# ARBORICULTURAL IMPACT ASSESSMENT

## Eastlakes South Town Centre Redevelopment

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**APPENDICIES**

# 1 EXECUTIVE SUMMARY

This Arboricultural Impact Assessment was commissioned by Ms Lani Bezzina of Crown Group on 15th May 2019. The report relates to twenty-seven (27) trees located within the adjoining Eastlakes Reserve, Evans Avenue and Barber Avenue Council verge, Eastlakes within the Bayside Council local government area. The report provides evaluation of the likely impact to existing trees approved for retention & removal under Major Project Approval MP09_0146 (MOD 4) as a result of proposed modifications to the approved built form on site for a mixed use development.

The proposed modifications seek to provide additional basement parking, expansion of the ground floor commercial area, modification to the layout of the public domain interface including new vehicle drop –off zone, modifications to the upper floor residential, mezzanine and podium levels and well as various refinements for site services.

The primary building modifications that are to result in impacts to those trees approved for retention relate to the provision of a new double height awning along the entire frontage to Eastlakes Reserve to enable covered outdoor dining areas. This is likely to conflict with the upper canopy of a number of trees located along the edge of Eastlakes Reserve. In addition a new vehicle drop-off zone on Evans Avenue is to cause conflict with existing street trees.

Should the development proceed in its current form, the following impacts are likely:

- Removal of five (5) trees of 'high' retention value (***Tree 26, 27, 28, 29 & 48***) due to unsustainable levels of pruning required to provide clearance to the proposed built form and encroachment from the new drop-off zone on Evans Avenue;

- Removal of two (2) trees of 'medium' retention value (***Tree 35 & 90***) due to unsustainable levels of pruning required to provide clearance to the proposed built form or full encroachment from the proposed drop-off zone on Barber Avenue;

- Pruning of three (3) trees of 'high' retention value (***Tree 33, 34, 37)*** to provide clearance to the proposed built form.

Accordingly, the proposal will necessitate the removal of seven (7) trees due to unsustainable levels of incursion to the TPZ or pruning necessary for building clearance to the modified western façade.

Provided pruning for building clearance is undertaken in accordance with *AS4373-2009 Pruning of Amenity Trees* and suitable protection is carried out in accordance with ***Appendix 5***, the proposed modifications are not likely to result in any additional impacts to other trees approved for retention.

Recommendations have been provided relating to tree removals, tree protection, pruning and replacement planting.

It is noted that this assessment takes into consideration only those trees that are potentially to suffer additional impacts from the proposed modified building works sought under this application. All other trees on and adjoining the site have been detailed in a previous Tree Report prepared by Treescan dated April 2012 which should be referred to if necessary for further information of other trees on site.

# 2 INTRODUCTION

## 2.1 Background

This Arboricultural Impact Assessment was commissioned by Ms Lani Bezzina of Crown Group on 15th May 2019 to evaluate the potential impacts of modified development works to existing trees located on land within the adjoining Eastlakes Reserve (Refer to ***Figure 1***).

The purpose of this report is to assess the potential impact of the proposed development on the subject trees, together with recommendations for amendments to the design or construction methodology where necessary to minimise any adverse impact. The report also provides recommended tree protection measures to ensure the long-term preservation of the trees to be retained where appropriate as well as replacement planting to compensate for any tree removals.

It is noted for reference that a previous Tree Report has been prepared by Treescan dated April 2012 which provided assessment of those trees to be impacted under the original approved proposal. Reference should be made to the Treescan report for any details regarding other trees not covered by this Report.

## 2.2 Objectives

This report has been prepared to assess the level of impact development works are likely to cause to existing trees and make a determination as to whether trees will be adversely affected. The report will aim to provide guidance as to those trees requiring removal, retention or protection in accordance with the provisions of *AS4970-2009 Protection of trees on development sites*. Where necessary, it will also provide recommendations for design modifications and any replacement planting. As such, the objectives of this report are as follows:

- Assess the current site and growing conditions of trees;
- Assess the current health, condition, lifespan & significance of the trees within the site;
- Identify relative retention values of trees within the site;
- Calculate anticipated encroachment levels resulting from proposed works;
- Determine the likely impact as a result of the calculated encroachments;
- Assess potential for retention and protection of trees where possible;
- Inform of any tree removal necessary due to unsustainable impacts;
- Provide guidance and recommendations for any replacement planting necessary.

No aerial inspection, exploratory root trenching or internal diagnostic testing is to be carried out as part of this report. Additionally, no cation exchange capacity testing or plant tissue analysis has been undertaken.

## 2.3 Legislation & Regulating Documents

The Arboricultural Impact Assessment Report has considered the following regulatory documents:

- *State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017*
- *Botany Bay Local Environmental Plan 2013*
- *Botany Bay Development Control Plan 2013 – Part L Landscaping & Tree Management*

## 2.4 Documentation Received

The following documents were received and have been relied upon for this Assessment:

*Table 1 - Documentation received and relied upon as part of Arboricultural Impact Assessment:*

| Document Description | Author | Revision No. / Date |
|---|---|---|
| Architectural Plans | FJMT Architects | M01 / 11.10.2019 |
| Architectural Detail - Canopy | FJMT Architects | SK180705B / 05.07.2018 |
| Planning Statement | URBIS | 28.02.2018 |
| Tree Report | Treescan | April 2012 |
| Detail Survey | Thorpe & Co. | 08.07.2004 |

Care has been taken to obtain all information from reliable sources; however the author makes no representations, guarantees or warranties as to the accuracy of information provided by others. No other information has been reviewed, should this become available impacts may be subject to change.

## 2.5 Limitations

Trees are living organisms whose health and condition can change rapidly. The conclusions and recommendations in this report are valid for one (1) year only from the date of the report, unless otherwise stated. Any changes to the site as it stands at present, for example building extensions, excavation works, importing of soils, extreme weather events etc. will invalidate this report. Any reproduction of this report must be in full colour using the report in its entirety.

This Arboricultural Impact Assessment takes into consideration only those trees located within Eastlakes Reserve which may be affected by the proposed modification works.

## 2.6 The Site

The site is known as the Eastlakes Shopping Centre and is legally described by Lots 30 and 31 in DP1246820 Nos. 19A Evans Avenue and 193A Gardeners Road, Eastlakes (the site). The site is separated into two landholdings located on either side of Evans Avenue and known as the 'North Site' and 'South Site' of which the South Site is subject of this Report and is shown outlined in blue in ***Figure1*** below.

With regards to those trees affected relating to the site, they fall within the boundaries of the adjoining public park to the west known as Eastlakes Reserve, the street verge of Evans Avenue to the north of the South Site and the street verge of Barber Avenue to the west of the South Site.


***Figure 1*** *- Aerial image indicating subject site (South Site) outlined blue*

## 2.7 Proposed Development

The approved development is for the redevelopment of Eastlakes Shopping Centre comprising a mixed use development incorporating basement car parking, ground floor retail area, and residential development above, communal open space, public domain landscaping and associated infrastructure works. The proposed modifications seek to provide additional basement parking, expansion of the ground floor commercial area, new vehicular drop-off zone on Evans Avenue, modification to the layout of the public domain interface, modifications to the upper floor residential, mezzanine and podium levels and well as various refinements for site services. (Refer ***Figure 2*** below).

Specifically, those works considered likely to impact the existing trees approved for retention within Eastlakes Reserve relate to the revised design of the western elevation at the ground floor level. It is proposed that a new double height awning is to extend along the western frontage to provide opportunities for covered outdoor dining areas and protection from the westerly aspect. In addition the new vehicle drop-off zone on Evans Street is to result in impacts to existing street trees.

It is understood from discussions with the project architects (FJMT) that works shown on the plans within the adjoining Eastlakes Reserve are for illustration purposes only and not proposed as part of the subject modifications. As such, impacts from those works shown on the plans within Eastlakes Reserve have not been considered in this assessment.

