ARBORICULTURAL IMPACT ASSESSMENT REPORT
TREE PROTECTION SPECIFICATION

Saint Ignatius College
Riverview

Prepared for: ESPY MANAGEMENT

28th October 2015
Revision A

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1.0 INTRODUCTION

1.1 Background

1.1.1 This Arboricultural Impact Assessment Report and Tree Protection Specification was prepared for Espy Management, on behalf of Saint Ignatius College, in relation to the proposed State Significant Development for the Saint Ignatius College Master Plan and Stage 1 Works. The purpose of this Report is to undertake a Visual Tree Assessment (VTA) of the subject trees, determine the impact of the proposed works on the subject trees, and provide tree protection measures for the subject trees to be retained.

1.1.2 In preparing this report, the author is aware of and has taken into account the objectives of the Lane Cove Council’s Tree Preservation Regulatory Controls, Clause 5.9 of Lane Cove Local Environmental Plan 2009, Australian Standard 4970 Protection of Trees on Development Sites (2009), Australian Standard 4373 Pruning of Amenity Trees (2007) and Australian Standard 2303 Tree Stock for Landscape Use (2015).

Refer to Methodology (Appendix 1)

1.1.3 The following documentation/plans were viewed in the preparation of this report:

- St Ignatius College Development Application – Stage 1 Landscape Plan, dated 27th October 2015

Refer to Plans (Appendix 2)

1.2 Aims

1.2.1 The aims of this report are to:

- Undertake a visual assessment of the subject trees
- Review Council’s policies for applicable conditions regarding the preparation of Arboricultural Reports
- Review the supplied plan to determine the impact on the subject trees
- Where appropriate, recommend the use of sensitive construction methods to minimise the adverse impacts on the subject trees
- Where appropriate, prepare site specific tree protection measures for the subject trees to be retained

1.2.2 There is no warranty or guarantee, expressed or implied that problems or deficiencies regarding the subject tree(s) or the subject site may not arise in the future. Information contained in this report covers only the subject tree(s) assessed and reflects the condition of the subject tree(s) at the time of inspection.

2.0 RESULTS

2.1 The Site

2.1.1 The Saint Ignatius College campus is situated on the banks of the Lane Cove River within the suburb of Riverview. The campus is bordered by the Lane Cove River to the south, south-east and south-west, and by residential developments to the north, north-east and north-west.

2.1.2 For the purpose of this Report, the subject site comprises of pavement, grassed and garden bed areas to the north, west and south of the Therry Building.
2.2 The Proposal

2.2.1 DA Approval is sought for Stage 1 works to include:

- Expansion and refurbishment of the existing Therry and O’Neil Buildings.
- Upgrading of the existing courtyard between Therry and Vaughan Buildings.
- Upgrading of the existing courtyard to the north of Therry Buildings.
- Upgrading of the landscape at the north-eastern corner of the Therry courtyard.

Refer to Plans (Appendix 2)

2.3 The Trees

2.3.1 Ten (10) trees were assessed using the Visual Tree Assessment (VTA) criteria and notes. The trees comprise a mix of Australian native and exotic species. Information relating to individual tree assessment is contained within Tree Assessment Schedule (Appendix 3).

2.3.2 All of the trees are protected by the tree management controls within Clause 5.9 of Lane Cove Local Environmental Plan 2009.

2.3.3 A search of the BioNet Atlas of NSW Wildlife Database was undertaken in October 2015. No individual threatened tree species that were listed within this database for the area were identified during the current field investigations of the site. The ecological significance and habitat value of the trees has not been assessed and is beyond the scope of this report.

3.0 ARBORICULTURAL IMPACT ASSESSMENT

3.1 Trees 1 & 2

3.1.1 Trees 1 and 2 have been identified as Corymbia maculata (Spotted Gum) and are located at the southern end of the courtyard area, between the Therry and Vaughan Buildings. The trees have been assessed as being of good health and structural condition. It appears that ground levels have been slightly raised at the trees bases as indicated by the absence of basal trunk flare. Minor cracking of the surrounding pavement was noted however the surface appears level.

3.1.2 Trees 1 and 2 have been heavily crown lifted. In particular, Tree 1 has developed an asymmetrical crown form due to the extent of pruning works required to provide clearance from the adjacent building which is in close proximity to the tree. Trees 1 and 2 have been allocated a high Landscape Significance and a Retention Value of Consider for Retention.

