ABNOBA ARBOR
Arboricultural Services

ARBORICULTURAL IMPACT ASSESSMENT| 102 SANDAKAN RD. REVESBY HEIGHTS

Prepared For Livingstone Homes

29.11.23

Prepared By Liam Strachan

ABNOBA ARBOR
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1 EXECUTIVE SUMMARY

On the 23rd November 2023 Livingstone Homes commissioned Abnoba Arbor to provide an arboricultural impact assessment for the proposed development at 102 Sandakan Rd. Revesby Heights.

The property lies within the Canterbury Bankstown Council LGA.

The development proposes the demolition of one single storey brick dwelling and the installation of one double storey duplex.

The recommendations and comments in this report are based on the following:

- Conduct a basic ground based visual tree assessment
- Provide information regarding tree species, dimensions, Landscape amenity value, health and vigour assessment, structural condition including potential mitigation options, priority rating for all recommended works.
- Ascertain Tree Protection Zones and Structural Root Zones.
- Determine the impact of the development on all of the trees.
- The amenity of adjoining neighbours and members community is to be considered.
- That report contains all relevant information as outlined in Canterbury Bankstown DCP 2023.

A total of 5 trees were assessed in total. 3 trees have been recommended for removal.

Table 1

Retention Value	To Retain	Tree Numbers	To Remove	Tree Numbers
Very High	0		0	
High	0		1	T1
Medium	1	T2	0	
Low	0		0	
Priority for Removal	1	T3	0	
Exempt	0		0	
Total	2		1	

The following trees may be retained and subject to the following tree protection measures;

Table 2

Tree ID	Tree Species	TPZ Radius (M)	SRZ Radius (M)	Retention Value (STARS)	Generic Tree Protection Measures	Specific Tree Protection Measures
T2	Melaleuca bracteata (Black Tea-Tree)	2.6	1.9	Medium	Site Fence Sufficient	The surface around the pool must be constructed at grade with no excavation. Please see Section 8.1 of this report
T3	Dead tree	1.7	1.6	Priority for Removal	Site Fence Sufficient	

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3 INTRODUCTION

On the 23rd November 2023 Livingstone Homes commissioned Abnoba Arbor to provide an arboricultural impact assessment for the proposed development at 102 Sandakan Rd. Revesby Heights.

The property lies within the Canterbury Bankstown Council LGA.

The development proposes the demolition of one single storey brick dwelling and the installation of one double storey duplex.

Site inspection was conducted by Liam Strachan AQF Level 5 Arborist on the 27th November 2023.

3.1 SCOPE

The purpose of this report is to provide information on any trees that may be affected by the proposed demolition and development at 102 Sandakan Rd. Revesby Heights.

The recommendations and comments in this report are based on the following:

- Conduct a basic ground based visual tree assessment
- Provide information regarding tree species, dimensions, Landscape amenity value, health and vigour assessment, structural condition including potential mitigation options, priority rating for all recommended works.
- Ascertain Tree Protection Zones and Structural Root Zones.
- Determine the impact of the development on all of the trees.
- The amenity of adjoining neighbours and members community is to be considered.
- That report contains all relevant information as outlined in Canterbury Bankstown DCP 2023.

In preparing this report, the author has considered the objectives of:

- The State environmental Planning Policy 'Biodiversity and Conservation' 2021
- The State environmental Planning Policy 'Vegetation in Non-Rural Areas' 2017,
- Canterbury Bankstown Local Environmental Plan 2023,
- Canterbury Bankstown Development Control Plan 2023
- AS 4373 'Pruning of Amenity Trees' 2007.

Australian Standard AS4970-2009 Protection of Trees on Development Sites has been used as a benchmark in the preparation of this report.

The report will also assess the on-going viability of the tree and if deemed appropriate, provide recommendations for pruning or the removal of the subject trees. The following report will focus on the trees sustainability within the landscape and will provide recommendations on the most appropriate course of action. The determination will be reached through the assessment of the tree's health, vigour, and structural condition at the time of inspection. The assessment did not include any internal diagnostics such as picus, resistograph, woody tissue examination, nor has any soil testing been conducted.

4 METHOD

4.1 METHODOLOGY SUMMARY

Table 3

Characteristic	Method
Photos	Digital camera
Tree measurements • **Height** • **DBH(Diameter at breast height)** • **SRZ (Structural root zone)** • **TPZ (Tree protection zone)**	• Clinometer, Tape measure • Diameter tape • SRZ = $(DAB \times 50)^{0.42} \times 0.64$ • DBH x 12 (AS4970-2009)
Documents Reviewed	• Canterbury Bankstown DCP 2023 • Canterbury Bankstown LEP 2023 • Canterbury Bankstown DCP 2023 Chapter 2.3 Tree Management
Drawings Reviewed	• Ecs Surveying Pty Ltd Group 22060 Sheet 1 of 1 • Femme Build Project No. FB0077 Dwg No. A.01.0 • Femme Build Project No. FB0077 Dwg No. A.01.1 • Femme Build Project No. FB0077 Dwg No. A.01.2 • Femme Build Project No. FB0077 Dwg No. A.01.3 • Femme Build Project No. FB0077 Dwg No. A.01.4 • Femme Build Project No. FB0077 Dwg No. A.01.5 • Femme Build Project No. FB0077 Dwg No. A.01.6 • Femme Build Project No. FB0077 Dwg No. A.02.1 • Femme Build Project No. FB0077 Dwg No. A.02.2 • Femme Build Project No. FB0077 Dwg No. A.02.3 • Femme Build Project No. FB0077 Dwg No. A.03.1 • Femme Build Project No. FB0077 Dwg No. A.03.2 • Femme Build Project No. FB0077 Dwg No. A.04.1 • Femme Build Project No. FB0077 Dwg No. A.04.2
Tree retention assessment	ULE (Useful life expectancy) STARS METHOD (IACA, 2010)
Tree health assessment	Visual Tree Assessment, (VTA) as per (Mattheck, et al., 2015) Inspection limited to ground based visual examination of the tree.

4.2 LIMITATIONS

Care has been taken to obtain all information from reliable sources. All data has been verified as far as possible. However, Liam Strachan - Consulting Arborist can neither guarantee nor be responsible for the accuracy of information provided by others. Unless stated otherwise:

- Information contained in this report covers only the trees examined and reflects the health and structure of the tree at the time of inspection. The documented, observations, results, recommendations and conclusions given may vary after the site visit due to environmental conditions. Liability will not be accepted for damage to person or property as a result of natural processes, unforeseeable actions or occurrences.
- Observations recorded for trees located within adjacent properties have been made without entering that property. Deciduous trees inspected during winter and all trees obscured by other vegetation are not able to be properly assessed. As a result, measurements for these trees are estimated. Similarly, these trees were not subject to a complete visual inspection and defects or abnormalities may be present but not recorded.
- The inspection was limited to visual examination from the base of the subject tree without dissection, excavation, probing or coring (unless specifically noted otherwise).
- There is no warranty or guarantee, expressed or implied, that problems or deficiencies of the subject tree may not arise in the future.

4.3 SITE INSPECTION

A visual inspection of the tree/s was performed from ground level, data collected includes:

- Genus, Species, Common Name;
- Height, Width, DBH (Diameter at Breast Height), DRB (Diameter above Root Buttress);
- Age, Health & Vigour;
- Significance, Amenity and Ecological Value;
- Form and Structural Condition;
- Visible Defects or Evidence of Wounding.

4.4 MEASUREMENTS

- Tree locations are supplied by client on the survey plan or triangulated using a measuring tape.
- Diameter at breast height (DBH) and Diameter above Root Buttress (DRB) are measured using a diameter tape.
- Height is measured using a clinometer.
- Canopy width is measuerd using a laser measure or tape measure.
- Structural Root Zone (SRZ) and Tree Protection Zone (TPZ) radii are calculated (in accordance with *AS 4970-2009*).
- TPZ or SRZ incursions are measured from the nearest face of the trunk to the face of the structure.

Tree schedule data is recorded in Appendix1.

4.5 REFERENCE DOCUMENTS

This report was written in coordination with:

- Australian Standard AS4970-2009 Protection of Trees on Development Sites
- Canterbury Bankstown DCP 2023
- Canterbury Bankstown LEP 2023
- Canterbury Bankstown DCP 2023 Chapter 2.3 Tree Management

4.6 DETERMINING A TREES SIGNIFICANCE

Tree health assessments were carried out using VTA as per Mattheck and significance and retention determinations were carried out using the STAR's method which combines ULE (useful life expectancy of subject tree) and significance rating based on characteristics such as health, form, vigour, cultural, heritage and amenity value. The 2 results are placed within a matrix which determines the retention value.

1. Is the tree a locally native remnant; an endangered species; a part of an endangered ecological community; or does the tree provide critical habitat for an endangered species?
2. Is the tree of botanical interest; Is it included in a significant tree register or listed as a heritage item under the Federal State or Local Regulations?
3. Is the tree visually prominent in the locality?
4. Is the tree well structured?
5. Is the tree in good health and/or does it display signs of good vigour?
6. Is the tree typically formed for the species?
7. Is the tree currently located in a position that will accommodate future growth?

Please see Appendix 2: STARS.

4.7 PLANNING GUIDELINES AND SPECIFIC LEGISLATION

Tree management measures are in place for Canterbury Bankstown Council under the provisions of the trees and vegetation preservation for properties covered under Canterbury Bankstown Council DCP 2023.

- According to the NSW Planning Portal, the site is listed as R2 Low Density Residential.
- The site is not listed within, nor does it form a heritage item.
- The site is not listed on the Canterbury Bankstown Council terrestrial biodiversity map.
- The site is not located on the NSW State Biodiversity Values map.
- The site does not contain any Threatened Ecological Communities or Critically Endangered Communities

4.8 TREE MANAGEMENT CONTROLS

For the purposes of this report, a prescribed tree as per Canterbury Bankstown DCP 2023 Chapter 2.3 Tree Management is:

- all trees that are 5m or more in height; and
- all mangroves, regardless of size; and
- all trees, regardless of size, listed as Vulnerable or Endangered or a component of an Endangered Ecological Community listed under the *Biodiversity Conservation Act 2016*; and

- all trees, regardless of size, listed under the *Environmental Protection and Biodiversity Conservation Act 1999*; and
- all trees, regardless of size, located on land included on the Biodiversity Map under the Canterbury-Bankstown Local Environmental Plan 2023; and
- all trees, regardless of size, located on sites listed as a heritage item in Schedule 5 of the Canterbury-Bankstown Local Environmental Plan 2023; and
- all trees, regardless of size, located in the foreshore area under the Canterbury-Bankstown Local Environmental Plan 2023.

A person must not cut down, fell, uproot, kill, poison, ringbark, burn or otherwise destroy, lop or otherwise remove a substantial part of any prescribed tree defined in clause 2.3 or carry out excavation and earthworks within the tree protection zone except with a permit from Council and subject to any conditions specified in the permit.

The dropping of leaves, flowers, fruits, seeds or small elements of deadwood are part of a tree's normal life cycle, and ordinarily will not provide the basis for the pruning or removal of the tree.

