Abel Ecology

Arborist impact assessment report

For

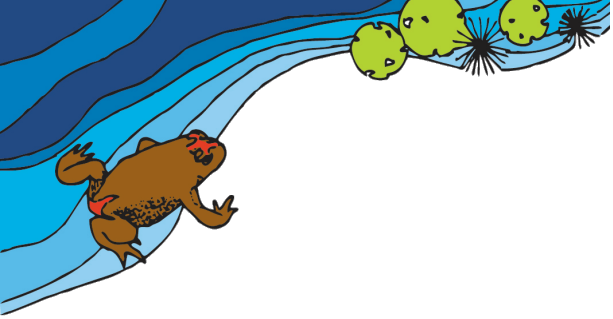
Masterplan and Stage 1
Pacific Brook Christian School
72-74 Maitland Street, Muswellbrook
Lot 100 DP 1261496

Prepared for:	Pacific Brook Christian School Ltd
Report No:	AE20-2145-REP-ISS 5
Prepared by:	Abel Ecology
Date:	8 October 2021

BAM Ecology Pty Ltd (T/A Abel Ecology)
2 Samuel 20:18
ACN 626 221 467 – ABN 37 626 221 467

PO Box 495
Unit 2, 10-11 Ferguson Road
Springwood, NSW, 2777

T (02) 4751 9487
E info@abelecology.com.au
www.abelecology.com.au



Disclaimer

No tree is entirely without hazard potential. No responsibility is accepted for any damage or injury that may be caused by any trees on the site. All measures outlined should minimise damage inflicted on the trees if carefully implemented.

This report does not provide an assessment of risk of harm posed from tree hazards. Information may be provided about the structure, function, defects or tree pests and/or diseases, vitality, condition and life expectancy. However, no assessment of targets, frequency of use by potential targets or guidance of risk of harm is included in this report.

This report is an arboricultural assessment; it is not a risk assessment.

No internal examination of any kind has been undertaken on any tree described in this report, unless expressly stated. On occasions, a mallet may be used as an auditory guide to assist in determining the presence of internal hollows.

Document History

Report	Version	Prepared by	Technical Review by	Proofread by	Submission	
					Method	Date
Report	Issue 1	Dr Danny Wotherspoon		Steven Smith	Dropbox	3 Sept 20
Report	Issue 2	Dr Danny Wotherspoon		Jane Bonwick	Dropbox	6 AUG 21
Report	Issue 3	Dr Danny Wotherspoon		Jane Bonwick	Dropbox	17 SEP 21
Report	Issue 4	Dr Danny Wotherspoon		Jane Bonwick	Dropbox	22 SEP 21
Report	Issue 5	Dr Danny Wotherspoon		Jane Bonwick	Dropbox	08 OCT 21

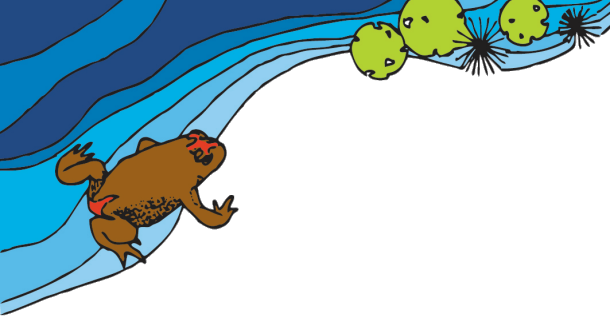
© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

Table of Contents

Table of Figures

Table of Tables

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)



List of Abbreviations

d.b.h.	Diameter at breast height (~1.4 metres)
SRZ	Structural Root Zone
TPZ	Tree Protection Zone
VTA	Visual Tree Assessment
LGA	Local Government Area

Note regarding maps in this report

The diagrams/site maps used in this report have been supplied by and are used with the permission of the client.

With regard to maps provided by the Land Information Centre, Topographic maps used with the permission of © Land and Property Information, NSW.

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

Glossary

Explanation of Tree assessment terminology and rationale:

Amenity - Trees with recreational, functional, environmental, ecological, social, health or aesthetic value rather than for production purposes (Standards Australia 2007).
A desirable or useful feature or facility of a building or place; the pleasantness or attractiveness of a place (Google Dictionary 2017). An assessment of amenity value is to some extent subjective and qualitative, however it also includes Arboricultural assessments of structure and health of the tree.

Arborist - A person with training to AQF Level 3 in Arboriculture, or above, or equivalent recognized and relevant experience that enables the person to perform the tasks required by the Australian Standards for Arboricultural practice (AS4373-2007 Pruning of amenity trees and AS4970-2009 Protection of trees on development sites).

Australian Qualification Framework (AQF) - A national framework for all educational and training purposes in Australia.

Codominant stems - Stems or trunks of about the same size originating from the same position from the main stem.

Condition - An evaluation of the structural status of the tree including defects that may affect the useful life of an otherwise healthy specimen. Such influencing factors include cavities and decay, weak unions between scaffolds (major branches) or trunks and faults of form or habit.

Coppiced - Cutting a trunk close to ground level in order to stimulate the production of multiple new stems (epicormic shoots).

DBH (Diameter at breast height) –A standard Arboricultural measurement used to calculate the Tree Protection Zone (TPZ), taken at 1.4 m from the ground.

Epicormic Growth - The production of epicormic growth from dormant buds is a response to stress, fire and damage, including poor pruning methods. 'Epi's' can occur on branches, stems and from the rhizome base of the tree. Arising from the cambium (actively growing bark region) they are often weakly attached. Epicormic shoots arising from rhizomes is an adaptive strategy in many Australian native plants including Eucalypts and plants in the Proteacea family, occurring commonly after fire, damage or drought.

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

Mycorrhizae/Rhizosphere - Mycorrhizae are fungi that grow in symbiotic association with tree roots (especially the fine root hairs) and are attributed with increasing the uptake of nutrients, particularly phosphorus, and reducing infection from soil borne pathogens. They greatly increase the surface area of a tree's root system. Mycorrhizae require aerobic soil conditions and are reduced in number by compaction, waterlogging and overuse of soil fertilisers.
Forest litter or similar mulch provides ideal conditions for the proliferation of Mycorrhizae. Rhizosphere is a term describing the peripheral area of a tree's root system where this symbiotic association most commonly occurs.

Remedial (restorative) pruning - Removing damaged, diseased or lopped branches, taking the cut back to undamaged tissue, in order to induce the production of shoots from latent or adventitious buds, from which a new crown will be established.

Stem - Organ supporting the branches, leaves, flowers and fruit, and connecting the upper parts of the tree to the root system; may also be referred to as 'the trunk'.

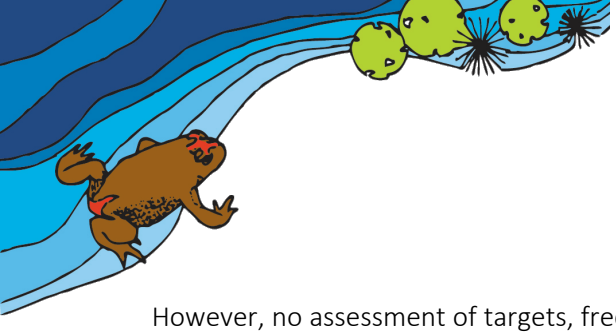
Visual Tree Assessment (VTA) - using external characteristics as indicators of the internal conditions and structural stability of a tree. It is described by Mattheck and Breloer (1994), the first step of the method is to visually examine a tree to find external symptoms of internal defects. It is generally used in some form by Arborists in Australia for tree assessment.
A full VTA is comprised of three steps. This report does not undertake a full VTA. Only the first step, a visual inspection is described in this report. No internal examination was be undertaken. On occasions, a mallet may be used as an auditory guide for the presence of internal hollows. The assessment described in this report is ground based assessment. No climbing of any tree was done as part of an assessment.

Vitality - Indicates the energy reserves of the tree and is determined by the observed crown colour and density, the percentage of dead/dying branches and epicormic growth, and the tree's response to wounding, disease and decay pathogens. Poor vitality compromises the tree's ability to initiate internal defence systems (including compartmentalisation of damage or decay) is reduced and it can also become predisposed to attack by insects and pathogens. Often used synonymously in Arboricultural writing with 'vigour' or 'health'.

Tree Hazard Potential - An assessment of the risks associated with retaining a tree in its existing or proposed surroundings. Factors to consider are the growth characteristics of the species, tree vitality, condition and the frequency and type of potential targets. The impact the proposed works can have on any individual tree can only be assumed from general principals about trees.

This report does not provide an assessment of risk of harm posed from tree hazards. Information may be provided about the structure, function, defects or tree pests and/or diseases, vitality, condition and life expectancy.

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)



However, no assessment of targets, frequency of use by potential targets or guidance of risk of harm is included in this report.

Tree Protection Zone (TPZ) – Based on the DBH measurement of the tree. It specifies an area around the tree to protect the upper parts as well as the underground root system from impacts of development works. Specifications for TPZ may include maintenance actions such as application of mulch and irrigation.

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

Executive summary

A survey of the proposed development site at 72-74 Maitland Street Muswellbrook ('the site' – Figure 1) was undertaken on 9-12 June 2020.

The proposal is to develop the site for use as a school.
Pacific Brook Christian School proposes the staged construction of a new school at 72-74 Maitland Street, Muswellbrook. This will involve site preparation work (including remediation), the removal of 96 trees (7 within Stage 1), civil works, infrastructure works, landscaping, signage and construction works in stages over the next 10 years.

The vitality and condition of 240 trees is generally poor and variable.
Being an arboretum planted to display a range of trees produced by the nursery on site, few of the trees are in conditions that match their natural habitat.

Consequently, trees have grown with many defects of structure and low vitality. The great majority of the trees appear to have been planted in the 1960s and 1970s so those trees that have performed reasonably well are now dying or senescent.

The following recommendations apply:

a) Remove trees that are structurally unsound

b) Make provision for fencing around senescent and declining trees to minimise the safety hazard posed by those trees.

c) Apply mulch 100-150mm deep with a radius of at least 2m, (or to the edge of the calculated tree protection zone where possible) around retained trees to stimulate growth of absorbing roots. For trees that will be located beneath fill, apply mulch on top of fill soils.

d) Show tree locations and protective fencing on all construction plans used on site.

e) Engage a qualified ecologist to inspect trees for bird nests and hollow-bearing trees before they are removed. The ecologist will provide further advice as applicable.

f) All site activity must be excluded from tree protection zones during any future demolition and construction phases (see 'Tree protection guidelines' in Appendix 2).

g) Route all trenching for underground services outside the TPZs of retained trees. If any underground service installation or underground boring will occur within TPZs, engage an arborist to supervise the activity.

h) Crown pruning must comply with the appropriate class of pruning described in AS4373-2007 Pruning of amenity trees and be undertaken by a qualified arborist practising modern arboricultural methods.

i) Advanced stock (>300 mm pot size) must not be planted within nominated tree protection areas so as to avoid disrupting the critical root zone of protected trees.

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

1. Introduction

A survey of the proposed development site at 72-74 Maitland Street Muswellbrook ('the site' – Figure 1) was undertaken on 9-12 June 2020.
The main aim of this survey was to assess the trees on the site and prepare a report that addresses issues pertaining to the proposal and tree protection.
This report will provide a description of individual trees and assess the condition and prospects for future growth. The data informed the Master Plan design for the project.

1.1 Site description

For the purpose of this report the site is defined as Lot 100 DP1261496, with a frontage to Maitland Street Muswellbrook (Figure 1).
The site is 2.432 ha in size and the elevation is approximately 170 m above sea level.
Existing features include buildings that were infrastructure for a Forestry Commission plant nursery.
There is a golf course to the north, residential area to the south east and commercial development on the other side of Maitland Street (New England Highway).

1.2 The proposal

Pacific Brook Christian School proposes the staged construction of a new school at 72-74 Maitland Street, Muswellbrook. This will involve site preparation work (including remediation), the removal of 96 trees (7 within Stage 1), civil works, infrastructure works, landscaping, signage and construction works in stages over the next 10 years.

The proposal is a State Significant Development Application (SSDA) for the proposed Pacific Brook Christian School (PBCS) Masterplan including Stage 1. The proposed PBCS development is located at 72 - 74 Maitland Street, Muswellbrook New South Wales (NSW) (Lot 100/DP 1261496) (Figure 1).

The proposed PBCS development includes the construction of a new Kindergarten to Year 12 (K-12) school with a total enrolment of up to 656 students. The proposed PBCS development will comprise of a staged concept development application (DA) under Section 4.22 of the EP&A Act. The proposed Stage 1 development represents the establishment of the site and includes vegetation clearing, the construction of demountable buildings and associated infrastructure. This assessment will consider impacts to trees resulting from the construction of the overall scope of works detailed for the new PBCS (Figure 3). The demolition of existing nursery buildings and removal of planted vegetation immediately surrounding the structures is subject to an existing demolition DA with Muswellbrook Shire Council.

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

2. Method

Tree assessments were undertaken on 9-12 June 2020.

Muswellbrook Shire Council has no definition of a tree in any environmental planning instrument.

The definition of a tree is taken as indicated in the Trees (Disputes Between Neighbours) Act 2006 No 126.

Section 3(1) **tree** includes any woody perennial plant, any plant resembling a tree in form and size, and any other plant prescribed by the regulations.

Trees (Disputes Between Neighbours) Regulation 2019 refers to section 3(1) of the Act for definition of a tree.

The vitality and condition of trees were assessed from ground level using the VTA (Visual Tree Assessment) method (Mattheck & Breleor, 1994). Tree heights were determined by visual estimation, using a 5m measuring pole for reference. Trees were marked using nails and numbered aluminium tags, which correspond with the tree identification numbers used in this report.

The Tree Protection Zone (TPZ) of each tree was determined using the formula “TPZ = d.b.h. X 12”, and Structural Root Zone (SRZ) was calculated using the formula “SRZ radius = (Base Diameter X 50) 0.42 X 0.64”. Formulae used to calculate TPZs and SRZs are provided in the Australian Standard for Protection of Trees On Development Sites AS4970-2009 (Standards Australia, 2010).

Tree locations are shown in Figure 5. Trees are individually described in Appendix 2.

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

3. Survey Results

3.1 Condition and vitality of trees on site

The vitality and condition of 240 trees is generally poor and variable of Category Z (Appendix 4).

Being an arboretum planted to display a range of trees produced by the nursery on site, few of the trees are in conditions that match their natural habitat.

Consequently, trees have grown with many defects of structure and low vitality.

The great majority of the trees appear to have been planted in the 1960s and 1970s so those trees that have performed reasonably well are now dying or senescent.

Trees of low vitality and/or poor structural integrity include the following (Table 1):

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

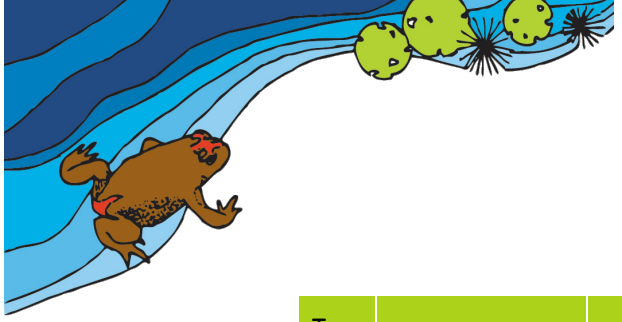
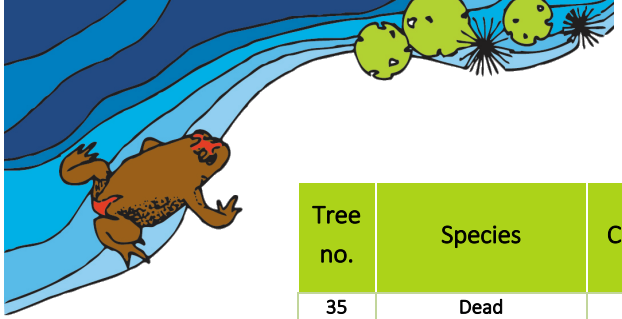


Table 1: Trees recommended for removal.

