Independent
Arboricultural
Services

Arboricultural Impact Assessment

Prepared For: School Infrastructure NSW

Narrabeen Education Precinct

Narrabeen Sports High School
Narrabeen NSW 2101

12th Setpember 2022

IAS8602

Independent Arboricultural Services - Disclaimer

The material contained in this document has been prepared on an independent basis free of any bias and represents the honest opinion of the consulting arborist.

Tissue or soil samples have not been collected nor submitted for testing unless otherwise stated. Excavation is limited to minor earthworks and we submit this assessment on the basis that all data is based on visual inspection of the tree/s and its/their location, species, health and condition at the time of writing unless otherwise stated. Measurements and tree locations noted in this report are approximate and have not been determined by survey unless information and analysis has been provided by the consultant or such information is otherwise noted. Please request a more detailed arborist report if further information and analysis is required. Depending on site requirements, specific alternate specialist advice including engineering consultancy and certification maybe required in combination with this assessment. This assessment contains arborist advice and associated general information only and does not purport to provide other site-specific specialist advice such as engineering certification unless arrangement to source such advice for inclusion in this assessment has been requested and authorised.

This report containing opinions, advice and recommendations based on information and data gathered from site inspections carried out by personnel from Independent Arboricultural Services as well as information provided by the client and/or its representatives, is to be relied on by the client in that context. It is assumed that all such information provided to Independent Arboricultural Services is correct. All recommended arboricultural works detailed in this assessment including pruning of tree canopy or roots, tree removal, tree transplantation or other associated works including stump grinding or the application of any prescribed treatment shall be carried out in accordance with applicable standards including Australian Standards AS 4373-2007 Pruning of amenity trees and AS 4970-2009 Protection of trees on development sites.

The invoice for this report will be issued to the person or entity as per the address advised at the time of confirmation of appointment. Assessment in this report is based on plans provided at the time of confirmation of engagement and report preparation. Additional time required for re-assessment of report detail due to subsequent re-issue of plans after report preparation will be subject to an additional fee which will be charged at our hourly rate. This report shall not be conveyed to any third party including regulatory authority/s until full payment of this invoice is received by Independent Arboricultural Services and a finalised report has been issued unless agreement to do so has been granted.

Factors including the absence of historical records or local knowledge, recognition of the variability of the integrity of a tree as a naturally living organism as well as the impact of conditions within its surrounds to which it maybe subject including the impacts of mechanical force and the occurrence of weather events, do not allow an arborist to guarantee the age of a tree, or the length of time a tree/s may live or such time as it /they may fail. There is no warranty or guarantee, expressed or implied that the problems or deficiencies of the plants or property in question may not arise in the future.

Table of Contents

Document Tracking & Information

Project Name	Arboricultural Impact Assessment		
Project Arborist	Chantelle Brackenridge-Hughes (AQF Level 5) & Roger Rankine (AQF Level 8)		
Client	School Infrastructure NSW		
Address	Narrabeen Sports High School, Narrabeen NSW 2101		
IAS Reference	IAS8602		
Prepared By	Chantelle Brackenridge-Hughes (AQF Level 5) & Roger Rankine (AQF Level 8)		
Checked By	Andrew Rankine (AQF Level 5)	**Date**	12th September 2022
Revision	1		
Andrew Rankine ***Director*** Mobile: 0412 035 396	• Diploma Arb. (AQF Level 5) • Arboriculture Australia Registered Professional Arborist • QTRA (Lic. 2768)	• TRAQ (Qualified) • ISA Certified Arborist & Municipal Specialist AU-0269AM • QAA Qualified Member	
Roger Rankine ***Director*** Mobile: 0408 161 015	• Diploma Arb. (AQF Level 5) • Grad Cert Arb. (AQF Level 8) • ISA Qualified Arborist (QL-0001A) • QTRA (Lic. 4988)	• TRAQ (Qualified) • Arboriculture Australia Registered Professional Arborist • QAA Qualified Member	
Stephen Catchpoole ***Consulting Arborist*** Mobile: 0400 473 500	• Diploma Arb. (AQF Level 5) • QTRA (Qualified) • Doctor of Philosophy in Forestry (PhD)	• TRAQ (Qualified) • Bachelor of Science Forestry • Bachelor of Science (Hons Botany) • QAA Qualified Member	
Mick Maher ***Consulting Arborist*** Mobile: 0400 606 640	• Diploma Arb. (AQF Level 5) • Cert IV Project Management • Cert III Conservation and Land Management	• TRAQ (Qualified) • Cert II Horticulture (Turf Management) • QAA Qualified Member	
Garry Rangi ***Consulting Arborist*** Mobile: 0418 793 534	• Diploma Arb. (AQF Level 5) • Cert III in Civil Construction: (Plant Operations), (Pipe Laying), (Road Construction & Maintenance) • Advanced Diploma of Civil Construction • Cert III in Conservation Earthworks	• TRAQ (Qualified) • Diploma Horticulture • Diploma Project Management • Diploma Business Management • Associate Diploma (Wilderness Reserves & Wildlife) • Arboriculture Australia Registered Consulting Arborist • QAA Qualified Member	
Sam Gilbey ***Consulting Arborist*** *Mobile: 0400 229 587*	• Diploma Arb. (AQF Level 5) • TRAQ Qualified • QTRA Qualified	• Bachelor of Science in Ecology and Conservation Biology	
Kieran Pentland ***Consulting Arborist*** Mobile: 0448 827 976	• Diploma Arb. (AQF Level 5) • Grad Cert Arb. (AQF Level 8) • MSc. Arb. & Urban Forestry (AQF Level 9) • QAA Qualified Member • QTRA Qualified	• TRAQ (ISA Qualifications) • Bachelor of Arts in Leisure Management • National Cert in Tree Management • National Cert in Horticulture	

Contact Details

Phone	(07) 3399 5865
Enquiries	office@independentarb.com.au
Accounts	accounts@independentarb.com.au
Web	www.independentarb.com.au
Postal Address	PO Box 287, Morningside QLD 4170
ABN	65 062 099 495

Abbreviations

NBC	Northern Beaches Council	**RPA**	Root Protection Area
DA	Development Application	**TMP**	Tree Management Plan
VPO	Vegetation Protection Order	**CMP**	Construction Management Plan
ULE	Useful Life Expectancy	**VMP**	Vegetation Management Plan
BLF	Building Location Footprint	**AS**	Australian Standard
BLE	Building Location Envelope	**AS 4373: 2007**	Pruning of amenity trees
TPZ	Tree Protection Zone	**AS 4970: 2009**	Protection of trees on development sites
SRZ	Structural Root Zone	**DBH**	Diameter at Breast Height

All comments and recommendations in this report have been determined in accordance with Australian Standards AS 4373-2007 Pruning of amenity trees and AS 4970-2009 Protection of trees on development sites. All recommended tree work should be carried out in accordance with these standards.