4.8.1 EXEMPTIONS

Council approval is not required for the following:

- trees located within 3m of the external wall of an approved dwelling, not including a secondary dwelling. The distance shall be measured from the external wall of the approved dwelling to the centre of the trunk of the tree at 1.4m above ground level; p
- plants declared a weed under the *Biosecurity Act 2015*;
- dead trees where they are not required as habitat for native fauna;
- dangerous trees where it can be proved by the owner to Council's satisfaction that pruning or removal is the only reasonable option to avoid an imminent threat to human life or property;
- recognised horticultural varieties of trees grown for fruit production;
- pruning of palms to remove fruit or fronds
- selective pruning of up to a total of 10% of the crown of an indigenous tree and up to a total of 20% of the crown of an exotic tree species over a 12 month period. Branches pruned must be no greater than 150 mm in diameter. Pruning works must comply with the Australian Standard AS 4373–2007, *Pruning of amenity trees* and consist of the following pruning classes only:
    - Crown maintenance: deadwooding, crown thinning, selective pruning
    - Crown modification: reduction pruning, crown lifting, remedial pruning, line clearance

Exemptions do not apply under the following circumstances:

- all trees, regardless of size, listed as Vulnerable or Endangered or a component of an Endangered Ecological Community listed under the *Biodiversity Conservation Act 2016*; and
- all trees, regardless of size, listed under the *Environmental Protection and Biodiversity Conservation Act 1999*; and
- all trees, regardless of size, located on land included on the Biodiversity Map under the Canterbury-Bankstown Local Environmental Plan 2023; and
- all trees, regardless of size, located on sites listed as a heritage item in Schedule 5 of the Canterbury-Bankstown Local Environmental Plan 2023; and
- all trees, regardless of size, located in the foreshore area under the Canterbury-Bankstown Local Environmental Plan 2023.

4.8.2 EXEMPT SPECIES

Table 4

Acacia baileyana (Cootamundra Wattle)	Acacia podalyriaefolia (Queensland Silver Wattle)	Acacia salicina Lindl. (Cooba)	Ailanthus altissima (Tree of Heaven)
Bambua spp.	Celtis sinensis (Chinese Hackberry)	Cinnamomum camphora (Camphor Laurel)	Citrus sp.
Eriobotrya japonica (Loquat)	Erythrina x sykesii (Coral Tree)	Eucalyptus nicholii (Narrow-Leaved Peppermint)	Eucalyptus scoparia (Willow/Wallangarra White Gum)
Ficus elastica (Rubber Tree)	Gleditsia triacanthos (Honey Locust)	Ligustrum lucidum (Broad-leafed Privet)	Ligustrum sinense (Narrow-leaf Privet)
Liquidamber styraciflua (Liquidamber/Sweet Gum)	Malus spp.	Mangifera indica (mango)	Morus spp.
Olea europaea var Africana (African Olive)	Phoenix canariensis (Canary Island Date Palm)	Phyllostachys spp. (Rhizomatous Bamboo)	Pinus radiata (Radiata/Monterey Pine)
Populus spp. (Poplar species)	Prunus sp.	Pyrus communis and cvs. (European Pear)	

4.9 SIGNIFICANCE IN THE ENVIRONMENT.

Trees are subject to the following legislation:

- Biodiversity Conservation Act NSW (BIO Act 2016): Provides provisions for conserving biodiversity.
- The State environmental Planning Policy 'Biodiversity and Conservation' 2021
- Threatened Species Conservation Act NSW (1995 TCS Act): Provides provisions for conserving threatened species, populations and ecological communities of animals and plants as well as managing key threatening processes.
- Environmental Protection and Biodiversity Conservation Act NSW (EPBC Act 1999): Provides provision to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places.
- Biosecurity Act NSW (BIO Act 2015): Refers to the protection of native plant communities, reducing the risk to human's health and the risk to agricultural production from invasive weeds.
- NSW Bushfire Brigade 10/50 Legislation is not enforced for this site.

4.10 VTA

The VTA system is based on the theory of tree biology, physiology and tree architecture and structure. This method is used by Arborists to identify visible signs on trees that indicate good health or potential problems. Symptoms of decay, growth patterns and defects are identified and assessed as to their potential to cause whole tree, part tree or branch failure, this system is based around methods discussed by Claus Mattheck in `The Body Language of Trees' (1994). For the purpose of this report, parts of the VTA system will be used along with other industry standard literature and other relevant studies that provide an insight into potential hazards in trees. This assessment is a snapshot of what could be reasonably seen or determined from a basic visual inspection. The VTA system is generally used as a means to identify hazardous trees, it is important to realize that for a tree to be hazardous there must be a target.

4.11 AUSTRALIAN STANDARD AS4970-2009

- The Australian Standard AS4970–2009 Protection of trees on development sites has been used as a benchmark in the preparation of this report and the terminology and impact assessment methodology have been adopted from this document. This AIA complies with 2.3.5 Arboricultural Impact Assessment of AS4970-2009.

- Recommendations have been based on tree Retention Value, Vigour, Condition and ULE. Trees with a high Retention Value should be given greater priority for retention than trees with Medium Retention Value. Trees with Long (40 years +) ULE should be given greater priority for retention than trees with Short (5-15 years) ULE

- **ULE –** Useful Life Expectancy. The length of time from the date of inspection that the Arborist estimates the tree will live and provide a useful positive contribution to the landscape amenity of the site. ULE ratings are Long (retainable for 40 years or more), Medium (retainable for 16-39 years), Short (retainable for 5-15 years) and Removal (tree requiring immediate removal due to imminent risk or absolute unsuitability).

- **VIGOUR –** Good (G), Fair (F) or Poor (P). The general appearance of the canopy/foliage of the tree at the time of inspection. Vigour can vary with the season and rainfall frequency. A tree can have Good vigour but be hazardous due to Poor condition. A tree in Good vigour has the ability to sustain its life processes. Vigour is synonymous with health.

- **CONDITION –** Good (G), Fair (F) or Poor (P). The general form and structure of the trunk/s and branching. Trunk lean, trunk/branch structural defects, canopy skewness or other hazard features are considered.

- Tree Protection Zones (TPZ) and Structural Root Zones (SRZ) are as per Section 3 of AS4970-2009 and are defined in the rear of this report. It should be noted that the TPZs and SRZs indicated on the site drawings are notional areas only and do not reflect actual root locations.

- **SRZ RADIUS –** Structural Root Zone. The area around a tree required for tree stability. Earthworks should be prohibited within the SRZ. The area is calculated from the formula and graph at Figure 1 ofAS4970-2009. The SRZ graph has been adapted from the work of Claus Mattheck (1994). DBH + 10% has been used for the calculation of SRZ. Where DBH is measured at grade or at a height other than 1.4m above grade, 10% has not been added.

- **TPZ RADIUS –** Tree Protection Zone. Radial offset (m) of twelve times (12x) trunk DBH measured from centre of trunk (for trees less than 0.3 metre DBH minimum TPZ is 2.0 metres). To satisfactorily retain the tree, construction activity (both soil cut and fill) must be restricted within this offset. TPZ offsets are rounded to the nearest 0.1 metre. Existing constraints to root spread can vary. Generally, an area equivalent to the TPZ should be available to the tree post development. Encroachment occupying up to 10% of the TPZ area is acceptable without detailed rootzone assessment. Encroachments greater than 10% require specific arboricultural assessment.

- "Construction" for the purpose of this AIA means excavation (greater than 100mm), compacted fill or machine trenching. "Excavation" includes cut batters, boxing–out for the various pavement types, trenching for utilities and footings for retaining walls.

- Trees within proposed construction footprints are recommended for removal (Rm).

- Where construction is proposed within Structural Root Zone (SRZ) offsets, those trees have been similarly recommended for removal (Rm). Fully elevated, pier and beam type construction or hand dug services trenches (or horizontal boring) is recommended and an accepted form of construction methodology for this type of structure.

- Trees with greater than 25% of the Tree Protection Zone (TPZ) impacted by construction are generally recommended for removal (Rm). There are however different types of construction incursions proposed (e.g. fill, cut, services, pavement type, retaining walls) with varying tree impacts likely. Existing constraints to root development also vary the notional TPZ. Compacted fill can be equally as damaging to tree longevity: root development is restricted within heavily compacted soils.

- Trees to be retained with construction impacting less than 25% of the TPZ area will require specific construction. (refer to Recommendations).

- TPZ encroachments of >10% are defined (3.3.3 of AS4970) as 'major'. This does not mean that the tree will be fatally injured, but that 'the project arborist must demonstrate that the tree(s) would remain viable'.

- Where construction is proposed beyond the TPZ, those trees are rated as Retain (R) with no specific tree protection design or tree protection monitoring required.

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5 FINDINGS

5.1 SITE CONTROL MAPS

According to the NSW Planning Portal, the site is listed as R2 Low Density Residential. Please see Figure 1

Figure 1

The following relevant Government environmental and heritage mapping overlays have been reviewed (SEED – NSW Government 2020).

- The site is not listed within, nor does it form a heritage item.
- The site is not listed on the Canterbury Bankstown Council terrestrial biodiversity map.
- The site is not located on the NSW State Biodiversity Values map.
- The site does not contain any Threatened Ecological Communities or Critically Endangered Communities. Please see Figure 2.

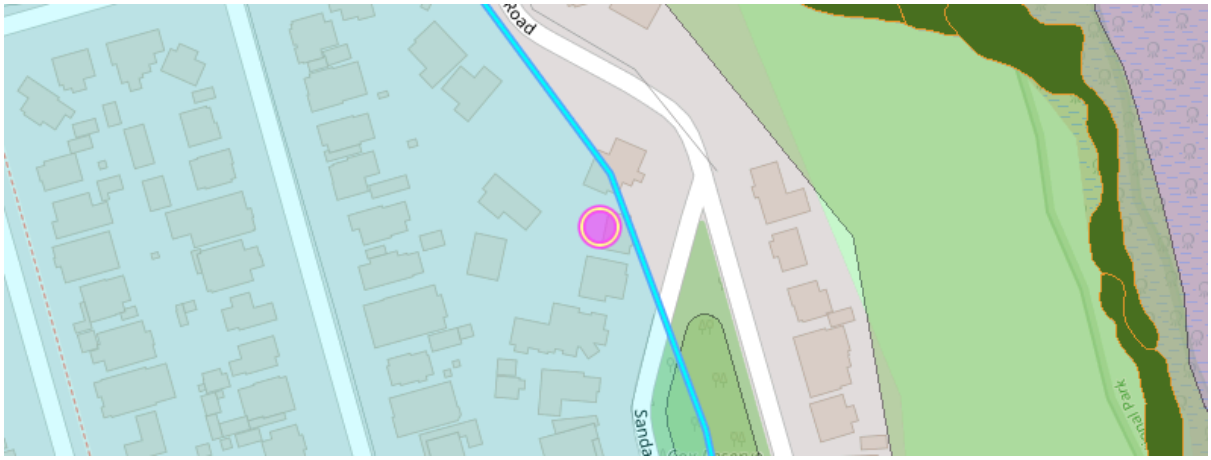


Figure 2

5.2 THE SITE

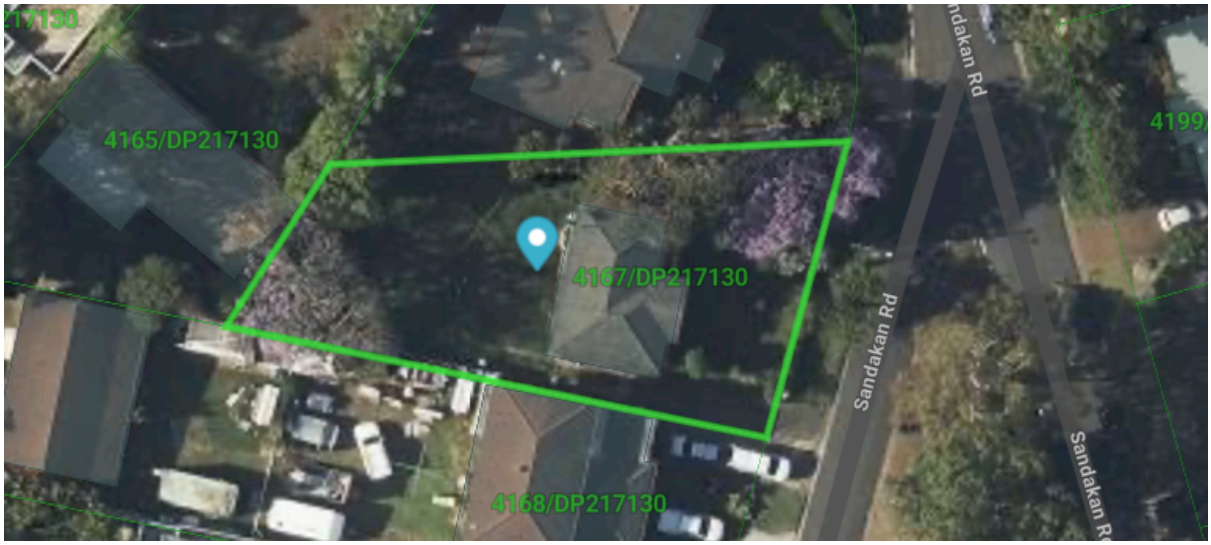


Figure 3

Site soils are likely to deviate from their natural state due to past urban development, however, site soils are classified as 9130bt (Blacktown) Residual soil characterised as:

