



Arboricultural Impact Assessment Report

Site Address:

51 Centre Road
Vermont VIC

Client:

Harmer Architecture

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1 Executive Summary

- 1.1 Howell Arboriculture Consultants has been engaged to undertake an Arboricultural Impact Assessment on all site specimens greater than 3 metres in height located within proximity to the proposed development that may have the potential to be impacted either directly or indirectly by the proposed design and provide advice and recommendations on those impacts within the form of this report.
- 1.2 This primary scope of this Arboricultural Assessment Report is to provide the following:
- Assess & provide comment on the subject trees health, structure, form and significance
 - Determine the Tree Protection and Structural Root Zones (TPZ & SRZ) in accordance with Australian Standard AS4970 – 2009 Protection of Trees on Development Sites.
 - Provide an appropriate plan showing tree location with tree numbers, retention values and Tree Protection Zones (TPZ)
 - Provide a Detailed Arboricultural Impact Assessment.
 - Assess debris piles and determine if these are from mechanically removed trees or fallen debris
- 1.3 This report has been prepared in accordance with *Australian Standard 4970:2009 Protection of Trees on Development Sites* and the reporting guidelines set out by *Council Arborist Victoria (CAV)*. It provides an assessment of the site specimens with regards to their health, structure and retention value within their current landscape and identifies the impact of the proposed design on the future longevity of the trees. This report may recommend design modifications and construction methods to minimise construction impacts on the site specimens where there may be intrusions into the respective Tree Protection Zones.
- 1.4 Thirteen (13) specimens were assessed in total forming this report. Of those specimens the following were observed to be:
- Two (2) specimens were identified as Exotic specimens native outside of Australia
 - Seven (7) specimens were identified as Victorian Native specimens
 - Four (4) specimens were identified as Aus. Native specimens native outside of Victoria
- 1.5 All specimens were attributed an Arboricultural Retention Value which reflects the individual tree's general worthiness for retention, these are as follows:

Retention Value (RV)	Tree ID	Total Trees
Third Party Owned Trees	2	1
Very High Retention		
High Retention Trees		
Medium Retention Trees	3,4,5,10,11,13	6
Low Retention Trees	1,6,7,8,9,12	6
		13

Table 2 Retention Value Overview

- 1.6 The decision on which trees are to be removed should be based on sound arboricultural advice and guided by arboricultural ratings attributed to each individual tree which related to combined tree condition factors such as age, health, structure, useful life expectancy and retention value
- 1.7 On the basis of future site safety and potential amenity, preference should be given to retaining trees primarily of Very High, High, & Moderate arboricultural value in built areas or areas of increased target potential.
- 1.8 The following table identifies the current impact subjected to the site trees, for further details see section 8 for Arboricultural Impact Assessment.

Impact on Trees	Tree Retention Value					Total Trees
	Third Party Owned	Very High	High	Medium	Low	
Major Impact – Not Retainable					1	1
Design Modification or Further Investigation				1		1
Major Impact – Retainable				2	1	3
Minor Impact				1		1
No Impact	1			3	3	7
						13

Table 3 Tree Impact Table In Accordance with AS4970:2009

- 1.9 Tree protection measures must be put in place prior to any development to protect all trees subjected for retention as well as any other trees that are intended to remain in the landscape.
- 1.10 A Project Arborist should be appointed to assist in the design and protection of trees warranting retention.

2. Arboricultural Report Assumptions and Limitations

- 2.1 It is assumed that any property/project is not in violation of any applicable codes, ordinances, statutes, or other government regulations.
- 2.2 All legal description provided to the consultant is assumed to be correct. Any titles and ownership of any property are assumed to be good. Howell Arboriculture Consultants hold no responsibility for matters that are legal in character.
- 2.3 No consultant nor employee of Howell Arboriculture Consultants shall be required to give testimony or attend court by reason of this report unless subsequent contractual arrangements are made, including of an additional fee for such services required.
- 2.4 Loss or alterations of any form of this report invalidates the entire report.
- 2.5 Possessions of this report or a copy thereof does not imply right of publications or use for any purpose by anyone but the person to whom It is addressed or without written consent from the director of Howell Arboriculture Consultants Ricky Howell.
- 2.6 Information contained within this report covers only the items that were examined and reflect the conditions of those items at the time of assessment.
- 2.7 The tree(s) discussed herein were inspected for physical appearance, visible biological function and aesthetic conditions. The inspection was undertaken in accordance with standard industry procedures which is a macro visual observation from ground level. Tree inspections, in this case, do not cover micro-biological examination, soil root excavation, internal cavities, internal structures or diseases with non-visible symptoms and the reporting herein reflects the overall visual appearance of the trees at the time of review.
- 2.8 The subsequent report findings are the culmination of research combined with the professional opinion of the author of this report. This report has not been produced to support a particular motive, produce a desired value or predict a desired occurrence. All findings within this reported are provided without bias towards certain parties or results.
- 2.9 Although all recommendations within this report are based on sound and accepted Arboricultural practices, neither the author nor Howell Arboriculture Consultants have assumed responsibility for liability associated with the trees discussed within this report, their future demise and/or any damage which may result.
- 2.10 Howell Arboriculture Consultants are qualified professionals that have acquired the minimum qualifications required through training (*Diploma of Arboriculture AQF5*) for a person responsible for carrying out tree assessment, report preparation, consultation with designers, specifying tree protection measures, monitoring & certification in accordance with Section 1.4.4 of the *Australian Standard 4970:2009 Protection of Trees on Development Sites*. Howell Arboriculture Consultants take great care to provide information that is accurate, knowledgeable, and reliable. You hereby agree to the extent of the law that we will not be held responsible (regardless of liability theory) for occurrences or advice, due to direct, indirect or negligent actions (using professional opinions, experience, or information – including information from third parties) which lead to or are perceived to lead to: any loss or damage (monetary, or otherwise), perceived loss, perceived damage; injury; revenue changes; aesthetic changes; and/or lifestyle impacts. We do not provide warranties or guarantees.

This disclaimer is governed by law in force in the state of Victoria, Australia.

3 Methodology

- 3.1 A ground based visual assessment was conducted on the 5th of April 2023.
- 3.2 The assessment was conducted in accordance with the principles of Visual Tree Assessment (VTA) and tree hazard assessment described in *Harris, Clark and Matheny (1999)* and *Mattheck and Breloer (1994)* by Ricky Howell (*Dip.Arb*)
- 3.3 Tree locations & images were recorded on an Apple iPhone 13 Pro using Fulcrum data collection app on GPS location (generally +/- 1.0m accuracy).
- 3.4 Observations were made of the assessed trees to determine the following.
- | | |
|--------------------------------|-----------------------------------|
| • Genus & Species | • Height (m) |
| • Origin | • Canopy Width (m) |
| • Health | • Diameter at Breast Height (DBH) |
| • Structure | • Diameter at Base (DAB) |
| • Useful Life Expectancy (ULE) | • Tree Protection Zone (TPZ) |
| • Age | • Structural Root Zone (SRZ) |
| • Retention Value | • Recommended Works |
| | • Tree Significance |
- 3.5 Assessment details of individual trees are listed within Appendix (1) and a copy of the tree location plan can be observed in Appendix 2 Observations. Characteristic Descriptors used in the assessment can be seen in Appendix 4
- 3.6 Each tree assessed was attributed a 'Tree Retention Value' this value correlated the combination of tree health and structural rating with tree amenity value. Tree Retention Value matrix can be observed within Appendix 5
- 3.7 Each tree assessed has an allocated Tree Protection Zone (TPZ). The TPZ have been measured and allocated within accordance of *Australian Standard AS4970-2009 Protection of Trees of Development Sites*. Tree Protection Zone (TPZ) is measured as a radius, from the centre of the trunk at (or near) ground level.
- 3.8 To successfully retain suitable trees within or surrounding a development site, consideration must be given to protecting the trunk, crown and roots of each specimen. Tree Protection Zones (TPZ's) are used to provide adequate space for the preservation of sufficient roots to maintain tree health (particularly important for mature trees) whilst providing a buffer zone between construction activity and the tree trunk and crown. The method for determining tree protection zones adopted in this report is the 'Australian Standard for Protection of trees on development sites' (AS4970-2009). The TPZ area is determined by the trunk diameter measurement measured in metres at 1.4m (DBH) and multiplied by 12 and is a guide for planning purposes. The trunk of the tree is used as the centre point for the radial measurement.