Roger Rankine

Consulting Arborist

Map

Figure 1: Subject Site (Nearmap 2021)

Introduction

This report is based on a visual inspection carried out from the ground on 24th November 2021 & 21st June 2022. No soil or tissue sampling has been conducted. Tree assessment and Qualitative Visual Tree Analysis has been carried out in accordance with TRAQ ISA guidelines. Data and information provided to the client by others has been incorporated into this report as appropriate.

All Arboricultural recommendations contained in this report have been determined in accordance with Australian Standards AS 4373-2007 Pruning of amenity trees and AS 4970-2009 Protection of trees on development sites.

For the purposes of this report reference to a Consulting or Project Arborist is held to mean an Arboricultural specialist who holds minimum Arboricultural qualifications of Dip Arb/AQF 5, appropriate professional insurances and has appropriate experience in the protection of trees on construction sites. Where tree work is specified, all recommended tree work is to be carried out in accordance with the above-mentioned standards by an appropriately trained and AQF qualified arborist practitioner/s with an up-to-date record of training and membership of a recognised Australian Arboricultural association, e.g. NSW Arboricultural Association, Arboriculture Australia (AA), or a recognised international Arboricultural association. No climbing spikes are to be used if pruning is to be carried out on live trees except in the instance of an emergency.

Qualifications of the report authors include Diploma of Arboriculture/AQF Level 5 and ISA Certified Arborist accreditation. Report authors hold current insurances and memberships including qualified memberships of Queensland Arboricultural Association (QAA), and Arboriculture Australia (AA) as well as current accreditation and membership of International Society of Arboriculture (ISA).

Independent Arboricultural Services is a qualified registrant on the QAA Register of Consulting Arborists.

Executive Summary

Independent Arboricultural Services have been engaged by School Infrastructure NSW to assess potential impacts to the nominated vegetation resulting from the proposed Narrabeen Education Precinct development which includes the redevelopment of the Narrabeen North Public School (NNPS) and Narrabeen Sports High School (NSHS). The public school and the High School have been identified by the NSW Department of Education (DoE) as requiring upgrade works.

The proposed Narrabeen Education Precinct development includes redevelopment of Narrabeen North Public School (NNPS) and Narrabeen Sports High School (NSHS). The Public School and High School have been identified by the NSW Department of Education (DoE) as requiring upgrade works.

The works at NSHS upgrade the school including addition of new two (2) storey extension to Building A, construction of new single storey amenities building and refurbishment of four (4) existing buildings (Buildings A, B, C and K).

This Development Application (DA) will seek consent for the following works at NSHS:

- Alterations and additions to Building A (Gymnasium) to create new stage for gymnasium and new two (2) storey addition comprising canteen, boys and girls changing rooms and staff room on the ground floor; and movement studio and two (2) new General Learning Spaces (GLS) on the first floor.

Other development works are occurring on the site under separate planning pathways including:

- Development without consent (REF); and
- Exempt development
- The proposed development does not seek to increase staff or student numbers

Advice on both specific and general tree protection measures and Project Arborist Requirements have been detailed in this report. It is important as the design is refined, further reviews are undertaken by the Project Arborist and protection measures are further specified as required.

Chantalle Hughes (AQF Level 5) attended site on 24th November 2022 to undertake the assessment of the impact of the works. Roger Rankine (AQF Level 5) attended site on the 21st June 2022 to further review the impact of the proposed works. Advice on both specific and general tree protection measures and Project Arborist Requirements have been detailed in this report. It is important as the design is refined, further reviews are undertaken by the Project Arborist and protection measures are further specified as required.

Further detailed designed will be assessed as available during the project including civil works (cut / fill) services layouts and building footprints. Protection measures and assessment of incursion has been based on the available information provided. Based on the current designs, three (3) individual trees 65, 66 & 67 will have major incursion and the long-term health and structural viability will be affected by the works.

As part of the design process and operational works it is recommended that the following is undertaken,

- The Project Arborist is to be consulted during the detailed design phase to minimise impacts to retainable vegetation.
- Current retention/removal recommendations are based on plans provided. Detailed assessment of final design plans and bulk earthworks are required prior to final retention/removal recommendations.

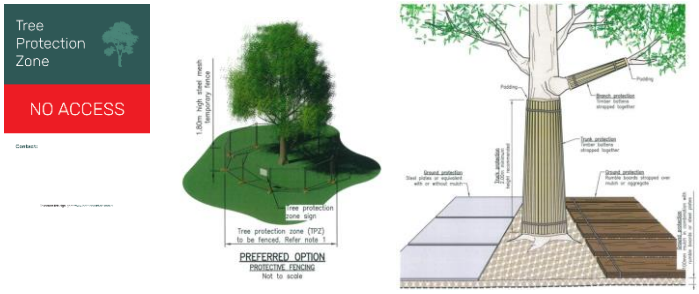
- Ensure all approvals and permits are in place before works commence.
- Undertake a pre-start meeting with contractors before works commence.
- Tree Protection Fencing is to be erected before works commence and audited by the Project Arborist (Min AQF Level 5).
- Supervision by a Project Arborist (Min AQF Level 5) and Fauna Spotter/Catcher of the approved tree removals.
- Any works proposed within the TPZ of retained trees requires supervision of a minimum AQF5 Project Arborist.
- Tree Pruning is to be undertaken by a minimum AQF Level 3 Arborist.
- Laydown areas and site shed/office locations are to be identified/finalised and excluded from the Tree Protection Zones of retained trees and minimise public impact.
- Route vehicles and equipment outside of TPZs. If access is required within TPZ, mulch to a depth of 100mm and tree padding needs to be installed with the option of track mats as determined and signed off by a minimum AQF5 Project Arborist.
- Construction materials, spoil, stockpiles, tools and equipment are not permitted within the TPZs of retained trees.

Arborist Comment

- **Protection of retained trees during construction works**
- **Impact of proposed works**

Protection of Retained Trees During Construction Works

An exclusion zone is to be established along the perimeters of retained trees surrounding the development site and cordoned off with a physical barrier of wire mesh fence, 1.8m in height, which is securely anchored (as indicated on the Tree Protection Plan). The role of these fences is to prevent any damage to the complete tree including root system (SRZ & TPZ), stem and branch structure as well as the crown or canopy. Alternatively, and on approval of a minimum AQF5 Project Arborist, plastic mesh fencing, 1.2m in height, secured with star pickets and caps with straining wire can be utilised. All TPZ fencing will require appropriate signage to signify the relevant protection zones. This will require audit and sign off prior to operational works onsite.



Tree Protection Fencing to be utilised. Where works will be undertaken close to and within Tree Protection Zones specific tree protection measures to be utilised a directed by the project Arborist.

Impact of proposed works

Based on the proposed new COLA building, Trees 65 & 66 will encounter complete incursion under AS4970-2009 and the long term health and structural viability will be affected by the proposed works. The writer ha been advised that the area around and under Tree 67 will be re-paved and complete incursion will occur. It is recommended that all removals are replaced in accordance with the landscaping plans.

