Summary

Reason for Assessment
Treelogic was engaged to undertake a visual assessment of trees located within and immediately adjacent to 86-89 Stubbs Street, Kensington; known as 15 Thompson St. The report provides information relating to the trees’ condition and recommended tree protection zones and serves to inform the proposed redevelopment of the site.

Overview
A total of 31 trees were assessed, 24 of which were within the site of proposed redevelopment, with an additional 7 trees assessed on the adjoining road reserve.

The trees on site spanned a wide range of age classes and arboricultural ratings with seven early-mature to mature trees desirable for retention (Moderate A and Moderate B rating), the remainder Moderate C or with a Low rating due to their size or young age.

Under the proposed design plan, all 24 of the site trees would be removed under the proposed design. The removal of two street trees (Tree 6 and Tree 7) to allow construction of vehicular access is required to be negotiated with the City of Melbourne under their Tree Retention and Removal Policy.

Refer to Appendix 1 for tree data, Appendix 2 for tree locations against existing site conditions, Appendix 3 for Tree TPZ of trees to be retained tree against proposed design plan, and Appendix 4 for descriptors used in the assessment.

Tree protection zones (TPZ) and structural root zones (SRZ) were assigned according to the Australian Standard AS4970-2009 Protection of Trees on Development Sites as described in Appendix 5.
Background

Site description and permit requirements

The site is bounded by Thompson Street to the west and Stubbs Street to the east, with laneways on the north and south of the site. The site is currently used for commercial and light industry with about 20% of the site currently having canopy cover.

The site is zoned Mixed Use Zone (MUZ), with no overlays requiring tree retention on site.

The street trees are public trees under the jurisdiction of the City of Melbourne and are covered under their Tree Retention and Removal Policy and the requirements of Section 5.3 must be complied with:

5.3.1. Removals of trees will not occur unless approved by Council.

5.3.2. An authorised agent of Council will undertake any tree removals that are required.

5.3.3. Trees will not be pruned in any form and branches and roots will be removed only by an authorised agent of Council unless Council’s arborist advises otherwise.

5.3.4. Pruning of roots and branches will be in accordance with the Australian Standard AS 4970-2009 Protection of trees on development sites (Australian Standard) or any more recent relevant Standard.

5.3.5. A Tree Protection Zone (TPZ) shall be established for the duration of any works near a tree. A TPZ preserves roots and soil and keeps branches clear of contact with construction equipment and materials.

5.3.6. The tree protection distance method outlined in the Australian Standard will be used for the allocation of tree protection zones (TPZ) for trees. The TPZ for individual trees is calculated based on trunk (stem) diameter (DBH), measured at 1.4 metres up from ground level. The radius of the TPZ is calculated by multiplying the trees DBH by 12. Example; Tree with 40cm DBH requires a TPZ of 4.8 metres. The method provides a TPZ that addresses both the stability and growing requirements of a tree. TPZ distances are measured as a radius from the centre of the trunk at (or near) ground level. There is scope within AS 4970 to modify TPZs with certain provisos. Council’s arborist must approve any modification to a TPZ.

5.3.7. Mechanical excavation on the road, footpath or any public space within the defined TPZ of a tree is not permitted without the approval of Council’s arborist.

5.3.8. Stockpiling of building materials, debris or soil is not permitted within the TPZ of a tree except on existing hard surfaces.

5.3.9. The extent or length of boring in the vicinity of trees will be determined by the TPZ. The entry and exit pits for boring will be positioned outside the designated TPZ for each tree. This requirement should apply unless root sympathetic exploratory investigations have been
undertaken and it has been determined that access within the TPZ will not significantly affect
the tree. A minimum boring depth of 800mm - 1100mm from natural grade to the TOP should
apply under all TPZs. The depth of the boring tunnel should be increased according to the size
of the tree trunk.

5.3.10. Boring depth should also consider soil topography. Boring within the ‘A’ soil horizon
(topsoil) will impact on the root system of the tree, as this area is the most conducive soil
environment for root growth. Boring below this area in the ‘B’ horizon or sub-soil layer will
reduce the impact on the root system of the tree by avoiding most of the lateral and absorbing
roots as well as avoiding root damage to services.