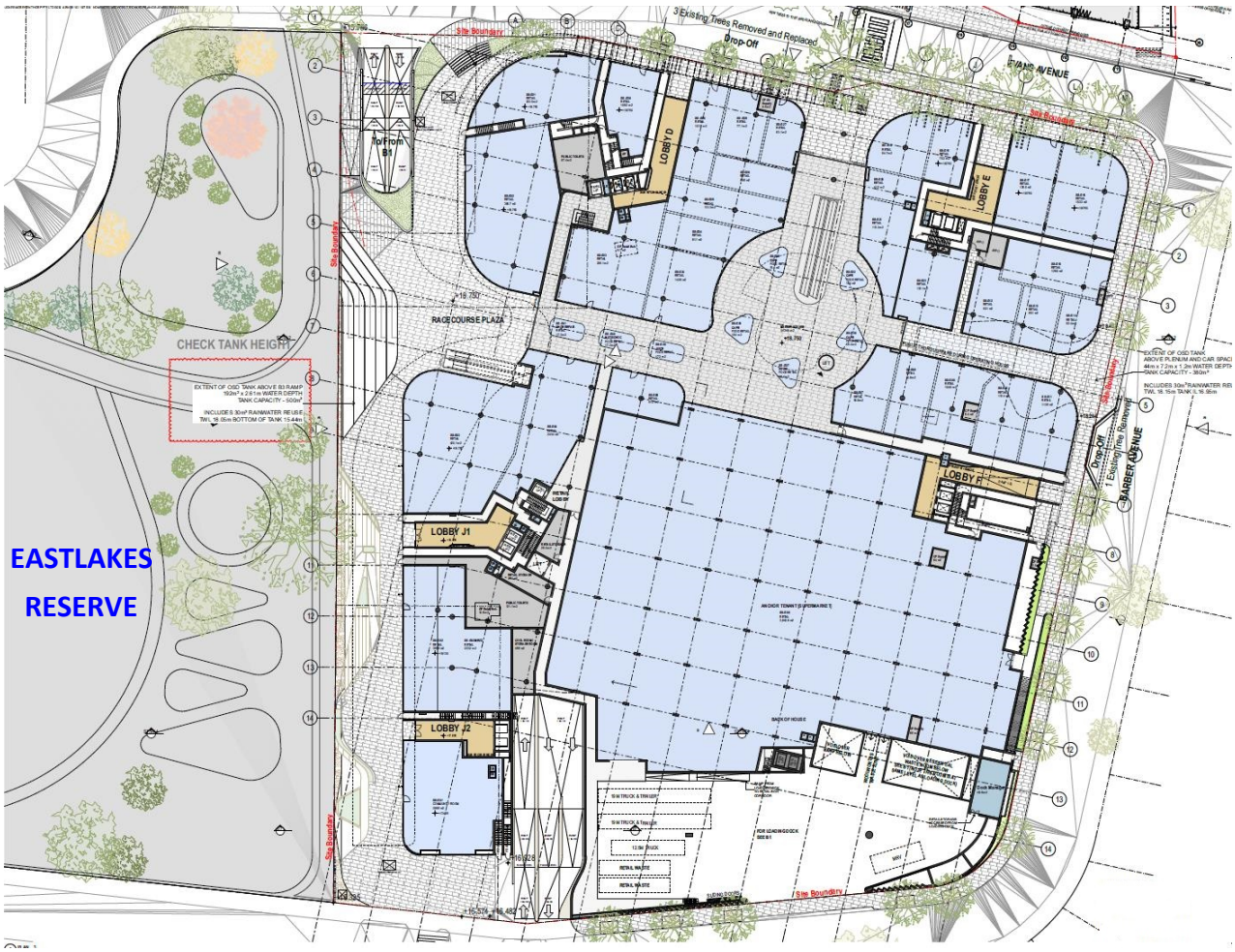


***Figure 2*** *– Ground Floor Plan showing relationship of site (South Site) to adjoining Eastlakes Reserve*

## 2.8 Methodology

### 2.8.1 Site Inspection

A site inspection was carried out by the author with the subject trees and the general growing environment evaluated on 04th July 2018. The weather at the time of inspection was partly clear and dry with good visibility.

The subject trees were inspected visually from ground level with the following information recorded and provided in tabulated form at ***Appendix 1***:

- Tree Species (Botanical & Common Name);
- Approximate height;
- Approximate canopy spread;
- Trunk diameter (measured at 1.4 metres from ground level);
- Trunk Diameter at base (above root crown);
- Age class;
- Health & vigour; using foliage size, colour, extension growth, presence of disease or pest infestation, canopy density, presence of deadwood, dieback and epicormic growth as indicators;
- Condition; using visible evidence of structural defects, instability, evidence of previous pruning and physical damage as indicators;
- Suitability of the tree to the site and its existing location;
- Useful Life Expectancy (ULE).

### 2.8.2 Useful Life Expectancy (ULE)

The remaining Useful Life Expectancy of a tree is an estimate of the sustainability of the tree in the landscape, calculated based on an estimate of the average age of the species in an urban area, less its estimated current age. The life expectancy of each tree has been further modified where necessary in consideration of its current health, vigour, condition and suitability to the site. The estimated SULE of each tree is shown in ***Appendix 1***.

The following ranges have been allocated to each tree:

- Long ULE: Trees that appear to be retainable with an acceptable level of risk for > 40 years.
- Medium ULE: Trees that appear to be retainable with an acceptable level of risk for 15 to 40 years.
- Short ULE: Trees that appear to be retainable with an acceptable level of risk for 5–15 years.
- Remove: Trees with a high level of risk that would need removing within the next 5 years.
- Small, Young or Regularly Pruned.

### 2.8.3 Tree Significance

The landscape significance of a tree is an essential criterion to establish the importance that a particular tree may have on a site. Several factors contribute towards the assessment of a trees significance including but not limited to condition and vigour, form, visual prominence, heritage status, indigeneity, legislative protection, cultural sentiment and future growth potential.

For the purposes of this report the Australian Institute of Consulting Arborists (IACA) Significance of a Tree, Assessment Rating System (STARS)© has been utilised. 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.

***Appendix 3*** provides a full outline of assessment criteria for each significance rating as per IACA STARS (2010).

### 2.8.4 Retention Value

Retention values have been determined for each tree on site to establish a hierarchy for tree retention. Retention values are based on estimated life spans and their associated landscape significance rating in accordance with the Tree Retention Value Priority Matrix. This matrix established the following retention values and can be found at ***Appendix 3*** with attributed retention values found within ***Appendix 1***:

- Priority for Retention (High)
- Consider for Retention (Medium)
- Consider for Removal (Low)
- Priority for Removal

### 2.8.5 AS4970-2009 Protection of Trees on Development Sites

The Australian Standard, *AS4970-2009-'Protection of trees on development sites'*, has been used as a guide to provide recommendations for the assessed trees. The Standard provides guidance on the principles for protecting trees on land subject to development as well as principles for determining viability of tree retention. Terminology and recommended methods are consistent with *AS4970-2009*.

### 2.8.6 Tree Protection Zones

The assessed trees have been allocated Tree Protection Zones (TPZ). The Australian Standard, *AS4970-2009-'Protection of trees on development sites'*, has been used as a guide in the allocation of TPZs for the assessed trees. The TPZ is calculated based on trunk (stem) diameter at breast height (DBH), measured at 1.4 metres above ground level. The radius of the TPZ is calculated by multiplying the trees DBH by 12. The method provides a TPZ that addresses health and growing requirements of a tree as well as the trees stability. TPZ distances are measured as a radius from the centre of the trunk at (or near) ground level. The maximum TPZ should be no more than 15m radius and the minimum TPZ should be no less than 2m radius.

An extract of the *AS4970-2009* for calculating TPZ has been provided at ***Appendix 4*** for reference.

### 2.8.7 Structural Root Zone

The assessed trees have been allocated Structural Root Zones (SRZ). The Australian Standard, *AS4970-2009-'Protection of trees on development sites'*, has been used as a guide in the allocation of SRZ's for the assessed trees. The SRZ is a radial area extending outwards from the centre of the trunk and is calculated as follows:

**SRZ (Radius) = (D x 50)0.42 x 0.64**

# 3 OBSERVATIONS

## 3.1 General

The site area subject to this assessment was observed as disturbed with minimal understorey present. Trees were observed generally growing within existing deep soil lawn areas with some trees growing within garden bed areas. Street trees have been planted within tree pits and are surrounded by hard paving associated with footpath areas. All trees appeared to be planted specimens of a mature age class. Recent amenity pruning had been undertaken to a number of the assessed trees within Eastlakes Reserve. Root zones and spread of trees located close to the western side boundary are likely to have been restricted by built structures to the east being Eastlakes Shopping Centre.

## 3.2 The Trees

A total of twenty-seven (27) trees were observed within the site area surveyed as part of this assessment. All tree data recorded on site has been tabulated and is contained at ***Appendix 1***. Each tree has been provided with an identification number for reference purposes which has been adopted from the Treescan Report dated April 2012 & denoted on the attached Tree Location Plan at ***Appendix 2***.

***Tree 26, 27, 28 & 29*** are located within the Council verge of Evans Avenue and consist of a row of four (4) *Platanus x hybrida* (London Plane) street trees. These trees were generally observed in good health and condition with Long Safe Useful Life Expectancies (SULE). Pavements surrounding these trees are seeing some uplift and heave as a result of the maturing root spreads. Whilst these trees have not reached full mature dimensions, the row is prominent within the streetscape and therefore combined with the health and condition and SULE have been attributed a 'high' retention value.

**Tree 33, 34, 37, 42, 48 & 51** are located to the west of the subject site within the adjoining Eastlakes Reserve and consist of three (3) *Eucalyptus botryoides* (***Tree 33, 37, 42***), two (2) *Eucalyptus microcorys* (***Tree 48, 51***) and one (1) *Eucalyptus grandis* (***Tree 34***). These trees were all observed in fair to good health and condition and medium to long Safe Useful Life Expectancies (SULE). Combined with their prominence in the landscape setting of Eastlakes Reserve, these trees have been attributed a 'high' retention value.