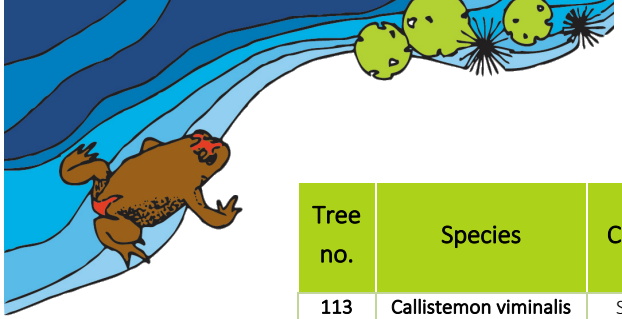
Tree no.	Species	Comments	Action	Retention value	Age Class	Vitality	Condition	Health	Structure	Defect 1	Defect 2	Defect 3
3	**Allocasuarina littoralis**	Dead	Remove	Z4 Dead	Dead							
6	**Dead**	Dead	Remove	Z4 Dead	Dead							
7	**Casuarina cristata**	Lost leader, suppressed canopy, poorly pruned for canopy lift	Remove	Z5 Defects	Mature	Fair	Poor	Fair	Good	Decay	Cavity	tip die back
10	**Casuarina cristata**	Dead	Remove	Z4 Dead								
11	**Casuarina cristata**	Dead	Remove	Z4 Dead								
14	**Casuarina cristata**	Dead	Remove	Z4 Dead	Dead							
16	**Casuarina cristata**	Dead	Remove	Z4 Dead	Dead							
17	**Casuarina cristata**	Nearly dead	Remove	Z5 Defects	Senescent	Poor	Poor	Poor	Poor			
18	**Casuarina cristata**	Codom trunk at 6m	Remove	Z4 Defects	Mature	Poor	Poor	Poor	Fair	Included bark - stem junction;		
23	**Casuarina cristata**	Dead	Remove	Z4 Dead	Dead							
29	**Dead**	Dead	Remove	Z4 Dead	Dead							
31	**Casuarina cunninghamiana**	Dying	Remove	Z5 Defects	Juvenile	Poor	Poor	Poor	Poor			
34	**Dead**	Dead	Remove	Z4 Dead	Dead							

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)



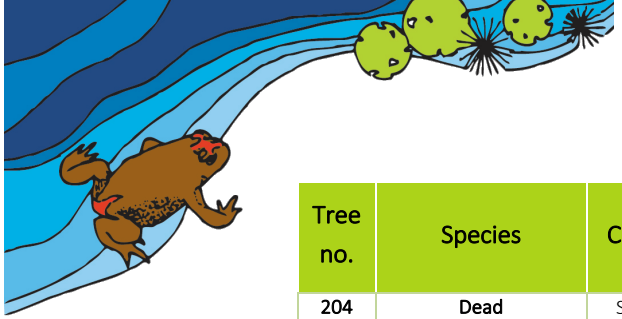
Tree no.	Species	Comments	Action	Retention value	Age Class	Vitality	Condition	Health	Structure	Defect 1	Defect 2	Defect 3
35	**Dead**	Dead	Remove	Z4 Dead	Dead							
46	**Dead**	Dead	Remove	Z4 Dead	Dead							
47	**Eucalyptus seeana**	Structurally unsound	Remove	Z4 Diseased	Mature	Fair	Poor	Poor	Poor	failed branch/es;	tip die back	epicormic shoots
50	**Ironbark**	Structurally unsound	Remove	Z4 Diseased	Semi-mature	Poor	Poor	Poor	Poor	tip die back	failed branch/es;	epicormic shoots
51	**Acacia pendula**	Structurally unsound	Remove	Z4 Diseased	Mature	Poor	Poor	Poor	Fair	failed branch/es;	tip die back	
52	**Eucalyptus melanophloia**	Declining	Remove	Z4 Defects	Senescent	Poor	Poor	Poor	Poor	failed branch/es;	tip die back	epicormic shoots
58	**Dead**	Structurally unsound	Remove	Z4 Dead	Dead							
66	**Eucalyptus**	Crossed trunks, split bark, dying	Remove	Z5 Defects	Mature	Fair	Poor	Fair	Poor	failed branch/es;	tip die back	Included bark - stem junction;
67	**Eucalyptus sp.**	Split bark, dying, major limb shed, very sparse canopy	Remove	Z5 Defects	Mature	Poor	Poor	Poor	Poor	failed branch/es;	epicormic shoots	
84	**Eucalyptus albens**	Structurally unsound	Remove	Z5 Defects	Senescent	Poor	Poor	Poor	Poor	failed branch/es;	tip die back	epicormic shoots
85	**Dead**	Dead	Remove	Z4 Dead	Dead							
93	**Eucalyptus sp.**	Structurally unsound	Remove	Z4 Diseased	Senescent	Poor	Poor	Poor	Poor	failed branch/es;	tip die back	epicormic shoots

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)



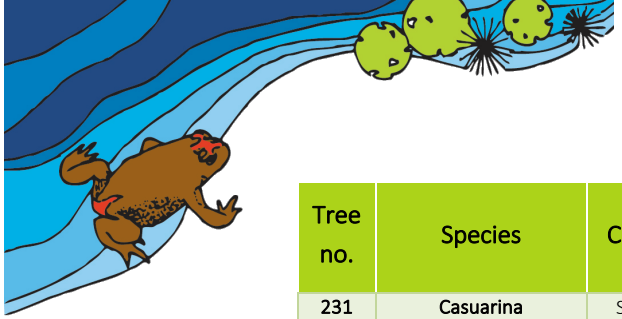
Tree no.	Species	Comments	Action	Retention value	Age Class	Vitality	Condition	Health	Structure	Defect 1	Defect 2	Defect 3
113	Callistemon viminalis	Structurally unsound	Remove	Z5 Defects	Senescent	Fair	Fair	Fair	Poor	failed branch/es;		
114	Callistemon viminalis	Structurally unsound	Remove	Z5 Defects	Senescent	Poor	Poor	Poor	Poor	failed branch/es;	tip die back	epicormic shoots
129	Casuarina cristata	Dangerous overweight on highway side	Remove	Z5 Defects	Mature	Good	Good	Good	Poor	Stem wound	Included bark - stem junction;	Included bark - branch stem attachment;
146	Dead	Structurally unsound	Remove	Z4 Dead	Dead							
148	Casuarina cunninghamiana	Structurally unsound	Remove	Z5 Defects	Senescent	Poor	Poor	Poor	Poor	epicormic shoots	failed branch/es;	tip die back
167	Casuarina cristata	Weak branch attachment	Remove	Z5 Defects	Over-mature	Fair	Poor	Fair	Poor			
173	Eucalyptus viridis	Structurally unsound, bracket fungus	Remove	Z5 Defects	Mature	Poor	Poor	Poor	Poor	Stem wound	epicormic shoots	Included bark - stem junction;
176	Dead	Structurally unsound	Remove	Z4 Dead	Dead							
181	Dead	Structurally unsound	Remove	Z4 Dead	Dead							
189	Casuarina cunninghamiana	Structurally unsound	Remove	Z5 Defects	Senescent	Poor	Poor	Poor	Poor	Decay	tip die back	epicormic shoots
195	Melaleuca decussata	Structurally unsound	Remove	Z5 Defects	Senescent	Poor	Poor	Poor	Poor			
203	Dead	Structurally unsound	Remove	Z4 Dead	Dead							

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)



Tree no.	Species	Comments	Action	Retention value	Age Class	Vitality	Condition	Health	Structure	Defect 1	Defect 2	Defect 3
204	Dead	Structurally unsound	Remove	Z4 Dead	Dead							
205	Populus deltoides	Structurally unsound	Remove	Z5 Defects	Mature	Poor	Poor	Fair	Poor			
206	Populus deltoides	Structurally unsound	Remove	Z5 Defects	Senescent	Poor	Poor	Poor	Poor	failed branch/es;		
207	Dead	Structurally unsound	Remove	Z4 Dead	Dead							
220	Casuarina cunninghamiana	Structurally unsound	Remove	Z5 Defects	Over-mature	Poor	Poor	Poor	Poor	failed branch/es;	epicormic shoots	tip die back
221	Casuarina cunninghamiana	Structurally unsound	Remove	Z5 Defects	Over-mature	Fair	Fair	Good	Good	failed branch/es;	tip die back	
222	Casuarina cunninghamiana	Structurally unsound	Remove	Z5 Defects	Over-mature	Fair	Fair	Fair	Good	failed branch/es;	tip die back	poor pruning
224	Casuarina cunninghamiana	Structurally unsound	Remove	Z5 Defects	Senescent	Poor	Poor	Poor	Poor	failed branch/es;	epicormic shoots	poor pruning
226	Casuarina cunninghamiana	Structurally unsound	Remove	Z5 Defects	Over-mature	Fair	Fair	Fair	Good	poor pruning	Decay	poor occlusion
227	Casuarina cunninghamiana	Structurally unsound	Remove	Z5 Defects	Over-mature	Fair	Fair	Fair	Good	failed branch/es;	epicormic shoots	
228	Casuarina cunninghamiana	Dying, dangerous	Remove	Z5 Defects	Senescent	Poor	Poor	Poor	Poor	failed branch/es;	Decay	
229	Casuarina cunninghamiana	Structurally unsound	Remove	Z5 Defects	Over-mature	Fair	Fair	Poor	Fair	Decay	Stem wound	epicormic shoots
230	Casuarina cunninghamiana	Structurally unsound	Remove	Z5 Defects	Over-mature	Fair	Fair	Fair	Good	failed branch/es;	Decay	tip die back

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)



Tree no.	Species	Comments	Action	Retention value	Age Class	Vitality	Condition	Health	Structure	Defect 1	Defect 2	Defect 3
231	Casuarina cunninghamiana	Structurally unsound	Remove	Z5 Defects	Senescent	Poor	Poor	Poor	Poor	failed branch/es;	Cavity	Decay
232	Casuarina cunninghamiana	Structurally unsound	Remove	Z5 Defects	Senescent	Fair	Fair	Fair	Fair	failed branch/es;	Decay	poor pruning
234	Casuarina cunninghamiana	Bird nest, Structurally unsound	Remove	Z5 Defects	Over-mature	Poor	Fair	Fair	Fair	failed branch/es;	poor occlusion	
235	Casuarina cunninghamiana	Structurally unsound	Remove	Z5 Defects	Senescent	Fair	Fair	Fair	Poor	failed branch/es;	Cavity	Cavity
237	Casuarina cunninghamiana	Structurally unsound, borers	Remove	Z5 Defects	Over-mature	Fair	Fair	Fair	Poor	Stem wound	failed branch/es;	tip die back

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

The trees on site are predominantly planted natives from west of the Great Dividing Range and inland of New South Wales.

Species identified within the site include the following (Table 2):

Table 2 Tree species identified.

Species name	Common name	Count
Acacia pendula	Weeping myall	1
Acacia sp.	Wattle	3
Acacia salicina	Cooba	2
Acacia williamsonii	Whirrakee wattle	1
Allocasuarina gymnanthera	Mallee she-oak	1
Allocasuarina littoralis	Black She-oak	4
Allocasuarina sp.	She-oak	1
Callistemon citrinus	Crimson bottlebrush	2
Callistemon viminalis	Weeping bottlebrush	18
Casuarina cunninghamiana	River Sheoak	35
Casuarina cristata	Belah	68
Chamaecyparis sp.	Cypress	1
Corymbia citriodora	Lemon-scented Gum	1
Corymbia eximia	Yellow bloodwood	1
Cupaniopsis anacardioides	Cheese tree	1
Eucalyptus albens	White box	8
Eucalyptus beyeriana	Beyer's Ironbark	2
Eucalyptus bosistoana	Coast grey box	1
Eucalyptus camaldulensis	River red gum	2
Eucalyptus conspicua	Gum tree	1
Eucalyptus crebra	Narrow-leaved ironbark	7
Eucalyptus dawsonii	Slaty Gum	6
Eucalyptus dealbata	Tumbledown Red Gum	4
Eucalyptus largiflorens	Black Box	1
Eucalyptus melanophloia	Silver-leaved Ironbark	3
Eucalyptus intertexta	Gum Coolibah	5
Eucalyptus propinqua	Small-fruited grey gum	3
Eucalyptus seeana	Narrow-leaved Red Gum	1
Eucalyptus sideroxylon	Mugga Ironbark	4
Eucalyptus socialis	Red Mallee	1
Eucalyptus sp.	Eucalypyts	7
Eucalyptus tereticornis	Forest red gum	1
Eucalyptus viridis	Green Mallee	2
Fraxinus raywoodii	Claret ash	1
Fraxinus griffithii	Evergreen Ash	1
Grevillea robusta	Silky oak	2
Melaleuca bracteata	Black tea-tree	3
Melaleuca decussata	Cross-leaf honey-myrtle	3

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

Species name	Common name	Count
Melaleuca halmaturorum	kangaroo honey-myrtle	1
Melaleuca stypheloides	Prickly paperbark	11
Melia azedarach	White cedar	1
Murraya sp.	Mock orange	1
Photinia robusta	Photinia	1
Populus deltoides	Poplar	2
Tamarix aphylla	Athel Pine, Tamarisk	1
Ulmus parvifolia	Chinese elm	1
Dead		12
	Total	240

3.2 Trees to remove and retain

The vegetation on site is entirely a planted landscape with almost no local ecological value.

The tree schedule (Table 3, Table 4) describes the numbered trees shown in (Figure 2, Figure 3, Figure 4, Figure 5).

Trees to remove and retain are shown in those Tables and Figures. Given the age and condition of trees on site there is very little of medium to long term value to retain in the project design.

Many trees are recommended for immediate removal as being in condition Z (Table 1, Table 4, Appendix 4). Category Z comprises trees not worthy of being a material constraint.
For example, Z4 is trees dead, dying, diseased or declining, and Z5 is for trees with dangerous structural defects.

Trees specifically to be protected for site works include T100, T102, T169, T171, T172 (Figure 4), T190 AND T193 (Figure 5).

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

4. Discussion

The trees on site are in general poor condition, with many declining or senescent. Some have structural faults that require removal for safety. Very few are in good condition.

The long rows of trees along the boundaries have trees in variable condition. Many of them need to be removed but to do so would create breaks in the line of trees. Such breaks may dispose the remaining trees to wind throw. Numerous breaks also have an effect on the visual appearance of the row.

Levinsson (2015) suggests effective management may be more valuable to tree survival than beginning with a vigorous specimen. In the context of trees on or adjacent to development sites, effective management is simply a matter of adequate protection, mulching, and regular irrigation, as this satisfies the most commonly limiting factors for tree growth (Harris *et al.,* 2004; Mauseth, 2009). Additionally, wood chip and leaf litter mulches are effective and cost-efficient methods for stimulating new root growth and improving soil quality in compacted urban soils (Scharenbroch, & Watson, 2014

Mycorrhizae are fungi that grow in symbiotic association with tree roots (especially the fine root hairs) and are attributed with increasing the uptake of nutrients, particularly phosphorus, and reducing infection from soil borne pathogens. They greatly increase the surface area of a tree's root system. Mycorrhizae are reduced in number by compaction, waterlogging and overuse of soil fertilisers, as they require aerobic soil conditions, that is, they need oxygen. Forest litter or similar mulch provides ideal conditions for the proliferation of Mycorrhizae (Harris et al., 2004).

Adequately insulated soils allow small absorbing roots to grow in the upper 150mm of soil, whereas exposed soils are prone to become hot enough that roots are restricted to greater depths because absorbing roots cannot survive in the upper layer of soil (Harris et al., 2004).

Roots cannot grow without oxygen, and they cannot survive in compacted soils. Any activity that buries or cuts roots such as a soil stockpile or service trench will result in death of a corresponding portion of the canopy (Perry, 1982). The vast majority of roots are found within the top metre of soil, though this is highly dependent on the soil type. Roots systems are shallow in poorly aerated clay soils, deep in well-aerated sandy soils, and widespread in desert environments, all according to the availability of oxygen, water, and soil nutrients (Dobson, 1995).

The project design has been modified to retain trees where possible for amenity and ecological significance. A new landscape planting design can incorporate horticultural species that will perform adequately in the site soils and climate of the locality.

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

5. Recommendations

The following recommendations apply:

a) Remove trees that are structurally unsound or hazardous and within the footprint of construction.

b) Make provision for fencing around senescent and declining trees to minimise the safety hazard posed by those trees.

c) Apply mulch 100 - 150 mm deep with a radius of at least 2 m, (or to the edge of the calculated tree protection zone where possible) around retained trees to stimulate growth of absorbing roots. For trees that will be located beneath fill, apply mulch on top of fill soils.

d) Show tree locations and protective fencing on all construction plans used on site.

e) Engage a qualified ecologist to inspect trees for bird nests and hollow-bearing trees before they are removed. The ecologist will provide further advice as applicable.

f) All site activity must be excluded from tree protection zones during any future demolition and construction phases (see 'Tree protection guidelines' in Appendix 2).

g) Route all trenching for underground services outside the TPZs of retained trees. If any underground service installation or underground boring will occur within TPZs, engage an arborist to supervise the activity.

h) Crown pruning must comply with the appropriate class of pruning described in AS4373-2007 Pruning of amenity trees and be undertaken by a qualified arborist practising modern arboricultural methods.

i) Advanced stock (>300 mm pot size) must not be planted within nominated tree protection areas so as to avoid disrupting the critical root zone of protected trees.

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

6. References

Ashton, (1975) The root and shoot development of Eucalyptus regnans F. Muell. *Australian Journal of Botany* 23: 867-87

Barrell, J. (1995) 'Pre-development Tree Assessment' from *Trees and Building Sites, Proceedings of an International Conference held In the interest of developing a scientific basis for managing trees in proximity to buildings*, the International Society of Arboriculture, Illinois, USA, pp 132-142.

Barrell, J. (October 2010) *TreeAZ: Detailed guidance on its use – Australia and New Zealand (Version 10.10-ANZ).*

Dobson, M. (1995), Tree Root Systems, Arboriculture Research and Information Note 130/ARB/95. Arboricultural Advisory and Information Service, Farnham.

Esau, K. (1977) *Anatomy of Seed Plants* (2nd Edn). John Wiley & Sons, Inc. New York.

Hadlington, P. and Johnston, J. (1988) *Australian Trees – Their Care and Repair*. NSW University Press, Kensington, NSW.

Hamilton, W.D. (1989) Significance of Root Severance on Performance of Established Trees, *Arboricultural Journal* 13: 249-257

Harris, R.W., Matheny, N.P. and Clark, J.R 2004 *Arboriculture integrated management of landscape trees and vines*. 4th Ed, Prentice Hall, New Jersey USA.

