

2A RUSKIN ROWE, AVALON BEACH, NSW



ARBORICULTURAL IMPACT ASSESSMENT

Date 17 July 2019
Clients Amber and Sven Almenning
LGA Northern Beaches Council - Pittwater

Author Selena Hannan *Consulting Arboriculturist, AQF Level 5*

Phone 02 8919 0553 **Mobile** 0403 041 187

Email selena@selenalandscape.com.au

www.selenahannanlandscapedesign.com.au

PO Box 419, Avalon Beach, NSW 2107

SELENA
HANNAN
LANDSCAPE
DESIGN



CONTENTS

1	Summary	4
1.1	Introduction	4
1.2	Landscape Significance ratings (LS) and Retention Values (RV) of trees within site	4
1.3	Trees to be retained in the proposal	5
1.4	Trees to be removed in the proposal	6
1.5	General recommendations	6
2	Introduction	7
2.1	Reason for the report	7
2.2	Aims of the report	7
2.3	The proposed works	7
2.4	Qualifications of consulting arborist, author of report	8
2.5	The site, and relevant development controls	8
2.6	Site location and description	8
2.7	Wind and aspect	9
3	Method	9
3.1	Trees on development sites	9
3.2	Visual Tree Assessment (VTA)	9
3.3	Soils	10
3.4	Other site observations	10
3.5	Summary of assessment methodologies	10
3.6	Plans and diagrams	11
4	Results and observations	11
4.1	Visual Tree Assessment (VTA)	11
4.2	Tree Significance Schedule	11
4.3	Exempt or weed species	12
4.4	Age and general description of trees	13
4.5	Landscape Significance ratings (LS) and Retention Values (RV) of trees within site	13
4.6	Tree 14 <i>Angophora costata</i> (Sydney Red Gum)	14
4.7	Tree 20 <i>Corymbia gummiifera</i> (Red Bloodwood)	14
4.8	Tree 25 <i>Eucalyptus robusta</i> (Swamp Mahogany)	15
5	Proposed development, and discussion of impacts on trees to be retained	15
5.1	Proposed development	15
5.2	Tree Protection Zone (TPZ) and Structural Root Zone (SRZ)	15
5.3	Clause 3.3.4 of AS4970	16
5.4	Trees to be retained in the proposal	16
5.5	Trees to be removed in the proposal	17
5.6	Impact on Trees 4, 5, 9, 10, 11, 15, 17, 18, 19, 27, 28 and 29, all <i>Livistona australis</i> (Cabbage Tree Palms), Tree 2 <i>Jacaranda mimosifolia</i> and Tree 3 <i>Melaleuca quinquenervia</i> , to be retained	18
5.7	Construction of driveway near Tree 8 and Tree 9 <i>Livistona australis</i> (Cabbage Tree Palms) to be retained	19

5.8	Construction of decking around Trees 11 and 15 <i>Livistona australis</i> (Cabbage Tree Palms) to be retained	20
5.9	Impact on Tree 20 <i>Corymbia gummifera</i> to be retained near proposed elevated building	21
6	Conclusions and recommendations	22
6.1	Summary of trees to be retained and removed in the proposal. Refer to Sections 5.4 and 5.5 for detail.	22
6.2	Specific recommendations. Refer to Sections 5.4, 5.5, 5.6, 5.7, 5.8 and 5.9 for detail.....	22
6.3	General recommendations	22
6.4	Tree protection	23
6.5	Monitoring	23
7	References.....	23
7.1	Books and journals.....	23
7.2	Websites	23
8	Tree protection plan and specification	24
8.1	Introduction	24
8.2	Aims	24
8.3	The role of the project arborist	24
8.4	Scope of works for the project arborist.....	24
	PRE-CONSTRUCTION	24
	THROUGHOUT THE CONSTRUCTION PROCESS.	24
	POST- CONSTRUCTION CERTIFICATION	25
8.5	Tree Protection Plans and Details.....	25
8.6	Refer to Tree Location Plan TLP01 (Appendix D) for:	25
8.7	Refer to Proposed Works Plan - PWP01 (Appendix E) for:	25
8.8	Pre-construction scope of works	25
	PRUNING AND TREE REMOVAL.....	25
	INSTALLATION OF TREE PROTECTION FENCING	26
	ACTIVITIES THAT ARE RESTRICTED FROM WITHIN THE TPZ (AS PER AS4970-2009)	26
	TREE PROTECTION MEASURES TO BE INSTALLED WHEN TPF REQUIRED TEMPORARY REMOVAL, OR WHEN FENCING MUST BE LOCATED WITHIN THE TPZ – TRUNK AND BRANCH PROTECTION	27
8.9	Scope of works for tree protection during construction	27
	GENERAL	27
	GROUND PROTECTION	28
	HAND EXCAVATION AND ROOT PROTECTION DURING EXCAVATION	28
	INSTALLING UNDERGROUND SERVICES WITHIN THE TPZ.....	28
8.10	Maintaining the TPZ	28
	MULCHING	28
	WATERING	28
	WEED REMOVAL	28
8.11	Scope of works post-construction	29
	REMOVAL OF TREE PROTECTION FENCING	29
	DEFECTS LIABILITY PERIOD	29

Appendices	30
APPENDIX A TREE ASSESSMENT SCHEDULE.....	31
APPENDIX B ULE	36
USEFUL LIFE EXPECTANCY (ULE) CATEGORIES (after Barrell, updated 01/04/01).....	36
APPENDIX C METHODOLOGY FOR DETERMINING TREE RETENTION VALUES	37
IACA SIGNIFICANCE OF A TREE - ASSESSMENT RATING SYSTEM (STARS) © (IACA2010) ©.....	37
TREE SIGNIFICANCE - ASSESSMENT CRITERIA.....	37
1. HIGH SIGNIFICANCE IN LANDSCAPE	37
2. MEDIUM SIGNIFICANCE IN LANDSCAPE	37
3. LOW SIGNIFICANCE IN LANDSCAPE	37
TABLE 1.0 TREE RETENTION VALUE - PRIORITY MATRIX	38
USE OF THIS DOCUMENT AND REFERENCING	38
REFERENCES.....	38
APPENDIX D TREE LOCATION PLANS -TLP01	39
APPENDIX E PROPOSED WORKS PLAN - PWP01.....	42

DISCLAIMER This report is not a hazard or risk assessment report. No aerial or below-ground investigations have been undertaken. The inspection was limited to a visual examination without any dissection, probing, root investigation or other means of investigation. Trees are living structures, are inherently unpredictable and may fail from above-ground and/or below-ground parts. Structural weaknesses may exist within roots, stems and branches. Regular inspections and monitoring are necessary to make informed assessments of trees' condition and development of any problems over time. The recommendations in this report for tree protection aim to reduce risk. However, no responsibility is accepted for damage or injury caused by the trees, nor can responsibility be accepted if the recommendations in this report are not adopted.

1 SUMMARY

1.1 Introduction

- i. This report is an assessment of twenty nine (29) trees or groups of trees, growing on the site and within Council-owned road reserve.
- ii. The site is located at 2A Ruskin Rowe, Avalon Beach, NSW 2107, being Lot 1 in DP 22361 in the Northern Beaches - Pittwater Council local government area.
- iii. Development controls contained within the Pittwater Local Environmental Plan 2014 (PLEP 2014) and Pittwater 21 Development Control Plan 2014 (PDCP 2014) were referred to in the preparation of this report, in particular the provisions of PDCP 2014, B4.22 Preservation of Trees or Bushland Vegetation and B4.7 Pittwater Spotted Gum Forest – Endangered Ecological Community.
- iv. Reference was made to the Biodiversity Impact Assessment prepared by Narla Environmental, dated July 2019, which classifies part of the plant community present on the site as Coastal Alluvial Bangalay Forest which forms part of the Endangered Ecological Community (EEC) Swamp Sclerophyll Forest.
- v. Tree species of the Pittwater Spotted Gum Forest plant community are located within the property. Pittwater Spotted Gum Forest is listed in the Biodiversity Conservation Act 2016 No.63, Schedule 2 Threatened Ecological Communities, Part 2 Endangered Ecological Communities.
- vi. Development is proposed for the site, and trees over 5 metres high that are located in the vicinity of proposed development, and also where in proximity to creek bank stabilisation works, were assessed using Stage 1 Visual Tree Assessment methodology. Exempt ('undesirable') species were assessed where considered relevant to the report.
- vii. The trees' retention values were determined using the STARS© methodology, and discussed in this report; the potential impact of construction on trees was assessed; and recommendations have been made for appropriate management and construction methods so as to enable their viable retention.
- viii. The process of assessment, planning and preparation of the report has been undertaken in conjunction with project architects so that planning decisions could be made with regards to retention of significant trees, and to minimise impacts on trees.

1.2 Landscape Significance ratings (LS) and Retention Values (RV) of trees within site

- i. Refer to summary in **Table 4.2 Tree Significance Schedule**.
- ii. Twenty (20) trees, Trees 1, 2, 4, 5, 8, 9, 11, 12, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 25 and 27 are rated with High Landscape Significance.
- iii. Sixteen (16) trees, Trees 1, 3, 4, 5, 8, 9, 11, 12, 14, 16, 19, 20, 21, 22, 23 and 27 are rated with High Retention Value.
- iv. Tree 2 has a High Retention Value and is also listed as an Exempt species.
- v. Three (3) trees, Trees 15, 17 and 18 have inconclusive, but probable, High Retention Values. Further investigation is recommended for a more informed assessment to be able to be made of the trees' condition. These trees were not able to be fully inspected at the base due to their location below the deck.

Arboricultural Impact Assessment

- vi. Nine (9) trees, Trees 3, 6, 10, 13AB, 26, 28, 29, H and I are rated with Medium Landscape Significance.
- vii. Seven (7) trees, Trees 6, 10, 13AB, 28, 29, H and I are rated with Medium Retention Value. 13AB are Exempt species.
- viii. Ten (10) trees, Trees 7, 25, 26, A, B, C, D, E, F, and G have Low Retention Values.

1.3 Trees to be retained in the proposal

- i. **Trees that are to be retained in the proposal are:**

Trees 1, 2, 3, 4, 5, 8, 9, 10, 11, 13AB, 14, 15, 17, 18, 19, 20, 21, 22, 23, 27, 28, 29, H and I.