Landscape – gently undulating rises on Wianamatta Group shales and Hawkesbury shale. Local relief to 30 m, slopes are usually <5%. Broad rounded crests and ridges with gently inclined slopes. Cleared eucalypt woodland and tall open-forest (wet sclerophyll forests).

Soils – shallow to moderately deep (<100 cm) Red and Brown Podzolic Soils (Dr3.21, Dr3.11, Db2.11) on crests, upper slopes and well-drained areas; deep (150–300 cm) Yellow Podzolic Soils and Soloths (Dy2.11, Dy3.11) on lower slopes and in areas of poor drainage.

Limitations – moderately reactive highly plastic subsoil, low soil fertility, poor soil drainage.

Vegetation for the site is classified as Almost completely cleared tall open-forest (wet sclerophyll forest) and open-woodland (dry sclerophyll forest). Remaining traces of the original wet sclerophyll forest containing Sydney blue gum *Eucalyptus saligna* and blackbutt *E. pilularis* are located at Ashfield Park. The original woodland and open-forest in drier areas to the west were dominated by forest red gum *E. tereticornis*, narrow-leaved ironbark *E. crebra* and grey box *E. moluccana*. This has been almost completely cleared. At Duffys Forest there is an open-forest dominated by ash *E. sieberi* with a dry sclerophyll shrub understorey.

5.3 SUMMARY OF PROPOSED DEVELOPMENT

The development proposes the demolition of one single storey brick dwelling and the installation of one double storey duplex.

5.4 SUMMARY OF SITE INSPECTION DATA

Generally, the sites vegetation was observed to have a mixture of exotic and endemic tree canopy. The existing surveyed trees are shown in Appendix 1.

Other vegetation on site does not meet the dimensions for Canterbury Bankstown Council to consider them as tree, a prescribed tree as described in Canterbury Bankstown DCP 2023 Chapter 2.3 Tree Management as:

- Having a height greater than 5 metres

5.5 CURRENT TREE POPULATION

A total of 3 trees were assessed in total. The following table summarises the surveyed tree species:

Table 5

Tree Species	Species Origin	Tree Numbers	Total
Jacaranda mimosifolia (Jacaranda)	Exotic	T1	**1**
Melaleuca bracteata (Black Tea-Tree)		T2	**1**
Dead tree	Exotic	T3	**1**

T2 and T3 are located in adjoin properties to the rear.

5.6 U.L.E

Useful Life Expectancy (Barrell, 2009). The length of time from the date of inspection that the Arborist estimates the tree will live and provide a useful positive contribution to the landscape amenity of the site. ULE ratings are Long (retainable for 40 years or more), Medium (retainable for 16-39 years), Short (retainable for 5-15 years) and Removal (tree requiring immediate removal due to imminent risk or absolute unsuitability).

Table 6

U.L.E	Number of Trees	Tree Numbers
40 Plus	0	
15-40yrs	2	T1, T2
5-15yrs	0	
1-5yrs	0	
Remove Hazardous	0	
Dead	1	T3
Total		**3**

5.7 LANDSCAPE SIGNIFICANCE

Landscape significance was deemed using IACA Significance of a Tree, Assessment Rating System (STARS). Results are published in the table below.

Table 7

Landscape Significance	Number of Trees	Tree Numbers
High	1	T1
Medium	1	T2
Low	1	T3
Exempt	0	
Environmental Weed	0	
Total		**3**

IACA 2010, *IACA Significance of a Tree, Assessment Rating System (STARS)*, Institute of Australian Consulting Arborculturists, Australia, www.iaca.org.au Appendix 2.

5.8 RETENTION VALUES

Retention values were recorded using IACA Significance of a Tree, Assessment Rating System (STARS).

Table 8

Retention Value	Number of Trees	Tree Numbers
Very High	0	
High	1	T1
Medium	1	T2
Low	0	
Priority for Removal	1	T3
Exempt	0	
Total		**3**

IACA 2010, *IACA Significance of a Tree, Assessment Rating System (STARS)*, Institute of Australian Consulting Arborculturists, Australia, www.iaca.org.au Appendix 2.

5.8.1 RETENTION VALUE DESCRIPTIONS

Table 9

Very High – Priority for Retention	These are trees that the assessor deems that the council will not approve for removal based on their significance. These trees tend to belong to Critically Endangered Economic Communities/Threatened Ecological Communities, are located within Heritage Conservation Areas, are important, endemic species that provide significant habitat.
High – Priority for Retention	These trees are considered important for retention and should be retained and protected. Design modification or re-location of buildings should be considered to accommodate the setbacks as prescribed by AS4970-2009 Protection of Trees on Development Sites. Tree-sensitive design maybe implemented in order to encroach within the Tree Protection Zone.
Medium – Consider for Retention	These trees maybe retained and protected but are considered less critical; however, their retention should remain a priority with removal considered only if adversely affecting the proposed building/works and all other alternatives have been considered/exhausted.
Low – Consider for Removal	These trees are not important for retention, nor require special works or design modification to be implemented for their retention.
Priority for Removal	These trees are considered hazardous, or in irreversible decline and should be removed irrespective of the development.
Exempt	Exempt trees vary from council to council, some exempt species in certain councils are not necessarily environmentally declared weeds. Other exemptions may apply in certain councils such as the trees proximity to existing buildings.

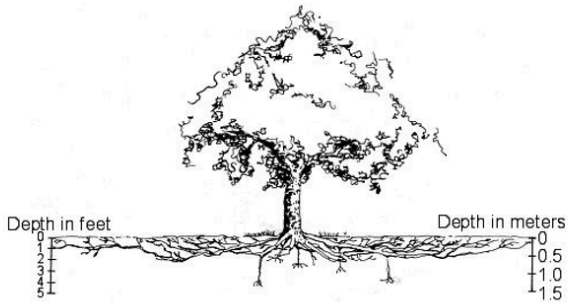
6 TYPICAL DAMAGE TO TREES ON DEVELOPMENT SITES

Root damage is the most common cause of damage to trees on construction sites. Roots are far more extensive and closer to the surface that commonly thought.

Common root damage causes include:

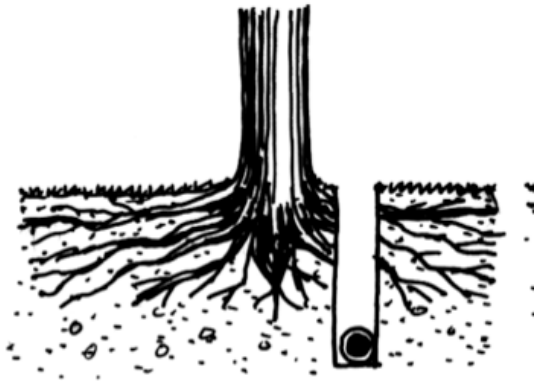
- removal during grading, excavation and trenching for foundations, services etc;

Typically, tree roots only inhabit the first 600mm of soil, so even shallow excavation will incur significant root loss to trees. Most tree roots are found near the soil surface. Soils near the surface have high nutrient and microorganism concentrations, good aeration, and warm temperatures, so are ideally suited to root growth.



Drawing of a typical tree root system. Typically, tree roots extend beyond the dripline whilst the majority of the roots inhabit the top 600mm of soil.

Figure 4



Drawing depicting the extent of root damage that can be caused by trenching next to trees.

Figure 5

In addition to this, tree roots are also significantly compromised by activities that reduce or prevent the flow of oxygen through the soil such as soil compaction of the existing soil or raising the soil levels to much in the incorrect manner.

- The decreased levels of oxygen in filled over root systems can also lead to decay of structural roots, which may compromise tree stability. Where the affected tree has grown roots up in the fill profile (a common response to deoxygenation of the natural profile) the tree may appear healthy with the canopy sustained by the active feeder roots, but may ultimately be a hazard in its location due to decay of critical structural roots.
- Both oxygen and water are held in pores between the soil particles. When the soil pores are large (i.e. in coarse sandy soils) the soil is generally aerated and free draining and roots are often found deeper in the profile. In heavy soils (clays / compacted soils) drainage is not as effective and oxygen is limited. Roots are often very shallow in these situations.
- Placing soil or other materials over root systems at depths greater than 100mm will impede air movement into and out of the soil and will invariably restrict air flow around roots.
- Compaction makes pore sizes smaller and not only reduces space for oxygen to move through the soil but effectively reduces the capacity for roots to grow through the soil.

- Roots respire and convert stored carbohydrate to sugars for energy. Waterlogged or compacted soils hold low levels of oxygen and prevent roots from respiring. This means a tree can't access its stored energy when it needs to.
- Poor soil aeration can stunt tree growth and in worst case scenarios cause a tree to die a slow - or in severe cases, rapid - death. When roots aren't functioning properly, they can't meet the ongoing nutrient and water requirements of the above ground portion of the tree. Growth slows, and if the situation does not improve (e.g. through intervention including gentle removal of fill, growth of new roots beyond the zone of fill or growth of new roots within the fill profile), shoots or branches may die back in response to the shortage of resources. Where roots are severely compromised, the tree is likely to continue into a spiral of decline, culminating in premature death.

6.1 TPZ ENCROACHMENT

There are two types of zones (as defined by AS 4970-2009) that need to be considered when undertaking an arboricultural impact assessment:

- **Tree protection zone (TPZ):** The TPZ is the optimal combination of crown and root area (as defined by AS 4970-2009) that requires protection during the construction process so that the tree can remain viable. The TPZ is calculated by measuring the diameter at breast height (DBH) and multiplying it by twelve (12). The resulting value is applied as a radial measurement from the centre of the trunk to delineate the TPZ.
- **Structural root zone (SRZ):** The SRZ is the area of the root system used for stability, mechanical support, and anchorage of the tree.

Encroachment within the TPZ is acceptable, providing that the arborist can demonstrate that the tree will remain viable. There are three (3) levels of encroachment (as defined by AS 4970-2009):

- No encroachment (0%): No encroachment within the TPZ.
- Minor encroachment (<10%): The encroachment is less than 10% of the TPZ.
- Major encroachment (>10%): The encroachment is greater than 10% of the TPZ.