Project Hold Points

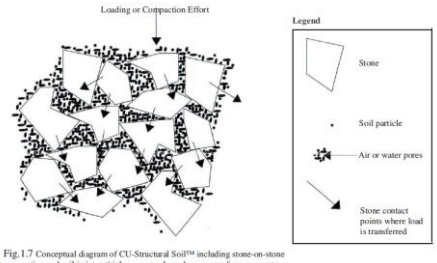
Engage an AQF5 minimum Project Arborist during the project life;

- Once tree protection fencing and signage has been established and finalised. Project Arborist (minimum AQF Level 5) to audit and sign off.
- Supervision of approved tree removals in conjunction with a fauna spotter.
- Any works within the TPZ of retained trees is required.
- If tree roots are encountered over 50mm in diameter outside of TPZs of retained trees.
- Changes to the plans occur.
- On completion of the project to conduct a final audit and summary.

(Site audits/summary reports will be conducted at each hold point interval by the Project Arborist)

Project Arborist Requirements	
1.	Pre-Start Inspection and Audit of Tree Protection Fencing Before Works Commence
2.	Any required Tree Works to be undertaken by a minimum AQF Level 3 Arborist under the Supervision of the Project Arborist (Min AQF Level 5). Tree Services Company to be a member of Queensland Arboricultural Association or Arboriculture Australia.
3.	All works within the Tree Protection Zones of the retained vegetation to be supervised by the Project Arborist (Min AQF Level 5). Audit Reports to be completed and submitted by the Project Arborist. Any below ground incursion to be water excavated under low pressure, under the supervision of the Project Arborist.
4.	All works to be excluded from the Structural Root Zone (SRZ) and supervised if located within Tree Protection Zone.
5.	The Project Arborist to be consulted if changes to plans are made that affect any retained vegetation.
6.	At the Completion of works, Project Arborist to undertake a site assessment and an audit report compile of any further remedial actions required.

Examples of Amended Protection Measures

Examples	Photos
Example of the use low pressure water excavation for the installation of conduits	 
Example of the use of black plastic to line pier holes	
Example of the use of black plastic to line concrete	 
Example of the use of Structural Soil. Structural Soils – (Source: Cornell University)	   Fig.1.7 Conceptual diagram of CU-Structural Soil™ including stone-on-stone compaction and soil in interstitial spaces used as a base course for pavements.

Conclusion

For all retained trees, with due care, implementation of appropriate work methodology as noted in this report and isolation of all TPZs of retained trees from construction works, the potential for ill-effect to retained/affected trees can be minimised in accordance with guidelines of AS4970:2009 – Protection of trees on development sites.

The following must occur:

NBC approvals must be in place prior to the commencement of any tree work for future construction work. Approvals are required should the Project Arborist prescribe pruning such as crown clean, canopy lift and/or directional pruning.

- Project Arborist must be appointed and engaged to guide the protection of protected trees from project commencement, i.e. during Design Planning and during the construction period until its completion.
- **All Arboricultural reports, TMPs, VMPs & approvals must be included in the CMP**
- Design Plans must be drafted to incorporate raised foundations supported by sleeved pier design or similar low impact design to bridge the roots zone of any development within TPZ's. Exploratory low pressure water excavation is to be undertaken as specified.
- Arborist briefing of all engaged persons on their commencement as well as diligent work practice must occur during all approved future construction work.
- Root disturbance must be minimised to prevent accidental injury, compression and the creation of exposure points to allow future entry of pests and pathogens.
- **All work within any TPZ must be supervised by the Project Arborist.**

All work within TPZs must be carried out with due care to avoid mechanical impact with retained tree/s during the construction phase. Where present existing strip footings or installed pier locations are to be utilised for any replacement of existing fence structures; alternatively, any removal of existing fence structures and new replacement work is to be carried out as detailed above, i.e. new fence foundations should utilise post and rail design with no concreted footing unless authorised by the Project Arborist. Sleeving should be installed to provide an impervious barrier between exposed TPZ perimeter/s and new concreted areas to prevent chemical leeching into the surrounding soil of retained trees.

Reactionary processes, such as the emergence of deadwood, dieback etc. are likely to occur as a result of disturbance and/or injury to any retained tree on a construction site. Amended design plans and construction methodology can serve to avoid or minimise the likely emergence of such issues and therefore their associated future OH&S issues to the future occupants of the new dwellings and or pedestrian or vehicular traffic within the vicinity of retained tree/s. Any required pruning is to be undertaken by a minimum AQF Level 3 Arborist under the supervision of the Project Arborist (AQF Level 5).

Tree Locations

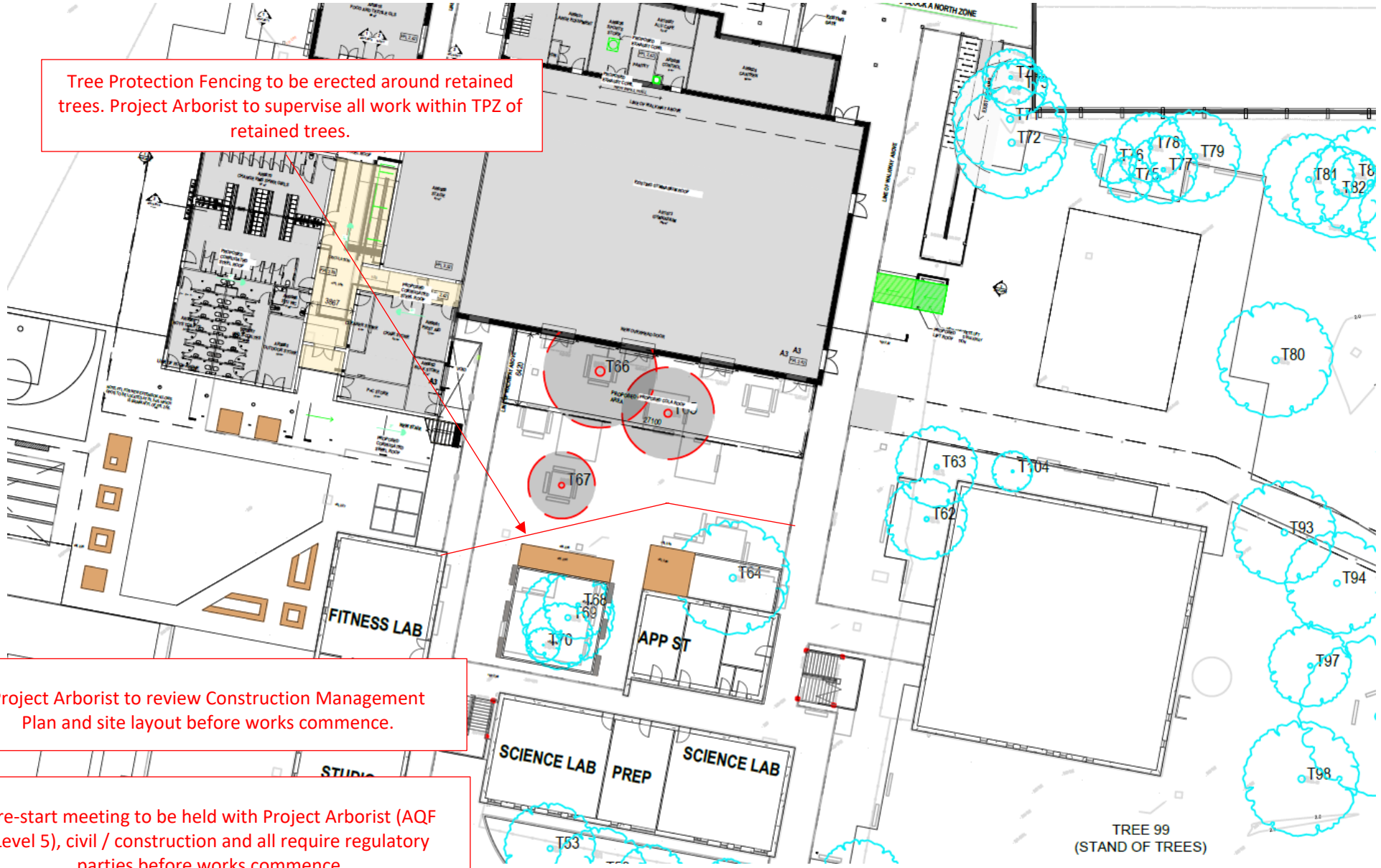
Please Note: Tree Locations are an approximate only


