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# Arborist Report – New Western Sydney University, Bankstown City Campus

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**Archerfield Partners**

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## DOCUMENT TRACKING

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Template 2.8.1

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## Abbreviations

Abbreviation	Description
AQF	Australian Qualifications Framework
AS	Australian Standards
DBH	Diameter at Breast Height
ELA	Eco Logical Australia
m	Metre
mm	Millimetre
NDE	Non-Destructive Excavation
NO	Number
NSW	New South Wales
SP	Species
SRZ	Structural Root Zone
TPZ	Tree Protection Zone
VTA	Visual Tree Assessment

# 1. Background

## 1.1 Proposed activity

Eco Logical Australia Pty Ltd (ELA) was commissioned by *Archerfield Partners* to prepare an arborist report for trees within an area proposed to be developed for a future Western Sydney University (WSU) campus at Rickard Road, Bankstown.

The key features of the proposed development that are likely to negatively affect the subject trees (trees within the study area) can be summarised as follows:

- excavation works
- plant movement
- changes in soil grades
- installation of underground services.

## 1.2 The study area

The study area comprised of an area between 66-72 Rickard Road and 80 Rickard Road, Bankstown, between Bankstown Library and Knowledge Centre and an office tower containing Canterbury Bankstown Council Chambers. It also includes a portion of 375 Chapel Road, Bankstown. The study area is mapped in **Appendix A**.

## 1.3 Purpose of report

The purpose of this report is to:

- identify the trees within the study area that are likely to be affected by the proposed works
- assess the current overall health and condition of the subject trees
- evaluate the retention value of the subject trees
- determine the likely impact to the subject trees.

## 2. Method

### 2.1 Definitions used in this assessment

#### 2.1.1 Definition of a tree

The City of Canterbury Bankstown defines a tree as being:

*“(a) all trees that are 5.0 metres more in height” (exemptions apply) (Bankstown Council 2015).*

#### 2.1.2 Tree protection zone (TPZ)

The TPZ is the combination of crown and root area (as defined by AS 4970-2009) that requires restriction of access during the construction process. Tree sensitive construction measures must be implemented if works are to proceed within the Tree Protection Zone.

#### 2.1.3 Structural root zone (SRZ)

The SRZ is the area of the root system (as defined by AS 4970-2009) used for stability, mechanical support and anchorage of the tree. It is critical for the support and stability of trees. Severance of roots within the SRZ is not recommended as it may lead to the destabilisation and/or decline of the tree.

