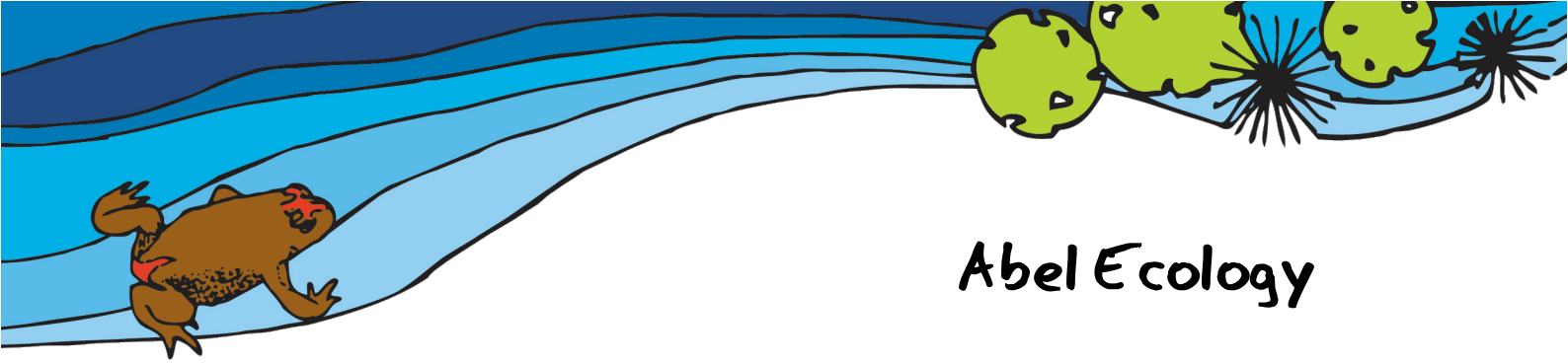

Abel Ecology

Arboricultural Impact Assessment

for

Cooma Hospital
2A Bent Street, Cooma, NSW, 2630
Lot 2, DP 1161366

Proposed new staff accommodation

Prepared for:	Health Infrastructure
Report No:	AE23-2548-REP-ISS-1
Prepared by:	Abel Ecology
Date:	15 February 2023

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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 impact 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.

I confirm that I have read the NSW Land and Environment Court Practice Note commencing on 14 May 2007, Division 2, Part 31 of the Uniform Civil Procedure Rules 2005 and the Expert Witness Code of Conduct in Schedule 7 to the Uniform Civil Procedure Rules 2005. I have prepared this advice in accordance with the requirements of the Practice Note and Code of Conduct and believe this report is consistent with the requirements of the Practice Note and the Code of Conduct. I agree to be bound by the Practice Note and Code of Conduct.

Document History

Report	Version	Prepared by	Technical Review by	Proofread by	Submission	
					Method	Date
Report	Draft A	Dr Danny Wotherspoon	Mark Sherring	Janelle Merry	Dropbox	20 January 2023
Report	Issue 1	Dr Danny Wotherspoon	Mark Sherring	Janelle Merry	Dropbox	15 February 2023

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List of Abbreviations

DBH	Diameter at breast height (~1.4 metres)
DAB	Diameter at base/root junction
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 Health Infrastructure NSW.

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

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 metres 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.

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. 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.

Executive summary

Abel Ecology carried out a tree assessment survey at Cooma Hospital on 17th and 18th of January 2023, on behalf of Health Infrastructure NSW, to assess the likely impacts of construction of buildings on trees on the site, and to address issues pertaining to tree protection.

The proposal is to remove existing exotic landscape trees to enable construction of staff accommodation.

Trees on site vary in age and condition, from severely damaged to excellent condition, and juvenile to over-mature. Species are all exotic horticultural landscape trees, with no hollows suitable for fauna occupation.

This report does not authorise tree removal on the site.

AS4970 Protection of trees on development site applies to management of the site by means of suitable tree protection zones being established and monitored by a project arborist supervising building contractors for compliance with tree protection measures.

This AIA addresses the development submission stage described in Table 1 of AS4970. A matter for consideration at the submission stage is: "Identify trees for retention through comprehensive arboricultural impact assessment of proposed construction."

The vegetation is all exotic so not part of any Endangered Ecological Community.

The vegetation is not likely to be habitat for any threatened fauna species.

The site is not coded on the Biodiversity Values Map.

The project therefore does not trigger the requirement for a Biodiversity Assessment Report.

All vegetation may be habitat for native fauna species and therefore we would recommend a mitigation measure be imposed that requires all trees to be checked for fauna occupation prior to their removal in a pre-clearance survey.

The following recommendations apply:

Remove/replace tree species which are known environmental weeds: *Acer negundo* (Box Elder) and *Ligustrum sinense* (Small-leaf Privet).

Conduct a fauna preclearance survey and relocate any faun as required.

1. Introduction

1.1 Scope

A survey of the proposed development site at Cooma Hospital (2A Bent St, Cooma, NSW 2630) ('the site' – Figure 1) was undertaken on 17th and 18th of January 2023.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 management.

This report will provide a description of individual trees and assess the anticipated impact of the development to the trees on the site.

Introductory information is provided in Section 1.

Methods are provided in Sections 2, 8 and the Appendices.

This report includes an Arboricultural Impact Assessment for submission with an application for development approval.

The Australian Standard (AS 4970-2009) *Protection of trees on development sites* describes five stages in planning (Section 2.3 of AS 4970-2009). Each stage from Section 2.3 is listed below. The relationship between sections from this report and the Australian Standard are provided below.

> AS 4970-2009 Section 2.3.1 Site Survey – When required - Section 3 and Appendix 1 and Appendix 2 of this report.
>
> AS 4970-2009 Section 2.3.2 Preliminary tree assessment and AS 4970-2009 Preliminary arboricultural report – Section 4 and Appendix 2 of this report.
>
> *AS 4970-2009 Section 2.3.5 Arboricultural impact assessment* – Sections 5 and 6; and Appendix 2 of this report.

The preparation of this report has been guided by the Australian Standard (AS 4970-2009), local council legislation and related policies as well as the scope of works discussed with the client.

1.2 Information and Documentation Provided

Abel Ecology has been provided the following documents from the client:

- 03 CKWA Vegetation Assessment – dsb.pdf
- 04 CKWA Landscaping Report – dsb.pdf

No further documentation was provided.

2. Method

Tree assessments were undertaken by Abel Ecology on 17th and 18th January 2023.

Snowy Monaro Regional Council defines a "native tree" as being:

"A native tree which satisfies any of the following criteria:

- a height greater than four (4) metres.
- for a single trunk tree species, a trunk diameter equal to or exceeding one (1) metre or 60cm for Eucalypt species at a height of one (1.3) metres from ground level.
- for a multi trunk tree species, a combined trunk circumference (measured around the outer girth of the group of trunks) equal to or exceeding one (1) metre at a height of one (1) metre above ground level" (p 152-9).

Undesirable tree species are also listed in Table 13, page 156-13 of the Cooma-Monaro Shire DCP (2014), including Box Elder *Acer negundo* and Privets *Ligustrum* spp.

https://www.snowymonaro.nsw.gov.au/files/assets/public/building-and-planning/development/documents/22-34442-2022-04-05-17-14389-cooma-monaro-shire-development-control-plan-2014-amendment-4.pdf

The vitality and condition of trees were assessed from ground level using a modified VTA (Visual Tree Assessment) method (Mattheck & Breleor, 1994). No internal investigations of the tree were undertaken. Tree heights were determined by visual estimation. 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).

Useful Life Expectancy (ULE) is based upon the method developed by Barrell (1993; 2001). It is very similar to the Safe Useful Life Expectancy (SULE) method developed by the same author. The word "safe" has been removed from the acronym as Jeremy Barrell noted that trees cannot be considered as perfectly safe (Barrell 2006).

The ULE is comprised of the Life expectancy of the tree modified by the current age of the tree, its health, structure, location, economics, effects on better trees and sustaining amenity.

The STARS method is used to determine the tree retention value. The reference for the STARS method is: IACA 2010 IACA Significance of a Tree, Assessment Rating System (STARS), Institute of Australian Consulting Arborists, Australia, www.iaca.org.au.

The term 'health' in this document is used synonymously with other words such as 'vigour 'and 'vitality'.

The term ‘structure’ is synonymous with the word ‘condition’.

Tree locations are shown in Figure 3 and Figure 4.

Trees are individually described in Appendix 2.

2.1 Plotted Tree Locations

Tree locations were provided by the client as a survey plan and landscape architect plan.