Common Name
Brush Cherry
Coast Banksia (11)
Common Paperbark (36)
Coral Tree (2)
Cotton Wood (12)
Crimson Bottlebrush (7)
Glossy Laurel
Grey She-oak (52)
Group of Trees (9)
Gum
Hibiscus
Hill's Weeping Fig
Monterey Pine
Native Pine
Norfolk Island Hibiscus (3)
Norfolk Island Pine
Ponderosa Pine (2)
Prickly Paperbark (3)
Queensland Brush Box
River She-oak (39)
Southern Mahogany (5)
Spotted Gum (8)
Swamp Mahogany (56)
West Australian Willow Myrtle (14)
White Cedar
20m

Tree Locations with TPZ


Common Name
Brush Cherry
Coast Banksia (11)
Common Paperbark (36)
Coral Tree (2)
Cotton Wood (12)
Crimson Bottlebrush (7)
Glossy Laurel
Grey She-oak (52)
Group of Trees (9)
Gum
Hibiscus
Hill's Weeping Fig
Monterey Pine
Native Pine
Norfolk Island Hibiscus (3)
Norfolk Island Pine
Ponderosa Pine (2)
Prickly Paperbark (3)
Queensland Brush Box
River She-oak (39)
Southern Mahogany (5)
Spotted Gum (8)
Swamp Mahogany (56)
West Australian Willow Myrtle (14)
White Cedar
20m

Tree Protection Plan



Tree Detail

Tree Id	Botanical Name	Common Name	DBH [cm]	Tree Protection Zone (TPZ) [m]	Structural Root Zone (SRZ) [m]	Tree Height (Estimated) [m]	Canopy Spread [m]	Est. Height to Lowest Branch	Health	Form	STARS - Tree Significance	Tree Retention Value	SULE	Observations
65	*Eucalyptus robusta*	Swamp Mahogany	34	4.1	2.1	14	8	4	Fair	Typical	Medium Significance	Medium	2A-2D	Deadwood over 50mm, dieback, epicormic growth
66	*Eucalyptus robusta*	Swamp Mahogany	41	4.9	2.6	14	12	8	Fair	Typical	Medium Significance	Medium	2A-2D	Deadwood under 50mm , dieback, epicormic growth
67	*Lophostemon confertus*	Queensland Brush Box	23	2.8	1.9	8	6	3	Fair	Typical	Medium Significance	Medium	2A-2D	Dieback

Table Legend:			
Health	**Form**	**Aged Class**	**Further Detail**
Good: Trees foliage is in exceptional condition and can be considered an excellent specimen of its species. No pests or diseases are present.	Good: Trees structure is exceptional and can be considered an excellent specimen of its species. No visible defects are present.	Juvenile: Tree will generally grow rapidly in this phase of its life cycle.	Diameter at Breast Height (DBH) measured at 1.4m above ground level. Diameter at Root Flare (DRF) measured at the base of the tree, at the trunk / root system transition zone. Diameter = circumference divided by π
Fair: Trees foliar condition is satisfactory but may be exhibiting some signs of stress such as tip dieback or chlorosis, pests or diseases may be present but not adversely affecting the tree.	Typical: Trees structure is normal for the species; some minor structural constraints may be present.	Mature: Tree has reached maturity and is producing flowers, fruits and seeds. Tree continues to grow.	Tree Protection Zone (TPZ) defined as metres radius. Calculated being DBH x 12 (minimum 2.0m and no greater than 15m).
Poor: Foliage density is sparse or largely discoloured, tree health is at or approaching a critical value which may be irreversible, pests or diseases are highly prevalent throughout the crown.	Poor: Structure is a poor example of its species and exhibits a combination of structural issues.	Full to Late Maturity: Tree has reached the maximum height for its species, elongation has stopped but the trunk continues to thicken, overall growth rate is starting to slow, foliar density may be starting to thin.	Structural Root Zone (SRZ) displaced as metres radius. Calculation being $(DRF \times 50)^{0.42} \times 0.64$ (never less than 1.5m or greater than 15m).
Dead: Tree is in advanced decline or completely dead.	Dead: Tree is in advanced decline or completely dead.	Senescent: Tree has / is starting to retract in size through dieback and shedding of limbs. Trees in this age class may be ecologically valuable, as their structure contains habitat necessary for native fauna.	

Tree Recommendations

Tree Id	Botanical Name	Common Name	DBH [cm]	TPZ [m]	Impact	Recommendations*
65	*Eucalyptus robusta*	Swamp Mahogany	34	4.1	Major – COLA	Remove and replace in accordance with landscaping plans
66	*Eucalyptus robusta*	Swamp Mahogany	41	4.9	Major - COLA	Remove and replace in accordance with landscaping plans
67	*Lophostemon confertus*	Queensland Brush Box	23	2.8	Major – Resurfacing of the area outside of COLA**	Remove and replace in accordance with landscaping plans

*Project Arborist (AQF Level 5) to be engaged during construction works and review the final footprint of building works including cut / fill, building, services layout, construction entry and exit and lay down areas. **Writer has been advised that re-paving of the area outside of the COLA building will result in the complete removal of the Tree and paving over the current garden bed.

Tree Protection Measures and Guidelines

Note 1: TPZ perimeter fencing should be grouped where perimeters overlap and appropriate.

Note 2: Signage is to be installed in accordance with Australian Standard AS 4970-2009 Protection of trees on development sites as illustrated below.