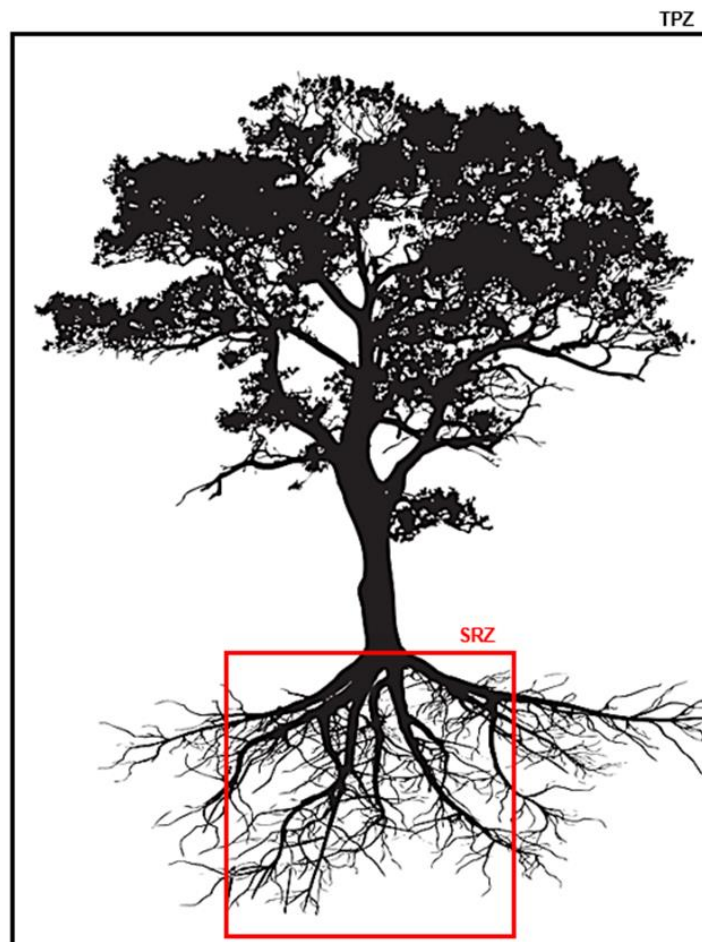


Figure 1: Indicative TPZ and SRZ

## 2.2 Tree assessment

The health and structure of the subject trees was assessed in accordance with a stage one visual tree assessment (VTA) as formulated by Mattheck & Breloer (1994), and practices consistent with modern arboriculture. Measurements to determine the tree protection zone were carried out in accordance with Clause 3.2 and 3.3.5 of AS4970-2000 Protection of Trees on Development Sites (Standards Australia 2009).

A total of **23** subject trees were inspected on 10 May 2019 by AQF Level 5 Consulting Arborist, Elizabeth Hannon.

The following applies to this methodology:

- Trees were inspected from ground level, without the use of any invasive or diagnostic tools and testing. Trees that met the definition of a tree in *Clause 2.3 Bankstown Council Development Control Plan (2015)*
- No aerial inspections or root mapping was undertaken.
- Tree heights were determined using a clinometer 15 metres from the base of the tree
- Canopy spread was determined using a measured stride out on site.
- The diameter at breast height (DBH) was measured by placing a diameter tape around the trunk of the tree at 1.4 metres above ground and recording the measurement. The DBH measurements were used to determine the area for the tree protection zone (which also incorporates the structural root zone).
- The structural root zone (SRZ) was calculated by an estimated measurement of the trunk diameter taken above the root buttress
- Tree identification to species level was based on broad taxonomical features present and visible from ground level at the time of inspection.

## 2.3 Retention value

The retention value/importance of a tree or group of trees is determined using a combination of environmental, cultural, physical and social values. This tree retention assessment has been undertaken in accordance with the Institute of Australian Consulting Arboriculturists (IACA) *Significance of a Tree, Assessment Rating System (STARS®)*. The following categories were used:

- **Low:** These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.
- **Medium:** These trees are moderately important for retention. Their removal should only be considered if adversely affected by the proposed works and all other alternatives have been considered and exhausted.
- **High:** These trees are considered important and should be retained and protected. Design modification or re-location of building/s should be considered to accommodate the setbacks as prescribed by Australian Standard AS4970 - Protection of trees on development sites.

Further details and assessment criteria are in Appendix B.

## 2.4 Potential impacts

Trees may be impacted by cutting or damaging roots or branches. Impacts to the tree protection zones are determined by the percentage of the area that the development incurs into the tree protection zone. The following are the definition of these impacts:

- **High impact:** The SRZ may be impacted if the proposed encroachment is greater than 20 % of the TPZ. Trees may not remain viable if they are subject to high impact.
- **Medium impact:** If the proposed encroachment is greater than 10% of the TPZ and outside of the SRZ, the project arborist may require detailed root investigation to demonstrate that the tree(s) would remain viable.
- **Low impact:** If the proposed encroachment is less than 10% (total area) of the TPZ, and outside of the SRZ, detailed root investigations should not be required.
- **No impact:** No likely or foreseeable encroachment within the TPZ.

