Arboricultural Impact Assessment

Site address: 142 Melwood Ave
Killarney Heights NSW 2087

Prepared for: Mr. David Barda

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1. Summary

This Arboricultural Impact Assessment report provides an overview of the trees on the subject site and information relating to the health, structure, and tree retention values of the trees. It also discusses the potential impacts of the proposed development to the trees on the site and the adjoining sites.

A1 Trees – There were five high value trees (Trees 3, 4, 6, 10 and 12). These trees were deemed a high priority for retention and according to the DA plans provided to us, all A1 trees are proposed to be retained. These trees will require tree protection for the duration of the build and the specifications for this protection can be found in section 7 - Tree Protection Plan Specifications

A2 Trees– These are trees which have minor defects but are still a priority for retention (Trees 2, 9 and 11). These trees should be considered for retention as they were in fair to good health. The proposed plans would require the removal of Tree 11, while Trees 2 and 9 will be retained and require protection. The relevant protection measures are also specified in Section 7.

Z3 Trees– These are trees which are not protected by the current Northern Beaches Council DCP (Trees 1, 5, 7 and 8). Whether they are removed or retained, these trees should not place a constraint on the proposed development proceeding.

2. Introduction

2.1 Scope of Works

2.1.1 Our company was commissioned by Mr. David Barda to prepare this Arboricultural Impact Assessment (AIA) report regarding the proposed development occurring on 142 Melwood Avenue, Killarney Heights NSW 2087. The development involves additions and alterations to an existing dwelling. The scope of the report was to:

- Assess the health and condition of the trees on site and the adjoining sites;
- Assess the significance and retention value of each tree;
- Determine the impacts of the proposed development on the trees;
- Identify which trees on site should be retained;
- Provide a Tree Protection Plan (TPP) to ensure the health and longevity of the trees to be retained.

2.2 Assessment Method

2.2.1 A ground based Inspection was made of the above ground portions of the tree on December 6, 2022.

2.2.2 Identification of the trees was based on broad features visible at the time of inspection. Complete taxonomical identification was not undertaken.

2.2.3 The condition of the trees was determined using three parameters: the length of incremental shoot growth (extension growth), the percentage of the canopy cover and the development of wound wood over pruning cuts or other wounds.

2.2.4 The Diameter at Breast Height (DBH) was performed on the north side of the trees. All other measurements were approximations only, unless otherwise stated.

2.2.5 The method for determining the retention value of the trees was performed using TreesAZ. This method can be found in Appendix I – Tree Retention Method.

2.3 Additional Documents

- Barba Residence – Site Plans – 03/04/23 – Drawing No. 1411 – Sheet L-01 – L-13

3. The Subject Site

3.1 The Site

3.1.1 The subject site of this report is on the lands of the Guringai, Garigal and Cammeray people of the Eora Nation. Council lists the subject site as 142 Melwood Avenue, Killarney Heights NSW 2087. The site is classified as [R2] Low Density Residential under the *Warringah Local Environmental Plan 2011*.

3.1.2 The subject site is approximately 699.5m^2 with a north eastern aspect with an approximate 4m slope from north-east to south-west

3.1.3 There is approximately a three-metre grade change from the front of the property at street level to the bottom of the driveway.

3.1.4 The site is located on the Gymea soil landscape classification. The soil on this landscape is predominantly sand to loamy sand throughout the area, with the parent material being Hawkesbury sandstone. (NSW Department of Planning, 2020)

3.1.5 The site has a sandstone outcrop in the rear of the property, from the plans provided, no development will impact this area.

3.2 The Proposal

3.2.1 The proposed development for the site includes the retention of the existing dwelling, installing a carport with a paved terrace in the front yard, excavation for piers and construction of an elevated spa pool in the rear yard with a decked area.

3.2.2 The site will have a proposed 307m^2 landscaped area, with no development impacting the garden in the rear property, and retaining a large portion of the garden area in the front garden.

4. The Subject Trees

4.1.1 The trees located on the site and their relevant data can be found in Table 1 - Tree Schedule.

4.1.2 There are twelve trees in total that may be affected by the proposed development. These trees are located on the subject site, with no trees on neighbouring properties being impacted.

