URBAN FORESTRY AUSTRALIA

TREE MANAGEMENT CONSULTING ARBORICULTURISTS

TREE PROTECTION PLAN

–INCLUDING NEW DRIVEWAY IMPACT ASSESSMENT–

for

Eric Sanderson
C/- CMS Surveyors Pty Ltd
2/99A South Creek Road, Dee Why, NSW

SITE ADDRESS

31 BELLARA AVENUE
NORTH NARRABEEN

SEPTEMBER 2019

Prepared by
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1 INTRODUCTION

1.1 This Driveway Arboricultural Impact Assessment (AIA) and Tree Protection Plan (TPP) for the proposed subdivision of 31 Bellara Avenue, North Narrabeen ('the site') was commissioned by Mr. Eric Sanderson, owner of the site.

1.2 This TPP addresses a request for its preparation following discussions with Northern Beaches Council's landscape and tree officers at a section 34 conciliation conference held at the Dee Why Council offices on 22 August 2019:

1.3 The reader is directed to refer to previous reports prepared for this matter, including the original Preliminary Tree Assessment by Owen Tebbutt (which provides a species and tree numbers breakdown) and the Arboricultural Opinion by Catriona Mackenzie, which provided a detailed Arboricultural Impact Assessment of the proposal, including a proposed driveway handle and apron in the site. These two reports assist in the understanding of the tree assets on the site and the process whereby the latest plans and this current report have responded to Council's request for additional information.

1.5 Subsequent to the discussion at the S 34 conciliation hearing, amended driveway and stormwater plans have been provided. It is these new plans that form the basis of this current AIA and Tree Protection Plan, which are prepared to also address tree retention and minimising tree impacts on the site.

1.6 Plans and Documents Reviewed

2.1.1 Plans and documents referenced for the preparation of this report include:

- Survey Plan of Proposed Subdivision, Issue 4, prepared by CMS Surveyors, dated 25 March 2019.
- Plans 1 – 6, by Raise the Roof, dated 16 April 2019
- Structural Details Sheet-5/B by Taylor Consulting, dated 16 September 2019
- Stormwater Subdivision Concept Plan Sheet-1/G by Taylor Consulting, dated 16 September 2019.
- Preliminary Tree Assessment prepared by Owen Tebbutt of Plateau Tree Services ('Tree Report'), dated 27 June 2018
- Arboricultural Comment by Owen Tebbutt of Plateau Trees, dated 19 July 2018
- Arboricultural Opinion by Catriona Mackenzie dated 28 July 2019.
- Australian Standard 4970-2009 Protection of trees on development sites (AS4970)

2 DRIVEWAY IMPACT ANALYSIS

2.1 Potential Driveway Impacts on Trees Proposed for Retention

2.1.1 Under the Australian Standard 4970-2009 *Protection of trees on development sites* (AS4970), encroachments less than 10% of the *Tree Protection Zone* (TPZ) are considered to be minor. No specifications are provided in AS4970 for potential impacts of 10% or greater. This 10% is interpreted as the threshold figure, and the trigger where arboricultural investigations into TPZ encroachments beyond this figure need to be considered.

2.1.2 The potential extent of root zone impacts to protected trees to be retained can be generally rated using the *Impact Level Rating* ("ILR") Table 1, below.

Table 1: *Guideline to the rating of impacts on trees to be retained.*
Based on discussions with executive members of the Institute of Australian Consulting Arboriculturists.

IMPACT LEVEL RATING	
0	0 – 0.9% of root zone impacted – **no** impact of significance
L	1 to 10% of root zone impacted – **low** (minor) level of impact
L - M	>10 to 15% of root zone impacted – **low** (minor) **to moderate** level of impact
M	>15 to 20% of root zone impacted – **moderate** level of impact
M – H	>20 to 25% of root zone impacted – **moderate to high** level of impact
H	>25 to 35% of root zone impacted – **high** level of impact
S	>35% of root zone impacted – **significant** level of impact

2.1.3 Trees 26, 27, 29, 31, 38, 39, 40, 42 and 43 were assessed regarding the potential for TPZ encroachment resulting from the proposed new driveway and turning head in the site.

2.1.4 Reference should be made to the Tree Plan at Appendix C of the Arboricultural Opinion by Catriona Mackenzie 28 July 2019 (the July 2019 Report) for the site locations of these trees and the Owen Tebbutt Preliminary Tree Assessment June 2018 (the June 2018 Report) for the tree details (e.g. tree heights, spreads, DBH's, health and condition, etc).

2.1.5 Disturbance within the *Structural Root Zone* (SRZ), and extent of encroachments into the TPZ's of protected site trees to be retained are summarised in Table 2, below.

Table 2: *Estimated encroachments into the SRZ and TPZ of trees proposed for retention*.
Note 1: These figures are based on the *notional* SRZ and TPZ's offsets of the trees as calculated under AS4970 and do not necessarily reflect the actual root zones of the trees. Existing at or below ground structures, site topography and soil hydrology will influence the presence, spread and direction of tree root growth.

Tree No.	Tree	Tree located on site	SRZ affected	TPZ area (m^2)	TPZ encroachment (approx. m^2)	TPZ encroachment (approx. %)	ILR
26	Smooth-barked Apple	✕	✕	72	4.05	5.6	L
27	Smooth-barked Apple	✓	✕	72	7.5	10.4	L-M
31	Smooth-barked Apple	✕	✕	41	1.62	<4	L
38	Turpentine	✓	✕	28	1.83	6.5	L
40	*Eucalyptus* sp.	✓	✕	137	15.2	11.1	L-M
42	Cheese Tree	✓	possible	28	1.2	4.2	L
43	Grey Ironbark	✓	✕	92	8.0	8.7	L

2.1.6 **Tree 29**—*Myrsine howittiana* syn. *Rapanea howittiana* (Brush Muttonwood)

The proposed lower ground floor roofline of the indicative dwelling footprint extends to the trunk of this High Retention Value tree. It is unlikely this tree could be successfully retained for the long term due to probable trunk and roof contact causing damage to each structure. Redesigning the roofline creates an issue with built from and functionality. However, I would suggest the retention of this tree should be considered if set-out of the building prior to construction confirms it could be retained without future conflict with the building. This is preferable to removal at this stage, given the trunk position on the survey at ground level does not necessarily reflect the actual trunk position above ground level.

2.1.7 **Tree 39**—*Allocasuarina littoralis* (Black She-oak)

This tree stands in the footprint of the proposed turning head in the site. The tree is in very poor condition and of Low Retention Value, with a poor prognosis as a long-term, safe amenity tree. It should not be considered a material constraint to the construction of the driveway and turning head.

2.1.8 **Tree 26**—*Angophora costata* (Smooth-barked Apple) located on adjoining property.