**Tree 35, 44, 45, 47, 50 & 52** are located to the west of the subject site within the adjoining Eastlakes Reserve and consist of two (2) *Eucalyptus botryoides* (***Tree 47, 52***), two (2) *Tristaniopsis laurina* (***Tree 44, 45***), one (1) *Eucalyptus microcorys* (***Tree 50***) and one (1) *Casuarina cunninghamiana* (***Tree 35***) all of a mature age class. These trees were all observed in fair to good health and condition and medium Safe Useful Life Expectancies (SULE). Combined with their moderate landscape significance within Eastlakes Reserve, these trees have been attributed a 'medium' retention value.

***Tree 38, 39 & 40*** are located to the west of the subject site within the adjoining Eastlakes Reserve and consist of two (3) *Allocasuarina torulosa* all of mature age class and observed in fair-poor health and condition and poor structural condition. Given their low landscape significance, these trees have been attributed a 'low' retention value.

***Tree 90*** is located within the Council verge on Barber Avenue and consist of one (1) *Callistemon viminalis* street tree. This tree was observed in fair health with poor condition and medium SULE. This tree has been attributed a 'medium' retention value.

## 3.3 Unidentified Trees

Six (6) trees shown on the supplied survey plans and Tree Report prepared by Treescan dated April 2012 were not found on site (***Tree 36, 41, 43, 46, 47a & 49***). It is assumed they have been removed prior to the site inspection. As such these trees are denoted on the Tree Location Plan by a red X. Additional trees were not indicated on the survey plans supplied which have been located based on measurements and offsets taken on site.

## 3.4 Tree Preservation Order

Part 3L.4.2 of Botany Bay Development Control Plan (DCP) 2013 (Tree Works Requiring Council Approval) applies to all land within the former Botany Bay local government area. The DCP generally protects any tree or vegetation with a height of or exceeding three (3) metres and/or having a trunk diameter at breast height (DBH) equal to or greater than 200mm or 600mm circumference for a multi trunked tree.

## 3.5 Threatened Species & Ecological Communities

None of the species observed are listed as Threatened or Vulnerable under the provisions of the *Threatened Species Conservation Act 1995* (NSW) or the *Environmental Protection and Biodiversity Conservation Act 1999*.

Further specialist ecological input may be required to determine the suitability of any tree removals from an ecological and biodiversity perspective.

# 4 DISCUSSION

## 4.1 Impact Assessment

The impact assessment is to calculate the incursions to the root zones and canopies as a result of the proposed development and evaluate the likely impact of the proposed works on the subject trees. A summary of the impacts anticipated are contained within the Tree Schedule at ***Appendix 1***. Additionally, plans demonstrating the level of encroachment to TPZ's and SRZ's can be found at ***Appendix 2***.

As part of the assessment the following criteria have been considered:

- Existing Relative Levels (R.L.);
- Proposed Relative Levels;
- Tree Protection Zones (TPZ);
- Structural Root Zones (SRZ);
- Footprint of the proposed development (incl. stormwater and services) and temporary structures (scaffolding, hoardings etc.);
- Incursions to the TPZ & SRZ, including estimated cut & fill beyond the building footprint;
- Incursions to the tree canopy from the building envelope and temporary structures;
- Species tolerance to disturbance; and
- Assessment of the likely impact of the works on existing trees.

## 4.2 Trees Impacted by Development

Based on the plans supplied, the proposed development in its current form will necessitate the removal of seven (7) trees due to unsustainable levels encroachment and pruning necessary to provide clearance to the modified building. An additional three (3) trees will require pruning works to be carried out to provide suitable levels of clearance for construction however the levels of pruning necessary are considered to be sustainable. Refer to ***Appendix 2*** for a plan indicating the trees that will require removal (dashed red) and those to be retained and protected (shaded green).

**Removal Required**

***Tree 26, 27, 28 & 29*** are located to the north of the subject site within the street verge of Evans Avenue. Based on the revised plans, a new vehicular drop-off zone and pedestrian crossing are proposed in the location of these trees and as such they are to suffer full encroachment from the new roadway design. Accordingly these trees are not capable of retention under the current proposal and as such will require removal.

***Tree 35*** is located to the west of the subject site within Eastlakes Reserve approximately 2.5m from the site boundary. The design and extent of the new overhead canopy to the western façade will necessitate canopy pruning for building clearance in the order of >20% of the canopy. Given the significant pruning of a large co-dominant stem in the recent past, it is considered that the additional pruning required for building clearance will be unsustainable and as such is recommended for removal should the development procced in its current form.

***Tree 48*** is located to the west of the subject site within Eastlakes Reserve approximately 1m from the site boundary. The design and extent of the new overhead canopy to the western façade will necessitate significant canopy pruning for building clearance in the order of 30-40% of the canopy. The removal of this level of live foliage and significant scaffold branches is likely to result in negative health impacts and eventual decline of this tree. Furthermore, the extent of canopy pruning required will result in a highly unbalanced canopy and poor structural condition which is likely to become a hazard. Accordingly, the level of impact to this tree is considered too severe to enable retention and therefore this tree will require removal to enable construction if the development is to proceed in its current form.

***Tree 90*** is located within the footprint of the proposed drop-off zone on the Barber Avenue frontage and is to suffer full encroachment as a result of the new pathway and kerb alignments. In this regard, should the proposal proceed in its current form, removal will be required.

***Note:*** It will not be possible to undertake the required construction works without removal of these trees. Owner's consent must be obtained from adjoining land owners prior to any removals taking place. Non-cooperation of adjoining land owners would require legal interpretation and is beyond the scope of this report.

**Pruning Required**

***Tree 33*** will require pruning of part of the eastern canopy conflicting with the building facade to provide suitable building clearance. This consists of one (1) first order branch at approximately 5m being 200mmØ and a number of second and third order branches of 50-100mmØ totalling approx. 20% of the canopy. Provided pruning is carried out in accordance with *AS4373-2009 Pruning of Amenity Trees* and suitable protection is carried out in accordance with ***Appendix 5***, the proposed building modifications are not likely to result in any long term negative impact to this tree.

***Tree 34*** will require pruning of part of the eastern canopy conflicting with the building facade to provide suitable building clearance. This consists of three (3) second order branches at approximately 8-10m being 75-100mmØ totalling approx. 10% of the canopy. Provided pruning is carried out in accordance with *AS4373-2009 Pruning of Amenity Trees* and suitable protection is carried out in accordance with ***Appendix 5***, the proposed building modifications are not likely to result in any long term negative impact to this tree.

***Tree 37*** will require pruning of part of the eastern canopy conflicting with the building facade to provide suitable building clearance. This consists of the removal of two (2) second order branches at approximately 8m being 100mmØ and 200mmØ totalling approx. 10% of the canopy. Provided pruning is carried out in accordance with *AS4373-2009 Pruning of Amenity Trees* and suitable protection is carried out in accordance with ***Appendix 5***, the proposed building modifications are not likely to result in any long term negative impact to this tree.

## 4.3 Trees Unaffected by Development Modifications

Based on the plans supplied and referenced above, the proposed building modifications are not to result in any additional impact to ten (10) existing trees located within Eastlakes Reserve provided suitable tree protection is undertaken in accordance with ***Appendix 5***. This includes **Trees 38, 39, 40, 42, 44, 45, 47, 50, 51 & 52**.

# 5 CONCLUSION

## 5.1 Proposed Development Impact

Based on the plans and information supplied, should the development proceed in its current form the proposal would result in the following additional impacts to trees within Eastlakes Reserve:

- Removal of one (1) tree of 'high' retention value (***Tree 48***) due to unsustainable levels of pruning required to provide clearance to the proposed built form;

- Removal of four (4) trees of 'high' retention value (***Tree 26, 27, 28 & 29***) located on the Evans Street frontage due to full encroachment from the new drop-off zone/roadway construction;

- Removal of two (2) trees of 'medium' retention value (***Tree 35 & 90***) due to unsustainable levels of pruning required to provide clearance to the proposed built form or full encroachment from the proposed drop off zone on Barber Avenue;

- Pruning of three (3) trees of 'high' retention value (***Tree 33, 34, 37****)* to provide clearance to the proposed built form.

Accordingly, the proposal will necessitate the removal of a total of seven (7) trees due to major and unsustainable levels of encroachment and pruning required for building clearance and construction.

Provided pruning for building clearance is undertaken in accordance with *AS4373-2009 Pruning of Amenity Trees* and suitable protection is carried out in accordance with ***Appendix 5***, the proposed modifications are not likely to result in any additional impacts to **Trees 38, 39, 40, 42, 44, 45, 47, 50, 51 & 52** approved for retention.

