a 10mm thick jute geotextile fabric. The geotextile fabric shall be kept in a damp condition at all times.

Excavation for Piers

All approved excavations within the TPZs and SRZs will be carried out using tree sensitive manual excavation (hand tools).

Exposed roots will be protected from direct sunlight, drying out and extremes of temperature by covering with geotextile fabric, and plastic membrane or glad wrap (where practical). Coverings shall be weighted to secure them in place. The geotextile fabric shall be kept damp at all times.

Hand excavation for piers will be undertaken under arborist supervision.

Any conflicting roots (>50mm in diameter) shall be pruned using clean, sharp secateurs or a pruning saw to ensure a clean cut, free from tears.

Pre-Determined Arborist Construction Hold Points, Inspection and Certification

The following pre-determined Site Arborist stages are witness points and will require the attendance of a Site Arborist to document the works and certify that the inspection has taken place and that all works are completed in accordance with Council's Conditions of Consent, this Tree Protection Plan and AS 4970 - 2009 Protection of Trees on Development Sites.

Table 3 Witness Points for Site Arborist Inspection and Certification				
Hold Point	Task	Responsibility	Certification	Inspection Timing
1	Following Installation of Protective Fencing	Principal Contractor	Project Arborist	Prior to demolition & site establishment
2	Witnessing excavation for crossover, driveway and walling piers	Principal Contractor	Project Arborist	Prior to ground works or at time of construction.
2	Witnessing pruning of any roots greater than 40 mm in diameter	Principal Contractor	Project Arborist	At any time during construction.
4	Final inspection, assessment of trees and final compliance certification as per Council's Notice of Determination	Principal Contractor	Project Arborist	Prior to issue of occupation certificate.

Tree Protection Devices – as per AS4970.

Figure 3 Protection Fencing Section 4.3, Trunk and Branch Protection, Section 4.5.2

