



Arbor Survey

DEVELOPMENT IMPACT ASSESSMENT

Site Address:

Bacchus Marsh Grammar - 37 Maddingley Road,
MADDINGLEY

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DOCUMENT CONTROL

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1. SUMMARY

The Development Impact Assessment has been undertaken to determine the impact to trees or vegetation on or adjoining Bacchus Marsh Grammar – 37 Maddingley Road, Maddingley from the proposed construction of a new science building. The report provides an overview of the site characteristics and relevant regulatory controls, the arboricultural condition of the trees and determines the Protection Value of the trees and vegetation on the project site and adjoining lands where the tree protection zones may be impacted. The primary purpose of this assessment is to identify the impact from the proposed construction and to outline impact mitigation and tree protection measures for trees of high or moderate protection value. The survey has identified a total of 8 trees or groups of trees within and surrounding the project site. The following is a summary of the protection value of the trees.

HIGH PROTECTION VALUE TREES

- No (0) trees or groups of trees are of high protection value

MODERATE PROTECTION VALUE TREES

- 1 tree, Tree 2 is of moderate protection value. This tree has been given this rating as it is of fair arboricultural condition overall and of moderate to high landscape significance. This tree may have characteristics that can be improved with modern arboricultural practices. Where possible and practical, this tree should be considered for protection within the project site.

TREES OF NO PROTECTION VALUE

- 7 trees or groups of trees (Trees 1 & 3-8*) are of no protection value. These trees are given a rating of 'None'. Trees of no protection value may be of poor arboricultural condition in terms of their health and/or structure, low landscape significance, unsuitable within the project site as they are situated in an inappropriate location for long term growth or landscape functionality or causing damage to surrounding infrastructure.

The proposed development plans were viewed in the preparation of this report. Based on the proposed design and the guidelines of the *Australian Standard AS4970 - 2009 - Protection of Trees on Development Sites*:

TREES THAT CANNOT BE PROTECTED

- 3 trees (Trees 5-7) cannot be protected as they are located within building/ driveway envelopes or they are within close proximity to buildings and works and will incur a high level of encroachment into the Tree Protection Zone (TPZ) and the Structural Root Zone (SRZ). All trees are of no protection value.

TREES THAT WILL INCUR MAJOR ENCROACHMENT (GREATER THAN 10%) INTO THE TREE PROTECTION ZONE

- 2 trees or groups of trees (Trees 1 & Part of 8*) will incur 'Major Encroachment' into the tree protection zones. All of these trees have no protection value and should not be retained or protected as part of any future development.

TREES THAT WILL INCUR NO OR MINOR ENCROACHMENT (10% OR LESS) INTO THEIR TREE PROTECTION ZONE

- 3 trees will incur no or 'Minor Encroachment' into the tree protection zones.
 - Tree 2 is of moderate protection value. Impact mitigation (where required) and protection measures are outlined in Section 6.2.
 - 2 trees (Trees 3 & 4) have no protection value and should not be retained or protected as part of any future development.

The Tree Location Plan (Existing Conditions) and Development Impact Plan in Section 7.2 provide a visual representation of the protection values of the trees and indicates the Tree Protection Zone (TPZ), Structural Root Zone (SRZ) and encroachment from proposed works for trees that are considered to be of moderate protection value.

* - Denotes groups of trees

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2. INTRODUCTION

Arbor Survey Pty Ltd has undertaken a Development Impact Assessment in accordance with the *Australian Standard AS4970 - 2009 - Protection of Trees on Development Sites* for the trees on and adjoining Bacchus Marsh Grammar – 37 Maddingley Road, Maddingley. This assessment is an analysis of 8 trees or groups of trees that are located within the project site where the tree protection zones (TPZ) may extend into the works area and may be affected by the proposed construction.

This report provides an assessment of the condition of the trees, expressed as the Arboricultural Value and a determination of the Protection Value. The Protection Value of the trees takes into account the arboricultural condition, landscape and environmental significance, ownership and relevant legislative controls including local municipal laws and vegetation, environmental/ landscape significance, cultural or heritage overlays or any other relevant considerations (i.e. exemptions) of the relevant Planning Scheme.

The assessment of the trees in terms of their overall condition has been made in accordance with the Survey Methodology and Descriptors in Appendix 8.1. These must be referred to when reading this report.

Impact mitigation and tree protection measures are recommended to reduce the impact on high and moderate protection value trees where possible. These measures are based on the guidelines of the *Australian Standard AS4970 - 2009 - Protection of Trees on Development Sites*.

3. REPORT OBJECTIVES, RESOURCE DOCUMENTS AND VEGETATION CONTROLS

3.1 REPORT OBJECTIVES

The Development Impact Assessment has been prepared in accordance with relevant industry standards. The report objectives are:

- To assess tree condition based on the Visual Tree Assessment Methodology (VTA) and landscape significance of the trees or groups of trees on the project site and adjacent land where the tree protection zones (TPZ) may extend into the project site and may be affected by any proposed development or construction
- To identify any relevant Local Laws or Planning controls or exemptions that may be applicable to the site
- To assess the impact to all trees from the proposed development or construction (based upon the *Australian Standard AS 4970 - 2009 - Protection of Trees on Development Sites*)
- To provide impact mitigation and tree protection measures for trees of moderate or high protection value.

The recommendations given are based on the condition of the trees or groups of trees and their suitability for retention and or protection in relation to their current and future growing environment. Recommendations are not driven by the proposed development of the land and impact mitigation measures are provided where possible and practical regarding trees that are of moderate or high protection value.

Trees that are considered to be worthy of protection are afforded general guidelines for tree protection measures. These guidelines do not constitute a Tree Management or Protection Plan (as per the *Australian Standard AS 4970 - 2009 - Protection of Trees on Development Sites*).

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3.2 DOCUMENTS / RESOURCES VIEWED IN PREPARATION OF THIS REPORT

The following documents and resources were viewed or relied upon in preparation of this report:

PLANS

- Existing Conditions: Plan of Feature, Level And Services Survey from Taylors (Ref No.: 22327/S6, Version: 01, Sheet; 12 of 21 Dated: 29/08/2022)
 - Full Site Building Extend Sketch (Ref No.: 3255, Dated: 15/03/2024).
- (Note: All plans assessed from others and used as a basis for this assessment are assumed to be true and correct)*

PLANNING CONTROLS

- Vic Plan – Department of Environment, Land, Water and Planning (DELWP) (<https://mapshare.vic.gov.au/vicplan/>)

RESPONSIBLE AUTHORITY

- Moorabool Planning Scheme

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OTHER

- VicMap Data (Spatial Property Cadastre) (<http://services.land.vic.gov.au/SpatialDatamart/>)
- Aerial Photograph of the site (Nearmap™ – Dated: 04/02/2022).