Structural Root Zone impacts:

- Excavation for the proposed turning head retaining wall, including a 500mm disturbance/over-excavation allowance, would be approximately 3.4m from the centre of the tree. This is approximately 1m outside the tree's SRZ.
- Given the tree has limited opportunity for root spread to the west where the neighbour's existing retaining wall is located, allowance for roots to potentially extend beyond the notional SRZ radius must be acknowledged.
- However, it is generally more likely that these roots will be located upslope of the tree and not in the direction of the proposed wall. In any event, an arboriculturist must be present to supervise the excavation works within 5m of the tree.

Tree Protection Zone impacts:

- Approximately 5.6% (low level) of TPZ encroachment is estimated for the tree, which includes the 500mm wide disturbance/over-excavation allowance.
- Following wall construction, a relatively unobstructed, contiguous soil area of approximately 2.22m^2 or 3.0% of the 5.6% affected TPZ area is regained and available for root generation and occupation.
- Overall, the estimated TPZ encroachment is supportable from an arboricultural perspective.

Pruning impacts:

- Pruning of the tree is not required.

2.1.9 **Tree 27**—Smooth-barked Apple located on site.

Structural Root Zone impacts:

- Excavation for the proposed driveway retaining wall, including a 500mm disturbance/over-excavation allowance, would be approximately 2.8m from the centre of the tree. This is approximately 500mm outside the tree's notional SRZ.

- An arboriculturist must be present to supervise the excavation works within 5m of the tree.

Tree Protection Zone impacts:

- Approximately 10.4% (low to moderate level) of TPZ encroachment is estimated for the tree, which includes the 500mm wide disturbance/over-excavation allowance.
- Following wall construction, an unobstructed, contiguous soil area of approximately 3.35m^2 or 4.6% of the 10.4% affected TPZ area is regained and available for root generation and occupation.
- Overall, the estimated TPZ encroachment is supportable from an arboricultural perspective.

Pruning impacts:

- Pruning of the tree is not required.

2.1.10 **Tree 31**—Smooth-barked Apple located on adjoining property.

Structural Root Zone impacts:

- Excavation for the proposed driveway retaining wall, including a 500mm disturbance/over-excavation allowance, would be approximately 2.9m from the centre of the tree. This is approximately 900m outside the tree's notional SRZ.
- An arboriculturist must be present to supervise the excavation works within 4m of the tree.

Tree Protection Zone impacts:

- Less than 4% (low level) of TPZ encroachment is estimated for the tree, which includes the 500mm wide disturbance/over-excavation allowance.
- Following wall construction, almost the entire affected TPZ area is regained and available for root generation and occupation.
- Overall, the estimated TPZ encroachment is supportable from an arboricultural perspective.

Pruning impacts:

- Pruning of the tree is not required.

2.1.11 **Tree 38**—*Syncarpia glomulifera* (Turpentine) located on site.

Structural Root Zone impacts:

- Excavation for the proposed driveway retaining wall, including a 500mm disturbance/over-excavation allowance, would be approximately 2.3m from the centre of the tree. This is approximately 300mm outside the tree's notional SRZ.
- An arboriculturist must be present to supervise the excavation works within 3m of the tree.

Tree Protection Zone impacts:

- Approximately 6.5% (low level) of TPZ encroachment is estimated for the tree, which includes the 500mm wide disturbance/over-excavation allowance.

- Following wall construction, a relatively unobstructed and contiguous soil area of approximately 1.72m^2 or 6.1% of the 6.5% affected TPZ area is regained and available for root generation and occupation.
- Overall, the estimated TPZ encroachment is supportable from an arboricultural perspective.

Pruning impacts:

- Pruning of the tree is not required.

2.1.12 **Tree 40**—*Eucalyptus* species located on site.

Structural Root Zone impacts:

- Excavation for the proposed driveway retaining wall, including a 500mm disturbance/over-excavation allowance, would be approximately 4.1m from the centre of the tree. This is approximately 1.4m outside the tree's SRZ.
- An arboriculturist must be present to supervise the excavation works within 6m of the tree.

Tree Protection Zone impacts:

- Approximately 11.1% (low to moderate level) of TPZ encroachment is estimated for the tree, which includes the 500mm wide disturbance/over-excavation allowance.
- Following wall construction an unobstructed, contiguous soil area of approximately 4.9m^2 or 3.5% of the 11.1% affected TPZ area is regained and available for root generation and occupation, and the estimated TPZ encroachment is supportable from an arboricultural perspective.

Pruning impacts:

- Pruning of the tree is not required.

2.1.13 **Tree 42**—*Glochidion ferdinandi* (Cheese Tree) located on site.

Structural Root Zone impacts:

- Excavation for the proposed turning head retaining wall, including a 500mm disturbance/over-excavation allowance, would be approximately 1.85m from the centre of the tree and at the edge of the tree's notional SRZ.
- Whilst it is possible to encounter roots at this offset, the encroachment would occur in the disturbance area where action can be taken to minimise or avoid root cutting.
- An arboriculturist must be present to supervise the excavation works within 3m of the tree.

Tree Protection Zone impacts:

- Approximately 4.2% (low level) of TPZ encroachment is estimated for the tree, which includes the 500mm wide disturbance/over-excavation allowance.
- Following wall construction, an unobstructed, contiguous soil area of approximately 1.0m^2 or 3.5% of the 4.2% affected TPZ area is regained and available for root generation and occupation.
- Overall, the estimated TPZ encroachment is supportable from an arboricultural perspective.

Pruning impacts:

- Pruning of the tree is not required.

2.1.14 **Tree 43**—*Eucalyptus paniculata* (Grey Ironbark) located on site.

Structural Root Zone impacts:

- Excavation for the proposed turning head retaining wall, including a 500mm disturbance/over-excavation allowance, would be approximately 3.1m from the centre of the tree. This is approximately 650mm outside the tree's notional SRZ.
- An arboriculturist must be present to supervise the excavation works within 5m of the tree.

Tree Protection Zone impacts:

- Approximately 8.7% (low level) of TPZ encroachment is estimated for the tree, which includes the 500mm wide disturbance/over-excavation allowance.
- Following wall construction an unobstructed, contiguous soil area of approximately 3.0m^2 or 3.2% of the 8.7% affected TPZ area is regained and available for root generation and occupation.
- Overall, the estimated TPZ encroachment is supportable from an arboricultural perspective.

Pruning impacts:

- Pruning of the tree is not required.

2.1.15 The proposed stormwater plan includes two rainwater storage tanks on the west side of the building footprint and outside the recommended tree protection fencing alignment. The tanks will be well clear of the Tree Protection Zone (TPZ) of adjacent trees 25 and 26.

- The dwelling roof drainage lines will be entirely within the building footprint of the drain to the rainwater tanks without affecting trees.
- Overflow drainage to the street from the tanks will not affect trees to be retained.
- The proposed inlet pit and grated drain trench will not affect trees.

2.2 Adjusted Proposed Trees Removal and Trees Retained Count

2..2.1 The following table is amended to reflect the proposed tree removals and tree retention count, following review of the proposed driveway and turning head. The July 2019 Report indicated eighteen (18) trees would be removed. This current document (Tree Protection Plan and Driveway Impact Assessment) provides an updated tree removal count of nineteen (19) trees, with one possible additional tree (Tree 29).