- ii. Trees 4, 5, 8, 9, 11, 15, 17, 18, 19, 21, 23, 27, are all mature *Livistona australis* Cabbage Tree Palms. These trees all have High Landscape Significance and High Retention Value.
- iii. Three *Livistona australis* Cabbage Tree Palms, Trees 10, 28 and 29 are sited on the sides of the creek banks where they are leaning, or appear to be possibly unstable and require monitoring, and are rated Medium Retention Value.
- iv. *Livistona australis* Cabbage Tree Palms, Trees 4, 5, 9, 10, 11, 15, 17, 18, 19, 27, 28 and 29 are located in areas where **creek bank stabilisation** works are proposed, and the potential impacts of this, and construction methods to be adopted to minimise impacts are discussed in this report – refer to Section 5.6 for detail.
- v. Palm trees 13AB *Archontophoenix cunninghamiana* are also in the area of proposed creek bank stabilisation under an existing deck, however these palms are Exempt and may be removed without Council permission if required. If they are to be retained then the same measures as described for retention of Cabbage Tree Palms as noted in iv will be required so that their root systems are not destabilised or killed.
- vi. *Livistona australis* Cabbage Tree Palms, Trees 8 and 9 are located within the area of **proposed new driveway**. The potential impacts, and construction methods to be adopted to minimise impacts, are discussed in this report – refer to Section 5.7 for detail.
- vii. Two *Livistona australis* Cabbage Tree Palms, Trees 11 and 15, and, are located within areas of **existing or proposed new decking**. The potential impacts, and construction methods to be adopted to minimise impacts, are discussed in this report – refer to Section 5.8 for detail.
- viii. Tree 20 *Corymbia gummifera* with High Landscape Significance and High Retention Value is located where it may be impacted by the **proposed building works**. The potential impacts of this, and construction methods to be adopted to minimise impacts are discussed in this report – refer to Section 5.9 for detail.
- ix. Tree 1 *Stenocarpus sinuatus*, Tree 14 *Angophora costata*, Tree 21 *Livistona australis* and Tree 23 *Livistona australis*, Tree 22 *Eucalyptus botryoides*, are all located where they should NOT be impacted by proposed building works or creek bank stabilisation works. These trees all have High Landscape Significance and High Retention Value. They will require Tree Protection Fencing (TPF) for their TPZs.
- x. Trees H and Tree I, *Callistemon viminalis* have Low Retention Value and may be retained in the proposal without impact, although will require Tree Protection Fencing (TPF) for their TPZs.

Arboricultural Impact Assessment

- xi. Tree 2 *Jacaranda mimosifolia* and Tree 3 *Melaleuca quinquenervia*, are located in areas where **creek bank stabilisation** works are proposed. The potential impacts of this, and construction methods to be adopted to minimise impacts are discussed in this report – refer to Section 5.6. They are not directly impacted by building works.

1.4 Trees to be removed in the proposal

- i. **Site trees proposed to be removed as a result of the impact of the proposed building construction are: Trees 6, 7, 12, 16, 25 and 26.**
- ii. **Trees growing on the road reserve** that are proposed to be removed for a new driveway on Ruskin Rowe are **A, B, C, D, E, F and G**. All of these trees are rated with Low Retention Value and are Exempt due to small dimensions.
- iii. Tree 6 *Magnolia grandiflora* cv is of Medium Retention Value. It is to be removed for the garage footprint.
- iv. Tree 7 *Magnolia x soulangiana* is Exempt due to small dimensions. It is to be removed for the garage footprint.
- v. Tree 12 is a mature *Livistona australis* Cabbage Tree Palm with High Landscape Significance and High Retention Value. The tree is located within the proposed building footprint.
- vi. Tree 16 is a mature *Cryptocarya microneura* Murrogon with High Landscape Significance and High Retention Value. The tree is located within the proposed building footprint.
- vii. Tree 25 is a late mature *Eucalyptus robusta* Swamp Mahogany with High Landscape Significance and probable Low Retention Value due to termite infestation (the extent of structural defect in the tree is not known at this stage). The tree is located within the proposed building footprint.
- viii. Tree 26 is an early mature *Schinus ariera* Peppercorn with Medium Landscape Significance and Low Retention Value. The tree is located within the footprint of proposed driveway on Ruskin Rowe frontage.

1.5 General recommendations

- i. **Tree Protection Fencing** to be erected, to exclude construction workers, storage of materials etc from the TPZ of all trees to be retained to a practical extent. Refer to the Tree Protection Plan and Specification in Section 9.
- ii. Planting of new trees, shrubs and groundcovers within the TPZs of retained trees shall be with tubestock only.
- iii. **No trenching for services or other excavation, piers or footings, and/or additional structures below ground, shall be approved in the TPZ areas unless it can be proven that the impact on roots is negligible.** This may necessitate hand digging and non-damaging, below-ground root investigation prior to design or installation of services/structures to determine the potential impact on the tree and may not be possible – the viability and stability of a retained tree will depend on the size, number and location of roots that may be required to be severed.
- iv. Canopy pruning is anticipated to be required for retained trees as has been described in detail in the report Sections 5 and 6. The pruning shall be undertaken according to Australian Pruning Standards by experienced, qualified arborists. This may require being able to have access into the neighbouring property.
- v. Removal of weeds will be required to be undertaken carefully (not by mass excavation methods) so as to preserve the roots of trees to be retained.

2 INTRODUCTION

2.1 Reason for the report

This report has been commissioned by site owners Amber and Sven Almenning for a Development Application to Northern Beaches - Pittwater Council for proposed works on the site.

The report is a combined Preliminary Tree Assessment and Arboricultural Impact Assessment and includes a generic Tree Protection Plan and Specification.

2.2 Aims of the report

The aims of this report are to:

- Provide relevant information to the client, architect and Northern Beaches - Pittwater Council regarding trees located in areas of the site and/or on properties adjacent to the site, in proximity to proposed development.
- Assess the dimensions, health, condition and other characteristics of subject trees, including any obvious defective structures.
- From the collected data, determine retention values, useful life expectancies, and the contribution to the site in terms of significance and amenity, of subject trees.
- Provide planning and design options to prevent unnecessary removal of trees and to minimise impacts on retained trees.
- Comply with the requirements of *Australian Standard AS 4970 -2009 Protection of Trees on Development Sites*.
- Comply with the requirements of *Australian Standard AS 4373 – 2007 Pruning of Amenity Trees*.
- Review development plans and the impact on trees to be retained. Architectural plans have been designed so as to retain in the proposed development the greatest number of trees with most significance.
- Describe the subject trees that are proposed to be retained and protected, and trees proposed to be removed, based on the plans for proposed development.
- Describe the location of tree protection measures to be installed. These are detailed in Section 8 of this report, the Tree Protection Plan and Specification.

2.3 The proposed works

Proposed building works in the vicinity of trees include:

- Alterations and additions to existing structures, and new pavilion-style rooms to be built.
- An existing swimming pool is to be retained.
- Renovations to an existing driveway to Avalon Parade frontage.
- New driveway on Ruskin Rowe frontage.
- Stabilisation works to an existing creek.

2.4 Qualifications of consulting arborist, author of report

The author of this report has arboricultural AQF Level 5 qualification as required by council.

2.5 The site, and relevant development controls

The site is located at 2A Ruskin Rowe, Avalon Beach, NSW 2107, being Lot 1 in DP 22361 in the Northern Beaches - Pittwater Council local government area.

Development controls contained within the Pittwater Local Environmental Plan 2014 (PLEP 2014) and Pittwater 21 Development Control Plan 2014 (PDCP 2014) were referred to in the preparation of this report, in particular the provisions of PDCP 2014, B4.22 Preservation of Trees or Bushland Vegetation and B4.7 Pittwater Spotted Gum Forest – Endangered Ecological Community.

Reference was made to the Biodiversity Impact Assessment prepared by Narla Environmental, dated July 2019, which classifies part of the plant community present on the site as Coastal Alluvial Bangalay Forest which forms part of the Endangered Ecological Community (EEC) Swamp Sclerophyll Forest.

- The exempt tree species list and noxious weeds lists were referred to.
- Trees within 5 metres of proposed building works were assessed.
- Tree species of the Pittwater Spotted Gum Forest plant community are located within the property.
- Pittwater Spotted Gum Forest is listed in the Biodiversity Conservation Act 2016 No.63, Schedule 2 Threatened Ecological Communities, Part 2 Endangered Ecological Communities.

2.6 Site location and description

The site is level, with a creekline running from west to east. The existing house is located to the north east of the site. The site supports a number of mature trees growing across the site, including a stand of mature Cabbage Tree Palms *Livistona australis*. The existing house's decks have been built over and around a number of these palms. Existing garden areas contain areas of grass, and the site perimeters are generally planted with predominately native shrubs and trees. The creek banks are partially stabilised with retaining walls, and include areas of steeply sloping embankments with exotic and locally native planting.

The area is described on the Tree Location Plan TLP01 (Appendix D) of this report, based on the site survey.



Figure 1: Aerial view of site, approximate subject area, (base image from Six Maps)

2.7 Wind and aspect

The site is protected from winds from most directions due to its location down in the valley.

3 METHOD

3.1 Trees on development sites

This report refers to the Australian Standard *Protection of Trees on Development Sites AS4970-2009* for guidance on the principles for protecting trees on land subject to development.

3.2 Visual Tree Assessment (VTA)

Site inspections on 15 and 17 August, and 26 November 2018 were undertaken to assess trees from ground level only. No aerial inspections were made. A Stage 1 Visual Tree Assessment (VTA) of the biological and mechanical characteristics of the tree was undertaken (Mattheck, Bethge and Weber 2015). The VTA results are included in Appendix A – Tree Assessment Schedule.

Observations from ground level included, but were not limited to:

- Species identification and tree characteristics.
- Dimensions - height estimated by eye, canopy spread with tape measure,
- Diameter of the stem at breast height of 1.4 metres above ground level at the base of tree (DBH), and diameter of the stem at the base, above the root flare, (DAB) were determined by measuring the circumference with tape at these points, then by calculation.
- Canopy health and condition - foliage density, size and colour; location, size and quantity of dieback; deadwood; epicormic growth; and signs of stress.
- Branches - signs of structural defects, insect and animal activity, and disease. Previous pruning was noted.

Arboricultural Impact Assessment

- Stem - the base of the stem and root crown area was inspected for signs of cavities, wounds, decay, basal flare, degree of lean, soil upheaval, root damage, surface roots and structural defects.
- Photographs were taken.

3.3 Soils

Soil profile investigation and testing were not undertaken.

3.4 Other site observations

- Proximity of trees to buildings and structures.
- Aspect and protection/exposure to prevailing winds.
- Overland flow path of water.
- Signs of erosion, recent excavation, construction works, and level changes.
- Site usage by people and vehicles.

3.5 Summary of assessment methodologies

Type of assessment	Description	Source	Appendix/Location
VTA	Visual Tree Assessment (VTA) of the biological and mechanical characteristics of trees was undertaken (Mattheck, Bethge and Weber)	Mattheck, Bethge and Weber (2015)	Appendix A
ULE	Useful Life Expectancy (ULE) categories (updated 01/04/01)	Barrell, Jeremy (2001)	Appendix B
Landscape Significance LS	IACA Significance of a Tree, Assessment Rating System (STARS) © based on tree condition and form; heritage, ecological and amenity values; was applied according to the assessment criteria.	IACA Significance of a Tree, Assessment Rating System (STARS)© Institute of Australian Consulting Arborists (IACA 2010)©	Appendix C
Retention Value RV	IACA Significance of a Tree, Assessment Rating System (STARS)© Table 1.0 Tree Retention Value – Priority Matrix combines the Landscape Significance rating with Estimated Life Expectancy (ULE), to determine Retention Value (RV).	IACA Significance of a Tree, Assessment Rating System (STARS)© Institute of Australian Consulting Arborists (IACA 2010)©	Appendix C
TPZ	Tree Protection Zones were calculated from the DBH of trees, where relevant	AS4970-2009	Appendix A
SRZ	Structural Root Zones were calculated from the DAB of trees where relevant.	AS4970-2009	Appendix A

Arboricultural Impact Assessment

3.6 Plans and diagrams

Assessed trees are shown and numbered on Tree Location Plan TLP01 (Appendix D), prepared by the author, from measurements and observations taken.