3.1.3 The supplied plans show works proposed within the Tree Protection Zone (TPZ) areas of Trees 1 and 2 include the demolition of existing structures and pavements, and construction of retaining walls, stairs, pavement areas and associated landscape works.

---

1 Mattheck & Breloer (2003)
2 Lane Cove Council (2009)
3 NSW Office of Environment and Heritage (2011)
3.1.4 The extent of these works represent a Major Encroachment as defined by Australian Standard 4970 – 2009 Protection of Trees on Development Sites (AS-4970). Clause 3.3.4 of AS-4970 outlines that tree sensitive design and construction methods can be used to minimize the impact of an encroachment.

3.1.5 Recommendations - To minimize the impact of the works on Trees 1 and 2, the following tree sensitive demolition/construction methods should be used:

- **Demolition**: Tree sensitive demolition works should be used for the removal of existing structures and pavements within TPZ areas. Where possible, existing footings and sub-base materials should be left in situ and reused.

- **Retaining Walls, Stairs & Other Landscape Structures**: Footings within TPZ areas should utilize a piered (and above-grade beam, as required) footing system to bridge tree roots unless root investigations (supervised by the Project Arborist) show no roots (>25mmø) are present.

  The location of piers should be determined by preliminary hand excavation (supervised by the Project Arborist) to enable the retention of roots (>25mmø), where deemed necessary by the Project Arborist. In excavated areas where roots (>25mmø) are present and are to be retained, the location of the piers should be adjusted.

- **Pavement**: New pavement surfaces within TPZ areas should be installed at or above the existing grade and utilize existing sub-base materials, where present. No excavation of the soil profile beneath the existing pavement should be undertaken. Where possible, pavement surfaces and sub base materials within TPZ areas should be permeable.

- **Planting**: The installation of plants within TPZ areas should be undertaken using hand tools and roots (>25mmø) should be protected. No mechanical cultivation/ripping of soils should be undertaken within TPZ areas.

3.2 Tree 3

3.2.1 Tree 3 has been identified as *Eucalyptus microcorys* (Tallowwood) and is located centrally within the courtyard area between the Therry and Vaughan Buildings. The tree has been assessed as being of good health, and fair structural condition due to evidence of possible termite activity at the base of the trunk. Tree 3 has been allocated a moderate Landscape Significance and a Retention Value of Consider for Retention.

3.2.2 Tree 3 is currently located in the corner of a raised, grassed garden bed area, adjacent to a paved area and a flight of concrete steps. *Eucalyptus microcorys* (Tallowwood) are a very large species in maturity. Whilst no damage to pavements or the steps was observed at the time of assessment, it is likely that pressure exerted by the root system of the tree will cause displacement/damage to existing structures as the tree grows.

3.2.3 The supplied plans show that Tree 3 is to be removed as part of the proposed landscape treatment.

3.3 Tree 4

3.3.1 Tree 4 has been identified as *Eucalyptus globulus* subsp. *bicostata* (Southern Blue Gum) and is located at the western end of the courtyard area, between the Therry and Vaughan Buildings. The tree has been assessed as being of good health and structural condition. Tree 4 has been allocated a moderate Landscape Significance and a Retention Value of Consider for Retention.
3.3.2 Tree 4 is located in a small grassed garden bed area adjacent to the top of a pedestrian ramp. It appears that root pressure exerted on the rear of the low, masonry retaining wall that borders the ramp has caused cracking of the blockwork. At present time, the damage is relatively minor and could be repaired using tree sensitive methods.

3.3.3 The supplied plans show works proposed within the TPZ of Tree 4 includes the demolition of existing structures and pavements, and construction of retaining walls, pavement areas and associated landscape works. The extent of these works represent a Major Encroachment as defined by AS-4970.

3.3.4 Recommendations - To minimize the impact of the works on Tree 4, the following tree sensitive demolition/construction methods should be used:

- **Demolition**: Tree sensitive demolition works should be used for the removal of existing structures and pavements within the TPZ. Where possible, existing footings and sub-base materials should be left in situ and reused.

- **Retaining Walls & Other Landscape Structures**: Footings within the TPZ should utilize a piered (and above-grade beam, where required) footing system to bridge tree roots unless root investigations (supervised by the Project Arborist) show no roots (>25mmø) are present.