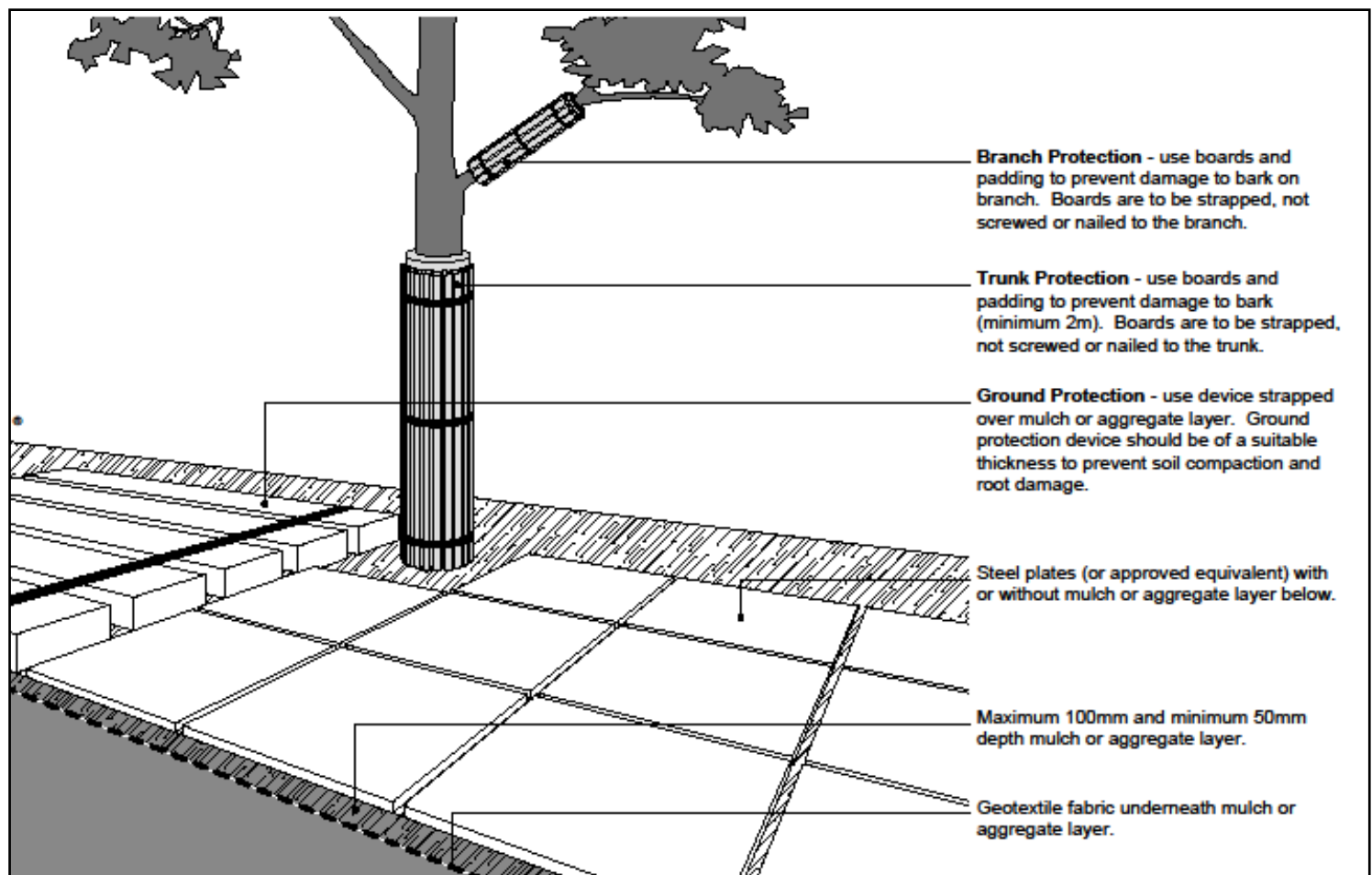


Table 4 Tree Protection Zone Calculations

Trees to be Retained and Protected

Diameter (Φ) at Root Base (DRB) is estimated at 10% greater than D.B.H.

Radius measured from centre of the trunk.

TREE NO.	Ø 1	Ø 2	D.B.H.(cm)	D.R.B. (cm)	TPZ radius (m)	TPZ area (m ²)	SRZ radius (m)
1	21		21	24	2.5	20	1.9
2	45		45	51	5.4	92	2.5
3	57		57	63	6.8	147	2.8
4	15	15	22	25	2.6	22	1.9
5	15		15	20	1.8	10	1.7
6	15		15	20	1.8	10	1.7

Figures

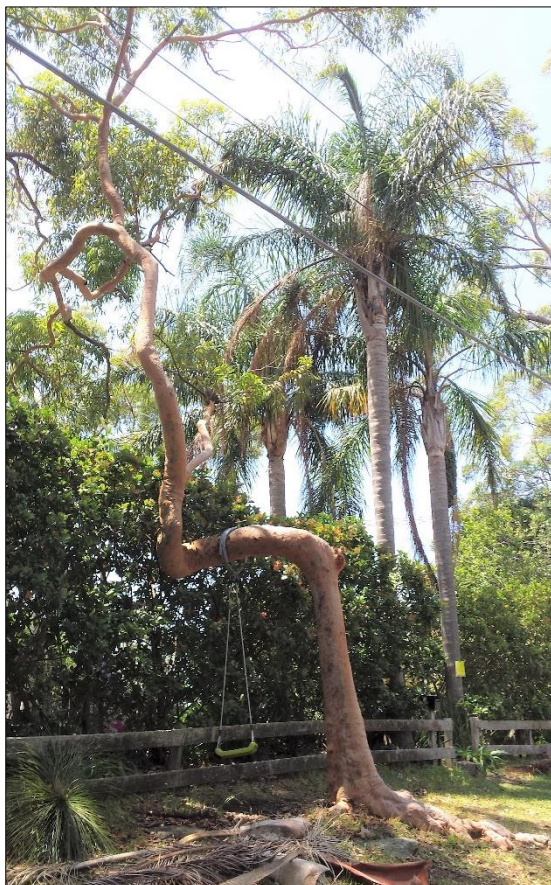


Figure 4 (at left) stand of significant trees in location of the proposed driveway (lawn area with colorbond shed).

Syagrus romanzoffianum (Cocos Palm) in the foreground left, is an exempt species and can be removed and replaced if required.

Figure 5 (bottom left), Figure 6 (bottom right) *Angophora costata* (Smooth Barked Gum) has a severely crooked trunk and an exposed root plate.

The street tree can be safely retained as part of the proposal.



Appendix 8

Significance of a Tree, Assessment Rating System (STARS) ©

From Institute of Australian Consulting Arborists 2010© from an original concept by
Footprint Green Tree Significance & Retention Value Matrix, June 2001.

Tree Significance - Assessment Criteria

1. High Significance in landscape

- The tree is in good condition and good vigour;
- The tree has a form typical for the species;
- The tree is a remnant or is a planted locally indigenous specimen and/or is rare or uncommon in the local area or of botanical interest or of substantial age;
- The tree is listed as a Heritage Item, Threatened Species or part of an Endangered ecological community or listed on Councils significant Tree Register;
- The tree is visually prominent and visible from a considerable distance when viewed from most directions within the landscape due to its size and scale and makes a positive contribution to the local amenity;
- The tree supports social and cultural sentiments or spiritual associations, reflected by the broader population or community group or has commemorative values;
- The tree's growth is unrestricted by above and below ground influences, supporting its ability to reach dimensions typical for the taxa *in situ* - tree is appropriate to the site conditions.