3.3 VEGETATION CONTROLS

The project site is located within Special Use Zone – Schedule 1 & 4 (SUZ1 & SUZ4) of the Moorabool Planning Scheme. The following table shows the statutory regulations and / or exemptions that may or not apply:

Table 1: Vegetation Protection Controls

Vegetation Controls / Exemptions	Applies to Site	Applies to tree(s):	Reason
Heritage Overlay (HO167)	Yes	No	No tree controls apply
Significant Landscape Overlay (SLO)	No	N/A	Does not cover the site
Environmental Significance Overlay (ESO)	No	N/A	Does not cover the site
Vegetation Protection Overlay (VPO)	No	N/A	Does not cover the site
Clause 52.17 'Native Vegetation'	Yes	None	All Victorian Native and Indigenous trees/vegetation on public land or land greater than 4000m ² that are considered to be self-sown are subject to a Native Vegetation Removal report and offset. All trees assessed are considered planted.
Clause 52.12 'Bushfire Protection: Exemptions'	Yes	None	Site is within a Bushfire Prone Area (BPA) however no trees assessed are within 10m of an existing dwelling (pre-2009) or 4m of vegetation over a fence line.
Local Law	No	N/A	No Local law for tree protection exists in Moorabool Shire Council

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4. SITE ANALYSIS

4.1 SITE LOCATION, AREA AND TOPOGRAPHY

The project site is located on the eastern side of Maddingley Road, Maddingley. The site is approximately 5800m² in size and is relatively flat with a change in grade of approximately 1m across the site. The aerial photograph in Figure 1 shows the project site and the approximate outline of the property boundaries.

4.2 TREE LOCATION

All trees or groups of trees assessed are located within the project site boundaries

4.3 ORIGIN AND LANDSCAPE SIGNIFICANCE

From the assessment, 4 trees are Victorian Native specimens (not Indigenous to the local area), 2 trees are Australian Native specimens (not Indigenous to Victoria) and 2 trees / groups are Exotic specimens. All trees are considered to be planted and there are no remnant trees within the project site.

From the trees or groups of trees assessed 3 trees (trees numbered 2, 3, 4) are of moderate landscape significance. These trees may provide screening or other landscape attributes that are of value.

The remaining trees are of low landscape significance and value in terms of their mass and contribution to the canopy coverage to the immediate local area. Some of these trees may be in good condition in terms of their arboricultural characteristics, however, the landscape or amenity value they provide could easily be replaced with new planting.



Figure 1: Aerial photograph and property outline (Nearmap™ – Dated: 04/02/2022)

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Figure 2: Tree Assessment area

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5. ARBORICULTURAL AND PROTECTION VALUE ASSESSMENT

5.1 ARBORICULTURAL VALUE ASSESSMENT

Arboricultural value is rated according to the overall health, structure, life expectancy and significance within the landscape. The Arboricultural Value only relates to the physical condition of the tree or trees and does not take into account the vegetation/ environmental status/ controls, the suitability of the tree in the landscape or the ownership of the tree (Refer to Appendix 8.1 for further information on the descriptors used).

The Arboricultural Value rankings are provided in the tree data is found in Section 7.1. The Arboricultural Value only provides a rating of the arboricultural condition of the trees. In general, trees that are considered to be of moderate to high Arboricultural Value are also considered to be of moderate to high Protection Value unless the trees are inappropriate for long term growth or landscape functionality or causing damage to surrounding infrastructure. Additionally, some trees may be of no Protection Value if there are relevant planning exemptions (i.e. Clause 52.12). Similarly, some trees may be of low Arboricultural Value, however they are given a high Protection Value as they are located on adjoining private property or Council owned land.

5.2 PROTECTION VALUE ASSESSMENT

The Protection Value of the trees has been determined by taking into consideration the arboricultural value, landscape significance, habitat value, ownership and relevant legislative controls (including local municipal laws, vegetation protection and environmental/landscape significance overlays and cultural/heritage overlays) or any other relevant considerations (i.e. exemptions) of the relevant Planning Scheme. Only trees of high and moderate protection value should be considered for protection (Refer to Appendix 8.1 for further information).

Table 2 documents the trees that are worthy of protection and provides the trunk and basal diameters (DBH and Basal Dia.), Structural Root Zone (SRZ) and Tree Protection Zone (TPZ) (Note: SRZ and TPZ are a radial measurement from the centre of the trunk). This table should be viewed in conjunction with the Tree Location (Existing Conditions) and Development Impact (Proposed Development) Plans located in Section 7.2. Trees that have been determined to have a high and moderate protection value are shown and have the Tree Protection Zone (TPZ) and Structural Root Zone (SRZ) drawn.

Table 2: Moderate Protection Value Trees - Tree Protection Distances

Tree No	Botanical Name	Owner ship	Protection Value	DBH (cm)	Basal Dia (cm)	SRZ (m)	TPZ (m)	TPZ Area (m ²)
2	<i>Eucalyptus leucoxylon</i>	Project Site	Moderate	29	31	2.3	5.4	92

* - Denotes groups of trees

Note: DBH (cm) is the diameter at breast height (1.4m from natural ground level), Basal Dia (cm) is the diameter of the trunk above the root flare, SRZ (m) is the structural root zone in metres in a radius from the centre of the trunk, TPZ (m) is the tree protection zone in metres in a radius from the centre of the trunk. These measurements and distances are calculated based on the Australian Standard AS4970 - 2009 - Protection of Trees on Development sites.

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6. DEVELOPMENT IMPACT ASSESSMENT AND IMPACT MITIGATION RECOMMENDATIONS

6.1 DEVELOPMENT / CONSTRUCTION IMPACT ASSESSMENT

The following table provides a summary of the impact of the proposal on the assessed trees based on their protection value in accordance with the guidelines of the *Australian Standard AS4970 - 2009 - Protection of Trees on Development Sites*. The encroachment is based on all works including the building footprint, crossovers, driveways and hard landscaping elements such as pathways.