4. Documents Reviewed

4.1 The following documents provided by the client are assumed correct. These documents are used to calculate the level of impacts inflicted by the proposed design on the site trees.

- *Feature Survey*
- *Existing & Demo Site Plan*
- *Proposed Site Plan*

5. Site Details

5.1 The subject site presented as St James Catholic Primary School. The scope area was primarily located within the front carpark located on centre road. A total of Thirteen (13) specimens were assessed in total within the scope area.

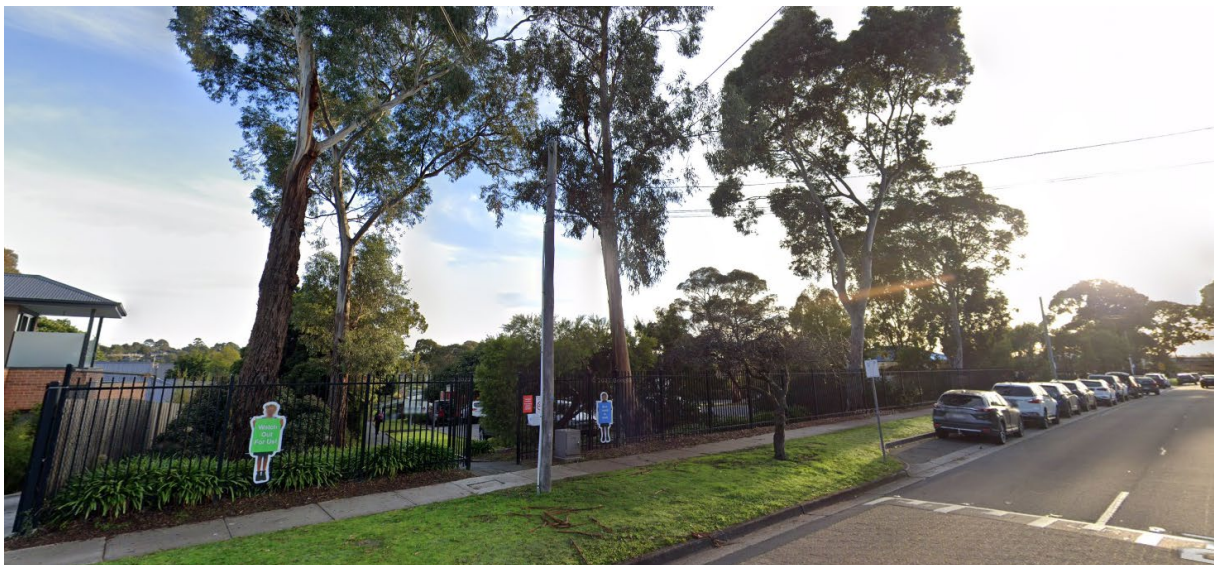


Figure 1 Street view of St James Catholic Primary School – Centre Road (Google Maps July 2022)

5.2 Site Map

5.2.1 *A site map detailing tree locations has been provided on the following page.*



Legend

- Road Casements - Vicmap
- Property (ROAD_CASEMENT_POLYGON)
- Parcel Map Polygons - Vicmap Property (PARCEL_MP)
- Tree Protection Zone
- Structural Root Zone
- howell_arboriculture_XYTableToPoint1
- tree_retention_value
 - <Null>
 - Low
 - Medium
 - Third Party Owned
 - <all other values>

51 Centre Road
Vermont VIC 3133

Commissioned By:
Harmer Architecture

Document Reference:
JN359 AIA 51 Centre Rd Vermont

Map Extent

Scale 1:450



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5.3 Construction

- 5.3.1 The current proposal will see 23 carpark bays, an existing sand pit & playground, along with an existing gravel road removed. The existing carpark will then be reinstated along with a new proposed crossover & and a admin building constructed.

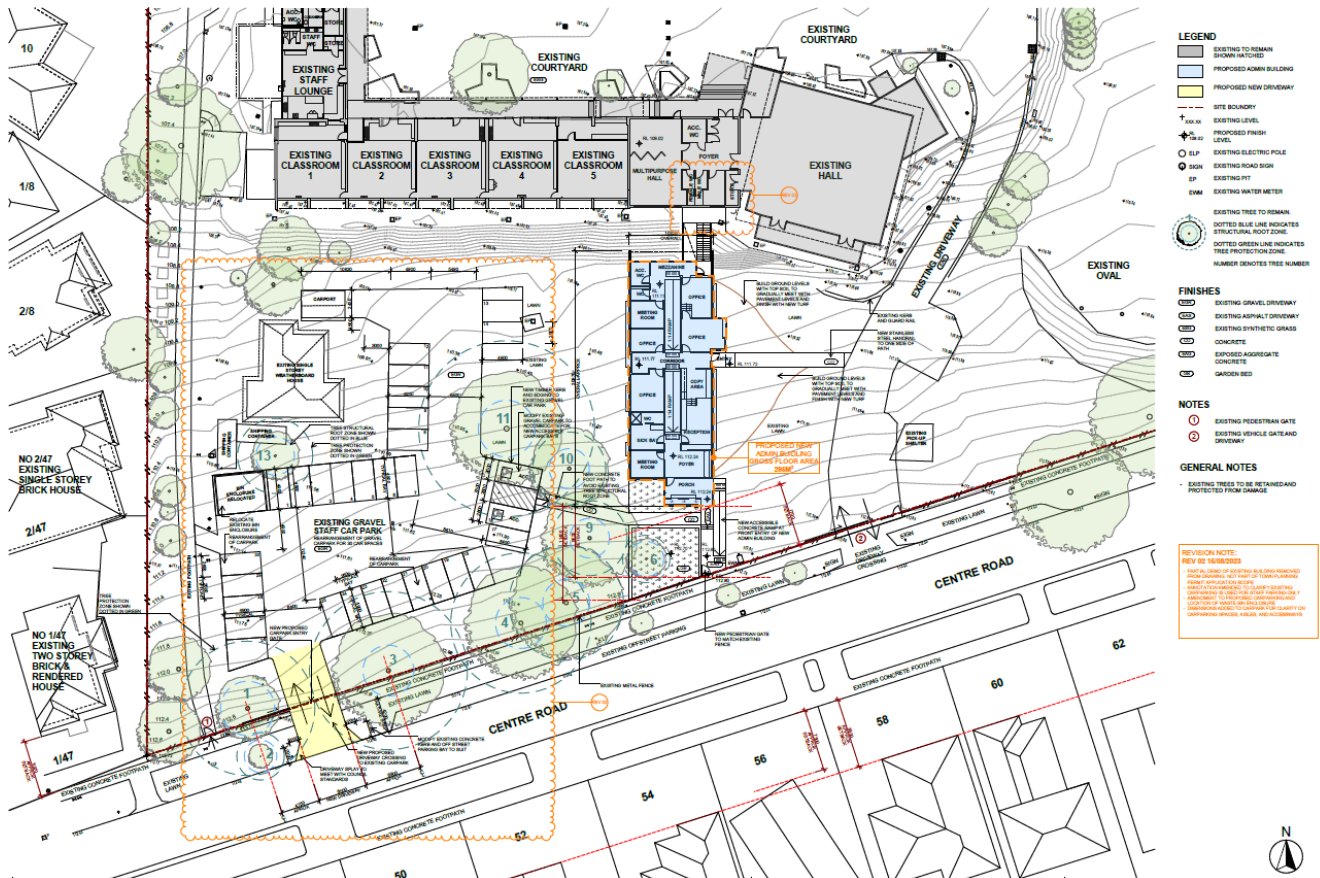


Figure 2 Proposed Design

5.4 Planning & Policy Context

5.4.1 In accordance with the Whitehorse City Council & the Victorian Planning Provisions the following are the Planning Scheme Zones & Overlays subjected to the property parcel.

Planning Scheme Overlays

- NRZ NEIGHBOURHOOD RESIDENTIAL ZONE
- NRZ3 NEIGHBOURHOOD RESIDENTIAL ZONE - SCHEDULE 3

Planning Scheme Zones

- SLO SIGNIFICANT LANDSCAPE OVERLAY
- SLO9 SIGNIFICANT LANDSCAPE OVERLAY - SCHEDULE 9

5.4.2 In Accordance with the Whitehorse City Council Significant Landscape Overlay Schedule 9 (SLO9)

“Permit requirement

A permit is required to remove, destroy or lop a tree.

