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Arboricultural Impact Assessment

The Edgecliff Centre
Lot 203/ DP 1113922
203-233 New South Head Road
Edgecliff
NSW 2027

Prepared by:

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1 EXECUTIVE SUMMARY

Truth About Trees Pty. Ltd. have been engaged by Longhurst Group to prepare an Arboricultural Impact Assessment (AIA) report in accordance with the requirements of *AS4970-2009: The Protection of Trees on Development Sites* (Standards Australia, 2009).

The purpose of this assessment is to provide an AIA report in relation to a proposed development at the Edgecliff Centre. The proposal seeks to redevelop the centre to include new and updated mixed use development and facilitate the future development of a community facility for local residents.

The scope of the report was to inspect and assess all trees within the property boundary and all trees within the neighbouring properties where directly adjacent to the proposed development.

Only trees that had the potential to be impacted upon by the proposed development were captured, provided they satisfied the definition criteria of a 'tree' in accordance with Councils Development Control Plan (DCP).

Assessment of the trees was undertaken on 8 March 2023 by Tom Hare using the framework of the *Visual Tree Assessment procedure* (VTA) as prescribed by Mattheck & Breloer (Claus Mattheck, 1994).

The site is located within the Woollahra Municipal Council (WMC) catchment area and is subject to the conditions detailed within Councils Development Control Plan (DCP).

The site is bounded by New South Head Road (NSHR) to the north, New McLean Street to the south and west, and the 235 NSHR to the east.

The site is detailed within the DPE eSpatial mapping system as zone B2-Local Centre.

The site is not mapped on the NSW Department of Planning & Environment Biodiversity Values Map, as an area of Biodiversity Value

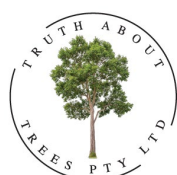
- A total of forty-eight (48) trees were surveyed on 8 March 2023.
- Ten (10) trees were allocated a high retention value in accordance with the STARS system of assessment: 2,3,4,5,6,7,8,9,10,11.
- Five (5) trees were allocated a medium retention value in accordance with the STARS system of assessment: 1,15,17,24,47.
- Thirty-three (33) trees were allocated a low retention value in accordance with the STARS system of assessment: 12,13,14,16,18,19,20,21,22,23,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,48.
- Seventeen (17) trees including one (1) weed species* are located adjacent to the proposed development of the Edgecliff Centre and were assessed as to the likelihood of being impacted, based upon current design, trees 1-17.
- Of these seventeen (17) trees, five (5) trees receive no direct impacts from the development: trees 1-5.
- Five trees are subject to impacts of less than 10% of the TPZ and can be successfully retained using standard tree protection measures: 6,8,9,10,11.
- One (1) tree is subject to encroachment of 16.7% from demolition of existing structures and paving works. The tree is of high retention value and will be retained through sensitive construction/demolition methodologies: 7.
- Trees 15 & 17 are council street trees located on New McLean Street with medium retention values. The trees structural root zones have caused significant displacement and distortion of the surrounding ground levels making their integration into the new streetscape impossible without substantial modification of the existing levels that would likely require raising the existing footpath levels and using suspended slab construction within the root zones.

- Six (6) trees will be subject to significant encroachments and development impacts from the proposal and will require removal: 12,13,14,15,16,17.
- Thirty-one (31) trees are potentially impacted by the proposed Community Facility and associated public domain works: trees 18-48.
- Fifteen (15) trees 22,23,24,25,26,27,28,34,35,36,37,38,44,45,47 are wholly within the footprint of the proposed community centre development area.
- Trees 29,46 & 48 are subject to encroachments of 32.5%,23.8% & 37.9% respectively and would also be subject to significant canopy modification pruning. These trees are unsuitable for retention.
- Trees 30,39 & 42 are subject to encroachments of 15%,19.2% & 18.8% respectively. Trees 39 & 42 would also be subject to significant canopy modification pruning resulting in very poor aesthetic outcomes. Tree 30 has poor and suppressed form and is not worth retaining. These trees are unsuitable for retention.
- Ten (10) trees are unaffected by the direct impacts from the development based on existing detail: 18,19,20,21,31,32,33,40,41,43. Only two of these trees should be considered for retention:20,21. The remaining trees are recommended for removal regardless of design.
- This report has considered the future character objectives, specifically Chapter E3 Tree Management of Woollahra DCP 2015.
- The redevelopment of the site will offer opportunities to revamp the streetscape to include the planting of suitable specimens, preferably using strata vaults to increase the available soil volume for any new plantings.
- The shadow diagrams provided and shown in Appendix 4 of this report show that the potential impacts of overshadowing of Trumper Oval imposed by the proposal appear to be negligible and in my opinion are unlikely to impose any significant impact upon turf management of the oval and the future recreational use of the site.