4.1.3 Of these twelve trees, five are native species and seven are exotic.

4.1.4 The natives are commonly planted species throughout the area and the specimens on the site are of no exceptional size, age or ecological value.

4.1.5 Five of the twelve trees are proposed to be removed - Trees 1, 5, 7, 8 and 11. Of these, trees 1, 5, 7 and 8 are listed as undesirable species in Part E1 – Table 1 of the Warringah DCP 2011.

4.1.6 Given the location of Tree 5 and the tendency of the Camphor Laurel species to self seed, this specimen is highly unlikely to have been planted.

Table 1 - Tree Schedule

Tree No.	Botanical Name	Common Name	DBH (cm)	Height (m)	Canopy spread (m)	TPZ Radius	Health	Structure	Age Class	Retention value (TreesAZ	Remove/Retain
1	*Jacaranda mimosifolia*	Jacaranda	55	10	14, 9	6.6	Good	Good	Mature	Z3	Removed
2	Corymbia cvs	Corymbia	40	10	8, 6	4.8	Fair	Good	Mature	A2	Retain
3	Camellia sinensis	Camellia	20	4	4,4	2.4	Good	Good	Mature	A1	Retain
4	*Gordonia axillaris*	Fried Egg Plant	25	5	7,6	3	Good	Good	Mature	A1	Retain
5	*Cinnamomum camphora*	Camphor laurel	40	9	6,5	4.8	Good	Good	Semi-Mature	Z3	Removed
6	*Camellia sinensis*	Camellia	25	6	5,6	3	Fair	Fair	Mature	A1	Retain
7	*Howea forsteriana*	Kentia Palm	20	9	3,3	2.4	Fair	Fair	Mature	Z3	Removed
8	*Dypsis decaryi*	Triangle Palm	40	6	4,4	4.8	Good	Good	Mature	Z3	Removed
9	*Banksia integrifolia*	Coast Banksia	25	6	4,3	3	Fair-Good	Good	Semi-mature	A2	Retain
10	*Callistemon salignus*	Willow Bottlebrush	25	8	5,5	3	Good	Good	Mature	A1	Retain
11	*Camelia sinensis*	Camellia	20	3	3,3	2.4	Good	Good	Semi-Mature	A2	Removed
12	*Callistemon salignus*	Willow Bottlebrush	24	10	4,4	2.8	Good	Good	Mature	A1	Retain

5. Discussion and Tree Protection

5.1.1 The relevant standard relating to this report is Australian Standard 4970 – Protection of Trees on development sites (2009)

Definitions from the standard are:

- Tree Protection Zone (TPZ) – A specified area above and below ground and at a given distance from the trunk set aside for the protection of a tree's roots and crown to provide for the viability and stability of a tree to be retained where it is potentially subject to damage by development
  TPZ radius = DBH × 12

- Structural Root Zones (SRZ) – The area around the base of a tree required for the tree's stability in the ground. The woody root growth and soil cohesion in this area is necessary to hold the tree upright. The SRZ is nominally circular with the trunk at its centre and is expressed by its radius in meters. This zone considered a tree's stability only, not the root zone required for a tree's vigour and long-term viability.
  SRZ radius = $(D \times 50)^{0.42} \times 0.64$

5.1.2 Clause 3.3.2 of AS 4970 regards encroachments of up to 10% as minor and acceptable insofar as no root investigations are required. However, an area equivalent to that lost by any incursion must be compensated for in a space contiguous to the Tree Protection Zones (TPZ).

5.1.3 Encroachments greater than 10% into the TPZ and any encroachment into the SRZ are regarded as major (Clause 3.3.3 AS 4970). If this is to occur, t needs to be demonstrated by a suitably qualified arborist how and why this can be sustainable for the subject trees. It must be able to be compensated for with an equivalent offset contiguous with the TPZ.

5.2 Protection of Trees on Development Sites

5.2.1 The calculated TPZs and SRZs are guidelines and not set rules. However, any alteration or diminishing of them must be adequately justified. An arborist must demonstrate that the trees would remain viable if a major encroachment (>10) or incursion into the SRZ were required to facilitate excavation or construction.

5.2.2 Construction sites are an environment vastly removed from that in which trees have naturally evolved over millennia. The likelihood of retaining a tree on a construction site without it suffering some degree of injury or damage is almost impossible (Harris et al., 2004).