  The location of piers should be determined by preliminary hand excavation (supervised by the Project Arborist) to enable the retention of roots (>25mmø), where deemed necessary by the Project Arborist. In excavated areas where roots (>25mmø) are present and are to be retained, the location of the piers should be adjusted.

- **Pavements**: The new pavement surfaces within TPZ should be installed at or above the existing grade and utilize existing sub-base materials, where present. No excavation of the soil profile should be undertaken. Where possible, pavement surfaces and sub base materials within TPZ areas should be permeable.

  Where decking is to be installed, the location of posts within the TPZ areas should be determined by preliminary hand excavation (supervised by the Project Arborist) to enable the retention of roots (>25mmø), where deemed necessary by the Project Arborist. In excavated areas where roots (>25mmø) are present and are to be retained, the location of the posts should be adjusted. Sufficient space should be provided between the decking subframe and tree to allow for future trunk expansion. Decking may extend within 100mm from the tree’s trunk if provision has made within the design for the periodic cutting back of decking to accommodate trunk expansion.

- **Planting**: The installation of plants within TPZ areas should be undertaken using hand tools and roots (>25mmø) should be protected. No mechanical cultivation/ripping of soils should be undertaken within TPZ areas.

3.4 Trees 5, 6 & 7

3.4.1 Trees 5, 6 and 7 have been identified as *Ficus benjamina* (Weeping Fig) and are located within a small garden bed between the handball courts and the Therry Building. The trees have been assessed as being of good health, and fair structural condition due to the presence of major bark inclusions and wounds with early stages of decay. Trees 5-7 have been allocated a low Landscape Significance and a Retention Value of Consider for Removal.
3.4.2 *Ficus benjamina* (Weeping Fig) are a very large species in maturity, and the planting of three specimens in a relatively small garden bed surrounded by structures/buildings is considered inappropriate. Due to mutual suppression and the proximity of the buildings, the trees have developed an etiolated form and the crowns of the trees will require ongoing Reduction Pruning to provide building clearance. Whilst no damage to pavements and adjacent structures was observed at the time of assessment, it is likely that pressure exerted by the root system of the trees will cause displacement/damage to structures as the trees grow.

3.4.3 The supplied plans show that Trees 5-7 are to be removed as part of the proposed landscape treatment.

3.5 Trees 8, 9 & 10

3.5.1 Trees 8, 9 and 10 have been identified as *Ficus benjamina* (Weeping Fig) and are located within a small raised planter between the St Johns and Therry Buildings. These trees have been assessed as being of good health and fair structural condition. Trees 8-10 have been allocated a low Landscape Significance and a Retention Value of *Priority for Removal*.

3.5.2 As discussed above, *Ficus benjamina* are a very large tree in maturity and it appears that root pressure exerted by the trees’ root system is beginning to displace the wall of the raised planter. In addition, a 50mm diameter root has grown beneath the wall of the raised planter and is beginning to lift the wall. As with Trees 5, 6 and 7, due to the restricted nature of their growing environment and the proximity to adjacent buildings, Trees 8-10 are considered to inappropriate for their location.

3.5.3 The supplied plans show that Trees 8-10 are to be removed as part of the proposed landscape treatment.

3.6 Replacement Planting

3.6.1 Replacement planting is recommended where trees are proposed for removal. Replacement trees should be grown in accordance with *Australian Standard 2303 (2015)* Tree Stock for Landscape Use.

4.0 CONCLUSION

4.1 Ten (10) trees were assessed and comprise a mix of Australian native and exotic species.

4.2 DA Approval is sought for Stage 1 works, including expansion and refurbishment of the existing Therry and O’Neil buildings, and associated landscape works.

4.3 The supplied plans show that seven (7) trees (Trees 3 & 5-10) will need to be removed to accommodate the proposed development.

4.4 The supplied plans show that three (3) tree (Trees 1, 2 & 4) are to be retained as part of the proposed development. Works are proposed within the TPZ areas of these trees and represent *Major Encroachments* as defined by AS-4970. To minimize the impact of works on Trees 1, 2 and 4, tree sensitive demolition/construction methods should be used as (outlined within Sections 3.1.5 and 3.3.4) to minimise the impact of the works on the trees. Existing levels within TPZ areas should be maintained, unless prior root mapping results show no roots are present. Adjustment of final levels and design within TPZ areas shall remain flexible to enable the retention of structural roots (>25mm), where deemed necessary by the Project Arborist. The trees should be protected in accordance with the Tree Protection Speciation (Appendix 5).