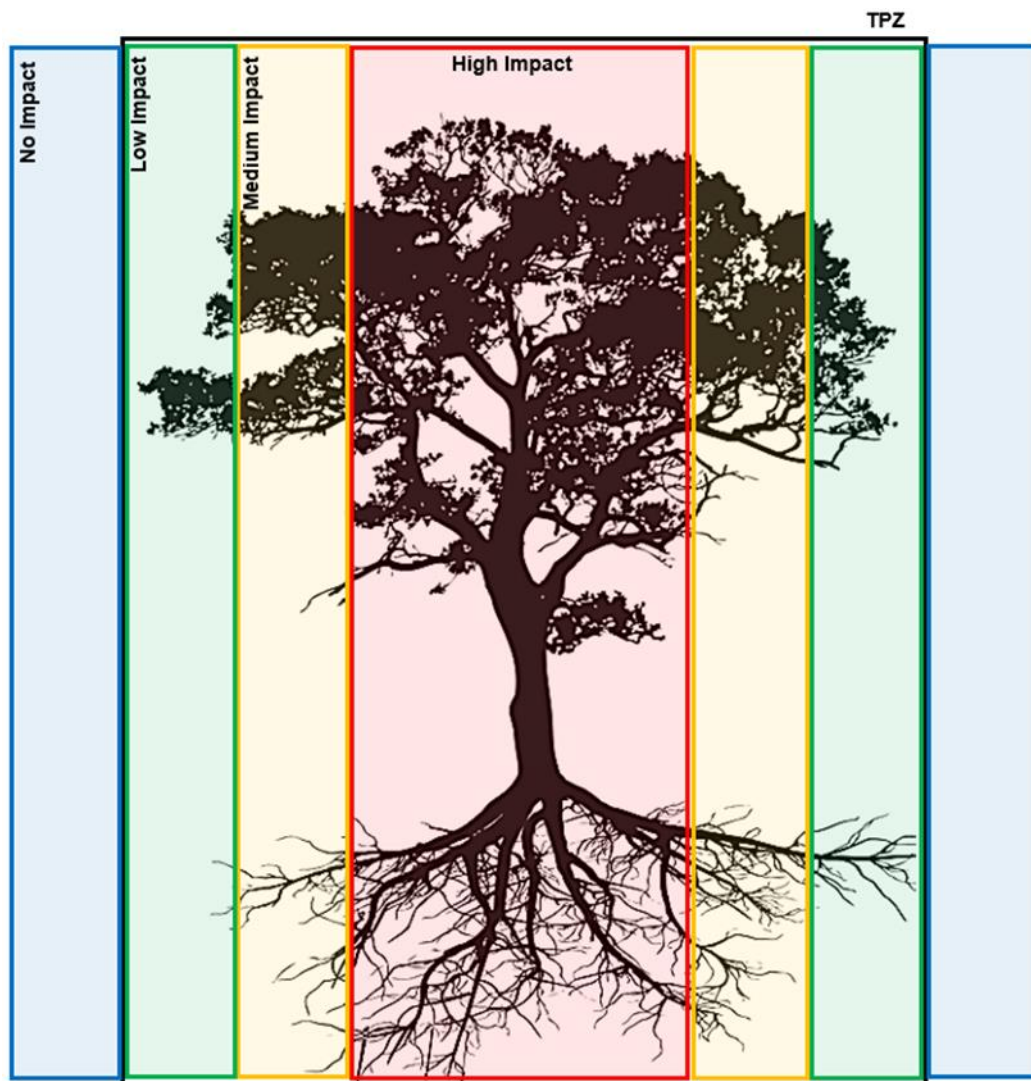


Figure 2: Indicative zones of impact



### 3. Results and discussion

Results of the arboricultural assessment are tabulated and mapped in Appendix A and Table 1.

- **High impact (>20%):** **17** trees would be subject to a major encroachment (>20%) within the TPZ. These trees are unable to be sustainably retained without substantial modification of the proposed footprint. Trees in this category have the following retention values:
  - **Four** trees with a low retention value
  - **11** trees with a medium retention value
  - **two** trees with a high retention value.
- **Medium impact (<20%):** **Three** trees would be subject to a medium impact (<20%) of the TPZ. More detailed assessments will be required to determine the suitability of retention. Trees in this category have the following retention values:
  - **three** trees with a medium retention value
- **Low impact (<10%):** **Three** trees would be subject to a low impact within the TPZ. The anticipated low impact of the proposed development will have negligible impacts to the tree's health, vigour or stability. Under the current proposal, these trees can be successfully retained. Trees within this category have the following retention values:
  - **One** tree with a medium retention value
  - **two** trees with a low retention value.