The following plans and drawings were relied upon for this arboricultural assessment.

Author	Title	Reference	Date	Drawing Number and Version
SCS Engineering Surveyors	Survey – 4 SHEETS	10572	21.10.2017	Rev A
Sandberg Schoffel Architects	Floor Plan and Site Section		July 2019	
Narla Environmental	Biodiversity Impact Assessment		July 2019	
Northern Beaches Consulting Engineers Pty Ltd	Creek bank stabilisation (draft)		July 2019	
Selena Hannan Landscape Design	Landscape Plan		17.07.2019	LP02 - B

4 RESULTS AND OBSERVATIONS

4.1 Visual Tree Assessment (VTA)

Detailed results are listed in Tree Assessment Schedule (Appendix A).

4.2 Tree Significance Schedule

The following is a summary of assessed and determined values, as per the methodology outlined in 3.5.

Tree No.	Species Name	Common Name	ULE	Landscape Significance (LS)	Retention Value (RV)	TPZ (m)	SRZ (m)
1	Stenocarpus sinuatus	Qld Firewheel Tree	2A	H	H	4.2	2.3
2	Jacaranda mimosifolia	Jacaranda	2B	H	H/E	7.2	3.0
3	Melaleuca quinquenervia	Broad-leaved Paperbark	1A	M	H	2.4	1.9
4	Livistona australis	Cabbage Tree Palm	2B	H	H	3.5	2
5	Livistona australis	Cabbage Tree Palm	2B	H	H	3.5	2
6	Magnolia grandiflora cv	Little Gem Magnolia	5B	M	M	2	1.7
7	Magnolia x soulangiana	Saucer Magnolia	5A	L	L/E	-	-
8	Livistona australis	Cabbage Tree Palm	1A	H	H	3.5	2
9	Livistona australis	Cabbage Tree Palm	1A	H	H	3.5	2
10	Livistona australis	Cabbage Tree Palm	2B	M	M	3.5	2
11	Livistona australis	Cabbage Tree Palm	1A	H	H	3.5	2
12	Livistona australis	Cabbage Tree Palm	1A	H	H	3.5	2

Arboricultural Impact Assessment

13 A & 13B	Archontophoenix cunninghamiana	Bangalow Palm	2B	M	M/E	3	2
14	Angophora costata	Sydney Red Gum	1A	H	H	5	2.4
15	Livistona australis	Cabbage Tree Palm	1A/2B?	H	H?	3.5	2
16	Cryptocarya microneura	Murrogun	1B	H	H	5.4	2.7
17	Livistona australis	Cabbage Tree Palm	1A/2B?	H	H?	3.5	2
18	Livistona australis	Cabbage Tree Palm	1A/2B?	H	H?	3.5	2
19	Livistona australis	Cabbage Tree Palm	1B	H	H	3.5	2
20	Corymbia gummifera	Red Bloodwood	2A/2D	H	H	5.8	2.8
21	Livistona australis	Cabbage Tree Palm	1A	H	H	3.5	2
22	Eucalyptus botryoides	Bangalay	2B	H	H	4.8	2.4
23	Livistona australis	Cabbage Tree Palm	1A	H	H	3.5	2
25	Eucalyptus robusta	Swamp Mahogany	4	H	L	8	3.2
26	Schinus ariera	Peppercorn	3B	M	L	3.8	2.3
27	Livistona australis	Cabbage Tree Palm	1A	H	H	3.5	2
28	Livistona australis	Cabbage Tree Palm	2B	M	M	3.5	2
29	Livistona australis	Cabbage Tree Palm	2D	M	M	3	2
STREET TREES – RUSKIN ROWE							
*A	Syzygium australe	Brush Cherry	5	L	L		
*B	Viburnum odoratissimum	Glossy Viburnum	5	L	L		
*C	Dyopsis lutescens	Golden Cane Palm	5	L	L		
*D	Unidentified shrub		5	L	L		
*E	Viburnum odoratissimum	Glossy Viburnum	5	L	L		
*F	Schinus ariera	Peppercorn	5	L	L		
*G	Viburnum odoratissimum	Glossy Viburnum	5	L	L		
*H	Callistemon viminalis	Weeping Bottlebrush	3B	M	M		
*I	Callistemon viminalis	Weeping Bottlebrush	3B	M	M		

KEY

* Located in neighbouring property or on Council road reserve.

? Further investigation recommended, or difficult to inspect, therefore difficult to assign value at this stage.

H High Value M Medium Value L Low Value R Removal recommended E Exempt

4.3 Exempt or weed species

Three of the trees located within the site are categorised as 'exempt' species.

Seven of the assessed trees located on the road reserve are 'exempt' due to small dimensions.

Arboricultural Impact Assessment

4.4 Age and general description of trees

All of the *Livistona australis* (Cabbage Tree Palms) are of mature age. These remnant palms are estimated over 70 years in age.

Several mature to late mature Eucalyptus trees are probably remnant and self-seeded trees.

A mix of mature exotic and non-locally native trees have been planted in the Avalon Parade setback, these trees are estimated to be up to 60 years old.

4.5 Landscape Significance ratings (LS) and Retention Values (RV) of trees within site

Refer to summary in Table 4.2 Tree Significance Schedule.

- i. Twenty trees, Trees 1, 2, 4, 5, 8, 9, 11, 12, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 25 and 27 are rated with High Landscape Significance.
- ii. Sixteen trees, Trees 1, 3, 4, 5, 8, 9, 11, 12, 14, 16, 19, 20, 21, 22, 23 and 27 are rated with High Retention Value.
- iii. Tree 2 has a High Retention Value and is also listed as an Exempt species.
- iv. Three trees, Trees 15, 17 and 18 have inconclusive, but probable, High Retention Values. Further investigation is recommended for a more informed assessment to be able to be made of the trees' condition. These trees were not able to be fully inspected at the base due to their location below the deck.
- v. Nine trees, Trees 3, 6, 10, 13AB, 26, 28, 29, H and I are rated with Medium Landscape Significance.
- i. Seven trees, Trees 6, 10, 13AB, 28, 29, H and I are rated with Medium Retention Value. 13AB are Exempt palm species.
- ii. Ten trees, Trees 7, 25, 26, A, B, C, D, E, F, and G have Low Retention Values.
- iii. Trees assigned High Retention Value are recommended to be retained as a priority. This may require design, placement of buildings and infrastructure so as to minimise any adverse impact with respect to the Tree Protection Zones. The extent of the canopy with regards to proposed development building height must be considered in site and building design and placement, and significant pruning of canopy or roots of these trees is not generally acceptable.
- iv. Trees with Medium Retention Value may be retained and protected, however are considered to be less critical for retention. Their retention should remain a priority, however, and removal considered only if all planning and design options for building and other structures have been considered.
- v. Trees with Low Retention Value (due to having Short ULE, and rated with Medium or Low Landscape Significance) are not considered to be important for retention, and do not require special planning considerations to be implemented to enable their retention.
- vi. Exempt trees may be removed without requiring Council permission.
- vii. Generally speaking, trees on land owned by others are considered as having a 'high retention value' even if they are Exempt species or have low ULE. Damage to the roots or canopies may have a deleterious impact on the trees' health, vigour, condition and stability.

Arboricultural Impact Assessment

4.6 Tree 14 *Angophora costata* (Sydney Red Gum)



Figure 2: Tree 14 displays good vigour and condition.

4.7 Tree 20 *Corymbia gummifera* (Red Bloodwood)



Figure 3: Tree 20 displays fair vigour and fair condition. Medium and large diameter deadwood should be removed. The tree may be somewhat environmentally stressed by the drought and extent of grass in its root zone. The tree should be inspected by a climbing arborist regularly, and closely monitored for any signs of further decline.

4.8 Tree 25 *Eucalyptus robusta* (Swamp Mahogany)



Figure 4: Tree 25 with arrow showing location of termite nest at 7 metres high. Termites eat dead wood so the nest is an indication of the presence of a structural defect with decay and dead wood at the stem junction area. This area would require further investigation to determine the structural integrity of the defective area, if the tree were to be retained. In any case the tree is probably not retainable for the longer term. The canopy displays small branch dieback of approximately 10%.

5 PROPOSED DEVELOPMENT, AND DISCUSSION OF IMPACTS ON TREES TO BE RETAINED

5.1 Proposed development

Refer to architects' and engineers' documents for detail.

Proposed building works in the vicinity of trees include:

- Alterations and additions to existing structures, and new pavilion-style rooms to be built.
- An existing swimming pool is to be retained.
- Renovations to an existing driveway to Avalon Parade frontage.
- New driveway on Ruskin Rowe frontage.
- Stabilisation works to an existing creek.

5.2 Tree Protection Zone (TPZ) and Structural Root Zone (SRZ)

Table 4.2 Tree Significance Schedule lists the calculated TPZ and SRZ for trees.

The Tree Location Plan TLP01 (Appendix D) shows the location and numbering for all assessed trees.

Arboricultural Impact Assessment

Proposed Works Plan PWP01 (Appendix E) shows the TPZs and SRZs of trees to be retained in the proposal where relevant.

Tree Protection Zones (TPZ) and Structural Root Zones (SRZ) are a radial distance measured from the centre of the trees, based on calculations determined from Australian Standard *Protection of trees on development sites 4970-2009*.

The TPZ defines an area within which construction of buildings and other structures, trenching, soil level changes (cut or fill), use of machinery, storage of site materials, at minimum, should be excluded. The TPZ is the theoretical minimum area which is required for maintaining a viable tree.

The SRZ defines an area within which no excavation or construction should encroach. The SRZ is the area in which roots required for stability are typically found. If an encroachment is considered into the SRZ then this must be proven to be of no impact to the structural roots, by preliminary root mapping.

Some encroachment into the TPZ may be possible depending on site conditions and tree location, species, age, vigour, condition and canopy spread, presence of existing structures (or other trees) that may be limiting or affecting root growth.

A 10% encroachment into the TPZ may be considered to be allowable provided that there is compensatory area contiguous to the TPZ - this may be advised on a site- and tree-specific basis.

Encroachments over 10% into the TPZ, if contemplated, may require preliminary root mapping to determine the potential impact on the tree and may not be possible – the viability and stability of a retained tree will depend on the size, number and location of roots that may be required to be severed in the proposal.