5.3.11. Soil levels and structure must not be altered within TPZ of a tree without permission
from Council’s arborist.

5.3.12. Care shall be taken to ensure that no damage is caused to tree trunks, roots, canopy or
branches during construction.

5.3.13. Where a gantry or hoarding is to be constructed over a footpath the placement of the
footings and gantry structure must not adversely impact trees.

5.3.14. If a tree is enclosed within a hoarding or gantry space, the owner and/or builder are
responsible for implementing a maintenance program for affected trees as approved by Council.

5.3.15. A protection zone should be established for the duration of any development or
construction project according to the measures detailed in this Section 5.

5.3.16. No service pit or hatch is permitted on a nature strip within the TPZ of a tree without
permission from Council’s arborist.

5.3.17. A vehicular crossing is not permitted within the TPZ of a tree without permission from
Council’s arborist.
1 Method

1.1 The site was inspected on 25 July 2019. A total of 31 trees (24 site trees and seven street trees) were assessed. Trees were assessed from the ground with observations made of their growing environment. The trees were not climbed, and no inspection of below ground or internal tree parts was undertaken.

1.2 Observations were made of the assessed trees to determine the species, age category, and condition with measurements taken to establish crown height (measured with a height meter), crown width (paced) and trunk dimensions measured. Where access to neighbouring trees was not possible, estimates of dimensions are included.

1.3 Assessment details of individual trees are listed in Appendix 1. A tree location plan with numbered specimens and groups, as well as showing the TPZ of significant and neighbouring trees potentially encroached by proposed development shown over Title Re-establishment Feature & Level Survey in Appendix 2. Descriptors used in the assessment can be seen in Appendix 3. Discussion on tree protection zones and general tree protection guidelines included in Appendix 4.

1.4 A selection of photographs of the trees were taken for reference and inclusion in the report.

1.5 Each of the assessed trees was attributed an ‘Arboricultural Rating’. The arboricultural rating correlates the combination of tree condition factors (health and structure) with tree amenity value. It should be noted that the arboricultural rating is different to the conservation/ecological values placed on trees by other professions. Definitions of arboricultural ratings can be seen in Appendix 3. Discussion of Tree Protection zones

1.6 The assessed trees have been allocated tree protection zones (TPZ). The Australian Standard, AS 4970-2009, has been used as a guide in the allocation of TPZs for the assessed trees. This method provides a TPZ that addresses both the stability and growing requirements of a tree. TPZ distances are measured as a radius, from the centre of the trunk at (or near) ground level. TPZ measurements for all assessed trees are provided in Appendix 1 and a plan is included showing TPZ of trees encroached. Descriptors used in the tree assessment can be seen in Appendix 3.

1.7 Tree protection zones were calculated and mapped according to the method outlined in Australian Standard AS4970-2009 Protection of Trees on Development Sites.

1.8 Documents viewed:

  Boundary re-establishment Feature and level Survey- by Veris dated 27/02/2019.
  Project Plans- 15 Thompson Street, Kensington- by Hayball dated 31/05/2019.
  Proposed Site Plan- 15 Thompson Street, Kensington TPO1.00 Rev 1 by Hayball dated 23/04/2020.
2 Tree Observations

2.1 Thirty-one trees were assessed in relation to the site. Twenty-four of the trees were within the property. Seven were street trees.

2.2 The remaining woody vegetation at the site was mostly of little arboricultural value being general garden shrubs, and understorey.

2.3 Most (25) assessed trees were Australian native species; with one being a Victorian native. All appeared to be planted on site.

2.4 Most of the trees recorded were of fair condition, showing fair-healthy growth. Their structure was mostly fair to poor based on presence of structural weakness as discussed in Appendix 4.