2.2 Limitations

DBH and DAB may be estimated for trees when access is difficult. The access difficulties may be due to proximity to structures, materials, hazardous fauna and flora, overgrown vegetation or located on neighbouring properties. When an estimate is recorded the abbreviation “est” is included in the table.

No soil, root or other below ground investigations were done as part of this assessment.

No aerial inspections were undertaken as part of this assessment.

3. Site Survey

3.1 Site description

For the purpose of this report the site is defined as Cooma Hospital (Figure 1).

The site is approximately 3.2 ha and the elevation is approximately 800 metres above sea level.

The site has been extensively landscaped and maintained by mowing. A range of buildings, access roads and car parks are present. Underground services include stormwater drainage and natural gas pipelines.

The site is not an area of high biodiversity value as shown on the Biodiversity Values Map and Threshold Tool (Figure 2).

The vegetation community of the site is regarded as “cleared” for the purpose of native vegetation description.

3.2 The proposal

The proposal is to clear landscape trees in order to enable construction of staff accommodation.

3.3 Site Plans

The following site plans are provided in this report:

Figure 1. Locality map and area of study.

Figure 2. Biodiversity Values map and study site for Cooma Hospital.

Figure 3. Air photo with numbered tree locations.

Figure 4. Plan of site (with numbered trees).

Figure 5. Tree removal plan (with numbered trees, construction requirement marked X).

4. Observations

4.1 Assessed Trees

Data for thirty (30) trees assessed at the time of the survey is further outlined in Appendix 2.

The trees on site are all planted exotic species.

Species identified within and adjacent to the site include the following (Table 1):

Table 1. Tree species identified

Species name	Common name	Count
Acer negundo	Box elder	6
Arbutus unedo	Strawberry tree	1
Cupressus sp.	Cypress	12
Fraxinus sp.	Ash	1
Ilex aquifolium	Holly	1
Ligustrum sinense	Small-leaved privet	1
Platanus x acerifolia	Plane tree	4
Ulmus parvifolia	Chinese elm	4
	Total	30

4.2 Health and Structure of Assessed Trees

Health and Structure for assessed trees was observed to be good to poor.

Trees of poor health/structure are listed in Table 2 below:

Table 2. Trees with Poor Health/Structure

Tree Numbers	Health and Structure
2	Poor
14	Poor
16	Poor
24	Poor

Data for individual assessed tree health and structure and comments are recorded in Table 9. Photos of individual trees and groups of trees are shown in Appendix 1.

4.3 Tree Retention Values

Tree STARS retention values for tree assessed on site were High to Priority for Removal. Trees of Priority for Removal or Low retention Values are listed in Table 3 below:

Table 3. Trees of Low STARS Retention Value

Tree Numbers	STARS Retention Value
2	Low
14	Priority for Removal
16	Priority for Removal
24	Low

4.4 Trees on adjacent land

Trees on adjacent land are planted exotics, being street trees, London Plane Tree.

Standard protection fences will be required for street trees.

5. Arboricultural impact assessment

5.1 Tree Retention

The proposal indicates the retention of the following trees within the property (Table 4):

Table 4. Trees proposed for retention

Tree number	Plan no.	Species
1001	9	*Cupressus sp.*
1006	10	*Cupressus sp.*
1012	24	*Cupressus sp.*
1013		*Cupressus sp.*
1014		*Ilex aquifolium*
1015		*Arbutus unedo*
1016	22	*Ligustrum sinense*
1017		*Fraxinus sp*
1018	16	*Platanus x acerifolia*
1019	17	*Platanus x acerifolia*
1020		*Platanus x acerifolia*
1021		*Platanus x acerifolia*
1022	32	*Ulmus parvifolius*
1023	27	*Ulmus parvifolius*
1024	27A	*Ulmus parvifolius*
1025	26	*Ulmus parvifolius*
1026		*Acer negundo*
1027	29	*Acer negundo*
1028	30	*Acer negundo*
1029	34	*Acer negundo*
1030	33	*Acer negundo*

Trees marked for retention that are not feasible because of poor health and structural defects include (Table 5):

Table 5. Trees not viable for retention

Tree number	Plan no.	Species
1014		*Ilex aquifolium*
1016	22	*Ligustrum sinense*
1024	27A	*Ulmus parvifolius*

5.2 Tree removal

Trees that conflict with the plan for construction thus requiring removal include (Table 6):

Table 6. Trees conflicting with construction

Tree number	Plan no.	Species
1002	10	Cupressus sp.
1003	11	Cupressus sp.
1004	12	Cupressus sp.
1005	13	Cupressus sp.
1007	18	Cupressus sp.
1008	19	Cupressus sp.
1009	20	Cupressus sp.
1010	21	Cupressus sp.
1011	25	Acer negundo

The small *Cupressus* trees T1007, T1008, T1009 and T1010 are small enough to transplant if a suitable site is available for relocation in the hospital grounds.

5.3 Direct impacts

5.3.1 Impact of proposal on retained trees

Trees in proximity to the proposed building are anticipated to sustain some root loss from excavation and compaction.

The construction process will require works compounds and materials storages that need to be included in the project design.

The Australian Standard 4970-2009 specifies that an encroachment into the TPZ of 10% of the total area is allowable (see Appendix 5). We recommend that tree protection fencing be installed at minimum of the TPZ radius distance from trees as detailed in Appendices.

This is likely for the trees T1001, T1006, T1012, T1013, T1017 and T1025.

Street trees T1018 and T1019 will also require fence protection.

5.3.2 Impact of proposed building on crown volume

Pruning at the indicated distances from buildings and height from the ground will be necessary to avoid contact with the building.

This is likely for the trees T1001, T1006, T1012, T1013, T1017 and T1025.

5.3.3 Services

All excavated trenching is to be routed outside the tree protection zones. Where this is not achievable underboring may be an acceptable method after consultation with an arborist.

6. Discussion

Trees to be retained have extensive root systems and some have wide canopies, both of which may conflict with any or all phases of development. Access by both demolition and construction contractors will be constrained to some extent and trees will require protection fencing.

Trees proposed to be removed for construction are in generally good condition. Loss of those trees however is not significant either ecologically or for streetscape value. The small *Cupressus* trees T1007, T1008, T1009 and T1010 are small enough to transplant if a suitable site is available for relocation in the hospital grounds.

Some of the trees are known environmental weeds: *Acer negundo* (Box Elder) (T1011, T1026-T1030), *Ligustrum sinense* (Small-leaf Privet) (T1016). Removal and replacement with non-invasive species is recommended.

Existing stormwater drainage under the row of trees T1001 to T1006 may be blocked by tree roots. Further investigation is desirable and may require particular management in the demolition phase. Maintenance or replacement of the pipes is likely to be necessary.

A Construction Environment Management Plan (CEMP) will be the appropriate document to control all aspects of site works, including works compound and storage of building materials and machinery.

Tree protection fencing will be required before demolition begins, certified and supervised by a Project Arborist.

Dead or damaged roots such as those resulting from mower damage or vehicle access may indicate increase failure potential. Excavation across a tree's root crown decreases stability by severing roots. Trees can usually survive with only a small operational root system, however their ability to respond to stress and environmental factors is reduced depending on the extent of root loss (*Matheny & Clark, 1994*).

Roots grow opportunistically in response to favourable environments. A favourable environment is one that offers adequate supply of oxygen, water, mineral nutrients, physical support, and warmth (*Perry, 1982*). A large proportion of tree roots for T1001 are likely to be found north of the tree, away from the paved road, within the gas compound. Similarly, roots of trees T1006 and T1017 will mostly extend away from paved road and path surfaces.

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*). It follows, then, that a large soil stockpile near the base of the tree will remove oxygen for a significant proportion of the root system, and thus impact the live crown.

Section 3.3.3 of the Australian Standard for tree protection (*Standards Australia, 2010*) says the following with regard to encroaching in TPZs by more than 10%:

> *3.3.3 Major encroachment*
>
> *If the proposed encroachment is greater than 10% of the TPZ or inside the SRZ (see Clause 3.3.5), the project arborist must demonstrate that the tree(s) would remain viable. The area lost to this encroachment should be compensated for elsewhere and contiguous with the TPZ. This may require root investigation by non-destructive methods and consideration of relevant factors listed in Clause 3.3.4.*

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).*

Root loss will be compensated by applying mulch to a depth of approximately 100-150 mm around the base of each retained tree at least two months prior to site demolition excavation or trenching, and by regularly watering the trees (*Roberts et al, 2006*). This will boost vitality and stimulate the growth of new absorbing roots.