Levinsson, A, (2015) *Urban Tree Establishment: The Impact of Nursery Production Systems and Assessment Methods*, Swedish University of Agricultural Sciences, Alnarp

Matheny, N.P. and Clark, J.R. 1994 *Evaluation of hazard trees in urban areas*. 2nd Ed. International Society of Arboriculture Illinois USA.

Mattheck, C. and Breloer H. (1994) Field Guide for Visual Tree Assessment (VTA), *Arboricultural Journal*, 18: 1–23, Academic Publishers, UK

Mauseth J. D. (2009), *Botany: and introduction to plant biology*, 4th edition, Jones and Bartlett Publishers, Massachusetts, USA

Pallardy, S. G. (2008) *Physiology of Woody Plants* (3rd Edn). Academic Press, USA.

Patch, D. and Holding, B. (2007) Trees in Focus APN12 Through the trees to development.

Perry, T.O. (1982) The ecology of tree roots and the practical significance thereof. *Journal of Arboriculture* 8(8) 197-211.

Roberts, J., Jackson, N. and Smith, M. (2006) *Tree roots in the built environment*. Norwich: The Stationary Office, UK.

Shigo, A.L. (1989) *A New Tree Biology*. Shigo and Trees, Associates, Durham, New Hampshire USA.

Standards Australia (2007) *Pruning of amenity trees* (AS 4373 – 2007)

Standards Australia (2010) *Protection of trees on development sites* (AS 4970-2009 – incorporating Amendment No. 1).

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

Appendix 1. Figures

Figure 1. Locality map for Maitland Street, Muswellbrook.

Site location

© Land and property Information NSW. Spatial Information eXchange (SIX) website 2020.

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

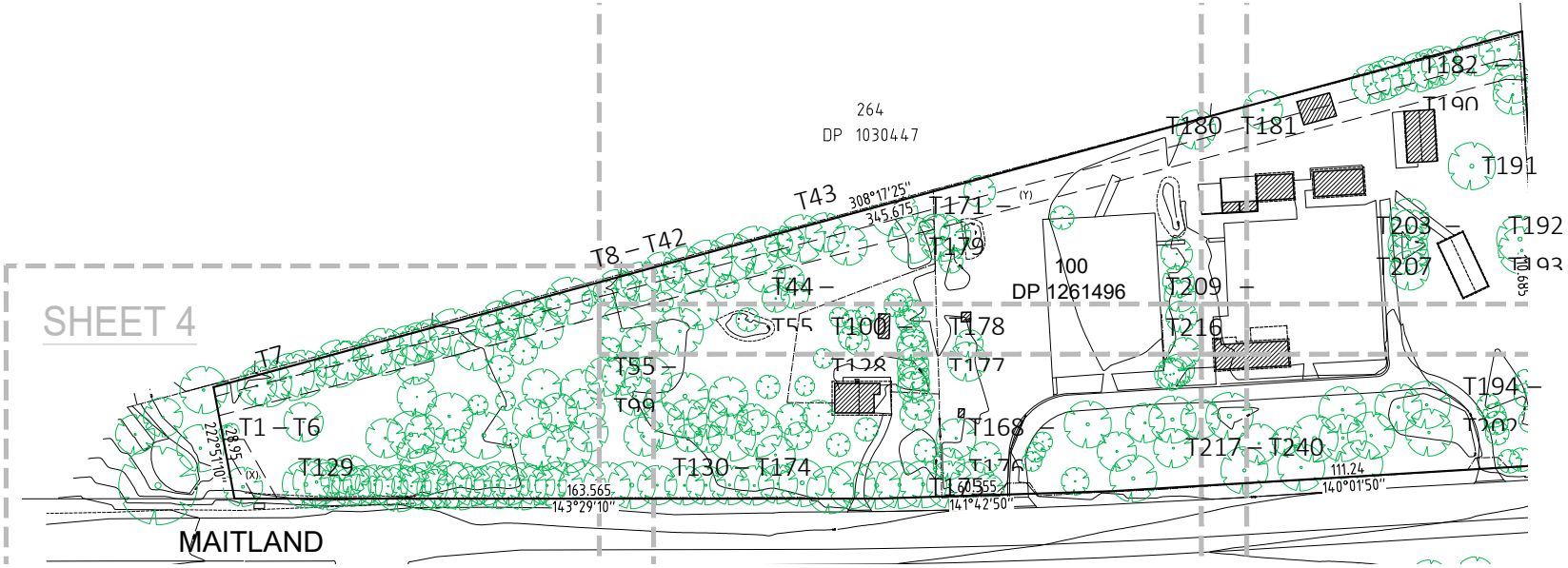


Figure 2. Plan of site (with numbered trees).

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

Figure 3. Site map showing school concept plan layout with all trees numbered.

LEGEND

BOUNDARY

EXISTING FENCE

EXISTING ELECTRIC

EXISTING GAS

EXISTING SEWER

EXISTING STORMWATER

EXISTING TEL COMMS

EXISTING TREES TO BE RETAINED

EXISTING TREE PROTECTION ZONE (TPZ)
(trees identified as significant & to be protected during works as per arborist report)

EXISTING TREE PROTECTION ZONE (TPZ)
(trees potentially impacted by works showing TPZ as noted by arborist)

EXISTING TREES TO BE REMOVED
(refer to arborist report)

EXISTING BUILDING FOOTPRINT

EXISTING GRAVEL DRIVEWAY

EXISTING BUILDING TO BE DEMOLISHED

TO BE DEMOLISHED

TREE PROCTECTION ZONE (TPZ)

STRUCTRAL ROOT ZONE (SRZ)

Source: Pacific Brook Christian School plans 19055-NBRS-DR-A-SSDA-0141

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

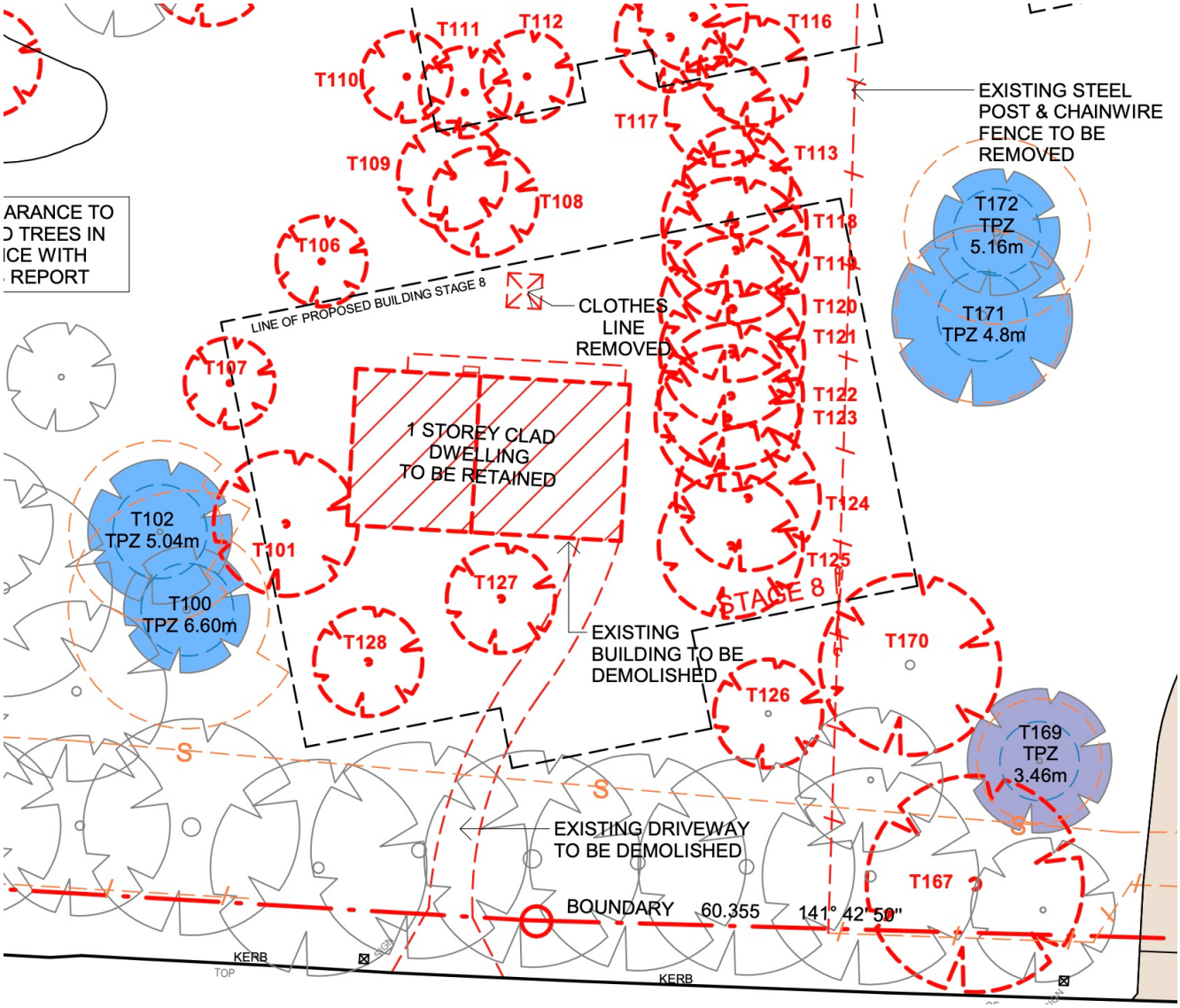


Figure 4. Site map showing trees retained T100, T102, T169, T171, T172.

LEGEND

- BOUNDARY
- EXISTING FENCE
- EXISTING ELECTRIC
- EXISTING GAS
- EXISTING SEWER
- EXISTING STORMWATER
- EXISTING TEL COMMS
- EXISTING TREES TO BE RETAINED
- EXISTING TREE PROTECTION ZONE (TPZ) (trees identified as significant & to be protected during works as per arborist report)
- EXISTING TREE PROTECTION ZONE (TPZ) (trees potentially impacted by works showing TPZ as noted by arborist)
- EXISTING TREES TO BE REMOVED (refer to arborist report)
- EXISTING BUILDING FOOTPRINT
- EXISTING GRAVEL DRIVEWAY
- EXISTING BUILDING TO BE DEMOLISHED
- TO BE DEMOLISHED
- TREE PROCTECTION ZONE (TPZ)
- STRUCTRAL ROOT ZONE (SRZ)

Source: Pacific Brook Christian School plans 19055-NBRS-DR-A-SSDA-0141

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

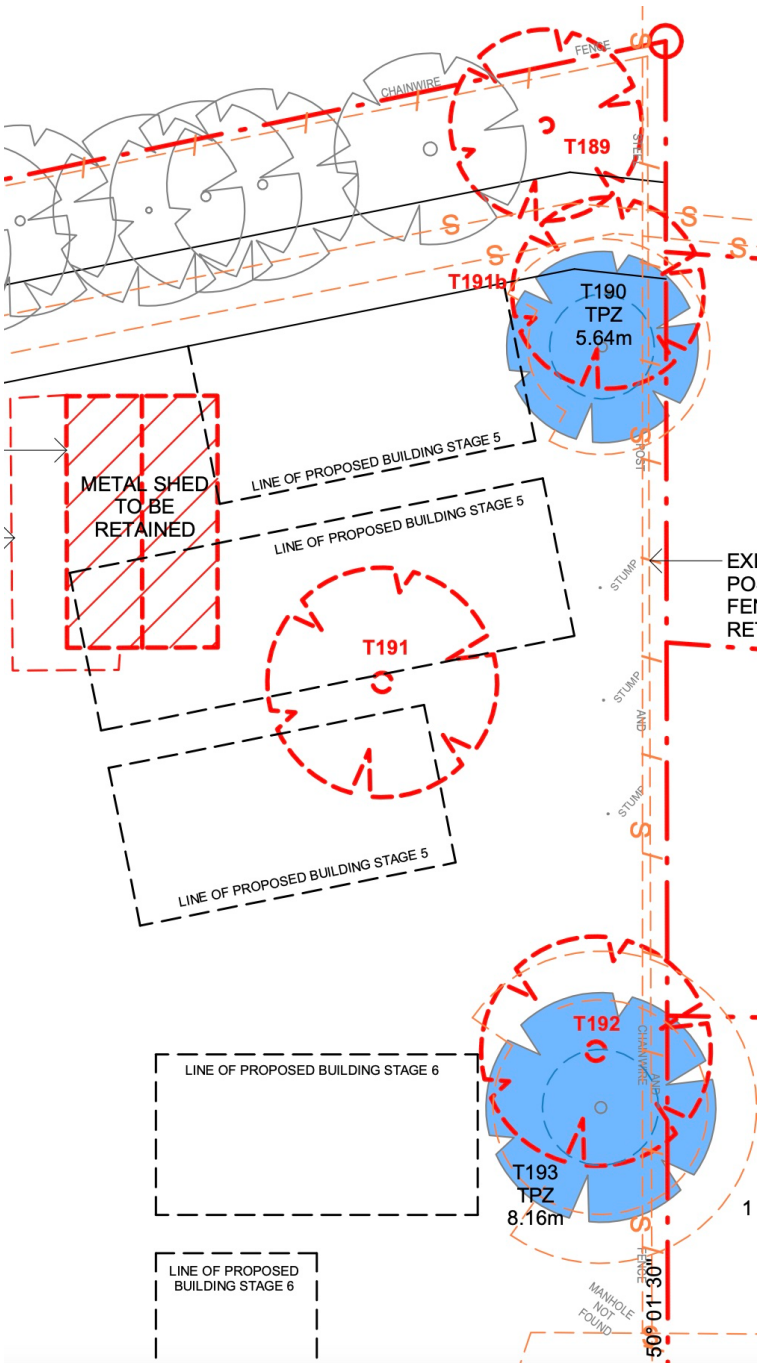
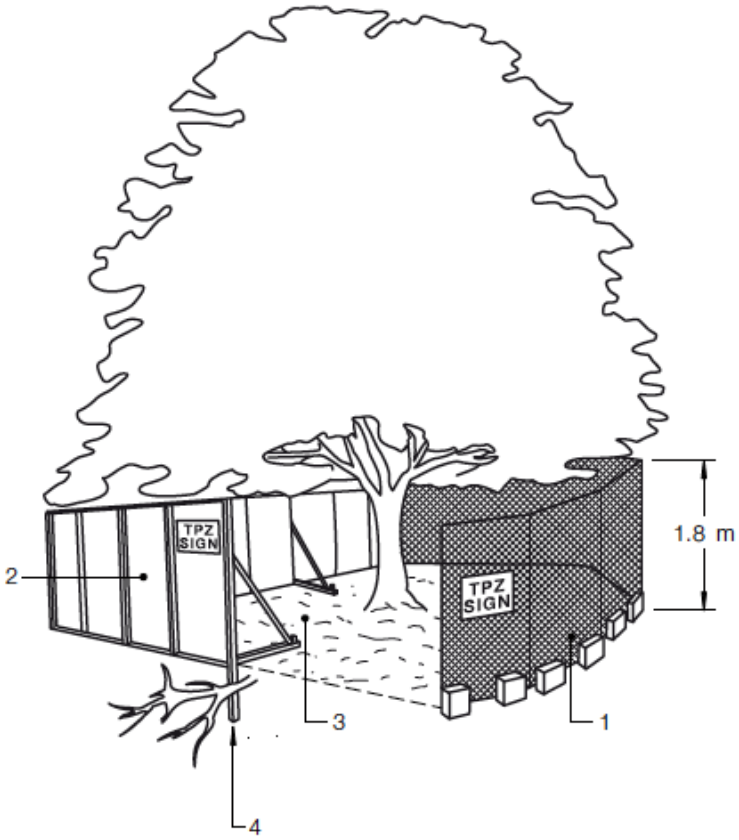


Figure 5. Site map showing trees retained T190, T193.

Source: Pacific Brook Christian School plans 19055-NBRS-DR-A-SSDA-0141

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)



LEGEND:

1 Chain wire mesh panels with shade cloth (if required) attached, held in place with concrete feet.
2 Alternative plywood or wooden paling fence panels. This fencing material also prevents building materials or soil entering the TPZ.
3 Mulch installation across surface of TPZ (at the discretion of the project arborist). No excavation, construction activity, grade changes, surface treatment or storage of materials of any kind is permitted within the TPZ.
4 Bracing is permissible within the TPZ. Installation of supports should avoid damaging roots.

Figure 6 Extract from Section 3 of AS 4970-2009: Protective fencing.

Standards Australia (2010) Protection of trees on development sites (AS 4970-2009 – incorporating Amendment No. 1).

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

Appendix 2. Tree data and condition tables

The following tree schedule (Table 3, Table 4) describes the numbered trees shown in (Figure 2, Figure 3, Figure 4, Figure 5).

KEY

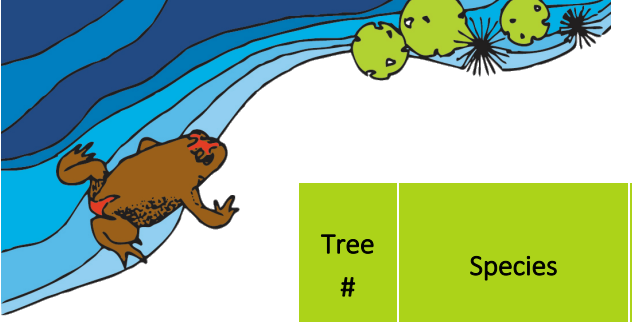
J - juvenile	E - excellent	BI - bark inclusion	dw - small diameter deadwood	SW - stem wound
SM - semi-mature	G - good	CB - canopy bias	DW - large diameter deadwood	SC - trunk cavity
M - mature	F - fair	CD - codominant stems	EC - elevated crown	TL - trunk lean
OM – over-mature	P - poor	DBH - Trunk diameter at 1.4 m	ep - epicormic growth	

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

Table 3 Tree data.