5.2.3 Apart from direct mechanical injury, the most frequent cause of tree decline post construction occurs from alteration of the root zone. The root zone consists of the soil, air spaces, water, chemical elements, soil organisms and plant roots functioning in a system. Roots are highly dependent upon this system being in relative balance, so when one or more of these features becomes deficient or in excess, it inhibits the correct functioning of the roots. Therefore, the protection of the trees on development sites is critical for their long term survival.

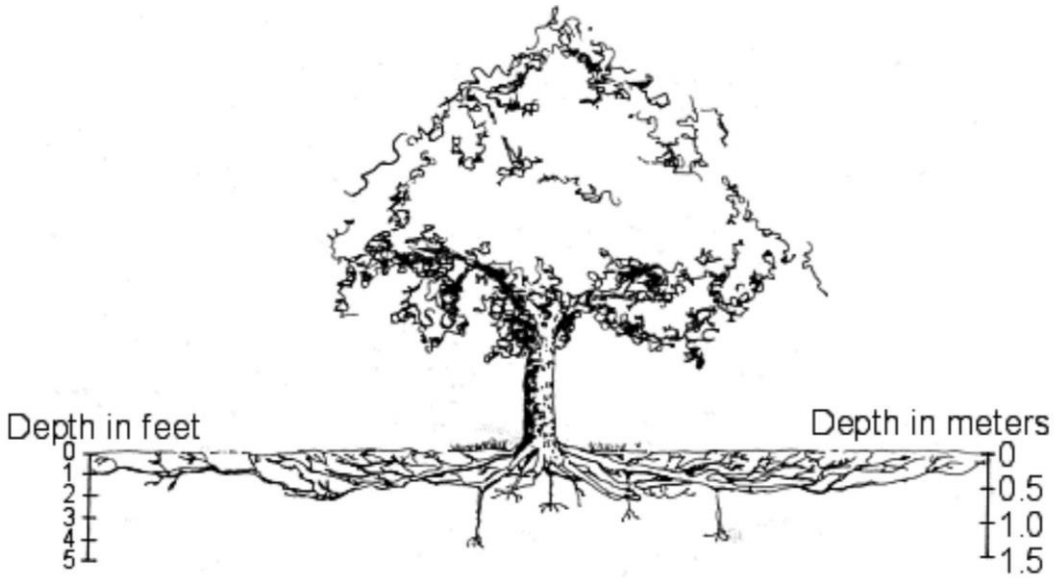

Figure 1 - Diagram of a Typical Root System

6. Conclusions

6.1.1 The proposed development requires the removal of five trees. Of which, one tree is native palm - Tree 7 – *Howea forsteriana* – Kentia.

6.1.2 Of the five trees to be removed, four trees are listed on the Northern Beaches DCP as being exempt from protection and the remaining tree (Tree 11) is a small Camellia. The removal of this tree will not cause a significant loss to the local landscape or environment.

6.1.3 The excavation and construction work for the new driveway and carport will occur within the TPZ of four trees (Trees 2, 3, 4 & 6) which will impact these trees. It is not possible to quantify the likely impacts as we have not been provided with specifications for the driveway construction. If the depth of the driveway is to remain at the same grade (including the subbase) then minimal impact to the trees is likely to occur. However, if the level or depth of the driveway changes, there may be a significant impact and further root investigation may be required.

6.1.4 As the location of the swim spa is not in the vicinity of any TPZ's there is no requirement for hand excavation or supervision of the excavation by an arborist.

6.1.5 As no alterations to the soil area/root zones are proposed within the TPZ of Trees 9, 10, and 12, the health of these trees should not be impacted by the construction. To ensure this is the case, they will still require protection as per the specifications in section 7.

6.1.6 Beyond the impacts that may occur from new structures, there is a multitude of ways that trees can be severely impacted on construction sites. Consequently, it is critical that all of the tree protection measures specified in Section 7 of this report, are strictly adhered to.

7. Tree Protection Plan Specifications

7.1 Tree protection

7.1.1 The following tree protection measures are to be undertaken during all works on the site, including excavation, construction and landscaping. This will ensure the health and long-term viability of the subject tree. These measures must comply with the relevant sections of the Australian Standard 4970-2009 Protection of Trees on development sites. When required, the relevant clauses of the standard will be provided. To save on repetition, the full name of the standard will not be written, only the reference of AS 4970-2009.