This does not apply to:

A tree that has both:

a height less than 5 metres; and

a single trunk circumference of less than 1.0 metre at a height of 1.0 metre above ground level.

A tree that is less than 3 metres from the wall of an existing Dwelling or an existing Dependent Person's Unit when measured at ground level from the outside of the trunk. For the avoidance of doubt, this exemption does not apply to a tree that is less than 3 metres from an existing outbuilding.

A tree that is located less than 3 metres from an existing inground swimming pool when measured at ground level from the outside of the trunk.

A tree that is an Environmental Weed species listed below:

- Box Elder (*Acer negundo*)
- Cape Wattle (*Paraserianthes lophantha*)
- Cherry Plum (*Prunus cerasifera*)
- Cootamundra Wattle (*Acacia baileyana*)
- Cotoneaster (*Cotoneaster* spp.)
- Desert Ash (*Faxinus angustifolia*)
- Hawthorn (*Crataegus monoxyna*)
- Mirror Bush (*Coprosma angustifolia*)
- Privet (*Ligustrum* spp.)
- Radiata or Monterey Pine (*Pinus radiata*)
- Sallow Wattle (*Acacia longifolia*)
- Sweet Pittosporum (*Pittosporum undulatum*)
- Willow (*Salix* spp.)

The pruning of a tree for regeneration or ornamental shaping.

A tree which is dead or dying or has become dangerous to the satisfaction of the responsible authority.

A tree outside the minimum street setback requirement in the Residential Growth Zone.

A tree on public land or in the road reserve removed by or on behalf of Whitehorse City Council.

The removal, destruction, or lopping of a tree to the minimum extent necessary:

to maintain the safe and efficient function of a Utility Installation to the satisfaction of the responsible authority or the utility service provider; or

by or on behalf of a utility service provider to maintain or construct a Utility Installation in accordance with the written agreement of the Secretary to the Department of Environment, Land, Water and Planning (as constituted under Part 2 of the Conservation, Forests and Lands Act 1987); or

to maintain the safe and efficient function of the existing on road public transport network (including tramways) to the satisfaction of the Department of Transport.

A tree required to be removed, destroyed or lopped in order to construct or carry out buildings or works approved by a Building Permit issued prior to 8 February 2018.

A tree that may require separate approval to remove, destroy or lop as part of an existing permit condition, a plan endorsed under a planning permit or an agreement under section 173 of the Planning and Environment Act 1987.

5.4.3 The following table breaks down the trees in accordance with the permit requirements addressed above.

Planning Permit	Trees requiring permit for removal
Clause 52.17 Victorian Native Vegetation Permit	1,6,9,10
Exempt from 52.17 Planted Vegetation	7,8,12
Permit required Under SLO9	1,3,4,5,6,7,8,9,10,11,12,13
Exempt from Permits	Nil

Table 4 Permit Requirements Table

6. Discussion

6.1 Tree Details

6.1.1 Six (6) specimens were assessed in total within this report.

6.1.2 Full details of the specimens assessed have been provided in Appendix 1: Tree Data

<i>Genus Species</i>	<i>Common Name</i>	<i>Origin</i>	<i>Count</i>
<i>Acacia implexa</i>	Lightwood	Vic. Native	3
<i>Acacia melanoxylon</i>	Blackwood	Vic. Native	1
<i>Corymbia maculata</i>	Spotted Gum	Aus. Native	2
<i>Eucalyptus botryoides</i>	Southern Mahogany	Vic. Native	1
<i>Eucalyptus melliodora</i>	Yellow Box	Vic. Native	2
<i>Eucalyptus pseudoglobulus</i>	Gippsland Blue Gum	Vic. Native	1
<i>Eucalyptus scoparia</i>	Wallangarra White Gum	Aus. Native	1
<i>Photinia robusta</i>	Red Leaf Photinia	Exotic	1
<i>Prunus cerasifera</i>	Cherry Plum	Exotic	1
			13

Table 5 Count of Assessed Species

6.2 Tree Retention Value

6.2.1 Trees that provide important environmental and/or aesthetic contribution to the area and are in good condition score a Very High, High or Medium retention value and conservation of these trees is encouraged. Trees identified as not suitable for retention or attained a low Tree Retention Rating, displayed one or several the following attributes:

- a. *provide limited environmental/aesthetic benefit,*
- b. *short lived species,*
- c. *represent a material risk to persons or property,*
- d. *identified as causing or threatening to cause substantial damage to a structure of value,*
- e. *limited Useful Life Expectancy.*
- f. *young and easily replaced.*

6.3 Third Party Owned Trees

6.3.1 As part of this assessment One (1) specimen was determined to be **Third Party Owned**

6.3.2 These specimens were determined to be "Third Party Owned" as it was identified to be a tree 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 protected from construction impact, unless a mutually acceptable outcome is negotiated with the tree owner and relevant authorities.

6.3.3 Third Party Owned Trees as Follows:

ID	Botanical Name	Common Name	Tree Retention	Address
2	<i>Prunus cerasifera</i>	Cherry Plum	Third Party Owned	51 Centre Road Vermont

Table 6 Third Party Owned Trees

6.4 Very High Retention Value Trees

6.4.1 As part of this assessment Zero (0) specimens were determined to be **Very High Retention Value.**

6.4.2 These specimens were determined to be "Very High Retention Value" due to being a large, mature example of the species, generally in fair to good condition. These specimens are often described as being potential remanent or have substantial habitat value. These specimens may have specific landscape context or be very prominent in the broader environment. These specimens may be suitable for inclusion within a significant tree register at local or state government. Significant efforts should be made to retain these specimens.

6.5 High Retention Value Trees

6.5.1 As part of this assessment Zero (0) specimens were determined to have a **High Retention Value.**

6.5.2 High Retention Valued Trees are described as a 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 were managed appropriately. Significant efforts should be made to retain these specimens.

6.6 Medium Retention Value Trees

6.6.1 As part of this assessment Six (6) specimens were determined to have a **Medium Retention Value**.

6.6.2 Medium Retention Valued trees are described as trees of moderate quality in fair condition. Generally a modest landscape feature that may have a health or structural issue that can be resolved with arboricultural input, or may refer to a medium to small tree in good condition that has the potential to be a medium to long term landscape component where managed appropriately. Where practical, design modifications should be considered to retain and protect from construction.

6.6.3 Medium Retention Trees as Follows:

ID	Botanical Name	Common Name	Tree Retention	Address
3	<i>Corymbia maculata</i>	Spotted Gum	Medium	51 Centre Road Vermont
4	<i>Corymbia maculata</i>	Spotted Gum	Medium	51 Centre Road Vermont
5	<i>Eucalyptus botryoides</i>	Southern Mahogany	Medium	51 Centre Road Vermont
10	<i>Eucalyptus melliodora</i>	Yellow Box	Medium	51 Centre Road Vermont
11	<i>Eucalyptus scoparia</i>	Wallangarra White Gum	Medium	51 Centre Road Vermont
13	<i>Photinia robusta</i>	Red Leaf Photinia	Medium	51 Centre Road Vermont

Table 7 Medium Retention Trees

6.7 Low Retention Value Trees

6.7.1 As part of this assessment Six (6) specimens were determined to have a **Low Retention Value**.

6.7.2 Low Retention Value trees are described as trees generally of low quality in poor condition. Provides little amenity value. Unlikely to be a long- or medium-term landscape component. The tree may be considered a weak species, structurally unsound, dead/dying/disease, nearing the end of its ULE or may not be suitable for the site. Or a small tree of good to fair condition which can be easily replaced in the landscape through advanced planting.

6.7.3 Low Retention Trees as Follows

ID	Botanical Name	Common Name	Tree Retention	Address
1	<i>Eucalyptus pseudoglobulus</i>	Gippsland Blue Gum	Low	51 Centre Road Vermont
6	<i>Acacia implexa</i>	Lightwood	Low	51 Centre Road Vermont

ID	Botanical Name	Common Name	Tree Retention	Address
7	<i>Acacia implexa</i>	Lightwood	Low	51 Centre Road Vermont
8	<i>Acacia implexa</i>	Lightwood	Low	51 Centre Road Vermont
9	<i>Eucalyptus melliodora</i>	Yellow Box	Low	51 Centre Road Vermont
12	<i>Acacia melanoxylon</i>	Blackwood	Low	51 Centre Road Vermont

Table 8 Low Retention Trees

7. Tree Protection

7.1 *Australian Standard AS4970-2009 Protection of trees on development sites* prescribes the use of a Tree Protection Zone (TPZ) as the principle means of protecting trees throughout the development process. If encroachment is required within any TPZ, the Project Arborist should be consulted to identify impacts and recommend mitigation measures. The Tree Protection Zones should be used to inform any future development of the site, maintaining these areas as open space.