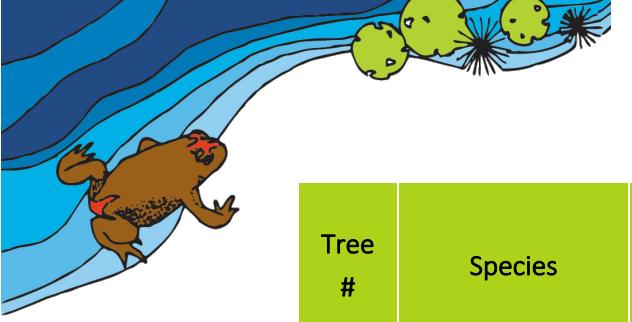
Tree #	Species	TPZ (m)	Reduced TPZ (m)	SRZ (m)	Stem lean (degrees)	Direction of lean	Canopy width (m) N	Canopy width (m) S	Canopy width (m) E	Canopy width (m) W	Tree height range (m)
1	Eucalyptus beyeriana	7.80	5.36	3.00	5	North	11	5	10	9	20 - 25
2	Allocasuarina littoralis	2.00	1.07	1.61		None	2	2	2	2	5 - 10
3	Allocasuarina littoralis	0.00	0.00			None					-
4	Eucalyptus beyeriana	6.48	4.46	1.75		None	10	10	5	7	15 - 20
5	Allocasuarina littoralis	9.12	6.27	3.09		None	12	4	7	8	25 - 30
6	Dead	0.00	0.00			None					-
7	Casuarina cristata	4.56	3.14	2.45		None	4	4	4	5	10 - 15
8	Casuarina cristata	6.60	4.54	2.80		None	10	5	10	6	20 - 25
9	Casuarina cristata	7.25	4.99	2.83		None	7	4	7	9	15 - 20
10	Casuarina cristata	0.00	0.00			None					-
11	Casuarina cristata	0.00	0.00			None					-
12	Casuarina cristata	10.80	7.43	2.95	23	North	13	5	8	5	20 - 25
13	Allocasuarina littoralis	4.32	2.97	2.45		None	3	4	8	5	20 - 25
14	Casuarina cristata	0.00	0.00	0.00		None					-

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)



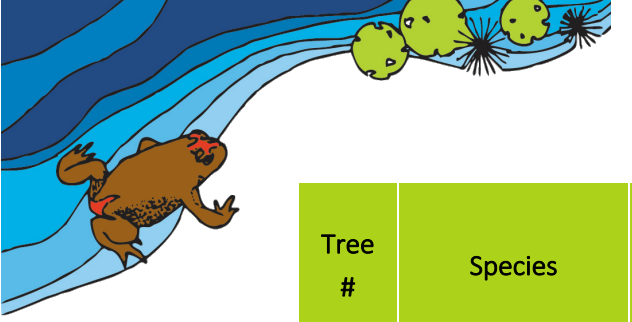
Tree #	Species	TPZ (m)	Reduced TPZ (m)	SRZ (m)	Stem lean (degrees)	Direction of lean	Canopy width (m) N	Canopy width (m) S	Canopy width (m) E	Canopy width (m) W	Tree height range (m)
15	Casuarina cristata	8.16	5.61	2.97		None	8	5	8	7	20 - 25
16	Casuarina cristata	0.00	0.00	0.00		None					-
17	Casuarina cristata	6.00	4.13	2.59		None	0	0	2	0	15 - 20
18	Casuarina cristata	4.20	2.89	2.34		None	3	3	3	3	20 - 25
19	Casuarina cristata	4.56	3.14	2.49		None	4	6	5	4	-
20	Casuarina cristata	7.56	5.20	2.97		None	7	8	11	10	20 - 25
21	Casuarina cristata	2.00	1.07	1.61		None	2	2	2	2	5 - 10
22	Casuarina cristata	5.04	3.47	2.43		None	5	3	6	4	15 - 20
23	Casuarina cristata	0.00	0.00	0.00		None					-
24	Casuarina cristata	6.36	4.37	2.92		None	6	8	8	5	20 - 25
25	Casuarina cunninghamiana	2.40	1.65	1.85		None	1	4	3	3	3 - 5
26	Casuarina cunninghamiana	3.24	2.23	2.05		None	3	1	0	3	10 - 15
27	Casuarina cristata	7.08	4.87	2.97		None	7	6	8	8	20 - 25
28	Allocasuarina gymnanthera	2.00	1.16	1.65		None	3	3	3	2	10 - 15
29	Dead	0.00	0.00	0.00		None					-

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)



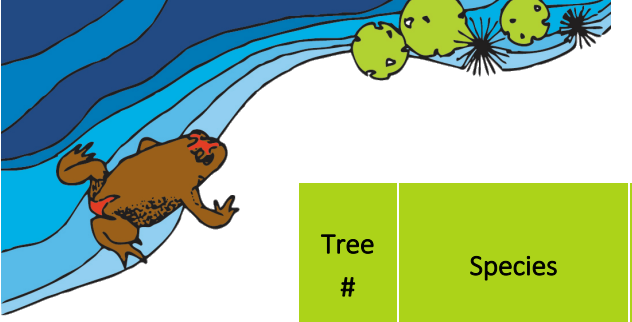
Tree #	Species	TPZ (m)	Reduced TPZ (m)	SRZ (m)	Stem lean (degrees)	Direction of lean	Canopy width (m) N	Canopy width (m) S	Canopy width (m) E	Canopy width (m) W	Tree height range (m)
30	Casuarina cristata	5.28	3.63	2.57		None	5	4	5	6	25 - 30
31	Casuarina cunninghamiana	2.40	1.65	1.85		None	2	0	3	0	5 - 10
32	Casuarina cristata	6.48	4.46	2.61		None	6	6	6	6	20 - 25
33	Casuarina cristata	6.24	4.29	2.81		None	8	4	8	7	20 - 25
34	Dead	0.00	0.00	0.00		None					-
35	Dead	0.00	0.00	0.00		None					-
36	Casuarina cristata	6.36	4.37	2.76	6	East	5	4	10	4	20 - 25
37	Casuarina cristata	5.76	3.96	2.61		None	4	6	6	5	15 - 20
38	Casuarina cristata	6.00	4.13	2.74		None	4	4	6	6	20 - 25
39	Casuarina cristata	4.92	3.38	2.49		None	3	3	3	4	20 - 25
40	Casuarina cristata	4.67	3.21	2.34		None	4	2	3	6	15 - 20
41	Casuarina cristata	5.88	4.04	2.74		None	4		7	6	20 - 25
42	Casuarina cristata	5.28	3.63	2.63		None	4	5	6	4	20 - 25
43	Casuarina cristata	8.16	5.61	2.88		None	2	5	7	4	20 - 25
44	Eucalyptus propinqua	7.56	5.20	2.93		None	4	5	6	7	20 - 25
45	Eucalyptus conspicua	5.64	3.88	2.47		None	1	4	4	4	15 - 20

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)



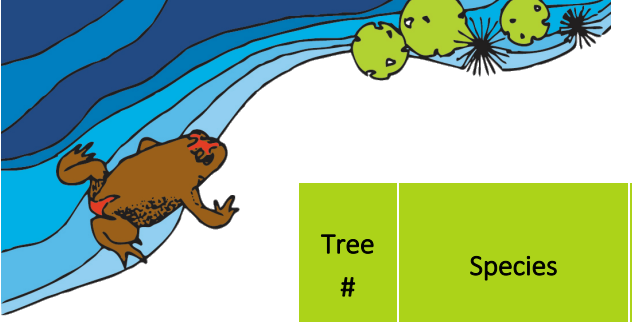
Tree #	Species	TPZ (m)	Reduced TPZ (m)	SRZ (m)	Stem lean (degrees)	Direction of lean	Canopy width (m) N	Canopy width (m) S	Canopy width (m) E	Canopy width (m) W	Tree height range (m)
46	Dead	0.00	0.00	0.00		None					-
47	Eucalyptus seeana	4.44	3.05	2.15		None	5	3	5	5	10 - 15
48	Eucalyptus melanophloia	4.56	3.14	2.41	6	North	8	4	6	4	15 - 20
49	Eucalyptus sideroxylon	5.52	3.80	2.53		None	5	6	4	8	15 - 20
50	Eucalyptus sp. Ironbark	2.76	1.90	1.91		None	0	0	4	1	5 - 10
51	Acacia pendula	4.80	3.30	2.28		None	7	5	5	5	5 - 10
52	Eucalyptus melanophloia	2.40	1.65	1.82		None	3	1	0.5	0.5	5 - 10
53	Corymbia citriodora	4.33	2.98	2.41		None	5	5	5	5	15 - 20
54	Acacia sp	3.38	2.33	2.13		None	1	4	2	4	10 - 15
55	Eucalyptus bosistoana	6.64	4.56	2.85		None	7	7	6	6	20 - 25
56	Eucalyptus intertexta	4.32	2.97	2.59		None	5	5	7	7	20 - 25
57	Eucalyptus intertexta	3.17	2.18	2.15		None	5	0	2	5	10 - 15
58	Dead	0.00	0.00	0.00		None					-
59	Eucalyptus intertexta	3.96	2.72	2.28		None	4	6	5	6	15 - 20
60	Eucalyptus intertexta	2.40	1.65	1.91		None	2	3	2	4	15 - 20
61	Eucalyptus intertexta	3.48	2.39	2.13		None	3	4	4	3	15 - 20

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)



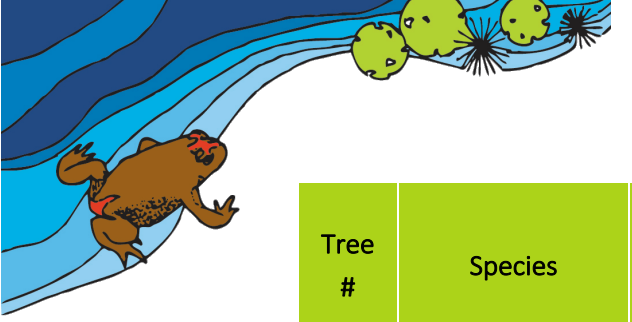
Tree #	Species	TPZ (m)	Reduced TPZ (m)	SRZ (m)	Stem lean (degrees)	Direction of lean	Canopy width (m) N	Canopy width (m) S	Canopy width (m) E	Canopy width (m) W	Tree height range (m)
62	Eucalyptus tereticornis	3.24	2.23	2.13		None	4	5	6	4	15 - 20
63	Eucalyptus sideroxylon	4.52	3.11	2.23		None	2	8	5	5	15 - 20
64	Eucalyptus sideroxylon	0.00	0.00	0.00		None	2	2	2	2	15 - 20
65	Eucalyptus albens	5.52	3.80	2.59		None	7	3	3	7	20 - 25
66	Eucalyptus sp.	8.40	5.78	2.88		None	9	2	5	11	20 - 25
67	Eucalyptus sp.	5.52	3.80	2.51		None	2	0	5	0	15 - 20
68	Melaleuca stypheloides	4.22	2.90	2.30		None	4	3	5	2	5 - 10
69	Eucalyptus sideroxylon	11.76	8.09	3.31		None	4	4	8	4	20 - 25
70	Eucalyptus dealbata	5.16	3.55	2.57		None	3	6	7	3	15 - 20
71	Eucalyptus dealbata	7.14	4.91	2.63	6	East	7	7	10	5	15 - 20
72	Allocasuarina sp.	2.16	1.49	1.82		None	2	3	2	3	20 - 25
73	Eucalyptus camaldulensis	11.88	8.17	3.28		None	5	8	9	6	-
74	Eucalyptus crebra	3.36	2.31	2.18		None	4	4	4	2	15 - 20
75	Eucalyptus crebra	3.24	2.23	2.02		None	5	4	6	4	15 - 20
76	Eucalyptus crebra	2.00	1.24	1.72		None	2	1	1	1	5 - 10
77	Eucalyptus dealbata	3.34	2.29	1.97		None	3	2	5	2	10 - 15

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)



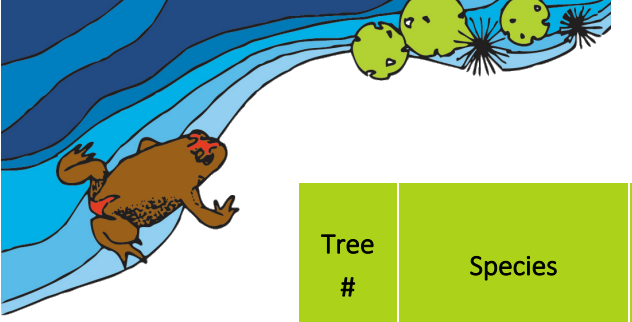
Tree #	Species	TPZ (m)	Reduced TPZ (m)	SRZ (m)	Stem lean (degrees)	Direction of lean	Canopy width (m) N	Canopy width (m) S	Canopy width (m) E	Canopy width (m) W	Tree height range (m)
78	Eucalyptus dealbata	3.72	2.56	2.18		None	3	3	5	2	10 - 15
79	Eucalyptus dawsonii	3.45	2.37	1.97		None	3	2	4	2	10 - 15
80	Eucalyptus dawsonii	5.76	3.96	2.63		None	8	7	8	6	20 - 25
81	Eucalyptus dawsonii	7.20	4.95	2.93		None	8	8	12	8	20 - 25
82	Eucalyptus socialis	3.50	2.41	2.51		None	0	6	7	0	5 - 10
83	Eucalyptus albens	3.24	2.23	2.18		None	5	6	5	0	10 - 15
84	Eucalyptus albens	2.64	1.82	1.94		None	1	1	2	0	15 - 20
85	Dead	0.00	0.00	0.00		None					-
86	Eucalyptus melanophloia	2.76	1.90	2.05		None	5	3	4	3	5 - 10
87	Eucalyptus crebra	4.20	2.89	2.23		None	8	6	5	6	15 - 20
88	Eucalyptus largiflorens	7.21	4.96	2.88		None	11	8	10	8	15 - 20
89	Eucalyptus dawsonii	8.40	5.78	2.92		None	12	9	10	8	20 - 25
90	Eucalyptus propinqua	3.66	2.52	2.37		None	4	5	2	6	10 - 15
91	Eucalyptus sp	6.12	4.21	2.67		None	8	6	8	6	20 - 25
92	Eucalyptus sp	5.37	3.69	2.74		None	3	6	2	3	15 - 20
93	Eucalyptus sp. (sim. to E.gracilis)	2.76	1.90	1.91		None	0	2	0	4	10 - 15

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)



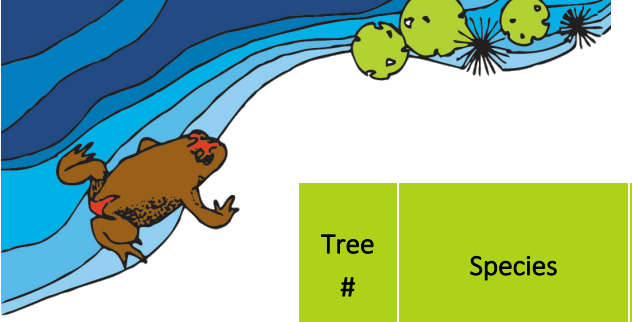
Tree #	Species	TPZ (m)	Reduced TPZ (m)	SRZ (m)	Stem lean (degrees)	Direction of lean	Canopy width (m) N	Canopy width (m) S	Canopy width (m) E	Canopy width (m) W	Tree height range (m)
94	Eucalyptus (fibrosa OR sideroxylon)	2.04	1.40	1.72		None	2	1	2	2	10 - 15
95	Eucalyptus albens	3.00	2.06	2.41		None	2	4	6	5	10 - 15
96	Eucalyptus crebra	4.56	3.14	2.34		None	6	4	6	4	10 - 15
97	Eucalyptus crebra	3.74	2.57	2.37		None	9	5	7	6	10 - 15
98	Eucalyptus albens	5.76	3.96	2.55	9	West	6	6	6	8	15 - 20
99	Eucalyptus crebra / beyeriana	4.90	3.37	2.85		None	8	6	6	3	10 - 15
100	Eucalyptus albens	6.60	4.54	2.57		None	6	3	11	2	-
101	Ulmus parvifolia	2.00	1.32	1.68		None	3	3	3	3	3 - 5
102	Eucalyptus albens	5.04	3.47	2.61	6	North	8	3	5	9	15 - 20
103	Eucalyptus albens	4.08	2.81	2.47	10	North	5	3	5	2	10 - 15
104	Corymbia eximia	2.52	1.73	1.94		None	5	2	6	1	5 - 10
105	Fraxinus greywoodii	4.44	3.05	2.10		None	5	5	5	5	5 - 10
106	Callistemon viminalis	2.04	1.40	1.82		None	3	3	3	3	5 - 10
107	Callistemon viminalis	2.91	2.00	2.20		None	4	4	4	4	5 - 10
108	Grevillea robusta	2.04	1.40	1.94		None	2	2	2	2	5 - 10
109	Grevillea robusta	2.83	1.95	2.00		None	3	3	3	3	5 - 10