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 wood chip 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 150 mm of soil, whereas exposed soils are prone to become hot enough, or in Cooma cold enough, that roots are restricted to greater depths because absorbing roots cannot survive in the upper layer of soil (*Harris et al., 2004*).

The vegetation is all exotic so not part of any Endangered Ecological Community. The vegetation is not likely to be habitat for any threatened fauna species. The site is not coded on the Biodiversity Values Map. The project therefore does not trigger the requirement for a Biodiversity Assessment Report.

All vegetation may be habitat for native fauna species and therefore we would recommend a mitigation measure be imposed that requires all trees to be checked for fauna occupation prior to their removal in a pre-clearance survey.

7. Recommendations

The following recommendations apply:

Construction Environment Management Plan

Prepare a site works management plan detailing all areas that will be used for access, storage, vehicle movements, works compound, fuel and chemical storage bunds and stockpile areas for excavated soils. Excluded areas for tree protection, both street trees and site trees, are to be marked for fence lines on the site plan.

Tree Protection

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

b) Engage a project arborist to ensure and certify that tree protection measures such as tree protection fencing and ground protection (mulch) are satisfactorily implemented and to provide advice as applicable. The arborist will inspect the site after tree protection measures are in place and before any construction/excavation works are conducted. The arborist will then attend the site at least once within every six months during construction, and once upon completion of demobilisation.

c) Construct tree protection fences at a minimum radius distance(s) measuring the TPZ from the centre of the tree, prior to construction to prevent unnecessary root damage. Construct tree protection fences using chain wire mesh panels to a height of 1.8 metres high. Fences are to be held in place with secure footing (

d) Figure 11).

e) Exclude all site activity from tree protection zones during demolition, construction and demobilisation phases (see 'Tree protection guidelines' in Appendix 3).

f) Do not remove tree protection fences until construction is completed, at which time the arborist will sign-off on fence removal and provide further advice as applicable.

Root Management

a) Apply mulch 100-150 mm deep with a radius of at least 2 metres, (or to the edge of the calculated tree protection zone where possible) around retained trees prior to construction to stimulate growth of absorbing roots.

b) Advice must be sought from a suitably skilled and experienced project arborist wherever roots over 40 mm diameter are encountered during excavation near trees to be retained. The tearing of roots of retained trees must be avoided and root pruning undertaken as directed by the nominated arborist

c) Cleanly cut any roots with a thickness of 2 cm or more encountered during excavation to reduce damage to roots from tearing, splitting and cracking.

d) Route any potential 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.

e) If trenching excavation is to occur within the TPZ of trees to be retained, hydraulic methods utilising a Vacuum Truck and trained operator to minimise damage to roots. These works are also to be conducted with the supervision of the Project Arborist

f) 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.

Crown Management

a) Limb/canopy protection and management may be required if high level parts of plant machinery is to be in close proximity of retained trees. Advice must be sought from a suitably skilled and experienced contracted arborist (AQF3 and above) to determine what measure are required.

b) If protection measures are unsuitable, crown pruning may be required. 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.

Certification by an arborist

A Project Arborist (AQF5 or equivalent) must inspect the site following the installation of the TPZ fencing and placement of the mulch. The Project Arborist must then provide compliance documentation to be retained on the project file records. Tree protection compliance is to be checked before any tree related or earthworks occur on the site. Tree protection measure must be reviewed when development design changes occur and at construction hold points as outlined in AS4970-2009 – Protection of Trees on Development Sites, Table 1. The hold points occur at the start of various construction phases which includes – Site Establishment, Construction work, Implement Hard and Soft Landscape Works and Practical Completion.

Fauna Management

A fauna clearance survey should be undertaken by an appropriately experienced ecologist prior to tree removal works. This is to ensure the appropriate management/relocation of existing protected fauna located at the Site, most likely nesting birds, under the Commonwealth *Environmental Protection and Biodiversity Conservation Act* (1999) and the NSW *Biodiversity Conservation Act* (2016) before the commencement of any high disturbance.

The requirements of AS 4970 Table 1 are shown below:

AS 4970—2009
(Incorporating Amendment No. 1)

Australian Standard®

Protection of trees on development sites

TABLE 1

INDICATIVE STAGES IN DEVELOPMENT AND THE TREE MANAGEMENT PROCESS

Stage in development	Tree management process	
	Matters for consideration	**Actions and certification**
Planning (Sections 2 and 3)		
Site acquisition	Legal constraints	
Detail surveys	Council plans and policies Planning instruments and controls Heritage Threatened species	Existing trees accurately plotted on survey plan
Preliminary tree assessment	Hazard/risks Tree retention value	Evaluate trees suitable for retention and mark on plan Provide preliminary arboricultural report and indicative TPZs to guide development layout
Preliminary development design	Condition of trees Proximity to buildings Location of services Roads Level changes Building operations space Long-term management	Planning selection of trees for retention Design review by proponent Design modifications to minimize impact to trees

Stage in development	Tree management process	
	Matters for consideration	**Actions and certification**
Development submission	Identify trees for retention through comprehensive arboricultural impact assessment of proposed construction. Determine tree protection measures Landscape design	Provide arboricultural impact assessment including tree protection plan (drawing) and specification
Development approval	Development controls Conditions of consent	Review consent conditions relating to trees
Pre-construction (Sections 4 and 5)		
Initial site preparation	State based OHS requirements for tree work	Compliance with conditions of consent
	Approved retention/removal	Tree removal/tree retention/transplanting
	Refer to AS 4373 for the requirements on the pruning of amenity trees	Tree pruning Certification of tree removal and pruning
	Specifications for tree protection measures	Establish/delineate TPZ Install protective measures
		Certification of tree protection measures
Construction (Sections 4 and 5)		
Site establishment	Temporary infrastructure Demolition, bulk earthworks, hydrology	Locate temporary infrastructure to minimize impact on retained trees Maintain protective measures Certification of tree protection measures
Construction work	Liaison with site manager, compliance Deviation from approved plan	Maintain or amend protective measures Supervision and monitoring
Implement hard and soft landscape works	Installation of irrigation services Control of compaction work Installation of pavement and retaining walls	Remove selected protective measures as necessary Remedial tree works Supervision and monitoring
Practical completion	Tree vigour and structure	Remove all remaining tree protection measures Certification of tree protection
Post construction (Section 5)		
Defects liability/ maintenance period	Tree vigour and structure	Maintenance and monitoring Final remedial tree works Final certification of tree condition

NOTES:

1 Owing to variations in planning legislation this table is a general indication of the process only.

2 Certification of tree protection and condition should be carried out by the project aborist.

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Appendix 1. Figures

Figure 1. Locality map and area of study

Land and property Information NSW. Spatial Information eXchange (SIX) website 2023.

Figure 2. Biodiversity Values map and study site for Cooma Hospital

Source: https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BOSETMap

Figure 3. Air photo with numbered tree locations

Land and property Information NSW. Spatial Information eXchange (SIX) website 2023.