7.2 Below is a list of the Tree Protection Zones and Structural Zone for each tree. It is these measurements that should be considered during any planning. Each measurement is given in metres as a radius from the trunk centre. Trees recommended for removal are not included within this list.

7.3 Please note in accordance with *Australian Standard AS4970-2009 Protection of trees on development sites* – Section 3.2 Determining the TPZ ‘The TPZ of palms, other monocots, cycads and tree ferns should not be less than 1m outside the crown projection’. The SRZ formula is not calculated for palms.

7.4 As per *Australian Standard AS4970-2009 Protection of trees on development sites*, A TPZ should not be less than 2m. And for trees with a trunk diameter less than 0.15m will have the minimum SRZ of 1.5m.

7.5 Encroachment into the Tree Protection Zone (TPZ) is permissible under certain circumstances though this is dependent on both site conditions and tree characteristics. Minor encroachment, up to 10% of the Tree Protection Zone (TPZ), is generally permissible provided encroachment is compensated for by recruitment of an equal area contiguous with the TPZ and the crown of the tree will not require excessive pruning that would cause the tree to become unbalanced or disfigure.

7.6 Tree Protection Zones are as follows:

ID	Botanical Name	Address	Retention Value	Multiple Trunk DBH (cm)	Total DBH (cm)	TPZ [m]	DAB (cm)	SRZ [m]
1	<i>Eucalyptus pseudoglobulus</i>	51 Centre Road Vermont	Low		68	8.16	99	3.30

ID	Botanical Name	Address	Retention Value	Multiple Trunk DBH (cm)	Total DBH (cm)	TPZ [m]	DAB (cm)	SRZ [m]
2	<i>Prunus cerasifera</i>	51 Centre Road Vermont	Third Party Owned		24	2.88	29	1.97
3	<i>Corymbia maculata</i>	51 Centre Road Vermont	Medium		80	9.60	85	3.09
4	<i>Corymbia maculata</i>	51 Centre Road Vermont	Medium		71	8.52	85	3.09
5	<i>Eucalyptus botryoides</i>	51 Centre Road Vermont	Medium		58	6.96	70	2.85
6	<i>Acacia implexa</i>	51 Centre Road Vermont	Low		24	2.88	35	2.13
7	<i>Acacia implexa</i>	51 Centre Road Vermont	Low		16	1.92	20	1.68
8	<i>Acacia implexa</i>	51 Centre Road Vermont	Low		16	1.92	19	1.65
9	<i>Eucalyptus melliodora</i>	51 Centre Road Vermont	Low		38	4.56	47	2.41
10	<i>Eucalyptus melliodora</i>	51 Centre Road Vermont	Medium		37	4.44	48	2.43
11	<i>Eucalyptus scoparia</i>	51 Centre Road Vermont	Medium		89	10.68	110	3.44
12	<i>Acacia melanoxylon</i>	51 Centre Road Vermont	Low		28	3.36	35	2.13
13	<i>Photinia robusta</i>	51 Centre Road Vermont	Medium		38	4.56	44	2.34

Table 9 Tree Protection Zones

8. Tree Protection Zone Impact Assessment

8.1 The following table details the percentage of intrusion caused by the proposed design on each tree. In accordance with the *Australian Standards AS4970:2009 Protection of Trees on Development Sites*.

8.2 Ideally;

All works should be excluded from the Structural Root Zone of any retained tree. It is within this area that those roots are responsible for anchoring the trees in the soil are likely to be found. Damage caused to these roots may cause the tree to become unstable.

8.3 New works within the Tree Protection Zone should be minimised. Any intrusion into a Tree Protection Zone of greater than 10% (measured in m2 of the total area of the radial Tree Protection Zone) is considered unacceptable in accordance with *AS 4970 – 2009 Protection of trees on development sites*. An intrusion of greater than 10% may be manageable but requires review by the Project Arborist to ascertain acceptability based on the specific conditions and any management criteria that may be applicable.

8.4 'Low' or 'No' retention valued trees are recommended for removal to facilitate the best possible tree related cost/benefit scenario throughout the works.

8.5 Tree Protection Intrusions as follows:

ID	Botanical Name	Address	Retention Value	Area of TPZ (m2)	TPZ intrusion %	Area Intruded (m2)	SRZ intrusion %
1	<i>Eucalyptus pseudoglobulus</i>	51 Centre Road Vermont	Low	209.18	21.37%	44.71	0%
2	<i>Prunus cerasifera</i>	51 Centre Road Vermont	Third Party Owned	26.06	0%	0	0%
3	<i>Corymbia maculata</i>	51 Centre Road Vermont	Medium	289.53	22.64%	65.55	0%
4	<i>Corymbia maculata</i>	51 Centre Road Vermont	Medium	228.05	12%	27.37	0%
5	<i>Eucalyptus botryoides</i>	51 Centre Road Vermont	Medium	152.18	5.71%	8.75	0%
6	<i>Acacia implexa</i>	51 Centre Road Vermont	Low	26.06	0%	0	0%
7	<i>Acacia implexa</i>	51 Centre Road Vermont	Low	11.58	43.60%	5.48	42.39%
8	<i>Acacia implexa</i>	51 Centre Road Vermont	Low	11.58	43.60%	5.48	42.39%
9	<i>Eucalyptus melliodora</i>	51 Centre Road Vermont	Low	65.33	0%	0	0%
10	<i>Eucalyptus melliodora</i>	51 Centre Road Vermont	Medium	61.93	0%	0	0%
11	<i>Eucalyptus scoparia</i>	51 Centre Road Vermont	Medium	358.34	52.54%	188.30	8.63%

ID	Botanical Name	Address	Retention Value	Area of TPZ (m2)	TPZ intrusion %	Area Intruded (m2)	SRZ intrusion %
12	<i>Acacia melanoxylon</i>	51 Centre Road Vermont	Low	35.47	16.74%	5.94	5%
13	<i>Photinia robusta</i>	51 Centre Road Vermont	Medium	65.33	0%	0	0%

Table 10 Tree Impact Assessment Table

9. Conclusions

- 9.1 High Retention Value trees or Third Party Owned trees **must be included** in future site surveys for development of this site. Tree Protection Zones (TPZ) (see section 8.3) should be included and clearly displayed in site development building plans for submission to council.
- 9.2 The proposed crossover & carpark modifications within the TPZ of trees 1 & 3 will intrude both respective tree protection zones by greater than 10% which is deemed major in accordance with *Australian standards AS4970:2009 Protection of Trees on Development Sites*. given that the current carpark presents within crushed rock and appears to be significantly compacted it is unlikely roots are present within this area. Any change in base material should be constructed upon existing ground level or have a site grade of less than 100mm in depth. The proposed crossover excavation must be undertaken under supervision of the project arborist.
- 9.3 Trees 4 & 5 will be intruded by the carpark modification. Similar to trees 1 & 3 roots are unlikely to be present within this area and given the level of intrusion it is expected that both trees remain viable landscape components.
- 9.4 Trees 7 & 8 will be majorly intruded by the proposed ramp, these were assessed as low retention worthiness due to their size and form, these trees are Planted Victorian native specimens and will require a permit under SLO9
- 9.5 Trees 6,9 & 10 will not be impacted by the proposed design, tree protection measures must be in place prior to the demolition of the existing playground & sandpit. These trees are expected to remain viable landscape components.
- 9.6 Tree 11 will be severely impacted by the carpark modification, works must be excluded from the structural root zone & modifications are required to reduce the intrusion to less than 10%. Carpark bays 15 & 16 should be removed from the proposed design allowing for a larger lawn area within the structural root zone. These works must be supervised by the project arborist.
- 9.7 Tree 12 is located upon an embankment, this specimen is of good health with a poor structure and should not be retained. Please note this specimen is planted vegetation and does not require a permit under clause 52.17
- 9.8 Tree 13 will have section of the bitumen (existing carpark) demolished and reinstated with a proposed bin enclosure, given the area of tree protection zone already intruded by the car park this is not deemed as a new area of intrusion, the proposed works are simply removal of two car park bays and replacement with a similar base material, roots are not expected to be within the proposed works envelope and therefor no impact has been provided

10. Recommendations

The Following recommendations are in accordance with industry best practices and with *Australian Standard AS4970-2009 Protection of Trees on Development Sites*.