2.5 The assessed trees varied in size, type, condition and arboricultural merit. Each tree assessed was assigned an Arboricultural Rating. The rating reflects tree retention value from an arboricultural perspective and can be used to assist with decisions relating to tree retention and management. A tree may be assigned an Arboricultural Rating of High, Moderate, Low or None. Descriptors relating to the ratings are provided at Appendix 4. The ratings will not always be consistent with those attributed by other professions as trees may also have specific heritage, landscape or ecological values not necessarily considered in an arboricultural assessment.

2.6 There were no trees of such prominence and standing that they met the criteria for a High-rated tree.

- Six trees were rated Moderate as they have the potential to be a moderate- to long-term component of the landscape. Trees in this category should be considered for retention; with A then B given a higher rating than C.
  - Two large and maturing Pepper Trees (Schinus molle) Trees 27 and 28, within the grounds and visible to the street were rated as Moderate A as they contribute to the landscape character.
  - Four trees including three Pepper Trees (Trees 26, 30, and 31) near the Stubbs Street boundary, and a semi-mature Rose She-oak (Allocasuarina torulosa) Tree 15 in the southeast corner were rated as a Moderate B as their size contributed to landscape character.
- Seventeen trees including the five footpath trees (Trees 1, 2, 3, 4-5) all White Cedars (Melia azedarach), seven Bottlebrush (Callistemon) (Trees 9, 10, 11, 13, 14, 15 and 17), four Rose Sheoak (Trees 18, 19, 20, and 21) and a Pencil Pine
(Cupressus sempervirens ‘Stricta’) were rated as Moderate C mostly due to reduced size.

- The remainder of the assessed trees had Low arboricultural value- due to limited useful life expectancy or small size as in case of street trees (Trees 5 and 6).
- All council managed trees, regardless of arboricultural rating or local law requirements, are required to be afforded appropriate protection to sustain the trees in association with any proposed redevelopment, unless otherwise negotiated with the City of Melbourne and appropriate permits/approvals gained.

3 Design Review and Impact Assessment

3.1 The TPZ according to AS4970 of all street trees to be retained have been placed over Proposed Site Plan (ground Floor), as shown in Appendix 3.

3.2 Trees to be retained that encroach the subject site, must be accurately plotted on proposed development plans.

3.3 Twenty-four assessed site trees (Tree 8 to 31) will require removal under the proposed design.

3.4 A review of the current design was undertaken to determine the impacts on the street trees in proximity to the proposed works, noting that an acceptable building footprint should not encroach by more than 10% into the TPZ of retained trees in accordance with AS4970.

3.5 Tree 7 a street tree, given the location of the proposed underground car park and thus required crossover to enter, is unsustainable.

- According to City of Melbourne’s Tree Retention and Removal Policy Section 5.3.17 a vehicular crossing is not permitted within the TPZ of a tree without permission from Council’s arborist.
- Approval for this is required to be negotiated with the City of Melbourne in accordance with Section 5.3.1. of Tree Retention and Removal Policy. It is a young tree no more than 2 metres in height, contributing little amenity or ecological services.

3.6 The Street trees 1, 2, 3,4,5 and 6 will require protection during both demolition and construction phases in accordance with City of Melbourne’s Tree Retention and Removal Policy in particular-

- 5.3.5. A Tree Protection Zone (TPZ) shall be established for the duration of any works near a tree.
- 5.3.6. The tree protection distance method outlined in the Australian Standard will be used for the allocation of tree protection zones (TPZ) for trees.
5.3.7. Mechanical excavation on the road, footpath or any public space within the defined TPZ of a tree is not permitted without the approval of Council’s arborist.

5.3.8. Stockpiling of building materials, debris or soil is not permitted within the TPZ of a tree except on existing hard surfaces.

5.3.9. The extent or length of boring in the vicinity of trees will be determined by the TPZ. The entry and exit pits for boring will be positioned outside the designated TPZ for each tree. This requirement should apply unless root sympathetic exploratory investigations have been undertaken and it has been determined that access within the TPZ will not significantly affect the tree. A minimum boring depth of 800mm

5.3.11. Soil levels and structure must not be altered within TPZ of a tree without permission from Council’s arborist.

5.3.12. Care shall be taken to ensure that no damage is caused to tree trunks, roots, canopy or branches during construction.

