Arboricultural Impact Assessment & Tree Protection Specifications

Assessment of trees at Castlemaine Botanic Gardens

Prepared by

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Prepared for

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19 September 2025

Executive Summary

Six trees were assessed in the south-west corner of the Castlemaine Botanical Gardens in relation to proposed works for a permanent public art installation. The table below summarises the impact of the proposed works on the assessed trees.

Table 1: Summary of impact from the proposed design

Arboricultural Impact	Tree Retention Value			Total no. of Trees
	High	Medium	Low	
Major	0	0	0	0
Moderate	0	0	0	0
Minor	0	1	0	1
No Impact	1	4	0	5
Total no. of trees	1	5	0	6

- **Tree 1 has a minor encroachment** under the proposed design of less than 1% of the Notional Root Zone area, with no Structural Root Zone impact. It is highly unlikely that there will be a significant impact to tree health, structure or longevity, providing tree protection measures are implemented on site.
- **Trees 2-6 have no NRZ encroachment** under the proposed design. There should be no impact to tree health, structure or longevity, providing tree protection measures are implemented on site.

All retained trees require protection to ensure they remain viable throughout the works. The following is recommended:

Engagement of Project Arborist & Induction

1. A Project Arborist shall be engaged to induct workers into the Tree Protection Specifications, verify Tree Protection Zone fencing locations, oversee works within the TPZs of retained trees, and provide certification of tree protection measures.
2. Any further works proposed within TPZs of assessed trees and not addressed within this report must be assessed by the Project Arborist prior to commencement of works and approved by the relevant authority.

Tree Protection - General

3. In accordance with the Tree Protection Plan a Tree Protection Zone must be established for all retained trees that conforms with the following:
   - 3.1 The TPZ fencing will be a minimum height of 1.2m and consist of orange safety mesh held in place with timber or steel pickets.
   - 3.2 Fixed signs are to be provided on all visible sides of the tree protection fencing stating ‘Tree Protection Zone – Keep Out’.
4. Where works are permitted within the TPZ, tree protection fencing is to be taken in to only the minimum amount necessary to allow the works to be completed.
5. Permitted works within the TPZs include:
   - 5.1 Tree 1: Excavation for footings for Sculpture 2
   - 5.2 Tree 1: Excavation for footings/posts for interpretive signage

6. Excavation works within the TPZ shall be undertaken under the direct supervision of the Project Arborist.
   - 6.1 Where roots within the TPZ require pruning, this shall be undertaken by the Project Arborist, in accordance with AS 4373:2007 Pruning of Amenity Trees.
   - 6.2 Where roots within the TPZ are exposed by excavation, soil shall be backfilled as quickly as possible, ensuring appropriate soil moisture is maintained.
7. Within the fenced tree protection areas the following must not occur:
   - 7.1 vehicular or pedestrian access;
   - 7.2 trenching or soil excavation;
   - 7.3 storage or dumping of any soils, materials, equipment, vehicles, machinery or waste products;
   - 7.4 any other actions or activities that may result in adverse impacts to retained native vegetation.
8. If temporary access for vehicles or machinery is required within TPZs, ground protection measures may be required. Access should occur in dry weather only.

Contents

Table 2: Table of Revisions

Rev No.	Report Date	Author	Description	Internal Review Date	Reviewed by
0	*19/09/2025*	*MNB*	*Report for Submission to client*	*TJR*	*19/09/2025*

1. Introduction

Homewood Consulting Pty Ltd has been engaged to provide an Arboricultural Impact Assessment and Tree Protection Specifications for trees at the Castlemaine Botanical Gardens in relation to a permanent public art installation.

A Preliminary Tree Assessment report was prepared for Mount Alexander Shire Council (Homewood Consulting 04/02/2025). The report provided information on the existing trees to guide the development layout, in the aim to ensure the impact to trees would be minimised.

Plans for the art installation location and layout have now been provided by the artist. An Arboricultural Impact Assessment is required to identify the impact of the proposed art installation on the future longevity of the trees. The Tree Protection Specifications and Tree Protection Plan provide instructions for tree protection throughout the project.

This report has been prepared in accordance with the Australian Standard AS 4970:2025 Protection of Trees on Development Sites.

2. Method

The trees were previously assessed in February 2025 for the Preliminary Tree Assessment report. Data collected for the trees included:

- Location
- Photograph
- Botanical name
- Tree dimensions
- Diameter at Standard Height (DSH)
- Diameter above basal root flare
- Age class
- Health
- Structure
- Useful Life Expectancy (ULE)
- Landscape contribution
- Retention value

For definitions and descriptors of the data recorded on site see Appendix 1.

A series of site plans have been reviewed including:

- Wildflowers Sculpture Locations V2; Laura Woodward; 12/09/2025 (sheets 1-5)
- Irrigation as Built; Make it Wet; Drawing IRR01, 13/12/2023, Issue 9

The plotted trees have been aligned to surveyed locations from the Irrigation Plans. The Sculpture Location plans have been used to determine the impact of proposed works on the assessed trees.

3. Protection of Trees on Development Sites

All retained trees require protection and the best way to protect trees is to establish a Tree Protection Zone (TPZ). The TPZ starts with a Notional Root Zone (NRZ).

The **Notional Root Zone (NRZ)** is a circular area around a tree that represents the theoretical root zone required for the tree's health and long-term viability. The NRZ encompasses the **Structural Root Zone (SRZ)**, a smaller circular area around the tree critical for tree stability. The woody root growth and soil cohesion in the SRZ are necessary to hold the tree upright. Both the NRZ and SRZ radius are calculated from trunk diameter measurements.

The **Tree Protection Zone (TPZ)** is the area designated on site that is isolated from construction impact or managed so that the tree remains viable. Determined by the Project Arborist, it begins with the Notional Root Zone and is adjusted based on the tree, site and encroachment characteristics that influence what area should, and can, be protected and managed on site.

Further description of the NRZ, SRZ and TPZ, and methods used for their calculation can be seen in Appendix 1.

3.1 Arboricultural Impact

Arboricultural impact is determined based on the level of encroachment into the Notional Root Zone of a tree as specified in AS 4970:2025 Protection of Trees on Development Sites.