Table 3: Encroachment Summary

Protection Value	No Encroachment	Minor Encroachment	Major Encroachment	Cannot be Protected
None	0 trees	2 trees (Trees 3 & 4)	2 trees (Trees 1 & 8*)	3 trees (Trees 5-7)
Moderate	0 trees	1 tree (Tree 2)	0 trees	0 trees
High	0 trees	0 trees	0 trees	0 trees

* - Denotes groups of trees

The encroachment into the tree protection zone from buildings and or any works (including the construction of paths, driveways, landscaping etc) may be considered as low impact to significant impact. For example, a tree may have an encroachment of 30% into the tree protection zone (TPZ), however this encroachment is from landscaping/ path works or for a wooden deck that is to be constructed above natural ground level. In such cases, the impact can be defined as 'Low Impact' and impact mitigation actions can be easily applied during construction. Conversely, an encroachment into the TPZ of 30% may be from a deep excavation (such as a basement) in which case the impact would be defined as 'Significant Impact' and impact mitigation can only be achieved through a redesign of the works proposal.

In some cases, similar type works (i.e. such as a new driveway or crossover in a TPZ) may be defined as either Low, Moderate, High or Significant Impact. In these cases, the impact level will be defined by the topography of the site and the ability to construct above natural grade.

Table 4 below provides a summary of the encroachment and indicates whether the impact is considered to be Low, Moderate, High or Significant. The impact mitigation recommendations in Section 6.2 outline what is required to protect these trees where possible. The impact to trees of no protection value are not provided as these trees should not be considered for retention or protection as part of the proposal. Encroachment calculations are provided for these trees in the tree data in Section 7.1

Table 4: Construction / Development Impact Summary

Tree No.	Botanical Name	Protection Value	Encroachment	Element	Impact Level
2	<i>Eucalyptus leucoxylon</i>	Moderate	1%	New Building	Low –Tree will tolerate minor encroachment. Standard tree protection measures required

* - Denotes groups of trees

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6.2 IMPACT MITIGATION RECOMMENDATIONS

Trees that have been determined to have no protection value should not be considered for long term retention and or protection as part of any future development on the project site. Trees of no protection value are not provided impact mitigation recommendations in this Development Impact Assessment.

Tree protection and impact mitigation measures are listed below in order to reduce the potential of direct or indirect impacts (soil compaction, physical tree/root damage etc). For further information on general guidelines for tree protection see Appendix 8.3.

TREES PROTECTION STATUS

- It is recommended that only Tree 2 is to be retained / protected as part of the works proposed.
- The remaining trees (Trees 1, 3-8*) are not worthy of retention. Suitable replacement planting should be undertaken in lieu of their removal.

PERMIT REQUIREMENTS

- No trees assessed require a permit for their removal.

FURTHER INVESTIGATION REQUIRED

- No further investigation is required. All Major encroachment potential impacts can be mitigated through the consideration of the requirements of Clause 3.3.4 of the *Australian Standard AS4970 - 2009 - Protection of Trees on Development Sites*

POTENTIAL DESIGN ALTERATIONS

- No design alterations are recommended.

SPECIFIC CONSTRUCTION RECOMMENDATIONS

- None required

STANDARD TREE PROTECTION MEASURES

- Standard tree protection fencing must be established around the TPZs of Protected Trees (where outside proposed works footprint). The fencing is to remain in place during all site preparation / levelling and construction works.

SPECIALISED TREE PROTECTION MEASURES

- Ground protection will be required where the TPZs cannot be adequately isolated with fencing and heavy vehicle access is required i.e. along the driveway.

GENERAL TREE PROTECTION REQUIREMENTS

- Soil levels within the TPZs (where outside building/ driveway or works footprints) should remain at existing grade and permeable
- Any excavation (demolition and construction) within the TPZs should be supervised by a qualified arborist. Any roots uncovered must be cleanly pruned with sharp/sterile hand tools
- All tree protection measures must remain in place for the duration of works and can only be removed in consultation with the Project Arborist or local Responsible Authority
- Any new boundary fencing within the TPZ should be of light weight construction with no continuous footings and manually excavated stump holes (by hand or post hole auger only)
- Any required pruning must be in accordance with *Australian Standard AS4373-2007 Pruning of Amenity Trees* and carried out by a minimum AQF Level 3 Arborist.
- All services should be located outside the TPZ of trees to be protected. Where no alternative exists, a non-destructive root investigation or directional boring under supervision of a qualified Arborist must be undertaken to install the services.

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TREE MANAGEMENT DURING CONSTRUCTION

Dependant on the final design, it is recommended that a Tree Management Report and Protection Plan (TMPP) is created as a condition of permit that will specify the exact requirements for tree protection of all high and moderate protection value trees to be protected. As part of the TMPP, it is recommended that there is a certification framework that details the actions required at all stages of development, the timing of supervision and the Certification methods to be undertaken by the Project Arborist.

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7. TREE DATA AND PLANS

7.1 TREE DATA

Tree No	Botanical Name	Common Name	Origin	DBH (cm)	Basal Dia (cm)	Height (m)	Spread (m)	Health	Structure	Age Class	Arbor Value	Ownership	Protect Value	SRZ (m)	TPZ (m)	Encroach (%)	Notes
1	<i>Eucalyptus leucoxylon</i>	Yellow Gum	Vic Native	45	44	7	7	Fair-Good	Fair	Mature	Medium	Project Site	None	2.3	5.4	14%	Codominant stems
2	<i>Eucalyptus leucoxylon</i>	Yellow Gum	Vic Native	29	31	8	7	Fair-Good	Fair	Semi-Mature	Medium	Project Site	Moderate	2.0	3.5	1%	Lopped stem
3	<i>Eucalyptus leucoxylon</i>	Yellow Gum	Vic Native	27/22 (35)	35	8	7	Fair-Good	Fair-Poor	Semi-Mature	Low	Project Site	None	2.1	4.2	6%	Acute stem unions
4	<i>Eucalyptus leucoxylon</i>	Yellow Gum	Vic Native	44	53	11	8	Fair-Good	Fair-Poor	Semi-Mature	Low	Project Site	None	2.5	5.3	8%	Pathogen present
5	<i>Robinia pseudoacacia</i>	Black Locust	Exotic	14/9/6 (18)	21	6	5	Fair-Good	Fair-Good	Semi-Mature	High	Project Site	None	1.7	2.2	100%	Weed species?
6	<i>Corymbia ficifolia</i>	Flowering Gum	Aus Native	4	6	2	1	Fair-Good	Fair	Juvenile	Medium	Project Site	None	1.5	2.0	100%	Root ball movement
7	<i>Ficus macrophylla</i>	Moreton Bay Fig	Aus Native	Multi-Stem	15	3	2	Fair-Good	Fair	Semi-Mature	Medium	Project Site	None	1.5	2.0	100%	Multi stem form
8 *	<i>Yucca elephantipes</i>	Yucca	Exotic	Multi-Stem	Approx. 40	4	2.5	Good	Fair	Mature	Medium	Project Site	None	1.5	2.3	Up to 28%	Group planting