- 10.1 Appoint and consult with a Project Arborist to assist with all Arboricultural matters in relation to development of this site.
- 10.2 Ensure Tree Protection Measures are installed for all trees subjected for retention in accordance with the *Australian standards AS4970:2009 Protection of Trees on Development Sites*.
- 10.3 Modify design to reduce the intrusion of tree 11 to exclude works outside the SRZ.

Arboricultural Assessment report written by:

A handwritten signature in blue ink, appearing to read "R. Howell".

Ricky Howell
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If you have any further questions in regard to this report or any other Arboricultural concerns, please do not hesitate to contact me.

11. References

Standards Australia 2009, AS 4970-2009 Protection of trees on development sites, Sydney

<https://mapshare.vic.gov.au/vicplan/>

Harris, Matheny, Clark, 2003, Arboriculture: Integrated Management of Landscape Trees, Shrubs, and Vines (4th Edition), Prentice Hall

Matheny, Clark, 1998, Trees and development: a technical guide to preservation of trees during land development, International Society of Arboriculture

Standards Australia 2009, AS 4970-2009 Protection of trees on development sites, Sydney

Standards Australia 2007, AS4373-2007 Pruning of Amenity Trees, Sydney

Standards Australian AS4454-1997 Composts, Soil Conditioners and Mulches.

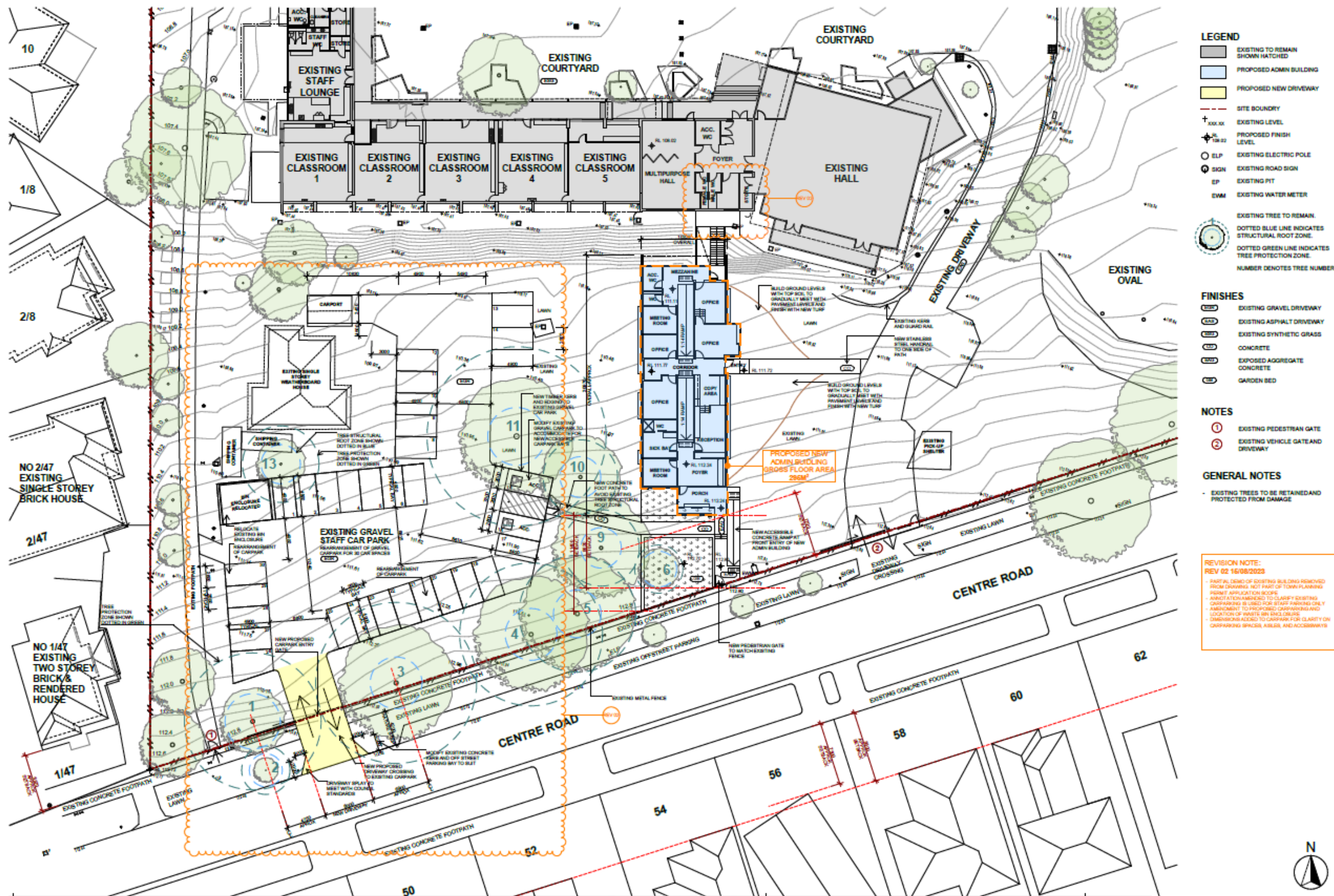
Appendix 1. Tree Data Table

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ID	Origin	Botanical Name	Common Name	Height (m)	Canopy (m)	DBH (cm)	DAB (cm)	Health	Structure	Age	ULE	Tree Retention Value	TPZ	SRZ	Comments
1	Vic. Native	<i>Eucalyptus pseudoglobulus</i>	Gippsland Blue Gum	23	13	68	99	Fair	Very Poor	Mature	<1-15 Years	Medium	8.16	3.30	Tree has been subjected to a large codominate leader failure.
2	Exotic	<i>Prunus cerasifera</i>	Cherry Plum	3	4	24	29	Fair	Poor	Mature	<1-15 Years	Low	2.88	1.97	
3	Aus. Native	<i>Corymbia maculata</i>	Spotted Gum	20	13	80	85	Fair	Fair	Mature	15 - 40 Years	Medium	9.60	3.09	
4	Aus. Native	<i>Corymbia maculata</i>	Spotted Gum	18	12	71	85	Fair	Fair	Mature	15 - 40 Years	Medium	8.52	3.09	
5	Aus. Native	<i>Eucalyptus botryoides</i>	Southern Mahogany	18	12	58	70	Fair	Poor	Mature	15 - 40 Years	Medium	6.96	2.85	Phellinus fruiting bodies on trunk wound at 1m
6	Vic. Native	<i>Acacia implexa</i>	Lightwood	5	4	24	35	Fair	Fair	Semi Mature	<1-15 Years	Low	2.88	2.13	
7	Vic. Native	<i>Acacia implexa</i>	Lightwood	5	4	16	20	Fair	Fair	Semi Mature	<1-15 Years	Low	2.00	1.68	
8	Vic. Native	<i>Acacia implexa</i>	Lightwood	5	4	16	19	Fair	Fair	Semi Mature	<1-15 Years	Low	2.00	1.65	
9	Vic. Native	<i>Eucalyptus melliodora</i>	Yellow Box	12	8	38	47	Fair	Poor	Mature	15 - 40 Years	Low	4.56	2.41	Included bark codominate leader - poor form
10	Vic. Native	<i>Eucalyptus melliodora</i>	Yellow Box	12	8	37	48	Fair	Fair	Mature	> 40 Years	Medium	4.44	2.43	
11	Aus. Native	<i>Eucalyptus scoparia</i>	Wallangarra White Gum	12	14	89	110	Fair	Fair	Mature	15 - 40 Years	Medium	10.68	3.44	
12	Vic. Native	<i>Acacia melanoxylon</i>	Blackwood	8	6	28	35	Fair	Poor	Mature	<1-15 Years	Low	3.36	2.13	Included codominate leaders
13	Exotic	<i>Photinia robusta</i>	Red Leaf Photinia	7	7	38	44	Fair	Fair	Mature	15 - 40 Years	Low	4.56	2.34	

Appendix 2. Proposed Designs

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Appendix 3. Explanation of Tree Assessment Terms

Tree Name: Provides the botanic name, (Genus, species, sub-species, variety and cultivar where applicable) in accordance with the International Code of Botanical Nomenclature (ICBN), and an accepted common name.