Owner's consent must be obtained from adjoining land owners prior to any removals taking place.

Replacement planting as per ***Section 6.2*** will be required to compensate for the loss of amenity and impact to landscape character resulting from the proposed tree removal.

# 6 RECOMMENDATIONS

## 6.1 Tree Removals

Remove ***Trees 26, 27, 28, 29, 35, 48 & 90*** (7 trees) to facilitate the proposed development works if approved in their current form.

Development consent and relevant approvals must be obtained from Bayside Council prior to the removal or pruning of any tree protected under Botany Bay DCP 2013 - Part L. All tree pruning and removal work is to be carried out by an experienced Arborist with minimum AQF Level 3 qualifications in accordance with *AS4373-2007 Pruning of Amenity Trees*, Safe Work Australia Guide for Managing Risks of Tree Trimming and Removal Work (2016) and other applicable legislation.

## 6.2 Tree Pruning

Prune ***Trees 33, 34 & 37*** to provide only sufficient building clearance to enable construction. Where possible branches are to be tied back rather than pruned.

## 6.3 Tree Protection

Tree protection measures should be provided for ***Trees 33, 34, 37, 38, 39, 40, 42, 44, 45, 47, 50, 51 & 52*** in accordance with the Tree Location Plan & Tree Protection Specification held at ***Appendix 2 & 5*** and *AS497-2009 Protection of trees on development sites*.

## 6.4 Replacement Planting

In order to compensate for loss of amenity resulting from the removal of trees on site, replacement planting should be provided at a ratio of 1:1 within Eastlakes Reserve, Evans Avenue & Barber Avenue. This will ensure there is no incremental loss of canopy cover within the locality over time.

Accordingly, two (2) large growing (15m+) locally endemic compensatory canopy tree plantings should be provided at a minimum 45 litre pot size within Eastlakes Reserve and three (3) street trees provided along Evans Avenue in accordance with Council's street tree masterplan. The following species should be considered for replacement planting:

- *Eucalyptus pilularis* (Blackbutt)
- *Eucalyptus robusta* (Swamp Mahogany)
- *Melaleuca quinquenervia* (Broad-leaved Paperbark)
- *Platanus x hybrida* (London Plane) – Evans Avenue only

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11th October 2019

# 7 References

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| Tree No. | *Genus & species* Common Name | Height (m) | Crown Spread (m) | DBH (mm) | TPZ (m) | Age Class | Health | Condition | Structure | SULE | Landscape Significance | Retention Value | Development Impact | Retain / Remove | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 26 | *Platanus x hybrida* London Plane | 12 | 12 | 500 | 6.00 | M | Good | Good | Good | Long 40+ yrs | Medium | High | Major encroachment - >20% | **Remove** | Pavement uplift from roots |
| 27 | *Platanus x hybrida* London Plane | 12 | 12 | 400 | 4.80 | M | Good | Good | Fair | Long 40+ yrs | Medium | High | Full encroachment from new drop off zone | **Remove** | Pavement uplift from roots |
| 28 | *Platanus x hybrida* London Plane | 10 | 12 | 400 | 4.80 | M | Good | Good | Good | Long 40+ yrs | Medium | High | Full encroachment from new drop off zone | **Remove** | Pavement uplift from roots |
| 29 | *Platanus x hybrida* London Plane | 10 | 12 | 400 | 4.80 | M | Good | Good | Good | Long 40+ yrs | Medium | High | Full encroachment from new drop off zone | **Remove** | Pavement uplift from roots |
| 33 | *Eucalyptus botryoides* Bangalay | 12 | 12 | 630 | 7.56 | M | Good | Good | Good | Long 40+ yrs | High | High | Pruning required for clearance, 20% crown | Retain & Protect | Lean to east, recent canopy pruning |
| 34 | *Eucalyptus grandis* Flooded Gum | 16 | 15 | 700 | 8.40 | M | Good | Good | Poor | Medium 15-40 yrs | High | High | Pruning required for clearance, 10% crown | Retain & Protect | Crown dominance to west, recent canopy pruning |
| 35 | *Casuarina cunninhamiana* River Sheoak | 15 | 12 | 650 | 7.80 | M | Good | Fair | Fair | Medium 15-40 yrs | Medium | Medium | Unsustainable pruning required for clearance | **Remove** | Recent remedial pruning of large co-dominant stem |
| 36 | *Allocasuarina torulosa* Forest Sheoak | - | - | - | - | - | - | - | - | - | - | - | - | - | Tree not identified on site – likely to have been previously removed |
| 37 | *Eucalyptus botryoides* Bangalay | 16 | 12 | 580 | 6.96 | M | Good | Good | Good | Long 40+ yrs | High | High | Pruning required for clearance, 10% crown | Retain & Protect | Nil |
| 38 | *Allocasuarina torulosa* Forest Sheoak | 5 | 5 | 200 | 2.40 | M | Fair | Poor | Poor | Medium 15-40 yrs | Low | Low | No additional impacts | Retain & Protect | Sparse canopy |
| 39 | *Allocasuarina torulosa* Forest Sheoak | 8 | 6 | 300 | 3.60 | M | Fair | Fair | Poor | Medium 15-40 yrs | Low | Low | No additional impacts | Retain & Protect | Sparse canopy |
| 40 | *Allocasuarina torulosa* Forest Sheoak | 10 | 5 | 250 | 3.00 | M | Good | Poor | Poor | Medium 15-40 yrs | Low | Low | No additional impacts | Retain & Protect | Sparse canopy |
| 41 | *Allocasuarina torulosa* Forest Sheoak | - | - | - | - | - | - | - | - | - | - | - | - | - | Tree not identified on site – likely to have been previously removed |
| 42 | *Eucalyptus botryoides* Bangalay | 15 | 8 | 500 | 6.00 | M | Good | Good | Good | Long 40+ yrs | High | High | No additional impacts | Retain & Protect | Lean to north-east |
| 43 | *Eucalyptus botryoides* Bangalay | - | - | - | - | - | - | - | - | - | - | - | - | - | Tree not identified on site – likely to have been previously removed |
| 44 | *Tristaniopsis laurina* Watergum | 5 | 6 | 400 | 4.80 | M | Good | Fair | Fair | Medium 15-40 yrs | Medium | Medium | No additional impacts | Retain & Protect | Multi-stemmed from 1m with inclusions |
| 45 | *Tristaniopsis laurina* Watergum | 5 | 6 | 400 | 4.80 | M | Good | Fair | Fair | Medium 15-40 yrs | Medium | Medium | No additional impacts | Retain & Protect | Multi-stemmed from 1m with inclusions |
| 46 | *Tristaniopsis laurina* Watergum | - | - | - | - | - | - | - | - | - | - | - | - | - | Tree not identified on site – likely to have been previously removed |
| 47 | *Eucalyptus botryoides* Bangalay | 10 | 8 | 400 | 4.80 | M | Good | Fair | Fair | Medium 15-40 yrs | Medium | Medium | No additional impacts | Retain & Protect | Bifurcated trunk at 4m |

| Tree No. | *Genus & species* Common Name | Height (m) | Crown Spread (m) | DBH (mm) | TPZ (m) | Age Class | Health | Condition | Structure | SULE | Landscape Significance | Retention Value | Development Impact | Retain / Remove | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 47a | *Tristaniopsis laurina* Watergum | - | - | - | - | - | - | - | - | - | - | - | - | - | Tree not identified on site – likely to have been previously removed |
| 47b | *Tristaniopsis laurina* Watergum | - | - | - | - | - | - | - | - | - | - | - | - | - | Tree not identified on site – likely to have been previously removed |
| 48 | *Eucalyptus microcorys* Tallowood | 16 | 14 | 650 | 7.80 | M | Good | Good | Good | Long 40+ yrs | High | High | Unsustainable pruning required for clearance | **Remove** | Root system confined by carpark |
| 49 | *Sapium sebiferum* Chinese Tallow | - | - | - | - | - | - | - | - | - | - | - | - | - | Tree not identified on site – likely to have been previously removed |
| 50 | *Eucalyptus microcorys* Tallowood | 10 | 5 | 200 | 2.40 | M | Good | Fair | Fair | Medium 15-40 yrs | Medium | Medium | No additional impacts | Retain & Protect | Suppressed by adjoining tree |
| 51 | *Eucalyptus microcorys* Tallowood | 16 | 15 | 900 | 10.80 | M | Good | Good | Good | Long 40+ yrs | High | High | No additional impacts | Retain & Protect | Existing encroachment to root zone |
| 52 | *Eucalyptus botryoides* Bangalay | 10 | 8 | 300 | 3.60 | M | Good | Fair | Fair | Medium 15-40 yrs | Medium | Medium | No additional impacts | Retain & Protect | Lean to east, crown dominance to east |
| 92 | *Callistemon viminalis* Weeping Bottlebrush | 5 | 4 | 250 | 3.00 | M | Fair | Poor | Poor | Medium 15-40 yrs | Low | Medium | Within drop-off zone | **Remove** | Poor form |

**Tree Inspection Data Notes & Terminology**

**Tree No. (Tree Number)**
The tree number associated to each tree located on or adjacent to the subject site. Relates to the Tree Location Plan held at Appendix 2.