* - Denotes groups of trees

Note: DBH (cm) is the diameter at breast height (1.4m from natural ground level), Basal Dia (cm) is the diameter of the trunk above the root flare, Arbor Value is the Arboriculture Vale, SRZ (m) is the structural root zone in metres in a radius from the centre of the trunk, TPZ (m) is the tree protection zone in metres in a radius from the centre of the trunk. The Encroach (%) is the level of encroachment into the tree protection zone of the tree from the excavation/ construction works. These measurements and distances are calculated from the Australian Standard AS4970 - 2009 - Protection of Trees on Development sites.

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7.2 DEVELOPMENT IMPACT PLAN

Site: Bacchus Marsh Grammar
37 South Maddingley Road
MADDINGLEY

Client: [REDACTED]

Arbor Survey Ref:
R6813

Revision: -

Date Drawn:
25 March 2024

Source Plan:
Full Site Building Extend Sketch
Ref: 3255 Date: 15/03/2024



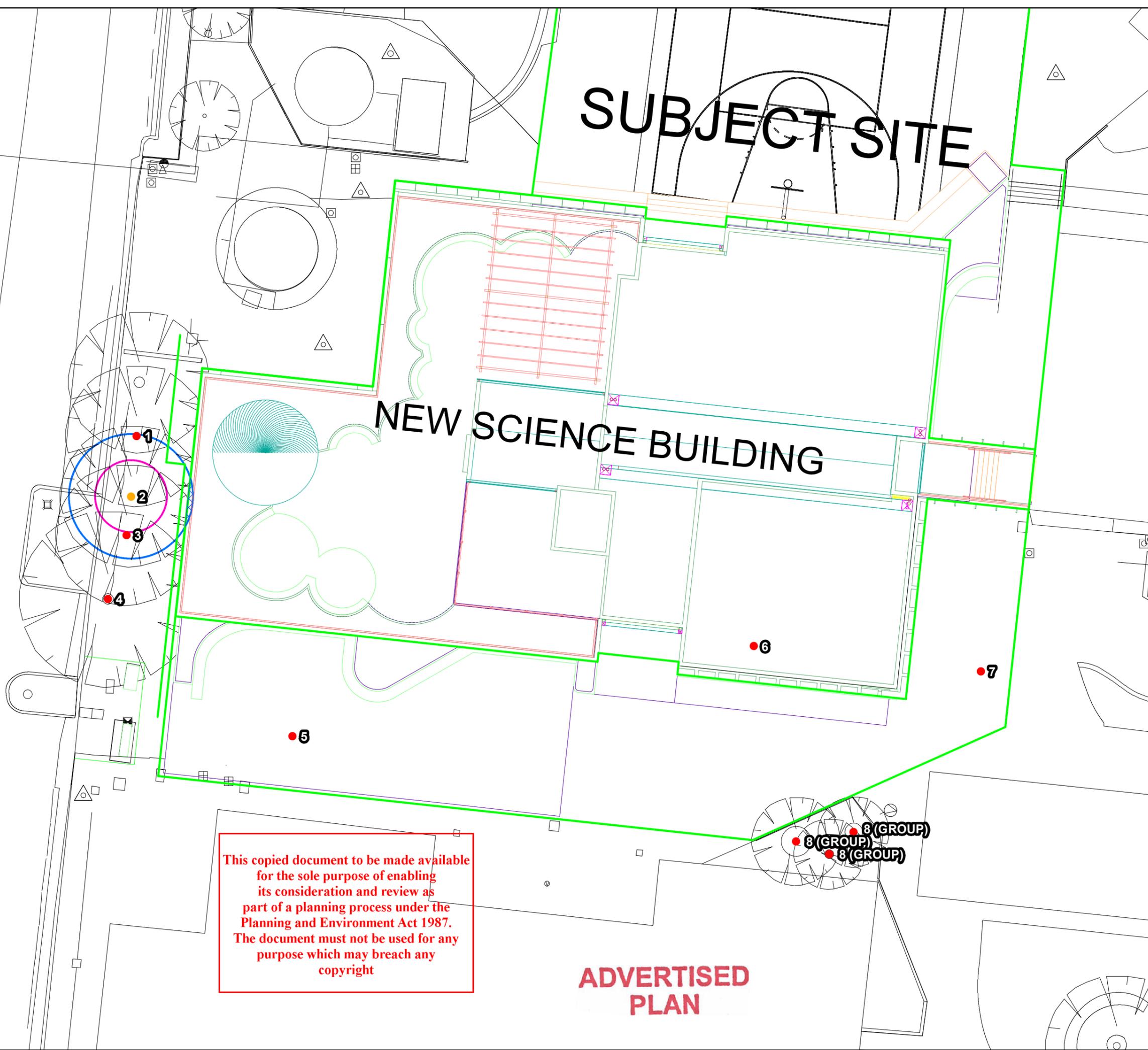
0 1 2 4 6 8 10 Meters

Coordinate System: GDA 2020 MGA Zone 55
Scale: 1:150 at Sheet Size A3

- Legend**
- Tree Protection Value**
- Mderate (1)
 - None (7)
- Tree Protection Areas**
- Tree Proetction Zone (TPZ)
 - Structural Root Zone (SRZ)
 - Encroachment

SUBJECT SITE

NEW SCIENCE BUILDING



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7.3 PHOTOGRAPHIC REFERENCES



Tree 1



Tree 2



Tree 3



Tree 4



Tree 5



Tree 6



Tree 7



Tree 8 (GROUP)

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8. APPENDICES

8.1 SURVEY METHODOLOGY AND DESCRIPTORS

Site observations and tree data was recorded on site at the date noted within Section 2 (Introduction). This report is based upon the condition of the trees and the site conditions noted on the inspection date(s) only. The characteristics of each tree or group of trees of similar characteristics have been undertaken in accordance with the Visual Tree Assessment (VTA) methodology (Mattheck & Breloer, 1998).