Origin: The point of place where the plant is derived

Category	Description
Exotic	A plant that originated outside of Australia
Australian Native	Originates within Australia but outside of Victoria
Victorian Native	Originates within Victoria but it's not localised
Indigenous	Originates within the local region
Weed	Recognised as an environmental weed species

Age: Refers to the life cycle of the tree.

Category	Description
Young	Newly planted tree not fully established may be capable of being transplanted or easily replaced.
Juvenile	Tree is small in terms of its potential physical size and has not reached its full reproductive ability.
Semi-Mature	Tree in active growth phase of life cycle and has not yet attained an expected maximum physical size for its species and/or its location.
Mature	Tree has reached an expected maximum physical size for the species and/or location and is showing a reduction in the rate of seasonal extension growth
Senescent	Tree is approaching the end of its life cycle and is exhibiting a reduction in vigour often evidenced by natural deterioration in health and structure.

Health: Summarizes the health and vigour of the tree.

Category	Description
Excellent	Canopy full with dense foliage coverage throughout, leaves are entire and are of an excellent size and colour for the species with no visible pathogen damage. Excellent growth indicators, e.g. seasonal extension growth.
Good	Canopy full with minor variations in foliage density throughout, leaves are entire and are of good size and colour for the species with minimal or no visible pathogen damage. Good growth indicators.
Fair	Canopy with moderate variations in foliage density throughout, leaves not entire with reduced size and/or atypical in colour, moderate pathogen damage. Reduced growth indicators, visible amounts of deadwood/dieback, and epicormic growth.
Poor	Canopy density significantly reduced throughout, leaves are not entire, are significantly reduced in size and/or are discoloured, significant pathogen damage. Significant amounts of deadwood and/or epicormic growth, noticeable dieback of branch tips, possibly extensive.
Dead	No live plant material observed throughout the canopy, bark may be visibly delaminating from the trunk and/or branches.

Structure: Summarises the structure of the tree from roots to crown.

Category	Description
Good	Good form and branching habit. Minor structural defects that are insignificant and typical or common within the species. e.g. included bark, co-dominant stems. No fungal pathogens present. No visible wounds to the trunk and/or root plate.
Fair	Moderate structural defects present that impact longevity e.g. apical leaders sharing common union(s). Minor damage to structural roots. Small wounds present where decay could begin. No fungal pathogens present. A fair representation of the species.
Poor	Significant structural defects present that have a significant impact on longevity and result in a poor representation of the species e.g. Branch/stems with included bark with failure likely within 0–5 years. Wounding evident with cavities and/or decay present. Damage to structural roots.
Hazardous	Serious structural defects with failure determined to be imminent e imminent (<12 months). Defects may include active splits and/or partial branch or root plate failures. Tree requires immediate arboricultural works to alleviate the associated risk.

Appendix 4. STARS© Retention Matrix

Significance of a Tree, Assessment Rating System* (IACA 2010) – S.T.A.R.S. ©

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

High Significance in landscape

- The tree is in Good condition and Good vigor;
- 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.

Medium Significance in landscape

- The tree is in Fair-Good condition and Good or Low vigor;
- 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.

Low Significance in landscape

- The tree is in fair-poor condition and good or low vigor;
- 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.

Institute of Australian Consulting Arboriculturists (IACA 2010), IACA Significance of a Tree, Assessment Rating System (STARS),

www.iaca.org.au

Useful Life Expectancy: The extent of time that a tree is expected to positively contribute to the landscape in which is set within, as determined by the arborist

Category	Description
0 Years Remove	<p>Trees with a high level of risk that would need removing within the next 5 years.</p> <p>Dead trees.</p> <p>Trees that should be removed within the next 5 years.</p> <p>Dying or suppressed or declining trees through disease or inhospitable conditions.</p> <p>Dangerous trees through instability or recent loss of adjacent trees.</p> <p>Dangerous trees through structural defects, including cavities, decay, included bark, wounds, or poor form.</p> <p>Damaged trees that considered unsafe to retain.</p> <p>Trees that could live for more than 5 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting.</p> <p>Trees that will become dangerous after removal of other trees for the reasons.</p>
<1-15 Years Short	<p>Trees that appear to be retainable with an acceptable level of risk for 5-15 years.</p> <p>Trees that may only live between 5 and 15 more years.</p> <p>Trees that may live for more than 15 years but would be removed to allow the safe development of more suitable individuals.</p> <p>Trees that may live for more than 15 years but would be removed during the course of normal management for safety or nuisance reasons.</p> <p>Storm damaged or defective trees that require substantial remedial work to make safe and are only suitable for retention in the short term.</p>
15 - 40 Years Medium	<p>Trees that appear to be retainable with an acceptable level of risk for 15-40 years.</p> <p>Trees that may only live between 15 and 40 more years.</p> <p>Trees that may live for more than 40 years but would be removed to allow the safe development of more suitable individuals.</p> <p>Trees that may live for more than 40 years but would be removed during the course of normal management for safety or nuisance reasons.</p> <p>Storm damaged or defective trees that require substantial remedial work to make safe and are only suitable for retention in the short term.</p>
> 40 Years Long	<p>Trees that appear to be retainable with an acceptable level of risk for more than 40 years.</p> <p>Structurally sound trees located in positions that can accommodate future growth.</p> <p>Storm damaged or defective trees that could be made suitable for retention in the long term by remedial tree surgery.</p> <p>Trees of special significance for historical, commemorative, or rarity reasons that would warrant extraordinary efforts to secure their long-term retention.</p>

		Tree Significance				
		1. High	2. Medium	3. Low		
		Significance in Landscape	Significance in Landscape	Significance in Landscape	Environmental Pest/ Noxious Weed	Hazardous/ Irreversible Decline
Useful Life Expectancy	Long >40 Years					
	Medium 15 – 40 Years					
	Short <1-15 Years					
	Dead					

Legend for Matrix Assessment	
	Priority for retention (High): These trees are considered important for retention and should be retained and protected. Design modification or re-location of building/s should be considered to accommodate the setbacks as prescribed by the Australian Standard AS4970 Protection of trees on development sites. Tree sensitive construction measures must be implemented if works are to proceed within the Tree Protection Zone.
	Consider for retention (Medium): These trees may be retained and protected. These are considered less critical; however, their retention should remain priority with the removal considered only if adversely affecting the proposed building/works, and all other alternatives have been considered and exhausted.
	Consider for removal (Low): These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.
	Priority for removal (Low): These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.

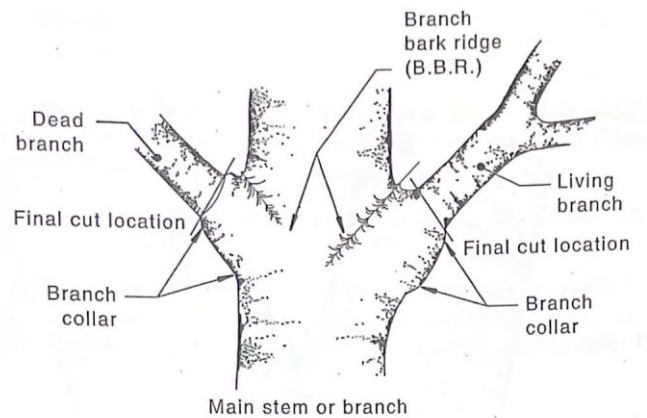
Reference

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

Appendix 5. General Comments

Appendix 5.1 Pruning of Amenity Trees

It is important that all pruning undertaken on trees subjected for retention as conducted in accordance with the *Australian Standard 4373:2007 Pruning of Amenity Trees* and carried out by a suitably qualified arborist with a minimum qualification of AQF3 in Arboriculture or equivalent. Under no circumstances must lopping take place and all pruning undertaken must be pruned to “natural target pruning” as defined with the *Australian Standard 4373:2009*.



Appendix 5.2 Tree Protection Zones

Tree Protection Zones (TPZ) are the principal means of protecting trees on development sites and are defined by *AS 4970-2009 Protection of trees on development sites (Standards Australia, 2009)*.