6.1.1 STRUCTURAL ROOT ZONE

Severing roots within the SRZ can result in the tree becoming unstable and may result in whole tree failure. Any construction within the SRZ will be required to of fully elevated, pier and beam construction. Any services will have to be installed using tree sensitive methods such as under boring or non-destructive excavation.

6.1.2 MINOR ENCROACHMENT (<10%)

When the extent of TPZ encroachment is deemed minor as per AS4970 Protection of Trees on Development Sites i.e., less than 10%, excavation may be undertaken using traditional methods provided that the area lost is compensated for elsewhere and contiguous to the TPZ. Excavation for Benching and Shoring must be considered.

6.1.3 MAJOR ENCROACHMENT (>10%)

Encroachments of more than 10% are deemed unacceptable as per AS4970 Protection of Trees on Development Sites. However, larger incursions can be achieved via way of non-destructive root investigation. Location and distribution of the roots to be determined through non-destructive investigation methods

(pneumatic, hydraulic, hand digging or ground penetrating radar). Photographs should be taken, and a root zone map prepared. Regardless of the method, roots must not be cut, bruised or frayed during the process. It is imperative that exposed roots are kept moist and the excavation back filled as soon as possible.

When determining the potential impacts of encroachment into the TPZ, the project arborist must consider the following:

- The potential loss of root mass resulting from the encroachment: number and size of roots.
- Tree species and tolerance to root disturbance.
- Age, vigour and size of the tree.
- Lean and stability of the tree. Roots on the tension side are likely to be most important for supporting the tree and are likely to extend for a greater distance.
- Soil characteristics and volume, topography and drainage.
- The presence of existing or past structures or obstacles affecting root growth.

If non-destructive root investigation shows few large roots to be severed designs can be approved however, it is encouraged that tree sensitive design is employed whilst building within the TPZ. These include limiting excavation with pier and beam, cantilevered or pad footings as opposed to raft or slab footings. Pier locations should be determined early on in the design phase, a project arborist should check the pier locations for roots and should any large roots be located, the pier locations should be moved.

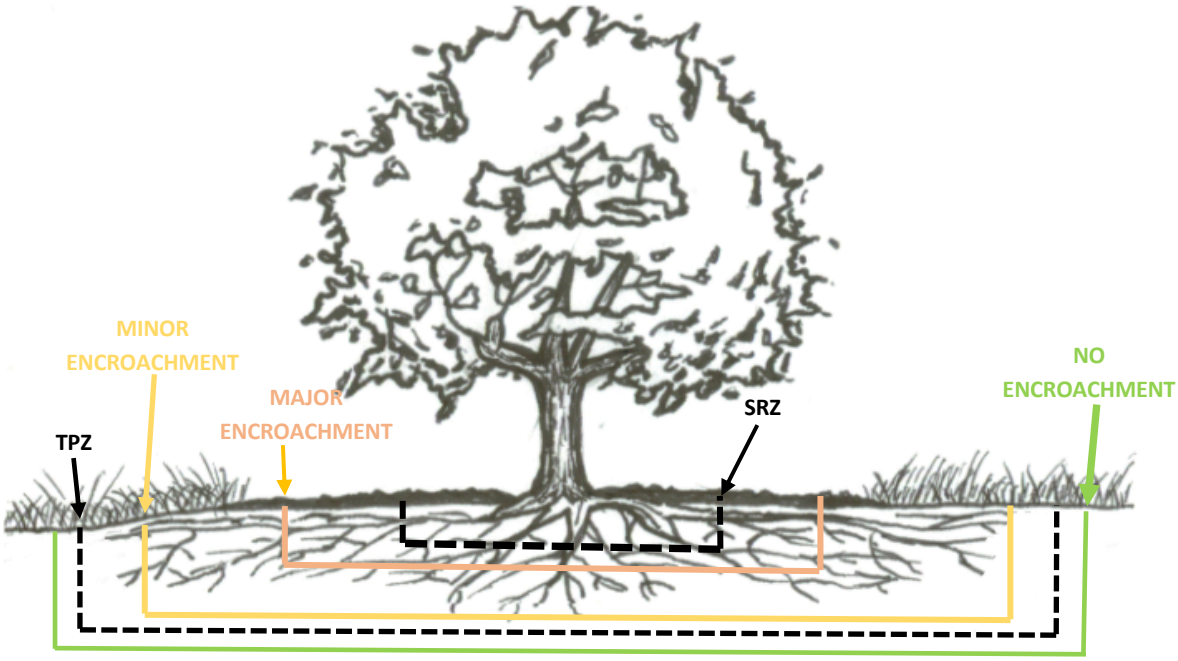


Figure 7

Figure 7 displays indicative zones of encroachment to the TPZ.

6.2 MITIGATING THE IMPACTS

Encroachment within the TPZ should be compensated with a range of mitigation measures to ensure that impacts to the subject tree(s) are reduced or restricted wherever possible. Mitigation should be increased relative to the level of encroachment within the TPZ to ensure the subject tree(s) remain viable. The table below outlines requirements under AS 4970-2009, and mitigation measures required within each category of encroachment. These mitigation measures will only apply if trees are proposed to be retained.

Table 10

Encroachment	Mitigation Measures
No encroachment (0%)	• Tree Protection will be required for trees on site for logistic purposes. Trees that may not suffer encroachments from developments maybe affected by access routes or lay down areas.
Minor encroachment (<10%)	• The area lost to this encroachment should be compensated for elsewhere, contiguous with the TPZ. • Detailed root investigations should not be required. • Tree protection must be installed.
Major encroachment (>10%)	• The project arborist must demonstrate the tree(s) would remain viable. • Root investigation by non-destructive methods may be required for any trees proposed for retention. • Consideration of relevant factors, including root location and distribution, tree species, condition, site constraints, and design factors. • The area lost to this encroachment should be compensated for elsewhere, contiguous with the TPZ. • The project arborist will be required to supervise any works within the TPZ. • Tree protection must be installed.

7 PROPOSED DEVELOPMENT IMPACT

Tree Protection Zones (TPZ's) and Structural Root Zones (SRZ's) are defined as per Section 3 of Australian Standard AS4970-2009 Protection of Trees on Development Sites. It should be noted that TPZ's and SRZ's are notional areas only and do not reflect actual root locations. All TPZ's and SRZ's are marked on plans located at the rear of this document. At this time no exploratory root investigation has been undertaken, it may be recommended based on the findings within this report.

7.1 TREES UNNAFFECTED BY PROPOSED DEVELOPMENT

Table 11

Tree ID	Tree Species	TPZ Radius (M)	Retention Value (STARS)	Observations and Defects	Notes	Development Notes	Generic Tree Protection Measures
T3	Dead tree	1.7	Priority for Removal	Standing Dead Tree			Site Fence Sufficient

7.2 TREES TO BE REMOVED

Table 12

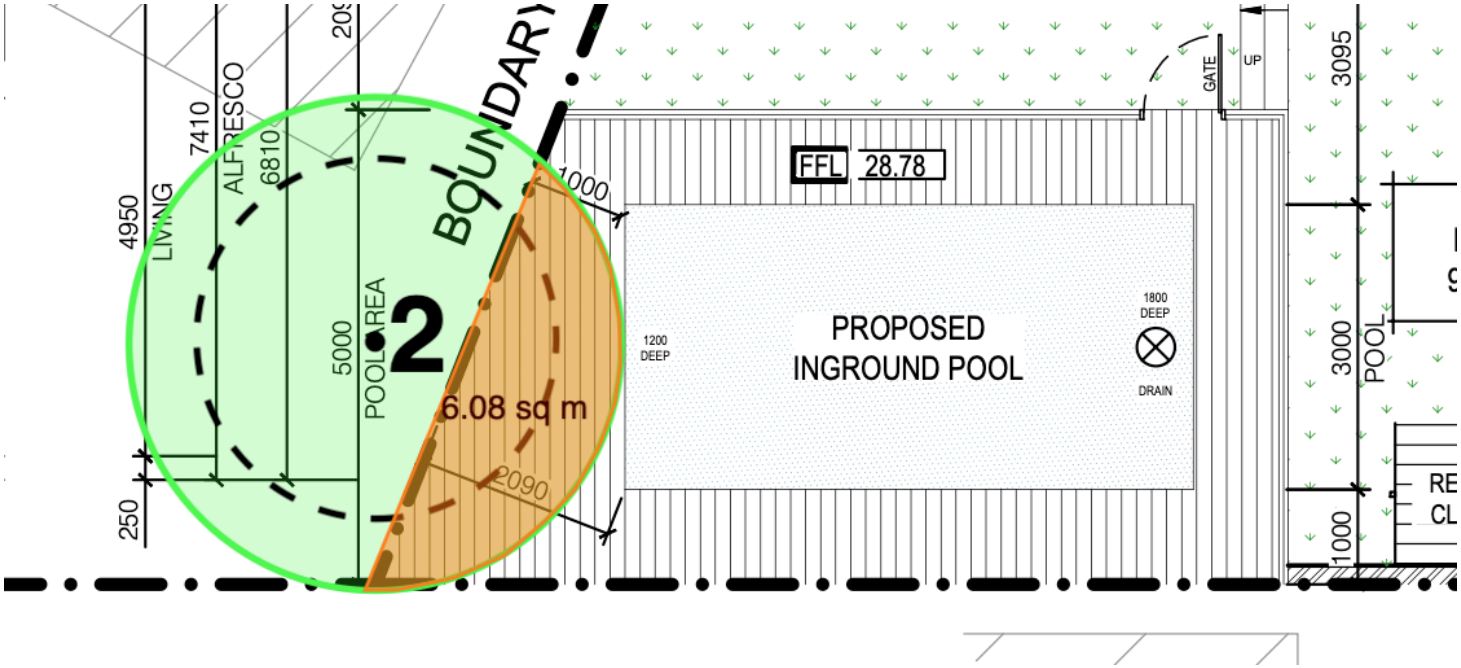
Tree ID	Tree Species	Health	E.L.E	Retention Value (STARS)	Observations and Defects	Notes	Encroachment Type
T1	Jacaranda mimosifolia (Jacaranda)	Good	15-40yrs	High	Co-Dominant Stems , Deadwood Amount (Minimal) , Deadwood Minor (0-30mm) , Wound Occlusion (Moderate) , Wounds (moderate)		Bulk excavtion for desired levels

7.3 TREES WITH MAJOR ENCROACHMENTS

Table 13

Tree ID	Tree Species	TPZ Radius (M)	Retention Value (STARS)	Observations and Defects	Notes	TPZ Encroachment %	Encroachment Type	Development Notes	Retain/ Remove	Generic Tree Protection Measures	Specific Tree Protection Measures
T2	Melaleuca bracteata (Black Tea-Tree)	2.6	Medium	Previous Failures (isolated)		27.77%	landscaping around the pool	Tree may be retained utilising tree sensitive techniques	Retain	Site Fence Sufficient	The surface around the pool must be constructed at grade with no excavation. Please see Section 8.1 of this report

7.4 INCURSION DIAGRAM



8 DISCUSSION

8.1 HARDSTAND SURFACES

Table 14

Applicable Trees	T2

A hardstand surface may be constructed at ground level without any excavation, by first killing with herbicide the plants to be removed from the pathway area, and then removing that plant material by cutting the trunks of woody shrubs to ground level and by raking all other plant material to expose the top soil surface without organic matter. This will remove the need for physically disturbing the soil and the roots of the tree.