Table 3: Levels of TPZ encroachment as defined by AS 4970:2025

Level of Encroachment	Description/ Definition	Requirements
Minor	• Encroachment of less than or equal to 10% of the area of the NRZ • Has not had recent NRZ encroachments • Is outside the SRZ	Generally unlikely that there will be a significant impact to tree health, structure or longevity.
Moderate	• Encroachment of greater than 10% and less than or equal to 20% of the area of the NRZ • Has not had recent NRZ encroachments • Is outside the SRZ	The Project Arborist shall review the proposed impact and determine if the tree will remain viable. This may be through consideration of relevant tree, site or encroachment factors, and/or through the implementation of suitable design measures and construction controls to mitigate impact. If trees designated for retention are not viable, The Project Arborist shall be engaged to recommend suitable design measures and construction controls to adequately reduce impact.
Major	• Greater than 20% of the area of the of the NRZ; and/or • Is inside the SRZ	The Project Arborist shall review the proposed impact and determine if the tree will remain viable. This may require root investigation by non-destructive methods and/or a detailed investigation of relevant factors of tree health, vigour, stability, species sensitivity and soil characteristics. If trees designated for retention are not viable, The Project Arborist shall be engaged to explore alternative designs and/or construction controls with the design team.

For all levels of encroachment, retained trees will require a Tree Protection Zone to be established and tree protection measures implemented.

4. Design Proposal

It is proposed to install a number of permanent artworks in the south-west corner of the Castlemaine Botanical Gardens.

Figure 1: Proposed area of works

Seven loosely figurative sculptures will be placed around the site. The sculptures are likely to be manually carried onto the site in pieces and assembled on site. Impacts to existing trees will be limited to excavation for footings for the sculptures, and posts or footings for an interpretive sign.

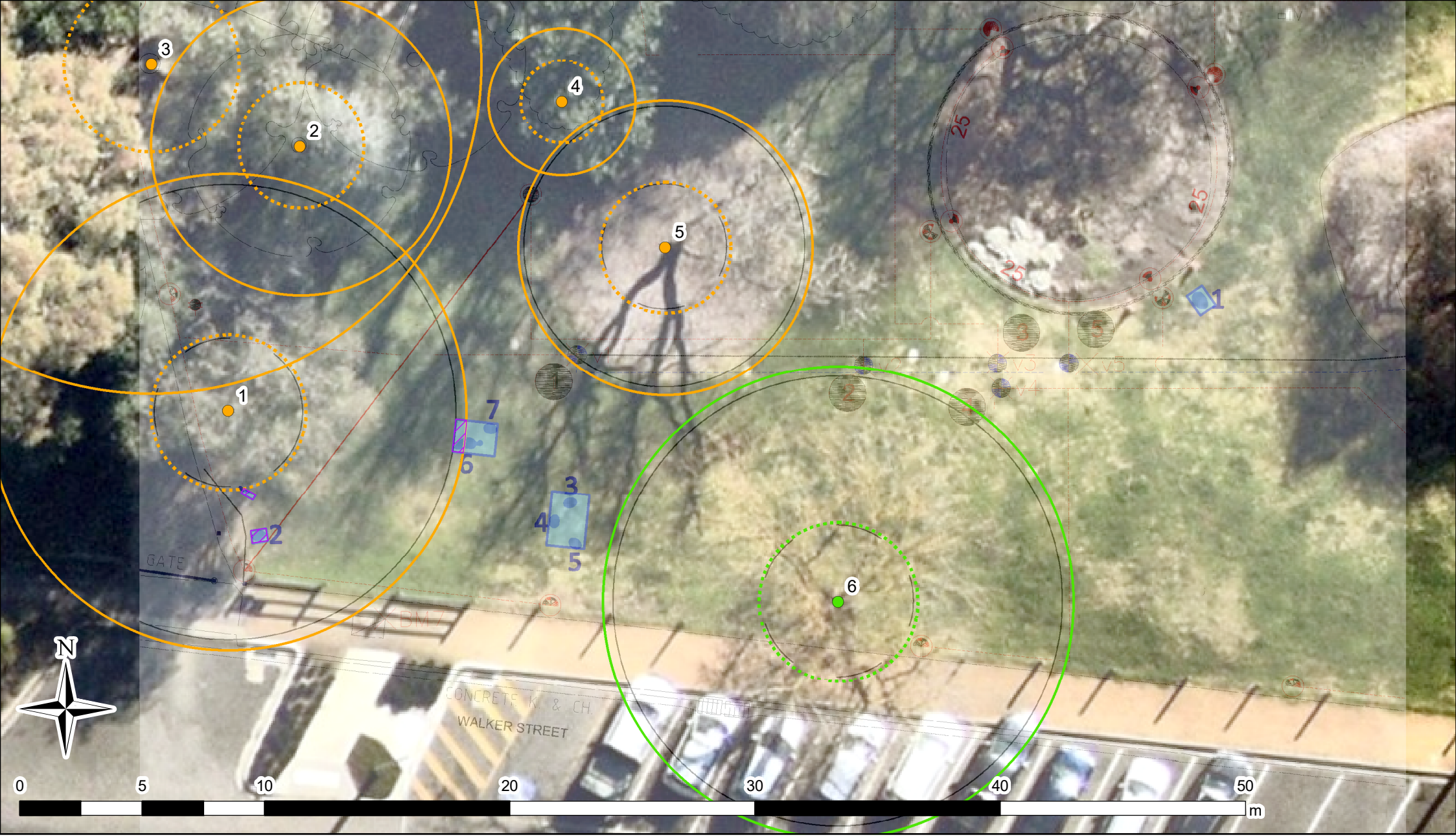
Table 4 displays the assessment data for all trees, as well as the dimensions of the NRZs, SRZs and the arboricultural impact from the proposed design.

Section 6 shows the Arboricultural Impact Assessment Plan. NRZs and SRZs for the assessed trees are depicted to scale and the impact footprint of the proposed works is indicated.

5. Tree Assessments

Table 4: Summary of tree assessments and arboricultural impact from the proposed design.