**Botanical Name and Common Name**
The botanical and common name of each tree is identified and recorded. Occasionally the exact species name is unknown; *sp.* is recorded to indicate this.

**Height, Crown Width and DBH**
- The trees height and crown spread is recorded in metres
- The tree DBH is recorded in millimetres. DBH is an abbreviation of Diameter (of the trunk) measured at Breast Height (or 1.4m from the base of the trunk). If more than one trunk is present the DBH is calculated in accordance with AS4970-2009 Protection of Tree on Development Sites

**Age Class**
The age class of each tree is estimated as either:
IM – Immature refers to well established but juvenile tree
SM – Semi Mature, a tree that has not grown to mature size
M – Mature, a tree that has reached mature size and will slowly increase in size over time
OM – Over Mature, a tree that has been mature for a long period and is beginning to display signs of decline, e.g. large dead branches
S – Senescent, an over mature tree that is now in decline

**Health & Condition**
The trees health and vigour is recorded as a measurement of:
G – Good, the tree does not appear to appear stressed with no excessive dieback, insect infestation, decay, deadwood or epicormic shoots
Av – Average health the tree appears stressed and has some crown dieback, and /or a few epicormic shoots, and/or some deadwood in the crown and some new growth at branch tips. These trees may benefit from remediation of the growing environment to reduce stress and return it to good health
F – Fair the tree may have areas of crown dieback, and/or epicormic shoots, and/or areas of decay, and/or reduced new growth at branch tips. These trees have been stressed for a short period of time, remediation of the growing environment may improve trees health.
P –Poor the tree may have large areas of crown dieback, and/or many epicormic shoots, and/or reduced new growth at branch tips. These trees have been stressed for a long period of time, remediation of the growing environment would not return the tree to good health.

**SRZ (Structural Root Zone)**
The SRZ is a radial area extending outwards from the centre of the trunk. This area contains the majority of the structural woody roots. This area is responsible primarily for stability. Root damage or root loss within this zone greatly increases the opportunity for decay fungi to ingress into the heartwood, causing internal decay in addition to destabilising the trees structural integrity. The SRZ is calculated as follows (This calculation is taken from the Australian Standard 4970 – 2009 Protection of Trees on development Sites):

***SRZ (Radius) = (D x 50)0.42 x 0.64***

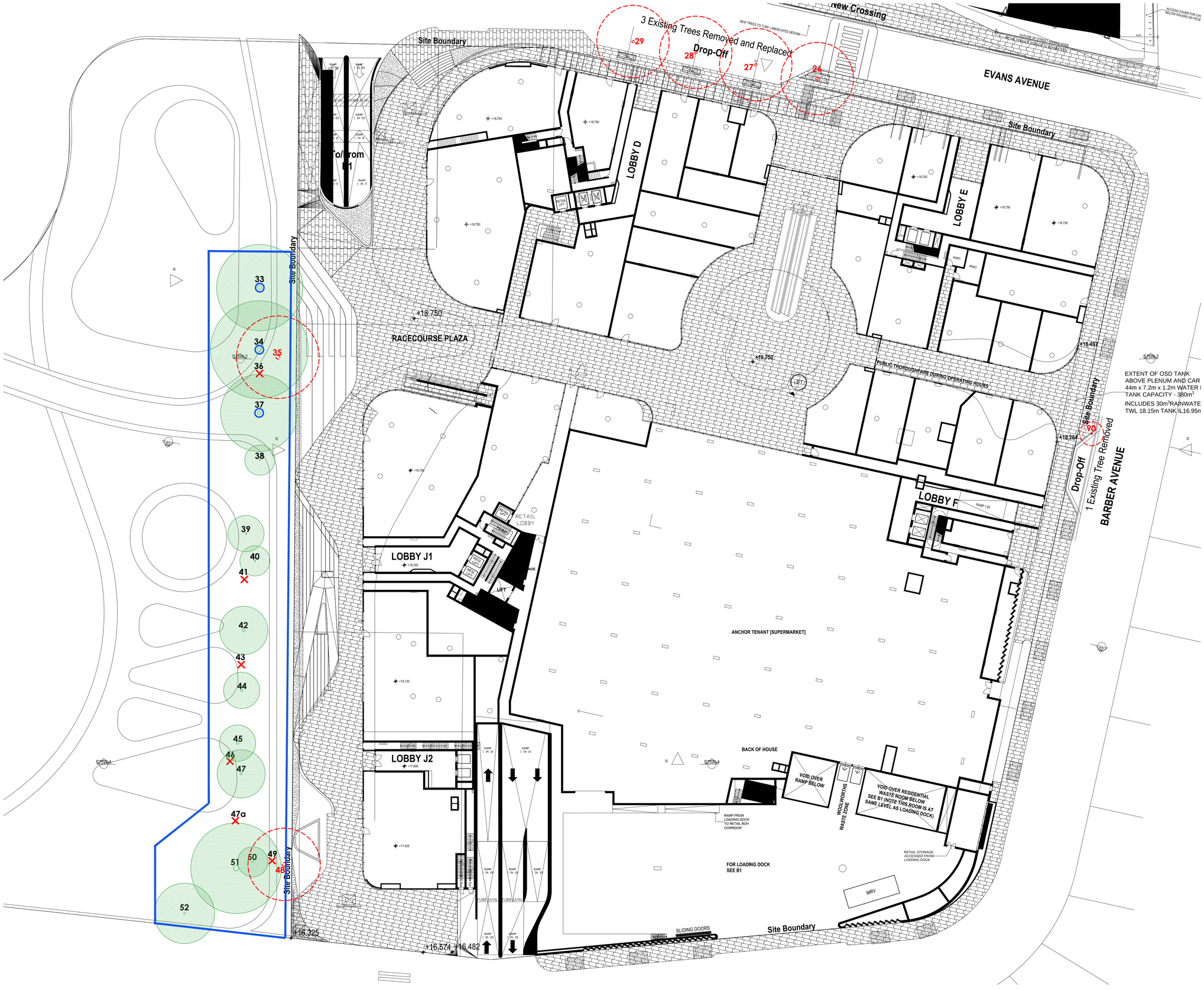
**TPZ (Tree Protection Zone)**
The TPZ is a radial area measured by multiplying the DBH by twelve (12) or a circular area the size of the trees drip line, whichever is greater. This rea contains the majority of the structural and feeder roots responsible for stability, gaseous exchange and water and nutrient uptake. Excavation, back filling, compaction or other disturbance should not occur in this area. The TPZ is used to identify the min9imum area required for the safe retention of a given tree. This calculation is derived from the Australian Standard 4970-2009 Protection of Trees in Development Sites. An incursion up to 10% within the TPZ is potentially acceptable if no other option is available. A major encroachment (in excess of 10%) is required to be clearly justified by the Project Arborist and compensated for elsewhere. Justification methodology may vary depending on site or individual tree's health, vigour and ability to withstand disturbance and may require root investigation.

**Retention Value (RV)**
Determined by [1] tree fee of visual defects and viable for retention, [2] viable for retention with minor faults which may reduce ULE, [3] trees which should not restrict development applications containing faults that are likely to become problematic in the short term, [4] trees to be considered for removal due to average condition.
**1 High retention** – Priority for retention **2 Medium retention** – Consider for retention **3 Low retention** – Consider for removal **4 Remove –** Priority for removal

**S.U.L.E. Categories**
Safe Useful Life Expectancy (after *Barrell* 1996, modified by the author). A trees U.L.E. category is the life expectancy of the tree modified first by its age, health, condition, safety and location. U.L.E. assessments are not static but may be modified as dictated by changes in trees health and environment.
1. Long S.U.L.E. - Appear retainable at the time of assessment for over 40 years with an acceptable degree of risk assuming reasonable maintenance.
2. Medium S.U.L.E. - Appear to be retainable at the time of assessment for 15 to 40 years with an acceptable degree of risk assuming reasonable maintenance.
3. Short S.U.L.E. - Trees appear to be retainable at the time of assessment for 5 to15 years with an acceptable degree of risk assuming reasonable maintenance.
4. Very short - Removal- Trees which should be scheduled for removal within the very short term or as specified within this report.
5. Small, young or regularly pruned – Trees under 5m in height that can be easily moved or replaced, includes screen plantings or hedge lines.