5.3.13. Where a gantry or hoarding is to be constructed over a footpath the placement of the footings and gantry structure must not adversely impact trees.

5.3.14. If a tree is enclosed within a hoarding or gantry space, the owner and/or builder are responsible for implementing a maintenance program for affected trees as approved by Council.

5.3.15. A protection zone should be established for the duration of any development or construction project according to the measures detailed in this Section 5.

5.3.16. No service pit or hatch is permitted on a nature strip within the TPZ of a tree without permission from Council’s arborist.

3.7 The TPZ of three footpath trees (Tree 1, 2 and 3) along the Stubbs Street boundary are shown to have TPZ encroachment from proposed construction to the boundary.

- Tree 3 is shown on plan with excessive encroachment of its TPZ at approximately 11.5%; however, the TPZ is reasonably adjusted to less than 10% (and therefore is acceptable) based on the location of existing concrete steps within the TPZ area.
  - As this tree overhangs the property by about 3 metres pruning back to boundary will need to be negotiated with City of Melbourne in accordance with Section 5.3.3. of Tree Retention and Removal Policy.

- Trees 1 and 2 are shown with an acceptable level of TPZ encroachment, as is less than 10% (~7%).

- As both these trees overhang property by about 1 metre pruning back to boundary will need to be negotiated with City of Melbourne (as for Tree 3 above).
3.8 In accordance with Section 6 of City of Melbourne’s Tree Retention and Removal Policy as activity is planned with the TPZ of public trees (Trees 1, 2 and 3) prior to commencement of a development project, a project owner or representative shall prepare a Tree Protection Management Plan in accordance with the Australian Standard which is to be prepared by a certified arborist.

3.9 Two tree species are shown on landscape palette for site being Maidenhair Tree *Ginkgo biloba* and Japanese Maple *Acer palmatum* ‘Seiryu’.

4 Conclusions

4.1 Thirty-one trees were assessed in relation to the proposed development at 86-96 Stubbs Street: known as 15 Thompson Street Kensington

4.2 All 24 site trees are required to be removed to undertake development as proposed. This includes six trees with a Moderate A or B arboricultural rating, two of which were large and maturing Pepper Trees (Trees 27 and 28).

4.3 There are no planning requirements to retain the trees on site.

4.4 Permission to remove the street trees (Tree 6 and Tree 7) which were juvenile White Cedar trees is required to be negotiated with the City of Melbourne under their Tree Retention and Removal Policy.

4.5 Tree Protection Management Plan is likely to be required for the street trees all Tree 1, 2, 3, 4, 5 and 6 on Stubbs Street.

4.6 Pruning back to boundary of trees 1, 2 and 3 will need to be negotiated with City of Melbourne.

4.7 If the recommendations of section 3 of this report are followed the street trees are likely to remain viable throughout the demolition and building phases of this project.

Under no circumstance shall this report be reproduced unless in full.

Julie Roach

Photos

Image 1 (Above): Mod A rated Pepper Tree (Tree 27)

Image 2 (Above): Mod A rated Pepper Tree (Tree 28)

Image 3 (Above): Mod B rated Pepper Tree (Tree 26)

Image 4 (Above): Mod B rated Rose Sheoak Tree 15 (Circled)
Image 5 (Left): Showing Mod rated Pepper Trees: Tree 30 –(right )and Tree 31 (left)

Image 6 (Left): Showing Stubbs Street frontage and Street trees, Tree 1 (front) throught to Tree 7 (rear)
Appendix 1: Tree Observations Table for 15 Kensington Street, Kensington, Victoria.

Refer to following 3 pages.

DBH = Diameter at Breast Height (measured 1.4m above ground unless otherwise stated). ULE = Useful Life Expectancy. Arb. rating = arboricultural rating. TPZ = Tree Protection Zone. SRZ = Structural Root Zone. TPZ & SRZ measurements are radius in metres from the centre of the trunk per AS 4970-2009. Definitions of the descriptor categories used in the assessment can be seen in Appendix 3.