ID	Botanical Name	Common Name	Age Class	Height x Canopy width (m)	DSH (cm)	Health	Structure	ULE (years)	Retention Value	NRZ radius (m)	SRZ radius (m)	NRZ encroach %	Arboricultural Impact
1	*Schinus molle*	Peppercorn Tree	Mature	7 x 9	81	Fair	Fair	10 to 20	Medium	9.72	3.17	<1	Minor
2	*Cedrus libani*	Cedar of Lebanon	Mature	11 x 9	51	Fair	Fair	20 to 40	Medium	6.12	2.55	0	No impact
3	*Schinus molle*	Peppercorn Tree	Mature	11 x 14	61-94	Fair	Fair	10 to 20	Medium	13.44	3.57	0	No impact
4	*Prunus laurocerasus*	Cherry Laurel	Mature	4 x 8	11-11-11-11-11	Good	Fair	10 to 20	Medium	3.00	1.68	0	No impact
5	*Koelreuteria bipinnata*	Chinese Flame Tree	Mature	8 x 7	37-33	Poor	Fair	5 to 10	Medium	6.00	2.67	0	No impact
6	*Acer negundo*	Box Elder	Mature	14 x 15	80	Fair	Fair	20 to 40	High	9.60	3.24	0	No impact



Arboricultural Impact Assessment
Public Art Installation at Castlemaine Botanical Gardens

HOMEWOOD CONSULTING PTY LTD
Unit 10/ 350 Settlement Road
Thomastown VIC 3074
T: 1300 404 558
ABN: 39 531 880 706

Tree Retention Value	NRZ	SRZ
High	●	
Medium	●	

Proposed Impact Area

NRZ Enrcoachment

Base Information:
Irrigation Plan,
Sculpture Location Plans
Nearmap
Trees Plotted: MNB
Date: 16/09/2025
Projection: GDA 94 Zone 55

7. Arboricultural Impact Assessment Summary

Table 5: Summary of impact from the proposed design

Arboricultural Impact	Tree Retention Value			Total no. of Trees
	High	Medium	Low	
Major	0	0	0	0
Moderate	0	0	0	0
Minor	0	1	0	1
No Impact	1	4	0	5
Total no. of trees	1	5	0	6

- **Tree 1 has a minor encroachment** under the proposed design of less than 1% of the Notional Root Zone area, with no Structural Root Zone impact.
  - Proposed works within the NRZ include excavation for footings for sculpture 2, and excavation for footings or posts for interpretive signage. It is highly unlikely that there will be a significant impact to tree health, structure or longevity, providing tree protection measures are implemented on site.
- **Trees 2-6 have no NRZ encroachment** under the proposed design. There should be no impact to tree health, structure or longevity, providing tree protection measures are implemented on site.

8. Tree Protection Specifications

Engagement of Project Arborist & Induction

1. A Project Arborist shall be engaged to induct workers into the Tree Protection Specifications, verify Tree Protection Zone fencing locations, oversee works within the TPZs of retained trees, and provide certification of tree protection measures.
2. Any further works proposed within TPZs of assessed trees and not addressed within this report must be assessed by the Project Arborist prior to commencement of works and approved by the relevant authority.

Tree Protection - General

3. In accordance with the Tree Protection Plan a Tree Protection Zone must be established for all retained trees that conforms with the following:
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   - 3.2 Fixed signs are to be provided on all visible sides of the tree protection fencing stating ‘Tree Protection Zone – Keep Out’.
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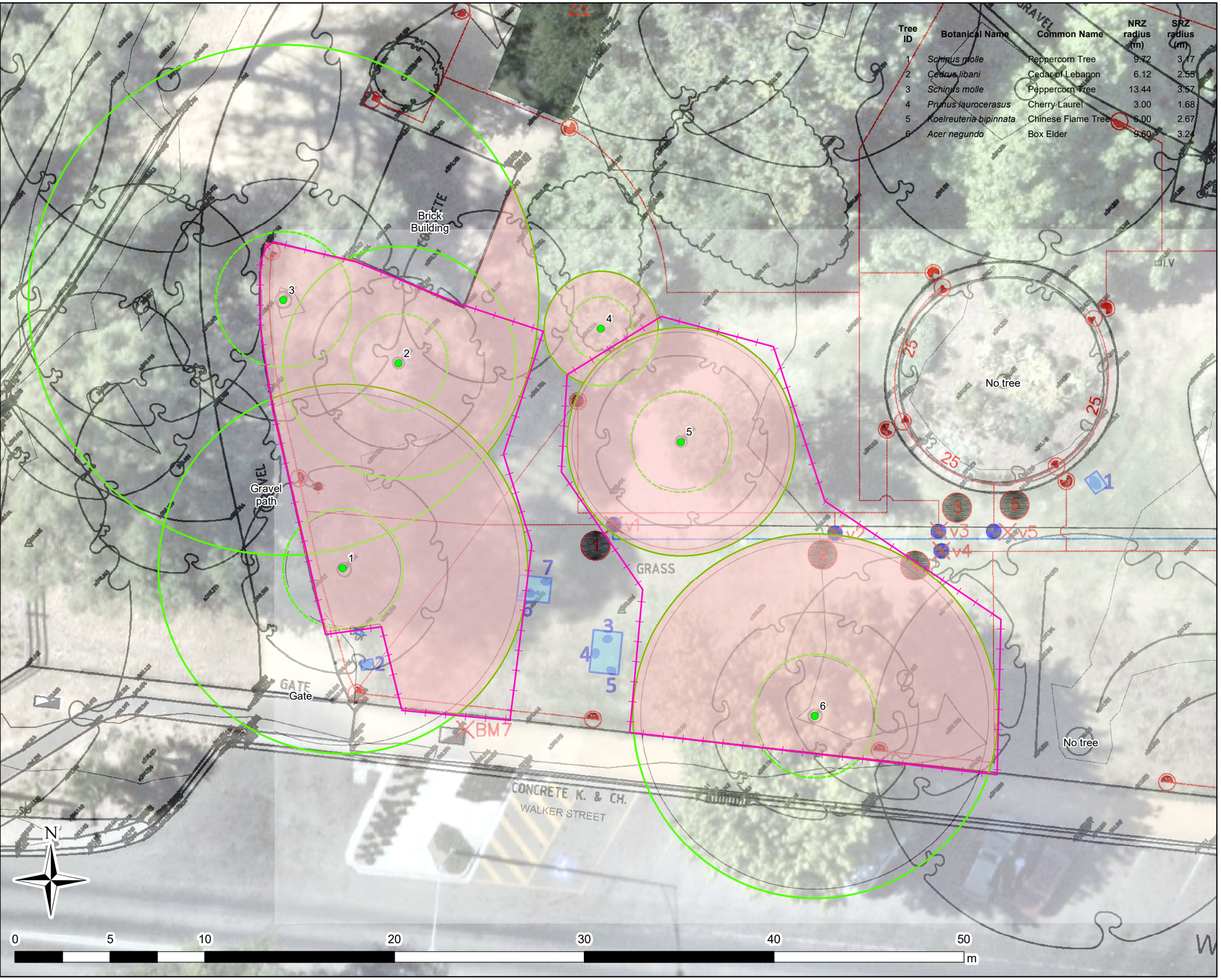
   - 6.1 Where roots within the TPZ require pruning, this shall be undertaken by the Project Arborist, in accordance with AS 4373:2007 Pruning of Amenity Trees.
   - 6.2 Where roots within the TPZ are exposed by excavation, soil shall be backfilled as quickly as possible, ensuring appropriate soil moisture is maintained.
7. Within the fenced tree protection areas the following must not occur:
   - 7.1 vehicular or pedestrian access;
   - 7.2 trenching or soil excavation;
   - 7.3 storage or dumping of any soils, materials, equipment, vehicles, machinery or waste products;
   - 7.4 any other actions or activities that may result in adverse impacts to retained native vegetation.
8. If temporary access for vehicles or machinery is required within TPZs, ground protection measures may be required. Access should occur in dry weather only.