Protective Fencing

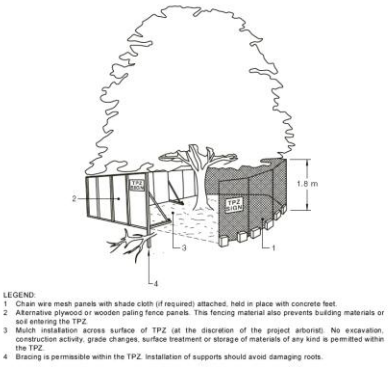


Figure 2

Examples of Trunk, Branch & Ground Protection

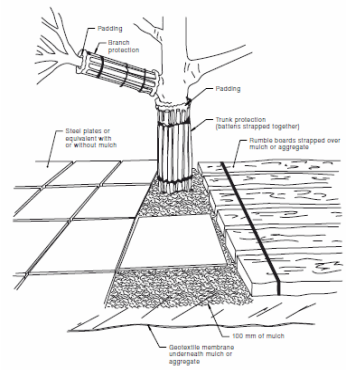


Figure 3

Tree Protection Zone Signage

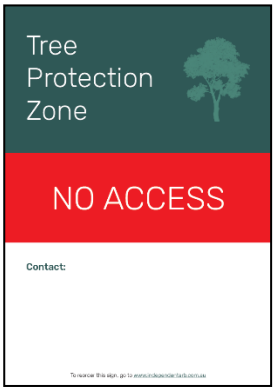


Figure 4

Low pressure Ground Excavation & Water Cutting

Figure 5

Figure 6

Figure 7

Figure 8

Example of Fauna Friendly Rigid Style Temporary Fencing

Figure 9

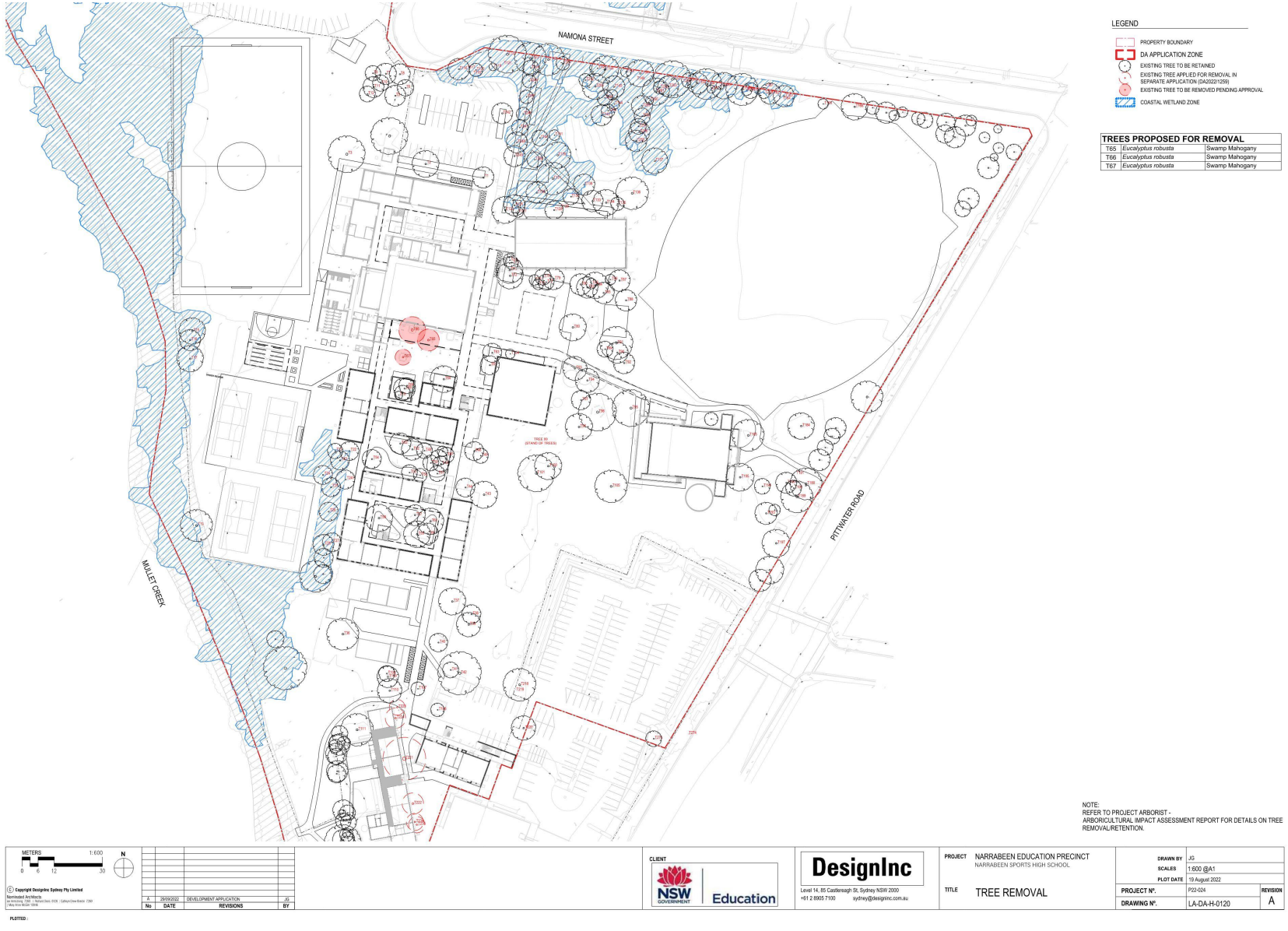
Figure 10

Source: AS4970-2009 Protection of Trees on Development Sites

Tree Management Plan (TMP) – Works Progress: Development Phase

Stage	Tasks	Specific Outcomes
Pre-construction Phase		
Prepare and finalise Arboricultural Impact Assessments for submission to Council	Project Arborist to be appointed Review tree details in all approved Arboricultural reports following any new issue of plans	Submit Arboricultural reports including Arboricultural Impact Assessment for final Council Approval
Project Arborist to conduct Prestart Meeting with all representatives involved in construction	Prior to meeting: TPZ temporary protection/fencing installed **Arboricultural Report, TMP & Council approval copies to be included in CMP** and made available to onsite crews	Prestart Certification and approvals in place & available onsite with CMP
Commencement - Construction Phase		
Initial Site Preparation	Project Arborist to supervise all tree work. **Construction crew or others are not to remove any part of a tree.** Arborist prestart site inspection.	Compliance Certification of Arboricultural works for lodgement to Council Arborist certification of TPZ measures.
Prestart Toolbox Meeting	All relevant onsite crews to be briefed by Project Arborist prior to commencement of each work phase. Project Arborist must be notified and onsite at all times when construction works are within or close to TPZ. Note: Onsite attendance of Project Arborist is a condition for issue of Arboricultural Site Audit Statement/s.	Arborist Site Audit Reporting system to be in place. Copies of Arboricultural Report to be retained onsite. Arboricultural Site Audit Statement/s will not be issued retrospectively
Construction Phase		
Site Establishment	Project Arborist to monitor tree health during establishment phase including bulk earthworks, changes in hydrology etc.	Instigate remedial tree care measures if required
Construction work	Site Manager to liaise with and ensure Project Arborist is advised in time to allow them to be present for all work carried out within TPZ area including any work likely to affect identified tree/s. Any deviation/s from approved plans to be approved by Project Arborist. **Project Arborist to provide ongoing Site Audit Certification of all work within TPZ**	Any remedial tree works to be carried out by qualified arborists under supervision of Project Arborist. Project Arborist is responsible for issue of Arborist Site Audit Reports.
Practical Completion	Project Arborist to carryout review of tree health and vigour and advise on TPZ fencing.	On Project Arborist approval, carryout removal of remaining temporary tree protection measures
Post Construction Phase		
Final Arborist inspection	Carryout tree health review and provide recommendations for required tree care.	Issue of final Arborist Site Audit Compliance Statement for inclusion in final DA documentation and sealing.