5.3 Clause 3.3.4 of AS4970

Clause 3.3.4 from the *Australian Standard for Protection of trees on development sites AS4970 2009* describes considerations that may be taken into account when determining encroachments into the TPZ:

- Species' tolerance to root disturbance,
- Age and vigour of tree,
- The presence of existing or past structures or obstacles which may affect root growth,
- Adoption of tree-sensitive construction methods such as pier and beam, suspended slabs, discontinuous footings that would minimise impact on root systems.

Tree sensitive design must be adopted if a major encroachment into a TPZ is contemplated.

A major encroachment is considered to be between 15 – 35% of the TPZ (root zone) impacted.

A marginal encroachment of between 10-15% without undertaking root mapping may be considered to be acceptable, but will be dependent upon a tree's vigour etc and tolerance to root disturbance.

5.4 Trees to be retained in the proposal

- i. **Trees that are to be retained in the proposal are:**

Trees 1, 2, 3, 4, 5, 8, 9, 10, 11, 13AB, 14, 15, 17, 18, 19, 20, 21, 22, 23, 27, 28, 29, H and I.

- ii. Trees 4, 5, 8, 9, 11, 15, 17, 18, 19, 21, 23, 27, are all mature *Livistona australis* Cabbage Tree Palms. These trees all have High Landscape Significance and High Retention Value.

Arboricultural Impact Assessment

- iii. Three *Livistona australis* Cabbage Tree Palms, Trees 10, 28 and 29 are sited on the sides of the creek banks where they are leaning, or appear to be possibly unstable and require monitoring, and have been rated with Medium Retention Value.
- iv. *Livistona australis* Cabbage Tree Palms, Trees 4, 5, 9, 10, 11, 15, 17, 18, 19, 27, 28 and 29 are located in areas where creek bank stabilisation works are proposed, and the potential impacts of this, and construction methods to be adopted to minimise impacts are discussed further in this report.
- v. Palm trees 13AB *Archontophoenix cunninghamiana* are also in the area of proposed creek bank stabilisation under an existing deck, however these palms are Exempt and may be removed without Council permission if required. If they are to be retained then the same measures as described for retention of Cabbage Tree Palms as noted in iv will be required so that their root systems are not destabilised or killed.
- vi. Two *Livistona australis* Cabbage Tree Palms, Trees 11 and 15, and, are located within areas of existing or proposed new decking. The potential impacts, and construction methods to be adopted to minimise impacts, are discussed further in this report.
- vii. *Livistona australis* Cabbage Tree Palms, Trees 8 and 9 are located within the area of proposed new driveway. The potential impacts, and construction methods to be adopted to minimise impacts, are discussed further in this report.
- viii. Tree 20 *Corymbia gummifera* with High Landscape Significance and High Retention Value is located where it may be impacted by the proposed building works. The potential impacts of this, and construction methods to be adopted to minimise impacts are discussed further in this report.
- ix. Tree 1 *Stenocarpus sinuatus*, Tree 14 *Angophora costata*, Tree 21 *Livistona australis* and Tree 23 *Livistona australis*, Tree 22 *Eucalyptus botryoides*, are all located where they should NOT be impacted by proposed building works or creek bank stabilisation works. These trees all have High Landscape Significance and High Retention Value. They will require Tree Protection Fencing (TPF) for their TPZs.
- x. Trees H and Tree I, *Callistemon viminalis* have Low Retention Value and may be retained in the proposal without impact, although will require Tree Protection Fencing (TPF) for their TPZs.
- xi. Tree 2 *Jacaranda mimosifolia* and Tree 3 *Melaleuca quinquenervia*, are located in areas where creek bank stabilisation works are proposed. The potential impacts of this, and construction methods to be adopted to minimise impacts are discussed further in this report. They are located where they should not be impacted by proposed building works.

5.5 Trees to be removed in the proposal

- xii. **Site trees proposed to be removed as a result of the impact of the proposed building construction are: Trees 6, 7, 12, 16, 25 and 26.**
- xiii. **Trees growing on the road reserve** that are proposed to be removed for a new driveway on Ruskin Rowe are **A, B, C, D, E, F and G**. All of these trees are rated with Low Retention Value and are Exempt due to small dimensions.
- xiv. Tree 6 *Magnolia grandiflora* cv is of Medium Retention Value. It is to be removed for the garage footprint.
- xv. Tree 7 *Magnolia x soulangiana* is Exempt due to small dimensions. It is to be removed for the garage footprint.

Arboricultural Impact Assessment

- xvi. Tree 12 is a mature *Livistona australis* Cabbage Tree Palm with High Landscape Significance and High Retention Value.
The tree is located within the proposed building footprint.
- xvii. Tree 16 is a mature *Cryptocarya microneura* Murrogun with High Landscape Significance and High Retention Value.
The tree is located within the proposed building footprint.
- xviii. Tree 25 is a late mature *Eucalyptus robusta* Swamp Mahogany with High Landscape Significance and probable Low Retention Value due to termite infestation (the extent of structural defect in the tree is not known at this stage). The tree is located within the proposed building footprint.
- xix. Tree 26 is an early mature *Schinus ariera* Peppercorn with Medium Landscape Significance and Low Retention Value.
The tree is located within the footprint of proposed driveway on Ruskin Rowe frontage.

5.6 Impact on Trees 4, 5, 9, 10, 11, 15, 17, 18, 19, 27, 28 and 29, all *Livistona australis* (Cabbage Tree Palms), Tree 2 *Jacaranda mimosifolia* and Tree 3 *Melaleuca quinquenervia*, to be retained

Trees 4, 5, 9, 10, 11, 15, 17, 18, 19, 27, 28 and 29, all mature *Livistona australis* (Cabbage Tree Palms), Tree 2 *Jacaranda mimosifolia* and Tree 3 *Melaleuca quinquenervia*, **are trees to be retained, that are located in areas where creek bank stabilisation works are proposed.**

The method of creek bank stabilisation works within the TPZs of the Cabbage Tree Palms must be undertaken so as not to alter, or to alter as minimally as possible, the soil levels within the TPZs of the trees.

The TPZ of the Cabbage Tree Palms is a 3.5 metre radius from the centre of the trees. If works are considered necessary to be closer to the palms, then there must not be any soil disturbance closer than a 3 metre radius from any of these trees. This is a 25% impact of the TPZ area and is a major encroachment, although the species should tolerate it.

There shall be no cut or fill within 3 metres radius of the Cabbage Tree Palms. The soil on the banks may be retained if required within the TPZs of the palms by means of placing a revetment mattress on top of existing soil levels in this 3 metre radius of the palms. No walls or footings can be built within a 3 metre radius of the palms. New planting should be with tubestock in the TPZ of palms.

Do not cut or fill within the TPZ of Tree 2 *Jacaranda* (TPZ is a 7.2 metre radius) and Tree 3 *Paperbark* (TPZ is a 2.4 metre radius). Revetment mattress may be used within the TPZ of these trees.

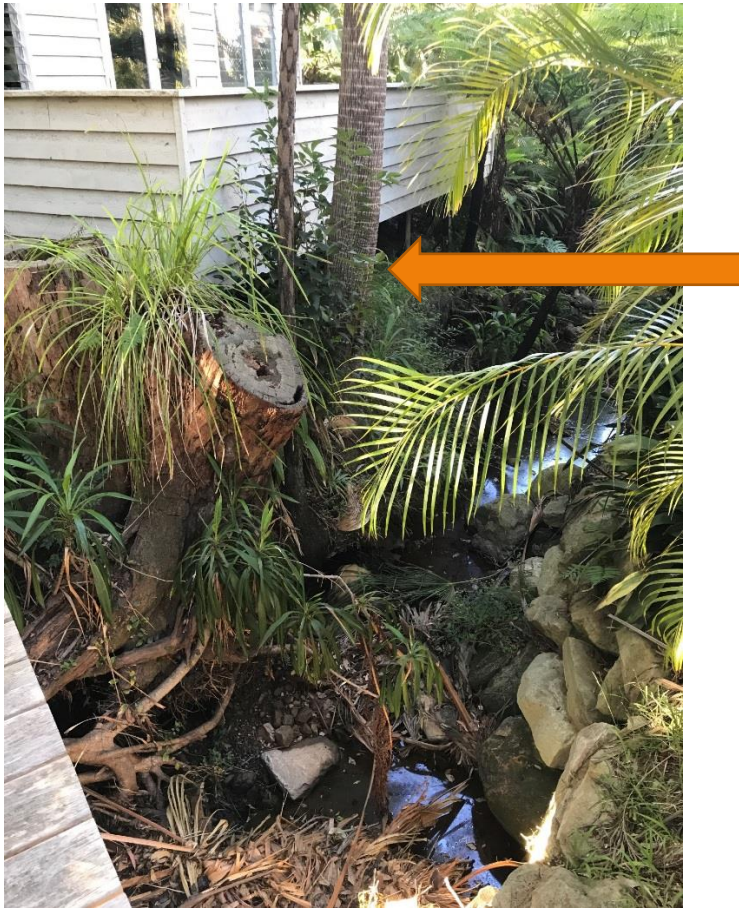


Figure 5: Cabbage Tree Palm Tree 29, near the gym, growing near a large stump. The stump would be required to be retained as Palm roots will likely be in the area under the stump, although stump could be cut down further if required. Revetment mattress will be the preferred method of bank stabilisation for a 3 metre minimum radius from Tree 29, and for all other palms to be retained in the areas of creek bank stabilisation.

5.7 Construction of driveway near Tree 8 and Tree 9 *Livistona australis* (Cabbage Tree Palms) to be retained

Tree 8 and Tree 9 are located close to a proposed new driveway, at approximately one metre away to the western side of the two trees. The driveway may be able to be built within the TPZ of the trees, however it **must be elevated above existing ground levels so that there is no change in soil levels in the TPZs of the two trees (no cut or fill in the TPZ). The TPZ is a radial distance of 3.5 metres from the centre of the palm trees.**

The elevated driveway slab may be able to be supported with isolated piers and with sufficient clearance above existing grades, for air and water to be maintained to the roots of the palms. The isolated piers shall not be any closer than 2 metres to the palms and shall be required to be placed at 2 metre spacings at least, to minimise root damage. Irrigation shall be required to be installed under the slab so as to maintain water to the palms' roots.

If this method of construction is not considered to be feasible (ie a suspended slab on isolated piers), then a permeable paving material may be able to be considered as an alternative within the TPZ of trees. This would require no cut or fill in the TPZ of 3.5 metres from the two palm trees, and would have to be laid on a free-draining, no fines, non-compacted subgrade to future specification, with no mortar joints between the pavers.



Figure 6: Tree 8 (at back) and Tree 9 (foreground) are examples of existing palms that have previously had decks constructed within their Tree Protection Zones (TPZs). The deck is to be removed near these two trees and a new driveway and parking area built within their TPZs. **The driveway will have to be constructed so that it is pierced and elevated over the roots in the TPZs.**

5.8 Construction of decking around Trees 11 and 15 *Livistona australis* (Cabbage Tree Palms) to be retained

Tree 15 is located within an existing deck area that it proposed to not be altered.