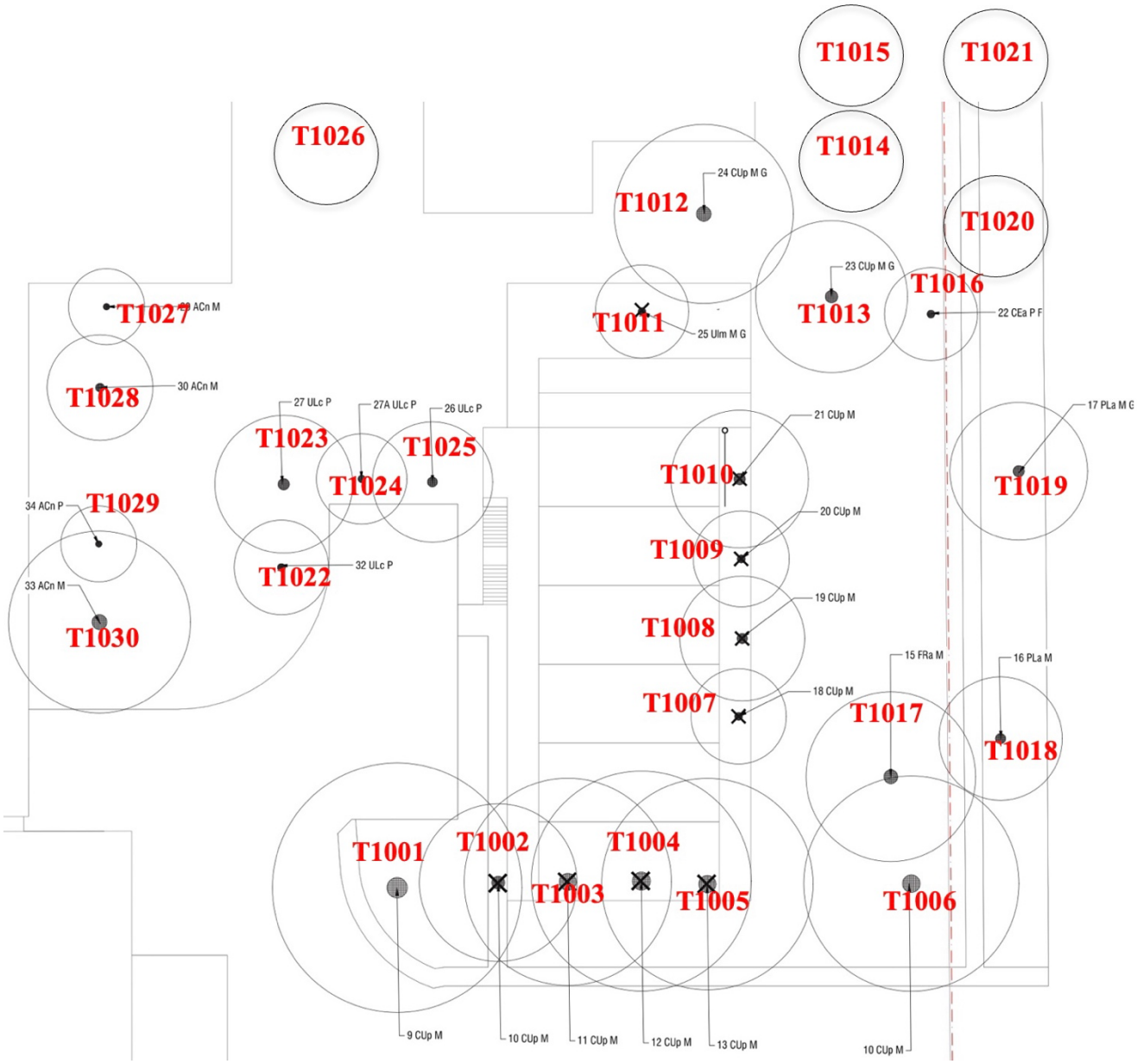


Figure 4. Plan of site (with numbered trees)

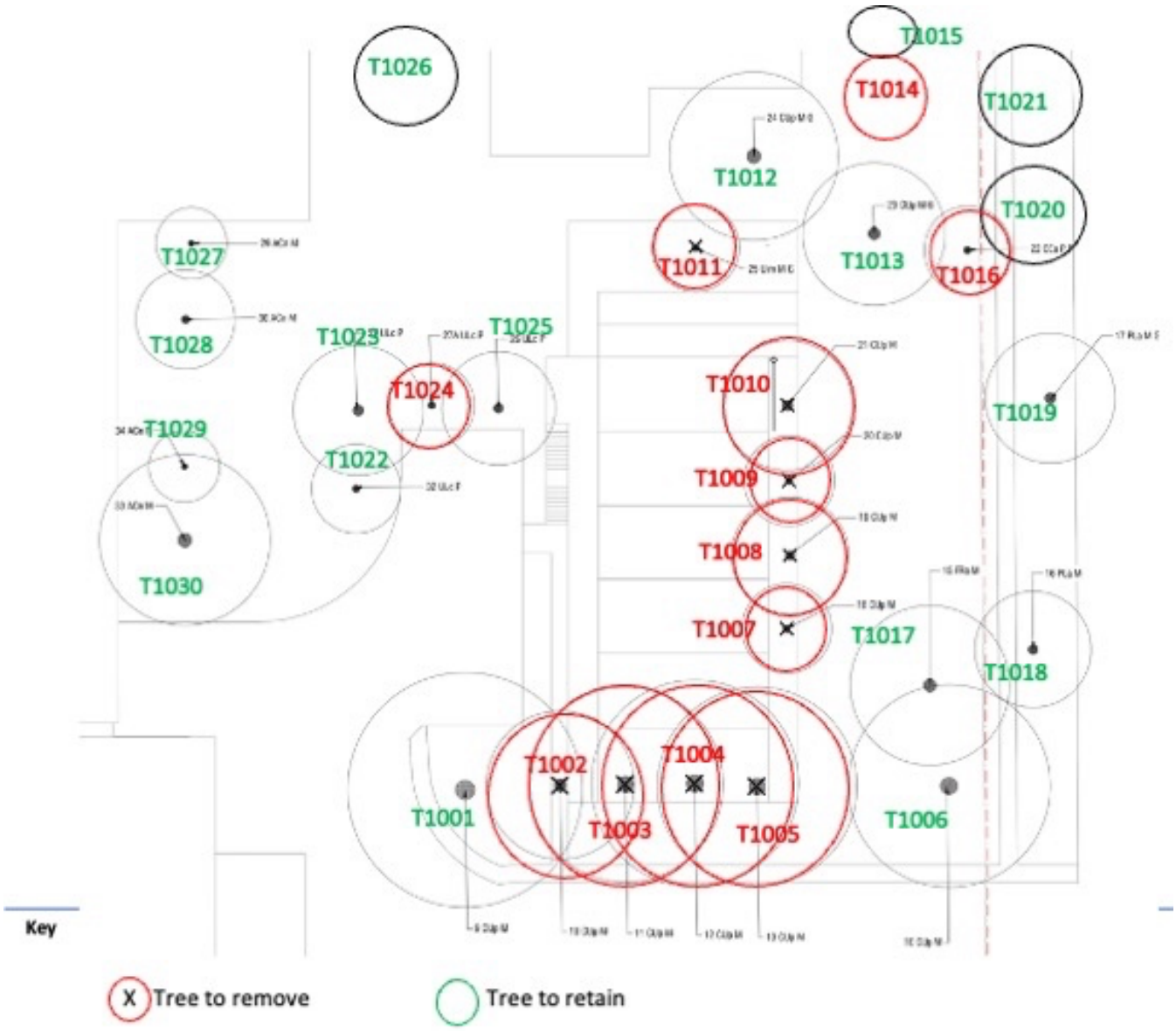


Figure 5. Tree removal plan (with numbered trees, construction requirement marked X)