Plans


NAMONA STREET
PITTWATER ROAD
MULLET CREEK
LEGEND
PROPERTY BOUNDARY
DA APPLICATION ZONE
EXISTING TREE TO BE RETAINED
EXISTING TREE APPLIED FOR REMOVAL IN SEPARATE APPLICATION (DA2022/1259)
EXISTING TREE TO BE REMOVED PENDING APPROVAL
COASTAL WETLAND ZONE
TREES PROPOSED FOR REMOVAL
T65 Eucalyptus robusta Swamp Mahogany
T66 Eucalyptus robusta Swamp Mahogany
T67 Eucalyptus robusta Swamp Mahogany
NOTE:
REFER TO PROJECT ARBORIST -
ARBORICULTURAL IMPACT ASSESSMENT REPORT FOR DETAILS ON TREE REMOVAL/RETENTION.
METERS 1:600
0 6 12 30
N
Copyright Designinc Sydney Pty Limited
Nominated Architects
A 29/09/2022 DEVELOPMENT APPLICATION JG
No DATE REVISIONS BY
CLIENT
NSW GOVERNMENT Education
DesignInc
Level 14, 85 Castlereagh St, Sydney NSW 2000
+61 2 8905 7100 sydney@designinc.com.au
PROJECT NARRABEEN EDUCATION PRECINCT
NARRABEEN SPORTS HIGH SCHOOL
TITLE TREE REMOVAL
DRAWN BY JG
SCALES 1:600 @A1
PLOT DATE 19 August 2022
PROJECT N°. P22-024
REVISION A
DRAWING N°. LA-DA-H-0120
PLOTTED :

Photos

Tree 65

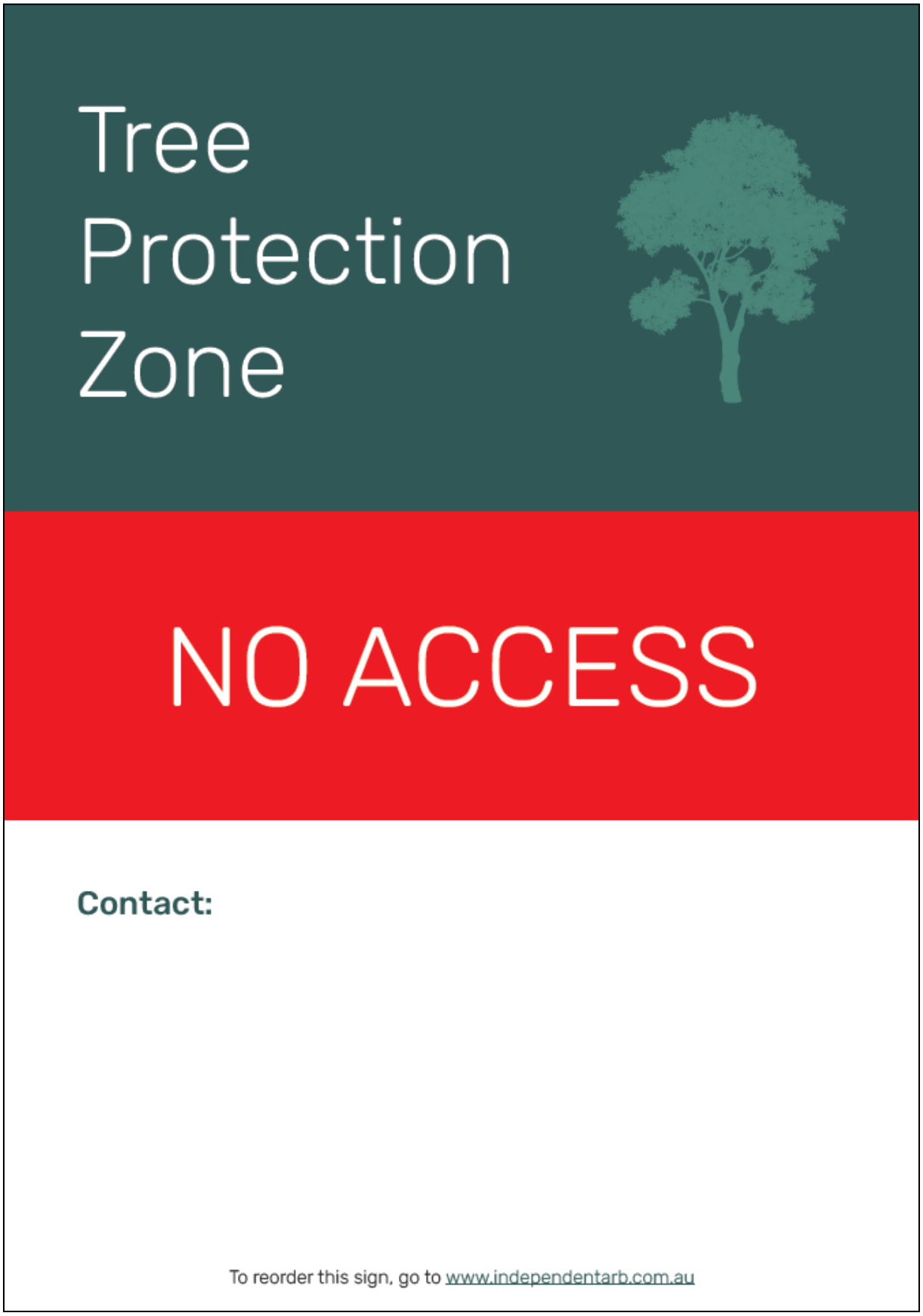
Tree 66

Tree 67

Reference Page

1. Australian Standards 2009, AS 4970-2009 Protection of trees on development sites
2. Australian Standards 2007, AS 4737-2007 Pruning of Amenity Trees
3. Mattheck K, Breloer H. 1994. The body language of trees, a handbook for failure analysis, London, England
4. Shigo, A.L. 1986. A New Tree Biology. Shigo & Trees, Associates, Durham, New Hampshire
5. Shigo, A.L. 1991, Modern Arboriculture. Shigo & Trees, Associates, Durham, New Hampshire
6. Bassuk, Nina, Jason Grabosky, Peter Trowbridge, and James Urban. "Structural Soil." Urban Horticulture Institute. Cornell University, 1996. Web. 26 Apr 2010. <http://www.hort.cornell.edu/uhi/outreach/csc/article.html>
7. Urban, J 2008, Up By Roots, Healthy Soils and Trees in the Built Environment, International Society of Arboriculture
8. Nearmap 2020, www.nearmap.com.au

Appendix 1


Tree
Protection
Zone
NO ACCESS
Contact:
To reorder this sign, go to www.independentarb.com.au

