

Arboricultural Root Investigation Report

Site location:

59 Alexander Street Manly
NSW

Prepared for:

Space Landscape Designs

Prepared by: Bryce Claassens

Urban Arbor Pty Ltd

Date Prepared: 16 September 2021

Ref: 210916-59 Alexander St-ARIR

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1. INTRODUCTION

- 1.1 Urban Arbor have been instructed by Space Landscape Designs to carry out root investigations to determine if significant roots are located within an area of proposed construction adjacent to one tree that adjoins the site.
- 1.2 Below is a list of all documents and information provided to assist in preparing this report;
 - A) Architectural Drawings, Space Landscape Designs, Revision C - 25 August 2021.
 - B) Arboricultural Impact Assessment Report, Urban Arbor Pty Ltd, Ref: 210831_59 Alexander St_AIA, 31 August 2021.
- 1.3 Urban Arbor completed the site inspection and root investigations on 16 September 2021. Access was available to the subject site and adjoining public areas only. The tree information used in this report has been duplicated from the Arboricultural Impact Assessment Report by Urban Arbor, dated 31 August 2021. The root and trench information used in this report was collected during the site inspection on 16 September 2021.

2. SCOPE OF THE REPORT

- 2.1 This report has been undertaken to meet the following objectives.
 - 2.1.1 Conduct root investigations to identify if significant woody roots are present in the location of one area of proposed works within the Tree Protection Zone (TPZ) of tree 1. Tree 1 is a street tree located to the North of the site.
 - 2.1.2 The proposed works within the TPZ of tree 1 include excavations for the proposed driveway crossover (trench 1).
 - 2.1.3 For the purpose of the investigations, a significant root is a root with a diameter equal to or greater than 40mm.

3. LIMITATIONS

- 3.1 The observations and recommendations are based on one site inspection. The findings of this report are based on the observations and site conditions at the time inspection.
- 3.2 The report reflects the subject tree as found on the day of inspection. Any changes to the growing environment of the subject tree, or tree management works beyond those recommended in this report may alter the findings of the report. There is no warranty, expressed or implied, that problems or deficiencies relating to the subject tree, or subject site may not arise in the future.
- 3.3 All diagrams, plans and photographs included in this report are visual aids only, and are not to scale unless otherwise indicated.
- 3.4 No specific tree risk assessment has been undertaken for the trees at the site.
- 3.5 Alteration of this report invalidates the entire report.

4. METHODOLOGY

- 4.1 The following information was collected during the assessment and root investigations of the subject tree.
 - 4.1.1 Location of roots
 - 4.1.2 Diameter of roots
 - 4.1.3 Depth of roots
 - 4.1.4 Notes/comments
- 4.2 Non-destructive root investigations were undertaken by the means of hand excavation, using digging shovels, small trowels and a digging knife. Root investigations took place in one area of proposed works within the TPZ of tree 1 (see Appendix 1).
- 4.3 Tree root diameter was measured using a DBH tape or in some cases estimated. The other tools used during the assessment were a nylon mallet, compass, camera, steel tape, wheel tape and a steel probe.

5. TREE INFORMATION

5.1 Tree 1 Information

Tree 1 is a mature Bunya Pine (*Araucaria bidwillii*) with an approximate height of 17m and a crown spread (radius at widest section of crown) of 6m. The tree has a DBH of 960mm and a DAB of 1090mm. Tree 1 has a TPZ of 11.5 metres and an SRZ of 3.4 metres, measured in radius from the centre of the trunk.

6. TRENCH 1 OBSERVATIONS & CONCLUSIONS

6.1 Trench 1 Information: Root investigations were completed in the location of the North and East footprint of the proposed driveway crossover excavations within the TPZ of tree 1 and are referred to as trench 1 (Image 1). Trench 1 was 4.9m in length and 250mm in width (Image 2). Trench 1 was 350mm in depth. The excavated material was predominantly turf underlay (80/20 sand/loam mixture). The aim of the trench 1 root investigations was to determine if any significant roots would be impacted by the proposed driveway crossover excavations, and to recommend tree sensitive construction options for the driveway crossover.