2.2.2 It should be noted that removal of Tree 29 (Brush Muttonwood) is quite possible, but it is my opinion the tree should be retained if at all possible. Building set-out will confirm whether the tree may be retained – there are minor root zone impacts, but the actual position of the tree's above ground stem and crown parts may not reflect the plotted position on the survey.

Table 3: *Proposed tree removal and retention table.*

Retention Value	Tree No	Trees proposed to be removed
Low	1, 2, 3, 4, 5, 6, 7, 8,10, 17, 19, 23, 24, 33, 36, 39, 48, 52, 56 (19 trees)	7, 8, 10, 19, 23, 33, 34, 39 (8 trees)
Medium	9, 12, 13, 14, 15, 20, 22, 28, 30, 36, 37, 40, 41, 42, 43, 44, 45, 46, 49, 50, 51, 53, 54, 55 (24 trees)	9, 12, 13, 14, 20, 22, 30, 36, 37 (9 trees)
High	11, 16, 18, 26, 27, 29, 31, 35, 38, 43 (10 trees)	35 (1 tree)
Palms	21, 32, 47 (3 palms)	32 (1 palm)

2.2.3 Refer to adjusted Tree Protection Plans, Appendix C, which illustrate those trees to be removed and those to be retained.

3 TREE PROTECTION MEASURES—INFORMATIVE

3.1 General

3.1.1 Tree protection measures include a range of activities and structures. Structures may be used to identify and isolate the TPZ. These measures are usually identified in the arboricultural impact assessment (AIA) and tree protection plan (TPP).

3.1.2 The TPZ is a restricted area usually delineated by protective fencing (or use of an existing structure such as an existing fence or wall). It is installed prior to site establishment and retained intact until completion of the works.

3.1.3 Some works and activities within the TPZ may be authorised by the determining authority. These must be supervised by the project arborist. Any additional encroachment that becomes necessary as the site works progress must be reviewed by the project arborist and be acceptable to the determining authority before being carried out.

3.1.4 Approved tree removal and pruning should be carried out before the installation of tree protection measures.

3.2 Restricted Activities within the TPZ

3.2.1 The area within the Tree Protection Zone (TPZ) shall exclude the following activities, unless otherwise approved by authority consent:

- Changes to existing soil levels (cut or fill), including excavations and trenching, soil stripping or cultivation;
- Machinery used for removal of vegetation;
- Movement of natural rock or altering natural watercourses;
- Storage of equipment, material, site sheds, and parking of vehicles and plant;
- Affixing of signage, cables, hooks or hoardings to a tree;
- Location and/or installation of services;
- Preparation or wash-down of building materials, refueling, dumping of waste, mixing or disposal of any building materials or chemicals;
- Lighting of fires, and
- Any other works that may cause damage to trees.

3.3 Tree Protection Devices

3.3.1 Protective fencing

Fencing should be erected before any machinery or materials are brought onto the site and before the commencement of works including demolition.
Once erected, protective fencing must not be removed or altered without approval by the project arborist. The TPZ should be secured to restrict access.
AS 4687 specifies applicable fencing requirements. Shade cloth or similar should be attached to reduce the transport of dust, other particulate matter and liquids into the protected area.

Fence posts and supports should have a diameter greater than 20mm and be located clear of roots. Existing perimeter fencing and other structures may be suitable as part of the protective fencing.
Appendix B illustrates some examples of protective fencing.

3.3.2 Trunk and branch protection

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

3.3.3 Ground protection

If temporary access for machinery is required within the TPZ ground protection measures will be required. The purpose of ground protection is to prevent root damage and soil compaction within the TPZ. Measures may include a permeable membrane such as geotextile fabric beneath a layer of mulch or crushed rock below rumble boards as per Figures 1, 2 and 3, Appendix B.
These measures may be applied to root zones beyond the TPZ.

3.3.4 Signage

Signs identifying the TPZ should be placed around the edge of the TPZ and be clearly visible from within the development site. The lettering on the sign should comply with AS 1319-1994 Safety *signs for the occupational environment*.
Appendix B provides an example of a suitable TPZ sign.

3.4 Minimising Impacts on Trees to Be Retained

3.4.1 Root protection

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

- If the grade is to be raised the material should be coarser or more porous than the underlying material. Depth and compaction should be minimised.
- Manual excavation should be carried out under the supervision of the project arborist to identify roots critical to tree stability. Relocation or redesign of works may be required.
- Where the project arborist identifies roots to be pruned within or at the outer edge of the TPZ, they should be pruned with a final cut to undamaged wood. Pruning cuts should be made with sharp tools such as secateurs, pruners, handsaws or chainsaws. Pruning wounds should not be treated with dressings or paints.
- It is not acceptable for roots within the Tree Protection Zone (TPZ) to be 'pruned' with machinery such as backhoes or excavators.

- Where roots within the TPZ are exposed by excavation, temporary root protection should be installed to prevent them drying out. This may include jute mesh or hessian sheeting as multiple layers over exposed roots and excavated soil profile, extending to the full depth of the root zone. Root protection sheeting should be pegged in place and kept moist during the period that the root zone is exposed.
- Other excavation works in proximity to trees, including landscape works such as paving, irrigation and planting can adversely affect root systems. Seek advice from the project arborist.

3.4.2 Installing underground services within TPZ

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

3.4.3 Scaffolding

- Where scaffolding is required it should be erected outside the TPZ. Where it is essential for scaffolding to be erected within the TPZ, branch removal should be minimized. This can be achieved by designing scaffolding to avoid branches or tying back branches.
- Where pruning is unavoidable it must be specified by the project arborist in accordance with AS 4373. NOTE: Pruning works may require approval by determining authority.
- Ground below the scaffolding should be protected by boarding (e.g. scaffold board or plywood sheeting) as shown in Figures 1 and 2, Appendix B. Where access is required, a board walk or other surface material should be installed to minimise soil compaction. Boarding should be placed over a layer of mulch and impervious sheeting to prevent soil contamination. The boarding should be left in place until the scaffolding is removed.

3.4.4 Fill Material

- Placement of fill material within the TPZ of trees to be retained should be avoided where possible. Where placement of fill cannot be avoided, the material should be a coarse, gap graded material such as 20 — 50mm crushed basalt or equivalent to provide some aeration to the root zone. Note that roadbase or crushed sandstone or other material containing a high percentage of fines is unacceptable for this purpose.
- No fill greater than 100mm depth is acceptable in a TPZ. Fill must be of a coarser texture and structure than the underlying natural soil to prevent development of long term perched water.
- The fill material should be consolidated with a non-vibrating roller to minimise compaction of the underlying soil.
- No fill material should be placed in direct contact with the trunk.