Tree 11 is located in an existing deck area (see Figure 7) that is proposed to be removed and re-built at approximately one metre higher. The isolated piers for the deck shall not be any closer than 2 metres to the palm and shall be required to be placed at 2 metre spacings at least, to minimise root damage.

There is to be no change in soil levels in the TPZs of the two trees (no cut or fill in the TPZ). The TPZ is a radial distance of 3.5 metres from the centre of the palm trees.

The decking material shall be required to be permeable to allow rainwater and air through, so as not to change the supply of water and air to the palms.



Figure 7: Tree 11 is proposed to have a new deck built around it at a higher level. It is strongly recommended that a wider distance between the stem and the deck be provided when building the new deck than as in the current situation, to provide for stem movement.

5.9 Impact on Tree 20 *Corymbia gummifera* to be retained near proposed elevated building

TPZ 5.8 metres

SRZ 2.8 metres

- The proposed encroachment into the TPZ for the house construction is a total of 23 square metres. The total TPZ area of Tree 20 is 106 square metres. The impact is 22%, which is considered to be a **major encroachment**. Encroachments over 10% into the TPZ, if contemplated, require preliminary root mapping to determine the potential impact on the tree. The viability and stability of a retained tree will depend on the size, number and location of roots that may be required to be severed in the proposal.
- The proposed new building is 2.4 metres away. This is a one-sided impact and is **inside the SRZ**.
- The proposed building is elevated above existing ground levels by approximately one metre. The impacts of the proposal should be able to be tolerated by the tree, **providing that the existing soil levels under the building will be required to be maintained as existing, so that the existing overland flow path of water is not altered, so as to maintain existing water and air supply to roots of the tree. There shall be no cut or fill allowed under the building except for isolated piers for support of the structure. A loose surface material such as non-compacted pebble could be used as a thin mulch under the building, over existing soil level.**

Arboricultural Impact Assessment

- Preliminary root mapping will be required to be undertaken to ensure that large roots are not to be cut, which may kill or destabilise the tree. **The preliminary root mapping, to be undertaken by careful, non-destructive hand excavation where piers are proposed, will determine the location, dimension and number of roots that may be required to be cut for the piers of the elevated building. It may be that the pier holes will be required to be moved to a different location if significant roots are found where piers are desired.**
- Pruning of branches to clear the proposed building will not be required as the canopy is high (canopy starts around 9 metres high).
- It must be noted that the tree already displays some evidence of environmental stress, and should have all medium and large diameter deadwood removed before construction begins. The tree will also require ongoing monitoring to assess any further decline in its vigour and condition.
- The entire TPZ of this tree outside the building footprint should be fenced off with Tree Protection Fencing (TPF) at 6 metres away from the tree. It may be fenced off at around one metre from the line of the proposed building works, and activities within the TPF exclusion area should be strictly prevented.
- Note recommendations in Section 8, Tree Protection Plan and Specification regarding mulching and irrigation in the TPZ area.

6 CONCLUSIONS AND RECOMMENDATIONS

6.1 Summary of trees to be retained and removed in the proposal. Refer to Sections 5.4 and 5.5 for detail.

i. Trees that are to be retained in the proposal are:

Trees 1, 2, 3, 4, 5, 8, 9, 10, 11, 13AB, 14, 15, 17, 18, 19, 20, 21, 22, 23, 27, 28, 29, H and I.

ii. Site trees proposed to be removed as a result of the impact of the proposed building construction are:

Trees 6, 7, 12, 16, 25 and 26.

iii. Trees growing on the road reserve that are proposed to be removed for a new driveway on Ruskin Rowe are A, B, C, D, E, F and G.

6.2 Specific recommendations. Refer to Sections 5.4, 5.5, 5.6, 5.7, 5.8 and 5.9 for detail.

All of the construction methods and setbacks as described in detail in Sections 5.4, 5.6, 5.7, 5.8 and 5.9 of this report are recommended to be adopted for the retention of trees.

Further detail may be required to be documented by the project arborist after creek bank stabilisation methods are determined and provided by engineers.

6.3 General recommendations

- iv. Planting of new trees, shrubs and groundcovers within the TPZs of retained trees shall be with tubestock only.

Arboricultural Impact Assessment

- v. No trenching for services or other excavation, piers or footings, and/or additional structures below ground, shall be approved in the TPZ areas unless it can be proven that the impact on roots is negligible. This may necessitate hand digging and non-damaging, below-ground root investigation prior to design or installation of services/structures to determine the potential impact on the tree and may not be possible – the viability and stability of a retained tree will depend on the size, number and location of roots that may be required to be severed.
- vi. Canopy pruning is anticipated not to be required for retained trees as has been described in previous sections. Any pruning that may be required of retained trees at any time shall be undertaken according to Australian Pruning Standards - *Standards Australia 2007, Pruning of Amenity Trees, AS 4373-2007* by experienced, qualified arborists.
- vii. Removal of weeds will be required to be undertaken carefully (not by mass excavation methods) so as to preserve the roots of trees to be retained.

6.4 Tree protection

Tree Protection Fencing to be erected, to exclude construction workers, storage of materials etc from the TPZ of all trees to be retained to a practical extent. Refer to the Tree Protection Plan and Specification in Section 8 for further direction.

6.5 Monitoring

All retained site trees should be monitored regularly (annually or bi-annually) by an experienced, qualified arborist to note any change in their vigour and development of defects.

7 REFERENCES

7.1 Books and journals

Mattheck, C, Bethge, K & Weber, K 2015, *The Body Language of Trees*, Karlsruhe Institute of Technology, Karlsruhe, Germany.

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

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

7.2 Websites

<https://maps.six.nsw.gov.au/>

www.northernbeaches.nsw.gov.au

8 TREE PROTECTION PLAN AND SPECIFICATION

8.1 Introduction

This section provides general **Tree Protection Plan and Specification** measures for tree protection works to be implemented at the proposed development, as described in the **Arboricultural Impact Assessment**.

Previous sections of the **Arboricultural Impact Assessment** examined the impact on trees to be retained and removed, and made recommendations as to how the site may be managed in order to minimise negative impacts by construction on trees to be retained.

This stage in planning, the **Tree Protection Plan and Specification**, provides specifications for the required Tree Protection measures to be implemented, as recommended in the **Arboricultural Impact Assessment**.

All works are to comply with **Australian Standard *Protection of Trees on Development Sites AS 4970-2009***.

8.2 Aims

The aims of this Tree Protection Plan and Specification are to:

- identify the responsibilities of the project arborist for site developers and managers, and to
- recommend general tree protection works required to protect trees retained on the proposed development site.

8.3 The role of the project arborist

An AQF5-qualified consulting arborist (hereafter referred to as 'the project arborist') will be required to:

- inspect and assess and supervise works within the TPZ of trees,
- specify and supervise any pruning works,
- specify and monitor compliance of tree protection measures,
- specify and certify remediation works, and to
- provide written statement of compliance at specific milestones in accordance with AS4970- 2009.

8.4 Scope of works for the project arborist

PRE-CONSTRUCTION

The project arborist is to:

- Mark trees for pruning, retention, removal or transplanting, with reference to approved plans and documentation.
- Specify all pruning works.
- Certify all pruning, removal and transplanting on completion of these works.
- Tree Protection: the Project arborist shall certify that all tree protection measures have been installed in compliance with the Tree Protection Plan and Specification.

THROUGHOUT THE CONSTRUCTION PROCESS.

The project arborist may be required to provide reports and/or certification to Council at the following specific hold-points/milestones:

- Completion of site establishment.

Arboricultural Impact Assessment

- Installation of services.
- Installation of footings or slabs.
- Erection of scaffolding, if required, near trees.
- Works within Tree Protection Zones.

POST- CONSTRUCTION CERTIFICATION

At completion of the defects liability period, the project arborist may be required to certify that all tree protection measures throughout the construction and landscaping works have complied with all plans, specifications, and reports prepared by the project arborist and with the Conditions as specified in Development Application approval/Notification of Determination Conditions of Consent.

8.5 Tree Protection Plans and Details

- Erection of Tree Protection Fencing to enclose a practical TPZ exclusion area for trees prior to any works on the site.
- Work in the vicinity of the retained trees will require additional care and supervision by project arborist so as not to damage the roots within the TPZ during demolition and excavation.
- Sediment control devices may be required to be installed within the on the line of the Tree Protection Fencing, to prevent runoff of construction pollutants or other sediment onto site vegetation.

8.6 Refer to Tree Location Plan TLP01 (Appendix D) for:

- location of trees, tree numbers and spot levels at the base of trees, shown on current site survey.

8.7 Refer to Proposed Works Plan - PWP01 (Appendix E) for:

- location of trees to be retained and protected, where in the vicinity of proposed building works,
- location and levels of proposed building works,
- SRZ and TPZ of trees to be retained in vicinity of proposed building works.

8.8 Pre-construction scope of works

- Prior to any construction works, the project arborist is to:
- Mark trees for pruning, retention, removal or transplanting, with reference to approved plans and documentation.
- Specify (and supervise, if required) pruning works.
- Certify all pruning and tree removal on completion of these works.
- Supervise installation of tree protection measures, and certify that all tree protection measures have been installed in compliance with the Tree Protection Plan and Specification.

PRUNING AND TREE REMOVAL

- Approved tree removal and pruning works are to be carried out before the installation of TPF and other protection measures such as may be required when scaffolding is to be installed within the TPZ.
- The project arborist shall mark trees for pruning, retention, removal or transplanting, with reference to approved plans and documentation.
- The project arborist shall supervise any pruning required and tree removal works.
- Pruning works are to be carried out as per AS4373-2007.
- Tree removal work shall not damage trees to be retained.

Arboricultural Impact Assessment

- Vehicles used for tree removal works may require limited movement within TPZs. The arborist is to supervise.
- Stumps to be removed within a TPZ must be removed so as to not damage or disturb roots of trees to be retained. The arborist is to supervise.

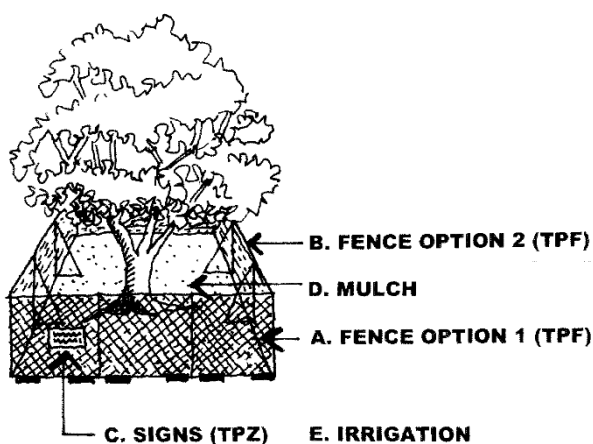
INSTALLATION OF TREE PROTECTION FENCING

- Refer to Diagrams 1 to 3 for types of fencing, and additional ground protection measures if required.
- The TPZ is a restricted area and TPF is to be installed prior to site establishment.
- The TPF is to be retained intact until works are completed.
- Permission for works within the TPZ must be sought and approved by Northern Beaches/Pittwater Council.
- These works are to be supervised by the project arborist, and any additional works that may arise during the progress of site works must be reviewed by the project arborist and be acceptable to Council before the works are carried out.
Failure to do this proactively may result in the arborist being unable to certify the works.