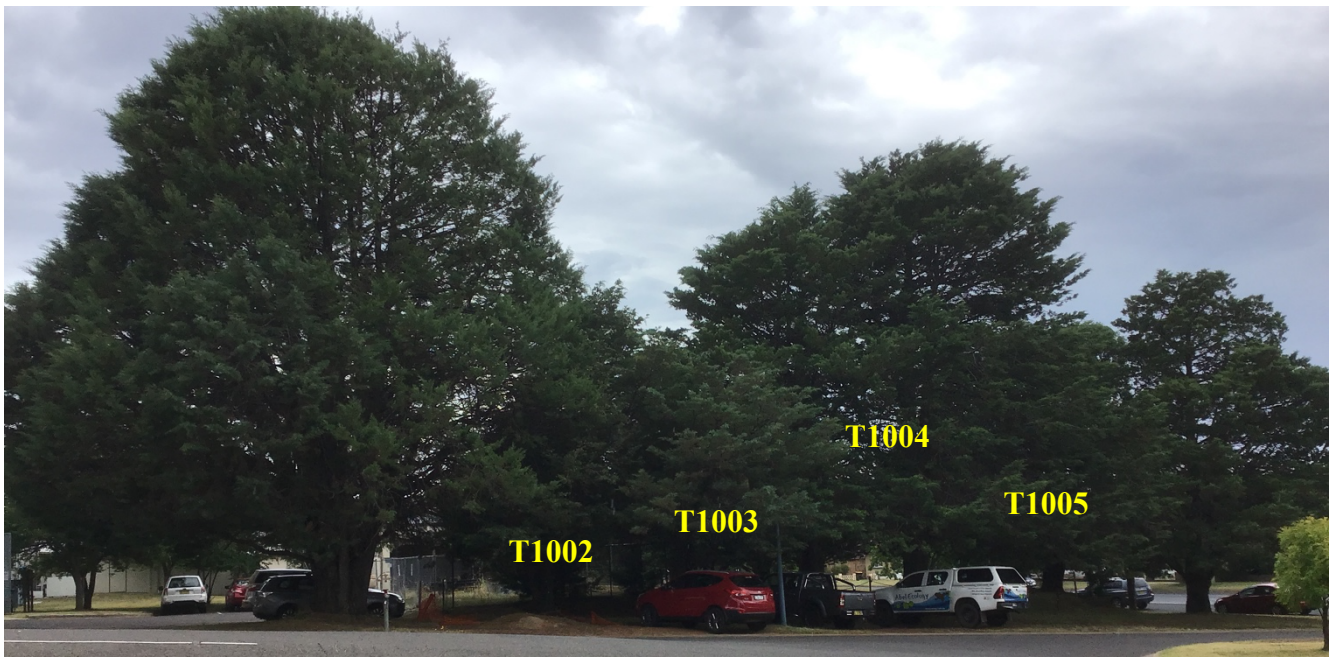


Figure 6. Remove trees T1002, 1003, 1004, 1005 for construction

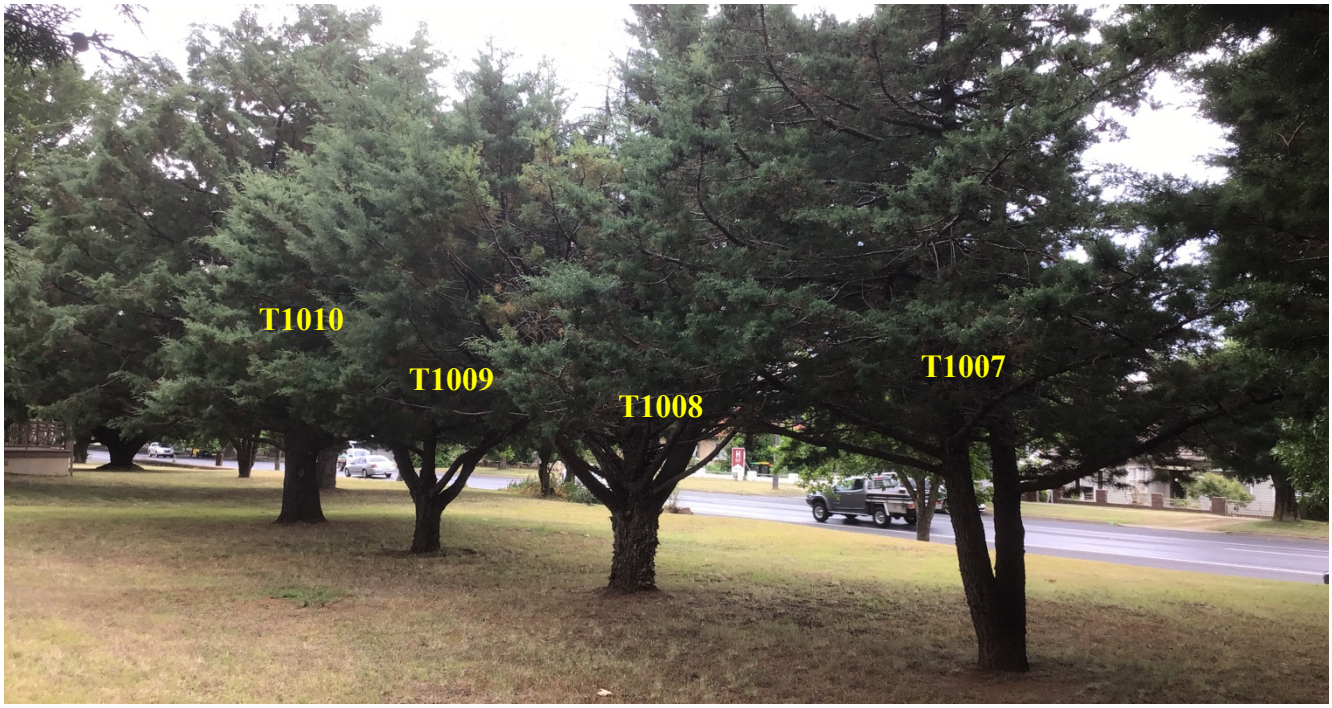
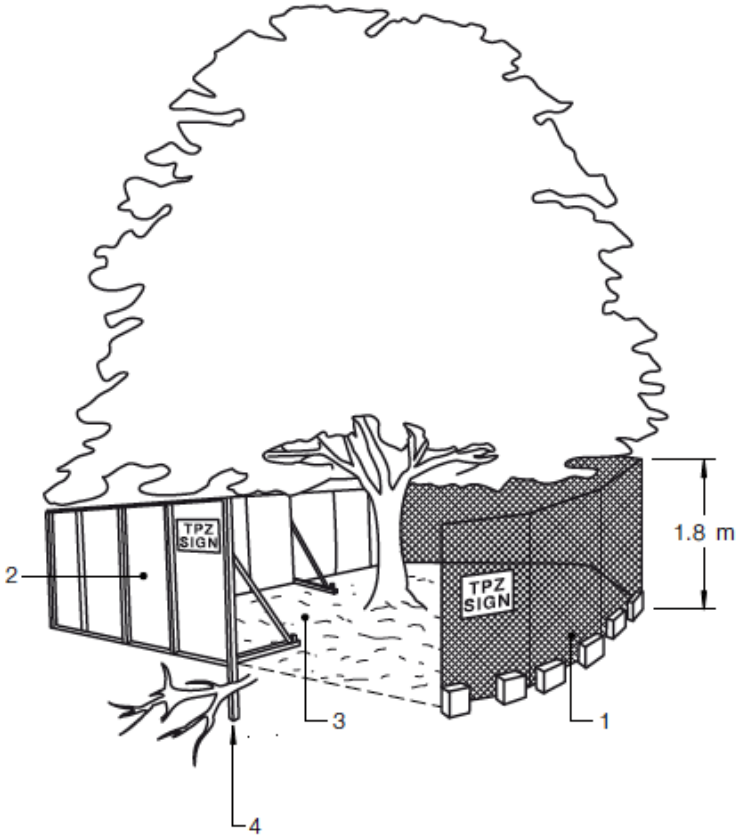


Figure 7. Remove Trees 1007, 1008, 1009, 1010 for construction

Figure 8. Remove T1011 for construction

Figure 9. Remove T1014 severe decline

Figure 10. Remove T1016 as weed and structural defects



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 11. 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).

Appendix 2. Tree data tables

The following tree schedule describes the numbered trees shown in Figure 4 and Figure 5.

Note that some species – *Acer negundo* (Box Elder) and *Ligustrum sinense* (Small-leaf privet) are weeds; replacement with suitable non-invasive species is recommended.

KEY

Age Class	Vitality and condition	Comments		Age Class
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 1.4m	ep - epicormic growth	

Table 7. Tree Data

Tree no.	Plan no.	*Species*	DAB (cm)	DBH (cm)	TPZ (m)	Reduced TPZ (m)	SRZ (m)	Canopy radius (m)
1001	9	*Cupressus sp.*	152	165	15	13.61	3.95	8
1002	10	*Cupressus sp.*	54	39	5.32	3.65	2.55	3
1003	11	*Cupressus sp.*	74	46	7.24	4.98	2.92	3
1004	12	*Cupressus sp.*	73	73	8.76	6.02	2.9	4
1005	13	*Cupressus sp.*	96	95	11.4	7.84	3.25	6
1006	10	*Cupressus sp.*	87	80	9.6	6.6	3.12	3
1007	18	*Cupressus sp.*	39	22	3.73	2.57	2.23	2.5
1008	19	*Cupressus sp.*	58	53	6.36	4.37	2.63	2.5
1009	20	*Cupressus sp.*	38	34	4.08	2.81	2.2	2.5
1010	21	*Cupressus sp.*	65	55	6.6	4.54	2.76	3.5
1011	25	*Acer negundo*	25	22	2.64	2	1.85	3

Tree no.	Plan no.	*Species*	DAB (cm)	DBH (cm)	TPZ (m)	Reduced TPZ (m)	SRZ (m)	Canopy radius (m)
1012	24	*Cupressus sp.*	75	72	8.64	5.94	2.93	4
1013		*Cupressus sp.*	57	55	6.6	4.54	2.61	4
1014		*Ilex aquifolium*	43	15	4.49	3.09	2.32	2
1015		*Arbutus unedo*	92	25	6.54	4.49	3.2	4
1016	22	*Ligustrum sinense*	43	18	2.81	2	2.32	2
1017		*Fraxinus sp*	93	83	9.96	6.85	3.21	8
1018	16	*Platanus x acerifolia*	35	32	3.84	2.64	2.13	3
1019	17	*Platanus x acerifolia*	35	32	3.84	2.64	2.13	3
1020		*Platanus x acerifolia*	40	37	4.44	3.05	2.25	3
1021		*Platanus x acerifolia*	41	34	4.08	2.81	2.28	3
1022	32	*Ulmus parvifolius*	41	17	3.25	2.24	2.28	3
1023	27	*Ulmus parvifolius*	32	17	3.34	2.29	2.05	4
1024	27A	*Ulmus parvifolius*	55	6	2	2	2.57	2.5
1025	26	*Ulmus parvifolius*	35	11	3.25	2.24	2.13	3
1026		*Acer negundo*	32	30	3.6	2.48	2.05	3
1027	29	*Acer negundo*	35	22	2.64	2	2.13	3
1028	30	*Acer negundo*	28	27	3.24	2.23	1.94	3
1029	34	*Acer negundo*	20	18	2.16	2	1.68	3
1030	33	*Acer negundo*	56	32	5.69	3.91	2.59	6