**NOTES**: This report acknowledges the current Australian Standards 'Protection of Trees on Development Sites' AS 4970 – 2009 with reference to the Tree Protection Zone (TPZ): being a combination of the root and crown area requiring protection. The TPZ takes into consideration the Structural Root Zone (SRZ): The area required for tree stability. Determined by AS4970 - 2009 Figure 1,Table of determining the SRZ, section 3.3.5 of the standards. The standard states where a greater than 10% encroachment occurs the arborist is to take into consideration the schedule of determining impacts as set within AS4970 s. 3.3.4. Encroachments are referred to within this report as major or minor encroachments (AS4970 s. 3.3.2 & 3.3.3). Below is the terminology used for estimated percentage of development incursion used within this report. To retain specific trees and ensure their viability development must take into consideration protection of the TPZ radius. The extent of inclusion within the TPZ radius has been categorised within this report as follows:

<10% - negligible incursion
>10 - <15% - low to moderate level of incursion
>15 - <20% - moderate level of incursion
>20 - <25% - moderate to high level of incursion
>25 - <35% - high level of incursion
>35% - significant incursion within the TPZ

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**DIMENSIONS :**
All dimensions are in millimetres unless otherwise noted. Do not scale from this drawing.

Verify all dimensions on site prior to construction.

**CIVIL, STRUCTURAL, HYDRAULIC, ELECTRICAL AND SPECIALIST WATER FEATURE WORKS :**
Refer to specialist and consultant's drawings for all information contained within these documents relating to and nominated as specialist and consultant work. Specialist and consultant drawing information contained in the landscape documents are indicative only and not for construction or certification purposes.

PROJECT

# Eastlakes South Town Centre Redevelopment

CLIENT

LEGEND

- TREE NOT IDENTIFIED ON SITE - LIKELY TO HAVE BEEN REMOVED
- TREE TO BE REMOVED
- TREE TO BE RETAINED AND PROTECTED IN ACCORDANCE WITH APPENDIX 5
- TREE PROTECTION FENCE IN ACCORDANCE WITH APPENDIX 5
- TRUNK PROTECTION IN ACCORDANCE WITH APPENDIX 5

| Issue | Code | Issue Description | By | Chk | Date |
|---|---|---|---|---|---|
| | | | | | |
| F | CA | Amend for new arch. plans | GT | GT | 11.10.19 |
| E | CA | Amend for new arch. plans | GT | GT | 02.10.19 |
| D | CA | Amend for new arch. plans | TP | GT | 04.06.19 |
| C | CA | Amend for new arch. plans | TP | GT | 20.05.19 |
| B | CA | For Approval | TP | GT | 16.08.18 |
| A | CA | For Approval | GT | GT | 18.07.18 |

PRE - Preliminary CA - Council Approval T - Tender CON - Construction

DRAWING TITLE

# TREE LOCATION PLAN

Drawn : GT
Designed : GT
Project No. : D002
Scale: 1:300 @ A1

North

SHEET NUMBER D002_TLP_01

REVISION F

APPENDIX 3

# IACA Significance of a Tree, Assessment Rating System (STARS)© (IACA 2010)©

In the development of this document IACA acknowledges the contribution and original concept of the Footprint Green Tree Significance & Retention Value Matrix, developed by Footprint Green Pty Ltd in June 2001.

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

### 1. High Significance in landscape

- The tree is in good condition and good vigour;
- 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.

### 2. Medium Significance in landscape

- The tree is in fair-good condition and good or low vigour;
- 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*.

### 3. Low Significance in landscape

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

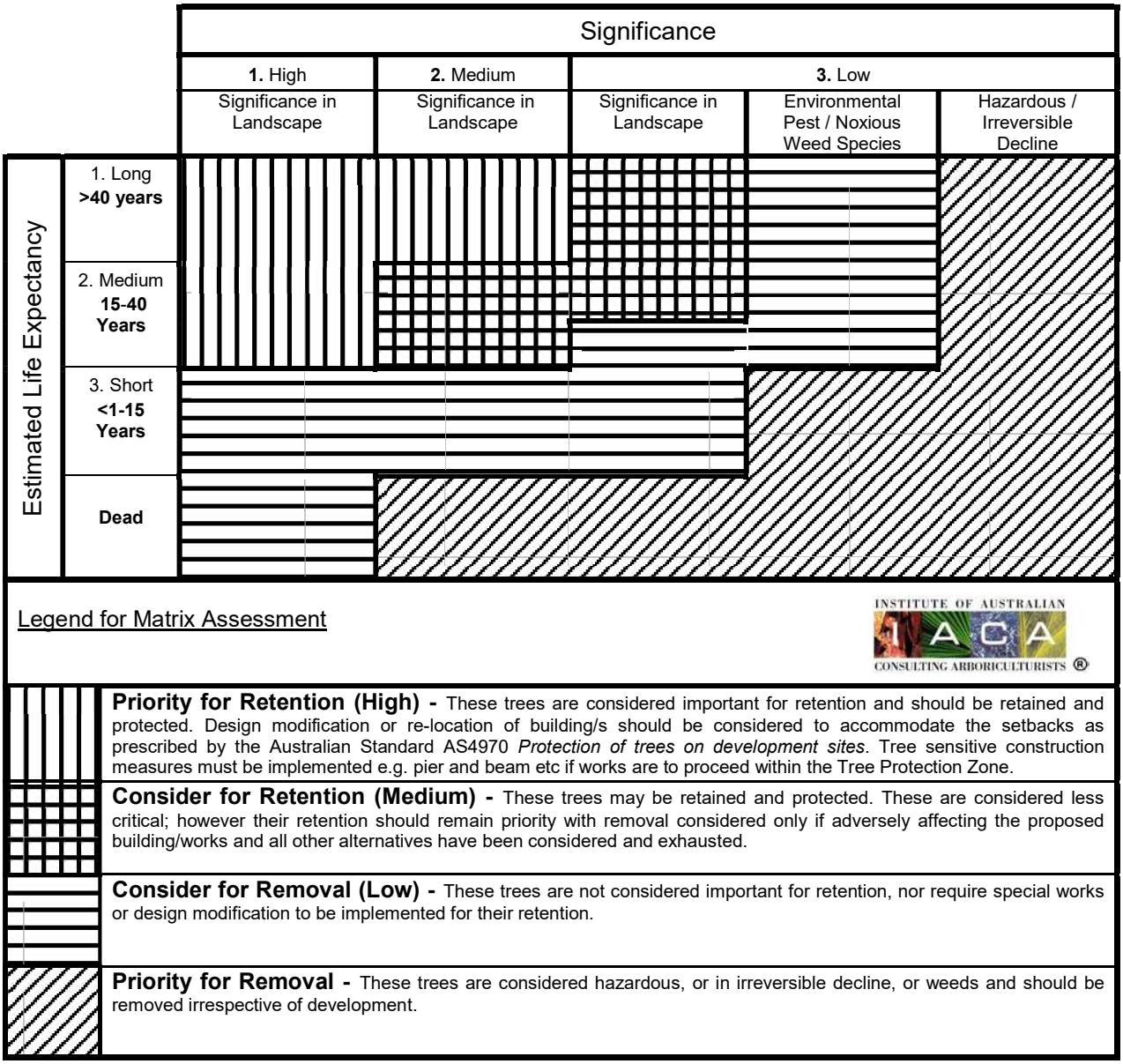
**Hazardous/Irreversible Decline**

- 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.

## Table 1.0 Tree Retention Value - Priority Matrix.




### USE OF THIS DOCUMENT AND REFERENCING

The IACA Significance of a Tree, Assessment Rating System (STARS) is free to use, but only in its entirety and must be cited as follows:

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

### REFERENCES


Australia ICOMOS Inc. 1999, *The Burra Charter – The Australian ICOMOS Charter for Places of Cultural Significance*, International Council of Monuments and Sites, www.icomos.org/australia

Draper BD and Richards PA 2009, *Dictionary for Managing Trees in Urban Environments*, Institute of Australian Consulting Arboriculturists (IACA), CSIRO Publishing, Collingwood, Victoria, Australia.

Footprint Green Pty Ltd 2001, *Footprint Green Tree Significance & Retention Value Matrix*, Avalon, NSW Australia, www.footprintgreen.com.au

The following example shows the IACA **Significance** of a **Tree, Assessment Rating System** (STARS) used in an Arboricultural report.

*Tree Significance*

Determined by using the Tree Significance - Assessment Criteria of the *IACA Significance of a Tree, Assessment Rating System* (STARS)© (IACA, 2010), Appendix B.

Trees 14, 16, 17/3, 19 and 20/4 are of high significance with the remaining majority of medium significance and a few of low significance. Tree 14 is significant as a prominent specimen and a food source for indigenous avian fauna. Tree 16 as a non-locally indigenous planting is of good from and prominent *in situ*; Tree 17/3 as a stand of 6 street trees along the Davey Street frontage screening views to and from the site and contiguous with trees in Victoria Park extending the aesthetic influence of the urban canopy to the site. Similarly for Trees 20/4 as street trees in Long Road and Tree 19 as an extant exotic planting as a senescent component of the original landscaping. The trees of low significance are recent plantings as fruit trees – Avocados, and 1 Cootamundra Wattle as a non-locally indigenous tree in irreversible decline and potentially structurally unsound.