<table>
<thead>
<tr>
<th>Species and Common Name</th>
<th>Common Name</th>
<th>Type</th>
<th>DBH (cm)</th>
<th>Basal (cm)</th>
<th>HxW (m)</th>
<th>Age</th>
<th>Health</th>
<th>Structure</th>
<th>ULE (years)</th>
<th>Comment</th>
<th>Arb. rating</th>
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<th>SRZ (m)</th>
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Tree Logic Pty Ltd Unit 4, 21 Eugene Terrace Ringwood VIC 3134

Tree Report 86-96 Stubbs Street, Kensington TLRef 009820
<p>| Callistemon viminalis-Weeping Bottlebrush | White Cedar | Australian native | 8 | 12 | 5X5 | Semi-mature | Fair-poor | Fair-poor | 6-10 | Leaning with asymmetric crown | Low | 2.0 | 1.5 |
| Callistemon viminalis-Weeping Bottlebrush | White Cedar | Australian native | 14 | 28 | 6X4 | Semi-mature | Fair | Fair-poor | 11-20 | Moderate C | 2.0 | 1.9 |
| Callistemon viminalis-Weeping Bottlebrush | White Cedar | Australian native | 22 | 37 | 7X5 | Maturing | Fair | Fair-poor | 11-20 | Moderate C | 2.6 | 2.2 |
| Callistemon viminalis-Weeping Bottlebrush | White Cedar | Australian native | 14,10 | 24 | 5X5 | Maturing | Fair | Fair-poor | 11-20 | Moderate C | 2.0 | 1.8 |
| Allocasuarina torulosa-Rose Sheoak | Australian native | 19 | 30 | 9X6 | Early maturity | Fair | Fair | 21-40 | Moderate B | 2.3 | 2.0 |
| Callistemon Cvr.-Bottlebrush | Australian native | 12,11,10,10 | 38 | 7X3 | Maturing | Fair | Fair-poor | 11-20 | Moderate C | 2.6 | 2.2 |
| Allocasuarina torulosa-Rose Sheoak | Australian native | 28 | 39 | 9X5 | Early maturity | Fair | Fair-poor | 21-40 | Asymmetric | Moderate C | 3.4 | 2.2 |
| Allocasuarina torulosa-Rose Sheoak | Australian native | 12 | 20 | 6X2 | Semi-mature | Fair | Fair-poor | 11-20 | Moderate C | 1.4 | 1.7 |
| Allocasuarina torulosa-Rose Sheoak | Australian native | 22 | 34 | 9X4 | Semi-mature | Fair | Fair-poor | 21-40 | Moderate C | 2.6 | 2.1 |
| Allocasuarina torulosa-Rose Sheoak | Australian native | 14 | 26 | 9X3 | Semi-mature | Fair | Fair-poor | 21-40 | Deadwood. | Moderate C | 1.7 | 1.9 |
| Pittosporum undulatum | Victorian native | 50 | 62 | 8X7 | Maturing | Fair | Fair-poor | 11-20 | Deadwood. | Low | 6.0 | 2.7 |
| Pittosporum undulatum | Victorian native | 12 | 17 | 5X4 | Semi-mature | Fair | Fair | 11-20 | Low | 2.0 | 1.6 |</p>
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<td>Fair</td>
<td>Fair</td>
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Appendix 3: TPZ of retained trees
Appendix 4: Tree Protection Zones

1. Introduction
To sustain trees on a development site, consideration must be given to the establishment of tree protection zones.

The physical dimensions of tree protection zones can sometimes be difficult to define. The projection of a tree’s crown can provide a guide but is by no means the definitive measure. The unpredictable nature of roots and their growth, differences between species and their tolerances, and observable and hidden changes to the trees growing environment, because of development, are variables that must be considered.