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)



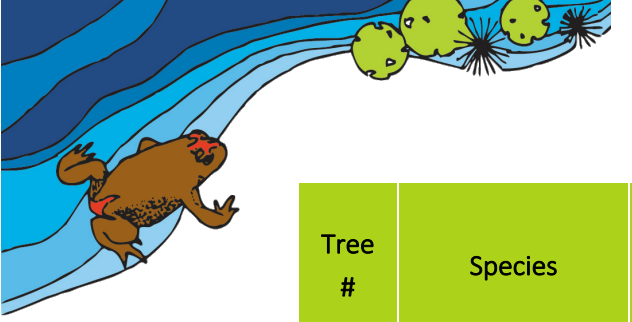
Tree #	Species	TPZ (m)	Reduced TPZ (m)	SRZ (m)	Stem lean (degrees)	Direction of lean	Canopy width (m) N	Canopy width (m) S	Canopy width (m) E	Canopy width (m) W	Tree height range (m)
110	Callistemon viminalis	2.00	1.07	1.65	16	North	2	0	1	1	5 - 10
111	Callistemon viminalis	2.00	1.16	1.82		None	4	2	4	3	5 - 10
112	Callistemon viminalis	2.16	1.49	1.79		None	3	0	4	1	5 - 10
113	Callistemon viminalis	3.69	2.54	2.25		None	2	3	3	6	5 - 10
114	Callistemon viminalis	2.00	1.11	1.68		None	1	1	0	4	3 - 5
115	Fraxinus griffithii	2.31	1.58	1.94		None	3	1	2	4	5 - 10
116	Photinia robusta	2.00	1.29	2.47		None	4	4	4	2	5 - 10
117	Melaleuca styphlioides	4.43	3.04	2.41		None	5	5	5	2	5 - 10
118	Melaleuca styphlioides	2.81	1.93	2.08		None	5	5	1	1	5 - 10
119	Melaleuca styphlioides	3.78	2.60	2.32		None	5	5	1	1	5 - 10
120	Melaleuca styphlioides	4.83	3.32	2.67		None	5	5	1	1	5 - 10
121	Melaleuca styphlioides	2.31	1.58	1.72		None	5	5	1	1	5 - 10
122	Melaleuca styphlioides	3.57	2.45	2.15		None	5	5	1	1	5 - 10
123	Melaleuca styphlioides	5.88	4.04	2.43		None	5	5	1	2	10 - 15
124	Melaleuca styphlioides	4.80	3.30	2.45		None	5	5	2	2	5 - 10

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)



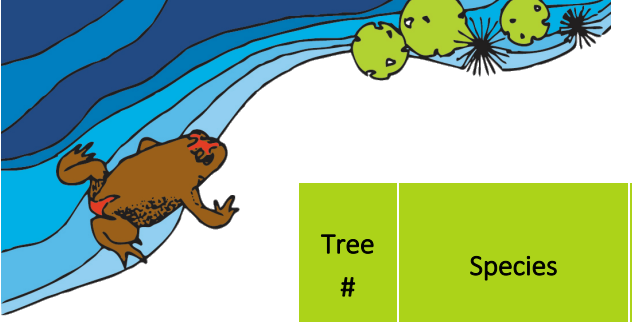
Tree #	Species	TPZ (m)	Reduced TPZ (m)	SRZ (m)	Stem lean (degrees)	Direction of lean	Canopy width (m) N	Canopy width (m) S	Canopy width (m) E	Canopy width (m) W	Tree height range (m)
125	Melaleuca styphlioides	3.30	2.27	2.10		None	5	5	2	5	5 - 10
126	Cupaniopsis anacardioides	1.08	0.74	1.50		None	5	1	4	2	3 - 5
127	Murraya sp.	0.60	0.41	1.68		None	2	2	2	2	< 3
128	Chamaecyparis sp. (or Cupressus sp.)	2.00	0.99	1.50		None	1	1	1	1	5 - 10
129	Casuarina cristata	8.40	5.78	3.11		None	6	6	6	6	20 - 25
130	Casuarina cunninghamiana	5.16	3.55	2.85		None	5	3	10	7	20 - 25
131	Casuarina cristata	5.14	3.54	2.53		None	5	3	5	9	20 - 25
132	Casuarina cunninghamiana	4.86	3.34	2.25		None	7	0	5	8	15 - 20
133	Casuarina cristata	6.48	4.46	2.78	6	West	6	8	8	8	15 - 20
134	Casuarina cunninghamiana	3.48	2.39	2.20		None	3	3	1	4	10 - 15
135	Casuarina cristata	4.92	3.38	2.55		None	5	4	9	6	20 - 25
136	Casuarina cunninghamiana	3.96	2.72	2.37		None	2	3	8	1	15 - 20
137	Casuarina cristata	6.12	4.21	2.83		None	7	5	3	8	20 - 25
138	Casuarina cunninghamiana	3.12	2.15	2.13		None	2	2	0	5	10 - 15

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)



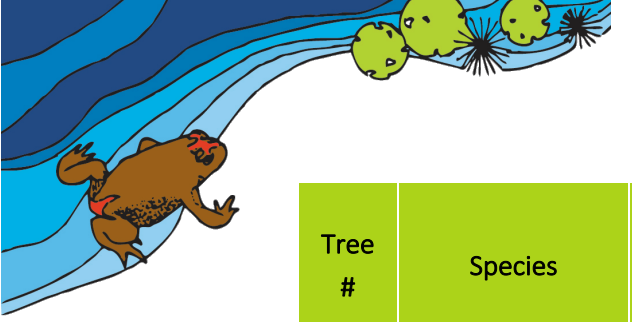
Tree #	Species	TPZ (m)	Reduced TPZ (m)	SRZ (m)	Stem lean (degrees)	Direction of lean	Canopy width (m) N	Canopy width (m) S	Canopy width (m) E	Canopy width (m) W	Tree height range (m)
139	Casuarina cristata	8.64	5.94	2.88		None	5	8	10	3	20 - 25
140	Casuarina cunninghamiana	4.44	3.05	2.39		None	1	8	1	9	20 - 25
141	Casuarina cristata	6.19	4.26	2.87		None	5	3	8	8	20 - 25
142	Casuarina cristata	6.24	4.29	2.87		None	8	7	6	7	20 - 25
143	Casuarina cristata	4.32	2.97	2.32		None	2	5	3	8	20 - 25
144	Casuarina cristata	5.76	3.96	2.47		None	6	9	9	7	20 - 25
145	Casuarina cristata	6.24	4.29	2.88		None	5	5	4	10	20 - 25
146	Dead	0.00	0.00	0.00		None					-
147	Casuarina cristata	7.38	5.08	3.08		None	5	6	7	10	20 - 25
148	Casuarina cunninghamiana	3.12	2.15	2.15		None	2	2	2	5	-
149	Casuarina cristata	6.48	4.46	2.61		None	5	6	4	9	20 - 25
150	Casuarina cristata	6.00	4.13	2.74		None	4	8	5	6	20 - 25
151	Casuarina cristata	7.68	5.28	2.97		None	9	12	9	12	20 - 25
152	Casuarina cristata	7.56	5.20	2.98		None	6	9	7	8	20 - 25
153	Casuarina cristata	8.40	5.78	3.04		None	8	10	6	10	20 - 25
154	Casuarina cristata	6.00	4.13	2.80		None	4	10	5	10	20 - 25

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)



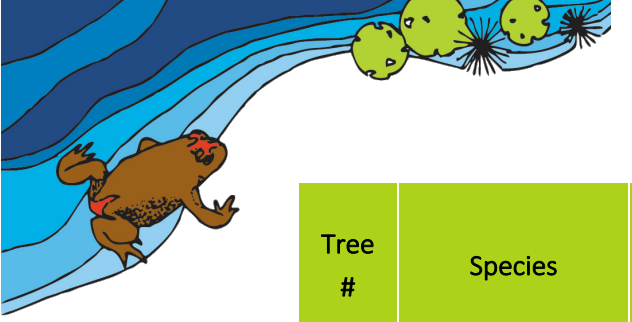
Tree #	Species	TPZ (m)	Reduced TPZ (m)	SRZ (m)	Stem lean (degrees)	Direction of lean	Canopy width (m) N	Canopy width (m) S	Canopy width (m) E	Canopy width (m) W	Tree height range (m)
155	Casuarina cristata	5.88	4.04	2.71		None	5	7	7	7	20 - 25
156	Casuarina cristata	6.12	4.21	2.83		None	7	7	7	8	20 - 25
157	Casuarina cristata	6.36	4.37	2.92		None	5	7	3	6	20 - 25
158	Casuarina cristata	7.08	4.87	2.87		None	5	9	5	12	20 - 25
159	Casuarina cristata	5.64	3.88	2.61		None	3	7	4	4	20 - 25
160	Casuarina cristata	9.50	6.53	3.25		None	8	7	8	9	20 - 25
161	Casuarina cristata	7.44	5.12	3.04		None	7	7	6	9	20 - 25
162	Casuarina cristata	9.00	6.19	3.25		None	11	9	9	12	20 - 25
163	Casuarina cristata	9.00	6.19	3.20		None	8	12	9	12	20 - 25
164	Casuarina cristata	8.16	5.61	3.04		None	7	7	7	8	20 - 25
165	Casuarina cristata	9.48	6.52	3.32		None	8	7	7	8	20 - 25
166	Casuarina cristata	7.56	5.20	3.18		None	8	5	9	9	20 - 25
167	Casuarina cristata	8.88	6.11	3.08		None	6	7	10	10	20 - 25
168	Acacia williamsonii	2.16	1.49	1.72	20	South	1	4	2	1	3 - 5
169	Eucalyptus camaldulensis	3.48	2.39	2.20	20	East	1	8	9	4	5 - 10

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)



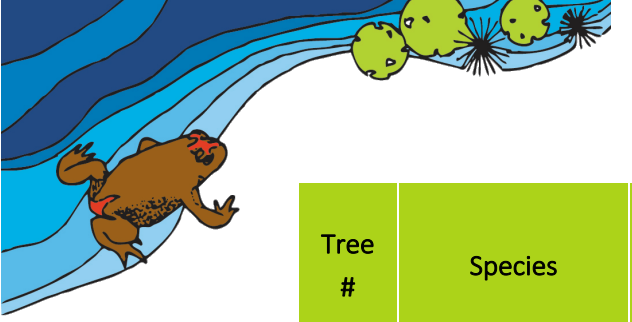
Tree #	Species	TPZ (m)	Reduced TPZ (m)	SRZ (m)	Stem lean (degrees)	Direction of lean	Canopy width (m) N	Canopy width (m) S	Canopy width (m) E	Canopy width (m) W	Tree height range (m)
170	Eucalyptus propinqua	3.48	2.39	2.18	7	East	9	2	6	2	15 - 20
171	Acacia sp. (sim. to A.macradenia)	4.80	3.30	2.49	5	South	5	8	7	6	10 - 15
172	Eucalyptus viridis	5.16	3.55	2.41	5	West	8	6	5	6	15 - 20
173	Eucalyptus viridis	4.08	2.81	2.23		None	4	6	5	3	-
174	Melia azedarach	2.40	1.65	1.88		None	5	5	3	5	3 - 5
175	Acacia salicina	3.96	2.72	2.23	8	South	4	8	6	2	15 - 20
176	Dead	0.00	0.00	0.00		None					-
177	Casuarina cristata	2.40	1.65	1.85		None	2	2	2	2	10 - 15
178	Acacia salicina	3.72	2.56	2.15	8	South	4	4	4	4	5 - 10
179	Eucalyptus dawsonii	4.92	3.38	2.45		None	7	7	7	7	15 - 20
180	Eucalyptus dawsonii	6.12	4.21	2.63		None	7	8	7	7	15 - 20
181	Dead	0.00	0.00	0.00		None					-
182	Casuarina cunninghamiana	6.36	4.37	2.93		None	10	4	10	10	15 - 20
183	Acacia sp. (sim. to A.macradenia)	3.60	2.48	2.05	30	East	0	10	5	1	10 - 15
184	Casuarina cunninghamiana	4.08	2.81	2.25		None	4	4	4	4	5 - 10
185	Casuarina cristata	6.36	4.37	2.87		None	8	9	8	7	20 - 25
186	Casuarina cunninghamiana	4.92	3.38	2.30		None	4	4	5	3	10 - 15
187	Casuarina cristata	8.28	5.69	3.12		None	10	9	10	9	20 - 25

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)



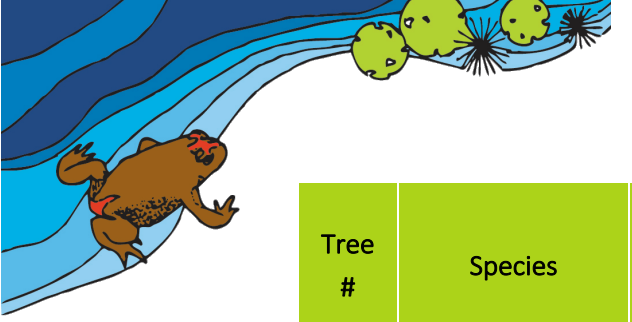
Tree #	Species	TPZ (m)	Reduced TPZ (m)	SRZ (m)	Stem lean (degrees)	Direction of lean	Canopy width (m) N	Canopy width (m) S	Canopy width (m) E	Canopy width (m) W	Tree height range (m)
188	Casuarina cristata	6.96	4.79	3.01	7	North	10	7	10	7	20 - 25
189	Casuarina cunninghamiana	3.84	2.64	2.20	4	North	4	2	6	1	5 - 10
190	Casuarina cunninghamiana	5.64	3.88	2.73		None	6	7		5	15 - 20
191	Tamarix aphylla	4.64	3.19	1.85		None	8	8	8	8	5 - 10
192	Casuarina cristata	10.92	7.51	3.61		None	8	9	9	6	20 - 25
193	Casuarina cristata	8.16	5.61	3.03	6	West	8	12	2	10	20 - 25
194	Melaleuca sp. (sim to M.decussata)	3.53	2.42	2.34		None	5	5	5	5	3 - 5
195	Melaleuca decussata	2.42	1.67	2.47		None	3	3	3	3	3 - 5
196	Melaleuca halmaturorum	0.00	0.00	0.00		None	4	4	4	4	3 - 5
197	Callistemon citrinus	3.66	2.51	2.51		None	1	2	3	1	3 - 5
198	Callistemon citrinus	2.81	1.93	2.13		None	3	2	2	2	3 - 5
199	Melaleuca bracteata	3.12	2.14	2.41		None	4	4	1	4	3 - 5
200	Melaleuca bracteata	2.55	1.75	2.15		None	4	4	1	1	3 - 5
201	Melaleuca bracteata	3.22	2.21	2.67		None	5	5	1	1	3 - 5
202	Melaleuca bracteata	2.60	1.79	2.20		None	4	4	5	1	3 - 5

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)



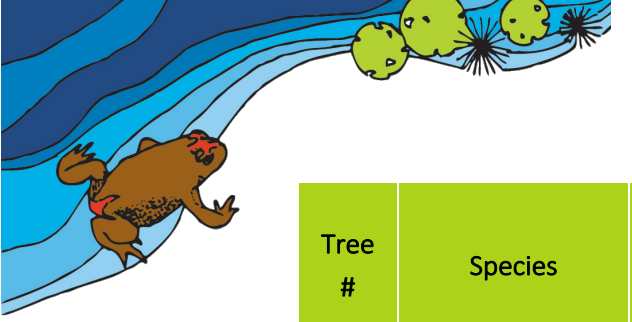
Tree #	Species	TPZ (m)	Reduced TPZ (m)	SRZ (m)	Stem lean (degrees)	Direction of lean	Canopy width (m) N	Canopy width (m) S	Canopy width (m) E	Canopy width (m) W	Tree height range (m)
203	Dead	0.00	0.00	0.00		None					-
204	Dead	0.00	0.00	0.00		None					-
205	Populus deltoides	3.12	2.15	1.91		None	3	4	2	2	10 - 15
206	Populus deltoides	2.76	1.90	1.88		None	3	3	2	2	10 - 15
207	Dead	0.00	0.00	0.00		None					-
208	Casuarina cristata	2.00	0.99	1.68		None	3	3	3	3	5 - 10
209	Callistemon sp	3.60	2.48	2.47		None	3	3	3	3	5 - 10
210	Callistemon sp	4.02	2.77	2.47		None	4	4	4	4	5 - 10
211	Callistemon sp	3.87	2.66	2.85		None	4	4	4	4	5 - 10
212	Callistemon sp	5.29	3.64	3.31		None	5	5	5	5	5 - 10
213	Callistemon sp	4.02	2.77	2.85		None	4	4	2	1	5 - 10
214	Callistemon viminalis hannah ray	4.06	2.79	2.34		None	5	5	4	1	5 - 10
215	Callistemon viminalis hannah ray	3.75	2.58	2.15		None	5	5	1	4	5 - 10
216	Callistemon viminalis hannah ray	4.69	3.22	2.47		None	5	5	1	5	5 - 10
217	Callistemon viminalis	2.00	1.11	1.61		None	3	3	3	1	3 - 5
218	Callistemon viminalis	2.00	1.12	1.85		None	3	2	4	1	3 - 5
219	Callistemon viminalis	2.08	1.43	1.85		None	3	3	2	3	3 - 5
220	Casuarina cunninghamiana	4.20	2.89	2.39		None	2	2	4	2	5 - 10