2. Medium Significance in landscape

- The tree is in fair-good condition and good or low vigour;
- The tree has form typical or atypical of the species;
- The tree is a planted locally indigenous or a common species with its taxa commonly planted in the local area
- The tree is visible from surrounding properties, although not visually prominent as partially obstructed by other vegetation or buildings when viewed from the street,
- The tree provides a fair contribution to the visual character and amenity of the local area,
- The tree's growth is moderately restricted by above or below ground influences, reducing its ability to reach dimensions typical for the taxa *in situ*.

3. Low Significance in landscape

- The tree is in fair-poor condition and good or low vigour;
- The tree has form atypical of the species;
- The tree is not visible or is partly visible from surrounding properties as obstructed by other vegetation or buildings,
- The tree provides a minor contribution or has a negative impact on the visual character and amenity of the local area,
- The tree is a young specimen which may or may not have reached dimension to be protected by local Tree Preservation orders or similar protection mechanisms and can easily be replaced with a suitable specimen,
- The tree's growth is severely restricted by above or below ground influences, unlikely to reach dimensions typical for the taxa *in situ* - tree is inappropriate to the site conditions,
- The tree is listed as exempt under the provisions of the local Council Tree Preservation Order or similar protection mechanisms,
- The tree has a wound or defect that has potential to become structurally unsound.
- Environmental Pest / Noxious Weed Species
- The tree is an Environmental Pest Species due to its invasiveness or poisonous/ allergenic properties,
- The tree is a declared noxious weed by legislation.
- Hazardous/Irreversible Decline
- The tree is structurally unsound and/or unstable and is considered potentially dangerous,
- The tree is dead, or is in irreversible decline, or has the potential to fail or collapse in full or part in the immediate to short term.

Appendix 9

Tree Retention Value - Priority Matrix.

References

Australia ICOMOS Inc. 1999, *The Burra Charter – The Australian ICOMOS Charter for Places of Cultural Significance*, International Council of Monuments and Sites, www.icomos.org/australia

Draper BD and Richards PA 2009, *Dictionary for Managing Trees in Urban Environments*, Institute of Australian Consulting Arboriculturists (IACA), CSIRO Publishing, Collingwood, Victoria, Australia.

Footprint Green Pty Ltd 2001, *Footprint Green Tree Significance & Retention Value Matrix*, Avalon, NSW Australia, www.footprintgreen.com.au

		Significance				
		1. High	2. Medium	3. Low		
		Significance in Landscape	Significance in Landscape	Significance in Landscape	Environmental Pest / Noxious Weed Species	Hazardous / Irreversible Decline
Estimated Life Expectancy	1. Long >40 years					
	2. Medium 15-40 Years					
	3. Short <1-15 Years					
	Dead					
Legend for Matrix Assessment						
	Priority for Retention (High) - These trees are considered important for retention and should be retained and protected. Design modification or re-location of building/s should be considered to accommodate the setbacks as prescribed by the Australian Standard AS4970 <i>Protection of trees on development sites</i> . Tree sensitive construction measures 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 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 10

Matrix - Sustainable Retention Index Value (SRIV) ©

Institute of Australian Consulting Arboriculturists, Australia, 2010, Sustainable Retention Index Value (SRIV), Version 4.

A visual method of objectively rating the viability of urban trees for development sites and management, based on general tree and landscape assessment criteria.

The matrix is to be used with the value classes defined in the Glossary for Age / Vigour / Condition.
An index value is given to each category where ten (10) is the highest value.