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3 INTRODUCTION & AIM

Truth About Trees Pty. Ltd. have been engaged by Longhurst Group to prepare an Arboricultural Impact Assessment (AIA) report in accordance with the requirements of *AS4970-2009: The Protection of Trees on Development Sites* (Standards Australia, 2009).

The purpose of this assessment is to provide an initial draft AIA report in relation to a proposed development at the Edgecliff Centre. The proposal seeks to redevelop the centre to include new and updated mixed use development and facilitate the future development of a community facility for local residents.

The scope of the report was to inspect and assess all trees within the property boundary and all trees within the neighbouring properties where directly adjacent to the proposed development.

Only trees that had the potential to be impacted upon by the proposed development were captured, provided they satisfied the definition criteria of a 'tree' in accordance with Councils Development Control Plan (DCP).



Figure 1 - Showing the approximate site boundaries of the Edgecliff Centre (red) and proposed community facility (yellow) with aerial imagery overlay - Image MetroMap. Please see Architectural plans for further detail.

4 METHODOLOGY

Assessment of the trees was undertaken on 8 March 2023 by Tom Hare using the framework of the *Visual Tree Assessment procedure* (VTA) as prescribed by Mattheck & Breloer (Claus Mattheck, 1994).

Trees within the survey area were geo-located and data collected using a TRIMBLE TDC600 data collector, with an external DA2 aerial capable of 30cm accuracy when used in optimal conditions.

Details provided for the trees are as follows:

- a) Correct botanical identification and common name
- b) Health assessment & rating
- c) Basic structural assessment & rating
- d) Dimensions: height, crown spread, DBH & DAB
- e) TPZ & SRZ calculations
- f) Age class
- g) Landscape significance assessment & rating
- h) Estimated Life Expectancy
- i) Retention value in accordance with the STARS system

Tree Protection Zones (TPZ) and Structural Root Zones (SRZ) were calculated in accordance with Australian Standard *AS4970-2009: Protection of Trees on Development Sites* (Standards Australia, 2009).

Tree Retention Values were determined using the Institute of Australian Consulting Arborists (IACA) '*Significance of a Tree, Assessment Rating System*' (STARS) (IACA©, 2010).

A detailed Arboricultural assessment methodology can be found in Appendix 1 of this report.

4.1 LIMITATIONS OF THE REPORT:

- No internal diagnostic testing has been completed.
- No sub surface root testing or soil analysis has been completed.
- All observations were made from ground-level only and where access was reasonably available.
- Tree height, canopy spreads and trunk diameters have been estimated.
- This report has been compiled based only on the information provided by the client as detailed in Table 1 below, and from observations made at the time of the site inspection(s) only.
- Only trees located within or directly adjacent to the subject site(s) boundaries that had the potential to be impacted were captured, provided they satisfied the definition criteria of a 'tree' in accordance with Councils Development Control Plan (DCP).
- Assessment of tree health and condition has been included to guide assessment of tree retention aspects only and is based on a basic visual assessment using elements of the VTA method. Tree structure and defects may be discussed briefly within this report; however, this report is not designed to be, nor does it satisfy the requirements of a detailed Arboricultural Risk Assessment report.

4.2 DOCUMENT SCHEDULE

The documents listed below have been relied upon in the preparation of this report.