Further description of the Tree Protection Measures listed can be seen in Appendix 3.



Tree ID	Botanical Name	Common Name	NRZ radius (m)	SRZ radius (m)
1	*Schinus molle*	Peppercorn Tree	9.72	3.47
2	*Cedrus libani*	Cedar of Lebanon	6.12	2.55
3	*Schinus molle*	Peppercorn Tree	13.44	3.57
4	*Prunus laurocerasus*	Cherry Laurel	3.00	1.68
5	*Koelreuteria bipinnata*	Chinese Flame Tree	6.00	2.67
6	*Acer negundo*	Box Elder	9.60	3.24

Recommended Tree Protection Measures

Project Arborist Engagement

1. A Project Arborist shall be engaged to induct workers into the Tree Protection Specifications, verify Tree Protection Zone fencing locations, oversee works within the TPZs of retained trees, and provide certification of tree protection measures.

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6.2 Where roots within the TPZ are exposed by excavation, soil shall be backfilled as quickly as possible, ensuring appropriate soil moisture is maintained.

7. Within the fenced tree protection areas the following must not occur:

7.1 vehicular or pedestrian access;

7.2 trenching or soil excavation;

7.3 storage or dumping of any soils, materials, equipment, vehicles, machinery or waste products;

7.4 any other actions or activities that may result in adverse impacts to retained native vegetation.

8. If temporary access for vehicles or machinery is required within TPZs, ground protection measures may be required. Access should occur in dry weather only.

Tree Protection Plan
Public Art Installation at Castlemaine Botanical Gardens

HOMEWOOD CONSULTING PTY LTD

Unit 10/ 350 Settlement Road
Thomastown VIC 3074
T: 1300 404 558
ABN: 39 531 880 706

Existing Trees
Notional Root Zone
Structural Root Zone
Proposed Area of Works
Tree Protection Zone/ Exclusion Area
Tree Protection Fencing (indicative locations)

Base Information:
Irrigation Plan,
Sculpture Location Plans
Nearmap
Trees Plotted: MNB
Date: 16/09/2025
Projection: GDA 94 Zone 55

10. Key Monitoring and Certification Stages

There are many stages in the development process where the Project Arborist is required to monitor or certify (provide a written statement of compliance) tree protection. These include:

Table 6: Project Arborist Involvement

Stage	Project Arborist Roles	Date Completed	Certification Compliance
Site Establishment	Induction into Tree Protection Specifications and Tree Protection Plan		
	Verification of Tree Protection fencing type, locations & signs		
Installation of Sculptures	Supervise excavation for footings/posts; Inspect and record root impacts during excavation works		
	Advise on tree protection requirements if any additional works are required within TPZs		
Project Completion	Tree inspection to confirm all tree protection activities have been satisfactorily completed		
	Prepare a statement on the condition of Trees 1-6, any deviations from the approved tree protection measures and any adverse impacts on the trees		
	Specify remedial works and timeframe for compliance, if applicable		
	The final certificate of compliance shall be forwarded to the Council for approval		

Certification will include a statement on the condition of retained trees, details of any deviations from the approved tree protection measures and their impacts on trees.

If there is non-compliance with tree protection measures or if trees have been damaged, a timeframe for compliance and remedial works will be specified by the Project Arborist.

11. References

AS 4970:2025, *Australian Standard, Protection of Trees on Development Sites*, Standards Australia.

Appendix 1. Data Collection Definitions & Descriptors

Tree assessments are based on the arborist's experience and opinion of the tree.

1.1 Botanical name

The scientific name identifying the genus and species of the tree. Each species has only one scientific name.

1.2 Common name

The colloquial name for a tree species, usually in plain English. Common names for a species are often local or regional and each species can have multiple common names.

1.3 Tree dimensions

Tree height and canopy width in metres (estimated unless stated otherwise).

1.4 DSH

Diameter of the trunk at standard height (1.4m above ground level) measured using a diameter tape. Used to calculate the Notional Root Zone radius.

For trees with multiple stems, the cross-sectional area of the stems is used to calculate the combined DSH, unless otherwise stated.

1.5 Basal diameter

Diameter of the trunk above the root buttress, measured using a diameter tape. Used to calculate the Structural Root Zone radius.

1.6 Health

Category	Description
Very Good	The tree is demonstrating excellent or exceptional growth. The tree exhibits a full canopy of foliage and is free of pest and disease problems.
Good	The tree is demonstrating good or exceptional growth. The tree exhibits a full canopy of foliage and has only minor pest or diseases problems.
Fair	The tree is in reasonable condition and growing well. The tree exhibits an adequate canopy of foliage. There may be some deadwood present in the crown. Some grazing by insects or possums may be evident.
Poor	The tree is not growing to its full capacity; extension growth of the laterals is minimal. The canopy may be thinning or sparse. Large amounts of deadwood may be evident throughout the crown. Significant pest and disease problems may be evident or there may be symptoms of stress indicating tree decline.
Very Poor	The tree appears to be in a state of decline. The tree is not growing to its full capacity. The canopy may be very thin and sparse. A significant volume of deadwood may be present in the canopy or pest and disease problems may be causing a severe decline in tree health.
Dead	The tree is dead.