ACTIVITIES THAT ARE RESTRICTED FROM WITHIN THE TPZ (AS PER AS4970-2009)

- Machine excavation including trenching
- Excavation for silt fencing
- Cultivation
- Storage
- Preparation of chemicals, including preparation of cement products
- Parking of vehicles and plant
- Re-fueling
- Dumping of waste
- Wash-down and cleaning of equipment
- Lighting of fires
- Soil level changes
- Temporary or permanent installation of utilities and signs, and
- Physical damage to the tree.

Diagram 1 TREE PROTECTIVE FENCING (TPF)



A. Fence Option 1 (TPF)

1.8 metre high chain wire mesh panels with shade cloth attached if required, to be held in place with concrete blocks.

B. Fence Option 2 (TPF)

1.8 metre high plywood or wooden panel/paling fence (prevents soil or building contaminants from coming under fence when panels are laid flush to ground).

C. Signs (TPZ)

Tree Protection Zone Signs

D. Mulch

50mm to 100mm thick layer of organic mulch, or aggregate, installed across surface area of TPZ.

E. Irrigation

Irrigation to arborist's advice.

Arboricultural Impact Assessment

TREE PROTECTION MEASURES TO BE INSTALLED WHEN TPF REQUIRED TEMPORARY REMOVAL, OR WHEN FENCING MUST BE LOCATED WITHIN THE TPZ – TRUNK AND BRANCH PROTECTION

The materials and positioning of protection as shown in [Diagrams 2 and 3](#) are to be specified by the project arborist on site. A minimum of 2 metres in height is recommended. Temporary powerlines, guys and stays are not to be attached to the tree. Nails are not to be driven into the trunks or branches.

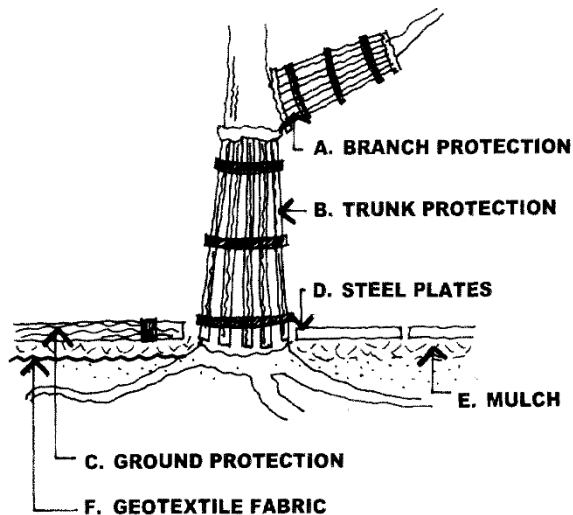


Diagram 2 TYPES OF BRANCH, TRUNK AND GROUND PROTECTION

A. Branch Protection

Prevent bark damage by use of timber boards and padding strapped to branch. (Do not use nails or screws).

B. Trunk Protection

Prevent bark damage by use of timber boards and padding for at least 2 metres above ground level. (Do not use nails or screws). Also refer to Detail Diagram 3.

C. Ground Protection

Install a suitable device eg timber rumble boards strapped together, above mulch or aggregate. The device shall be thick enough to prevent soil compaction and also to prevent compression or damage to roots.

D. Steel Plates

Steel plates (or similar, as approved by arborist) may be laid with, or without, mulch or aggregate under.

E. Mulch

Minimum 50mm thick, maximum 100mm thick, organic mulch or aggregate.

F. Geotextile fabric

Geotextile fabric laid under mulch or aggregate layer.

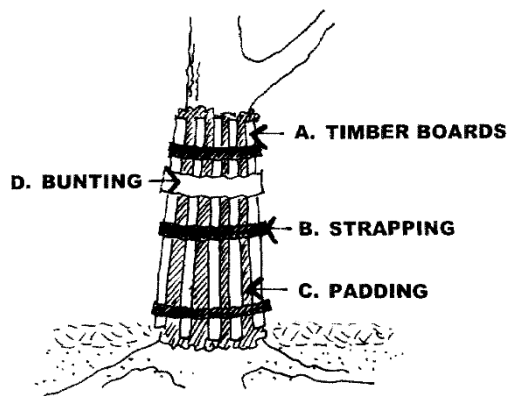


Diagram 3 DETAIL TRUNK PROTECTION

A. TIMBER BOARDS

Pine timber 3 metres x 50mm x 50mm at 150mm centres.

B. STRAPPING

Secure timber at no less than 3 locations with galvanised hoop strapping (or similar). Do not use nails or screws.

C. PADDING

Insert expansion joint padding at minimum of three points to prevent timber from touching trunk.

D. BUNTING

Secure high visibility bunting at around 2 metres above ground level for visual reinforcement.

8.9 Scope of works for tree protection during construction

GENERAL

During construction the following situations will require the arborist's input and on-site supervision. (These may be in addition to the predetermined number of site inspections that shall be agreed upon).

Arboricultural Impact Assessment

- Demolition, bulk earthworks, installation of sediment control works and drainage works near the TPZ.
- Installation of services, footings and slabs near the TPZ.
- Temporary construction work required within TPZs – ground protection, scaffolding (erection and moving).
- Hand excavation of roots at perimeter of TPZs.
- Changes arising from building works that are different to approved plans.
- Landscaping, including installation of landscape structures such as paths, walls, soil topdressing and cultivation, planting, lighting and irrigation.

GROUND PROTECTION

If temporary access for machinery is required into the TPZ, additional ground protection measures will be required (ie. in addition to mulching). Refer to [Diagram 2](#). This is to prevent root damage and soil compaction within the TPZ.

HAND EXCAVATION AND ROOT PROTECTION DURING EXCAVATION

Proposed works where inside Tree Protection Zones, must have minimal impact on root systems. Without prior investigation it is unknown if any large diameter roots are present.

Wounds shall not be treated with dressings or with paints.

Temporary protection of exposed roots may be required, to prevent drying out, by use of jute mesh or hessian sheeting laid in multiple layers over the exposed roots and soil profile, to the full depth of the root zone. This is to be pegged in place and kept moist for the duration of root zone exposure.

INSTALLING UNDERGROUND SERVICES WITHIN THE TPZ

Proposed works have been designed to reduce impacts on root systems. However without prior investigation it is unknown if any large diameter roots are present at the perimeter of, or extend past the TPZ of trees nominated for retention.

Should any large roots be found in locations where proposed services are to be laid then the work methods outlined above are to be adopted. The project arborist must be consulted.

8.10 Maintaining the TPZ

MULCHING

The area within the TPZ shall be mulched. The mulch shall be maintained to a depth of 50-100mm using material that complies with AS4454. However, the arborist may determine if mulch is required in areas where there is existing turf, gardens or mulch, and additional mulching may not be required.

WATERING

Temporary irrigation will be required in the TPZ of all site trees. This is to be maintained for the duration of construction works until final certification. The project arborist shall monitor soil water and adjust if necessary.

WEED REMOVAL

All weeds within the TPZ shall be removed by hand without soil disturbance, or shall be removed by use of species-appropriate herbicides by qualified operators.

Arboricultural Impact Assessment

8.11 Scope of works post-construction

REMOVAL OF TREE PROTECTION FENCING

TPF shall not be removed until all construction and landscaping works have been completed at Practical Completion.

DEFECTS LIABILITY PERIOD

Should any works be required during the defects liability period, such works shall not injure trees.

APPENDICES

Appendix A	Tree Assessment Schedule
Appendix B	Useful Life Expectancy (ULE) Categories
Appendix C	Methodology for Determining Tree Retention Values (STARS®)
Appendix D	Tree Location Plans - TLP01 (3 pages)
Appendix E	Proposed Works Plan - PWP01

APPENDIX A TREE ASSESSMENT SCHEDULE

Site address: 2A Ruskin Rowe, Avalon Beach, NSW

Date of assessment: 15 and 17 August 2018, and 26 November 2018

Assessed by: Selena Hannan

+ All palm heights are given as height of clear trunk only, + canopy additional

Tree No.	Botanical Name Common Name	Height (m)	Canopy spread (m) (N,E,S,W)	DBH or multi (mm)	DAB (mm)	Age	Health/Vigour	Condition	Comments	ULE	LSR	RV	TPZ (m) radius	SRZ (m) radius
1	<i>Stenocarpus sinuatus</i> Queensland Firewheel Tree	14	3,3,3,3	350	420	M	G	G	Planted rainforest native, not local. Codominant stems, included, at junction 5 m AGL. Very good vigour.	2A	H	H	4.2	2.3
2	<i>Jacaranda mimosifolia</i> Jacaranda	16	7,3,3,7	600	800	M	G	F	Exotic tree, 'exempt' species under Northern Beaches LGA. Leaning, self-corrected, minor epicormics, large flared buttress. Large diameter old wound with decay at NW, monitor.	2B	H	H/E	7.2	3.0
3	<i>Melaleuca quinquenervia</i> Broad-leaved Paperbark	7	4,2,1,3	200	280	SM	G	G	Probably planted, local native species. Somewhat suppressed form, stem bent, growing under Jacaranda canopy.	1A	M	H	2.4	1.9
4	<i>Livistona australis</i> Cabbage Tree Palm	11	5 total	300	400	M	G	G	Local native palm species – protected in Northern Beaches LGA. Leaning to East, crossing, rubbing stem with palm T5, growing at top of steep creek bank.	2B	H	H	3.5	2
5	<i>Livistona australis</i> Cabbage Tree Palm	10 stem plus canopy	5 total	250	400	M	G	G	Local native palm species – protected in Northern Beaches LGA. Crossing, rubbing stem with palm T4.	2B	H	H	3.5	2
6	<i>Magnolia grandiflora</i> cv (Little Gem?) Evergreen Magnolia cv	6	2,2,2,2	150	200	SM	F-G	G	Exotic species. Typical form, somewhat low canopy density.	5B	M	M	2	1.7
7	<i>Magnolia x soulangiana</i> Saucer Magnolia	3.5	3 total	150	150	SM	G	G	Exotic species, 'exempt' due to size.	5A	L	L/E	-	-
8	<i>Livistona australis</i> Cabbage Tree Palm	14+	5 total	300	450	M	G	G	Local native palm species – protected in Northern Beaches LGA. Located in timber deck, deck cut around stem.	1A	H	H	3.5	2