The data is included in this report in a detailed table, located in Section 7.1. Tree Location (existing conditions) and Development Impact (proposed development) Plans are provided in Section 7.2 where relevant. Site photographs (if relevant) are provided in Section 7.3.

The survey identifies all trees or groups of trees within the project site over 2 metres in height and on adjoining lands (neighbouring properties and or Council or other regulatory body or Crown land) where their projected Tree Protection Zones (TPZs) extend to within the project site and may be affected by the proposed buildings and or works. The assessment is undertaken from a visual inspection from ground level only. No individual tree or trees were climbed and no samples of soil, plant material or pest and disease infestation (if present) were taken for analysis. Defects not apparent from this ground-based visual inspection are excluded from the discussion within this report. This report is not a risk assessment and no other assessment methodologies have been used.

This assessment is based on an improved and modified version of current industry best practice. 'Retention Value' is not used as the primary driver for any recommendations. The primary driver for the recommendations within the report is the characteristic of 'Protection Value'. Protection value is derived from a combination of the physical arboricultural characteristics and life expectancy recorded as the 'Arboricultural Value' in conjunction with the landscape significance or amenity value, ownership, and relevant regulatory controls.

The following data is recorded on site:

- **Tree Identification Number (Tree No.)** – This is a sequential numeric numbering system used to identify each tree on the attached site map. These numbers may also relate to tags placed on each tree in the field if required. Any deviation of the numbering system will be specifically noted within the report.
- **Genus/ Species (Botanical Name)** – Species identification is considered as common and made using species characteristics observed on site or sampled and researched off site. Specific cultivar or subspecies details are omitted unless where known. No samples have been taken to the National Herbarium of Victoria for accurate analysis and identification unless specifically noted within the report.
- **Common Name** – This is the typical common name assigned to the tree species. For many trees, there is likely to be numerous common names that could be used. The common name provided should only be seen as a secondary identification tool.
- **Origin** – Relates to the species natural origin (i.e. if the tree would have been found in the local environment, pre-European settlement). Origin is recorded based on the following categories:

Category	Description
Exotic	May be planted or self-sown, Originates from outside of Australia.
Aus Native	May be planted or self-sown, Originates from Australia, but does not originate from Victoria.
Vic Native	May be planted or self-sown, Naturally found within Victoria but <u>not</u> originating from within the Local Government area
Indigenous	May be planted or self-sown, Originates from within the Local Government area of the site

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- DBH (cm)** – this is the Diameter at Breast Height (DBH) measured using a diameter tape at approximately 1.4 metres from natural ground level. Where the trunk diameter at this point may be affected by natural growth such as a major union point, the DBH will be measured just below this union point. For multiple stemmed trees, the measurements are provided for up to 4 stems (at 1.4 metres from natural ground level). These will be recorded, and the combined or total diameter will be calculated in accordance with the Australian Standard AS 4970-2009-Protection of Trees on Development Sites using the formula below:

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$$\text{Total DBH} = \sqrt{(\text{DBH}_1)^2 + (\text{DBH}_2)^2 + (\text{DBH}_3)^2 + (\text{DBH}_4)^2}$$

This is represented in the tree data as “Stem1/Stem2/Stem3/Stem4 (Calculated DBH)” – i.e. 15/28/34/19 (50.3). The calculated DBH of the stems is used to determine the Tree Protection Zone. For trees with more than 4 stems, the DBH (cm) measurement is recorded as ‘Multi-stemmed’ or similar. In instances where ‘Multi-stemmed’ is recorded, the Tree Protection Zone will be based on a basal measurement. For neighbouring property trees and where access is limited, an approximate DBH (cm) will be provided.

- Basal Dia (cm)** – this is the diameter of the tree at the trunk base (including multiple stemmed trees) at a level above the trunk basal flare. This is used to determine the Structural Root Zone (SRZ). In some cases, this will be noted as being ‘Multi -stemmed’ and the SRZ will be estimated using an approximate basal diameter. For neighbouring property trees and where access is limited, an approximate Basal Diameter (cm) will be provided.
- Height (m)** – this is the approximate height of the canopy of the tree or the largest canopy height of a group of trees. This is an approximated height based on known landscape reference points. In cases of large significant trees where accurate height measurements are required (as height will directly affect the outcome or recommendations of the report), a Nikon Forestry Pro Laser Range finder will be used. Where measured heights have been used, this will be noted within the report data and detailed within the report.
- Spread (m)** – this is the approximate canopy spread of the tree on the widest axis. This is given as a single measure and is provided as a guide to show overall canopy spread within the landscape. Where multiple canopy dimensions are required (i.e. proximity to buildings and or severely asymmetric canopy growth) as it may affect the outcome of tree protection, these will be noted within the report data and detailed in the Development Impact Assessment.
- Health** - relates to the tree vigour and canopy density. The characteristic assigned to the tree may be represented as a combination of any of these categories (e.g. Fair to Poor or Fair-Poor). In these instances, there may be a combination of the characteristics listed below or the foliage density is at the upper or lower scale of each category. In some cases, ‘Health’ may be noted as being ‘Very Good’ which indicates an optimal condition or ‘Very Poor’ which indicates that the tree is of such poor health and is unlikely to recover. In some cases, the ‘Health’ condition will be provided as ‘Dead’. In this case, there is no observable indication that the tree is alive at the time of inspection. Health is rated according to the following categories:

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Category	Description
Good	Foliage density / bud formation (Deciduous) is greater than 75% at optimal growth for the species. There may be less than 10% canopy dieback present and foliage has no or very minor tip dieback. Tree may also have visible extension growth if it is in active growth and is showing no signs of nutrient deficiency (i.e. chlorosis) or active pest or disease presence. The tree may also have good wound wood development.
Fair	Foliage density / bud formation (Deciduous) is between 50-75% at optimal growth for the species. There may be 10-30% canopy dieback present and foliage may have minor tip dieback. Tree maybe showing signs of normal growth, but it is not consistent throughout the crown. Some foliage discolouration may be present from possible nutrient deficiency or other cause (i.e. pest or disease).
Poor	Canopy may be asymmetrical (not typical for the species and affecting vigour) and or canopy may be suppressed. There may be greater than 30% canopy dieback present and foliage density is below 50%. Stunted growth through leaf size or petiole extension and discolouration of the leaf may be present. Tree may be producing epicormic shoots as a stress response. Nutrient deficiency, lack of resources (water, light etc) or pathogens may be the causal agent in the tree’s decline.