1.7 Structure

Category	Description
Good	The tree has a well-defined and balanced crown. Branch unions appear to be sound, with no significant defects evident in the trunk or the branches. Major limbs are well defined. The tree is considered a good example of the species.
Fair	The tree has some minor problems in the structure of the crown. The crown may be slightly out of balance, and some branch unions may be exhibiting minor structural faults. If the tree has a single trunk, it may be on a slight lean or exhibiting minor defects.
Poor	The tree may have a poorly structured crown. The crown may be unbalanced or exhibit large gaps. Major limbs may not be well defined. Branches may be rubbing or crossing over. Branch unions may be poor or faulty at the point of attachment. The tree may have suffered root damage.
Very Poor	The tree has a poorly structured crown. The crown is unbalanced or exhibits large gaps with possibly large sections of deadwood. Major limbs may not be well defined. Branches may be rubbing or crossing over. Branch unions may be poor or faulty at the point of attachment. Branches may exhibit large cracks that are likely to fail in the future. The tree may have suffered major root damage.
Has Failed	A section of the tree has failed or is in imminent danger of failure and the tree is no longer a viable specimen.

1.8 Age Class

Category	Description
Over-mature	Tree has reached its expected size and maturity and is in a state of age-related senescence or decline.
Mature	Tree has reached the expected size for the species at the site.
Semi-mature	Established tree that has not yet reach the expected size for the species at the site.
Young	Recently planted tree or juvenile self-sown tree (generally less than 5 years old).

1.9 Useful Life Expectancy (ULE)

Category	Description
40+ years	The tree is in excellent condition and under normal conditions and with appropriate management is expected to continue as a viable landscape component in excess of 40 years.
20 - 40 years	The tree is in good condition and under normal conditions and with appropriate management is expected to continue as a viable landscape component for 20-40 years.
10 - 20 years	The tree is in fair condition and under normal conditions and with appropriate management is expected to continue as a viable landscape component for 10-20 years.
5 - 10 years	The tree is in fair to poor condition or it is not a long-lived species. Removal and replacement may be required within the next 10 years.
1 - 5 years	The tree is in poor condition due to advanced decline or structural defect. Removal and replacement may be required within the next 5 years.
0 years	The tree is dead or is considered hazardous in the location. Removal may be required.

1.10 Tree Origin

Category	Description
Exotic	The species originates in a country other than Australia.
Aus Native	The species originates within Australia, in a state other than Victoria.
Vic Native	The species originates within Victoria.
Indigenous	The species originates within the local environs.

1.11 Contribution to the Landscape

Category	Description
High	Generally, a large tree which is a significant component of the local landscape and provides canopy cover to the site. May offer shade and other amenities such as screening.
Medium	Generally, a medium sized tree or group of small-medium trees which provide a moderate contribution to the local landscape and canopy cover. The tree may offer screening in the landscape or serve a particular function in the location.
Low	The tree offers little in the way of screening, amenity or canopy cover.
Negligible	The tree offers extremely little to nothing in the way of screening, amenity or canopy cover.

1.12 Tree Retention Value

Category	Description
Very High	A large, mature tree of exceptional quality in good condition. A prominent landscape feature and/or of historic, cultural, ecological or other significance. Has the potential to be a long-term landscape component where managed appropriately. Justification is generally required to remove the tree, and all efforts should be made to retain and protect the tree from arboricultural impact.
High	A large, mature tree of high quality in good to fair condition. Generally, a prominent landscape feature. Has the potential to be a medium to long-term landscape component where managed appropriately. Justification is generally required to remove the tree, and all efforts should be made to retain and protect the tree from arboricultural impact.
Medium	Tree of average quality in fair condition. Generally, an intermediate landscape feature. Maybe a large to medium tree with a health or structural issue that can be resolved with arboricultural input, or may be a medium to small tree in good condition. Has the potential to be a medium to long-term landscape component where managed appropriately. Justification may be required to remove the tree, and all reasonable efforts should be made to retain and protect the tree from arboricultural impact.
Low	Either: Tree of low quality in poor condition. Generally, provides minimal or negligible amenity value. The tree may be considered a weed species, structurally unsound, dead/dying/diseased, nearing the end of its ULE or may not be suitable for the site. It is unlikely to be a medium or long-term landscape component. Or: A small tree of good or fair condition which is easily replaced in the landscape through planting of advanced stock, or which may be suitable for transplanting. These trees are not worthy of impeding development and generally do not need to be incorporated into the development design
Third party ownership	The tree is located outside of the subject site and is owned by a third party. It may be owned by a private entity (residential) or public body (council). Third party owned trees must be retained and protected from arboricultural impact, unless a mutually acceptable outcome is negotiated with the tree owner and relevant authorities.

Appendix 2. NRZ, SRZ, TPZ & Encroachment

Injury to any part of the tree can detrimentally affect its health or structural stability.

Root damage is the most common cause of damage to trees on development sites. Root damage can cause decline and death of a tree. Roots may be directly damaged when removed, wounded, crushed or torn during grading, excavation or trenching. Roots may be indirectly damaged through changes to the soil environment including soil compaction and soil build up – both of which limit water and gas exchange, using impermeable materials over the soil surface, chemical contamination and changes in soil moisture levels through alteration of drainage patterns and surface water flow.

Trunks of trees may be wounded mechanically during demolition and construction work. This not only predisposes a tree to potential decay, but it also interferes with the transport of water, nutrients and sugars throughout the tree. Over time, large wounds can decay and structurally weaken the tree.

The canopy of trees can be damaged through incorrect pruning techniques or mechanical injury caused by construction equipment. The removal of leaves reduces the level of photosynthesis and reduces the tree's capacity to function normally and to withstand stresses imposed by a change in its environment. Incorrect pruning and mechanical damage can produce wounds that are susceptible to infection by wood decay organisms.

It is impossible to reverse injury to a tree, and reversing stress is difficult. Procedures for tree protection should be in place at every stage of the development process to successfully retain trees of value. These procedures should be established at the earliest planning stage of any outdoor event or design of a development project where there are trees.