Table 1: Results of arboricultural assessment

Tree	Scientific Name	Height (m)	Spread (m)	Health	Structure	Retention Value	DBH (mm)	TPZ (mm)	SRZ (mm)	Tree Impact
1	<i>Corymbia maculata</i>	4	3	Fair	Fair	Low	170	2000	1600	Low Impact: <10%
2	<i>Corymbia maculata</i>	6	3	Good	Fair	Medium	200	2400	1700	Medium Impact: <20%
3	<i>Corymbia maculata</i>	8	3	Good	Fair	Medium	240	2900	1800	High Impact: >20%
4	<i>Corymbia maculata</i>	9	3	Poor	Fair	Low	220	2600	1800	High Impact: >20%
5	<i>Corymbia maculata</i>	6	3	Poor	Fair	Low	200	2400	1700	High Impact: >20%
6	<i>Corymbia maculata</i>	6	3	Fair	Fair	Medium	190	2300	1600	High Impact: >20%
7	<i>Corymbia citriodora</i>	14	10	Good	Good	High	600	7200	2700	High Impact: >20%
8	<i>Pyrus calleryana</i>	3	2	Good	Fair	Medium	135	2000	1500	High Impact: >20%
9	<i>Pyrus calleryana</i>	4	2	Good	Fair	Medium	106	2000	1500	High Impact: >20%
10	<i>Pyrus calleryana</i>	4	2	Good	Fair	Medium	105	2000	1500	High Impact: >20%
11	<i>Pyrus calleryana</i>	4	2	Good	Fair	Medium	104	2000	1500	High Impact: >20%
12	<i>Lophostemon confertus</i>	7	4	Good	Good	High	420	5000	2300	High Impact: >20%
13	<i>Lophostemon confertus</i>	6	3	Good	Fair	Medium	320	3800	2100	High Impact: >20%
14	<i>Pyrus calleryana</i>	3	1	Poor	Fair	Low	100	2000	1500	High Impact: >20%
15	<i>Callistemon viminalis</i>	8	6	Fair	Fair	Medium	760	9100	2900	High Impact: >20%
16	<i>Callistemon viminalis</i>	10	8	Fair	Fair	Medium	670	8000	2800	High Impact: >20%
17	<i>Callistemon viminalis</i>	8	6	Fair	Fair	Medium	680	8200	2800	High Impact: >20%
18	<i>Callistemon viminalis</i>	6	5	Fair	Fair	Medium	330	4000	2100	Medium Impact: <20%
19	<i>Callistemon viminalis</i>	7	6	Fair	Fair	Medium	575	6900	2600	High Impact: >20%
20	<i>Callistemon viminalis</i>	7	5	Poor	Fair	Low	200	2400	1700	Low Impact: <10%
21	<i>Callistemon viminalis</i>	7	2	Fair	Poor	Low	410	4900	2300	High Impact: >20%
22	<i>Eucalyptus sideroxylon</i>	15	12	Good	Fair	Medium	580	7000	2600	Medium Impact: <20%
23	<i>Eucalyptus sideroxylon</i>	17	11	Good	Fair	Medium	500	6000	2500	Low Impact: <10%

## 4. Tree protection plan

Following the approval of a proposed building envelope, the following measures are to be implemented to protect trees to be retained:

### 4.1 Tree pruning and removal

- All tree work is to be carried out by an arborist with a minimum AQF Level 3 qualification in Arboriculture.
- All tree work must be in accordance with *Australian Standard AS 4373-2007, Pruning of Amenity Trees* and the *NSW WorkCover Code of Practice for the Amenity Tree Industry* (1998).
- Permission must be granted from the relevant consent authority prior to removing or pruning of any of the subject trees.

### 4.2 Tree protection measures

Encroachment within the TPZ must be offset with a range of mitigation measures to ensure that impacts to the subject tree(s) are reduced or restricted wherever possible. Mitigation must be increased relative to the level of encroachment within the TPZ to ensure the subject tree remains viable. Table 2 outlines mitigation requirements under AS 4970-2009 within each category of encroachment. Tree protection measures should be implemented by the contractor and would include:

- Tree protection fencing must be established around the perimeter of the TPZ (Table 2). If the protective fencing requires temporary removal, trunk, branch and ground protection must be installed and must comply with *AS 4970-2009 - Protection of trees on development sites*. Existing fencing and site hoarding may be used as tree protection fencing.
- If temporary access for machinery is required within the TPZ, ground protection measures will be required. The purpose of ground protection is to prevent root damage and soil compaction within the TPZ. Ground protection may include a permeable membrane such as geotextile fabric beneath a layer of mulch, crushed rock or rumble boards.
- Any additional construction activities within the TPZ of the subject trees must be assessed and approved by the project arborist and must comply with *AS 4970-2009 - Protection of trees on development sites*.