If a hardstand surface is to be constructed near a protected tree, careful excavation is to be undertaken manually by using non-motorized hand tools to determine the location of first order and lower order structural roots with a diameter of 20mm or greater, without damaging them. Where a driveway or footpath is to pass by the tree a suspended slab is to be constructed or approved similar, to protect the roots that may be encountered at, near, or above ground, and may be constructed on structural soil. Where such a driveway or footpath is to be constructed the edge of the structure closest to the tree is to terminate no closer than 0.5m from the outside edge of the trunk, or further depending on the species and its likely further growth to allow for future development and expansion of the trunk, buttresses, and first order and lower order roots as may be advised by a Consultant Arboriculturist.

The image below details how to construct such surfaces within the TPZ's of trees to be retained.

Open-graded asphalt surface

Asphalt pathways move and flex with tree roots, and are less prone to cracking than concrete pathways. Cracks that do occur can be easily repaired.

- Sub grade is to be hand firmed only (no machine compaction)
- Aggregate base of typically 75mm
- May include geofabric layer to separate aggregate from soil layer
- Optional edging for asphalt pathway - timber, masonry, concrete
- Build up edges to form batters on far side of path from tree. Ideally, these batters should be no greater than 200mm deep in TPZs, and consist of a porous material
- Mulch laid on near side to tree - battering down to natural grade at the trunk.

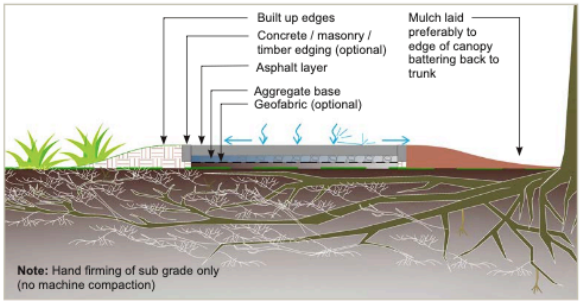
See *Figure 6: Typical elevation - open-graded asphalt surface* for further guidance.

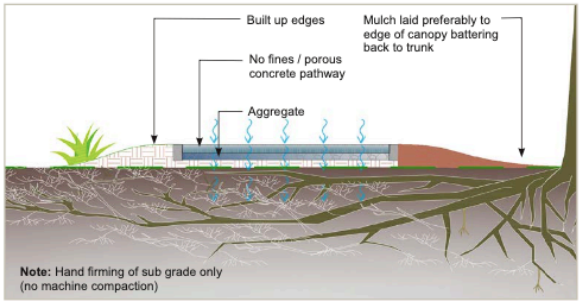
Porous or permeable - concrete surface (no fines)

No fines concrete is made without fine aggregate (including sand) in the mix, producing a surface with high permeability and drainage capacity.

- Sub grade is to be hand firmed only, with no machine compaction
- Aggregate base of typically 75mm
- May include geofabric layer to separate aggregate from soil layer
- Build up edges to form batters on far side of path from tree. Ideally, these batters should be no greater than 200mm deep in TPZs, and not compacted
- Mulch laid on near side to tree - battering down to natural grade at the trunk.

See *Figure 7: Typical elevation - porous or permeable concrete surface (no fines)* for further guidance.





9 CONCLUSIONS AND RECOMMENDATIONS

The following trees suffer development impacts that are not able to be mitigated and will require to be removed and replaced.

Table 15

Tree ID	Tree Species	Retention Value (STARS)
T1	Jacaranda mimosifolia (Jacaranda)	High

The following trees may be retained and subject to the following tree protection measures;

Table 16

Tree ID	Tree Species	TPZ Radius (M)	SRZ Radius (M)	Retention Value (STARS)	Generic Tree Protection Measures	Specific Tree Protection Measures
T2	Melaleuca bracteata (Black Tea-Tree)	2.6	1.9	Medium	Site Fence Sufficient	The surface around the pool must be constructed at grade with no excavation. Please see Section 8.1 of this report
T3	Dead tree	1.7	1.6	Priority for Removal	Site Fence Sufficient	

It is important to stress as this stage that the tree protection requirements and project consulting arborist instructions are to be strictly adhered to at all times, due to the fine tolerances and potential catastrophic impacts if not adhered to by the project consulting arborists instructions.

Failure to comply will result in not obtaining final sign off/practical completion, and upon a discovery of failure to comply, it is recommended the certifier be immediately notified.

It is therefore the responsibility of the builder/foreman to ensure no breaches into the TPZ exclusion zones occur by anyone on site / any contractor / sub-contractor.

9.1 REPLANTING

Suitable tree species for the site consist of;

- *Waterhousia floribunda* (Weeping lilly pilly)
- *Backhousia floribunda* (Lemon myrtle)
- *Syzigium australe* (Brush cherry)
- *Syzigium luehmannii*

Table 17

Tree #	Family	Genus & Species	Common Name	Height by Spread	Soil Tolerance	Climate	Considerations
1	MYRTACEAE	*Backhousea citriodora*	Lemon scented myrtle	5-18m by 8m	Sandy loam	Warm – sub-tropical	The Lemon Scented Myrtle is grown for its fragrant foliage and its flowers. It is planted in parks and gardens as a lawn specimen for shade or used along borders for screening. It can be pruned to form a hedge or maintained at shrub.
2	MYRTACEAE	*Syzigium australe*	Brush Cherry	5-18m by 4m	Sandy to clay loam	Warm – sub-tropical	The Brush Cherry is grown for its flowers, colourful fruits and shrubby habit. It is planted along garden borders for screening and may be trim to form a hedge. It is also trained to form a small shade tree or a topirary specimen
3	MYRTACEAE	*Waterhousea floribunda*	Weeping lilly pilly	8-30m by 5m	Sandy to light clay	Warm – sub-tropical	The Weeping Lilly Pilly is grown for its flowers and habit. It is used in parks or medium size gardens as a lawn specimen as a shade tree and for screening when young. It is suitable for coastal or mountain positions establishing in 2 to 4 years.
4	MYRTACEAE	*Syzigium lurhmanii*	Small leaf lilly pilly	15-30m by 9m	Sandy to Clay Loan	Warm – sub-tropical	The Small Leafed Lillypilly is grown for its foliage and is planted in gardens or parks as a specimen for shade and is used in border planting for screening. It is also planted in rainforest settings establishing in 2 to 4 years and is long lived

10 TREE PROTECTION MEASURES

10.1 FENCING

It will not be practical or possible to erect a TPZ fence encompassing the entire TPZ as access will be required to perform the works, however, an exclusion zone should be erected around the tree to limit activities that take place within the TPZ. *AS4970-2009 Protection of Trees on Development sites* states that the following activities are prohibited within the TPZs;

- Storage.
- Preparation of chemicals, including preparation of cement products.
- Refueling.
- Dumping of waste.
- Washing down and cleaning of equipment.

AS 4687 specifies applicable fencing requirements, 1.8M Mesh fence. Shade cloth or similar should be attached to reduce the transport of dust, other particulate matter and liquids into the protected area.

Fencing must

- be 1.8m high fully supported chainmesh protective fencing. The fencing shall be secure and fastened to prevent movement. The fencing shall have a lockable opening for access. Roots greater than 40mm in diameter shall not be pruned, damaged or destroyed during the installation or maintenance of the fencing. The fencing shall not be moved, altered or removed without the approval of the Project Arborist;
- have a minimum of two signs that include the words “Tree Protection Zone – Keep Out”. Each sign shall be a minimum size of 600mm x 500mm and the name and contact details of the Project Arborist. Signs shall be attached facing outwards in prominent positions at 10 metre intervals or closer where the fence changes direction. The signs shall be visible within the site;
- be kept free of weeds and, except where the existing surface is grass, grass. Weeds shall be removed by hand; and
- unless the existing surface is grass, have mulch installed and maintained to a depth of 75mm.

Fencing should be installed before any machinery or materials are brought onto the site and before the commencement of works including demolition. Once erected, protective fencing must not be removed or altered without approval by the project arborist. Fencing must be clearly signed and adhere to the standard as outlined in *AS4970-2009 Protection of Trees on Development Sites*.

10.2 TREE SENSITIVE METHODOLOGY

10.2.1 PRUNING RETAINED TREES

Trees that require pruning in order to facilitate the new build should be directed by an AQF Level 5 project arborist and undertaken by a minimum AQF Level 3 arborist adhering to *AS4373-2007* and NSW Workcover Code of Practice *Amenity Tree Industry 1998* and Safe Work *Guide to Managing Risks of Tree Trimming and Removal Work 2016*.

10.2.2 EXCAVATION WITHIN THE TPZ

When the extent of TPZ incursion is deemed minor as per AS4970 Protection of Trees on Development Sites i.e., less than 10%, excavation may be undertaken using traditional methods. Excavation for Benching and Shoring must be considered.

When the encroachment is deemed to be major i.e., greater than 10% of the TPZ of trees to be retained; exploratory root investigation using non-destructive root sensitive techniques should be undertaken at the perimeter of the required penetration point nearest the tree, bearing in mind compensation for benching and battering.

Techniques include:

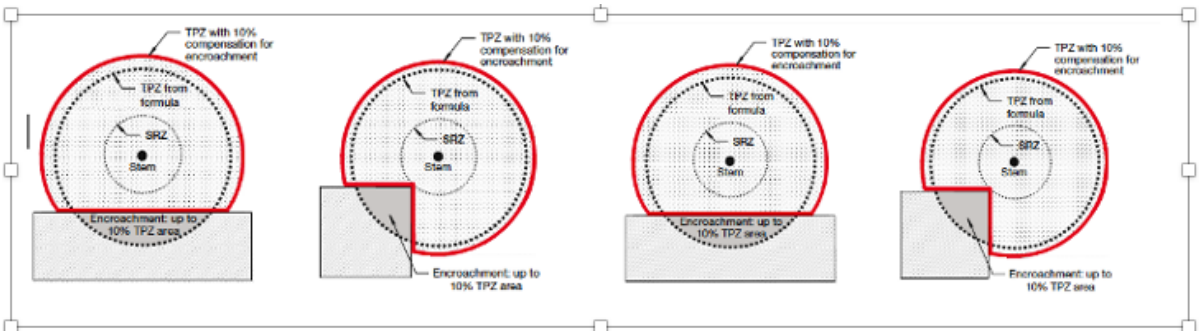
- Hand excavation
- Vacuum excavation
- High pressure water jet excavation
- Air Spade

The exploratory root investigation should be undertaken at the outer limits of the of the penetration point to a maximum of 700mm or when compacted sub-soil or rock bed is encountered. Roots greater than 50mm in diameter should be retained and advice from a project arborist sought.

Any roots less than 50mm in diameter that will require pruning should be undertaken by a suitably qualified arborist using sharp tools to ensure clean cuts. “When intentionally cutting roots, it is important to make clean cuts, perpendicular to the line of the root. Clean cuts offer a smaller surface for drying and compartmentalize better. Roots that are torn by large grading equipment can develop cracks that run laterally along the root, increasing the extent of damage. When grading near trees, always prune the roots in advance.” (Urban 2008)

10.2.3 TPZ COMPENSATION

TPZ area lost to incursions should be compensated for elsewhere on the site and contiguous to the TPZ.



10.2.4 INSTALLATION OF SERVICES WITHIN TPZ

All underground services should be placed outside the TPZs of the retained trees. When routing services outside the TPZ becomes unavoidable, trenching must be undertaken using tree sensitive excavation.