Provided below is an outline of how TPZs are defined, restrictions on activities within TPZs (see following section) and calculations to measure TPZs.

The TPZ is a combination of the root area and crown area requiring protection. It is an area isolated from construction disturbance, so that the tree remains viable. The TPZ incorporates the structural root zone (SRZ), described in section 2.2.2.

As defined in AS 4970-2009, the radius of the TPZ for an individual tree is calculated as follows:

$$TPZ = DBH \times 12$$

Where DBH = trunk diameter, measured at 1.4m above ground level

A TPZ should not be less than 2m nor greater than 15m (except where crown protection is required). It may be possible to encroach into or make variations to the standard TPZ.

This is further outlined in section 3.3 of AS4970-2009 Protection of Trees on Development Sites

Appendix 5.3 Structural Root Zones

The Structural Root Zone (SRZ) is an area considered essential for tree stability: loss of roots in this area are likely to cause the tree to become unstable in the ground.

As defined in AS 4970-2009, the radius of the SRZ for an individual tree is calculated as follows:

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

Where D = trunk diameter in metres, measured above the root buttress

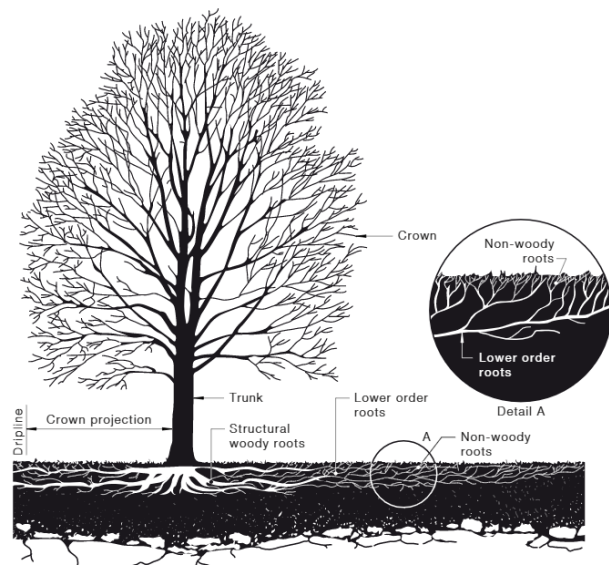
Appendix 5.4 Common Damage Caused During Construction

The following table details common causes of tree death during construction. Where trees are damaged particularly the above ground tree parts these wounds have the potential to provide entry points for pest & disease. These entry points may cause long term decay or can lead to decline in health & in worst case tree death.

Common Causes of Tree Death.		
Injury	Causes	Impact
Root loss	<ul style="list-style-type: none"> - Excavation (even shallow depth) - Perpetration of ground for paving or road surfacing - Trenching for underground service installation - Trenching for footings 	<ul style="list-style-type: none"> - Tree decline or in severe cases death - Partial root failure where a tree may fall to a lean - in severe cases total tree failure
Lack of water and oxygen within the root zone	<ul style="list-style-type: none"> - Compaction for paving construction (to form a stable sub base) - compaction through movement of vehicles and heavy machinery - storing heavy items for long periods (i.e machinery parked in root zone) 	<ul style="list-style-type: none"> - tree decline and in severe causes death
Damage to the canopy or trunk	<ul style="list-style-type: none"> - Poor pruning cuts (including access pruning) - contact damage caused by machinery - resting equipment on trunk - attaching signage of equipment to the tree 	<ul style="list-style-type: none"> - Rot/dieback - Loss of foliage, leading to increased stress - in severe cases, tree may require removal due to safety concerns
Poisoning/scorching	<ul style="list-style-type: none"> - Use of chemicals within the root zone - Accidental impact as a result of nearby chemical use (i.e exhaust blowing up into canopy) 	<ul style="list-style-type: none"> - Tree decline - Dieback or rot as a result of wounding

Appendix 5.5 Roots & Construction

The main function of roots includes the uptake of water & nutrients, anchorage, storage of sugar reserves and the production of some plant hormones required by the shoots, in order for the roots to function, they must be supplied with oxygen from the soil. The root system of trees consists of several types of roots found in different parts of the soil and is generally much more extensive than commonly thought. Damage to the root system is a common cause of tree decline and death. Construction damage such as alteration of existing soil grades are like to have effect on the trees vitality and in worse cases tree stability. Altering soil grades or compaction of soil may not be evident during construction phases and can take several years to show symptoms which by then can become irreversible.



Appendix 5.6 Restricted Activities with a Tree Protection Zone

Activities excluded from Tree Protection Zones (AS 4970-2009) include but are not limited to:

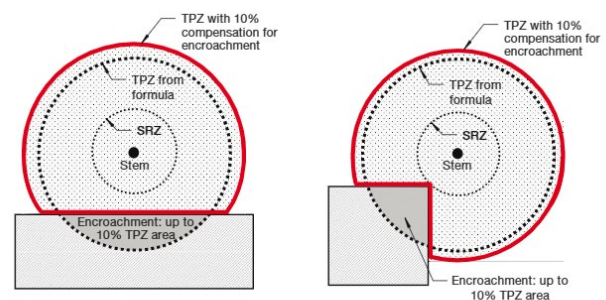
- machine excavation including trenching (unless on approved plans)
- cultivation
- preparation of chemicals, including cement products
- refuelling
- wash down and cleaning of equipment.
- lighting of fires
- temporary or permanent installation of utilities and signs
- excavation for silt fencing
- storage
- parking of vehicles or plant
- dumping of waste
- placement of fill
- soil level changes
- physical damage to the trees.

Appendix 5.7 Tree Protection Encroachment

In accordance with the *Australian Standards 4970:2009 Protection of Trees on Development Sites* it may be possible to encroach into or make variations to the standard TPZ. Encroachment includes excavation, compacted fill and machine trenching.

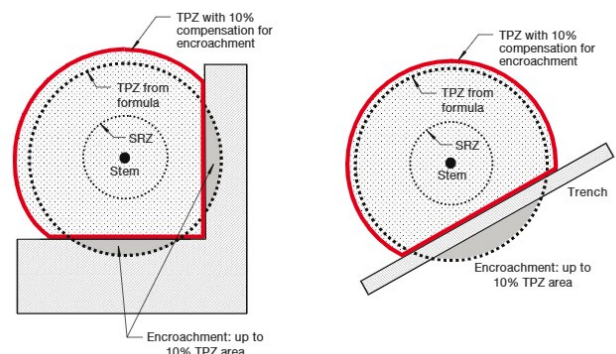
Minor Encroachment

If the proposed encroachment is less than 10% of the area of the TPZ and is outside the SRZ (see Clause 3.3.5), detailed root investigations should not be required. The area lost to this encroachment should be compensated for elsewhere and contiguous with the TPZ. Variations must be made by the project arborist considering relevant factors listed in Clause 3.3.4. The figures in Appendix D demonstrate some examples of possible encroachment into the TPZ up to 10% of the area.



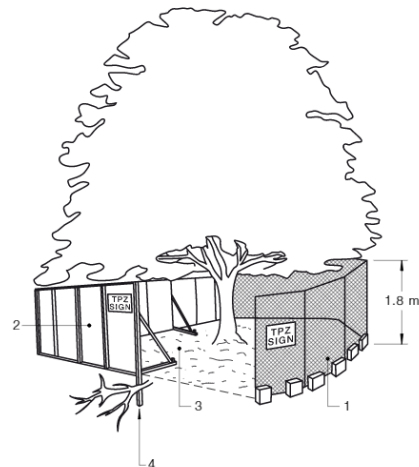
Major Encroachment

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



Appendix 5.8 Tree Protection Zone Fencing

Fencing should be erected 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. The TPZ should be secured to restrict access. AS 4687 specifies applicable fencing requirements. Shade cloth or similar should be attached to reduce the transport of dust, other particulate matter and liquids into the protected area. Fence posts and supports should have a diameter greater than 20 mm and be located clear of roots. Existing perimeter fencing and other structures may be suitable as part of the protective fencing.



Appendix 5.9 Tree Protection Signage

Signs identifying the Tree Protection Zone should be placed around the edge of the Tree Protection Zone at intervals so that it can be visible from all angles within the development site. The lettering on the sign should comply with AS 1319 and clearly state "Tree Protection Zone" "No Access". Signage should be greater than 600mm x 400mm in size and also label the project arborists contact details.