Further information and guidelines on tree protection are in Appendix C.

### 4.3 Hold points, inspection and certification

A copy of this report must be available on-site prior to the commencement of works, and throughout the entirety of the project. Hold points have been specified in the schedule of works below to ensure trees are adequately protected during construction. It is the responsibility of the principal contractor to complete each of the tasks.

- Pre-construction
  - Indicate clearly (with spray paint on trunks) trees marked for removal.
- During construction

- Monthly inspection of trees by the project arborist (or other timing as agreed with the project arborist)
- Notification to be given prior to the commencement of work within the tree protection zone, with supervision by the project arborist of any work undertaken in this zone.
- Post-construction
  - Final inspection of trees by project arborist after all major construction has ceased and following the removal of tree protection measures.

Once each stage is reached, the work will be inspected and certified by the project arborist and the next stage may commence. Alterations to this schedule may be required due to necessity, however, this shall be through consultation with the project arborist only.

#### 4.4 Replacement planting

Any loss of trees should be offset with replacement planting in accordance with the relevant offset policy and in consultation with the relevant consent authority.

Table 2: Mitigation measures

Impact	Requirements under AS 4970-2009	Mitigation (design phase)	Mitigation (construction phase)
Low impact (<10%)	<p>The area lost to this encroachment should be compensated for elsewhere, contiguous with the TPZ.</p> <p>Detailed root investigations should not be required.</p>	N/A	<p>The area lost to this encroachment should be compensated for elsewhere, contiguous with the TPZ.</p> <p>Tree protection must be installed.</p>
Medium impact (<20%)	<p>The project arborist must demonstrate the tree(s) would remain viable.</p> <p>Root investigation by non-destructive methods may be required.</p> <p>Consideration of relevant factors including: Root location and distribution, tree species, condition, site constraints and design factors.</p> <p>The area lost to this encroachment should be compensated for elsewhere, contiguous with the TPZ.</p>	<p>The following design changes should be considered to retain trees where practicable, considering the retention value of the tree and the complexity and cost of the change.</p> <p>Relocate services/pathways outside of tree protection zones</p> <p>Design services to be installed at a minimum depth of 1200mm below ground to avoid impact to the root zones of trees.</p> <p>Design pathways to be installed on or above grade, minimising/eliminating excavation within tree protection zones.</p> <p>Design pathways using porous materials (eco-paving, porous asphalt, decomposed granite) to allow water and oxygen to reach the root zone.</p> <p>Design pathways using tree sensitive techniques (pier and beam, suspended slabs).</p> <p>The area lost to encroachment should be compensated for elsewhere, contiguous with the TPZ.</p>	<p>The area lost to this encroachment should be compensated for elsewhere, contiguous with the TPZ.</p> <p>The project arborist would be consulted for any works within the TPZ.</p> <p>Tree protection must be installed.</p> <p>Tree sensitive techniques can be used to install services within the TPZ. Horizontal directional drilling (HDD), boring, non-destructive excavation (NDE).</p> <p>Location and distribution of roots may be determined through non-destructive excavation (NDE) methods such as hydro-vacuum excavation (sucker truck), air spade and manual excavation.</p>

**High impact (>20%)**

The project arborist must demonstrate the tree(s) would remain viable.

Root investigation by non-destructive methods may be required.

Consideration of relevant factors including: Root location and distribution, tree species, condition, site constraints and design factors.

The area lost to this encroachment should be compensated for elsewhere, contiguous with the TPZ.

Relocate services/pathways outside of tree protection zones

Design services to be installed at a minimum depth of 1200mm below ground to avoid impact to the root zones of trees.

Design pathways to be installed on or above grade, minimising/eliminating excavation within tree protection zones.

Design pathways using porous materials (eco-paving, porous asphalt, decomposed granite) to allow water and oxygen to reach the root zone.

Design pathway using tree sensitive techniques (pier and beam, suspended slabs).