The Australian Standard for the Protection of Trees on Development Sites (AS 4970:2025) uses the Notional Root Zone, the Structural Root Zone and the Tree Protection Zone to ensure trees are adequately protected from construction impact.

2.1 Notional Root Zone (NRZ)

The Notional Root Zone (NRZ) is a notional area (circular) around the tree which encompasses the theoretical root zone required for the tree's health and long-term viability. A larger area is required to maintain a viable tree.

The radius of the NRZ is calculated for each tree by multiplying its Diameter at Standard Height (DSH) by 12.

NRZ radius = DSH x 12

where

DSH = trunk diameter measured at 1.4m above ground

The radius of the NRZ is measured from the centre of the trunk. Any NRZ radius shall not be less than 2.0m or greater than 15.0m. The NRZ for palms, cycads, tree ferns and the like is not calculated but shall not be less than 2.0m.

2.2 Structural Root Zone (SRZ)

The Structural Root Zone (SRZ) is a notional area (circular) around the tree required for stability. A larger area is required to maintain a viable tree. The woody root growth and soil cohesion in the SRZ are necessary to hold the tree upright.

The radius of the SRZ is calculated as:

SRZ radius – $(D \times 50)^{0.42} \times 0.64$

where

D = trunk diameter measured above the root buttress flare

The radius of the SRZ is measured from the centre of the trunk. Any SRZ radius shall not be less than 1.5m. The SRZ calculation does not apply to palms, cycads, tree ferns and the like.

2.3 Tree Protection Zone (TPZ)

The Tree Protection Zone (TPZ) is the area on site that is isolated from construction impact or managed so that the tree remains viable. The TPZ is determined by the Project Arborist starting with the NRZ and considering the tree, site and encroachment factors that determine what area should, and can, be isolated and managed on site to ensure the tree remains viable.

This may include consideration of:

- Location and distribution of roots
- Potential loss of root mass
- Species tolerance to root disturbance
- Age, health and size of tree
- Lean and stability of the tree
- Tree canopy protection requirements
- Soil characteristics
- The nature of the encroachment
- Existing encroachments in the NRZ
- Proposed staging of root disturbance
- Root sensitive construction methods
- Proposed tree maintenance and tree care

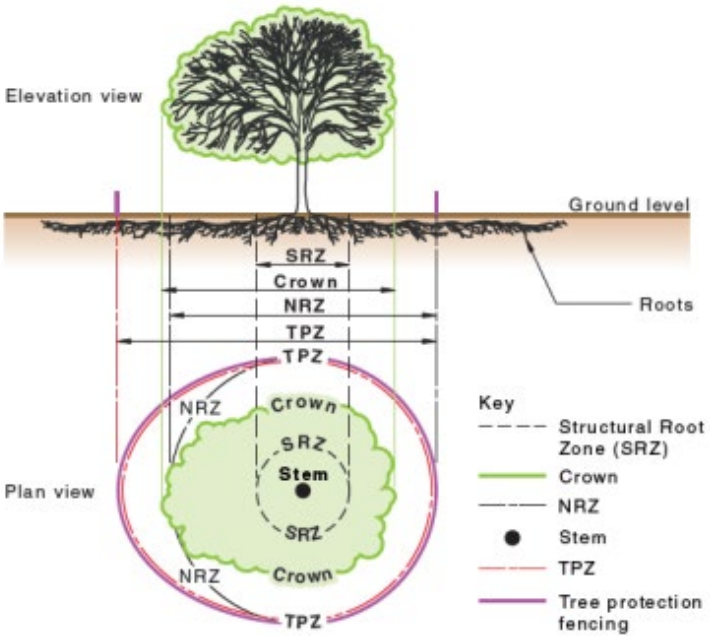

Figure 2: An example of the NRZ, SRZ and TPZ where there is no development in the NRZ. The TPZ – the area on site that is isolated from construction impact – has been modified to ensure the canopy is adequately protected.

2.4 NRZ and SRZ encroachment

It may be possible to encroach into the NRZ. Encroachment is defined as works or change of use (temporary or permanent) proposed to occur within an NRZ, either above or below ground, regardless of work method or construction type.

Encroachment can occur throughout all stages of development, including demolition, site preparation, civil works, installation of utilities and services, construction and landscaping.

Table 7: Levels of TPZ encroachment as defined by AS 4970:2025

Level of Encroachment	Description/ Definition	Requirements
Minor	• Encroachment of less than or equal to 10% of the area of the NRZ • Has not had recent NRZ encroachments • Is outside the SRZ	Generally unlikely that there will be a significant impact to tree health, structure or longevity.
Moderate	• Encroachment of greater than 10% and less than or equal to 20% of the area of the NRZ • Has not had recent NRZ encroachments • Is outside the SRZ	The Project Arborist shall review the proposed impact and determine if the tree will remain viable. This may be through consideration of relevant tree, site or encroachment factors, and/or through the implementation of suitable design measures and construction controls to mitigate impact. If trees designated for retention are not viable, The Project Arborist shall be engaged to recommend suitable design measures and construction controls to adequately reduce impact.
Major	• Greater than 20% of the area of the of the NRZ; and/or • Is inside the SRZ	The Project Arborist shall review the proposed impact and determine if the tree will remain viable. This may require root investigation by non-destructive methods and/or a detailed investigation of relevant factors of tree health, vigour, stability, species sensitivity and soil characteristics. If trees designated for retention are not viable, The Project Arborist shall be engaged to explore alternative designs and/or construction controls with the design team.

For all levels of encroachment:

- Tree protection measures should be implemented during site works.
- To avoid a net loss of soil area and volume, an area equivalent to the encroachment shall be incorporated into the TPZ, unless the Project Arborist otherwise demonstrates that the tree will remain viable (Figure 3).