**Significance Scale**

**1 – High**
**2 – Medium**
**3 – Low**

| Significance Scale | 1 | 2 | 3 |
|---|---|---|---|
| Tree No. / Stand No. | 14, 16, 17/3, 19, 20/4 | 1/1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12/2, 15, 18, 21/5 | 3, 13, 22 |

*Tree Retention Value*

Determined by using the Retention Value - Priority Matrix of the *IACA Significance of a Tree, Assessment Rating System* (STARS)© (IACA, 2010), Appendix B.

**Retention Value**

**High** – Priority for Retention
**Medium** – Consider for Retention
**Low** – Consider for Removal
**Remove** - Priority for Removal

| Retention Value | High<br>Priority for Retention | Medium<br>Consider for Retention | Low<br>Consider for Removal | Remove<br>Priority for Removal |
|---|---|---|---|---|
| Tree No. / Stand No. | 1/1, 5, 17/3*, 19 | 2, 4, 6, 7, 8, 9, 10, 11, 14, 15, 16, 18, 20/4*, 21/5 | 3, 12/2, 13, | 22 |

* Trees located within the neighbouring property and should be retained and protected.

# APPENDIX 4 - EXTRACT FROM AS4970 2009 PROTECTION OF TREES ON DEVELOPMENT SITES

**Section 3, Determining the tree protection zones of the selected trees**

### 3.1 Tree protection zone (TPZ)

*"The tree protection zone (TPZ) is the principal 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 TPZ incorporates the structural root zone (SRZ) (refer to Clause 3.3.5)."*

### 3.2 Determining the TPZ

The radius of the TPZ is calculated for each tree by multiplying its DBH x 12.

**TPZ = DBH x 12**

where

DBH = trunk diameter measured at 1.4 m above ground

Radius is measured from the centre of the stem at ground level.

### 3.3.5 Structural root zone (SRZ)

*"The SRZ is the area required for street stability. A larger area is required to maintain a viable tree. The SRZ only needs to be calculated when a major encroachment into a TPZ is proposed. Root investigation may provide more information on the extent of these roots."*

**Determining the SRZ**

The radius of the TPZ is calculated for each tree by multiplying its DBH x 12.

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

where

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

Note: The SRZ for trees less than 0.15 m will be 1.5 m (see Figure 1).

The curve can be expressed by the following formula:

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

NOTES:

1 $R_{SRZ}$ is the structural root zone radius.

2 D is the stem diameter measured immediately above root buttress.

3 The SRZ for trees less than 0.15 m diameter is 1.5 m.

4 The SRZ formula and graph do not apply to palms, other monocots, cycads and tree ferns.

5 This does not apply to trees with an asymmetrical root plate.

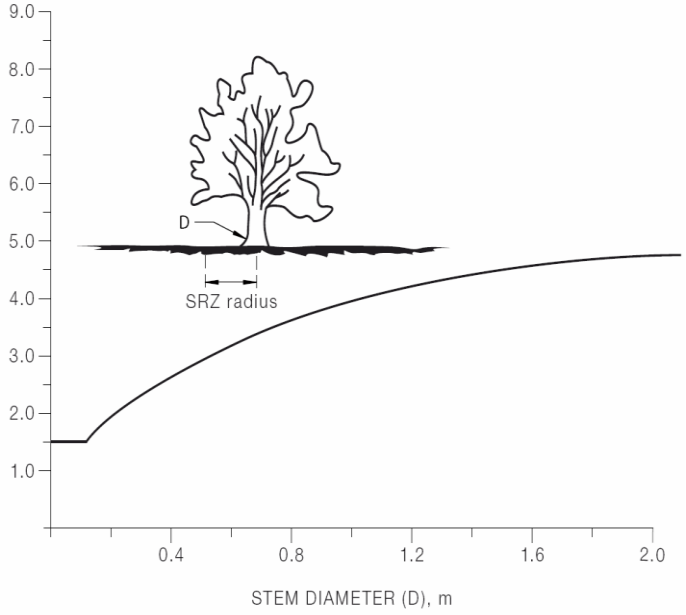



FIGURE 1 STRUCTURAL ROOT ZONE

# APPENDIX 5 – GENERAL TREE PROTECTION SPECIFICATION

**1.0 Appointment of Project Arborist**

A Project Arborist shall be engaged prior the commencement of work on-site and monitor compliance with the protection measures. The Project Arborist shall inspect the tree protection measures and Compliance Certification shall be prepared by the Project Arborist for review by the Principal Certifying Authority prior to the release of the Compliance Certificate.

The Project Arborist shall have a minimum qualification equivalent (using the Australian Qualifications Framework) of Level 5 or above in Arboriculture.

**2.0 Compliance**

Contractors and site workers shall receive a copy of these specifications a minimum of 3 working days prior to commencing work on-site. Contractors and site workers undertaking works within the Tree Protection Zone shall sign the site log confirming they have read and understand these specifications, prior to undertaking works on-site.

The Project Arborist shall undertake regular site inspections and certify that the works are being undertaken in accordance with this specification.

Compliance Documentation shall be prepared by the Project Arborist following each site inspection. The Compliance Documentation shall include documentary evidence of compliance with the tree protection measures and methods as outlined within this Specification. Upon the completion of the works, a final assessment of the trees shall be undertaken by the Project Arborist and future recommended management strategies implemented as required.

**3.0 Tree Removal**

The trees to be removed shall be removed prior to the establishment of the tree protection measures. Tree removal works shall be undertaken in accordance with the *Workcover Code of Practice for the Amenity Tree Industry (1998)*. Tree and vegetation removal shall not damage the trees to be retained.

**4.0 Tree Protection Zone**

The trees to be retained shall be protected prior and during construction from activities that may result in an adverse effect on their health or structural condition. The area within the Tree Protection Zone (TPZ} shall exclude the following activities, unless otherwise stated:-

- Modification of existing soil levels, excavations and trenching
- Mechanical removal of vegetation
- Movement of natural rock
- Storage of materials, plant or equipment or erection of site sheds
- Affixing of signage or hoarding to the trees
- Preparation of building materials, refueling or disposal of waste materials and chemicals
- Lighting fires
- Movement of pedestrian or vehicular traffic
- Temporary or permanent location of services, or the works required for their installation
- Any other activities that may cause damage to the tree

**5.0 Tree Protection Fencing**

TPZ fencing shall be located at the perimeter of the TPZ. Where TPZ areas overlap, TPZ fencing may be combined to form a single larger TPZ area. The exact location of the fencing shall be confirmed through consultation

between the Head Contractor/Project Manager and the Project Arborist prior to the commencement of works. Fencing may be setback to allow for demolition/construction access and for the installation of pavements only where appropriate ground protection is installed and approved by the Project Arborist.

As a minimum, the Tree Protection Fence shall consist of 1.8m high wire mesh panels supported by concrete feet. Panels shall be fastened together and supported to prevent sideways movement. The tree shall not be damaged during the installation of the Tree Protection Fencing. Refer to Typical Tree Protection Details (***Appendix 6***).

**6.0 Site Management**

Materials, waste storage, and temporary services shall not be located within the TPZ.

**7.0 Scaffolding**

Where possible, scaffolding shall not be located within the TPZ. Scaffolding shall not be in contact with the tree. As necessary, this shall be achieved by erecting scaffolding around branches. Branches shall be tied back and protected as deemed necessary by the Project Arborist. Refer to Typical Tree Protection Details (***Appendix 6***).

**8.0 Works within the Tree Protection Zones**

In some cases works within the TPZ may be authorized by the determining authority. These works shall be supervised by the Project Arborist. When undertaking works within the TPZ, care should be taken to avoid damage to the tree's root system, trunks and lower branches.

If roots (>25mm¢) are encountered during the demolition, excavation and construction works, these roots must be retained in an undamaged condition and advice sought from the Project Arborist. Adjustment of final levels and design shall remain flexible to enable the retention of roots (>25mm¢) where deemed necessary by the Project Arborist.

Drilling/piling machinery shall be of a suitable size to not damage the tree's roots, trunk, branches and crown. No clearance pruning is permitted to allow for machinery access. Machinery shall work in conjunction with an observer to ensure that adequate clearance from trees is maintained at all times.

**9.0 Ground Protection**

Where deemed necessary by the Project Arborist, machinery movements shall be restricted to areas of existing pavement or from areas of temporary ground protection such as ground mats or steel road plates. Refer to Typical Tree Protection Details (***Appendix 6***)

**10.0 Trunk Protection**

Where required by the Project Arborist, trunk protection shall be installed. Trunk protection shall be installed by wrapping padding (either carpet underlay or 10mm thick jute geotextile mat) around the trunk and first order branches to a minimum height of 2m. Timber battens (90 x 45mm) spaced at 150mm centres shall be strapped together and placed over the padding. Timber battens must not be fixed to the trees. Refer to Typical Tree Protection Details (***Appendix 6***).