7.1.2 In accordance with AS 4970-2009, a copy of this Tree Protection Plan should be on site prior to any work commencing and are to be retained on site throughout the project.

7.2 Site Preparation

7.2.1 **Access** - Prior to any excavation or construction works commencing, a point of access to the site needs to be established that does not involve movements inside the TPZ of any trees on site.

7.2.2 **Protective fencing** - Prior to any works commencing, TPZ protective fencing that complies with Clause 4.3 of AS 4970-2009 must be erected. For an illustration of the required fencing, see Figure 3 - Protective fencing - AS4970. The garden area should have TPZ fencing erected to prevent contamination or storage of materials within the area, which may cause compaction and damage to the subject trees.

7.2.3 TPZ fencing must be installed around Trees 2, 3, 4 and 6. This fencing is to be installed at the distance specified in Table 1 - Tree Schedule.

7.2.4 **Signage** - Signage in accordance with Clause 4.4 of AS 4970 (2009), identifying the TPZs must be fixed to the protective fencing. This signage should also list the activities that are prohibited within the TPZ.

7.2.5 **Ground protection** - The area within the TPZs must be covered with Geotech fabric, over which a layer of organic mulch with a minimum depth of 75mm is to be laid. The purpose of the Geotech is to aid in the removal of the mulch at the completion of the project without disturbing the soil surface. If the mulch is left in situ and not removed at the completion of the project, then Geotech fabric is not required to be laid down.

7.2.6 Areas of the subject site that will experience vehicle movements, such as bobcats and mini-loaders, will require additional ground protection. These areas are to be covered with the Geotech fabric, mulch to 75mm and a load bearing surface such as track mats laid on top.

7.2.7 The depth of the mulch and placement of the load bearing surfaces must comply with Clause 4.5.3 of AS 4970-2009 and be maintained for the project's duration.

7.2.8 **Chemical catchment and contamination prevention** - an area that is the sole location for all activities where there is the possibility of chemicals contaminating the soil must be established. The ground surface must be sufficiently protected from any spillage making its way into the soil, and the use of products such as a Slurrytub® are to be used.

7.2.9 Activities such as cleaning concreting and painting tools, the disposal of excess paint, cement adhesives and chemicals must all be done here. All contaminates are to be captured and ethically disposed of off site.

7.2.10 If feasible, it is also preferred that machinery or equipment refuelling be done here. If this is not practical, a procedure to prevent spillages must be in place and a spill kit must be present.

7.2.11 **Pruning** - Any tree pruning that is required must be undertaken by AQF level 3 arborists in accordance with pruning clause 7.3.3. and clauses 3.24, 6.1 and 6.2 of AS 4373-2007 Pruning of amenity trees.

7. Excavation works

7.1. **Excavation** - Methodical excavation techniques must be used when working near any trees. When excavating for the construction, it is unacceptable for roots to be 'pruned' with mattocks, shovels or similar. All roots must be cleanly cut with a sharp saw into undamaged wood. This pruning work is to be done by or under the supervision of the project arborist.

7.2. **Construction works –** The Tree Protection Zone – The areas inside the TPZs are not to be used for any purpose, in particular:

- The storage of tools or equipment;
- The stockpiling of materials, even temporarily;
- Vehicle of foot traffic;
- Disposing of waste material or contaminates;
- Mixing/ preparation of materials and chemicals;
- Refuelling;
- The attaching of nails, screws or hooks or similar to the trees for use as support structures.

7.3. If access is required into any of the TPZs, it becomes a hold point. The project arborist needs to be consulted.

7.4. **Dust containment** - Activities such as brick sawing that generate dust must have a containment or reduction system to prevent airborne pollutants from affecting the normal functioning of leaves. Trees that do become affected must be hosed clean.

7.5. **Site inspections** -A programme for the inspection of the trees by the project arborist is required to observe the condition of the trees and to assess the effectiveness of all tree protection measures. Inspections need to be scheduled every 12 weeks.

7.6. If there is an issue with any tree, then it is the discretion of the project arborist to increase the frequency of inspections as required.