4.5 Replacement planting is recommended where trees are proposed for removal. Replacement trees should be grown in accordance with *Australian Standard 2303 (2015)* Tree Stock for Landscape Use.
NOTE 1: Reference should be made to any relevant legislation including Tree Management Controls. All recommendations contained within this report are subject to approval from the relevant Consent Authority.

NOTE 2: This report provides recommendations relating to tree management only. Advice should be sought from appropriately qualified consultants regarding design/construction issues.

NOTE 3: A comprehensive risk assessment and management plan for the trees is beyond the scope of this report.

AS 4970, 2009: Tree iQ- amended and reproduced under copyright Licence1110-c049
AS 4373, 2007: Tree iQ- amended and reproduced under copyright Licence1110-c049

5.0 BIBLIOGRAPHY & REFERENCES


Lane Cove Council (2009), Lane Cove Local Environmental Plan.


Simon, Dormer &Hartshorne (1973), Lawson’s Botany, Bell & Hyman, London.

Standards Australia (2009), Protection of Trees on Development Sites AS-4970.


Standards Australia (2015), Tree Stock for Landscape Use AS-2303.
Appendix 1: Methodology

1.1 Site Inspection: This report was determined as a result of a comprehensive site during October 2015. The comments and recommendations in this report are based on findings from this site inspection.

1.2 Visual Tree Assessment (VTA): The subject tree was assessed using the Visual Tree Assessment criteria and notes as described in The Body Language of Trees – A Handbook for Failure Analysis (Mattheck & Breloer 2003). The inspection was limited to a visual examination of the subject tree from ground level only. The inspection was limited to a visual examination of the subject tree(s) from ground level only. No internal diagnostic testing was undertaken as part of this assessment. Trees outside the subject site were assessed from the property boundaries only.

1.3 Tree Dimensions: The dimensions of the subject tree(s) are approximate only.

1.4 Tree Locations: The location of the subject tree(s) was determined from the supplied plans.

1.5 Trees & Development: Tree Protection Zones, Tree Protection Measures and Sensitive Construction Methods for the subject tree were based on methods outlined in Australian Standard 4970-2009 Protection of Trees on Development Sites.

The Tree Protection Zone (TPZ) is described in AS-4970 as 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 Structural Root Zone (SRZ) is described in AS-4970 as the area around the base of a tree required for the tree’s stability in the ground. Severance of structural roots within the SRZ is not recommended as it may lead to the destabilisation and/or demise of the tree.

In some cases it may be possible to encroach into or make variations to the theoretical TPZ. A Minor Encroachment is less than 10% of the area of the TPZ and is outside the SRZ. The area lost to this encroachment should be compensated for elsewhere and contiguous with the TPZ. A Major Encroachment is greater than 10% of the TPZ or inside the SRZ. In this situation the Project Arborist must demonstrate that the tree would remain viable. This may require root investigation by non-destructive methods or the use of sensitive construction methods.

1.6 Tree Health: The health of the subject tree(s) was determined by assessing:

I. Foliage size and colour
II. Pest and disease infestation
III. Extension growth
IV. Crown density
V. Deadwood size and volume
VI. Presence of epicormic growth

1.7 Tree Structural Condition: The structure of the subject tree(s) was assessed by:

I. Visible evidence of structural defects or instability
II. Evidence of previous pruning or physical damage

1.8 Useful Life Expectancy (ULE): The ULE is an estimate of the longevity of the subject tree(s) in its growing environment. The ULE is modified where necessary to take in consideration tree(s) health, structural condition and site suitability. The tree(s) has been allocated one of the following ULE categories (Modified from Barrell, 2001):

I. 40 years +
II. 15-40 years
III. 5-15 years
IV. Less than 5 years
1.9 **Landscape Significance:** Landscape Significance was determined by assessing the combination of the cultural, environmental and aesthetic values of the subject tree(s). Whilst these values are subjective, a rating of high, moderate, low or insignificant has been allocated to the tree(s). This provides a relative value of the tree’s Landscape Significance which may aid in determining its Retention Value. If the tree(s) can be categorized into more than one value, the higher value has been allocated.