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)



Tree #	Species	TPZ (m)	Reduced TPZ (m)	SRZ (m)	Stem lean (degrees)	Direction of lean	Canopy width (m) N	Canopy width (m) S	Canopy width (m) E	Canopy width (m) W	Tree height range (m)
221	Casuarina cunninghamiana	8.16	5.61	3.17		None	7	7	7	3	20 - 25
222	Casuarina cunninghamiana	5.88	4.04	2.80		None	4	5	5	4	15 - 20
223	Casuarina cunninghamiana	6.12	4.21	2.80		None	5	5	6	7	15 - 20
224	Casuarina cunninghamiana	5.64	3.88	2.67		None	5	4	5	6	20 - 25
225	Casuarina cunninghamiana	8.52	5.86	2.98		None	10	4	8	7	15 - 20
226	Casuarina cunninghamiana	5.52	3.80	2.63		None	5	9	4	9	10 - 15
227	Casuarina cunninghamiana	5.88	4.04	2.73		None	7	3	6	7	15 - 20
228	Casuarina cunninghamiana	9.24	6.35	3.08		None	5	9	0	9	15 - 20
229	Casuarina cunninghamiana	7.56	5.20	2.85		None	8	5	4	6	15 - 20
230	Casuarina cunninghamiana	4.80	3.30	2.51		None	4	3	8	3	10 - 15
231	Casuarina cunninghamiana	4.44	3.05	2.37		None	9	1	1	3	15 - 20
232	Casuarina cunninghamiana	5.64	3.88	2.67		None	5	4	1	6	15 - 20
233	Casuarina cristata	11.64	8.00	3.57		None	13	7	10	10	20 - 25
234	Casuarina cunninghamiana	5.28	3.63	2.57		None	5	7	7	5	15 - 20

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)



Tree #	Species	TPZ (m)	Reduced TPZ (m)	SRZ (m)	Stem lean (degrees)	Direction of lean	Canopy width (m) N	Canopy width (m) S	Canopy width (m) E	Canopy width (m) W	Tree height range (m)
235	Casuarina cunninghamiana	5.64	3.88	2.67		None	5	7	7	3	15 - 20
236	Casuarina cunninghamiana	6.72	4.62	3.03		None	5	5	8	6	15 - 20
237	Casuarina cunninghamiana	4.32	2.97	2.34		None	2	5	3	4	15 - 20
238	Casuarina cunninghamiana	6.60	4.54	2.83		None	10	8	8	6	15 - 20
239	Casuarina cunninghamiana	6.48	4.46	2.78		None	8	5	6	4	15 - 20
240	Casuarina cunninghamiana	7.32	5.03	3.12		None	8	6	5	7	20 - 25

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

Table 4: Tree Condition.

Tree #	Species	Dead wood size (cm)	% DW	Age Class	Vitality	Condition	Health	Structure	Defect or disease
1	Eucalyptus beyeriana	5 - 10	5 - 10	Mature	Good	Good	Good	Fair	
2	Allocasuarina littoralis	-	-	Juvenile	Good	Good		Good	
3	Allocasuarina littoralis	-	-	Dead					Dead
4	Eucalyptus beyeriana	5 - 10	< 5%	Mature	Good	Fair	Good	Poor	Two trunks, stem wound base
5	Allocasuarina littoralis	5 - 10	5 - 10	Mature	Good	Fair	Good	Fair	Twin trunks, tip die back
6	Dead	-	-	Dead					Dead
7	Casuarina cristata	5 - 10	5 - 10	Mature	Fair	Poor	Fair	Good	Decay, cavity, tip die back. Lost leader, suppressed canopy, poorly pruned for canopy lift
8	Casuarina cristata	10 - 15	5 - 10	Mature	Fair	Good	Good	Good	failed branch/es;
9	Casuarina cristata	5 - 10	5 - 10	Mature	Fair	Fair	Poor	Poor	Stem wound, failed branches, tip die back, included bark stem junction
10	Casuarina cristata	-	-	Dead					Dead
11	Casuarina cristata	-	-	Dead					Dead

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

Tree #	Species	Dead wood size (cm)	% DW	Age Class	Vitality	Condition	Health	Structure	Defect or disease
12	Casuarina cristata	5 - 10	< 5%	Mature	Good	Fair	Fair	Fair	
13	Allocasuarina littoralis	5 - 10	< 5%	Mature	Fair	Fair	Fair	Poor	overextended branch
14	Casuarina cristata	-	-	Dead					Dead
15	Casuarina cristata	5 - 10	< 5%	Mature	Good	Fair	Good	Poor	Include bark - several junction types; Three codom trunks at 3m
16	Casuarina cristata	-	-	Dead					Dead
17	Casuarina cristata	20 - 25	> 90	Senescent	Poor	Poor	Poor	Poor	Nearly dead
18	Casuarina cristata	< 5	40 - 50	Mature	Poor	Poor	Poor	Fair	Included bark - stem junction; Codom trunk at 6m
19	Casuarina cristata	< 5	5 - 10	Mature	Good	Fair	Fair	Fair	Id sample, codom at 6m, failed branch/es; tip die back
20	Casuarina cristata	5 - 10	< 5%	Mature	Good	Fair	Good	Poor	Codom trunk at 4m and 5m, failed branch/es; Include bark - several juction types;
21	Casuarina cristata	< 5	< 5%	Juvenile	Excellent	Good	Excellent	Fair	Lost leader 4m

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

Tree #	Species	Dead wood size (cm)	% DW	Age Class	Vitality	Condition	Health	Structure	Defect or disease
22	Casuarina cristata	< 5	< 5%	Mature	Fair	Fair	Good	Poor	Codom at 4m
23	Casuarina cristata	-	-	Dead					Dead
24	Casuarina cristata	< 5	< 5%	Mature	Good	Fair	Good	Fair	Codomat 3m
25	Casuarina cunninghamiana	5 - 10	5 - 10	Juvenile	Fair	Poor	Fair	Poor	Stem wound, tip die back
26	Casuarina cunninghamiana	5 - 10	30 - 40	Juvenile	Poor	Poor	Poor	Poor	Stem wound, tip die back, stem wound
27	Casuarina cristata	5 - 10	< 5%	Mature	Excellent	Good	Good	Fair	Stem wound
28	Allocasuarina gymnanthera	< 5	10 - 20	Semi-mature	Good	Good	Good	Fair	Codom at 3m
29	Dead	-	-	Dead					Dead
30	Casuarina cristata	< 5	< 5%	Mature	Good	Good	Good	Good	
31	Casuarina cunninghamiana	10 - 15	> 90	Juvenile	Poor	Poor	Poor	Poor	Dying
32	Casuarina cristata	5 - 10	< 5%	Mature	Good	Fair	Good	Fair	Included bark - stem junction; Codom at 1.5m
33	Casuarina cristata	5 - 10	10 - 20	Mature	Fair	Fair	Fair	Poor	Codom at 3m, suppressed canopy, failed branch/es; tip die back
34	Dead	-	-	Dead					Dead
35	Dead	-	-	Dead					Dead
36	Casuarina cristata	5 - 10	5 - 10	Mature	Good	Fair	Good	Poor	Broken by fallen T35

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

Tree #	Species	Dead wood size (cm)	% DW	Age Class	Vitality	Condition	Health	Structure	Defect or disease
37	Casuarina cristata	< 5	< 5%	Mature	Good	Good	Good	Fair	Codom at 2m
38	Casuarina cristata	< 5	< 5%	Mature	Good	Good	Good	Fair	Codom at 4m
39	Casuarina cristata	< 5	5 - 10	Mature	Good	Good	Fair	Fair	Suppressed canopy south
40	Casuarina cristata	< 5	5 - 10	Mature	Good	Fair	Fair	Fair	Suppressed north and east, codom at 1.5m
41	Casuarina cristata	< 5	5 - 10	Mature	Good	Fair	Fair	Fair	Codom at 4m
42	Casuarina cristata	< 5	< 5%	Mature	Good	Good	Good	Fair	
43	Casuarina cristata	10 - 15	< 5%	Mature	Good	Poor	Fair	Poor	Borers. Codom broken off at 2m
44	Eucalyptus propinqua	5 - 10	< 5%	Mature	Good	Good	Good	Fair	7-flowered form
45	Eucalyptus conspicua	20 - 25	30 - 40	Mature	Poor	Poor	Poor	Poor	epicormic shoots, tip die back, failed branches
46	Dead	-	-	Dead					Dead
47	Eucalyptus seeana	5 - 10	30 - 40	Mature	Fair	Poor	Poor	Poor	epicormic shoots, tip die back, failed branches
48	Eucalyptus melanophloia	< 5	< 5%	Mature	Fair	Fair	Fair	Good	
49	Eucalyptus sideroxylon	< 5	< 5%	Mature	Fair	Good	Fair	Select...	
50	Eucalyptus sp. Ironbark	5 - 10	5 - 10	Semi-mature	Poor	Poor	Poor	Poor	epicormic shoots, failed branches

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

Tree #	Species	Dead wood size (cm)	% DW	Age Class	Vitality	Condition	Health	Structure	Defect or disease
51	Acacia pendula	< 5	10 - 20	Mature	Poor	Poor	Poor	Fair	failed branch/es; tip die back
52	Eucalyptus melanophloia	10 - 15	50 - 60	Senescent	Poor	Poor	Poor	Poor	Declining, failed branch/es; tip die back, epicormic shoots
53	Corymbia citriodora	< 5	5 - 10	Mature	Good	Good	Poor	Poor	
54	Acacia sp	5 - 10	20 - 30	Mature	Poor	Poor	Fair	Fair	Four trunks, one dead
55	Eucalyptus bosistoana	< 5	< 5%	Mature	Good	Good	Good	Fair	
56	Eucalyptus intertexta	< 5	< 5%	Mature	Fair	Fair	Good	Good	
57	Eucalyptus intertexta	< 5	< 5%	Mature	Fair	Fair	Fair	Good	epicormic shoots
58	Dead	-	-	Dead					
59	Eucalyptus intertexta	< 5	< 5%	Mature	Fair	Fair	Fair	Good	epicormic shoots
60	Eucalyptus intertexta	< 5	< 5%	Mature	Fair	Fair	Fair	Good	Borer
61	Eucalyptus intertexta	5 - 10	< 5%	Mature	Good	Good	Good	Good	
62	Eucalyptus tereticornis	< 5	< 5%	Mature	Good	Good	Good	Fair	
63	Eucalyptus sideroxylon	5 - 10	5 - 10	Mature	Fair	Fair	Fair	Fair	Suppressed
64	Eucalyptus sideroxylon	< 5	< 5%	Mature	Fair	Fair	Fair	Fair	
65	Eucalyptus albens	5 - 10	< 5%	Mature	Good	Good	Good	Fair	epicormic shoots

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

Tree #	Species	Dead wood size (cm)	% DW	Age Class	Vitality	Condition	Health	Structure	Defect or disease
66	Eucalyptus sp.	5 - 10	< 5%	Mature	Fair	Poor	Fair	Poor	Crossed trunks, split bark, dying, failed branch/es; tip die back, included bark stem junction, rubbing branch
67	Eucalyptus sp.	20 - 25	5 - 10	Mature	Poor	Poor	Poor	Poor	Split bark, dying, major limb shed, very sparse canopy, failed branch/es; epicormic shoots
68	Melaleuca stypheloides	< 5	< 5%	Mature	Good	Good	Good	Good	
69	Eucalyptus sideroxylon	5 - 10	< 5%	Mature	Fair	Fair	Fair	Poor	Four trunks joined, at one metre, sparse canopy, failed branch/es; tip die back, epicormic shoots, included bark, several junction types
70	Eucalyptus dealbata	5 - 10	< 5%	Mature	Fair	Fair	Fair	Fair	
71	Eucalyptus dealbata	< 5	5 - 10	Mature	Good	Good	Good	Good	tip die back, epicormic shoots
72	Allocasuarina sp.	< 5	5 - 10	Semi-mature	Poor	Poor	Poor	Poor	tip die back
73	Eucalyptus camaldulensis	10 - 15	5 - 10	Mature	Good	Good	Good	Good	

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

Tree #	Species	Dead wood size (cm)	% DW	Age Class	Vitality	Condition	Health	Structure	Defect or disease
74	Eucalyptus crebra	5 - 10	5 - 10	Mature	Fair	Fair	Fair	Good	
75	Eucalyptus crebra	< 5	< 5%	Mature	Good	Good	Good	Good	
76	Eucalyptus crebra	< 5	< 5%	Juvenile	Poor	Poor	Poor	Fair	Lost leader, epicormic shoots, tip die back
77	Eucalyptus dealbata	5 - 10	< 5%	Semi-mature	Fair	Fair	Fair	Fair	failed branch/es; tip die back, epicormic shoots
78	Eucalyptus dealbata	< 5	< 5%	Mature	Good	Fair	Fair	Good	epicormic shoots
79	Eucalyptus dawsonii	< 5	< 5%	Mature	Fair	Poor	Poor	Poor	epicormic shoots
80	Eucalyptus dawsonii	5 - 10	< 5%	Mature	Fair	Fair	Fair	Good	epicormic shoots
81	Eucalyptus dawsonii	< 5	< 5%	Mature	Fair	Fair	Fair	Good	
82	Eucalyptus socialis	5 - 10	20 - 30	Mature	Poor	Poor	Poor	Poor	failed branch/es; tip die back
83	Eucalyptus albens	5 - 10	5 - 10	Mature	Poor	Poor	Poor	Poor	failed branch/es; epicormic shoots
84	Eucalyptus albens	5 - 10	40 - 50	Senescent	Poor	Poor	Poor	Poor	failed branch/es; tip die back, epicormic shoots
85	Dead	-	-	Dead					Dead
86	Eucalyptus melanophloia	< 5	< 5%	Mature	Good	Good	Good	Fair	
87	Eucalyptus crebra	< 5	< 5%	Mature	Good	Good	Good	Good	
88	Eucalyptus largiflorens	5 - 10	5 - 10	Mature	Good	Good	Good	Poor	Included bark - stem junction;

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

Tree #	Species	Dead wood size (cm)	% DW	Age Class	Vitality	Condition	Health	Structure	Defect or disease
89	Eucalyptus dawsonii	5 - 10	< 5%	Mature	Good	Good	Good	Good	poor pruning
90	Eucalyptus propinqua	< 5	< 5%	Mature	Good	Good	Good	Good	11-flowered form
91	Eucalyptus sp	5 - 10	< 5%	Mature	Good	Good	Good	Fair	rubbing branch
92	Eucalyptus sp	15 - 20	10 - 20	Mature	Fair	Fair	Fair	Fair	failed branch/es; epicormic shoots
93	Eucalyptus sp. (sim. to E.gracilis)	5 - 10	30 - 40	Senescent	Poor	Poor	Poor	Poor	failed branch/es; tip die back, epicormic shoots
94	Eucalyptus (fibrosa OR sideroxylon)	< 5	< 5%	Mature	Poor	Fair	Fair	Good	
95	Eucalyptus albens	5 - 10	20 - 30	Mature	Poor	Poor	Poor	Poor	failed branch/es; tip die back
96	Eucalyptus crebra	< 5	< 5%	Mature	Good	Good	Good	Good	
97	Eucalyptus crebra	< 5	< 5%	Mature	Fair	Fair	Fair	Poor	
98	Eucalyptus albens	< 5	< 5%	Mature	Fair	Good	Good	Good	
99	Eucalyptus crebra / beyeriana	< 5	< 5%	Mature	Good	Good	Good	Poor	
100	Eucalyptus albens	< 5	< 5%	Mature	Good	Good	Good	Poor	Included bark - stem junction;
101	Ulmus parvifolia	< 5	< 5%	Mature	Good	Good	Good	Good	
102	Eucalyptus albens	15 - 20	10 - 20	Mature	Good	Fair	Fair	Poor	Included bark - stem junction; tip die back, failed branches, epicormic shoots

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

Tree #	Species	Dead wood size (cm)	% DW	Age Class	Vitality	Condition	Health	Structure	Defect or disease
103	Eucalyptus albens	10 - 15	10 - 20	Mature	Fair	Fair	Fair	Poor	poor pruning
104	Corymbia eximia	-	-	Semi-mature	Good	Good	Good	Poor	
105	Fraxinus greywoodii	5 - 10	5 - 10	Mature	Good	Good	Good	Good	failed branch/es; tip die back
106	Callistemon viminalis	-	-	Mature	Select...	Select...	Select...	Select...	
107	Callistemon viminalis	-	-	Mature	Good	Good	Excellent	Good	
108	Grevillea robusta	< 5	< 5%	Mature	Excellent	Fair	Excellent	Excellent	
109	Grevillea robusta	< 5	< 5%	Mature	Good	Good	Good	Poor	
110	Callistemon viminalis	< 5	< 5%	Mature	Fair	Fair	Fair	Poor	
111	Callistemon viminalis	< 5	< 5%	Mature	Good	Good	Good	Poor	
112	Callistemon viminalis	< 5	< 5%	Mature	Good	Good	Good	Poor	
113	Callistemon viminalis	5 - 10	5 - 10	Senescent	Fair	Fair	Fair	Poor	failed branch/es;
114	Callistemon viminalis	< 5	40 - 50	Senescent	Poor	Poor	Poor	Poor	failed branch/es; tip die back, epicormic shoots
115	Fraxinus griffithii	< 5	< 5%	Mature	Good	Good	Good	Good	
116	Photinia robusta	< 5	< 5%	Mature	Good	Good	Good	Poor	
117	Melaleuca styphlioides	< 5	< 5%	Mature	Good	Good	Good	Good	
118	Melaleuca styphlioides	< 5	< 5%	Mature	Good	Good	Good	Good	
119	Melaleuca styphlioides	< 5	< 5%	Mature	Good	Good	Good	Good	