The area lost to encroachment can be compensated for elsewhere, contiguous with the TPZ.

As above

Removal of existing hard surfaces should be undertaken manually to avoid root damage.

Tree sensitive techniques can be used to install the services: Horizontal directional drilling (HDD), boring, non-destructive excavation (NDE).

## 5. References

### 5.1 General references

- Barrell, J. 2001. 'SULE: Its use and status into the new millennium', in *Management of mature trees*, Proceedings of the 4th NAAA Tree Management Seminar, NAAA, Sydney.
- Brooker M.I.H, Kleinig D.A. 2006. *Field Guide to Eucalypts. Volume 1, South-eastern Australia*, 3<sup>rd</sup> ed Bloomings Books, Melbourne
- Draper, B. and Richards, P., 2009. *Dictionary for Managing Trees in Urban Environments*, Institute of Australian Consulting Arboriculturists (IACA), CSIRO Publishing, Collingwood, Victoria, Australia.
- Harris, R.W., Matheny, N.P., and Clark, J.R., 1999. *Arboriculture: integrated management of landscape trees, shrubs, and vines*, Prentice Hall, Upper Saddle River, New Jersey.
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- IACA 2010. *IACA Significance of a Tree, Assessment Rating System (STARS)*, Institute of Australian Consulting Arboriculturists, Australia, [www.iaca.org.au](http://www.iaca.org.au).
- Robinson L, 2003. *Field Guide to the Native Plants of Sydney*, 3<sup>rd</sup> ed, Kangaroo Press, East Roseville NSW
- Standards Australia 2007. *Australian Standard: Pruning of amenity trees, AS 4373 (2007)*, Standards Australia, Sydney.
- Standards Australia 2009. *Australian Standard: Protection of trees on development sites, AS 4970 (2009)*. Standards Australia, Sydney.

### 5.2 Project specific references

- Bankstown Council, *Bankstown City Council Development Control Plan, Part B11 Tree Management Order, 2015*
- RPS Australia East Pty Ltd, *Contour & Detail Survey over Bankstown Civic Precinct, Rickard Road Bankstown, Sheets 1 – 5, Revision A dated 2.8.18*
- Lyons, *Bankstown City Campus Development 74 Rickard Road Bankstown, Arborist – Excavation Diagram, Drawing No.SK19-05, Revision 1 Issue for Information, dated 31.05.2019*