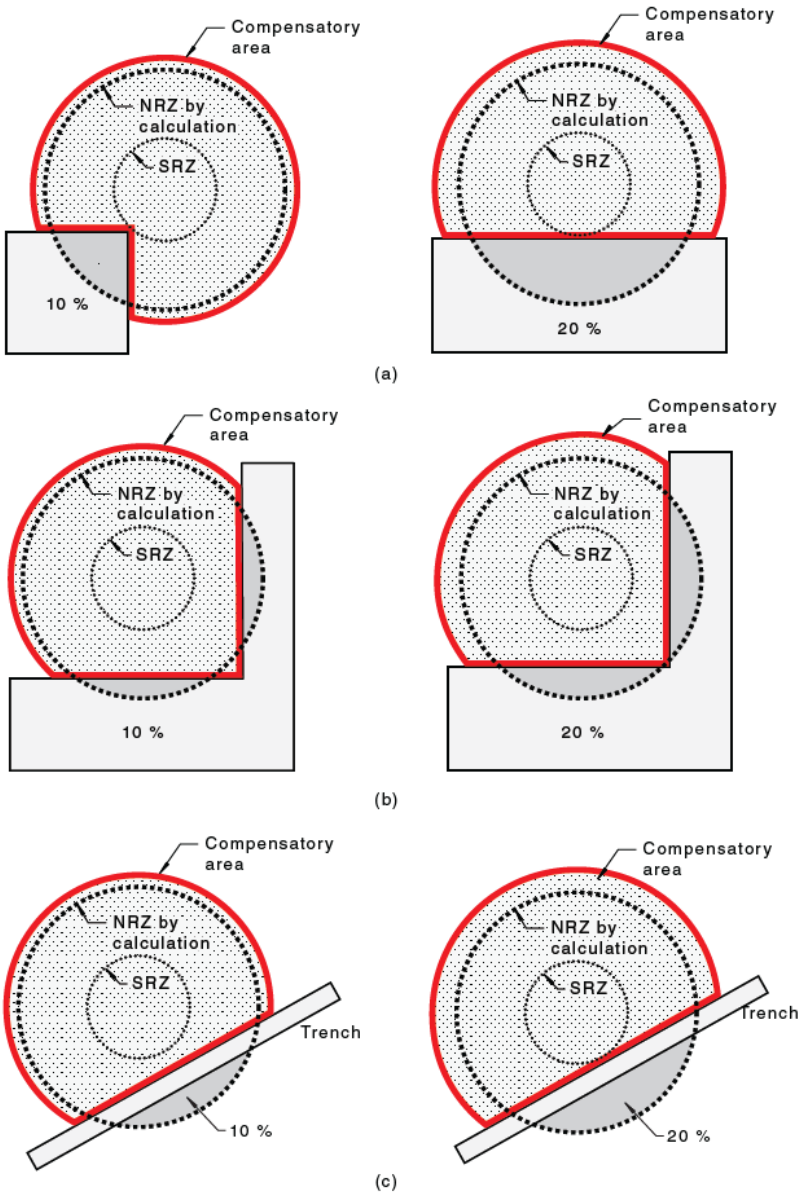

Figure 3: Example of minor and moderate encroachments and compensatory offsets (image from AS 4970:2025).

2.5 Root Investigation

A root investigation may be required to assess the impact of proposed works on trees to be retained when there is a major encroachment. The location and distribution of the roots should be determined through minimally destructive investigation methods (pneumatic, hydraulic, hand digging or ground penetrating radar). The Project Arborist should prepare a report, including photographs. Root damage must be minimised during this process and roots should only be exposed for as long as required to meet the purposes of the investigation.

Appendix 3. Tree Protection Zones and tree protection measures

Tree protection measures include a range of activities, structures and devices used to identify and isolate the Tree Protection Zone. These measures are documented in the Tree Protection Specifications and Tree Protection Plan.

The management of the TPZ shall commence prior to site establishment and continue until the completion of works. Approved trees removals and pruning should be undertaken prior to the installation of tree protection measures.

3.1 Activities excluded from the Tree Protection Zone

Activities generally excluded from the TPZ include but are not limited to:

- Excavation, cultivation or disturbance of the soil, including surface scraping
- Spreading or stockpiling of fill
- Movement or parking of vehicles and plant
- Equipment and material storage
- Refuelling
- Preparation of chemicals, including cement products
- Washing down and cleaning of equipment or hard surfaces
- Dumping of waste
- Fires
- Physical damage to the tree

Some works and activities within the TPZ may be permitted by the determining authority. These must be directly supervised on site by the Project Arborist. Before any additional TPZ encroachment occurs, it shall be reviewed and confirmed to be acceptable by the Project Arborist and, if required, the relevant authority.

3.2 Tree Protection Measures

3.2.1 Tree protection fencing

Tree protection fencing should be erected before any machinery or materials are brought onto the site and before the commencement of works, including demolition. The fence should restrict access to the TPZ, and semi-permanent fences or options that make it difficult to move the fence should be considered where appropriate. Tree protection fencing shall not be removed or altered without approval by the Project Arborist.

If temporary fencing panels are used, they must comply with AS 4687:2022 which specifies the requirements for fence strength, durability, height, stability, bracing and anchoring.

Existing perimeter fences and other structures may be used as part of the tree protection fencing if suitable.

3.2.1 TPZ Signs

Signs identifying the TPZ should be placed around the edge of the TPZ and be clearly visible from within the development site. The TPZ sign provides clear and readily accessible information to indicate that a TPZ has been established. Figure 5 provides an example of a suitable sign. The sign should be minimum A3 size.

Figure 4: Tree protection fencing is erected around retained trees prior to site works

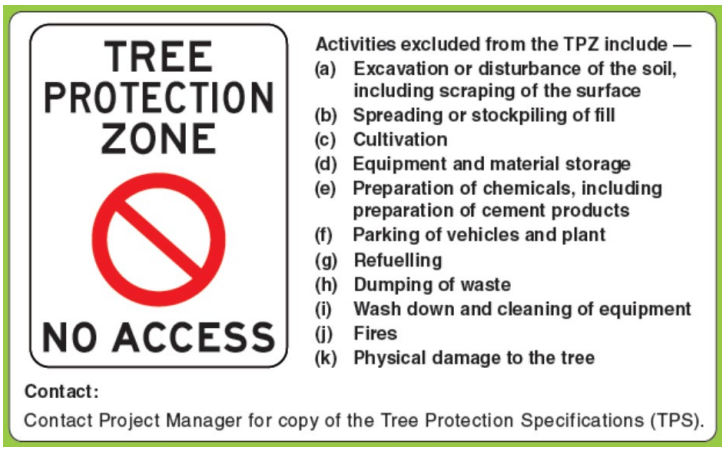

Figure 5: Tree Protection Zone sign (Source: AS 4970:2025)

Where tree protection fences cannot be installed, require temporary removal or where fencing is impractical - e.g. if site access is required through the TPZ, other tree protection measures should be used, including ground protection and/or trunk and branch protection.