3.4.5 Fencing and walls within the SRZ and TPZ of retained trees.

- Where fencing and/or masonry walls are to be constructed along site boundaries, they must avoid damage to any living woody tree roots greater than 30mm diameter.
- It may be acceptable to delete continuous concrete strip footings and replace with suspended in-fill panels (e.g. steel or timber pickets, lattice etc) fixed to pillars.
- Hand digging must occur within the SRZ of trees to be retained, or as advised by the Project Arboriculturist.

3.4.6 Pavements

- Pavements should be avoided within the TPZ of trees to be retained where possible.
- Proposed paved areas within the TPZ of trees to be retained should be placed above grade to minimise excavations within root zone and avoid root severance and damage.

3.4.7 Landscaping within tree root zones.

- Ripping or cultivation of sub-grade within the TPZ of trees to be retained is not permitted (i.e. do not follow landscape plan recommendations to rip or cultivate near trees).
- The level of introduced planting media into any proposed landscaped areas within the TPZ is not to be greater than 75–100mm depth, and be of a coarse, sandy material to avoid development of soil layers that may impede water infiltration.
- Container size of proposed plants within the SRZ of trees should be determined prior to purchase of plants. This is to identify planting locations, and container size of plants at the time of planting. Otherwise, any proposed landscaping within the SRZ must consist of tubestock only.
- Mattocks and similar digging instruments must not be used within the TPZ of the trees. Planting holes should be dug carefully by hand with a garden trowel, or similar small tool.
- Where possible, do not plant canopy trees beneath/within 6 - 8m of overhead power lines.

3.4.8 Stockpiling and location of site sheds

- It is advised if stockpiling within the TPZ of trees to be retained is unavoidable, the proposed stockpile location must be covered with thick, coarse mulch, placement of wooden pallets over the mulch, covering of those pallets with a tarpaulin (or similar), and the placement of the stockpile materials on top of this device (this is intended to prevent compaction and contamination of underlying soil with introduced materials).

3.4.9 Maintaining the Tree Protection Zone

- Mulching - The area within the TPZ should be mulched. The mulch must be maintained to a depth of 50–100 mm using material that complies with AS 4454. Where the existing landscape within the TPZ is to remain unaltered (e.g. garden beds or turf) mulch may not be required.
- Watering - Soil moisture levels should be regularly monitored by the project arborist. Temporary irrigation or watering may be required within the TPZ. An above-ground irrigation system should be installed and maintained by a competent individual.
- Weed removal - All weeds should be removed by hand without soil disturbance or should be controlled with appropriate use of herbicide.

4 TREE PROTECTION MEASURES—SITE SPECIFIC

4.1 PRE-DEMOLITION / PRE-CONSTRUCTION

4.1.1 **Project Arboriculturist**
An arboriculturist with a minimum Australian Qualification Framework Level 5 (AQF5) in arboriculture is to be retained as the project arboriculturist.

4.1.2 **Tree Protection Plan (TPP)**
The approved tree protection plan must be available onsite prior to the commencement of and during works. The tree protection plan will identify key stages where monitoring and certification will be required.

4.1.3 All tree protection fencing and other protection devices for trees to be retained are to be in place in accordance with the TPP and authority consent and confirmed as such in writing by the project arboriculturist, prior to any works, including site clearing, commencing.

4.1.4 **Pre-commencement of any works**
A pre-site clearing and tree removal meeting is to be held between the tree contractor, site manager and project arboriculturist to confirm precise locations of Tree Protection Devices (TPD) such as fencing, mulching and the like, and identify site construction access routes, storage areas and any potential conflicts that may arise between works and tree preservation.

4.1.5 Trees for removal or transplanting should be marked onsite as per the approved tree protection plan. Before removal, the project arborist should confirm that all marked trees correspond with those shown on the schedule or plan.

4.1.6 Subject to confirmation of the consent authority, the following trees would be removed:

Tree No.	Common name	Tree No.	Common name	Tree No.	Common name
7	Sweet Pittosporum	**19**	Grey Ironbark	**34**	Smooth-barked Apple
8	Sweet Pittosporum	**20**	Sweet Pittosporum	**35**	Broad-leaved White Mahogany
9	Unknown	**22**	Smooth-barked Apple	**36**	Smooth-barked Apple
10	Sweet Pittosporum	**23**	Red Bloodwood	**37**	Cheese Tree
12	Grey Gum	**30**	Cheese Tree	**39**	Black She-oak
13	Forest She-oak	**32**	Cabbage-tree palm		
14	Smooth-barked Apple	**33**	Smooth-barked Apple		

4.1.7 Appropriate means to ensure effective communications between the site/project manager and the project arboriculturist are maintained throughout the project must be established prior to set-out and construction.

4.1.8 **Tree Removal and pruning**

Tree removal should be carried out prior to erection of protection fencing. Contractors should be instructed to avoid damage to trees within protection areas when removing or pruning trees. This may include restrictions of vehicle movements.

4.1.9 Removal of approved trees shall only be undertaken by qualified tree contractors with a minimum AQF3 in Arboriculture.

- No trees to be retained shall be damaged during removal of approved trees.
- Trees shall be removed prior to installing site tree protection devices.
- Stumps to be removed from within a TPZ must be removed in a manner that avoids damaging or disturbing roots of trees to be retained.
- Tree removal works shall be undertaken in accordance with NSW Workcover *Code of Practice for the amenity tree industry* (1988).
- Any tree hollows in trees to be removed shall be initially inspected by a fauna ecologist or wildlife officer prior to the works commencing. The ecologist/wildlife officer shall provide advice on dismantling requirements to minimise disturbance to fauna or damage to nests and/or hollows.

4.1.10 **Tree protection devices (TPD)**

TPD's are to be maintained in a 'fit-for-purpose' condition throughout the entire construction phase of the project. No alterations, relocation, removal or otherwise of the approved TPD's are allowed without the written approval of Council or the project arboriculturist.

4.1.11 **Set-out**

Tree 29—Brush Muttonwood

- Following set-out and prior to construction, the true position of the tree's stem and crown and its relationship to the proposed lower ground floor roofline is to be determined.
- If the tree can be retained and prior to construction, the location and adequacy of mulching and/or ground protection is to be inspected & certified (in writing & supported by photographic evidence) as being satisfactory by the site's retained project arboriculturist.
- If the tree cannot reliably be retained for future growth, it shall be removed and replaced with another tree of the same species in a location that can accommodate future growth.

4.2 CONSTRUCTION

4.2.1 In order to ensure that protection measures are being adhered to during the pre-construction and construction stages, there should be a predetermined minimum number of site inspections carried out by the project arborist – refer to section 6.

4.2.2 Matters to be monitored and reported should include tree condition, tree protection measures and impact of site works which may arise from changes to the approved plans.

4.2.3 The area within the designated Tree Protection Zone (TPZ) shall exclude the following activities, unless otherwise approved by authority consent:

- Changes to existing soil levels (cut or fill), including excavations and trenching;
- Machinery used for removal of vegetation, including soil stripping or cultivation;
- Movement of natural rock or altering natural watercourses;
- Storage of equipment, material, site sheds, and parking of vehicles and plant;
- Affixing of signage, cables, hooks or hoardings to a tree
- Location and/or installation of services
- Preparation or wash-down of building materials, refueling, dumping of waste, mixing or disposal of any building materials or chemicals
- Lighting of fires
- Any other works that may cause damage to trees.