## Appendix A Maps

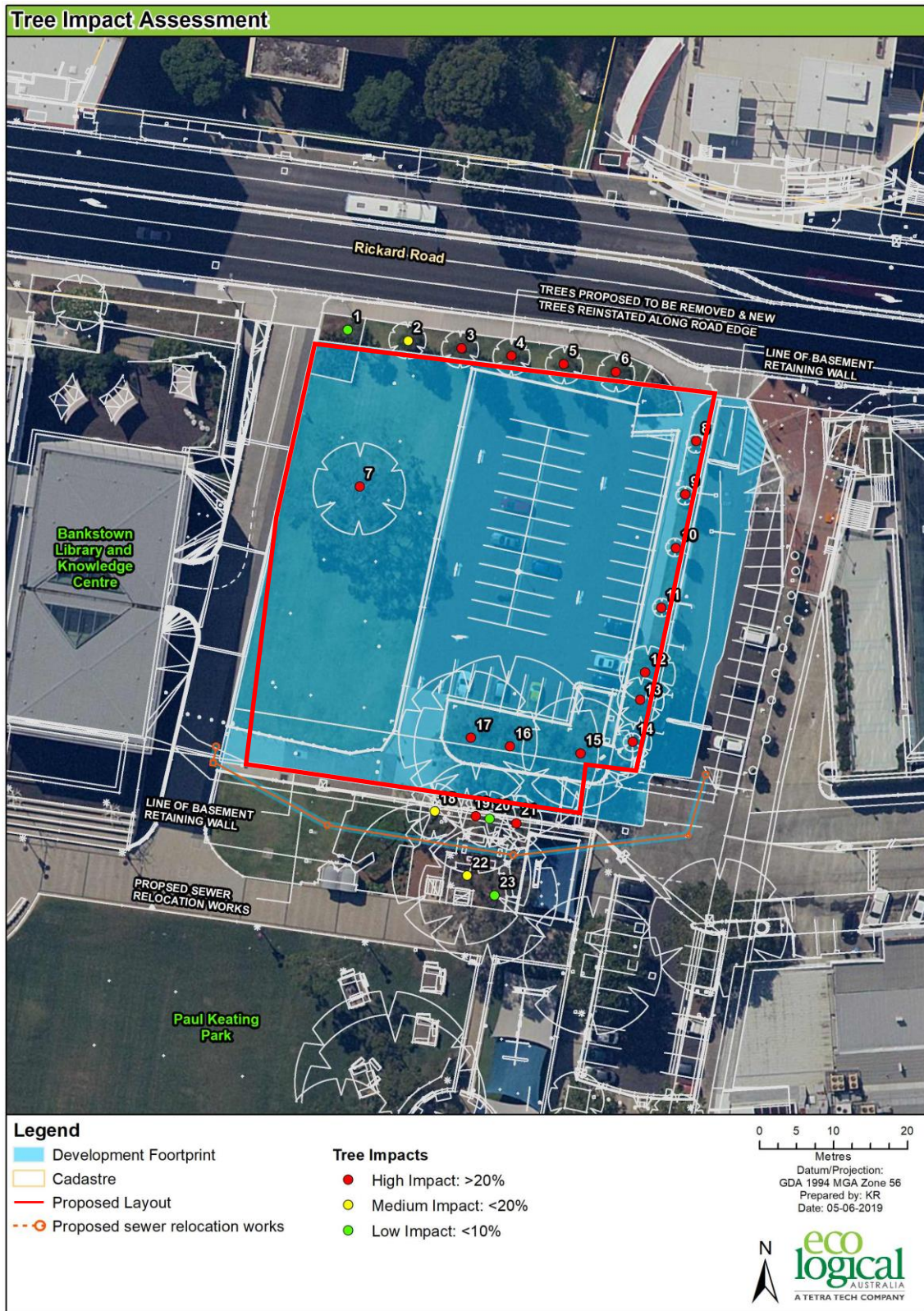


Figure 3: Tree Impact Map



## Appendix B Tree retention assessment method

### B1 Tree Significance Assessment Criteria - STARS®

Low	Medium	High
The tree is in fair-poor condition and good or low vigour.	The tree is in fair to good condition	The tree is in good condition and good vigour
The tree has form atypical of the species	The tree has form typical or atypical of the species	The tree has a form typical for the species
The tree is not visible or is partly visible from the surrounding properties or obstructed by other vegetation or buildings	The tree is a planted locally indigenous or a common species with its taxa commonly planted in the local area	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 provides a minor contribution or has a negative impact on the visual character and amenity of 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 is listed as a heritage item, threatened species or part of an endangered ecological community or listed on Council's significant tree register
The tree is a young specimen which may or may not have reached dimensions to be protected by local Tree Preservation Orders or similar protection mechanisms and can easily be replaced with a suitable specimen	The tree provides a fair contribution to the visual character and amenity of the local area	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'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's growth is moderately restricted by above or below ground influences, reducing its ability to reach dimensions typical for the taxa in situ	The tree supports social and cultural sentiments or spiritual associations, reflected by the broader population or community group or has commemorative values.
The tree is listed as exempt under the provisions of the local Council Tree Preservation Order or similar protection mechanisms		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.
The tree has a wound or defect that has the potential to become structurally unsound.		
The tree is an environmental pest species due to its invasiveness or poisonous/allergenic properties.		
The tree is a declared noxious weed by legislation		

## B2 Matrix assessment

		Tree significance			
		High	Medium	Low	
Useful Life Expectancy	Long >40 years				
	Medium 15-40 years				
	Short <1-15 years				
	Dead				

### Legend:

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

## Appendix C Tree protection guidelines

The following tree protection guidelines must be implemented during the construction period if no tree-specific recommendations are detailed.

### C1 Tree protection fencing

The TPZ is a restricted area delineated by protective fencing or the use of an existing structure (such as a wall or fence).