Techniques include:

- Hand excavation

- Vacuum excavation
- High pressure water jet excavation
- Air Spade
- Horizontal Directional Drilling (Entry and exit pits must be located outside of the TPZ)

All excavation should be undertaken or supervised by an AQF Level 5 Arborist.

10.2.5 PIER PLACEMENT WITHIN TPZ

When placing piers in the TPZ, the first 800mm should be undertaken by hand digging only. Care should be taken not to damage roots 50mm and over. Pier holes should be flexible in design and be placed in such a manner that significant roots are bridged rather than severed.

10.2.6 DEMOLITION OF HARDSTAND AREAS WITHIN TPZ

Demolition of hardstand areas within the TPZ's of trees may be undertaken using machinery but must be done so with care. Demolition should commence at the outer most point of the hard stand area nearest the tree working backwards away from the tree, with the machinery remaining on hard stand surfaces.

Where hard stand surfaces aren't available for machinery ground protection will be required. This should be done under the supervision of a project arborist. Once the hardstand surface has been demolished, ground protection as per AS4970 should be installed to limit the incidence of compaction and soil contamination.

10.2.7 LANDSCAPING WITHIN THE TPZ

Any landscaping works that require excavation within the TPZ should be done so using the methods outlined in 7.1.4.

Any pier holes for retaining walls should be done so by hand prior to piling.

Any excavation within the SRZ of trees should be done so under the direct supervision of a project arborist.

10.2.8 FILL WITHIN THE TPZ

Fill placed in the TPZ of trees to be retained shall be well-drained material equivalent or finer in texture than the existing site topsoil material and should comply with AS4419:2003 (Soils for Landscaping and Garden Use).

In order for the root conditions to remain favourable all vegetation should be removed, including sod and underbrush beneath the branch spread of the tree. Organic matter, as it decomposes beneath a soil fill, can create noxious gases detrimental to the tree roots. The top 75 to 150 mm of the soil surface should be cultivated or broken up carefully using non-motorized hand tools only, so as to disturb the least possible number of roots. This treatment allows better contact with the fill soil and prevents a sharp line of demarcation between the existing soil surface and the fill and where internal soil drainage is good. The fill should consist of large aggregate or sandy soil so that aeriation and drainage is achieved and then the organic layer on top.

10.2.9 PLANTING PROCEDURE

This planting procedure applies to the planting and maintenance of 25-litre plant stock only and should be appropriately modified if planting larger stock.

Dimensions of planting holes are as specified in the Planting Detail (Figure 1.4). Planting holes are to be at least 600mm in diameter and no less than 500mm deep wherever possible.

(a) Excavate a hole as indicated in the Planting Detail. Break up the base and sides of the hole a further 100mm with, for example, a pick, mattock or crowbar;

Note: Excavation is measured in other than rock. It is not intended that rock be excavated to plant *trees*. If rock is encountered, an alternative planting site should be sought;

(b) Remove plant from container, slightly tease the root ball and then place plant into hole. Top of root ball should be planted level with surrounding soil;

(c) Backfill the hole, lightly firming down in 150mm layers. Soil mix shall be:

i) 80% site soil, and
ii) 20% humus (eg, organic matter, potting mix, garden soil mix);

(d) Soil mix shall have a pH range of 5.5 to 6.5 and shall be free of noxious weeds and toxic materials detrimental to plant growth;

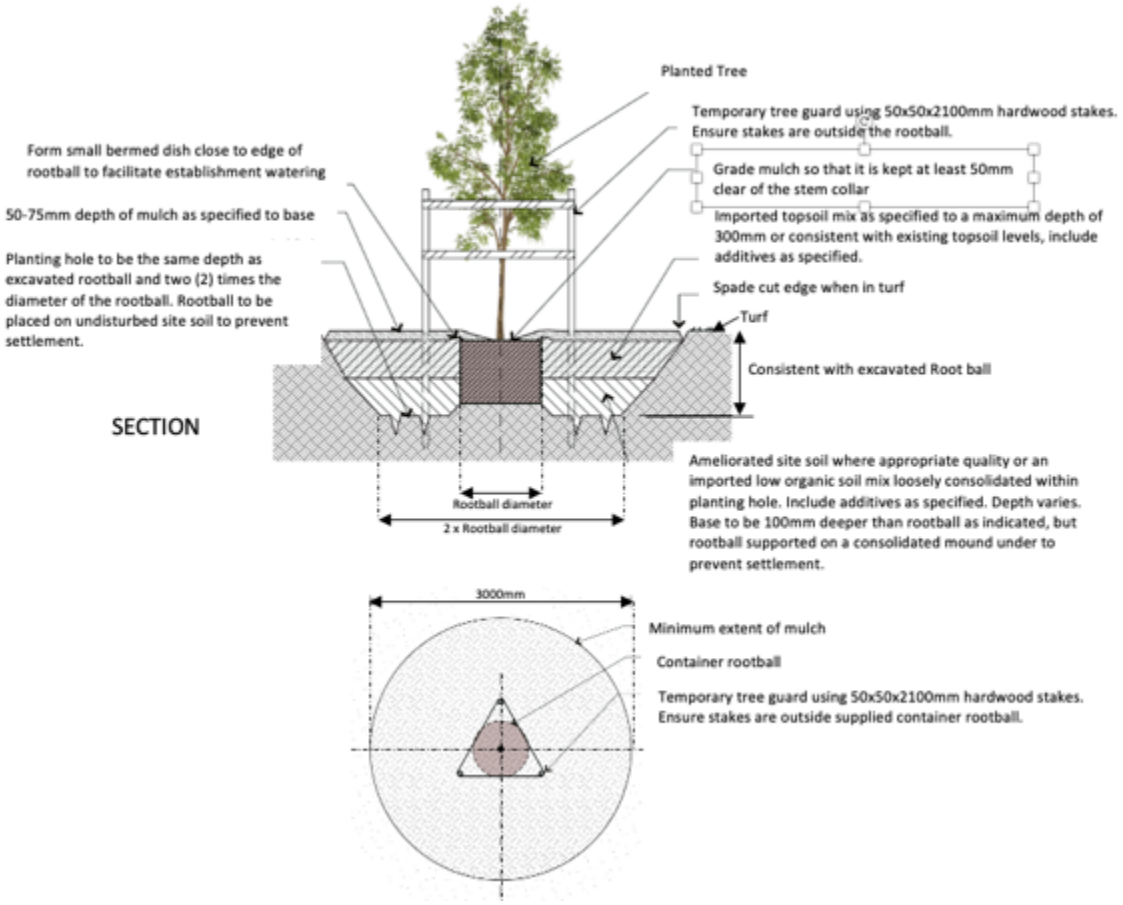
(e) Wetting agent and slow release fertiliser are to be incorporated into the planting operation at the manufacturer's recommended rate;

(f) Mound mulch on top of the soil surrounding the *tree* to a diameter of 500mm all around the *tree trunk* and to a depth of 75mm. Do not heap mulch around the *trunk* and ensure that it is 'dished' around the base of the *tree*;

(g) All *trees* shall be formatively *pruned* at the time of planting to ensure that all sucker growth is removed and that *trees* have one central leader only. *Trees* should be underpruned to the extent that the canopy constitutes one third only of the *tree's* total *height;*

(h) Stake the *trees* as shown on the attached Planting Detail using 2 x 50mm x 50mm x 1500mm hardwood stakes. *Trees* are to be supported with two lengths of 50mm wide nylon or hessian tie stapled to stakes;

(i) Water in well after planting using at least 10 litres of water for each *tree*.



10.2.10MAINTENANCE PROCEDURE

(a) All *trees* are to be watered thoroughly and each *tree* shall receive an amount of water that will ensure healthy, vigorous growth – at least ten (10) litres of water per *tree* per watering episode;

(b) Maintenance and watering of all planted *trees* are to continue for a period of at least six (6) months from the completion of planting of all designated *trees*; and

(c) The contractor/property owner shall ensure that they undertake the weeding, adjustment and/or replacement of stakes and ties, minor pruning work and re- instatement of mulch as required during the establishment period – which shall be a minimum of six (6) months.

10.2.11 SPECIFICATIONS FOR WATERING:

Recommendations for watering as per Ross Clarke at Trees Impact (Watering newly-planted trees, 2017)

- All recommendations assume that the trees conform with the 'Balance' criterion found in the NATSPEC specification for trees or the normative Balance section found in AS 2303 3,1. Without some logical relationship between the above-ground parts of the tree and root ball volumes, recommendations for watering will be meaningless.
- All recommendations assume that the water is applied slowly, directly, and effectively to the root ball
- Less water may be required for drought tolerant species, more for species with high water demands. Similarly, rainfall, drainage etc may result in lesser or higher water demands.

Due to Sydney's high summer temperatures as well as the well-drained clay loam soils of the site, Autumn is the recommended time to plant in order to achieve a reduced watering and maintenance cost.

10.3 HOLD POINTS, INSPECTION AND CERTIFICATION

To ensure all plans are implemented hold points have been specified in a schedule of works (below). Once each stage is reached the work will be inspected and certified by the project arborist and the next stage may commence.

10.3.1 SCHEDULE OF WORKS AND RESPONSIBILITIES

Table 5

Hold Point	Task	Responsibility	Certification	Timing of Inspection
1	Supervise Installation of Landscape works within TP of T2	Principle Contractor	Project Arborist	Prior to CC being granted
2	Final inspection of Trees by Project Arborist	Principle Contractor	Project Arborist	Prior to issue of occupancy certificate.

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12 GLOSSARY OF TERMS

Borers: larvae beetles, moths or wasps that cause damage within the phloem/cambium, sapwood and heartwood of the tree. Borers generally attack weakened trees or stressed trees.

Cambium: The layer of cells between the exterior bark and the inner wood which control cell division, hence stem, branch and shoot expansion.

Cavity: A void, initiated by a wound within the trunk, branches or roots. These voids are referred to as hollows.

Co-dominant: Stems or branches equal in size and relative importance.

Crown: The width of the foliage in the upper canopy of the assessed tree to the four cardinal points.

Crown lifting: The removal of the lower branches of the tree.

Crown thinning: The portion of the tree consisting of branches and leaves and any part of the stem from which branches arise.

Drip line: Where the canopy releases water shed from the foliage during precipitation.

DBH/Diameter: Diameter of trunk at 14meters in height of assessed tree.

Dead wooding: The removal dead branches from a tree.

Dieback: Tree deterioration where the branches and leaves die.

Flush cut: A cut that damages or removes the branch collar or removes the branch and stem tissue and is inconsistent with the branch attachment as indicated by the bark branch ridge.

Genus/ Species: Identified using its scientific name. Where the species name is not known, species is used. The common name for trees may vary considerably in each area of geographical differences and so will not be used in the field survey.

Height: Height has been estimated to + / - 2 meters.

Maturity: Tree age, Assessed as over mature (last 1/3 of life expectancy), mature (1/3 to 2/3 life expectancy) and semi mature (less than 1/3 life expectancy).

Remedial (restorative) pruning: includes: Removing damaged, deadwood; trimming diseased or infested branches. Trimming branches 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.

SRZ- Structural Root Zone: An area within the trees root zone in which roots stabilize the tree. Roots cut in this zone can cause instability and lead to anchorage loss.

Structural Integrity: Describes the internal supporting timber. (Substantial to frail)

Target: risk targets are people, property or activities that could injure, damage or disrupted.