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

Tree #	Species	Dead wood size (cm)	% DW	Age Class	Vitality	Condition	Health	Structure	Defect or disease
120	Melaleuca styphlioides	< 5	< 5%	Mature	Good	Good	Good	Good	
121	Melaleuca styphlioides	< 5	< 5%	Over-mature	Fair	Poor	Fair	Poor	
122	Melaleuca styphlioides	< 5	< 5%	Mature	Good	Good	Good	Good	
123	Melaleuca styphlioides	< 5	< 5%	Mature	Good	Good	Good	Good	
124	Melaleuca styphlioides	< 5	< 5%	Mature	Good	Good	Good	Good	
125	Melaleuca styphlioides	< 5	< 5%	Mature	Good	Good	Good	Good	
126	Cupaniopsis anacardioides	< 5	< 5%	Mature	Good	Good	Good	Poor	
127	Murraya sp.	< 5	< 5%	Mature	Good	Good	Good	Good	
128	Chamaecyparis sp. (or Cupressus sp.)	< 5	< 5%	Semi-mature	Good	Good	Good	Good	
129	Casuarina cristata	< 5	< 5%	Mature	Good	Good	Good	Poor	Dangerous overweight on highway side, Stem wound Included bark - stem junction; Included bark - branch stem attachment;
130	Casuarina cunninghamiana	5 - 10	< 5%	Mature	Poor	Poor	Poor	Poor	Stem wound, poor occlusion, decay

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

Tree #	Species	Dead wood size (cm)	% DW	Age Class	Vitality	Condition	Health	Structure	Defect or disease
131	Casuarina cristata	< 5	10 - 20	Mature	Good	Good	Good	Poor	Included bark - stem junction;
132	Casuarina cunninghamiana	15 - 20	10 - 20	Mature	Poor	Poor	Poor	Poor	failed branch/es;
133	Casuarina cristata	20 - 25	5 - 10	Mature	Good	Fair	Fair	Poor	Decay, Included bark - branch stem attachment; failed branch/es;
134	Casuarina cunninghamiana	5 - 10	30 - 40	Mature	Poor	Poor	Poor	Fair	Decay, failed branch/es; poor pruning
135	Casuarina cristata	< 5	5 - 10	Mature	Good	Fair	Good	Good	
136	Casuarina cunninghamiana	10 - 15	20 - 30	Mature	Poor	Poor	Fair	Poor	Lost leader, failed branch/es; tip die back
137	Casuarina cristata	< 5	5 - 10	Mature	Fair	Good	Good	Fair	
138	Casuarina cunninghamiana	10 - 15	40 - 50	Mature	Poor	Poor	Poor	Poor	failed branch/es; tip die back, epicormic shoots
139	Casuarina cristata	< 5	< 5%	Mature	Good	Good	Good	Fair	Included bark - stem junction;
140	Casuarina cunninghamiana	10 - 15	10 - 20	Mature	Fair	Fair	Fair	Poor	Borer, failed branch/es; tip die back
141	Casuarina cristata	5 - 10	< 5%	Mature	Good	Good	Good	Fair	Suppressed canopy
142	Casuarina cristata	< 5	< 5%	Mature	Good	Good	Good	Fair	
143	Casuarina cristata	< 5	< 5%	Mature	Poor	Poor	Poor	Fair	failed branch/es; tip die back

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

Tree #	Species	Dead wood size (cm)	% DW	Age Class	Vitality	Condition	Health	Structure	Defect or disease
144	Casuarina cristata	< 5	5 - 10	Mature	Poor	Fair	Poor	Fair	tip die back
145	Casuarina cristata	< 5	< 5%	Mature	Poor	Poor	Poor	Fair	tip die back
146	Dead	-	-	Dead					
147	Casuarina cristata	< 5	5 - 10	Mature	Fair	Fair	Poor	Poor	Stem wound, tip die back, tip die back
148	Casuarina cunninghamiana	5 - 10	40 - 50	Senescent	Poor	Poor	Poor	Poor	epicormic shoots, tip die back, failed branches
149	Casuarina cristata	< 5	5 - 10	Over-mature	Fair	Poor	Poor	Fair	Stem wound, tip die back, decay, failed branches
150	Casuarina cristata	< 5	< 5%	Mature	Fair	Fair	Poor	Fair	
151	Casuarina cristata	< 5	10 - 20	Mature	Fair	Fair	Fair	Poor	Decay, failed branches, poor occlusion, Lost leader
152	Casuarina cristata	< 5	5 - 10	Mature	Fair	Fair	Fair	Fair	Stem wound, decay, cavity
153	Casuarina cristata	< 5	< 5%	Mature	Good	Good	Good	Fair	Double trunk 4m
154	Casuarina cristata	5 - 10	20 - 30	Mature	Fair	Fair	Fair	Poor	Included bark - stem junction;
155	Casuarina cristata	< 5	< 5%	Mature	Fair	Good	Fair	Poor	Include bark - several juction types; stem wound, poor pruning. Lopped tops at 5m

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

Tree #	Species	Dead wood size (cm)	% DW	Age Class	Vitality	Condition	Health	Structure	Defect or disease
156	Casuarina cristata	5 - 10	5 - 10	Mature	Fair	Fair	Good	Fair	Stem wound, cavity
157	Casuarina cristata	< 5	5 - 10	Mature	Good	Good	Good	Fair	Included bark - stem junction;
158	Casuarina cristata	< 5	< 5%	Mature	Good	Good	Good	Fair	
159	Casuarina cristata	< 5	< 5%	Mature	Good	Good	Good	Poor	Included bark - stem junction;
160	Casuarina cristata	10 - 15	10 - 20	Mature	Good	Fair	Fair	Fair	Stem wound, decay, cavity, poor pruning
161	Casuarina cristata	5 - 10	5 - 10	Mature	Good	Good	Good	Fair	
162	Casuarina cristata	5 - 10	10 - 20	Over-mature	Poor	Poor	Fair	Good	failed branch/es; tip die back
163	Casuarina cristata	5 - 10	5 - 10	Mature	Good	Good	Good	Fair	poor pruning
164	Casuarina cristata	5 - 10	5 - 10	Mature	Good	Good	Good	Fair	Stem wound, Included bark - stem junction;
165	Casuarina cristata	10 - 15	30 - 40	Over-mature	Poor	Poor	Fair	Poor	failed branch/es; Included bark - stem junction;
166	Casuarina cristata	5 - 10	10 - 20	Mature	Fair	Fair	Good	Fair	
167	Casuarina cristata	5 - 10	30 - 40	Over-mature	Fair	Poor	Fair	Poor	Weak branch attachment
168	Acacia williamsonii	< 5	10 - 20	Mature	Excellent	Excellent	Excellent	Fair	
169	Eucalyptus camaldulensis	< 5	< 5%	Mature	Excellent	Excellent	Excellent	Fair	Planted on a mound.

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

Tree #	Species	Dead wood size (cm)	% DW	Age Class	Vitality	Condition	Health	Structure	Defect or disease
170	Eucalyptus propinqua	< 5	< 5%	Mature	Good	Fair	Good	Poor	11-flowered form
171	Acacia sp. (sim. to A.macradenia)	5 - 10	10 - 20	Mature	Excellent	Good	Excellent	Good	
172	Eucalyptus viridis	5 - 10	5 - 10	Mature	Good	Good	Fair	Good	Bracket fungus, failed branch/es; poor pruning
173	Eucalyptus viridis	-	-	Mature	Poor	Poor	Poor	Poor	Stem wound, bracket fungus, epicormic shoots, included bark stem junction
174	Melia azedarach	< 5	< 5%	Mature	Good	Poor	Fair	Poor	
175	Acacia salicina	< 5	< 5%	Mature	Excellent	Excellent	Excellent	Good	
176	Dead	-	-	Dead					
177	Casuarina cristata	< 5	< 5%	Mature	Good	Good	Good	Good	
178	Acacia salicina	< 5	< 5%	Mature	Excellent	Excellent	Excellent	Good	
179	Eucalyptus dawsonii	< 5	< 5%	Mature	Excellent	Excellent	Excellent	Excellent	
180	Eucalyptus dawsonii	< 5	< 5%	Mature	Excellent	Excellent	Excellent	Excellent	
181	Dead	-	-	Dead					
182	Casuarina cunninghamiana	25 - 30	30 - 40	Over-mature	Fair	Poor	Poor	Poor	Decay, Included bark - branch stem attachment; failed branches, tip dieback
183	Acacia sp. (sim. to A.macradenia)	< 5	< 5%	Mature	Excellent	Fair	Good	Poor	poor pruning

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

Tree #	Species	Dead wood size (cm)	% DW	Age Class	Vitality	Condition	Health	Structure	Defect or disease
184	Casuarina cunninghamiana	5 - 10	20 - 30	Over-mature	Poor	Poor	Poor	Poor	Included bark - stem junction;
185	Casuarina cristata	5 - 10	< 5%	Mature	Good	Good	Good	Fair	Included bark - stem junction;
186	Casuarina cunninghamiana	5 - 10	5 - 10	Mature	Poor	Fair	Good	Fair	poor occlusion, decay, rubbing branch
187	Casuarina cristata	10 - 15	< 5%	Mature	Good	Good	Good	Fair	
188	Casuarina cristata	20 - 25	5 - 10	Mature	Fair	Fair	Good	Fair	Stem wound, decay, stem wound
189	Casuarina cunninghamiana	5 - 10	10 - 20	Senescent	Poor	Poor	Poor	Poor	Decay, tip dieback, epicormic shoots
190	Casuarina cunninghamiana	10 - 15	5 - 10	Mature	Fair	Good	Fair	Good	failed branch/es;
191	Tamarix aphylla	-	-	Mature	Excellent	Excellent	Excellent	Good	Tamarix aphylla (Athel Pine) (Weed of National Significance)
192	Casuarina cristata	5 - 10	< 5%	Mature	Good	Fair	Good	Poor	Cavity, poor pruning. Top lopped at 10m and major limbs cut back

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

Tree #	Species	Dead wood size (cm)	% DW	Age Class	Vitality	Condition	Health	Structure	Defect or disease
193	Casuarina cristata	5 - 10	10 - 20	Mature	Fair	Fair	Fair	Poor	Included bark - stem junction; longitudinal cracks (compression)
194	Melaleuca sp. (sim to M.decussata)	< 5	5 - 10	Mature	Good	Fair	Good	Good	
195	Melaleuca decussata	< 5	50 - 60	Senescent	Poor	Poor	Poor	Poor	
196	Melaleuca halmaturorum	< 5	< 5%	Mature	Select...	Select...	Select...	Select...	failed branch/es; crack in crotch. Failing at base
197	Callistemon citrinus	< 5	< 5%	Mature	Excellent	Excellent	Excellent	Excellent	
198	Callistemon citrinus	< 5	< 5%	Mature	Excellent	Excellent	Excellent	Excellent	
199	Melaleuca bracteata	< 5	< 5%	Mature	Good	Good	Good	Fair	Revolution green
200	Melaleuca bracteata	< 5	< 5%	Mature	Good	Good	Good	Good	Revolution gold
201	Melaleuca bracteata	< 5	< 5%	Mature	Good	Good	Good	Good	R green
202	Melaleuca bracteata	< 5	< 5%	Mature	Good	Good	Good	Good	R gold
203	Dead	-	-	Dead					
204	Dead	-	-	Dead					
205	Populus deltoides	< 5	< 5%	Mature	Poor	Poor	Fair	Poor	
206	Populus deltoides	< 5	< 5%	Senescent	Poor	Poor	Poor	Poor	failed branch/es;
207	Dead	-	-	Select...	Select...	Select...	Select...	Select...	
208	Casuarina cristata	< 5	< 5%	Mature	Good	Good	Good	Good	

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

Tree #	Species	Dead wood size (cm)	% DW	Age Class	Vitality	Condition	Health	Structure	Defect or disease
209	Callistemon sp	< 5	< 5%	Mature	Excellent	Excellent	Excellent	Good	
210	Callistemon sp	10 - 15	> 90	Senescent	Poor	Poor	Poor	Poor	failed branch/es; tip dieback
211	Callistemon sp	15 - 20	> 90	Senescent	Poor	Poor	Poor	Poor	
212	Callistemon sp	15 - 20	80 - 90	Senescent	Poor	Poor	Poor	Fair	
213	Callistemon sp	5 - 10	60 - 70	Over-mature	Fair	Fair	Poor	Fair	
214	Callistemon viminalis hannah ray	< 5	< 5%	Mature	Good	Good	Good	Good	
215	Callistemon viminalis hannah ray	< 5	< 5%	Mature	Fair	Poor	Good	Poor	Lopped, poor pruning
216	Callistemon viminalis hannah ray	< 5	< 5%	Over-mature	Good	Poor	Good	Poor	poor pruning
217	Callistemon viminalis	< 5	< 5%	Mature	Fair	Fair	Fair	Fair	tip die back, leaf miner
218	Callistemon viminalis	< 5	< 5%	Mature	Good	Good	Good	Good	
219	Callistemon viminalis	< 5	< 5%	Mature	Good	Good	Good	Good	
220	Casuarina cunninghamiana	10 - 15	20 - 30	Over-mature	Poor	Poor	Poor	Poor	failed branch/es; tip dieback, epicormic shoots
221	Casuarina cunninghamiana	15 - 20	5 - 10	Over-mature	Fair	Fair	Good	Good	failed branch/es; tip dieback,
222	Casuarina cunninghamiana	5 - 10	10 - 20	Over-mature	Fair	Fair	Fair	Good	failed branch/es; tip dieback, poor pruning
223	Casuarina cunninghamiana	5 - 10	5 - 10	Over-mature	Good	Fair	Good	Good	failed branch/es; poor pruning

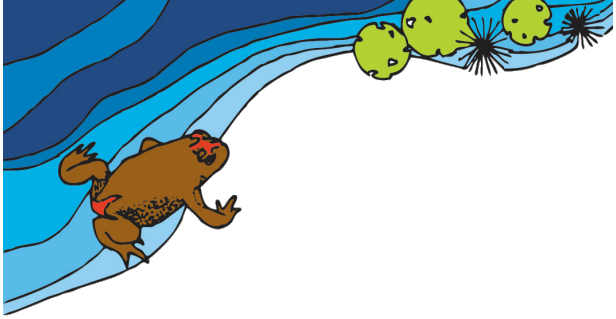
© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

Tree #	Species	Dead wood size (cm)	% DW	Age Class	Vitality	Condition	Health	Structure	Defect or disease
224	Casuarina cunninghamiana	5 - 10	40 - 50	Senescent	Poor	Poor	Poor	Poor	failed branch/es; tip dieback, poor pruning
225	Casuarina cunninghamiana	15 - 20	< 5%	Mature	Good	Good	Good	Fair	failed branch/es; poor pruning
226	Casuarina cunninghamiana	5 - 10	5 - 10	Over-mature	Fair	Fair	Fair	Good	poor pruning, decay, poor occlusion
227	Casuarina cunninghamiana	10 - 15	5 - 10	Over-mature	Fair	Fair	Fair	Good	failed branch/epicormic shoots
228	Casuarina cunninghamiana	25 - 30	> 90	Senescent	Poor	Poor	Poor	Poor	Dying, dangerous, failed branch/es; decay
229	Casuarina cunninghamiana	5 - 10	5 - 10	Over-mature	Fair	Fair	Poor	Fair	Decay, stem wound, epicormic shoots
230	Casuarina cunninghamiana	5 - 10	< 5%	Over-mature	Fair	Fair	Fair	Good	failed branch/es; tip dieback, decay
231	Casuarina cunninghamiana	5 - 10	30 - 40	Senescent	Poor	Poor	Poor	Poor	failed branch/es; cavity, decay
232	Casuarina cunninghamiana	5 - 10	20 - 30	Senescent	Fair	Fair	Fair	Fair	failed branch/es; decay, poor pruning
233	Casuarina cristata	5 - 10	< 5%	Mature	Good	Good	Good	Good	
234	Casuarina cunninghamiana	< 5	30 - 40	Over-mature	Poor	Fair	Fair	Fair	failed branch/es; poor occlusion
235	Casuarina cunninghamiana	5 - 10	30 - 40	Senescent	Fair	Fair	Fair	Poor	failed branch/es; cavity, decay

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

Tree #	Species	Dead wood size (cm)	% DW	Age Class	Vitality	Condition	Health	Structure	Defect or disease
236	Casuarina cunninghamiana	5 - 10	< 5%	Over-mature	Fair	Fair	Good	Good	
237	Casuarina cunninghamiana	5 - 10	20 - 30	Over-mature	Fair	Fair	Fair	Poor	Stem wound, tip dieback, failed branches
238	Casuarina cunninghamiana	10 - 15	10 - 20	Over-mature	Good	Fair	Good	Good	
239	Casuarina cunninghamiana	5 - 10	5 - 10	Mature	Good	Good	Good	Good	
240	Casuarina cunninghamiana	5 - 10	5 - 10	Mature	Good	Good	Good	Good	

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)



Appendix 3. Tree protection guidelines

A Pre-construction/Demolition phase

The following methods are to be implemented to minimise potential damage to retained trees, e.g. from soil compaction and site activity. Trees are to be protected at all stages of the development, and growing conditions are to be improved within the Tree Protection Zone (TPZ). These guidelines are consistent with AS4970-2009 Protection of trees on development sites.