7.7. **Watering** – The proposed work should have a minimal impact on the drainage within the TPZ, however, the addition of an automated irrigation system will help improve the health of the tree, increasing its ability to compensate for any minor damage to roots and changes to the soil condition. An automated irrigation system should be installed and a specific watering programme established by the site arborists.

7.8. The watering regime must consider the tree species present, seasonal rainfall averages for the area, site soil type, site drainage and current weather conditions. The site arborist can establish a specific watering program.

8. Additional measures

8.1. It is acknowledged that it may be challenging on occasions to adhere to the specifications in the protection plan. However, as previously stated, the likelihood of retaining a tree on a construction site without it suffering some degree of injury or damage is almost impossible. So it is necessary to take the extensive measures listed if the trees are not to be irreparably damaged.

8. References

Clark, J. & Matheny, N., 2001. *The Benefits of Trees.* America: International Society of Arboriculture.

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Roberts, J., Jackson, N. & Smith, M., 2006. *Tree Roots in the Built Environment.* London: The Stationery Office.

Urban, J., 2008. *Up by Roots.* Illinois, U.S.: International Society of Arboriculture.

9. Site plan

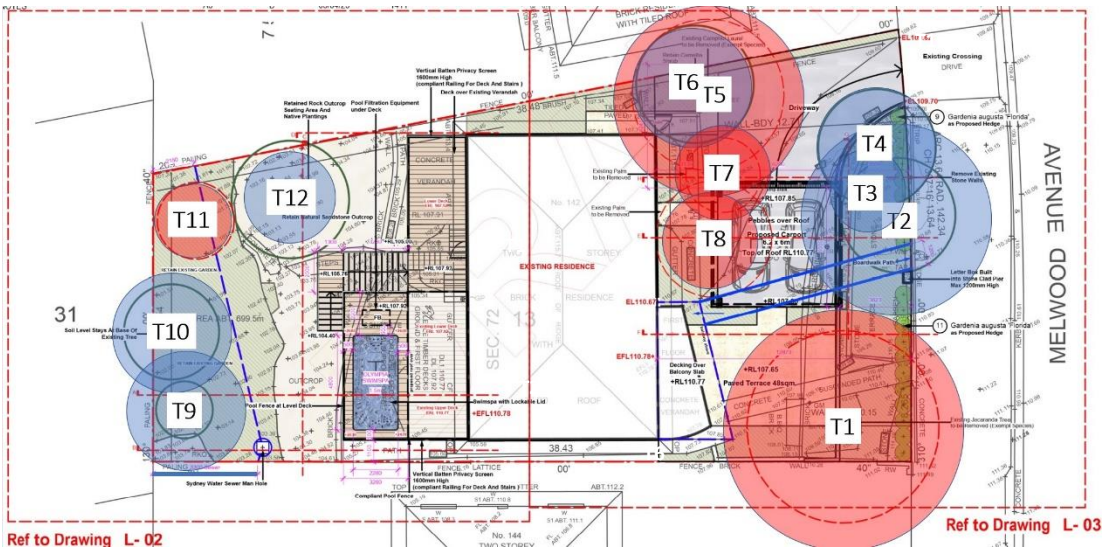

Figure 2 - Subject Site

- To be Retained
- To be Removed

10. Appendix I – Tree Retention Method

10.1 TreeAZ

TreeAZ Categories (Version 10.04-ANZ)