4.2.4 **Driveway and turning head**

- The 500mm allowance around excavation for the driveway and turning head must be maintained.
- No excavation batter toward any tree to be retained is permissible without the Project Arborists or Council's approval.

4.2.5 **Tree protection fencing and devices**

Prior to construction, the location and adequacy of installed tree protection fencing is to be inspected & certified (in writing & supported by photographic evidence) by the site's retained project arboriculturist as being 'fit-for-purpose' and generally in accordance with the approved Tree Protection Plan.

5 MONITORING AND SUPERVISION—COMPLIANCE AND CERTIFICATION

5.1 Project arborist responsibilities

5.1.1 The project arboriculturist has six major responsibilities during the construction phase of the project.

1. Maintain the Tree Protection Zone and Protection Devices.
2. Assist with changes in the field.
3. Monitor tree vigour and condition and specifying of appropriate treatments.
4. Communicate with the project manager and contractors.
5. Help identify appropriate work procedures around trees.
6. Facilitate completion of the project.

5.1.2 To this end, it is recommended the project manager keeps the project arboriculturist closely informed at each the stage of construction to ensure the best possible protection of trees is maintained.

5.1.3 Wherever possible all major utilities and service corridors are to be located away from trees, and preferably outside the TPZ of trees to be retained.

5.2 Specific tree protection recommendations

5.2.1 Construction of the driveway and turning head retaining walls shall be supervised by the project arborist within:

- 6m from Tree 40.
- 5m from Trees 26, 27 and 43.
- 4m from Tree 31.
- 3m from Trees 38 and 42.

5.2.2 **Tree 11**—Smooth-barked Apple

- The location and type of tree protection device is to be in accordance with the Tree Protection Plan attached—Appendix C.
- All works proposed within **6m** of the tree must be undertaken by, and/or supervised by the project arboriculturist.
- Root cutting is only to be done under approval of the project arboriculturist or Council.
- All works are to be certified in writing (supported by photographic evidence) as being compliant with AS4970.

5.2.3 **Trees 15, 16 and 17**—Spotted Gums x 2, and Coastal Banksia.

- The location and type of tree protection device is to be in accordance with the Tree Protection Plan attached—Appendix C.
- All works proposed within **3m** of the Crees must be undertaken by, and/or supervised

by the project arboriculturist, including any pad footings and the like
- Any root cutting is only to be done under approval of the project arboriculturist or Council.
- All works are to be certified in writing (supported by photographic evidence) as being compliant with AS4970.

5.2.4 **Tree 26**—Smooth-barked Apple

- The location and type of tree protection device is to be in accordance with Tree Protection Plan attached—Appendix C.
- All works proposed within **5m** of the tree must be undertaken by, and/or supervised by the project arboriculturist. This includes the excavation for the driveway turning head.
- Any root cutting is only to be done under approval of the project arboriculturist or Council.
- All works are to be certified in writing (supported by photographic evidence) as being compliant with AS4970.

5.2.5 **Trees 27, 28 and 29**— Smooth-barked Apple, Cheese Tree, and Brush Muttonwood

- The location and type of tree protection device is to be in accordance with the Tree Protection Plan attached—Appendix C.
- All works proposed within **5m** of Tree 27 must be supervised by the project arboriculturist. This includes the excavation for the driveway retaining walls.
- All works proposed within **3m** of Trees 28 and 29 (if retained) must be supervised by the project arboriculturist.
- Any root cutting is only to be done under approval of the project arboriculturist or Council.
- All works are to be certified in writing (supported by photographic evidence) as being compliant with AS4970.

5.2.6 **Tree 40**—*Eucalyptus* sp.

- The location and type of tree protection device is to be in accordance with Tree Protection Plan attached—Appendix C.
- All works proposed within **6m** of the tree must be undertaken by, and/or supervised by the project arboriculturist. This includes the excavation for the driveway retaining walls.
- Any root cutting is only to be done under approval of the project arboriculturist or Council.
- All works are to be certified in writing (supported by photographic evidence) as being compliant with AS4970.

5.2.7 **Tree 42**—Cheese Tree

- The location and type of tree protection device is to be in accordance with the Tree Protection Plan attached—Appendix C.
- All works proposed within **3m** of the tree must be undertaken by, and/or supervised

by the project arboriculturist. This includes the excavation for the driveway turning head.
- Any root cutting is only to be done under approval of the project arboriculturist or Council.
- All works are to be certified in writing (supported by photographic evidence) as being compliant with AS4970.

5.2.8 **Tree 42**—Grey Ironbark

- The location and type of tree protection device is to be in accordance with the Tree Protection Plan attached—Appendix C.
- All works proposed within **5m** of the tree must be undertaken by, and/or supervised by the project arboriculturist. This includes the excavation for the driveway turning head.
- Any root cutting is only to be done under approval of the project arboriculturist or Council.
- All works are to be certified in writing (supported by photographic evidence) as being compliant with AS4970.

5.3 Tree Pruning

- Pruning is to be limited to only provide construction and building clearance and include no more than 10% live material removal. Additional pruning will require Council approval.
- All pruning is to be undertaken by an arborist with a minimum Australian Qualification Framework Level 3 (AQF3) in arboriculture. Works are to comply with the NSW WorkCover Code of Practice for the amenity tree industry and Australian Standard 4373-2007 Pruning of Amenity Trees (AS4373).

5.4 Variations to the Tree Protection Plan

- Any minor variation to the above specifications must be endorsed by the project arboriculturist and written advice provided to the Private Certifying Authority.

6 SCHEDULE OF RECOMMENDED SITE INSPECTIONS—HOLD POINTS

6.1 The following inspections are recommended to ensure compliance with development approval and tree preservation.

1. Pre-demolition/Pre-construction
—Inspection of Tree Protection Devices.
Certification of compliance.

2. Set-out
—Inspection of building footprint and potential conflict with retention of Tree 29. Provide written record and/or advice.

3. Construction

a) Inspections as required to attain compliance – The principal contractor is to provide a minimum 48 hours' notice to the project arboriculturist for required site attendance and supervisory services.

b) Inspection of Tree Protection Devices.
Maintain and/or repair fencing/devices where necessary. Monitor tree health and condition, soil moisture, tree injuries, etc. provide treatments where necessary. Provide written record and/or advice.

c) Supervision of all works (including any isolated excavations) within **3m** of Trees 15, 16, 17, 28, 29, 38 and 42.
Any roots encountered that require cutting to accommodate approved works shall be recorded in writing and photographed prior to their clean cutting in accordance with the guiding principles of AS4373.

d) Supervision of all works (including any isolated excavations) within **4m** of Tree 31.
Any roots encountered that require cutting to accommodate approved works shall be recorded in writing and photographed prior to their clean cutting in accordance with the guiding principles of AS4373.

e) Supervision of all works (including any isolated excavations) within **5m** of Trees 26, 27 and 42.
Any roots encountered that require cutting to accommodate approved works shall be recorded in writing and photographed prior to their clean cutting in accordance with the guiding principles of AS4373.

f) Supervision of all works (including any isolated excavations) within **6m** of Trees 11 and 40.
Any roots encountered that require cutting to accommodate approved works shall be recorded in writing and photographed prior to their clean cutting in accordance with the guiding principles of AS4373.