<table>
<thead>
<tr>
<th>Landscape Significance</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very High</td>
<td>The subject tree is listed as a Heritage Item under the <em>Local Environmental Plan</em> with a local or state level of significance. The subject tree is listed on Council’s Significant Tree Register or is considered to meet the criteria for significance assessment of trees and/or landscapes by a suitably qualified professional. The criteria are based on general principles outlines in the Burra Charter and on criteria from the Register of the National Estate. The subject tree is a remnant tree.</td>
</tr>
<tr>
<td>High</td>
<td>The subject tree creates a ‘sense of place’ or is considered ‘landmark’ tree. The subject tree is of local, cultural or historical importance or is widely known. The subject tree has been identified by a suitably qualified professional as a species scheduled as a Threatened or Vulnerable Species or forms part of an Endangered Ecological Community associated with the subject site, as defined under the provisions of the <em>Threatened Species Conservation Act 1995 (NSW)</em> or the <em>Environmental Protection and Biodiversity Conservation Act 1999</em>. The subject tree is known to provide habitat to a threatened species. The subject tree is an excellent representative of the species in terms of aesthetic value. The subject tree is of significant size, scale or makes a significant contribution to the canopy cover of the locality. The subject tree forms part of the curtilage of a heritage item with a known or documented association with that item.</td>
</tr>
<tr>
<td>Moderate</td>
<td>The subject tree makes a positive contribution to the visual character or amenity of the area. The subject tree provides a specific function such as screening or minimising the scale of a building. The subject tree has a known habitat value. The subject tree is a good representative of the species in terms of aesthetic value.</td>
</tr>
<tr>
<td>Low</td>
<td>The subject tree is an environmental pest species or is exempt under the provisions of the local Council’s Tree Management Controls. The subject tree makes little or no contribution to the amenity of the locality. The subject tree is a poor representative of the species in terms of aesthetic value.</td>
</tr>
<tr>
<td>Insignificant</td>
<td>The subject tree is declared a Noxious Weed under the Noxious Weeds Act</td>
</tr>
</tbody>
</table>

1.10 **Retention Value:** Retention Value was based on the subject tree’s Useful Life Expectancy and Landscape Significance. The Retention Value was modified where necessary to take in consideration the subject tree’s health, structural condition and site suitability. The subject tree(s) has been allocated one of the following Retention Values:

I. Priority for Retention  
II. Consider for Retention  
III. Consider for Removal  
IV. Priority for Removal

<table>
<thead>
<tr>
<th>ULE</th>
<th>Landscape Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 years +</td>
<td>Very High: Priority for Retention</td>
</tr>
<tr>
<td>15-40 years</td>
<td>High: Priority for Retention</td>
</tr>
<tr>
<td>5-15 years</td>
<td>Moderate: Consider for Retention</td>
</tr>
<tr>
<td>Less than 5 years</td>
<td>Low: Priority for Removal</td>
</tr>
<tr>
<td></td>
<td>Insignificant: Priority for Removal</td>
</tr>
</tbody>
</table>

The above table has been modified from the Footprint Green Tree Significance and Retention Value Matrix.