9	<i>Livistona australis</i> Cabbage Tree Palm	14+	5 total	400	550	M	G	G	Local native palm species – protected in Northern Beaches LGA. Located in timber deck, deck cut around stem.	1A	H	H	3.5	2
10	<i>Livistona australis</i> Cabbage Tree Palm	8+	5 total	300	450	M	G	F	Local native palm species – protected in Northern Beaches LGA. Leaning to East, growing at top of steep creek bank. Head appears to have self-corrected (old lean? Monitor for movement).	2B	M	M	3.5	2
11	<i>Livistona australis</i> Cabbage Tree Palm	12+	5 total	330	450	M	G	G	Local native palm species – protected in Northern Beaches LGA. Located in timber deck, deck cut around stem.	1A	H	H	3.5	2
12	<i>Livistona australis</i> Cabbage Tree Palm	13+	5 total	320	450	M	G	G	Local native palm species – protected in Northern Beaches LGA. Located close to paving at higher level around pool.	1A	H	H	3.5	2
13A & 13B	<i>Archontophoenix cunninghamiana</i> Bangalow Palm	10+	4 total	220 X 2	300 X 2	M	G	G	Planted, not local species, 'exempt' under Northern Beaches LGA. Approx 1 metre apart. Growing in clump of Golden Cane Palms. Species does not transplant well.	2B	M	M/E	3	2
14	<i>Angophora costata</i> Sydney Red Gum	20	6,6,5,6	420	480	SM	G	G	Local native species – protected in Northern Beaches LGA. Straight, smooth stem. Decking and pool pump located at base of tree. 800mm from top of boundary fence to tree.	1A	H	H	5	2.4
15	<i>Livistona australis</i> Cabbage Tree Palm	11+	5 total	320	?	M	G	G?	Local native palm species – protected in Northern Beaches LGA. Located in timber deck, deck cut around stem, base cannot be seen – close to creek bank?	1A/2B?	H	H?	3.5	2
16	<i>Cryptocarya microneura</i> Murrogun	9	5,4,4,4	450	600	M	G	G	Probably planted rainforest native specimen, not local species. Codominant stems at 3 metres AGL. Buttressed at base, lichen on stem, minor deadwood and dieback, minor sooty mould.	1B	H	H	5.4	2.7
17	<i>Livistona australis</i> Cabbage Tree Palm	14+	5 total	300	?	M	G	G?	Local native palm species – protected in Northern Beaches LGA. Located at top of creek bank, under bridge, can't see base of palm.	1A/2B?	H	H?	3.5	2
18	<i>Livistona australis</i> Cabbage Tree Palm	13+	5 total	400	550	M	G	F	Local native palm species – protected in Northern Beaches LGA. Located at	1A/2B?	H	H?	3.5	2

									top of bank adjacent to timber retaining wall. Leaning. Stem oval in section (old lean? Monitor for movement).					
19	<i>Livistona australis</i> Cabbage Tree Palm	13+	5 total	320	550	M	G	F	Local native palm species – protected in Northern Beaches LGA. Some erosion of bank under root ball, located at top of creek bank. Not leaning.	1B	H	H	3.5	2
20	<i>Corymbia gummifera</i> Red Bloodwood	20	5,4,4,3	480	670	M	F	F	Local native species – protected in Northern Beaches LGA. Sparse foliage and small leaves, high canopy (branching starts at 9 metres AGL). Appears somewhat stressed (drought?), with 20% small tip dieback, epicormics throughout, some large deadwood present.	2A/2D	H	H	5.8	2.8
21	<i>Livistona australis</i> Cabbage Tree Palm	8+	5 total	350	500	M	G	G	Local native palm species – protected in Northern Beaches LGA.	1A	H	H	3.5	2
22	<i>Eucalyptus botryoides</i> Bangalay	18	3,3,3,4	400	480	M	F	F	Local native species – protected in Northern Beaches LGA. Stem bent, leaning to East at 30 degrees, no sign of recent soil movement. Minor epicormics on stem and scaffold branches.	2B	H	H	4.8	2.4
23	<i>Livistona australis</i> Cabbage Tree Palm	12+	5 total	350	600	M	G	G	Local native palm species – protected in Northern Beaches LGA. Slight sweep in stem at base.	1A	H	H	3.5	2
25	<i>Eucalyptus robusta</i> Swamp Mahogany	20	5,5,4,8	670	950	LM	G	P	Local native species – protected in Northern Beaches LGA. Arboreal termite nest at 7 metres AGL, indicating presence of cavities in the area of the stem and major branch junction. Multi-stemmed from 7 m AGL. Climbing arborist to investigate the structural integrity in this area. 10% dieback, good vigour generally, some large diameter deadwood present. Tapping indicates some decay in large diameter surface roots (old mechanical damage) heading to East. Form somewhat suppressed by Tree 24 (Tree 24 was struck by lightning and removed in 2018).	4?	H	L?	8	3.2

26	<i>Schinus areira</i> Peppercorn	9	5,3,3,4	200, 250	400	EM	P	P-F	Exotic species. Codominant stems at 1.5 metres AGL. Extensive dieback and deadwood, white wax scale infestation, epicormics on stem at base. Stem on south side from base very 'drummy' when tapped.	3B	M	L	3.8	2.3
27	<i>Livistona australis</i> Cabbage Tree Palm	13+	5 total	350	600	M	G	G	Local native palm species – protected in Northern Beaches LGA. Located on top of steep creek bank.	1A	H	H	3.5	2
28	<i>Livistona australis</i> Cabbage Tree Palm	13+	5 total	350	600	M	G	F?	Local native palm species – protected in Northern Beaches LGA. Leaning at 45 degrees, located near base of creek bank..	2B	M	M	3.5	2
29	<i>Livistona australis</i> Cabbage Tree Palm	17+	4 total	350	600?	M	F	F	Local native palm species – protected in Northern Beaches LGA. Located half way down steep bank, with root ball undermined and exposed. May possibly be destabilised if adjacent stump removed – keep stump.	2D	M	M	3	2
STREET TREES – RUSKIN ROWE														
A	<i>Syzygium australe</i> cv. Brush Cherry	4.5	3	40 x 3	150	M	G	G	Native cultivar, not local species. Codominant at ground level shrub form.	5	L	L		
B	<i>Viburnum odoratissimum</i> Glossy Viburnum	2	1	40	60	I	G	G	Exotic species.	5	L	L		
C	<i>Dypsis lutescens</i> Golden Cane Palm	4.5	2	50 x 6	350	SM	F	F	Exotic clumping palm, somewhat environmentally stressed.	5	L	L		
D	<i>unidentified</i>	2.5	1.5	multi	100	I	G	G	Psyllid.	5	L	L		
E	<i>Viburnum odoratissimum</i> Glossy Viburnum	4	1	40	50	I	G	G	Exotic species.	5	L	L		
F	<i>Schinus areira</i> Peppercorn	4	2	130	200	I	P	P	Exotic species, lopped at 2.5metres, epicormic growth from this point.	5	L	L		
G	<i>Viburnum odoratissimum</i> Glossy Viburnum	4	2	30 x 2 20 x 2	100	I	G	F	Exotic species. Rangy growth.	5	L	L		
H	<i>Callistemon viminalis</i> Weeping Bottlebrush	7	5	140, 120, 120,	300	M	G	F-G	Native, not local species. Pruned for powerline clearance. Co-dominant at 400mm AGL.	3B	M	M		
I	<i>Callistemon viminalis</i> Weeping Bottlebrush	7	3	100 x 4	350	M	F	F	Native, not local species. Suppressed form. Co-dominant from base. Located on top of embankment	3B	M	M		

APPENDIX A continued.

Key and explanation of table categories, and common abbreviations

Height is the approximate height of the tree in metres, from base of stem to top of crown (Note: Height of palms is measured to top of stem and shaft, not including leaves).

Canopy Spread is the approximate length in metres of the branches/canopy of the tree, measured from the stem/trunk to North, South, East and West.

DBH (in millimetres) is the approximate Diameter of tree stem/s (trunk) measured at Breast Height ie. at 1.4 metres above ground level, unless noted otherwise.

DAB (in millimetres) is the approximate Diameter at the Base of the tree, measured just above the root buttress.

Age classes: I is immature, EM is Early Mature, M is Mature, LM is Late Mature, OM is Over Mature, D is Dead.

Health is classed as P Poor, F Fair, G Good. Tree vigour is an indication of health. Assessment includes crown density, leaf colour, pest and disease presence/resilience, dieback amount and type.

Condition is classed as P Poor, F Fair, G Good. A tree may be in good health but have poor condition due to structural defects such as weak branch/stem junctions, cavities, cracks, signs of root plate failure etc. The tree's environment (proximity to other trees, soil types and profiles, water supply, aspect and topography) may modify its form and growth habit, and its condition.

ULE Useful Life Expectancy – Barrell. Refer to Appendix B for detail of categories.

LSR Landscape Significance Rating, of High, Medium and Low, based on IACA SIGNIFICANCE OF A TREE - ASSESSMENT RATING SYSTEM (STARS)© (IACA2010) ©. This rating system utilises structured qualitative criteria to assist in determining the retention value for a tree.

RV Retention Value, of High, Medium, Low, or Removal, is based on Useful Life Expectancy and Landscape Significance, as derived from the matrix of IACA SIGNIFICANCE OF A TREE - ASSESSMENT RATING SYSTEM (STARS)© (IACA2010) ©

E 'Exempt' species under Council's tree management order or policies.

TPZ Tree Protection Zone, expressed as a radial distance in metres, measured from the centre of the tree. It is defined in the Australian Standard *Protection of Trees on Development Sites*, AS 4970-2009 as 'a specified area above and below ground and at a given distance from the trunk set aside for the protection of a tree's roots and crown to provide for the viability and stability of a tree to be retained where it is potentially subject to damage by development'.

SRZ Structural Root Zone, expressed as a radial distance in metres, measured from the centre of the tree. It is defined in the Australian Standard *Protection of Trees on Development Sites*, AS 4970-2009 as 'the area around the base of a tree required for a tree's stability in the ground. The woody growth and soil cohesion in this area are necessary to hold the tree upright. The SRZ is nominally circular with the trunk at its centre and is expressed by its radius in metres. This zone considers a tree's structural stability only, not the root zone required for a tree's vigour and long-term viability, which will usually be a much larger area'.

AGL Above Ground Level (distance)

LGA Local Government Area

N (North), **S** (South), **E** (East), **W** (West)

APPENDIX B ULE

USEFUL LIFE EXPECTANCY (ULE) CATEGORIES (after Barrell, updated 01/04/01)

- 1 Long ULE:** Trees that appeared to be retainable at the time of assessment for **more than 40 years** with an acceptable level of risk, assuming reasonable maintenance:
 - A** Structurally sound trees located in positions that can accommodate future growth.
 - B** Trees that could be made suitable for retention in the long term by remedial tree care.
 - C** Trees of special significance for historical, commemorative or rarity reasons that would warrant extraordinary efforts to secure their long term retention.

- 2 Medium ULE:** Trees that appeared to be retainable at the time of assessment for **15–40 years** with an acceptable level of risk, assuming reasonable maintenance:
 - A** Trees that may only live between 15 and 40 more years.
 - B** Trees that could live for more than 40 years but may be removed for safety or nuisance reasons.
 - C** Trees that could live for more than 40 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting.
 - D** Trees that could be made suitable for retention in the medium term by remedial tree care.