3.2.2 Ground Protection

Ground protection measures shall be implemented if regular pedestrian access or temporary access for vehicles or machinery is required within the TPZ. Ground protection aims to prevent root damage and soil compaction within the TPZ.

Examples of ground protection include plastic or metal plates such as track mats (Figure 6) and rumble boards over mulch or crushed rock (Figure 7). Depending on weather conditions, geotextile fabric may be required to prevent mulch and crushed rock mixing into the site soils.

Wooden boards or plates should be of a suitable thickness to spread the load and prevent soil compaction. Existing hard surfaces, such as driveways or concrete slabs, may provide suitable ground protection.

Figure 6: Track mats

Figure 7: Rumble boards

3.2.3 Trunk and Branch Protection

Tree trunks and crowns can be injured by machinery and equipment. Protection can include the following measures:

- Expanding tree protection fencing to encompass the full extent of the crown
- Pruning of individual branches
- Tying back of branches
- Use of flagging to make a branch more visible
- Trunk or branch protection.

For trunk and branch protection, boards and padding may be used to prevent damage. Bards shall be joined to each other using hoops straps and screws or similar. They shall not be screwed or nailed to the tree.

If pruning is required, it must be undertaken by a qualified arborist (AQF Level 3 or above) and as per the specifications of AS 4373:2007 *Pruning of Amenity Trees.* Pruning should be undertaken prior to the installation of tree protection measures.

Temporary powerlines, stays, guys, structures and the like shall not be attached to trees.

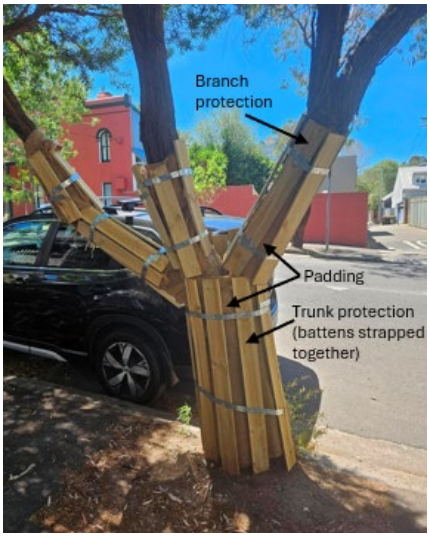

Figure 8: Trunk and branch protection

3.3 TPZ Maintenance

The fenced TPZ area should be mulched to retain soil moisture throughout the period of works. The mulch must be maintained to a depth of 50-100mm. Where the existing landscape within the TPZ is to remain unaltered (e.g. garden beds or turf) mulch may not be required.

Soil moisture levels should be regularly monitored by the Project Arborist. Temporary irrigation or watering may be required within the TPZ. An above-ground irrigation system should be installed and maintained by a competent individual.

All weeds should be removed by hand without soil disturbance or should be controlled with appropriate use of herbicide.

Asset ID:	**1**
Botanical Name:	*Schinus molle*
Common Name:	Peppercorn Tree
Origin:	Exotic
DSH (cm):	81
Height & Width (m):	7 x 9
Age Class:	Mature
Health:	Fair
Structure:	Fair
ULE:	10 to 20 years
Landscape Contribution:	Low
Retention Value:	Medium
NRZ radius (m):	9.72
SRZ radius (m):	3.17
Encroachment Percentage:	<1
Impact (AS 4970):	Minor
Comments:	Existing Label 589

Asset ID:	**2**
Botanical Name:	*Cedrus libani*
Common Name:	Cedar of Lebanon
Origin:	Exotic
DSH (cm):	51
Height & Width (m):	11 x 9
Age Class:	Mature
Health:	Fair
Structure:	Fair
ULE:	20 to 40 years
Landscape Contribution:	Medium
Retention Value:	Medium
NRZ radius (m):	6.12
SRZ radius (m):	2.55
Encroachment Percentage:	0
Impact (AS 4970):	No Impact
Comments:	Existing Label 590

Asset ID:	**3**
Botanical Name:	*Schinus molle*
Common Name:	Peppercorn Tree
Origin:	Exotic
DSH (cm):	61-94
Height & Width (m):	11 x 14
Age Class:	Mature
Health:	Fair
Structure:	Fair
ULE:	10 to 20 years
Landscape Contribution:	Medium
Retention Value:	Medium
NRZ radius (m):	13.44
SRZ radius (m):	3.57
Encroachment Percentage:	0
Impact (AS 4970):	No Impact
Comments:	Existing Label 592

Asset ID:	**4**
Botanical Name:	*Prunus laurocerasus*
Common Name:	Cherry Laurel
Origin:	Exotic
DSH (cm):	11-11-11-11-11
Height & Width (m):	4 x 8
Age Class:	Mature
Health:	Good
Structure:	Fair
ULE:	10 to 20 years
Landscape Contribution:	Medium
Retention Value:	Medium
NRZ radius (m):	3.00
SRZ radius (m):	1.68
Encroachment Percentage:	0
Impact (AS 4970):	No Impact
Comments:	Basal diameter estimated

Asset ID:	**5**
Botanical Name:	*Koelreuteria bipinnata*
Common Name:	Chinese Flame Tree
Origin:	Exotic
DSH (cm):	37-33
Height & Width (m):	8 x 7
Age Class:	Mature
Health:	Poor
Structure:	Fair
ULE:	5 to 10 years
Landscape Contribution:	Medium
Retention Value:	Medium
NRZ radius (m):	6.00
SRZ radius (m):	2.67
Encroachment Percentage:	0
Impact (AS 4970):	No Impact
Comments:	Existing Label 599

Asset ID:	**6**
Botanical Name:	*Acer negundo*
Common Name:	Box Elder
Origin:	Exotic
DSH (cm):	80
Height & Width (m):	14 x 15
Age Class:	Mature
Health:	Fair
Structure:	Fair
ULE:	20 to 40 years
Landscape Contribution:	High
Retention Value:	High
NRZ radius (m):	9.60
SRZ radius (m):	3.24
Encroachment Percentage:	0
Impact (AS 4970):	No Impact
Comments:	Basal diameter estimated