6.1.1 Trench 1 Root Observations

Five roots were identified within root investigations trench 1, including root 1, 2, 3, 4 and 5 (Image 3, 4, 5, 6, 7, 8 and 9). Root 1, 2, 3, 4 and 5 appeared to be emanating from tree 1 and had bark consistent with that of tree 1. All the identified roots are located within the TPZ and the SRZ of tree 1. Roots 1, 2, 3 and 5 were greater than 40mm in diameter and are considered critical to the condition and stability of the tree. All the identified roots are located at a depth of 240mm or greater below the existing ground levels (Image 10, 11 and 12).

6.1.2 Table 1: All roots identified in trench 1 have been listed in the table below (see section 7 Trench 1 Photographs for root images and locations).

Root No.	Diameter (mm)	Depth of root (mm)	Distance from centre tree (m)	Location along trench (m)
1	250	240	2.5	1.85
2	290	270	2.3	2.27
3	130	260	2.1	2.7
4	25	300	3.3	4.5
5	80	330	3.4	4.6

Notes:

- Root diameter measured adjacent to side of trench closest to tree.
- Depth of root measured from the top of the root to existing grade.
- Location along trench measured from the West side of the trench to the East side of the trench and continuing to the Southeast side of the trench.

6.2 Trench 1 Conclusions

- 6.2.1 To conclude, five roots were identified within root investigations trench 1, including root 1, 2, 3, 4 and 5. Root 1, 2, 3, 4 and 5 appeared to be emanating from tree 1 and had bark consistent with that of tree 1. All the identified roots are located within the TPZ and the SRZ of tree 1. Roots 1, 2, 3 and 5 were greater than 40mm in diameter and are considered critical to the condition and stability of the tree. All the identified roots are located at a depth of 240mm or greater below the existing ground levels.
- 6.2.2 Due to the depth of the identified roots within trench 1, it is possible to retain the roots below the proposed driveway crossover. It is essential to retain the identified roots to ensure the condition and stability of tree 1 is not impacted. Therefore, tree sensitive driveway construction is required to ensure the identified roots can be retained. It must be demonstrated by the project engineer that the following construction methods can be implemented.
- 6.2.3 **Tree Sensitive Driveway Crossover Construction :** To retain tree 1 in a viable condition, the driveway crossover must be constructed in a tree sensitive method. The driveway crossover should be constructed above the identified roots.
- The excavations should be supervised by a project Arborist with a minimum AQF level 5 qualification. All excavations for the driveway crossover should be carried out manually to avoid impacting retained tree roots. All tree roots greater than 40mm in diameter should be retained unless the project arborist has assessed and advised that the pruning/severing of the root will not impact the condition or stability of the tree. Manual excavation may include the use of hand tools, pneumatic and hydraulic tools, high-pressure air or a combination of high-pressure water and a vacuum device. The excavated material in the root investigations was 80/20 turf underlay, which is relatively easy to remove. Therefore, careful manual excavation with hand tools is the recommended option.
- Where tree roots greater than 40mm are encountered that must be retained, the surfacing should be elevated over the individual tree root to allow for its retention. Examples of methods that can be used to bridge individual tree roots that fall within the alignment of the surfacing have been included below (Image A and B). Using pier and beam bridges as per image B is the recommended/preferred method, as it will allow for future growth of the tree roots, reducing future damage to the surfacing from the roots.