4. Post-construction (and/or Occupation Certificate)

—Health and Condition inspection of trees.

- The project arborist should assess the condition of trees and their growing environment, and make recommendations for any necessary remedial actions.
- Following the final inspection and the completion of any remedial works, the project arborist should certify (as appropriate) that the completed works have been carried out in compliance with the approved plans and specifications for tree protection.
- Certification should include a statement on the condition of the retained trees, details of any deviations from the approved tree protection measures and their impacts on trees.
- Provide copies of monitoring documentation if required.
- Provide written and photographic evidence of compliance.

Catriona Mackenzie

September, 2019

INSTITUTE OF AUSTRALIAN CONSULTING ARBORICULTURISTS
IACA
ACCREDITED MEMBER™

MEMBER
ISA

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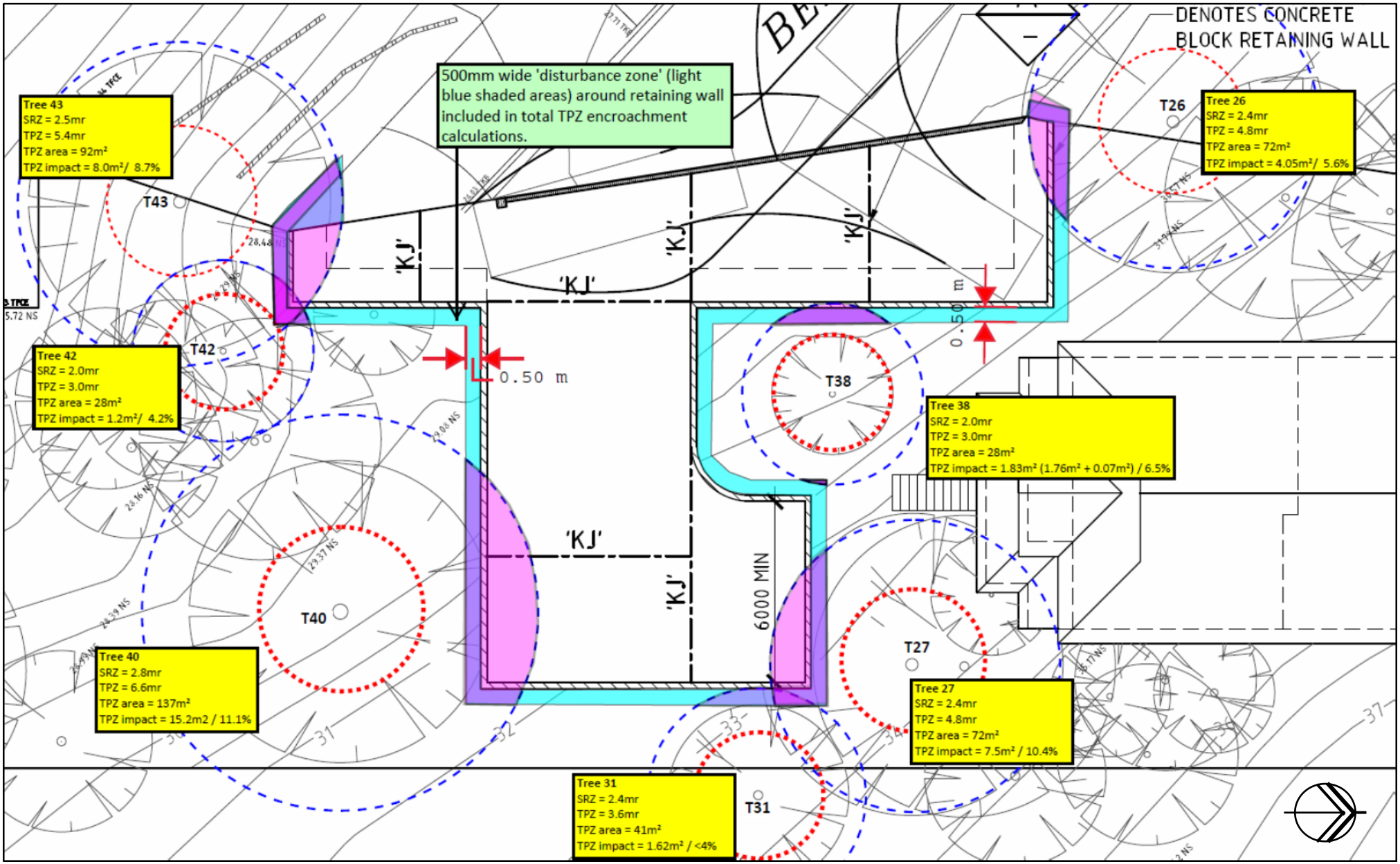
Associate Diploma of Applied Science (Landscape) *Distinction*
Member of the International Society of Arboriculture (ISA)
Founding Member of the Institute of Australian Consulting Arboriculturists (IACA) ACM0052003

APPENDIX A

DRIVEWAY IMPACT ANALYSIS PLAN


DENOTES CONCRETE BLOCK RETAINING WALL
500mm wide 'disturbance zone' (light blue shaded areas) around retaining wall included in total TPZ encroachment calculations.
Tree 43
SRZ = 2.5mr
TPZ = 5.4mr
TPZ area = 92m²
TPZ impact = 8.0m²/ 8.7%
T43
Tree 26
SRZ = 2.4mr
TPZ = 4.8mr
TPZ area = 72m²
TPZ impact = 4.05m²/ 5.6%
T26
Tree 42
SRZ = 2.0mr
TPZ = 3.0mr
TPZ area = 28m²
TPZ impact = 1.2m²/ 4.2%
T42
'KJ'
0.50 m
T38
Tree 38
SRZ = 2.0mr
TPZ = 3.0mr
TPZ area = 28m²
TPZ impact = 1.83m² (1.76m² + 0.07m²) / 6.5%
6000 MIN
T40
Tree 40
SRZ = 2.8mr
TPZ = 6.6mr
TPZ area = 137m²
TPZ impact = 15.2m2 / 11.1%
T27
Tree 27
SRZ = 2.4mr
TPZ = 4.8mr
TPZ area = 72m²
TPZ impact = 7.5m² / 10.4%
Tree 31
SRZ = 2.4mr
TPZ = 3.6mr
TPZ area = 41m²
TPZ impact = 1.62m² / <4%
T31