Tree Numbering: All trees listed in the tree survey have been numbered and plotted.

TULE- Tree Useful Life

Expectancy: An estimation of the trees useful life expectancy using appropriate industry methods with an inspection regime.

Vigour: This is an indication of the tree health. Trees have either been assessed as Good Vigour, Normal Vigour or Low Vigour.

13 APPENDIX 1: TREE SCHEDULE

13.1 SCHEDULE 1: ATTRIBUTES

Table 18

Tree ID	Tree Species	Height (M)	Spread (M) N, E, S, W	DBH (cm)	DRB (M)	TPZ Radius (M)	SRZ Radius (M)	Age Class	Structure	Health	E.L.E	Landscape Significance (STARS)	Retention Value (STARS)	Observations and Defects	Notes	Root Limiting Factors	Current Growing Condition	Species Origin
T1	Jacaranda mimosifolia (Jacaranda)	13	5,6,5,4	45	0.47	5.4	2.4	Mature	Good	Good	15-40yrs	High	High	Co-Dominant Stems , Deadwood Amount (Minimal) , Deadwood Minor (0-30mm) , Wound Occlusion (Moderate) , Wounds (moderate)		Retaining Wall (>1m)	Open Soil	Exotic
T2	Melaleuca bracteata (Black Tea-Tree)	6	2,2,3,2	22	0.28	2.6	1.9	Mature	Good	Good	15-40yrs	Medium	Medium	Previous Failures (isolated)			Open Soil	
T3	Dead tree	10	1,1,1,1	14	0.18	1.7	1.6	Dead	Poor	Dead	Dead	Low	Priority for Removal	Standing Dead Tree				Exotic

13.2 SCHEDULE 2: DEVELOPMENT IMPACT

Table 19

Tree ID	Tree Species	TPZ Radius (M)	TPZ Area (M2)	SRZ Radius (M)	SRZ Area (M2)	In Development Footprint	In SRZ	TPZ Encroachment (M2)	TPZ Encroachment %	In Footprint/ Major/ Minor/ Nil	Encroachment Type	Development Notes	Retain/ Remove	Generic Tree Protection Measures	Specific Tree Protection Measures
T1	Jacaranda mimosifolia (Jacaranda)	5.4	91.6	2.4	18.2	Yes		6.08	0.00%	In Footprint	Bulk excavtion for desired levels		Remove		
T2	Melaleuca bracteata (Black Tea-Tree)	2.6	21.9	1.9	11.8	No	Yes		27.77%	Major	landscaping around the pool	Tree may be retained utilising tree sensitive techniques	Retain	Site Fence Sufficient	The surface around the pool must be constructed at grade with no excavation. Please see Section 8.1 of this report

Tree ID	Tree Species	TPZ Radius (M)	TPZ Area (M2)	SRZ Radius (M)	SRZ Area (M2)	In Development Footprint	In SRZ	TPZ Encroachment (M2)	TPZ Encroachment %	In Footprint/ Major/ Minor/ Nil	Encroachment Type	Development Notes	Retain/ Remove	Generic Tree Protection Measures	Specific Tree Protection Measures
T3	Dead tree	1.7	8.9	1.6	8.1				0.00%	Nil	No direct encroachment		Retain	Site Fence Sufficient	

14 APPENDIX 2: STARS

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

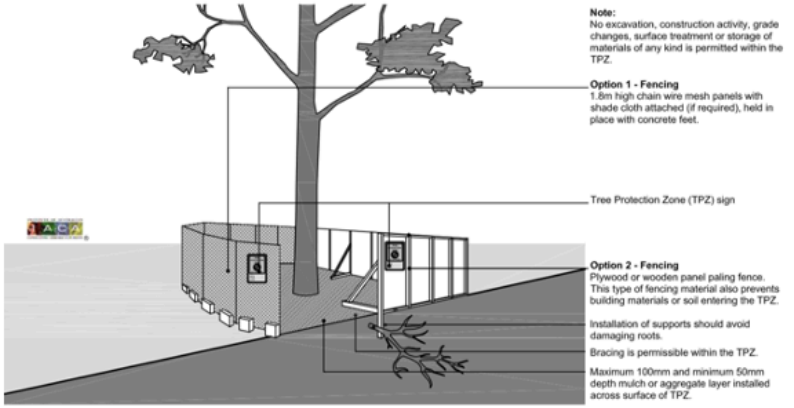
ESTIMATED LIFE EXPECTANCY (YEARS)	LANDSCAPE SIGNIFICANCE RATING				
	High	Medium	Low	Environmental Pest/Noxious Weed	Hazardous Irreversible Decline
Long (>40)					
Medium (15-40)					
Short (5-15)					
Dead Or Hazardous (0-5)					

LEGEND FOR MATRIX ASSESSMENT	
High – Priority for Retention	These trees are considered important for retention and should be retained and protected. Design modification or re-location of buildings should be considered to accommodate the setbacks as prescribed by AS4970-2009 Protection of Trees on Development Sites. Tree-sensitive design maybe implemented in order to encroach within the Tree Protection Zone.
Medium – Consider for Retention	These trees maybe retained and protected but are considered less critical; however, their retention should remain a priority with removal considered only if adversely affecting the proposed building/works and all other alternatives have been considered/exhausted.
Low – Consider for Removal	These trees are not important for retention, nor require special works or design modification to be implemented for their retention.
Priority for Removal	These trees are considered hazardous, or in irreversible decline and should be removed irrespective of the development.

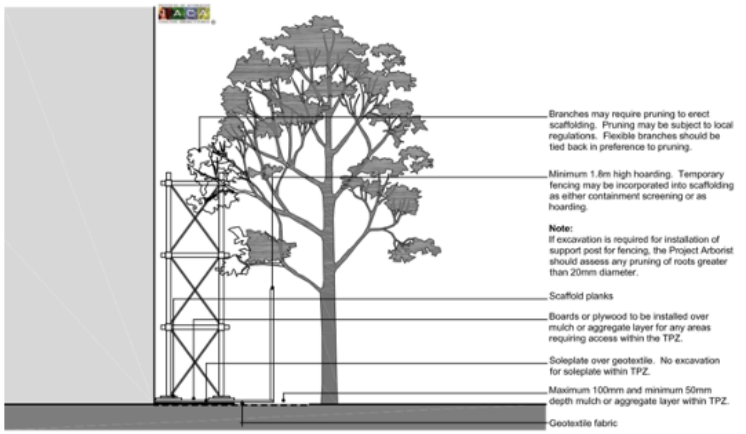
15 APPENDIX 3: SULE

	1. Long	2. Medium	3. Short	4. Removal	5. Moved or Replaced
	Trees that appeared to be retainable at the time of assessment for more than 40 years with an acceptable level of risk.	Trees that appeared to be retainable at the time of assessment for 15 – 40 years with an acceptable level of risk.	Trees that appeared to be retainable at the time of assessment for 5 – 15 years with an acceptable level of risk.	Trees that should be removed within the next 5 years.	Trees which can be reliably moved or replaced.
A	Structurally sound trees located in positions that can accommodate future growth.	Trees that may only live between 15 and 40 years.	Trees that may only live between 5 and 15 more years.	Dead, dying, suppressed or declining trees through disease or inhospitable conditions.	Small trees less than 5m in height.
B	Trees that could be made suitable for retention in the long term by remedial tree care.	Trees that may live for more than 40 years but would be removed for safety or nuisance reasons.	Trees that may live for more than 15 years but would be removed for safety or nuisance reasons.	Dangerous trees through instability on recent loss of adjacent trees.	Young trees less than 15 years old but over 5m in heights
C	Trees of special significance for historical, commemorative or rarity reasons that would warrant extraordinary efforts to secure their long term retention.	Trees that may live for more than 40 years but would be removed to prevent interference with more suitable individuals or to provide space for new planting.	Trees that may live for more than 15 years but should be removed to prevent interference with more suitable individuals or to provide space for new planting.	Damaged trees through structural defects including cavities, decay, included bark, wounds or poor form.	Trees that have been pruned to artificially control growth.
D		Trees that could be made suitable for retention in the medium term by remedial tree care.	Trees that require substantial remedial tree care and are only suitable for retention in the short term.	Damaged trees that are clearly not safe to retain.	
E				Trees that may live for more than 5 years but should be removed to prevent interference with more suitable individuals or to provide space for new plantings.	
F				Trees that are damaging or may cause damage to existing structures within 5 years.	
G				Trees that will become dangerous after removal of other trees for reasons given in (A) to (F).	

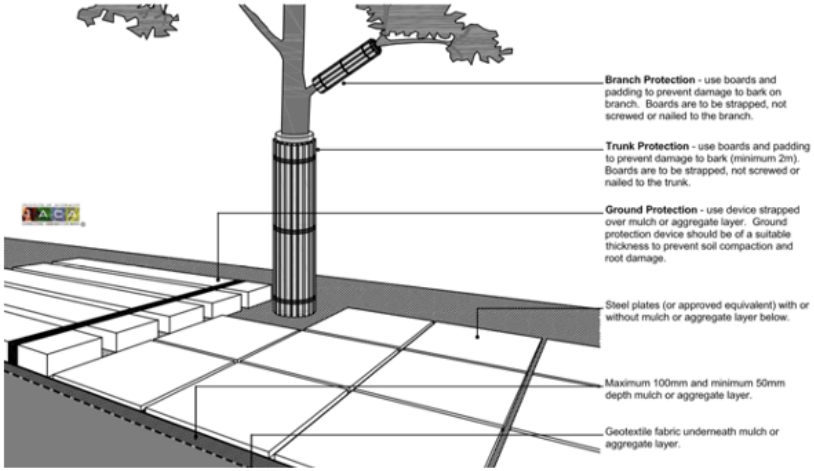
16 APPENDIX 4: TREE PROTECTION (GENERIC)