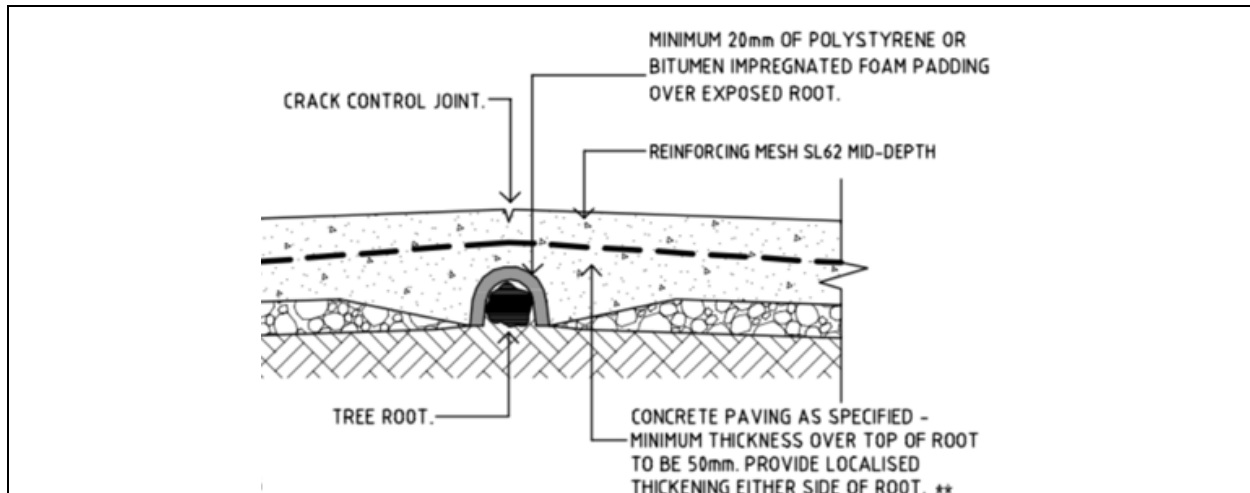


Image A: Example method for bridging concrete surfacing over tree roots provided in the Canterbury Bankstown Council standard drawings.¹

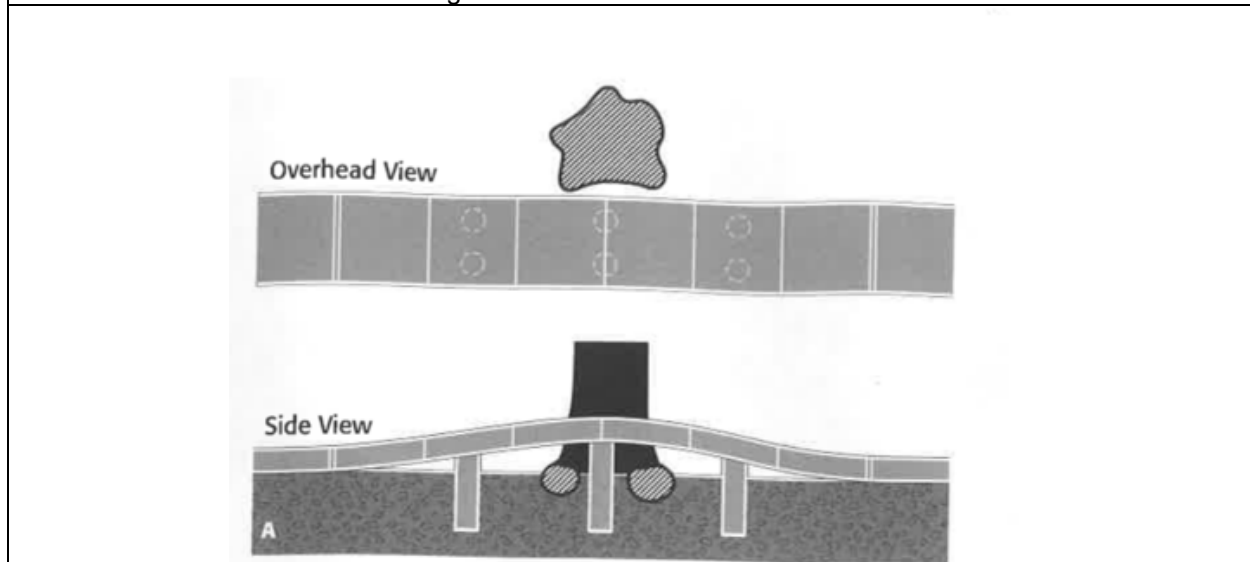


Image B: Example method from Reducing infrastructure damage by tree roots: A compendium of strategies.²

¹ Canterbury Bankstown Council standard drawing S-209 Existing street tree treatments, <https://www.cbccity.nsw.gov.au/development/planning-control-policies/council-standard-drawings>, accessed 3 October 2019.