APPENDIX B

TREE PROTECTION DEVICES

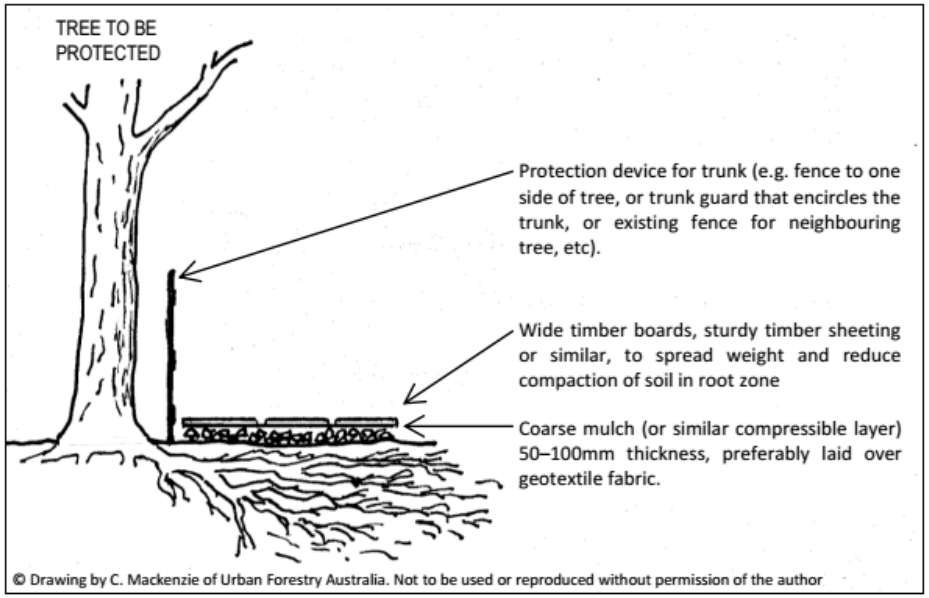


Figure 1
A method of reducing risk of root damage and soil compaction within the tree's Structural Root Zone.

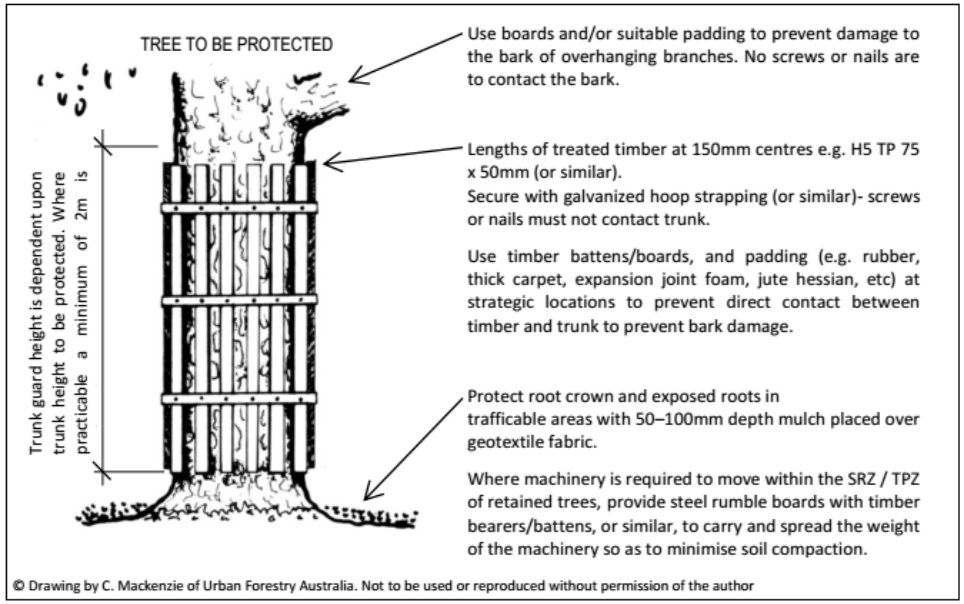


Figure 2
Example of tree trunk and tree branch protection.

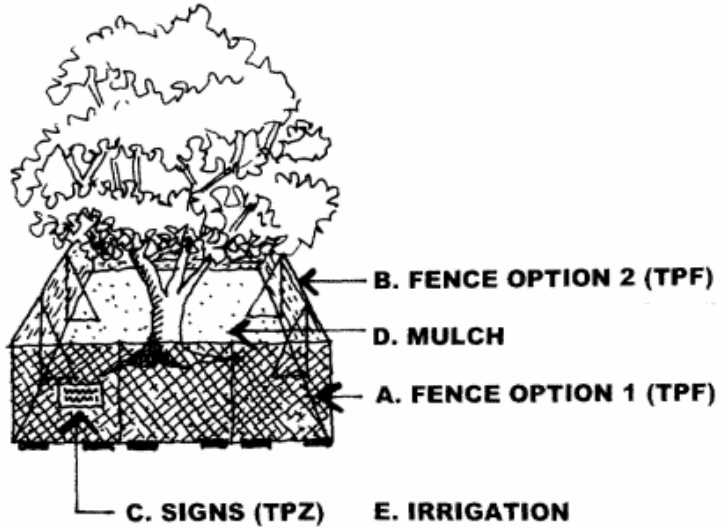


Figure 3
TREE PROTECTIVE FENCING (TPF)
A. Fence Option 1 (TPF)
1.8 metre high chain wire mesh panels with shade cloth attached if required, to be held in place with concrete blocks.
B. Fence Option 2 (TPF)
1.8 metre high plywood or wooden panel/paling fence (prevents soil or building contaminants from 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.
© Drawing by Selena Hannan. Used with permission.