Most vigorous, broad canopied trees survive well if the area within the drip-line of the canopy is protected. Fine root density is usually greater beneath the canopy than beyond (Gilman, 1997). If few to no roots over 3cm in diameter are encountered and severed during excavation the tree will probably tolerate the impact and root loss. A healthy tree can sustain a loss of between 30% and 50% of absorbing roots (Harris, Clark, Matheny, 1999), however encroachment into the structural root system of a tree may be problematic.

The structural root system of a tree is responsible for ensuring the stability of the entire tree structure in the ground. A tree could not sustain loss of structural root system and be expected to survive let alone stand up to average annual wind loads upon the crown.

2. Allocation of tree protection zone (TPZ)
The most important consideration for the successful retention of trees is to allow appropriate above and below ground space for the trees to continue to grow. This requires the allocation of tree protection zones for retained trees.

The method of allocating a TPZ to a tree will be influenced by site factors, the tree species, its age, and developed form.

Once it has been established, through an arboricultural assessment, which trees and tree groups are to be retained, the next step will require careful management through the development process to minimise any impacts on the designated trees. The successful retention of trees on any particular site will require the commitment and understanding of all parties involved in the development process.

The most important activity, after determining the trees that will be retained, is the implementation of a TPZ.

The intention of tree protection zones is to:

- mitigate tree hazards;
- provide adequate root space to sustain the health and aesthetics of the tree into the future;
- minimise changes to the trees growing environment, which is particularly important for mature specimens;
- minimise physical damage to the root system, canopy and trunk; and
- define the physical alignment of the tree protection fencing

The Australian Standard AS 4970-2009 Protection of trees on development sites has been used as a guide in the allocation of TPZs for the assessed trees. The TPZ for individual trees is calculated based on trunk (stem) diameter (DBH), measured at 1.4 metres up from ground level. The radius of the TPZ is calculated by
multiplying the trees DBH by 12. The method provides a TPZ that addresses both the stability and growing requirements of a tree. TPZ distances are measured as a radius from the centre of the trunk at (or near) ground level. The minimum TPZ should be no less than 2m and the maximum no more than 15m radius. The TPZ of palms should be not less than 1.0m outside the crown projection.

Encroachment into the TPZ is permissible under certain circumstances though is dependent on both site conditions and tree characteristics. Minor encroachment, up to 10% of the TPZ, is generally permissible provided encroachment is compensated for by recruitment of an equal area contiguous with the TPZ. Examples are provided in Diagram 1. Encroachment greater than 10% is considered major encroachment under AS4970-2009 and is only permissible if it can be demonstrated that after such encroachment the tree would remain viable.

The 10% encroachment on one side equates to approximately ½ radial distance. Tree root growth is opportunistic and occurs where the essentials to life (primarily air and water) are present. Heterogeneous soil conditions, existing barriers, hard surfaces and buildings may have inhibited the development of a symmetrically radiating root system.

Existing infrastructure around some trees may be within the TPZ or root plate radius. The roots of some trees may have grown in response to the site conditions and therefore if existing hard surfaces and building alignments are utilised in new designs the impacts on the trees should be minimal. The most reliable way to estimate root disturbance is to find out where the roots are in relation to the demolition, excavation or construction works that will take place (Matheny & Clark, 1998). Exploratory excavation prior to commencement of construction can help establish the extent of the root system and where it may be appropriate to excavate or build.

The TPZ should also consider the canopy and overall form of the tree. If the canopy requires severe pruning to accommodate a building or other works and in the process the form of the tree is diminished it may be worthwhile considering altering the design or removing the tree.

3. General tree protection guidelines

The most important factors are:

- Prior to construction works the trees nominated for tree works should be pruned to remove larger dead wood. Pruning works may also identify other tree hazards that require remedial works.
• Installation of tree protection fencing. Once the tree protection zones have been determined the next step is to mulch the zone with woodchip and erect tree protection fencing. This must be completed prior to any materials being brought on-site, erection of temporary site facilities or demolition/earth works. The protection fencing must be sturdy and withstand winds and construction impacts. The protection fence should only be moved with approval of the site supervisor. Other root zone protection methods can be incorporated if the TPZ area needs to be traversed.
  • Appropriate signage is to be fixed to the fencing to alert people as to importance of the tree protection zone.
  • The importance of tree preservation must be communicated to all relevant parties involved with the site.
  • Inspection of trees during excavation works.