² Costello, L. R., & Jones, K. S, *Reducing infrastructure damage by tree roots: A compendium of strategies*, Western Chapter of the International Society of Arboriculture, 31883 Success Valley Drive, Porterville, CA (2003), page 27.

Report on trees at: 59 Alexander St, Manly, NSW.

Prepared for: Space Landscape Designs.

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Date: 16 September 2021.

6.3 Additional Development Related Impacts to Consider

- 6.3.1 The new front boundary wall will replace the existing front boundary wall. This will not impact the root system of tree 1 providing that no excavations are required for the footings of the new wall. To ensure that the tree is not impacted by the new wall, the footings of the new wall should be located at the same grade as the existing wall footings. If additional excavations are required, the footings must be installed in accordance with the following tree sensitive footing specifications.
- 6.3.2 **Tree Sensitive Boundary Wall Footings:** To minimise root loss in the TPZ of the tree, the footings of the proposed front boundary wall should be pier and beam/suspended slab style footings to bridge over significant tree roots and minimise root loss. To ensure that significant tree roots are retained, it must be demonstrated by the project engineer that the following construction methods can be implemented;
- All excavations for piers must be carried out manually under the supervision of the project Arborist (see section 6.2.3 for details of manual excavation).
 - The location of piers must be flexible to avoid significant roots (roots greater than 40mm in diameter). All roots greater than 40mm in diameter must be retained unless the project arborist has assessed and approved in writing that severing the root will not impact the condition or stability of the tree.
 - Horizontal footing components must be located on or above the existing soil grades.
 - The piers should be located a minimum of 200mm from any root to be retained that is greater than 40mm in diameter.

7. TRENCH 1 PHOTOGRAPHS



Image 1: Looking East from the nature strip, showing tree 1 and trench 1.



Image 2: Looking South towards trench 1, showing the length of the trench.



Image 3: Looking West towards root investigation trench 1, showing the location of roots 1, 2, 3, 4 and 5.



Image 4: Looking South within root investigation trench 1, showing root 1, 2 and 3.



Image 5: Looking South within trench 1, showing a close up of root 1 (250mm diameter).



Image 6: Looking South within trench 1, showing a close up of root 2 (290mm diameter).



Image 7: Looking South within trench 1, showing a close up of root 3 (130mm diameter).



Image 8: Looking West within trench 1, showing a close up of root 4 (25mm diameter).



Image 9: Looking West within trench 1, showing a close up of root 5 (80mm diameter).



Image 10: Looking North within trench 1, showing the depth of root 1 (240mm below existing grade).



Image 11: Looking North within trench 1, showing the depth of root 2 (270mm below existing grade).



Image 12: Looking North within trench 1, showing the depth of root 3 (260mm below existing grade).

8. BIBLIOGRAPHY/REFERENCES

- Council Of Standards Australia, *AS4970 Protection of trees on development sites* (2009).

9. LIST OF APPENDICES

The following are included in the appendices:

Appendix 1 - Site Plan

Appendix 2 - Further Information of Methodology



Bryce Claassens

Diploma of Arboriculture (AQF5)