Ref. No.	Document / Drawing Title	Author	Date
SEPP_B&C 2021	State Environmental Planning Policy (SEPP) Biodiversity & Conservation - Chapter 2: Vegetation in non-rural areas	NSW DPE	2021
DCP 2015	Woollahra Tree Management Development Control Plan (DCP)	WMC	2015
LEP 2014	Woollahra Local Environmental Plan (LEP)	WMC	2014
AS4970	Australian Standard AS4970-2009 'Protection of trees on development sites'	Standards Australia / SAI Global	2009
AS4373	Australian Standard AS4373-2007 'Pruning of amenity trees'	Standards Australia / SAI Global	2007
Documentation provided to Truth About Trees by the client and or representatives:			
2000	Ground Floor Plan	FJC Studio	26/09/2023
2001	Level 1 Plan	FJC Studio	26/09/2023
2002	Level 2 Plan	FJC Studio	26/09/2023
2003	Level 3 Plan	FJC Studio	26/09/2023

Table 1 - Document Register

Upon finalisation of the design, a review of and amendments to the tree protection, retention and removal recommendations contained later within this report may be required.

5 SITE DETAILS

The site subject to assessment for the purposes of this report is legally classified as Lot 203/ DP1113922 located at 203-233 New South Head Road, Edgecliff NSW 2027 and will be further referenced as ‘the site’.

The site is located within the Woollahra Municipal Council (WMC) catchment area and is subject to the conditions detailed within Councils Development Control Plan (DCP).

The site is bounded by New South Head Road (NSHR) to the north, New McLean Street to the south and west, and the 235 NSHR to the east.

The site is detailed within the DPE eSpatial mapping system as zone B2-Local Centre.

The site is not mapped on the NSW Department of Planning & Environment Biodiversity Values Map, as an area of Biodiversity Value (Environment, Biodiversity Values Map, 2023).

The site is not mapped as Bushfire Prone Lands.

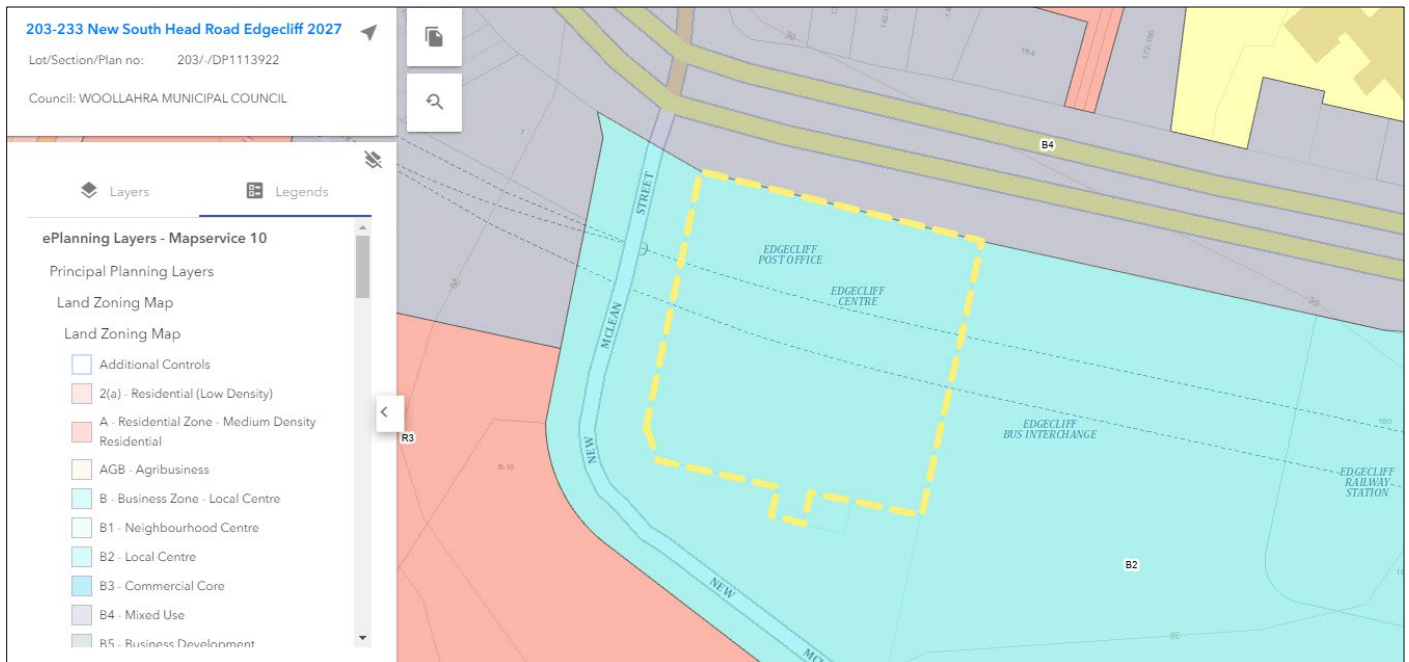


Figure 2 - Showing the subject site highlighted by dashed yellow boundary line, with zoning overlay - Image (Environment, ePlanning Spatial Viewer, 2023)