Table 8. Tree Canopy and Height Data

Tree no.	Plan no.	Species	Canopy radius (m)	Comments	Tree height (m)	Stem ht (m) (ground to lower canopy)	Live crown size (LCS) (m^3)	Dead wood size (mm)	% DW
1001	9	*Cupressus sp.*	8	Crown lift pruning	12	3	144	-	-
1002	10	*Cupressus sp.*	3	Crown lift pruning and lopped top, lost leader	8	3	8	-	-
1003	11	*Cupressus sp.*	3	Crown lift pruning	8	3	8	-	-
1004	12	*Cupressus sp.*	4	Crown lift pruning	8	3	10	-	-
1005	13	*Cupressus sp.*	6	Crown lift pruning	10	3	21	-	-
1006	10	*Cupressus sp.*	3	Crown lift pruning	8	2	9	-	-
1007	18	*Cupressus sp.*	2.5	Crown lift pruning	8	2	8	-	-
1008	19	*Cupressus sp.*	2.5	Crown lift pruning	8	2	8	-	-
1009	20	*Cupressus sp.*	2.5	Crown lift pruning	7	2	6	-	-
1010	21	*Cupressus sp.*	3.5	Crown lift pruning	9	2	12	-	-
1011	25	*Acer negundo*	3	Crown lift pruning	5	2	5	-	-
1012	24	*Cupressus sp.*	4	Crown lift pruning	7	2	10	-	-
1013		*Cupressus sp.*	4	Crown lift pruning	6	2	8	-	-
1014		*Ilex aquifolium*	2	Severe decline	6	2	4	20 - 25	30 - 40
1015		*Arbutus unedo*	4	Crown lift pruning	5	2	7	-	-
1016	22	*Ligustrum sinense*	2	Weed – remove. Poor pruning, trunk decay.	4	1	3	-	-
1017		*Fraxinus sp*	8	Crown lift pruning	9	2	28	-	-
1018	16	*Platanus x acerifolia*	3	Crown lift pruning	6	3	5	-	-
1019	17	*Platanus x acerifolia*	3	Crown lift pruning	6	3	5	-	-
1020		*Platanus x acerifolia*	3	Crown lift pruning	6	3	5	-	-
1021		*Platanus x acerifolia*	3	Crown lift pruning	6	3	5	-	-
1022	32	*Ulmus parvifolius*	3	Crown lift pruning	7	2	8	-	-
1023	27	*Ulmus parvifolius*	4	Crown lift pruning	7	2	10	-	-

Tree no.	Plan no.	Species	Canopy radius (m)	Comments	Tree height (m)	Stem ht (m) (ground to lower canopy)	Live crown size (LCS) (m^3)	Dead wood size (mm)	% DW
1024	27A	*Ulmus parvifolius*	2.5	Crown lift pruning	5	2	4	-	-
1025	26	*Ulmus parvifolius*	3	Crown lift pruning	7	2	8	-	-
1026		*Acer negundo*	3	Crown lift pruning	8	2	9	-	-
1027	29	*Acer negundo*	3	Crown lift pruning	7	2	8	-	-
1028	30	*Acer negundo*	3	Crown lift pruning	8	2	9	-	-
1029	34	*Acer negundo*	3	Trunk wound open to decay. Poor occlusion. Crown lift pruning. Suppressed by adjacent trees.	6	2	6	-	-
1030	33	*Acer negundo*	6	Crown lift pruning	8	2	18	-	-

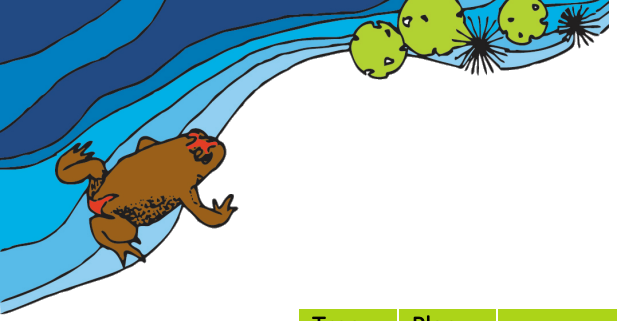
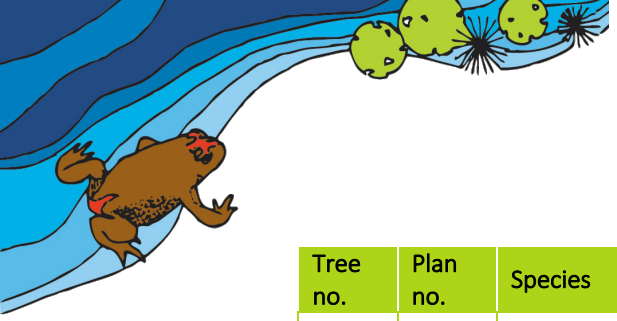


Table 9. Tree Health and Retention Values

Tree no.	Plan no.	Species	Action: remove / retain / relocate	Reason	Age Class	Vitality	Condition	Health	Structure	STARS value
1001	9	*Cupressus sp.*	Retain	Poor pruning	Mature	Good	Good	Good	Fair	High
1002	10	*Cupressus sp.*	Remove	Poor pruning	Mature	Fair	Poor	Good	Poor	Low
1003	11	*Cupressus sp.*	Remove	Rubbing branch	Mature	Good	Fair	Good	Fair	Low
1004	12	*Cupressus sp.*	Remove	Rubbing branch	Mature	Good	Fair	Good	Fair	Low
1005	13	*Cupressus sp.*	Remove	-	Mature	Good	Fair	Good	Fair	Low
1006	10	*Cupressus sp.*	Retain	-	Mature	Good	Good	Good	Fair	High
1007	18	*Cupressus sp.*	Remove or relocate	-	Mature	Good	Good	Good	Good	Low
1008	19	*Cupressus sp.*	Remove or relocate	-	Mature	Good	Good	Good	Good	Low
1009	20	*Cupressus sp.*	Remove or relocate	-	Mature	Good	Good	Good	Good	Low
1010	21	*Cupressus sp.*	Remove or relocate	-	Mature	Good	Good	Good	Good	Low
1011	25	*Acer negundo*	Remove	-	Juvenile	Good	Good	Good	Good	Low
1012	24	*Cupressus sp.*	Retain	-	Mature	Good	Good	Good	Fair	High
1013		*Cupressus sp.*	Retain	-	Mature	Good	Good	Good	Fair	High
1014		*Ilex aquifolium*	Remove	Diseased. Decay, tip die back, epicormic shoots.	Over-mature	Poor	Poor	Poor	Poor	Priority for removal
1015		*Arbutus unedo*	Replace with non-invasive species	-	Mature	Good	Good	Good	Good	High
1016	22	*Ligustrum sinense*	Remove	Diseased. Stem wound, epicormic shoots, poor pruning, poor occlusion	Senescent	Poor	Poor	Poor	Poor	Priority for removal



Tree no.	Plan no.	Species	Action: remove / retain / relocate	Reason	Age Class	Vitality	Condition	Health	Structure	STARS value
1017		*Fraxinus sp*	Retain	-	Mature	Good	Good	Good	Good	High
1018	16	*Platanus x acerifolia*	Retain	-	Semi-mature	Good	Good	Good	Good	High
1019	17	*Platanus x acerifolia*	Retain	-	Semi-mature	Good	Good	Good	Good	High
1020		*Platanus x acerifolia*	Retain	-	Semi-mature	Good	Good	Good	Good	High
1021		*Platanus x acerifolia*	Retain	-	Semi-mature	Good	Good	Good	Good	High
1022	32	*Ulmus parvifolius*	Retain	-	Semi-mature	Good	Good	Good	Good	High
1023	27	*Ulmus parvifolius*	Retain	-	Semi-mature	Good	Good	Good	Good	High
1024	27A	*Ulmus parvifolius*	Remove	Defects	Over-mature	Fair	Poor	Fair	Poor	Priority for removal
1025	26	*Ulmus parvifolius*	Remediate	-	Mature	Good	Fair	Good	Poor	Medium
1026		*Acer negundo*	Replace with non-invasive species	-	Semi-mature	Good	Good	Good	Good	High
1027	29	*Acer negundo*	Replace with non-invasive species	-	Mature	Good	Good	Good	Good	High
1028	30	*Acer negundo*	Replace with non-invasive species	-	Semi-mature	Good	Good	Good	Fair	High
1029	34	*Acer negundo*	Remove	Stem wound	Semi-mature	Fair	Fair	Fair	Fair	Low
1030	33	*Acer negundo*	Replace with non-invasive species	-	Mature	Good	Good	Good	Good	High

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.