A 1. All site workers are to be aware of relevant tree protection requirements. Nominated trees will be removed or transplanted as per the tree protection plan. An arborist is to supervise tree removal, pruning and transplanting and certify the completed works.

A 2. All trees not nominated for retention are to be removed prior to any construction activity. Approved tree pruning and removal operations near retained trees are to be carried out in a way that avoids soil compaction and damage to canopy, trunk or roots. Works are to be supervised by an arborist or the person responsible for site management.

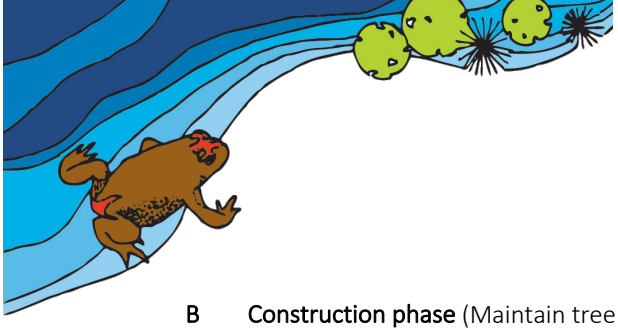
A 3. Stumps are to be ground, not dozed or dug out, if in the vicinity of retained trees. Machinery (other than stump machines) is to be kept beyond the nominated protection zones of retained trees during all operations.

A 4. Tree protection fencing is to be in place before the introduction of machinery or other materials to the site and before commencement of works. Fencing is to be located to at least the canopy dripline, be of sturdy construction and retained in-situ during works unless altered by the project arborist. All site activities are excluded from this zone. Refer to Appendix 2 for specific minimum setback distances. AS4687 specifies applicable fencing requirements.

A 5. The TPZ is to be mulched using material compatible with 'AS4454-2003 Composts, soil conditioners and mulches', e.g. decomposed leaf litter, and maintained at 50-100 mm depth. Some areas, e.g. turf, may not require mulch. Temporary irrigation may be required. Weeds are to be removed and controlled.

A 6. Pruning is to be undertaken by suitably qualified, skilled and insured people to comply with AS4373-2007, Australian Standard: Pruning of Amenity Trees. Initial pruning provides adequate clearances and general crown maintenance. Flexible branches are to be tied back, not pruned.

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)



B **Construction phase** (Maintain tree protection fencing)

B 1. Where access is required within a TPZ, temporary ground protection measures will be required (e.g. metal plates, rumble boards or exterior-grade ply over aggregate) capable of supporting the required load without deflection. Trunk protection may be required, e.g. battens wrapped around the trunk to a height of 2 m.

B 2. Material stockpiles or dumps, parking, excavation, site sheds, preparation of chemicals, fires, wash down areas or similar are to be located clear of TPZs. Areas designated for such requirements are not to divert drainage water into tree protection areas.

B 3. Machine trenching is to be excluded from the TPZ of retained trees. Any required root excavation inside a TPZ is to be done by hand and intact roots >40 mm in diameter are to be retained. Services are to be installed 100 mm clear of such roots. Damaged roots **must** be cut cleanly with sharp implements (backhoe blades and similar are excluded), with no root dressings or paints. Trenches are to be backfilled promptly to minimise soil desiccation. Underbore if no suitable alternative location is possible. All works within the TPZ are to be supervised by an arborist.

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

Appendix 4. Tree AZ categories

TreeAZ Categories (Version 10.04-ANZ)

CAUTION: TreeAZ assessments must be carried out by a competent person qualified and experienced in arboriculture. The following category descriptions are designed to be a brief field reference and are not intended to be self-explanatory. They must be read in conjunction with the most current explanations published at www.TreeAZ.com.

Category Z: Unimportant trees not worthy of being a material constraint

Local policy exemptions: Trees that are unsuitable for legal protection for local policy reasons including size, proximity and species	
Z1	Young or insignificant small trees, i.e. below the local size threshold for legal protection, etc
Z2	Too close to a building, i.e. exempt from legal protection because of proximity, etc
Z3	Species that cannot be protected for other reasons, i.e. scheduled noxious weeds, out of character in a setting of acknowledged importance, etc
High risk of death or failure: Trees that are likely to be removed within 10 years because of acute health issues or severe structural failure	
Z4	Dead, dying, diseased or declining
Z5	Severe damage and/or structural defects where a high risk of failure cannot be satisfactorily reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, overgrown and vulnerable to adverse weather conditions, etc
Z6	Instability, i.e. poor anchorage, increased exposure, etc
Excessive nuisance: Trees that are likely to be removed within 10 years because of unacceptable impact on people	
Z7	Excessive, severe and intolerable inconvenience to the extent that a locally recognized court or tribunal would be likely to authorize removal, i.e. dominance, debris, interference, etc
Z8	Excessive, severe and intolerable damage to property to the extent that a locally recognized court or tribunal would be likely to authorize removal, i.e. severe structural damage to surfacing and buildings, etc
Good management: Trees that are likely to be removed within 10 years through responsible management of the tree population	
Z9	Severe damage and/or structural defects where a high risk of failure can be temporarily reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, vulnerable to adverse weather conditions, etc
Z10	Poor condition or location with a low potential for recovery or improvement, i.e. dominated by adjacent trees or buildings, poor architectural framework, etc
Z11	Removal would benefit better adjacent trees, i.e. relieve physical interference, suppression, etc
Z12	Unacceptably expensive to retain, i.e. severe defects requiring excessive levels of maintenance, etc

NOTE: Z trees with a high risk of death/failure (Z4, Z5 & Z6) or causing severe inconvenience (Z7 & Z8) at the time of assessment and need an urgent risk assessment can be designated as ZZ. ZZ trees are likely to be unsuitable for retention and at the bottom of the categorization hierarchy. In contrast, although Z trees are not worthy of influencing new designs, urgent removal is not essential and they could be retained in the short term, if appropriate.

Category A: Important trees suitable for retention for more than 10 years and worthy of being a material constraint

A1	No significant defects and could be retained with minimal remedial care
A2	Minor defects that could be addressed by remedial care and/or work to adjacent trees
A3	Special significance for historical, cultural, commemorative or rarity reasons that would warrant extraordinary efforts to retain for more than 10 years
A4	Trees that may be worthy of legal protection for ecological reasons (Advisory requiring specialist assessment)

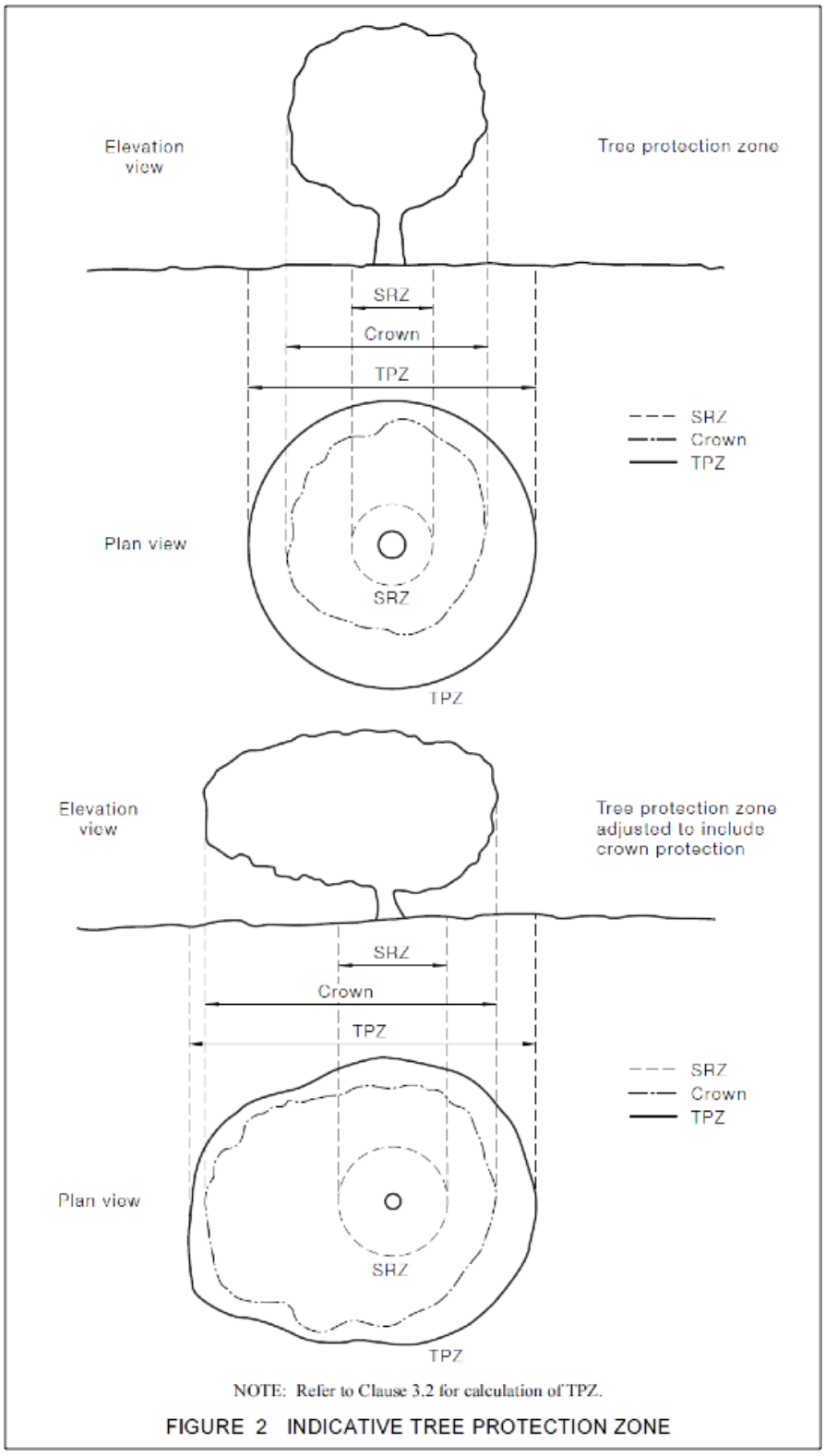
NOTE: Category A1 trees that are already large and exceptional, or have the potential to become so with minimal maintenance, can be designated as AA at the discretion of the assessor. Although all A and AA trees are sufficiently important to be material constraints, AA trees are at the top of the categorization hierarchy and should be given the most weight in any selection process.

TreeAZ is designed by Barrell Tree Consultancy (www.barrelltreecare.co.uk) and is reproduced with their permission

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

Appendix 5. Tree protection zone and structural root zone

Extract from Section 3 of AS 4970-2009



NOTE: Refer to Clause 3.2 for calculation of TPZ.

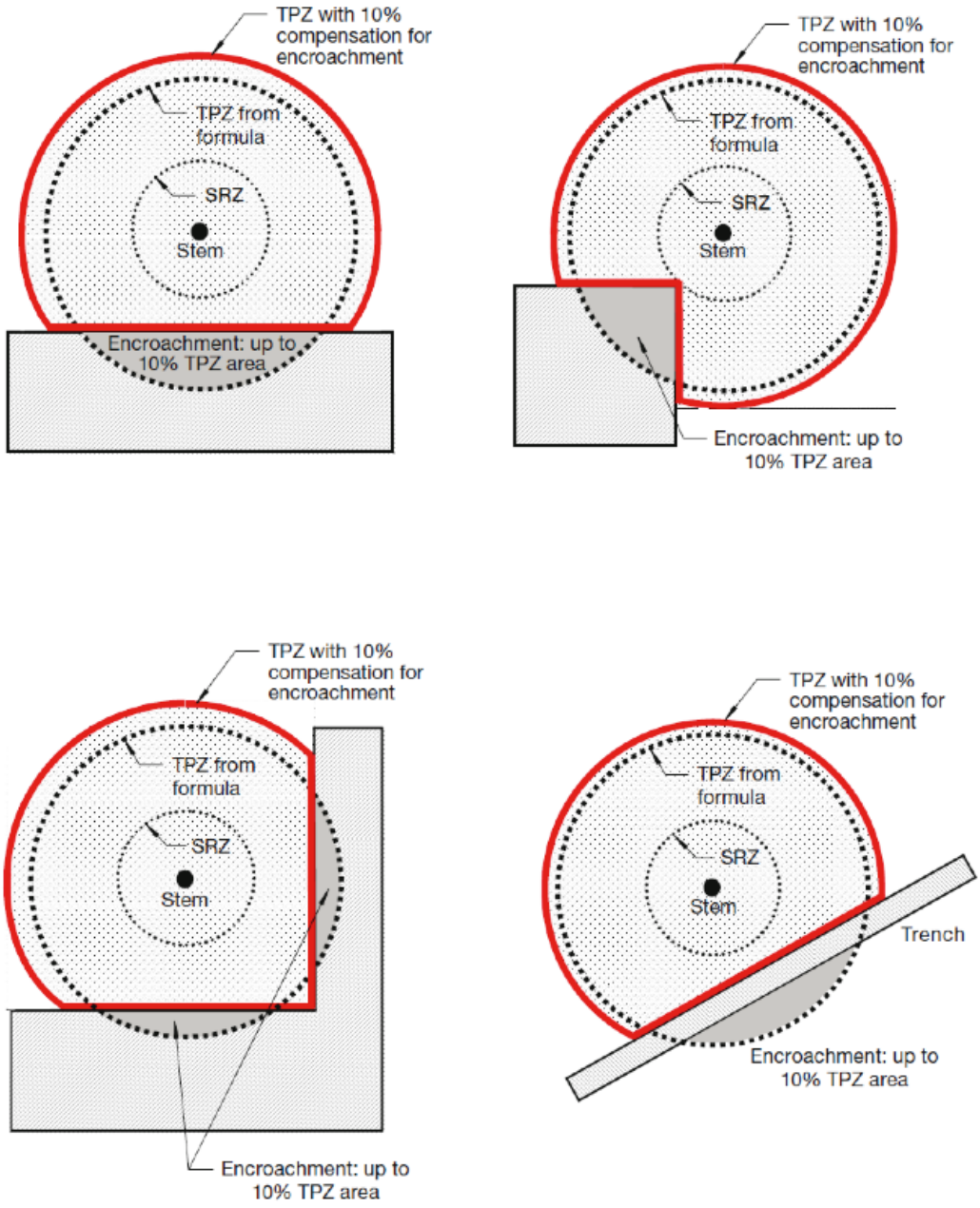
FIGURE 2 INDICATIVE TREE PROTECTION ZONE

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

Appendix 6. Encroachment into tree protection zones

Extract from Appendix D of AS 4970-2009

Encroachment into the tree protection zone (TPZ) is sometimes unavoidable. Figure D1 provides examples of TPZ encroachment by area, to assist in reducing the impact of such incursions.



NOTE: Less than 10% TPZ area and outside SRZ. Any loss of TPZ compensated for elsewhere.

FIGURE D1 EXAMPLES OF MINOR ENCROACHMENT INTO TPZ

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)

Appendix 7. Company Profile

Abel Ecology has been in the flora and fauna consulting business since 1991, starting in the Sydney Region, and progressively more state wide in New South Wales since 1998, and now also in Victoria. During this time extensive expertise has been gained with regard to Master Planning, Environmental Impact assessments including flora and fauna, bushfire reports, Vegetation Management Plans, Management of threatened species, Review of Environmental Factors, Species Impact Statements and as Expert Witness in the Land and Environment Court. We have done consultancy work for industrial and commercial developments, golf courses, civil engineering projects, tourist developments as well as residential and rural projects. This process has also generated many connections with relevant government departments and city councils in NSW. Our team consists of five scientists and two administrative staff, plus casual assistants as required.

Licences

NPWS s132C Scientific licence number is SL100780 expires 31 July 2021
NPWS GIS data licence number is CON95034
DG NSW Dept of Primary Industries Animal Care and Ethics Committee Approval expires 8 November 2021
DG NSW Dept of Primary Industries Animal Research Authority expires 8 November 2020

The Consultancy Team

Dr Daniel McDonald

PhD (The University of Sydney 2006)
M. Agr (The University of Sydney 1996)
B. Ag Sc. (The University of Sydney 1991)
QTRA (2014)
VTA (2014)
Diploma Arboriculture (Ryde, pending)
Subjects including:
Botany, biological physics, plant anatomy, plant physiology, entomology, plant pathology, mathematics, statistics

Dr Danny Wotherspoon

Grad Dip Bushfire Protection (University of Western Sydney 2012)
PhD, researching Cumberland Plain vegetation and fauna habitat, at Centre for Integrated Catchment Management (University of Western Sydney, 2007)
Dip Ed (University of New England, 1978)
BSc (University of New England - Triple Majors in Zoology, incl. Ecological Zoology, 1974)

© BAM Ecology Pty Ltd, 2021 AD (T/A Abel Ecology)