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The page contains structured information on landscape significance, retention value, and tables that categorize trees based on their significance and retention priority.
<table>
<thead>
<tr>
<th>Tree No.</th>
<th>Species</th>
<th>DBH (mm)</th>
<th>Height (m)</th>
<th>Radial Crown Spread (m)</th>
<th>Health Rating</th>
<th>Structural Rating</th>
<th>Comments</th>
<th>ULE (years)</th>
<th>L/Significance</th>
<th>Retention Value</th>
<th>TPZ (m)</th>
<th>SRZ (m)</th>
<th>Implication</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>Corymbia maculata</em> (Spotted Gum)</td>
<td>650</td>
<td>22</td>
<td>10</td>
<td>Good</td>
<td>Good</td>
<td>Asymmetrical crown spread due to adjacent building. Limited building clearance. Previously crown lifted. Small (&lt;25mm) &amp; medium (25-50mm) diameter deadwood in low volumes. Located in small tree pit within pavement. Lack of basal flare indicates grade alteration (fill) at base.</td>
<td>5-15</td>
<td>High</td>
<td>Consider for Retention</td>
<td>7.8</td>
<td>2.8</td>
<td>Retain &amp; protect.</td>
</tr>
<tr>
<td>2</td>
<td><em>Corymbia maculata</em> (Spotted Gum)</td>
<td>600</td>
<td>22</td>
<td>10</td>
<td>Good</td>
<td>Good</td>
<td>Previously crown lifted. Small (&lt;25mm) &amp; medium (25-50mm) diameter deadwood in low volumes. Located in small tree pit within pavement. Lack of basal flare indicates grade alteration (fill) at base.</td>
<td>5-15</td>
<td>High</td>
<td>Consider for Retention</td>
<td>7.2</td>
<td>2.7</td>
<td>Retain &amp; protect.</td>
</tr>
<tr>
<td>3</td>
<td><em>Eucalyptus microcorys</em> (Tallowwood)</td>
<td>550</td>
<td>19</td>
<td>10</td>
<td>Good</td>
<td>Fair</td>
<td>Possible termite activity. Small (&lt;25mm) &amp; medium (25-50mm) diameter deadwood in low volumes. Located in between pavement area and retaining wall.</td>
<td>5-15</td>
<td>Moderate</td>
<td>Consider for Retention</td>
<td>6.6</td>
<td>2.6</td>
<td>Remove.</td>
</tr>
<tr>
<td>4</td>
<td><em>Eucalyptus globulus</em> subsp. <em>bicostata</em></td>
<td>900</td>
<td>15</td>
<td>10</td>
<td>Good</td>
<td>Good</td>
<td>75-95% crown density. Mechanical damage to exposed surface roots. Small basal wound, early stages of decay. Located in between pavement area and ramp.</td>
<td>15-40</td>
<td>Moderate</td>
<td>Consider for Retention</td>
<td>10.8</td>
<td>3.2</td>
<td>Retain &amp; protect.</td>
</tr>
<tr>
<td>Tree No.</td>
<td>Species</td>
<td>DBH (mm)</td>
<td>Height (m)</td>
<td>Radial Crown Spread (m)</td>
<td>Health Rating</td>
<td>Structural Rating</td>
<td>Comments</td>
<td>ULE (years)</td>
<td>L/Significance</td>
<td>Retention Value</td>
<td>TPZ (m)</td>
<td>SRZ (m)</td>
<td>Implication</td>
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</tr>
<tr>
<td>8</td>
<td><em>Ficus benjamina</em> (Weeping Fig)</td>
<td>800</td>
<td>10</td>
<td>5</td>
<td>Good</td>
<td>Fair</td>
<td>Bark inclusions, major. Crossing branches. Wounds, early stages of decay. Partially suppressed. Located in small garden bed, wall displacement observed. Limited building clearance.</td>
<td>&lt;5</td>
<td>Low</td>
<td>Priority for Removal</td>
<td>9.6</td>
<td>3.1</td>
<td>Remove.</td>
</tr>
<tr>
<td>9</td>
<td><em>Ficus benjamina</em> (Weeping Fig)</td>
<td>300</td>
<td>10</td>
<td>5</td>
<td>Good</td>
<td>Fair</td>
<td>Bark inclusions, major. Crossing branches. Wounds, early stages of decay. Partially suppressed. Located in small garden bed, wall displacement observed. Limited building clearance.</td>
<td>&lt;5</td>
<td>Low</td>
<td>Priority for Removal</td>
<td>3.6</td>
<td>2</td>
<td>Remove.</td>
</tr>
<tr>
<td>10</td>
<td><em>Ficus benjamina</em> (Weeping Fig)</td>
<td>400</td>
<td>10</td>
<td>5</td>
<td>Good</td>
<td>Fair</td>
<td>Bark inclusions, major. Crossing branches. Wounds, early stages of decay. Partially suppressed. Located in small garden bed, wall displacement observed. Limited building clearance.</td>
<td>&lt;5</td>
<td>Low</td>
<td>Priority for Removal</td>
<td>4.8</td>
<td>2.3</td>
<td>Remove.</td>
</tr>
</tbody>
</table>
Appendix 4: Plates

Plate 1: Showing Trees 1 & 2
Plate 2: Showing pavement surrounding Tree 1
Plate 3: Showing trunk of Tree 3
Plate 4: Showing Tree 4
Plate 5: Showing limited clearance between buildings and Trees 5-7
Plate 6: Showing surface roots of Trees 6 & 7
Plate 7: Showing Trees 8-10
Appendix 5: 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 NSW TAFE Certificate Level 5 or above in Arboriculture.

The site specific requirements for tree protection fencing and temporary access, and other specific tree protection measures shall be confirmed through consultation between the Head Contractor/Project Manager and the Project Arborist prior to the commencement of works.