Appendix 2: Explanation of Terminology

Definition	Process Description
Removal	Complete tree removal leaving stump as close as possible to ground level. Recommended process will include chipping of all foliage limbs and timber and reinstatement of work site. Recommendation typically based on tree being assessed as representing a health and safety concern [Dead, dying, structurally unsound, unstable, poor form]
Remove and grind	Complete tree removal to include grinding of stump to a depth of 75 millimetres unless otherwise specified. Recommended process will include chipping of all foliage limbs and timber and reinstatement of work site. Stump site will be cleaned of all grinding debris and sawdust and backfilled with premium topsoil free from weeds.
Crown Clean (Deadwood)	Removal of all major/significant deadwood and dead branches up to [and including] 30 millimetres in diameter in trees overhanging pedestrian or vehicular areas or removal of dead branches > 50mm diameter in canopy of trees located in parkland or similar area unless otherwise specified.
Crown Clean (General pruning)	Recommended pruning process will include removal of broken, crossing, rubbing, diseased, stressed or dying branches or limbs with poor attachment. Additional work process may include pruning to define leaders, balance the crown, reduce weight load, or clear the tree from obstructions. In summary, to rectify, as far as is possible, any structural defects and eliminate undesirable growth or deadwood.
Crown Reduction (Canopy reduction)	Recommended pruning process may include light and general pruning typically to encompass removal of up to 15% but no more than 20% of the leaf-bearing crown. By definition the unique shape and form of the tree will not be altered or compromised by the pruning process. Typically, the consulting arborist will nominate the reduction percentage [%] appropriate to species, condition and assessment.
Crown Raising (Canopy lift)	Pruning processes maybe involve the raising of the tree's lower canopy to a height specified in metres. Typically, the process is performed to provide for pedestrian and or vehicular clearance and unless otherwise specified the default parameters will be to provide 2 metres clearance from ground level or as specified by local or state government regulation. From time to time pruning requirements may be altered to accommodate various site-specific requirements as advised by the consulting arborist accordingly.
Crown Restoration	Pruning process will encompass crown restoration and remedial works where the tree has been previously lopped or otherwise damaged. Not feasible when tree has extensive decay and should only be considered when there is evidence of healthy re- growth. When performed correctly the process of remedial pruning will most likely take several years to complete.
Hanger Limb / Unattached branch	Pruning process may be restricted to the removal of any hanger/s or dangerous/dead/dying limbs and will typically involve the removal of a single limb. In some instances, removal of an individual limb may be necessary to accommodate an obstruction and the consulting arborist will advise accordingly.
Directional Pruning	Pruning process will be restricted to pruning canopy away from buildings/service wires/property boundary and will typically be performed to avoid future growth in these areas. Where appropriate future growth will be directed away from obstruction by selected pruning so as to encourage the development of the growth of new leaders.

Habitat Pruning	When pruning deadwood from trees, simple techniques and methods can be employed to achieve hazard reduction whilst leaving food and habitat for tree dwelling fauna. Long pieces of deadwood can be reduced in length to limit potential hazard but still retain food for the insects and microorganisms. Stubs that have been left by old pruning or previous branch failure can be retained, and with the use of a hole-saw or chainsaw they may also be bored out to create a nesting hollow for native birds or small mammals. Source: Mosman Council
Deadwood	Dead branches within canopy of tree59F. Deadwood is a naturally occurring feature of most tree species and comprises dead or decaying branches within the canopy of a tree. Deadwood may have habitat value and require removal only according to the considered risk of its location, i.e. high use pedestrian area or damage to adjacent infrastructure.
Decay	The process of degradation of woody tissues by micro-organisms61F
Compaction	Results from loads or stress forces applied to the soil as well as shear forces. Both foot traffic and vehicle traffic exert both forces on soils. Vehicle traffic may cause significant compaction at depths of 150–200 mm (the area in which most absorbing roots are located). The degree of compaction will depend on weight of vehicles, number of movements, soil moisture levels and clay content. Soil handling, stockpiling and transporting also tend to lead to the breakdown of soil structure and thus to compaction. Vibration as a result of frequent traffic or adjacent construction activities will also compact soils55F
Codominant Structure:	Stems or trunks of about the same size originating from the same position from the main stem52F. When the stem bark ridge turns upward the union is strong; when the ridge turns inward the union is weak, a likely point of failure in storm or windy weather conditions or where increasing weight causes undue stress on the defective union53F

Source: AS4373-2003 Pruning of Amenity Trees & AS 4970-2009 Protection of Tree on Development Sites & Habitat Creation By Kieran O'Neill, Mosman Council.

Appendix 3: Normal Function of a Tree

Background Note: The following diagrams and explanatory notes are useful to illustrate the structure of a tree in a normal growing environment. This information is taken from AS4970-2009 Protection of trees on development sites which has been released subsequently to AS4373-2007 Pruning of amenity trees.

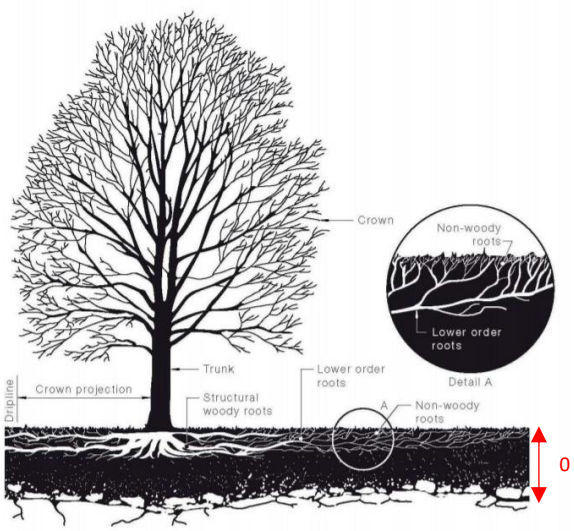


Figure 11: Structure of a tree in a normal growing environment

Leaves
The main function of leaves is photosynthesis, that is, the production of sugars. The sugars produced by the leaves (and any other green tissue) are the source of chemical energy for all living cells in the entire plant and as such are essential for the normal functioning and survival of the tree. Anything that directly or indirectly damages the leaves will interfere with photosynthesis.

Trunks and branches
Branches and trunks are composed of many tissues with specialized functions including the bark (protection), phloem (transport of sugars from the leaves), vascular cambium (growth of new transport tissues), sapwood (transport of water and nutrients from the roots), heartwood (strength and structural support) and rays (internal transport and storage of sugars). Damage to branches or trunks may allow infection by plant pathogens (disease causing organisms), disrupt the movement of vital materials and structurally weaken the tree.

Roots
The main functions of roots include the uptake of water and nutrients, anchorage, storage of sugar reserves and the production of some plant hormones required by the shoots. For roots to function, they must be supplied with oxygen from the soil. The root system of trees consists of several 'types' of roots found in different parts of the soil and is generally much more extensive than commonly thought. The importance of roots is easily overlooked because they are not visible, that is 'out of sight, out of mind'. Damage to the root system is a common cause of tree decline and death and is the most common form of damage associated with development sites.