- Structure** - relates to the physical form of the tree, including the trunk(s), main scaffold branches and roots. Structure includes the attributes that may influence the probability of trunk, limb, or root plate failure. The characteristic assigned to the tree may be represented as a combination of any of these categories (e.g. Fair to Poor or Fair to Good). In these instances, there may be a combination of the characteristics listed below. In some cases, 'Structure' may be noted as being 'Very Good' which indicates an optimal condition or 'Very Poor' which indicates that the tree has major structural defects and may be of a relatively high risk of failure of the identified tree part. Structure is rated according to the following categories:

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Category	Description
Good	The form of the tree is excurrent or decurrent and typical of the species characteristics and exhibits good symmetrical form. Major limbs are well formed with acceptable branch taper and unions appear to be strong with no signs of major defects. The tree has minimal defects or decay throughout the trunk and limbs. There is no signs of root plate heave or damage to the root system (mechanical or other). The tree is unlikely to suffer major branch or trunk failure under normal environmental (weather) conditions.
Fair	The form of the tree is excurrent or decurrent and typical of the species characteristics and has a fairly symmetrical form. Tree may exhibit minor structural defects that may be managed through formative/remedial/restorative or structural pruning. Only minor wounds and or areas of decay are present that do not affect the overall stability or structural integrity of any major parts of the tree. Minor root damage may have occurred in the past. Defects present are likely to cause only minor branch failure under normal environmental (weather) conditions.
Poor	Tree has a poorly formed crown that is not symmetrical. Branch and or trunk taper may be unacceptable and scaffold limbs may be overextended. Branch unions may exhibit significant defects that cannot be managed through formative pruning. There is likely to be decay in parts of the tree that may result in branch or trunk failure. Major root damage may have occurred and there may be evidence of root plate heave. Defects that are present may result in major failure of branches or trunk under normal environmental (weather) conditions.

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- Age Class** - is given as a guide to the current life stage of trees. Under the level of maturity that a tree may reach is dependent on the growing environment. The mature age class may extend for many years and is given only as an indication of the maturity of the tree based on the conditions of the local environment. Age Class is rated according to the following categories:

Category	Description
New Planting	Planted within approximately 2 years
Juvenile	Estimated as between 2 - 10 years old
Semi-mature	Estimated at between 10 - 20 years old, however, this may be species dependant
Mature	Estimated at over 25 years old or in a life stage that is considered at the peak of growth for the species.
Senescent	In the declining phase of the tree's lifespan
Dead	Tree has no live foliage and is no longer viable.

- Landscape Significance** - Landscape Significance only relates to the size of the tree relative to the immediate local area and its visual presence. Landscape significance should not be considered as the only factor in determining if a tree is worthy of retention. Landscape significance is rated according to the following categories:

Category	Description
None	Tree is dead and provides no value in the landscape from a visual amenity perspective
Low	Tree is less than 8 metres in height and spread and is not easily seen from outside of the site from within the public realm
Moderate	Tree is generally between 8 - 12 metres in height and can be easily viewed from within 50 metres of the site from the public realm
High	Tree is generally over 12 metres in height and can be viewed from over 50 metres away from the site and from adjoining streets

- **Arboricultural Value** - is rated according to the overall health, structure, and estimated life expectancy of the tree (often referred to as 'Useful Life Expectancy -ULE'). Often the life expectancy or ULE of a tree may be difficult to quantify as there are too many variables and therefore it is not directly recorded as a characteristic in the report. ULE has traditionally been used to guide future replanting and tree population heuristics.

The 'Arboricultural Value' takes into account the overall condition and life expectancy of the tree however it does not take into account the landscape or environmental status or suitability of the tree in the landscape. This rating is not a 'Retention Value' or 'Protection Value', it is only a rating of the overall condition of the physical characteristics of the tree and its expected longevity (based on growing conditions). For example, a tree of a semi mature or younger age class may be given a medium or high arboricultural value based on its condition, however it may be given no protection value based on its current size and low landscape significance and or amenity value. The arboricultural value is rated based on the following categories:

Category	Description
Low	A tree of low arboricultural value may be considered to be in poor condition overall with a low life expectancy (less than 10 years). The tree may be showing signs of poor health and or structure. The tree may either have a poor health rating and it is unlikely to recover or a poor structure that cannot be remedied through normal arboricultural pruning practices.
Medium	A tree of medium arboricultural value may be considered to be in fair condition overall. This tree may be considered as an average tree that provides average benefits to the site and local area with an estimated longevity of between 10 – 20 years. The tree may have evidence of fair to poor health that may be improved through cultural practices. The tree may have some structural defects that can be remedied through normal arboricultural pruning practices.
High	A tree of high arboricultural value may be considered to be of good overall health and structure. The tree is considered to have a life expectancy of greater than 20 years. Under normal maintenance practices this tree is expected to perform well in the landscape in the long term.

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- **Ownership** – the ownership is noted by the Arboricultural Value of a tree or group of trees. Generally, trees and or vegetation that are located on adjoining lands that are not of the ownership of the project site may be subject to permission for removal and or works within the tree protection zone. Traditionally, this may be referred to as 'Third Party Ownership'. Adjoining lands may be owned by private property owners and this is noted as being in the category 'Neighbours'. Trees located on road reserves, nature strips or adjoining parklands/ open spaces are often owned or managed by the local Responsible Authority and are given the ownership category of 'Council'. Where known, ownership may be noted as being 'Crown' or another regulatory body (e.g. Melbourne Water). In some cases, the ownership will be noted as 'Other' and this will be explained in the 'Site Analysis' section of the report.