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

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

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

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

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

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

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

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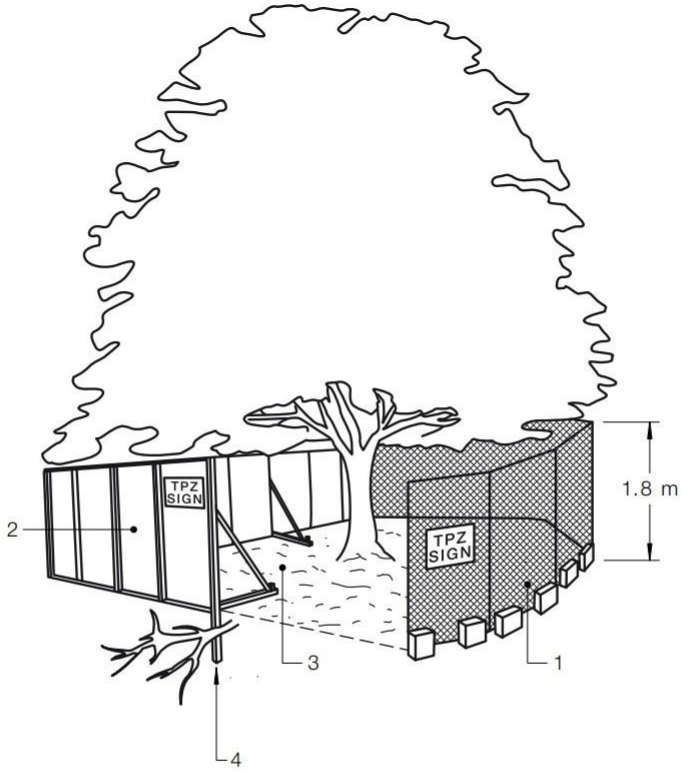
11. Appendix II – TPZ Fencing



LEGEND:

1 Chain wire mesh panels with shade cloth (if required) attached, held in place with concrete feet.

2 Alternative plywood or wooden paling fence panels. This fencing material also prevents building materials or soil entering the TPZ.

3 Mulch installation across surface of TPZ (at the discretion of the project arborist). No excavation, construction activity, grade changes, surface treatment or storage of materials of any kind is permitted within the TPZ.

4 Bracing is permissible within the TPZ. Installation of supports should avoid damaging roots.

FIGURE 3 PROTECTIVE FENCING

Figure 3 - Protective fencing - AS4970

12. Appendix III - Cause of Tree Death and Damage on Construction Sites

Causes of Tree Death and Damage on Construction Sites		
Cause of Injury or damage	Activity	Prevention
Mechanical Injury	• Impact with work vehicles & equipment • Impact with plant machinery	• Establish Tree Protection Zones (TPZ) • Install trunk protection. Be aware of the trees • Do not hit their trunk or branches
	• Delivering/craning materials in	• Move away from trees • Install branch protection at regular delivery spots
	• Installing scaffold near trees	• Work around tree branches. • Use an arborist to prune the trees if needed
	• Using trees as support structures	• Hang equipment & signage elsewhere
	• Lopping branches off	• Use an arborist for all tree pruning
	• Tree felling/removal	• Caution not to damage adjacent trees
	• Installing & removing site sheds	• Away from tree canopies for when lifting/shifting in and out • Use an arborist to prune trees if required
Root Damage	• Careless excavation, trenching, hand digging around trees	• Establish tree protection zones. Consult an arborist if you need to work inside a TPZ
	• Excessive excavation	• Use alternative construction methods such as pier and beams instead of strip footings. • Construct footpaths above grade.
	• Driving vehicles & machinery underneath trees	• Establish Tree Protection Zones (TPZ) • Install trunk protection. Be aware of the trees • Do not hit their trunk or branches
	• Scraping topsoil away from under trees • Changes to soil surface levels	• Don't damage or expose tree roots • Don't bury roots under loads of soil
	• Poor root pruning	• All roots need to be cleanly cut • Use an arborist for root pruning
	• Over excavating with batters or shoulders	• Excavate the minimum amount possible

Causes of Tree Death and Damage on Construction Sites		
Cause of Injury or damage	Activity	Prevention
		• Use piling or shoring if needed to reduce excavation
Compaction of the Soil	• Driving vehicles & machinery underneath trees • Any movements over saturated soils	• Install load sharing ground covering – track mats or similar • Avoid boggy or saturated areas
	• Foot traffic	• Install load sharing ground covering – track mats or mulch
	• Stockpiling of bulk soil • Storage of heavy materials • Storage of heavy tools, boxes and equipment • Location of the site sheds	• Storage of anything must be outside of Tree Protection Zones • Load sharing or minimisation underneath sheds
Soil Contamination	• Fuelling plant and machinery • Cleaning buckets, barrows and tools used for the above onto exposed soil	• Have a dedicated area for these activities where all material is captured and disposed of off site • Have a spill kit on hand
	• Spilling paint, thinners, waterproofing, mortar, cement etc	• Have a professional attitude and take your time • Immediately remove spilt material • Do not 'wash' the material into the soil