Root systems consist of three main parts:

1. The structural woody roots (anchorage, storage and transport);
2. Lower order roots (anchorage, storage and transport); and
3. Non-woody roots (absorption of water and nutrients, extension, synthesis of amino acids and growth regulators) (see Figure).

In addition to lateral root spread being underestimated, root depth in trees has also been grossly exaggerated. Deep root systems or taproots are the exception rather than the rule. Most roots of most trees are found in the very top of the soil. The vast majority of these roots are small non-woody absorbing roots which grow upward into the very surface layers of the soil and leaf litter. This delicate, non-woody system, because of its proximity to the surface, is very vulnerable to injury."

Explanatory Note: The importance of gas exchange in soils

The fact that tree roots require oxygen to function is often misunderstood. Accessibility to available oxygen and water within the soil structure is dependent on the integrity of soil structure within their surrounds; when soils are compacted there is little space between soil aggregates with soil volume and total pore space, especially macropore space diminished. In turn, good soil oxygenation and gas exchange (Lonsdale) levels allow for successful function of tree roots. Oxygen levels in soils will typically decrease as soil depth increases and /or soils are heavily compacted.

Macropore is the term used to describe the relatively large space between soil particles that is usually air filled and allows for water movement and root penetration. Micropore is the term used to describe the space between soil particles that is relatively small and likely to be water filled.

Compaction results from loads or stress forces applied to the soil as well as shear forces. When soil within the root zone of a plant, including a tree, is compacted through either pedestrian or vehicular traffic, or by the heavy weight of stored materials or machinery, the ability of water and oxygen to penetrate the soil around the roots of living plants is compromised. Whilst tree roots are typically found in the top 600mm of the soil horizon, vehicle traffic, in particular may cause significant compaction at depths of 150–200 mm (the area in which most absorbing roots are located). (Refer Tree Function Note above).

The degree of soil compaction will depend on weight of vehicles, number of movements, soil moisture levels and clay content. Soil handling, stockpiling and transporting also tend to lead to the breakdown of soil structure and thus to soil compaction. Vibration, as a result of frequent traffic or adjacent construction activities, will also cause compaction of soil.

Contrary to the commonly held myth that all trees have tap roots, tree roots are typically located within the top 600mm of soil. Just as leaves perform the vital function of photosynthesis, tree roots are vital for the primary functions of anchorage, storage, absorption and conduction. Larger tree roots fulfil the main functions of anchorage, storage and conduction and smaller more fibrous tree roots, which grow primarily at the end of the main woody roots, fulfil a vital role in absorbing oxygen, essential mineral elements and moisture from the soil, often through a symbiotic relationship with soil borne fungi referred to as Mycorrhizae; the extent of root loss has the potential to jeopardise any or all of these main functions and most importantly may compromise the structural integrity of an established tree and its associated potential OH&S risk of failure occurring; any OH&S risk of potential failure in a high use area such as public roads, is noteworthy for all the wrong reasons and should be of major concern and avoided at all times. (Refer Appendix 2, Tree Function Note).

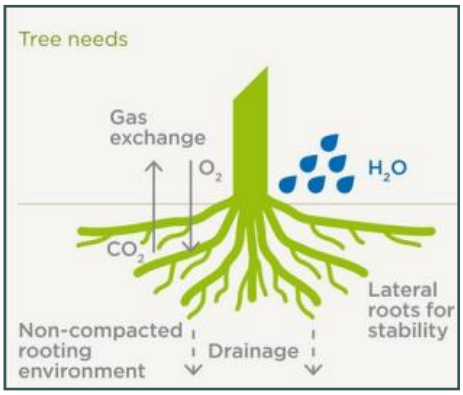


Figure 12: Gas exchange in woody tissues: the diffusion of gases into and out of a particular region (Jaluzot)

Reference Page

1. Australian Standards 2009, AS 4970-2009 Protection of trees on development sites.
2. Australian Standards 2007, AS 4737-2007 Pruning of Amenity Trees.
3. Mattheck K, Breloer H. 1994. The body language of trees, a handbook for failure analysis, London, England.
4. Shigo, A.L. 1986. A New Tree Biology. Shigo & Trees, Associates, Durham, New Hampshire.
5. Shigo, A.L. 1991, Modern Arboriculture. Shigo & Trees, Associates, Durham, New Hampshire.
6. Bassuk, Nina, Jason Grabosky, Peter Trowbridge, and James Urban. "Structural Soil." Urban Horticulture Institute. Cornell University, 1996. Web. 26 Apr 2010. <http://www.hort.cornell.edu/uhi/outreach/csc/article.html>.
7. Urban, J 2008, Up by Roots, Healthy Soils and Trees in the Built Environment, International Society of Arboriculture
8. Shigo, A.L. 1991, Modern Arboriculture. Shigo & Trees, Associates, Durham, New Hampshire.
9. Londsdale, David, Principles of Tree Hazard Assessment and Management Tree Hazard Assessment & Management TSO (The Stationery Shop, PO Box 29, Norwich, NR3 IGN)
10. Nearmap. (www.nearmap.com.au); accessed 21st March 2021.

Company Details

Independent Arboricultural Services

Independent Arboricultural Services, incorporated in May 2007, offers a completely independent arborist consulting and reporting service. Its directors and associated consultants bring extensive arboricultural knowledge gained over many years to this company. All consulting staff hold AQF Level 5 (Diploma of Arboriculture). Specialised advice when required, such as provision of survey mapping or engineering advice and certification is sourced from reputable professional providers according to site requirements as per Australian Standard 4970-2009.

Statement of Goal

To deliver continual improvement through the use of world's best arboricultural practices, supported by ongoing education and exposure to leading industry experts and research throughout the world.

Mission Statement

To provide timely, relevant and actionable consulting advice and practice based on the latest available and best scientific arboricultural knowledge.

Environmental Statement

Independent Arboricultural Services supports long term environmental sustainability sustainable sourced paper and ensuring all inks cartridges are recycled where possible.

Independent Arboricultural Services actively seeks to maintain a positive carbon footprint status and to that end is committed to protecting and preserving the environment, continuing to carry out tree planting, transplanting and replacement planting where practical, having planted in excess of 4000 trees in the first 2 years after its inception in May 2007 alone. Arboricultural recommendations involving the removal of tree/s will include replanting at a minimum ratio of 2 trees for any tree removed where possible. All arboricultural recommendations are made in accordance with world's best arboricultural practice and within the Australian Standards AS 4373-2007 Pruning of amenity trees and AS 4970-2009 – Protection of trees on development sites so as to ensure optimal outcomes for all living trees.

Independent Arboricultural Services acknowledges the benefits of healthy trees with good vigour and vitality and actively promotes better understanding in the general community of the contribution that trees make to reducing greenhouse gasses, the contribution of trees to better water retention and the prevention of soil erosion, the ability of trees to provide protection to infrastructure by diffusing strong winds in weather events and the contribution of trees to general liveability within the urban environment.

It is an acknowledged fact that air temperature beneath a tree canopy can be in excess of 5^{o} Celsius lower than the surrounding ambient air temperature thereby reducing reliance on greenhouse gas producing air conditioners and coal fired power sources.