**11.0 Structure & Pavement Demolition**

Demolition of existing structures/pavement within the TPZ shall be supervised by the Project Arborist. Machinery is to be excluded from the TPZ unless operating from the existing slabs, pavements or areas of ground protection (refer to Section 9.0). Machinery should not contact the tree's roots, trunk, branches and crown.

The existing pavement shall be carefully lifted to minimise damage to the underlying soil profile (or sub-base materials) and to prevent damage to tree roots. Wherever possible, existing sub-base materials shall remain in-situ.

When removing slab sections within TPZ, machinery shall work backwards out of the TPZ to ensure machinery remains on un- demolished sections of slab at all times. Wherever possible, footings or elements below grade shall be retained to minimise disturbance to the tree's roots.

Where deemed necessary by the Project Arborist, the structures shall be shattered prior to removal with a hand-operated pneumatic/electric breaker.

If roots (>25mmØ) are encountered during the demolition works, these roots must be retained in an undamaged condition and advice sought from the Project Arborist. Where the Project Arborist determines that the tree is using underground elements (i.e footings, pipes, rocks etc.) for support, these elements shall be left in-situ.

**12.0 Underground Services**

Underground service installation within the TPZ shall be supervised by the Project Arborist.

The installation of underground services shall be located outside of the TPZ. Where this is not possible, they shall be installed using either hydrovac or hand excavation methods with the services installed around/below roots (>25mm¢, or as determined by the Project Arborist).

Alternatively, boring methods may be used for underground service installation where the installation depth is greater than 800mm below existing grade. Excavations for starting and receiving pits for boring equipment shall be located outside of the TPZ or located to avoid roots (>25mm¢, or as determined by the Project Arborist).

**13.0 Excavations, Root Protection & Root Pruning**

Excavations and root pruning within the TPZ shall be supervised by the Project Arborist. Excavations within the TPZ shall be avoided wherever possible.

Excavations within the TPZ shall be undertaken by hand or using hydro vacuum excavation methods (or similar approved device) to protect tree roots. If there is any delay between excavation works and backfilling, exposed roots shall be protected from direct sunlight, drying out and extremes of temperature by covering with a 10mm thick jute mat. The mat shall be kept in a damp condition at all times.

Hand excavation and root pruning shall be undertaken along the excavation line prior to the commencement of mechanical excavation to prevent tearing and shattering damage to the roots from excavation equipment. Roots (>25mm¢) shall be pruned by the Project Arborist only. Roots (<25mm¢) may be pruned by the Principal Contractor. Root pruning shall be undertaken with clean, sharp secateurs or a pruning saw to ensure a smooth wound face, free from tears.

No over-excavation, battering or benching shall be undertaken beyond the footprint of any structure unless approved by the Project Arborist.

Damaged roots shall be pruned behind the damaged tissues with the final cut made to an undamaged part of the root.

# APPENDIX 6 - TYPICAL TREE PROTECTION DETAILS

**Note:**
No excavation, construction activity, grade changes, surface treatment or storage of materials of any kind is permitted within the TPZ.

**Option 1 - Fencing**
1.8m high chain wire mesh panels with shade cloth attached (if required), held in place with concrete feet.

Tree Protection Zone (TPZ) sign

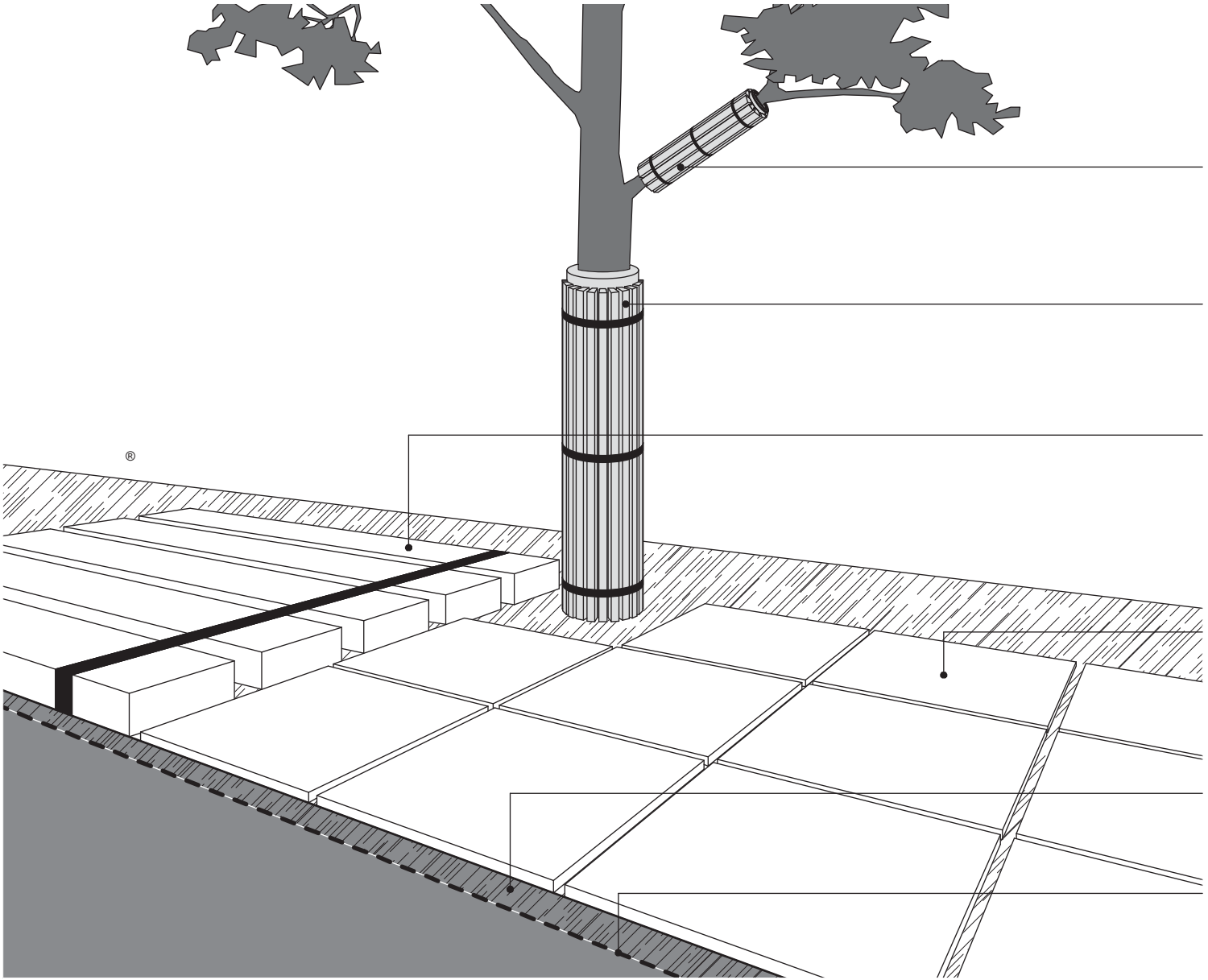
**Option 2 - Fencing**
Plywood or wooden panel paling fence. This type of fencing material also prevents building materials or soil entering the TPZ.

Installation of supports should avoid damaging roots.

Bracing is permissible within the TPZ.

Maximum 100mm and minimum 50mm depth mulch or aggregate layer installed across surface of TPZ.

01 Tree Protection Fencing



**Branch Protection** - use boards and padding to prevent damage to bark on branch. Boards are to be strapped, not screwed or nailed to the branch.

**Trunk Protection** - use boards and padding to prevent damage to bark (minimum 2m). Boards are to be strapped, not screwed or nailed to the trunk.

**Ground Protection** - use device strapped over mulch or aggregate layer. Ground protection device should be of a suitable thickness to prevent soil compaction and root damage.

Steel plates (or approved equivalent) with or without mulch or aggregate layer below.

Maximum 100mm and minimum 50mm depth mulch or aggregate layer.

Geotextile fabric underneath mulch or aggregate layer.

02 Examples of Branch, Trunk and Ground Protection

Branches may require pruning to erect scaffolding. Pruning may be subject to local regulations. Flexible branches should be tied back in preference to pruning.

Minimum 1.8m high hoarding. Temporary fencing may be incorporated into scaffolding as either containment screening or as hoarding.

**Note:**
If excavation is required for installation of support post for fencing, the Project Arborist should assess any pruning of roots greater than 20mm diameter.

Scaffold planks

Boards or plywood to be installed over mulch or aggregate layer for any areas requiring access within the TPZ.

Soleplate over geotextile. No excavation for soleplate within TPZ.

Maximum 100mm and minimum 50mm depth mulch or aggregate layer within TPZ.

Geotextile fabric

03 Indicative Scaffolding within a Tree Protection Zone (TPZ)