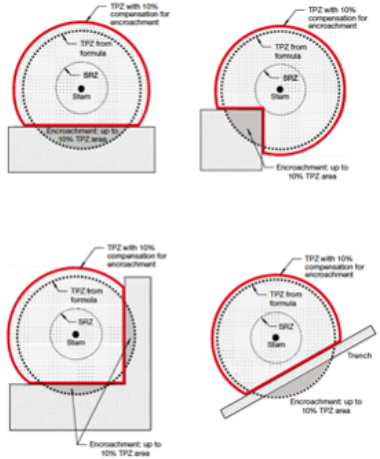
1. Tree Protection Fencing



2. Scaffolding Within TPZ

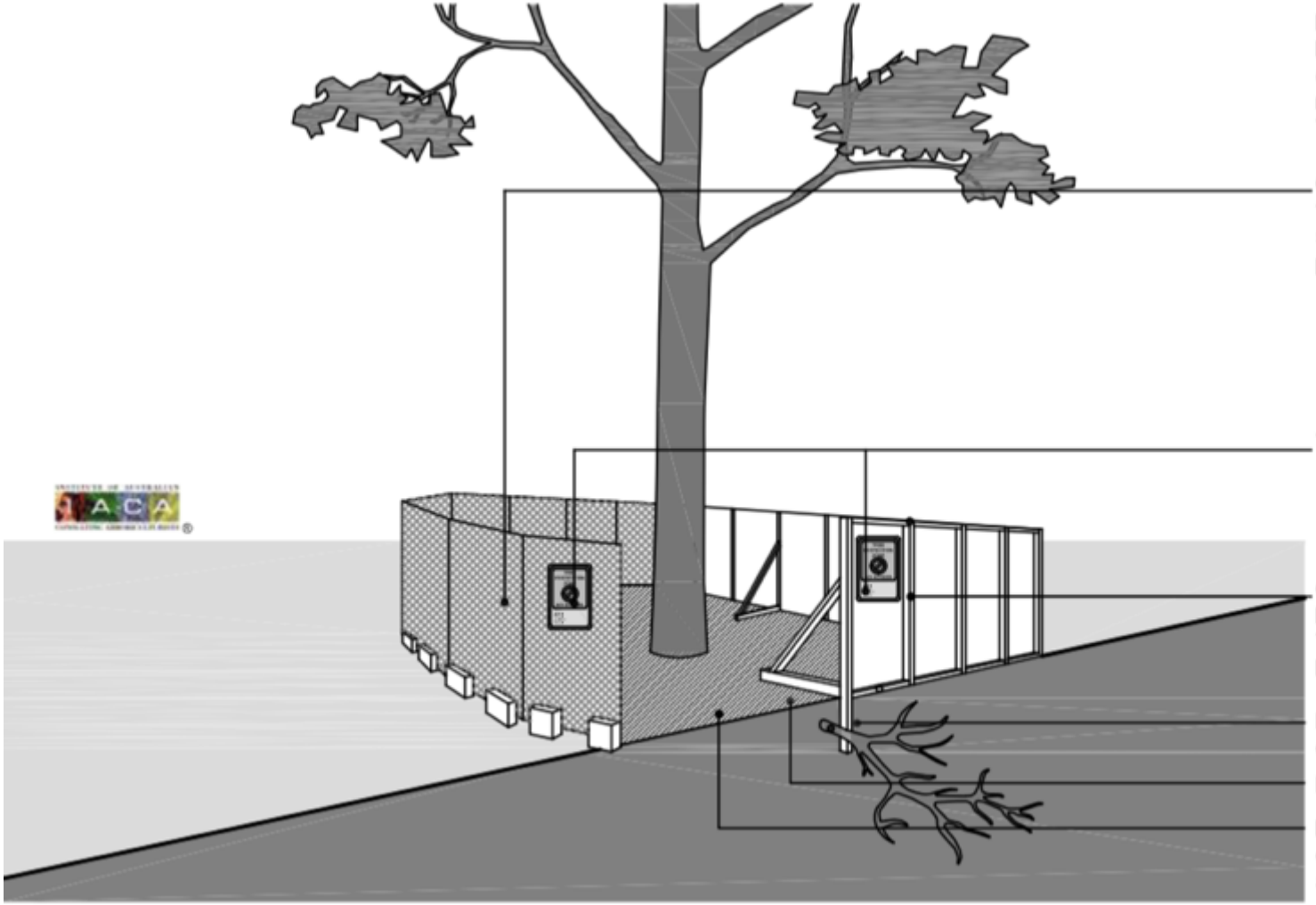


3. Examples Of Trunk, Branch and Ground Protection



4. TPZ Encroachment Compensation

17 TPZ FENCING



Note:
No excavation, construction activity, grade changes, surface treatment or storage of materials of any kind is permitted within the TPZ.

Option 1 - Fencing
1.8m high chain wire mesh panels with shade cloth attached (if required), held in place with concrete feet.

Tree Protection Zone (TPZ) sign

Option 2 - Fencing
Plywood or wooden panel paling fence. This type of fencing material also prevents building materials or soil entering the TPZ.

Installation of supports should avoid damaging roots.

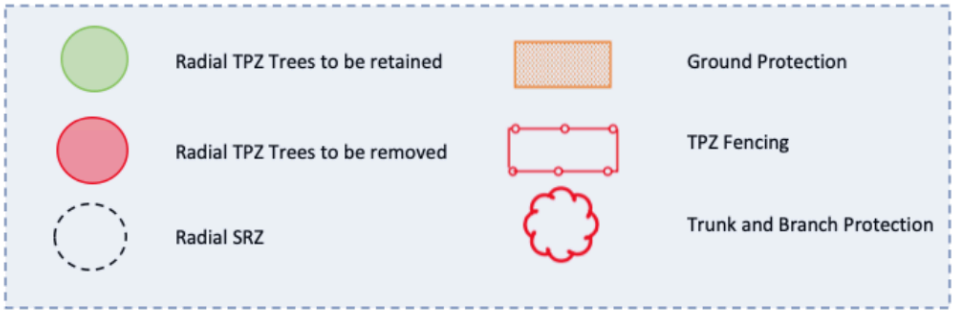
Bracing is permissible within the TPZ.

Maximum 100mm and minimum 50mm depth mulch or aggregate layer installed across surface of TPZ.

18 SITE DRAWINGS

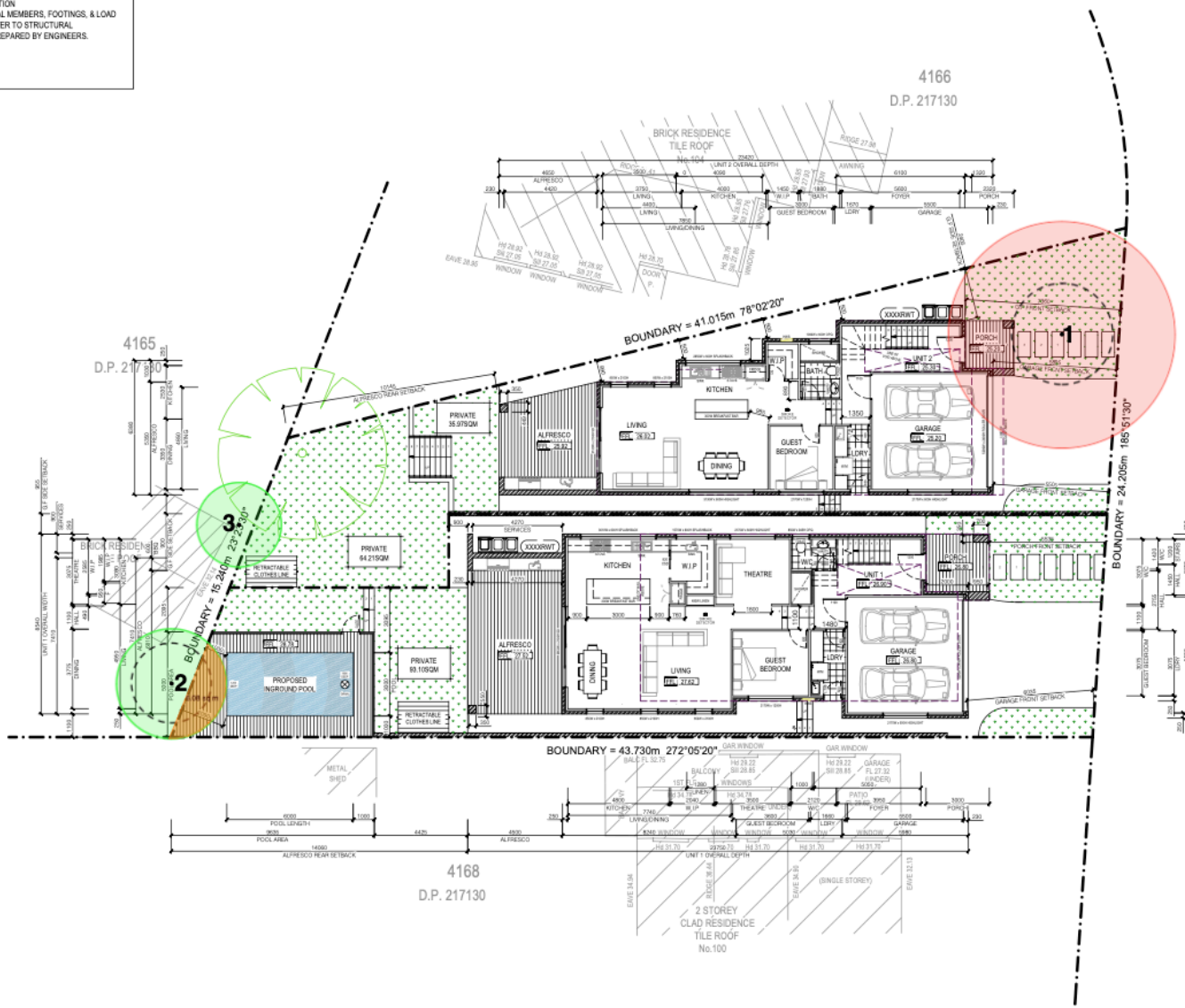
DRAWING 1: TREE LOCATION PLAN/TREE PROTECTION PLAN

SITE DRAWING LEGEND



CONSTRUCTION NOTES

- CONFIRM ALL DIMENSIONS ON SITE TO EXISTING RESIDENCE PRIOR TO COMMENCEMENT OF ANY WORK.
- SUPPLY AND INSTALL 'BIFLEX' CHEMICAL TERMITE TREATMENT (UNLESS OTHERWISE APPROVED) TO COMPLY WITH AS3660.1 AND MANUFACTURER'S SPECIFICATIONS
- ALL BRICKWORK (INCLUDING BRICK VENEER) SHALL BE IN ACCORDANCE WITH AS3700- MASONRY CODE
- ALL TIMBER FRAMING SHALL BE IN ACCORDANCE WITH AS1684. - UNLESS OTHERWISE APPROVED ROOF FRAMING SHALL BE OF TRADITIONAL TIMBER FRAMED CONSTRUCTION
- FOR ALL STRUCTURAL MEMBERS, FOOTINGS, & LOAD BEARING WALLS REFER TO STRUCTURAL DOCUMENTATION PREPARED BY ENGINEERS.



PROPOSED GROUND FLOOR PLAN
SCALE - 1 : 100

ELEVATION DIRECTION

WALL SCHEDULE

WALL SARKING & BULK INSULATION AS REQUIRED BY ENERGY ASSESSMENT

BRICK VENEER WALL.
SELECTED: EXPOSED FACE BRICK (RE-USE RECYCLED BRICK FROM DEMOLITION.
INTERIOR FINISH OTHER - PROVIDE FLUSH PLASTER FINISH.

EXTERIOR & INTERIOR TIMBER STUD WALL.
SELECTED: HORIZONTAL WEATHERBOARDS FIXED TO TIMBER STUD.
INTERIOR FINISH TO BE FLUSH PLASTERBOARD UNLESS SPECIFIED OTHERWISE.

FEMME BUILD
NEW CONSTRUCTION
REMODELS
ADDITIONS
RENOVATIONS
0403 132 106
info@femmebuild.com.au

REV	AMENDMENT DETAILS	BY	DATE
01	DEVELOPMENT APPLICATION	SK	31.05.2023

PROJECT STAGE
DEVELOPMENT APP.

PROJECT DETAILS
DETACHED DUAL-OCC
102 SANDAKAN ROAD,
REVESBY HEIGHTS

CLIENT DETAILS
LIVINGSTON HOMES

DRAWING TITLE
PROPOSED
GROUND FLOOR PLAN

DRAWN: SK
DESIGNED: FB
CHECK: FB
DATE DRAWN: MAY 2023
DRAWING SCALE: 1 : 100
SHEET SIZE: A1

0 1m 2m 3m 4m 5m 6m 7m 8m 9m 10m
1:100 @ A1 ■ 1:200 @ A3 ■ 1:267 @ A4

bdaa
ACCREDITED
BUILDING DESIGNER
ACCREDITATION NUMBER: 6013 - MEMBER NUMBER 6763-21

PROJECT NUMBER	DRAWING NUMBER	REVISION
FB0077	A.02.1	01