- 3 Short ULE:** Trees that appeared to be retainable at the time of assessment for **5–15 years** with an acceptable level of risk, assuming reasonable maintenance:
 - A** Trees that may only live between 5 and 15 more years.
 - B** Trees that could live for more than 15 years but may be removed for safety or nuisance reasons.
 - C** Trees that could live for more than 15 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting.
 - D** Trees that require substantial remedial tree care and are only suitable for retention in the short term.

- 4 Remove:** Trees that should be removed **within the next 5 years**.
 - A** Dead, dying, suppressed or declining trees because of disease or inhospitable conditions.
 - B** Dangerous trees because of instability or recent loss of adjacent trees.
 - C** Dangerous trees because of structural defects including cavities, decay, included bark, wounds or poor form.
 - D** Damaged trees that are clearly not safe to retain.
 - E** Trees that could live for more than 5 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting.
 - F** Trees that are damaging or may cause damage to existing structures within 5 years.
 - G** Trees that will become dangerous after removal of other trees for the reasons given in A to F.
 - H** Trees in categories (a) to (g) that have a high wildlife habitat value and, with appropriate treatment, could be retained subject to regular review.

- 5 Small, young or regularly pruned:** Trees that can be reliably moved or replaced.
 - A** Small trees less than 5m in height.
 - B** Young trees less than 15 years old but over 5m in height.
 - C** Formal hedges and trees intended for regular pruning to artificially control growth.

APPENDIX C METHODOLOGY FOR DETERMINING TREE RETENTION VALUES

IACA SIGNIFICANCE OF A TREE - ASSESSMENT RATING SYSTEM (STARS) © (IACA2010) ©

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 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

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.

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.

TABLE 1.0 TREE RETENTION VALUE - PRIORITY MATRIX

		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.

USE OF THIS DOCUMENT AND REFERENCING

The IACA Significance of a Tree, Assessment Rating System (STARS) is free to use, but only in its entirety and must be cited as follows:

IACA, 2010, IACA Significance of a Tree, Assessment Rating System (STARS), Institute of Australian Consulting Arboriculturists, Australia, www.iaca.org.au

REFERENCES

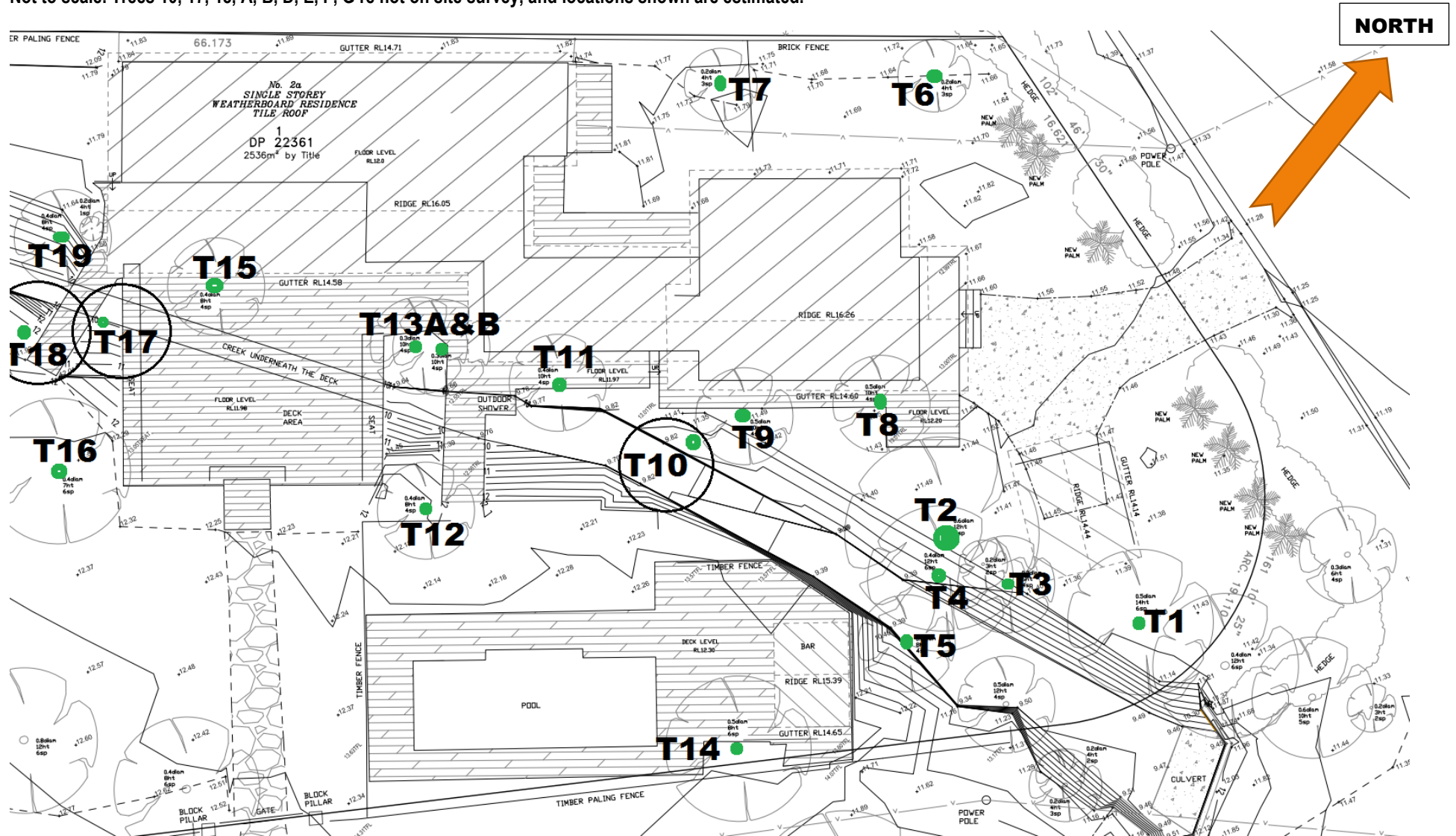
Australia ICOMOS Inc. 1999, The Burra Charter - The Australian ICOMOS Charter for Places of Cultural Significance, International Council of Monuments and Sites, www.icomos.org/australia

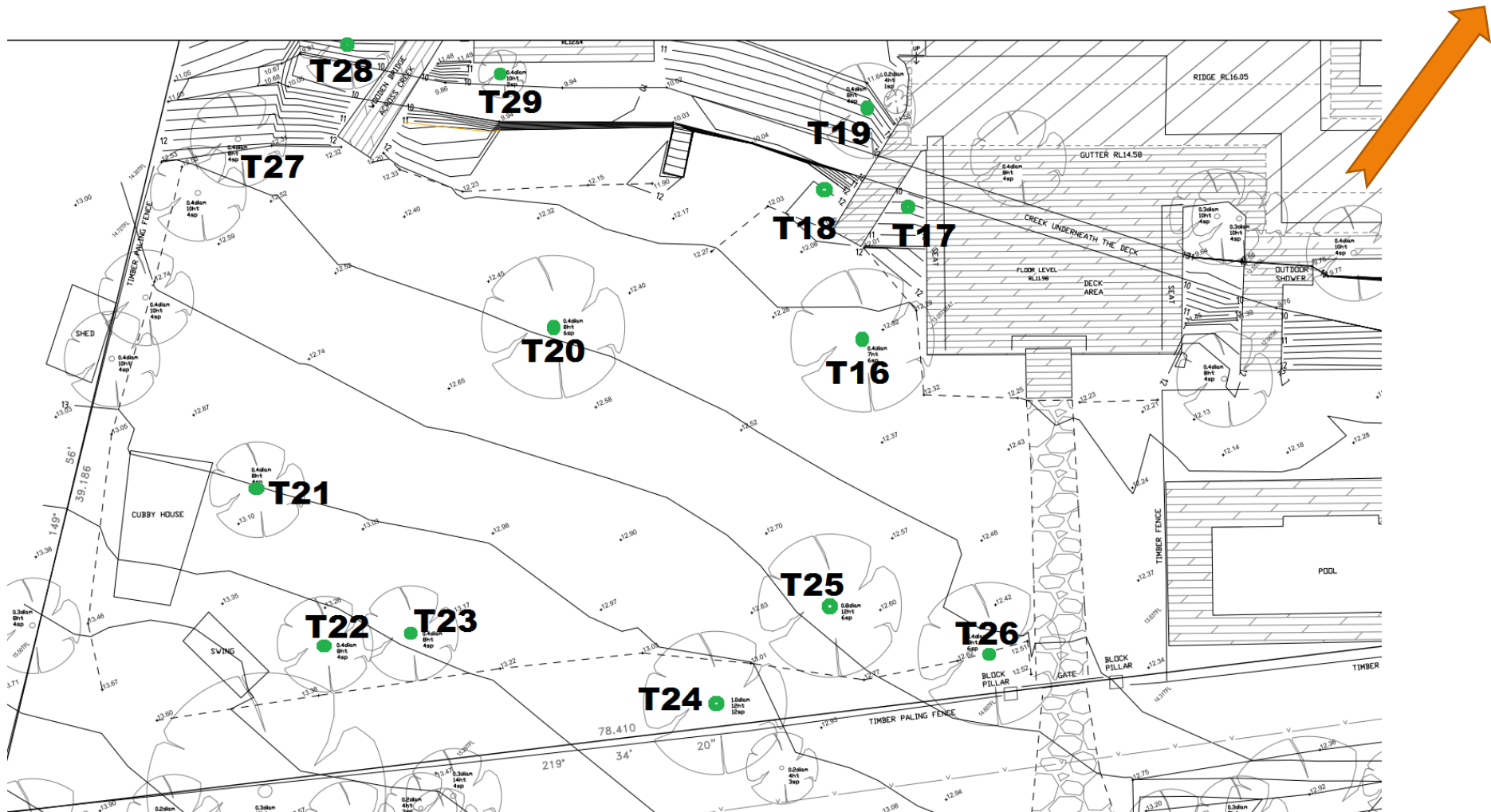
Draper BD and Richards PA 2009, Dictionary for Managing Trees in Urban Environments, Institute of Australian Consulting Arboriculturists (IACA), CSIRO Publishing, Collingwood, Victoria, Australia.

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

APPENDIX D TREE LOCATION PLANS -TLP01

Not to scale. Trees 10, 17, 18, A, B, D, E, F, G re not on site survey, and locations shown are estimated.





Cabbage Tree Palms, **Trees 9,10,11,15,17,18,19,27,28 and 29**, are all located within creek stabilisation areas. The works are to be carried out with revetment mattress on existing grades within the TPZs of these palms. This is to prevent an impact in the root zones which may kill or destabilise the trees. All of these trees have a 3.5 metre Tree Protection Zone (TPZ) measured as a radius from the centre of the trees. Any piercing for new decks shall be outside the SRZ of trees, 2 metre radius for each.