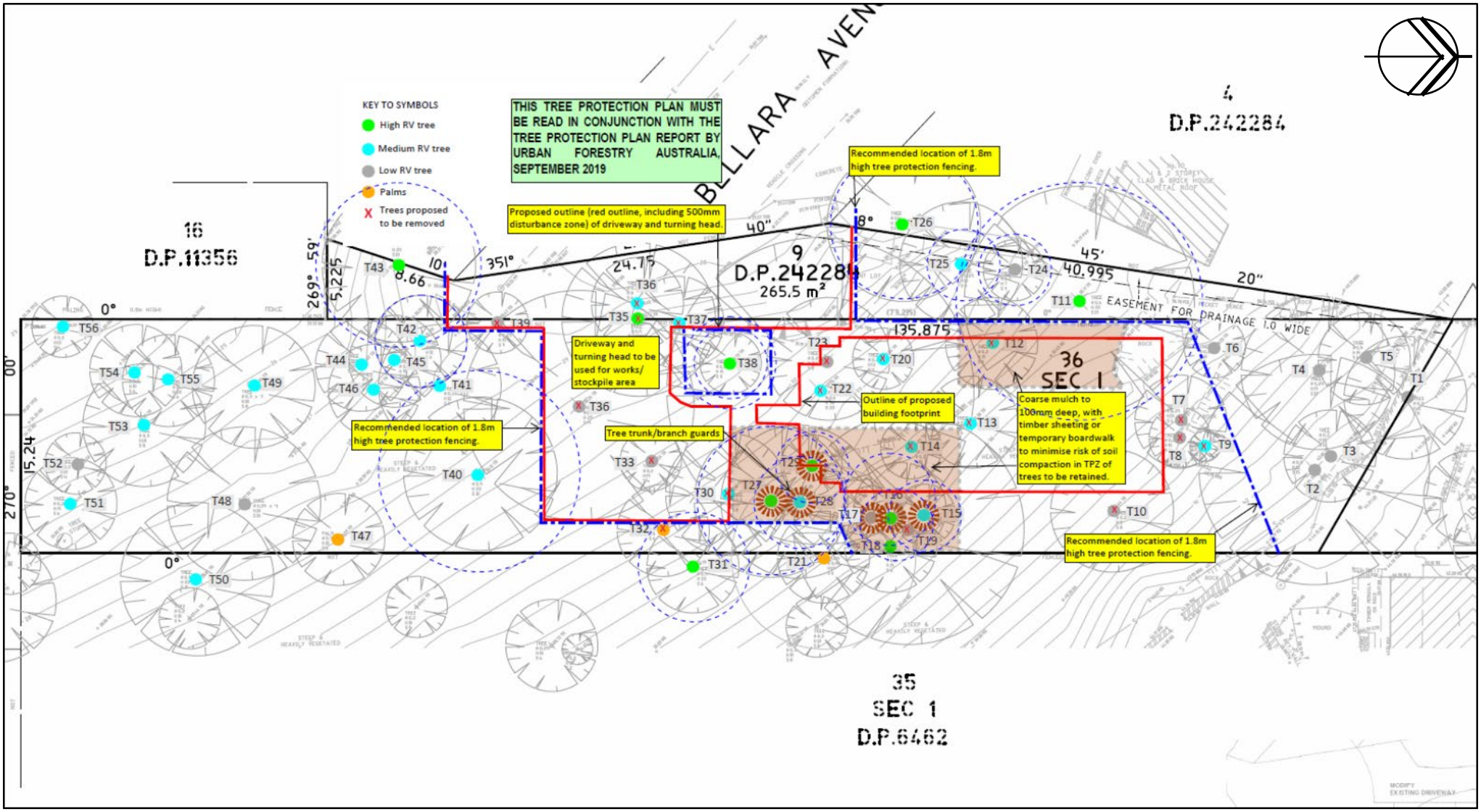
TREE PROTECTION ZONE SIGNAGE

Size: Approximate dimensions 225 x 300mm.
Material: Polypropylene or colourbond steel.

Include the Project Arboriculturist's details in the 'Contact' panel.

APPENDIX C

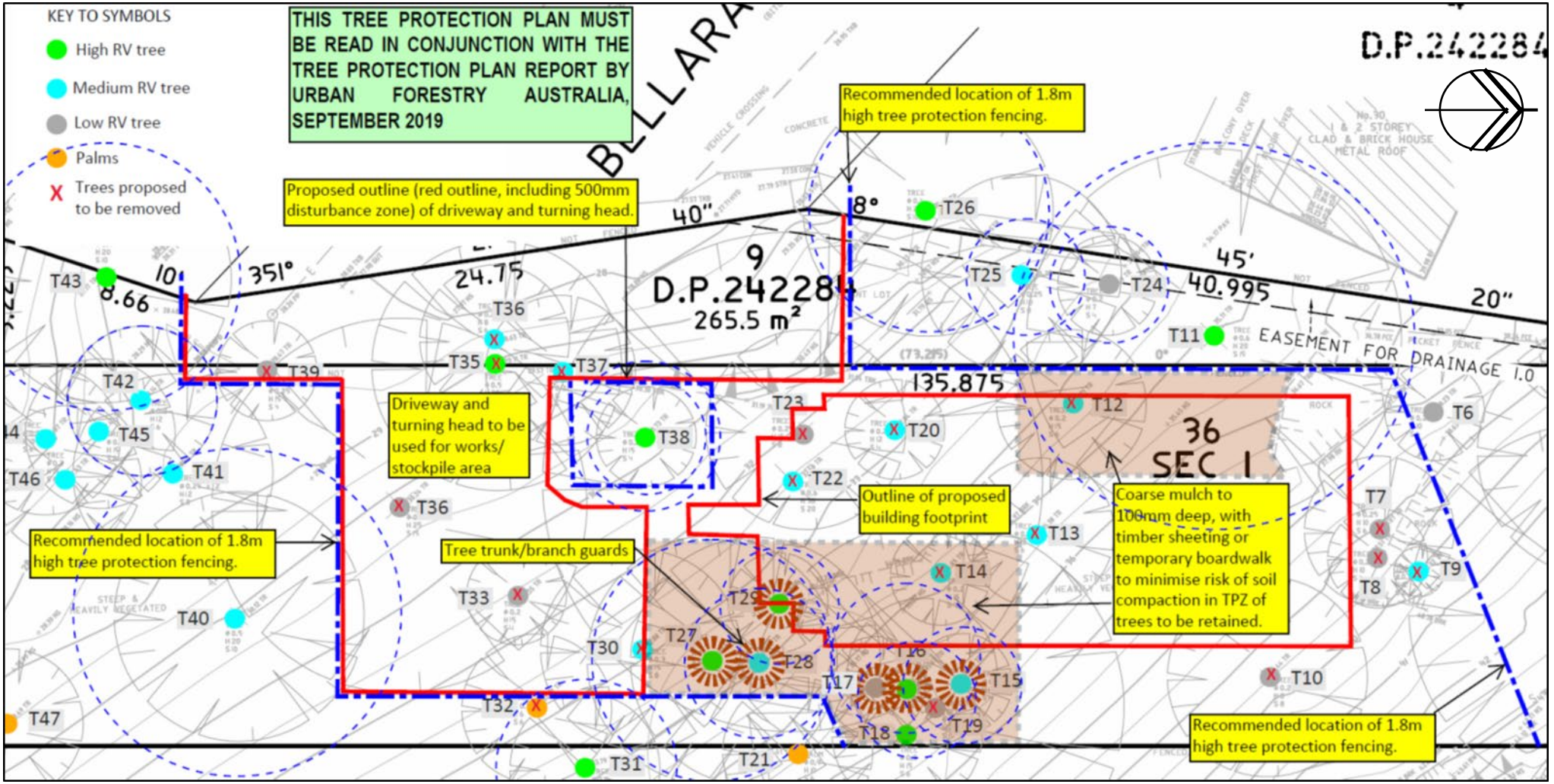
TREE PROTECTION PLANS



MARKED-UP SITE PLAN

NOT TO SCALE

Excerpt of survey dated 13/04/2018, marked up by C. Mackenzie



EXCERPT MARKED-UP SITE PLAN
NOT TO SCALE
Excerpt of survey dated 13/04/2018, marked up by C. Mackenzie