B Construction phase (Maintain tree protection fencing)

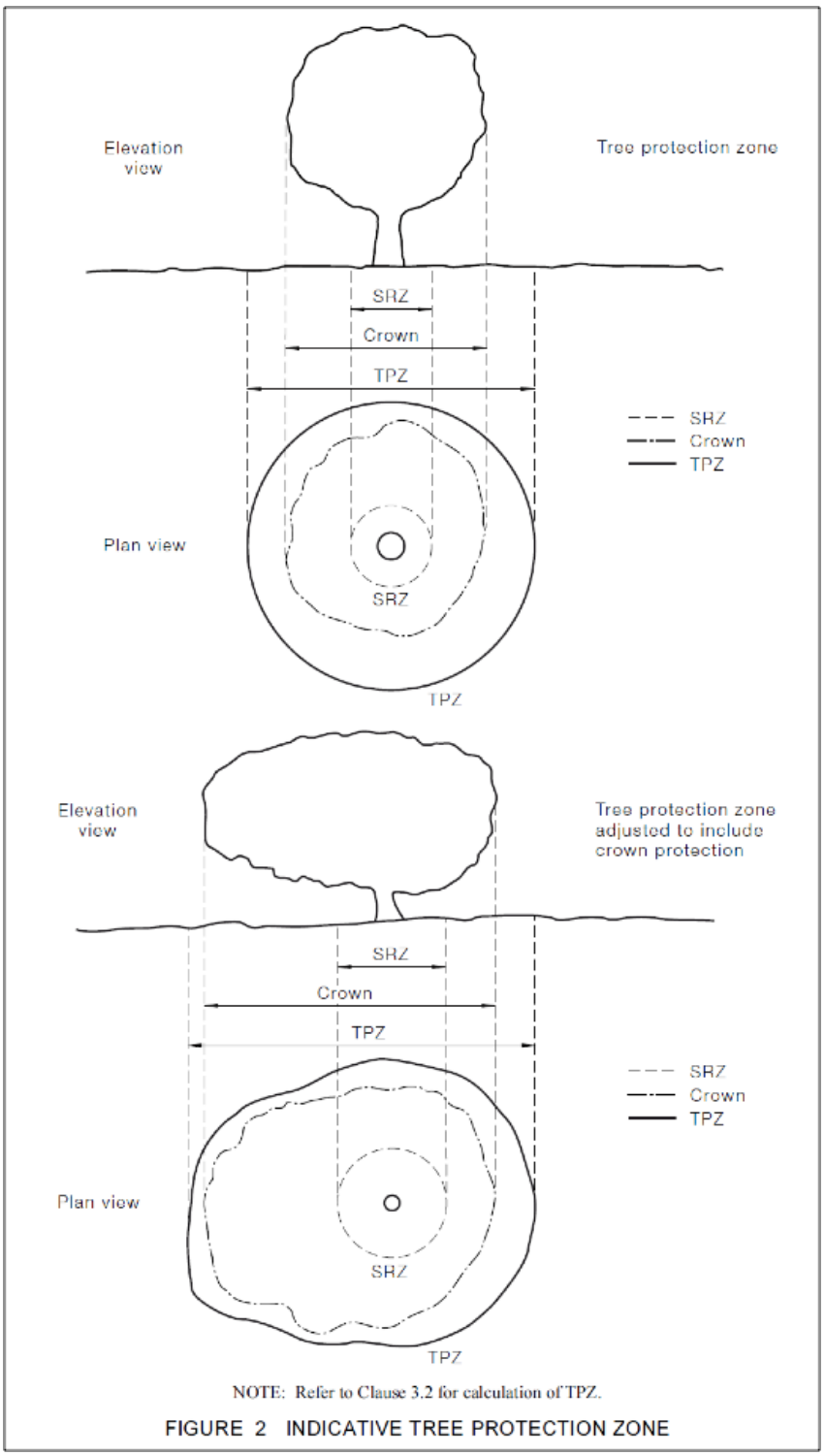
B 1. Where access is required within a TPZ, temporary ground protection measures will be required (e.g. metal plates, rumble boards or exterior-grade ply over aggregate) capable of supporting the required load without deflection. Trunk protection may be required, e.g. battens wrapped around the trunk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

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.

Appendix 4. Tree protection zone and structural root zone

Extract from Section 3 of AS 4970-2009



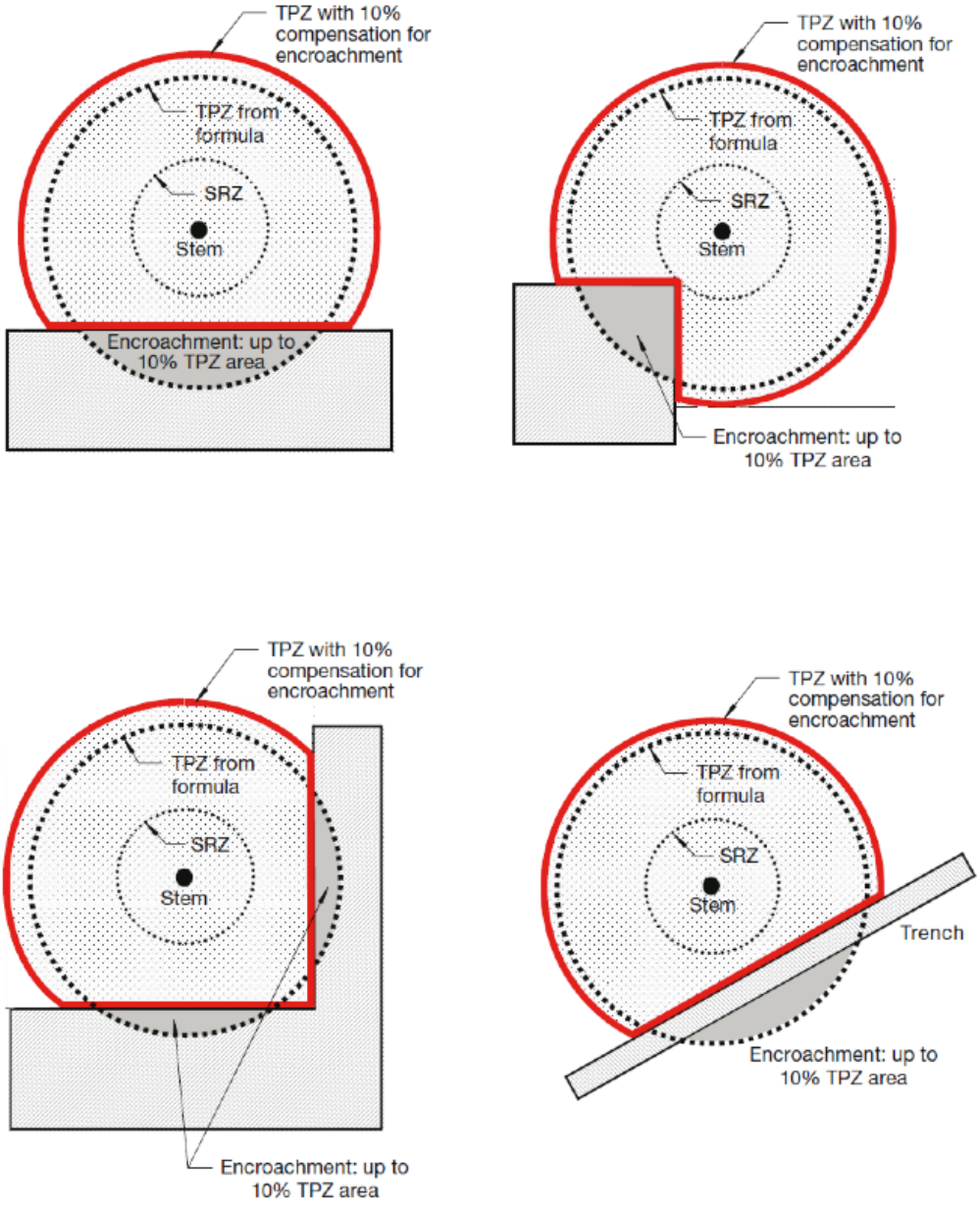
NOTE: Refer to Clause 3.2 for calculation of TPZ.