4. Exploratory excavation

The most reliable way to estimate root disturbance is to find out where the roots are in relation to the demolition, excavation or construction works that will take place (Matheny & Clark, 1998).

Exploratory excavation prior to commencement of construction can help establish the extent of the root system and where it may be appropriate to excavate or build. This also allows management decisions to be made and allows time for redesign works if required.

Any exploratory excavation within the allocated TPZ is to be undertaken with due care of the roots. Minor exploration is possible with hand tools. More extensive exploration may require the use of high pressure water or air excavation techniques. Either hydraulic or pneumatic excavation techniques will safely expose tree roots; both have specific benefits dependent on the situation and soil type. An arborist is to be consulted on which system is best suited for the site conditions.

Substantial roots are to be exposed and left intact.

Once roots are exposed decisions can be made regarding the management of the tree. Decisions will be dependent on the tree species, its condition, its age, its relative tolerance to root loss, and the amount of root system exposed and requiring pruning.

Other alternative measures to encroaching the TPZ may include boring or tunnelling.

5. How to determine the diameter of a substantial root

The size of a substantial root will vary according to the distance of the exposed root to the trunk of the tree. The further away from the trunk of a tree that a root is, the less significant the root is likely to be to the tree’s health and stability.

The determination of what is a substantial root is often difficult because the form, depth and spread of roots will vary between species and sites. However, because smaller roots are connected to larger roots in a framework, there can be no doubt that if larger roots are severed, the smaller roots attached to them will die. Therefore, the larger the root, the more significant it may be.

Gilman (1997) suggests that trees may contain 4-11 major lateral roots and that the five largest lateral roots account (act as a conduit) for 75% of the total root system. These large lateral roots quickly taper within a distance to the tree, this distance is identified as the Structural Root Zone (SRZ). Within the SRZ distance, all roots and the soil surrounding the roots are deemed significant.

6. No root or soil disturbance is permitted within the SRZ
In the area outside the SRZ the tree may tolerate the loss of one or a number of roots. The table below indicates the size of tree roots, outside the SRZ that would be deemed substantial for various tree heights. The assessment of combined root loss within the TPZ would need to be undertaken by an arborist on an individual basis because the location of the tree, its condition and environment would need to be assessed.

<table>
<thead>
<tr>
<th>Height of tree</th>
<th>Diameter of root</th>
<th>Height of tree</th>
<th>Diameter of root</th>
</tr>
</thead>
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<tr>
<td>Less than 5m</td>
<td>≥ 30mm</td>
<td>Less than 5m</td>
<td>≥ 30mm</td>
</tr>
<tr>
<td>Between 5m - 15m</td>
<td>≥ 50mm</td>
<td>Between 5m - 15m</td>
<td>≥ 50mm</td>
</tr>
<tr>
<td>More than 15m</td>
<td>≥ 70mm</td>
<td>More than 15m</td>
<td>≥ 70mm</td>
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</tbody>
</table>

7. Ground buffering

Where works are required to be undertaken within the tree root zone, surface, ground buffering and trunk and limb protection must be provided to minimise the potential for soil to become compacted and avoid potential for impact wounds to occur to surface roots, trunk or limbs. Refer below.
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There can be no guarantees provided for on-going tree safety. It should be noted that not all of the potential structural concerns associated with trees can be eliminated and that there will always be a residual risk following any mitigation works. Also, not all tree defects are observable and extreme weather events are unpredictable. Since trees are complex, living organisms, it is difficult to quantify and precisely measure all variables when inspecting a standing tree for hazard.

Trees should be reassessed on a regular basis; the scheduled period of reassessment will be dependent on the characteristics of the tree, the landscape context and perceived targets, and resources available to maintain them.