Cert III Landscape Construction

Member Arboriculture Australia

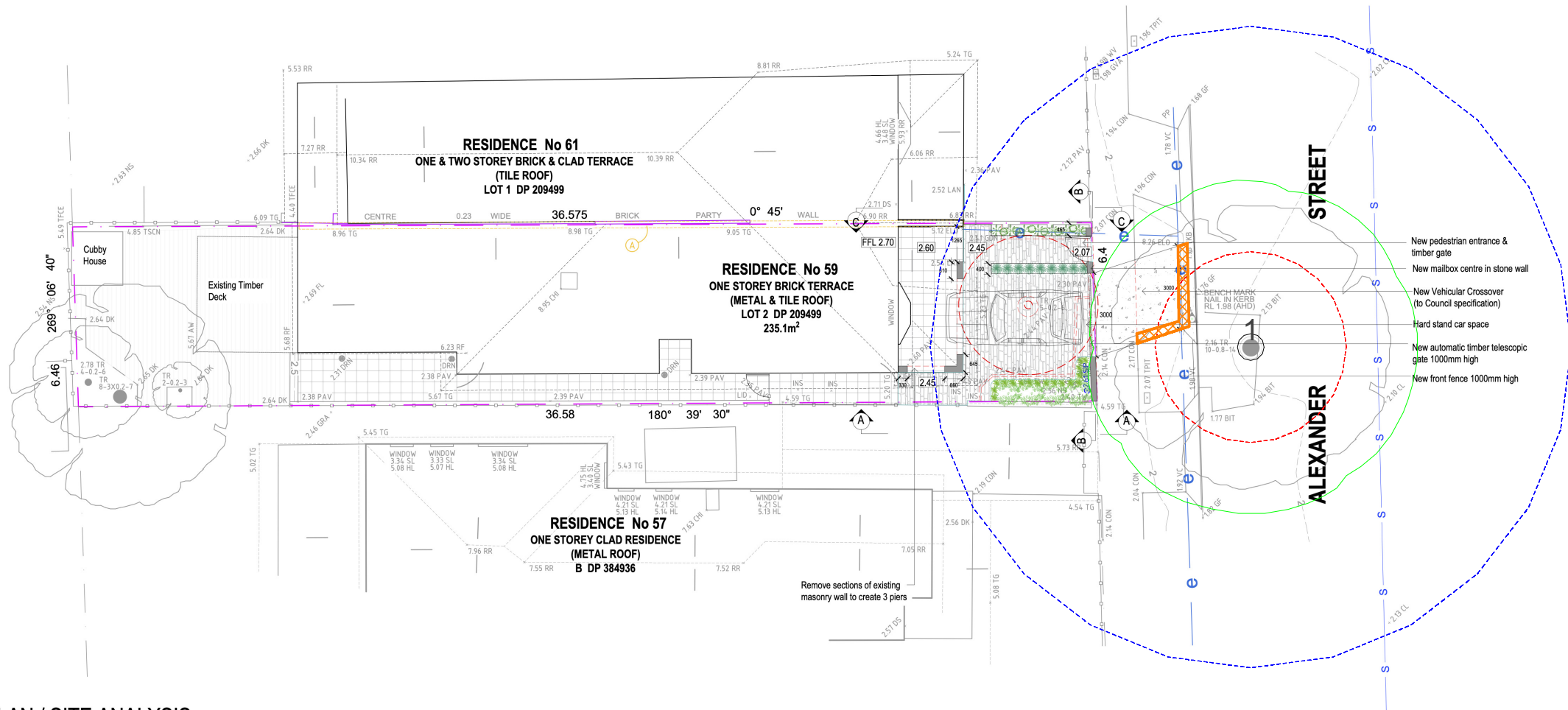
Quantified Tree Risk Assessment (QTRA)

ISA Tree Risk Assessment Qualification (TRAQ)

- LEGEND
- BOUNDARY
 - SEWER
 - EASEMENT
 - EXISTING CONTOURS
 - TO BE REMOVED
 - PROPOSED CONCRETE
 - EXISTING PAVING
 - PROPOSED PAVING (FILETTI PORPHYRY NATURAL STONE)
 - PROPOSED AUTOMATIC TIMBER TELESCOPIC GAT
 - PROPOSED STONE WALL 1000mm HIGH
 - TURF
 - PROPOSED LEVELS
 - TREE TO BE RETAINED
 - PALM TO BE REMOVED

23 SEC 1 DP 4603

24 SEC 1 DP 4603



SITE PLAN / SITE ANALYSIS

SCALE 1:100

Urban Arbor Pty Ltd

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02 8004 2802, sales@urbanarbor.com.au

Site Location: 59 Alexander St, Manly, NSW

SCALE :
1 : 200 @ A3

DATE :
16/09/21

Plan Title: Appendix 1 - Site Plan

URBAN ARBOR
The Trusted Name in Tree Management

Prepared by: Bryce Claassens

Map Legend

- Root Investigation Trench 1
- Tree Crown
- Tree Protection Zone
- Structural Root Zone