FIGURE 2 INDICATIVE TREE PROTECTION ZONE

Appendix 5. 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

Appendix 6. IACA Significance of a Tree, Assessment Rating System (STARS)© (IACA)©

IACA Significance of a Tree, Assessment Rating System (STARS)© (IACA 2010)©

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

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

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

Tree Significance - Assessment Criteria

1. High Significance in landscape

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

2. Medium Significance in landscape

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

3. Low Significance in landscape

- The tree is in fair-poor condition and good or low vigour;
- The tree has form atypical of the species;
- The tree is not visible or is partly visible from surrounding properties as obstructed by other vegetation or buildings,
- The tree provides a minor contribution or has a negative impact on the visual character and amenity of the local area,
- The tree is a young specimen which may or may not have reached dimension to be protected by local Tree Preservation orders or similar protection mechanisms and can easily be replaced with a suitable specimen,
- The tree's growth is severely restricted by above or below ground influences, unlikely to reach dimensions typical for the taxa *in situ* - tree is inappropriate to the site conditions,
- The tree is listed as exempt under the provisions of the local Council Tree Preservation Order or similar protection mechanisms,
- The tree has a wound or defect that has potential to become structurally unsound.

Environmental Pest / Noxious Weed Species

- The tree is an Environmental Pest Species due to its invasiveness or poisonous/ allergenic properties,
- The tree is a declared noxious weed by legislation.

Hazardous/Irreversible Decline

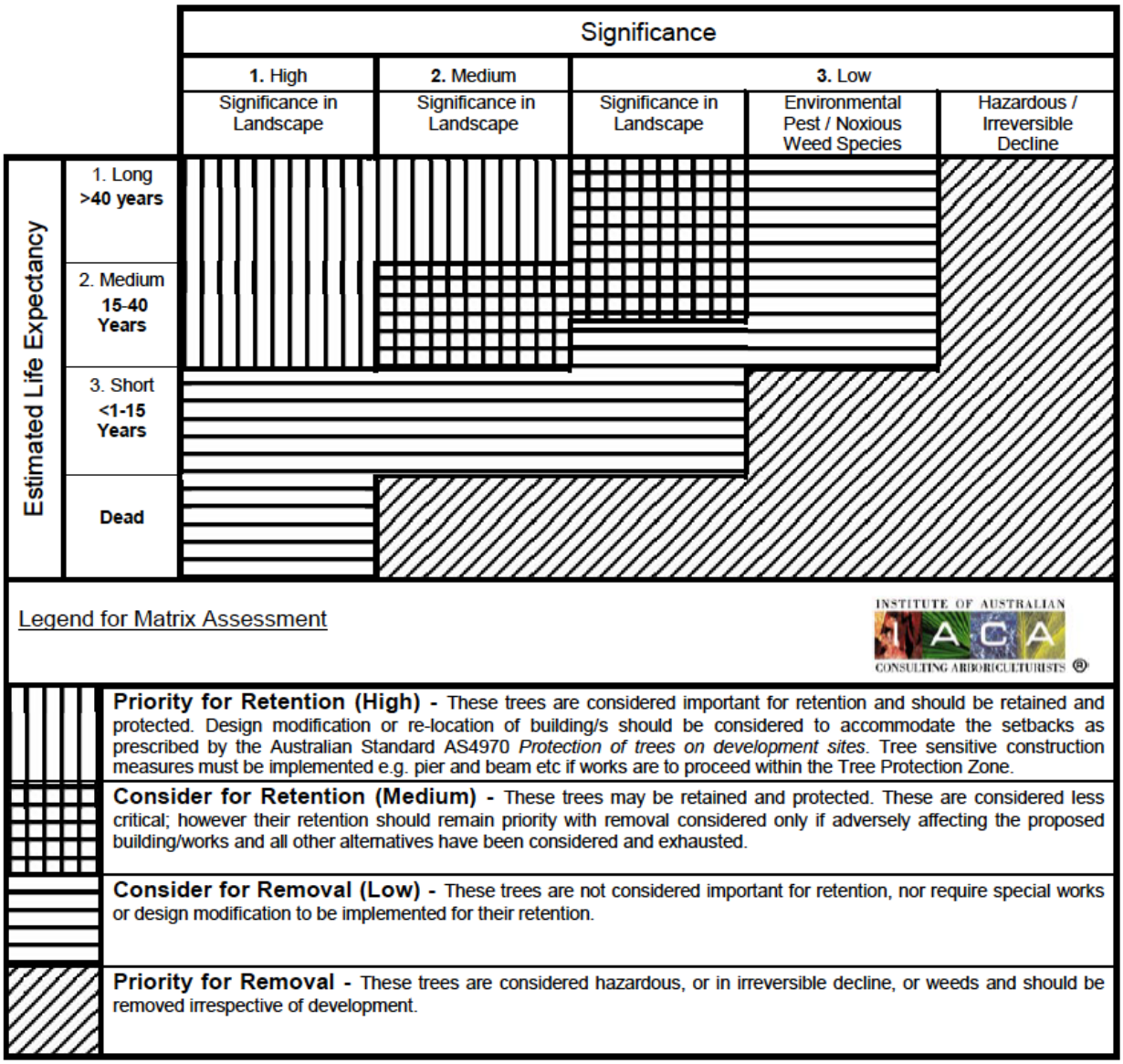
- The tree is structurally unsound and/or unstable and is considered potentially dangerous,
- The tree is dead, or is in irreversible decline, or has the potential to fail or collapse in full or part in the immediate to short term.

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

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

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

Table 1.0 Tree Retention Value - Priority Matrix.



USE OF THIS DOCUMENT AND REFERENCING

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

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

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

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

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

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 January 2024.

NPWS GIS data licence number is CON95034.

DG NSW Dept of Primary Industries Animal Care and Ethics Committee Approval expires 8 November 2023.

DG NSW Dept of Primary Industries Animal Research Authority expires 8 November 2023.

The Consultancy team

Dr Danny Wotherspoon

BSc, DipEd, MA, PhD, Grad Dip Bushfire Protection,
MECA NSW, MEPLA, MNELA, MESA, MEIANZ, White card.

Danny has practised as an arborist, ecological and bushfire consultant since 1991.

He is a consulting ecologist to private developers, State Government agencies and various City Councils on a regular basis, for development applications, government projects, and as expert witness in the NSW Land and Environment Court.

Danny's PhD researched fragmented vegetation and fauna habitat use. He has special expertise in fauna habitat use. Danny has presented invited papers at international conferences since 2001 in Australia, China, South Africa, Sri Lanka and Israel on his PhD and other research, including golf course habitat management. Danny's scientific papers have been published in both international and Australian academic journals.

Mark Mackinnon

B Env. Sci. (Hons); Grad. Dip. in Bushfire Protection.
Accredited Practitioner Level 3 - Bushfire Planning & Design (BPAD); Accreditation number 36395.
MEIANZ, White Card.

Mark is a passionate and enthusiastic scientist who thrives in the field of natural resource management. He has experience in threatened species, fire ecology, bushfire management, pest plant and animals, and landscape restoration. In particular he specialises in ornithology and bushfire management. Mark has several specialized field-based skills including simple and complex tree climbing, working at heights, general firefighter departmental fire accreditation, venomous snake and reptile handling, immunization to handle bat species, and an A - class bird banding licence with mist-net endorsement. Mark is also skilled in GIS mapping, first-aid and four -wheel-driving.

Mark Sherring

BM, MAABR, Cert. Hort., Cert. Bush Regen, Cert. Rural Ops, White Card.
Member of the Australian Association of Bush Regenerators.

Mark has extensive knowledge and experience of plant species in New South Wales. He has built up his expert knowledge on NSW native plant species over the many years that he has practised as a Botanist. He is regularly asked to contribute to the extensive (ongoing) flora surveys of the Sydney Basin and Blue Mountains carried out by the Royal Botanic Gardens, Sydney. Mark has extensive field survey experience, having worked for over ten years in various plant-related roles. His role in Abel Ecology is to provide expert advice on flora and on the full range of flora management issues encountered and in the design and management of environmental monitoring projects.

Jesse Cass

BSc (Zoology), MEScM (enrolled).
White Card, Working Safely at Heights.
CASA accredited drone pilot.
Botanist.

Jesse has a bachelor’s degree and is currently studying his Masters of Environmental Science and Management, online at UNE, as a pathway for a PhD. He is practicing and learning plant identification, as well as fauna identification within the Sydney Basin. His role in Abel Ecology is to provide assistance on field visits and report writing, while gaining knowledge and experience in flora identification.