1.1 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.

1.2 Tree & Vegetation Removal
Trees approved for removal by the determining authority shall be removed prior to the establishment of the tree protection measures. Tree removal shall not damage the trees to be retained.

Tree removal works shall be undertaken in accordance with the Workcover Code of Practice for the Amenity Tree Industry (1998).

1.3 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

NOTE: If access, encroachment or incursion into the TPZ is deemed essential, prior authorisation is required by the Site Arborist.

1.4 Tree Protection Fencing
Tree Protection Fencing shall be installed at the perimeter of the TPZ. Where works approved by the determining authority are required within the TPZ areas, fencing may be setback to provide temporary access, only where ground and trunk protection has been provided. Refer to Sections 1.5 & 1.8.

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 fence must have a lockable opening for access. The tree shall not be damaged during the installation of the Tree Protection Fencing. Refer to Typical Tree Protection Details (3) (Appendix 6).
1.5 Signage

Signs identifying the TPZ should be placed around the edge of the TPZ and be visible from within the development site. The lettering on the sign should comply with *Australian Standard - 1319 (1994) Safety signs for the occupational environment*. The signage shall be installed prior to the commencement of works on-site and shall be maintained in good condition for the duration of the development period.

1.6 Trunk & Branch Protection

Where deemed necessary by the Project Arborist, trunk protection shall be installed by wrapping padding around the trunk to a minimum height of 2m or as the lower branches permit. 2m lengths of timber battens (75mm x 45mm) spaced at 100mm centres shall be strapped together and placed over the padding. Branch protection shall be installed to those branches 1m or closer to scaffolding. Branch protection shall be installed by wrapping padding around the branch. Refer to Typical Tree Protection Details (4) (**Appendix 6**).

1.7 Site Management

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

1.8 Ground Protection & Temporary Access

Where required, Ground Protection & Temporary Access within the TPZ shall be shall be confirmed through consultation between the Head Contractor/Project Manager and the Project Arborist.

Where light traffic access <3.5 tons is required the ground surface shall be protected by a 100mm deep mulch cover overlaid with rumble boards/road plates. The mulch shall be Horticultural Grade Pine Bark as certified to AS4454: Composts, Soil Conditioners and Mulches (1997). The mulch shall be spread by hand to avoid soil disturbance and compaction.

Where heavy traffic access >3.5 tons is required the ground surface shall be protected by a layer of geo-textile fabric over which a 300mm layer of compacted road base is to be installed. The geo-textile shall extend a minimum of 300mm beyond the edge of the road base. When removing temporary access road the material shall be removed with care to prevent disturbance of natural ground levels below. Refer to Typical Tree Protection Details (4) (**Appendix 6**).

1.9 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 (5) (**Appendix 6**).

1.10 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 (>25mmø) 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 (>25mmø) where deemed necessary by the Project Arborist.

1.11 Structure Demolition

Demolition of existing structures 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 1.8). Machinery should not contact the tree’s roots, trunk, branches and crown.

When removing slab sections within TPZ, machinery shall work backwards out of the TPZ to ensure machinery remains on undemolished 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. Exposed roots shall be protected from direct sunlight, drying out and extremes of temperature by covering with a 10mm thick jute geotextile fabric. The geotextile fabric shall be kept in a damp condition at all times. Where the Project Arborist determines that the subject tree is using underground elements (i.e. footings, pipes, rocks etc.) for support, these elements shall be left in-situ.

1.12 Pavement Demolition

Demolition of the existing pavements within the TPZ shall be supervised by the Project Arborist. The existing pavement shall be carefully lifted by hand to minimise damage to the existing sub-base and to prevent damage to tree roots. Wherever possible, the existing sub-base material shall remain in-situ.

The exposed roots shall be protected from direct sunlight, drying out and extremes of temperature by covering with a 10mm thick jute geotextile fabric. The geotextile fabric shall be kept in a damp condition at all times.

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. Exposed roots shall be protected from direct sunlight, drying out and extremes of temperature by covering with a 10mm thick jute geotextile fabric. The geotextile fabric shall be kept in a damp condition at all times. Where the Project Arborist determines that the subject tree is using underground elements (i.e. footings, pipes, rocks etc.) for support, these elements shall be left in-situ.