- **Protection Value** - is determined based on a combination of the Arboricultural Value, the ownership/ location of the tree, the landscape/ ecological and or cultural / heritage significance of the tree. The Protection Value also takes into account the suitability of the tree in the current and future landscape and the species status (i.e. identified weed species). The tree may also be protected under any relevant Planning or Local Law regulations which is also taken into account under Protection Value. Protection Value is rated according to the following categories:

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Category	Description
None	A tree or group of trees of 'No' protection value may be considered to be in poor condition overall and is assigned a low arboricultural value and is within the project site. The tree may be of medium or high arboricultural value, however, if it is a known weed species, is doing considerable infrastructure damage or is not suitable to the site (based on its physical characteristics) it is considered to be of no protection value. The tree may be a juvenile to young specimen that can easily be replaced with new tree planting that will provide a greater amenity in the next 5 – 10 years. This tree may have a low landscape significance in terms of its height and mass within the landscape (i.e. generally less than 8 metres in height and spread) Trees that are located on adjoining land may be given a rating of 'None' if they are found to be dead or extremely hazardous and do not have any regulatory protection and or habitat value. In such instances this will be defined within the report.

Moderate	<p>A tree or group of trees of 'Moderate' protection value may be considered to be in fair to good condition overall and is located within the project site. The tree may be of medium or high arboricultural value, however, it may or may not be suitable to the site in the long term (based on its physical characteristics) for greater than 20 years. The tree may provide a moderate level of landscape significance or amenity and be of moderate individual significance. The tree may be in a semi mature to early mature life stage.</p> <p>Ideally any future development should consider a moderate protection value to be retained and incorporated into the design. However, if the retention and or adequate protection of this tree cannot be achieved with a reasonable design footprint then consideration should be given to the removal of the tree and replacement with a new tree suitable to the landscape and available space.</p> <p>Only trees within the project site may be given a rating of 'Moderate'. Trees that are located on adjoining land are not given a rating of 'Moderate'.</p>
High	<p>A tree or group of trees of 'High' protection value may be considered to be in good condition overall and is suitably located within the project site (i.e. within the front setback). The tree (if within the project site) will be of high arboricultural value and should have a life expectancy of greater than 20 years if protected and managed. The tree may provide a moderate to high level of landscape significance or amenity and be of moderate to high individual significance. The tree will be in a mature life stage but not beginning senescence. Ideally any future development should consider a high protection value to be retained and incorporated into the design when the tree is located on the site. The design should have regard to the adequate protection of this tree throughout any development on the project site. This tree may have a high landscape significance in terms of its height and mass within the landscape (i.e. generally greater than 12 metres in height and spread)</p> <p>Trees located on adjoining lands, not of the ownership of the project site, are given a high protection value, regardless of their overall condition (Arboricultural Value), the environmental / landscape significance and or cultural / heritage significance (i.e. historic or remnant old veteran trees) unless they are Dead and do not have any regulatory protection and or habitat value. High protection value may also be assigned to known weed species, however this will be noted within the report.</p> <p>The tree(s) may or may not be subject to any local Planning or other regulatory control (i.e. Local Law).</p>

- **SRZ (m)** - The Structural Root Zone (SRZ) (referenced from *Australian Standard AS4970-2009 - Protection of Trees on Development Sites*) is the calculated distance based on Basal Dia (cm). The SRZ identifies the minimum radius at which the root plate should not be disturbed. This measure only relates to the trees' stability and does not take into account the implications of a decline in health. The measurement is given in metres in a radius from the centre of the tree trunk.
- **TPZ (m)** - The Tree Protection Zone (TPZ) (referenced from *Australian Standard AS4970-2009 - Protection of Trees on Development Sites*) is the calculated distance based on the DBH of the tree. The TPZ addresses the physiological implications by retaining an ideal area around the tree to survive in the landscape on a long-term basis. The measurement is given in metres in a radius from the centre of the trunk.
- **TPZArea (m²)** - is the tree protection zone in square metres (m²) around the trunk.
- **TPZ10% (m)** - identifies the 10% encroachment radial distance into the tree protection zone on one side of the tree only (Minor Encroachment).
- **Encroach (%)** - is the level of encroachment into the TPZ of the tree from the excavation/ buildings and works.
- **Notes/ Comments** - The general notes/ comments provide additional support where required for the tree data collected in the field.

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8.2 GLOSSARY OF COMMONLY USED TERMS

Amenity

Although difficult to quantify, the term as used in this report relates to the contribution given to the landscape or streetscape in terms of visual aesthetics. It may also relate to the contribution in terms of shade or protection from the elements.

Bifurcation

A stem or branch forked or divided into two or more parts or branches. Used to describe a union point. A bifurcation may have different characteristics dependant on the load distribution on the union and the size of the branches or stems that arise from the union point.

Branch Bark Ridge

Swelling of bark tissue on the upper side of the branch junction or union. Considered the normal pattern of development in contrast to included bark (from Matheny & Clark, 1994).

Branch collar

Trunk tissue that forms around the base of a branch between the main stem and the branch. As the branch decreases in vigour or begins to die, the branch collar becomes more pronounced (AS4373).

Chlorotic

Discolouration of the leaves, yellow in colour resulting from a lack of chlorophyll

Codominant

Generally, relates to trunks/ stems (although it may relate to scaffold branches within the crown) of two or more and of equal or similar size and relative importance (Matheny & Clark, 1994).

Compartmentalisation

Physiological process which creates the chemical and mechanical boundaries that act to limit the spread of disease and decay organisms (Matheny & Clark, 1994).

Decay

Degeneration and de-lignification of plant tissue, including wood, by pathogens or micro-organisms (AS4373).

Epicormic Shoots

Shoots which arise from adventitious or latent buds (usually dormant). They are generally produced in response to environmental stress.

Included Bark

The pattern of development at a branch union where bark is turned inward rather than outward or pushed out. Relates to the branch bark ridge and bifurcations. (Matheny & Clark, 1994)

Live Crown Ratio (LCR)

Relative proportion of healthy crown in proportion to overall tree height. Often not used in isolation due to the different natural forms of many species and growing conditions. Generally, an LCR of less than 30% may result in a poor structural rating, however, when this is used and noted within this report, it is based on potential changes to the environment where this condition may have an effect on long term protection value.