Trees that are to be retained must have protective fencing erected around the TPZ (or as specified in the body of the report) to protect and isolate it from the construction works. Fencing must comply with the Australian Standard, AS 4687-2007, Temporary fencing and hoardings.

Tree protection fencing must be installed prior to site establishment and remain intact until completion of works. Once erected, protective fencing must not be removed or altered without the approval of the project arborist.

If the protective fencing requires temporary removal, trunk, branch and ground protection must be installed and must comply with AS 4970-2009, Protection of Trees on Development Sites.

Tree protection fencing shall be:

- Enclosed to the full extent of the TPZ (or as specified in the Recommendations and Tree Protection Plan).
- Cyclone chain wire link fence or similar, with lockable access gates.
- Certified and Inspected by the Project Arborist.
- Installed prior to the commencement of works.
- Prominently signposted with 300mm x 450mm boards stating “NO ACCESS - TREE PROTECTION ZONE”.

### C2 Crown protection

Tree crowns/canopy may be injured or damaged by machinery such as; excavators, drilling rigs, trucks, cranes, plant and vehicles. Where crown protection is required, it will usually be located at least one meter outside the perimeter of the crown.

Crown protection may include the installation of a physical barrier, pruning selected branches to establish clearance, or the tying/bracing of branches.

### C3 Trunk protection

Where provision of tree protection fencing is impractical or must be temporarily removed, truck protection shall be installed for the nominated trees to avoid accidental mechanical damage.

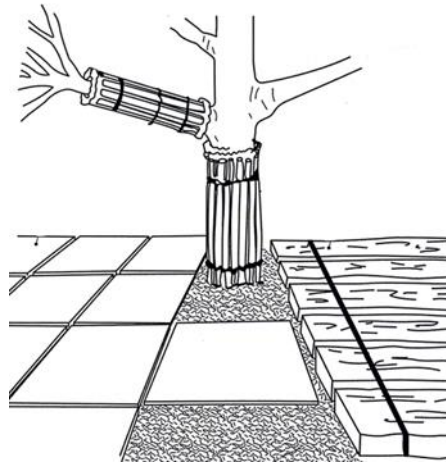
The removal of bark or branches allows the potential ingress of micro-organisms which may cause decay. Furthermore, the removal of bark restricts the trees' ability to distribute water, mineral ions (solutes), and glucose.

Trunk protection shall consist of a layer of either carpet underfelt, geotextile fabric or similar wrapped around the trunk, followed by 1.8 m lengths of softwood timbers aligned vertically and spaced evenly around the trunk (with an approx. 50 mm gap between the timbers).

The timbers must be secured using galvanised hoop strap (aluminium strapping). The timbers shall be wrapped around the trunk but not fixed to the tree, as this will cause injury/damage to the tree.



Tree protection fencing



Trunk protection fencing

#### C4 Ground protection

Tree roots are essential for the uptake/absorption of water, oxygen and mineral ions (solutes). It is essential to prevent the disturbance of the soil beneath the dripline and within the TPZ of trees that are to be retained. Soil compaction within the TPZ will adversely affect the ability of roots to function correctly.

If temporary access for machinery is required within the TPZ ground protection measures will be required. The purpose of ground protection is to prevent root damage and soil compaction within the TPZ. Ground protection may include a permeable membrane such as geotextile fabric beneath a layer of mulch, crushed rock or rumble boards.

If the grade is to be raised within the TPZ, the material should be coarser or more porous than the underlying material.

#### C5 Root protection and investigation

If incursions/excavation within the TPZ are unavoidable, root investigation may be needed to determine the extent and location of roots within the area of construction activity. The location and distribution of roots are found through non-destructive excavation (NDE) methods such as hydro-vacuum excavation (sucker truck), air spade and manual excavation. Root investigation does not guarantee the retention of the tree.

If the project arborist identifies conflicting roots that requiring pruning, they must be pruned with a sharp implement such as; secateurs, pruners, handsaws or a chainsaw back to undamaged tissue. The final cut must be a clean cut.

## C6 Underground services

All underground services should be routed outside of the TPZ. If underground services need to be installed within the TPZ, they should be installed using horizontal directional drilling (HDD). The horizontal drilling/boring must be at minimum depth of 600 mm below grade. Trenching for services is to be regarded as “excavation”.