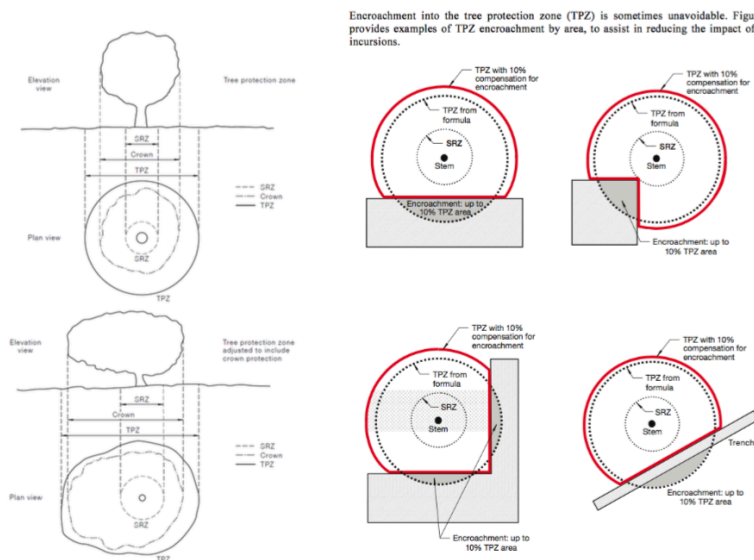
0 15m

Appendix 2 - Further Information of Methodology

1. **Tree Protection Zone:** The tree protection zone (TPZ) is the principle means of protecting trees on development sites. 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 radius of the TPZ is calculated for each tree by multiplying its DBH x 12. The derived value is measured in radius from the centre of the stem/trunk at ground level. A TPZ should not be less than 2.0 metres nor greater than 15 metres (except where crown protection is required). It is commonly observed that tree roots will extend significant further than the indicative TPZ, however the TPZ is an area identified AS4970-2009 to be extent where root loss or disturbance will generally not impact the viability of the tree. The TPZ is identified as a restricted area to prevent damage to trees either above or below ground during a development. Where trees are intended to be retained proposed developments must provide an adequate TPZ around trees. The TPZ is set aside for the tree's root zone, trunk and crown and it is essential for the stability and longevity of the tree. The tree protection also incorporates the SRZ (see below for more information about the SRZ). I have calculated the TPZ of palms, other monocots, cycads and tree ferns at one metre outside the crown projection. See appendices for additional information about the TPZ including information about calculating the TPZ and examples of TPZ encroachment.

Minor encroachment into TPZ: Sometimes encroachment into the TPZ is unavoidable. Encroachment includes but is not limited to activities such as excavation, compacted fill and machine trenching. Minor encroachment of up to 10% of the overall TPZ area is normally considered acceptable, providing there is space adjacent to the TPZ for the tree to compensate and the tree is displaying adequate vigour/health to tolerate changes to its growing environment.

Major encroachment into TPZ: Where encroachment of more than 10% of the overall TPZ area is proposed the project Arborist must investigate and demonstrate that the tree will remain in a viable condition. In some cases, tree sensitive construction methods such as pier and beam footings, suspended slabs, or cantilevered sections, can be utilised to allow additional encroachment into the TPZ by bridging over roots and minimising root disturbance. Major encroachment is only possible if it can be undertaken without severing significant size roots, or if it can be demonstrated that significant roots will not be impacted.



2. **Structural Root Zone:** This is the area around the base of a tree required for the trees stability in the ground. An area larger than the SRZ always need to be maintained to preserve a viable tree as it will only have a minor effect on the trees vigour and health. There are several factors that determine the SRZ which include height, crown area, soil type and soil moisture. It can also be influenced by other factors such as natural or built structures. Generally work within the SRZ should be avoided.

An indicative SRZ radius can be determined from the diameter of the trunk measured immediately above the root buttresses. Root investigation could provide more information about the extent of the SRZ. The following formula should be used to calculate the SRZ.

SRZ radius = $(D \times 50)^{0.42} \times 0.64$ (D = Diameter above root buttress).