1.13 Footing Installation

Footing installation within TPZ areas shall be supervised by the Project Arborist. Footings within the TPZ shall be supported on piers/piles/posts/columns (and above-grade beam, where applicable) to bridge tree roots unless root investigations show no roots (>25mmø) are present.

The locations of piers/piles/posts/columns within the TPZ shall be determined by preliminary hand excavation. In excavated areas where roots (>25mmø) are present and are to be retained, the location of the pier/pile/post/column shall be adjusted. The piers/piles/posts/columns within the TPZ shall be sheathed to prevent encapsulation of roots by concrete. Drilling/piling machinery shall be excluded from the TPZ unless operating from an area where ground protection has been installed (refer to Section 1.8) or from the existing slabs or pavements.

Drilling/piling machinery shall be of a suitable size to not damage the trees’ 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.

Sufficient clearance shall be provided from the decking sub-frame to allow for the future trunk expansion. Decking may extend within 100mm from the tree’s trunk if provision has made within the design for the periodic cutting back of decking to accommodate trunk expansion.

1.14 Pavement Installation

Installation of the pavements and sub-base within the TPZ shall be supervised by the Project Arborist. The new surfaces and sub-base materials shall be placed above grade to minimise excavations and retain roots (unless prior root mapping results show above sensitive construction to be unnecessary).

If roots (>25mmø) are encountered during the installation of the new sub-base and surfaces, 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 structural roots (>25mmø) where deemed necessary by the Project Arborist.

New sub-base material shall be a 20mm no-fines road base (Benedict Sand & Gravel - Product Code 20NF/RB or similar approved material). If required, bedding sand shall be a washed river sand (recycled crushed paving blends shall not be used). The bedding sand shall be consolidated with a pedestrian-operated plate compactor only. If possible, the pavement material shall be permeable.
1.15 Underground Services
Installation of underground services within the TPZ shall be supervised by the Project Arborist. Wherever possible, underground services shall not be located within the TPZ.

The location of stormwater pipes shall be excavated by hand/hydrovac to a depth of 600mm. When undertaking hydro-vacuum excavation, the tip of the high pressure lance is not to be pointed directly at roots at close range to avoid the removal or damage to bark. It is essential that the bark of roots remain intact.

Where roots (>25mmØ) are present and are to be retained (as determined by the Project Arborist), the pipes shall be installed by either inserting pipes beneath roots or using thrust (trenchless) boring methods.

Excavations for starting and receiving pits for thrust boring equipment shall be located outside the TPZ wherever possible. The top of the pipe being installed must be installed at a minimum depth of 600mm below existing grade. Boring techniques involving external lubrication of the boring head with materials other than water (e.g. oil, bentonite, etc.) shall be avoided.

Root pruning and excavations shall be undertaken as outlined within Section 1.17.

1.16 Plant Installation
Planting of new trees, shrubs and ground covers within the TPZ areas shall be undertaken using hand tools and roots (≥25mmØ) shall be protected. No mechanical cultivation/ripping of soils shall be undertaken within TPZ areas. Landscape planting shall be completed in the final stage of the development works and tree protection fencing and trunk protection shall remain in place until these works are due to commence.

1.17 Excavations & Root Pruning
Excavation within TPZ areas shall be supervised by the Project Arborist. Excavations within the TPZ shall be undertaken by hand or using hydro vacuum excavation methods (or similar approved device) to protect tree roots. If roots (>25mmØ) are encountered during excavation works, these roots shall be retained in an undamaged condition and advice sought from the Project Arborist as to the feasibility of root pruning. In areas where roots (>25mmØ) are present and are to be retained, finished levels shall be adjusted accordingly.

Roots to be pruned shall be cleanly severed with sharp pruning implements to ensure a smooth wound face, free from tears. Severance of structural roots (>25mmØ) within the Structural Root Zone is not recommended as it may lead to tree destabilisation. All root pruning requires approval from the Project Arborist.

No over excavation, benching or battering shall be undertaken when excavating adjacent to or within TPZ areas unless approved as part of the development proposal.
Appendix 6: Typical Tree Protection Details

Adapted from AS 4970-2009 Protection of Trees on Development Sites
(Source: Institute of Australian Consulting Arboriculturists)
Option 1 - Fencing
1.8m high chain wire mesh panels with shade cloth attached (if required), held in place with concrete feet.

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

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.

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

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**Indicative Scaffolding within a Tree Protection Zone (TPZ)**

Not to Scale

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