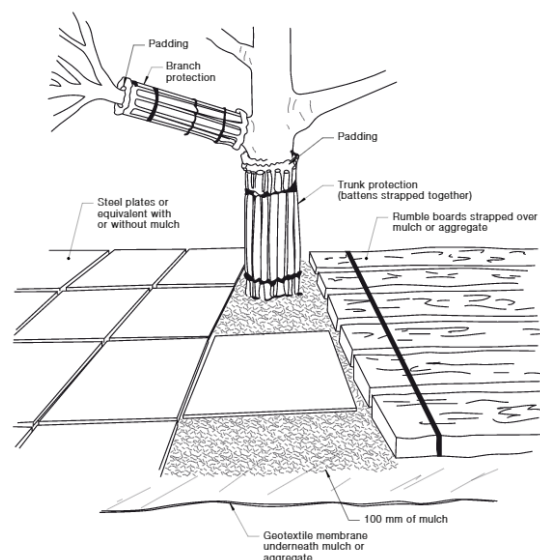


Appendix 5.10 Alternative Protection Measures

Where necessary, install protection to the trunk and branches of trees as shown in Figure 4.

The materials and positioning of protection are to be specified by the project arborist. A minimum height of 2 m is recommended. Do not attach temporary powerlines, stays, guys and the like to the tree. Do not drive nails into the trunks or branches.

If temporary access for machinery is required within the TPZ ground protection measures will be required. The purpose of ground protection is to prevent root damage and soil compaction within the TPZ. Measures may include a permeable membrane such as geotextile fabric beneath a layer of mulch or crushed rock below rumble boards as per the adjacent figure. These measures may be applied to root zones beyond the TPZ.



Appendix 5.11 Mulch

The area contained within the Tree Protection Zone should be mulched with good quality composted wood chip/leaf mulch that complies with *Australian Standards, AS 4454-2012, Composts, soil conditioners, and mulches*, and should be maintained at a depth of 150mm-200mm. Mulching around the base of the tree will provide nutrients and organic matter to the soil as it breaks down, improving and maintaining the overall health of the trees.

Appendix 5.12 Irrigation

Where practical temporary irrigation should be set up in the Tree Protection Zone of all trees to be retained and should distribute water evenly throughout the area of the Tree Protection Zones. The irrigation should be used for at minimum one hour daily throughout all stages of the development. the base of the tree will provide nutrients and organic matter to the soil as it breaks down, improving and maintaining the overall health of the trees.

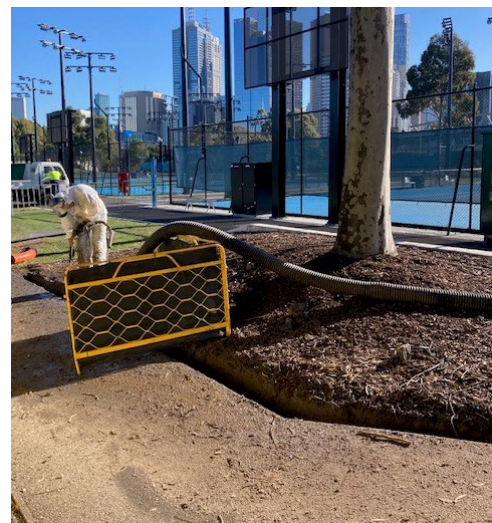
Appendix 5.13 Design Modifications

Works should ordinarily be designed outside of tree protection zones of trees subjected for retention but unfortunately within the urban environment this sometimes can not be avoided below are some options that may help mitigate tree damage and facilitate proposals subjected within the tree protection zones.

Non-Destructive Digging (NDD)

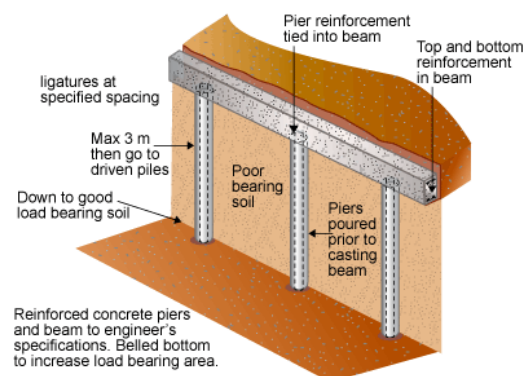
Non-Destructive Digging is described as any method of digging whether it be by hand, air or hydro that is non-invasive to plant tissue, Hydro or Air methods are used to dislodge soil within damaging large roots and can be used to better determine if trees subjected for retention will in fact be damaged by the proposed design.

In some cases hydro excavation can cause irreversible damage to vital root tissue due to high pressure water, therefore it is important that all non-destructive digging methods be supervised by a suitably qualified project arborist with a minimum qualification of AQF5 in Arboricultural or equivalent to ensure no unnecessary damage is caused trees subjected for retention.



Pier & Beam Construction

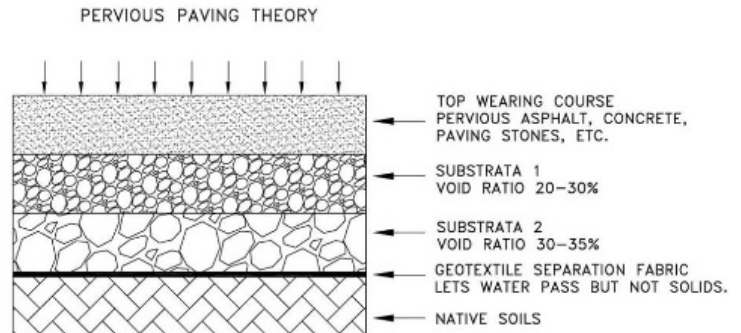
Bored pier footings with beams above ground level or cantilevered to support the floor of a building can be used to minimise encroachment into a TPZ and root damage. Consideration must be given to the soil type and lost catchment area beneath a raised structure. Footings should be positioned so as not to damage larger (>50mm diameter) roots.



Permeable, Porous and Pervious Paving

Permeable paving surfaces are made of either a porous material that enables stormwater to flow through it or nonporous blocks spaced so that water can flow between the gaps. Permeable paving can also include a variety of surfacing techniques for roads, parking lots, and pedestrian walkways.

Permeable pavement surfaces may be composed of; pervious concrete, porous asphalt, paving stones, or interlocking pavers. Unlike traditional impervious paving materials such as concrete and asphalt, permeable paving systems allow stormwater to percolate and infiltrate through the pavement and into the aggregate layers and/or soil below. In addition to reducing surface runoff, permeable paving systems can trap suspended solids, thereby filtering pollutants from stormwater.

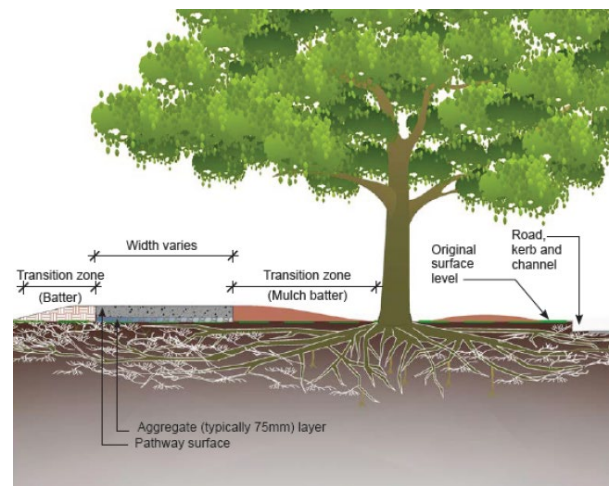


Above Grade Pathway 'No Dig'

Where elevated pathways/decks are considered cost prohibitive, above grade or 'No Dig' pathways are effective at reducing the extent of soil disturbance by avoiding creation of an excavated subbase.

Raised pathways prevent direct root loss by creating an above grade base for the pathway rather than a traditional below grade one which in return reduces soil compaction.

Generally, the treatment will only be required for the section of pathway directly adjacent to the tree in question there should also be enough length in the raised sections of pathway so that the ramps on either end comply with access requirements



Drains and Underground Services

Where underground services are intruding the Tree Protection Zone by greater than 10% or are present within the respective Structural Root Zone of trees proposed for retention, drains or services should be installed by non-destructive measures such as horizontal directional boring at a depth greater than 1100mm or undertaken using hydro excavation at low pressure to ensure roots remain intact.