Lateral

A branch arising from another branch or stem (AS4373)

Lopping

Cutting back a limb or stem at any point with no regard to natural target pruning. Random cutting of branches or stems between branch unions or at internodes on young trees. Not considered an acceptable practice as part of the *Australian Standard AS4373-2007 - Pruning of Amenity Trees*.

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Senescence or Senescent

The organic process of age and the deterioration of tissue within the tree.

Wound wood/ Reaction Wood

Lignified, partially differentiated tissue which develops from the callus associated with wound or pruning cuts.

8.3 BIBLIOGRAPHY AND CITED REFERENCES

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8.4 TREE PROTECTION GUIDELINES**8.4.1 BACKGROUND**

Arbor Survey Pty Ltd assesses individual tree protection requirements based upon the *Australian Standard AS4970-2009 - Protection of Trees on Development Sites*. Tree protection requirements are calculated based upon trunk diameter of the tree at breast height. These calculations produce what is referred to in this report as the Tree Protection Zone (TPZ) and is provided as a measurement in metres in a radius from the centre of the trunk.

The TPZ is the zone in which protective measures should be applied in order to protect the tree(s) whilst maintaining the current levels of health and vigour.

Determination of the structural root zone or the zone of rapid taper is provided as the Structural Root Zone (SRZ). The structural root zone calculations (may also be referred to as the Root Plate Radius (RPR)) of the tree, based upon the *Australian Standard AS4970-2009*. The SRZ determines the minimum distance around the tree in which the structural stability of the tree should be able to be maintained.

It is important to note that the SRZ only determines the root plate area or the zone of rapid taper. Excavation within this area will not only cause a decline in tree vigour but may also cause catastrophic tree failure (Coder, 1996).

Often it is difficult to protect the entire TPZ due to site constraints. In such events it is imperative that condition and species tolerance to disturbance are evaluated in conjunction with the site characteristics. Helliwell (1985) and Harris (1999) identified that a healthy tree may tolerate removal of up to one-third of its roots and possibly up to 50% in some cases, although stability may be compromised at this level.

In situations where the TPZ of a tree to be retained will be in close proximity to a proposed development or where there will be encroachment into the TPZ of a tree, a specific tree management plan should be developed. This plan provides prescriptive measures to protect trees on development sites

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8.4.2 GENERAL TREE PROTECTION REQUIREMENTS

The following requirements are only provided only for basic guidance, these guidelines do not constitute a specific tree management and protection plan.

- A tree protective fence should be installed at the recommended distance allocated for each tree to be retained. The fence should be located at the TPZ distance provided where possible.
- The protection fence should be rigid (chain link or similar) and should not be less than 1.8 metres in height. Fencing should be firmly attached to a removable concrete or similar base. Alternatively, star pickets (1.5 metre spacing) and para-webbing may be used to define the tree protection area. Fencing should be in accordance with the *Australian Standard for Temporary Fencing AS4687*.
- In cases where the TPZ cannot be entirely fenced, it is recommended that ground protection is used. Specific ground protection requirements will form part of a tree protection plan that should be developed for all trees to be retained.
- No soil levels must be altered within the fenced TPZ area, no heavy machinery should be allowed to pass within this area and no spoil, chemicals, building materials or refuse should be stored within this area. Nothing whatsoever should be attached to the tree (excluding tape to identify a tree to be protected).
- The area within the tree protection fence should be covered with a layer of organic mulch (mixed particle sized woodchip) to a depth of 100mm prior to the commencement of the project. Mulch material should comply with *Australian Standard AS4454*.
- The tree protective fencing should be installed prior to any works (including demolition) commencing on site and should remain in place until all site development work is completed. The protective fencing should be located at the prescribed TPZ distance where possible and clearly signed **TREE PROTECTION ZONE**. The sign should be similar to the attached image (as recommended by the *Australian Standard AS4970-2009*) and should be of a size no smaller than 400mm x 300mm:
- An area should be designated on site, outside of any tree protection zone, where all building materials, chemicals etc. can be stored throughout the proposed development.
- Open trenching for underground services located within the recommended tree protection zone (TPZ) must be avoided. Should there be no alternative for service location; the services must be bored underneath the TPZ or a non-destructive root investigation (NDRI) should be undertaken. No trenching with machinery should be used to install services within the protected area.
- Soil moisture during construction should be maintained at not less than 50% of field capacity (usually 10 litres of water per 10mm of each tree DBH per week). Irrigation may be applied by hand, automatic or manual irrigation system, or by fine spray from water tanker located outside the fenced area. Water is to be applied at a volume and frequency required so as to maintain turgor and leaf retention and encourage healthy root development. The Project Arborist should discuss variations to the amount of water to be supplied with the site or Project Manager.
- Remedial pruning works recommended to be undertaken on the project trees must be carried out to *Australian Standard AS4373-2007 - Pruning of Amenity Trees*, by a qualified Arborist (Minimum AQF Level 3). If pruning works are to be undertaken, then these works should be carried out prior to any construction works beginning on site.
- Documentation should be provided to the site manager by the Project Arborist for each inspection during the development process which details the consultant Arborist name, date and time of inspection, the stage of development, and provides comments of what actions are required.

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8.5 TERMS AND CONDITIONS

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2. Arbor Survey Pty Ltd contracts with you on the basis that your promise that all affected property complies with all applicable statutes and legislation.
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5. Alteration of this report invalidates the entire report.
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7. The contents of this report represent the professional opinion of the consultant. The consultancy fee for the preparation of this report is in no way contingent upon the consultant reporting a particular conclusion of fact, nor upon the occurrence of a subsequent event.
8. Sketches, diagrams, graphs, and photographs in this report are intended as visual aids, are not to scale unless stated to be so, and must not be construed as engineering or architectural reports or as surveys.
9. Unless expressly stated otherwise:
 - a. The information in this report covers only those items which were examined and reflects the condition of those items at the time of the inspection only.
 - b. The inspection is limited to visual examination of accessible components without dissection, excavation, or probing. There is no warranty or guarantee, expressed or implied, that even if they were not present during our inspection, problems or defects in plants or property examined may not arise in the future.
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