	Vigour Class and Condition Class 					
	Good Vigour & Good Condition (GVG)	Good Vigour & Fair Condition (GVF)	Good Vigour & Poor Condition (GVP)	Low Vigour & Good Condition (LVG)	Low Vigour & Fair Condition (LVF)	Low Vigour & Poor Condition (LVP)
Age Class	Able to be retained if sufficient space available above and below ground for future growth. No remedial work or improvement to growing environment required. May be subject to high vigour. Retention potential - Medium – Long Term.	Able to be retained if sufficient space available above and below ground for future growth. Remedial work may be required or improvement to growing environment may assist. Retention potential - Medium Term. Potential for longer with remediation or favourable environmental conditions.	Able to be retained if sufficient space available above and below ground for future growth. Remedial work unlikely to assist condition, improvement to growing environment may assist. Retention potential - Short Term. Potential for longer with remediation or favourable environmental conditions.	May be able to be retained if sufficient space available above and below ground for future growth. No remedial work required, but improvement to growing environment may assist vigour. Retention potential - Short Term. Potential for longer with remediation or favourable environmental conditions.	May be able to be retained if sufficient space available above and below ground for future growth. Remedial work or improvement to growing environment may assist condition and vigour. Retention potential - Short Term. Potential for longer with remediation or favourable environmental conditions.	Unlikely to be able to be retained if sufficient space available above and below ground for future growth. Remedial work or improvement to growing environment unlikely to assist condition or vigour. Retention potential - Likely to be removed immediately or retained for Short Term. Potential for longer with remediation or favourable environmental conditions.
Young (Y)	YGVG - 9 Index Value 9 Retention potential - Long Term. Likely to provide minimal contribution to local amenity if height <5 m. High potential for future growth and adaptability. Retain, move or replace.	YGVF - 8 Index Value 8 Retention potential - Short – Medium Term. Potential for longer with improved growing conditions. Likely to provide minimal contribution to local amenity if height <5 m. Medium-high potential for future growth and adaptability. Retain, move or replace.	YGVP - 5 Index Value 5 Retention potential - Short Term. Potential for longer with improved growing conditions. Likely to provide minimal contribution to local amenity if height <5 m. Low-medium potential for future growth and adaptability. Retain, move or replace.	YLVG - 4 Index Value 4 Retention potential - Short Term. Potential for longer with improved growing conditions. Likely to provide minimal contribution to local amenity if height <5 m. Medium potential for future growth and adaptability. Retain, move or replace.	YLVF - 3 Index Value 3 Retention potential - Short Term. Potential for longer with improved growing conditions. Likely to provide minimal contribution to local amenity if height <5m. Low-medium potential for future growth and adaptability. Retain, move or replace.	YLVP - 1 Index Value 1 Retention potential - Likely to be removed immediately or retained for Short Term. Likely to provide minimal contribution to local amenity if height <5 m. Low potential for future growth and adaptability.
Mature (M)	MGVG - 10 Index Value 10 Retention potential - Medium - Long Term.	MGVF - 9 Index Value 9 Retention potential - Medium Term. Potential for longer with improved growing conditions.	MGVP - 6 Index Value 6 Retention potential - Short Term. Potential for longer with improved growing conditions.	MLVG - 5 Index Value 5 Retention potential - Short Term. Potential for longer with improved growing conditions.	MLVF - 4 Index Value 4 Retention potential - Short Term. Potential for longer with improved growing conditions.	MLVP - 2 Index Value 2 Retention potential - Likely to be removed immediately or retained for Short Term.
Over-mature (O)	OGVG - 6 Index Value 6 Retention potential - Medium - Long Term.	OGVF - 5 Index Value 5 Retention potential - Medium Term.	OGVP - 4 Index Value 4 Retention potential - Short Term.	OLVG - 3 Index Value 3 Retention potential - Short Term. Potential for longer with improved growing conditions.	OLVF - 2 Index Value 2 Retention potential - Short Term.	OLVP - 0 Index Value 0 Retention potential - Likely to be removed immediately or retained for Short Term.

Age 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.

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 from, 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 from, or contributed to by vigour.

Poor Condition Tree is of good habit or *misshapen*, a form not severely restricted for space and light, exhibits symptoms of advanced and irreversible decline such as fungal or bacterial infestation, major dieback in the branch and foliage crown, structural deterioration from insect damage, or storm damage from lightning strike, ring barking from borer activity.

Crown Cover The estimated percentage of foliage covering the entire tree compared to that considered typical for the taxon when in good condition and in normal vigour and expressed as a percentage, considering crown form and vigour *in situ*.

Crown Form

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*, *co dominant*, *intermediate*, *emergent*, *forest* and *suppressed*. It may also be categorised as good form or poor form.

Dominant Crowns of trees generally not restricted for space and light, receiving light from above and on all sides

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.

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.

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*.

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 categorized as *Low Volume Deadwood*, *Medium Volume Deadwood* and *High Volume Deadwood*. See also *Dieback*.

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.

Determining the TPZ

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

TPZ = D.B.H. x 12 where D.B.H. = trunk diameter measured at 1.4 m above ground from the centre of the trunk. Radius is measured from the centre of the stem at ground level.

Structural Root Zone (SRZ)

The SRZ is the area required for street 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. Root investigation may provide more information on the extent of these roots.

Determining the SRZ

SRZ radius = $(D \times 50)^{0.42} \times 0.64$ where D = trunk diameter, in metres, measured above the root buttress.

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

Vigour 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.

Normal Vigour 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, e.g. 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 feed lot, 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.

Dormant Tree Vigour Determined by existing turgidity in lowest order branches in the outer extremity of the crown, with good bud set and formation, and where the last *extension growth* is distinct from those most recently preceding it, evident by bud scale scars. Normal vigour during dormancy is achieved when such growth is evident on a majority of branches throughout the crown.