6 THE PROPOSAL

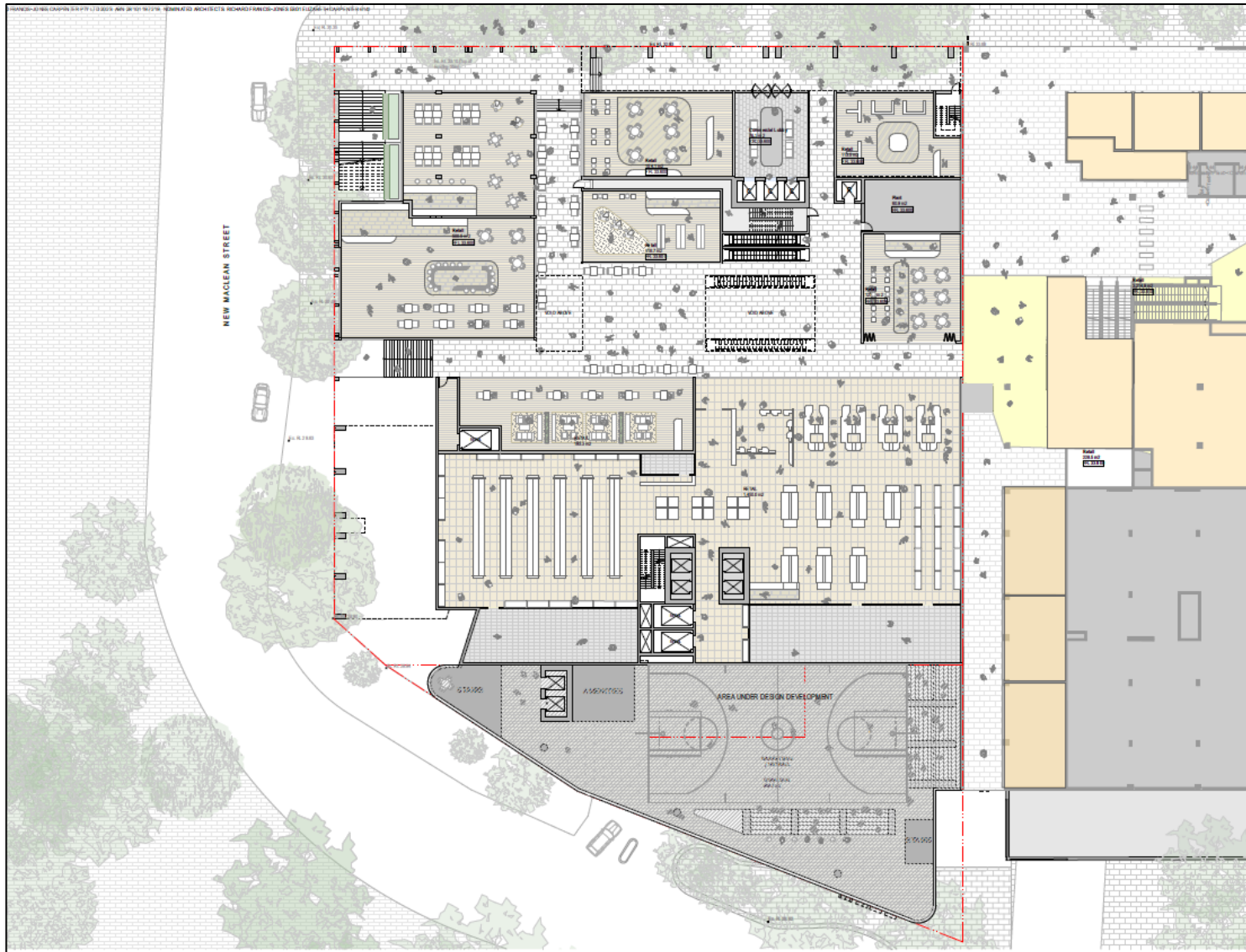


Figure 3- Ground Floor Plan.



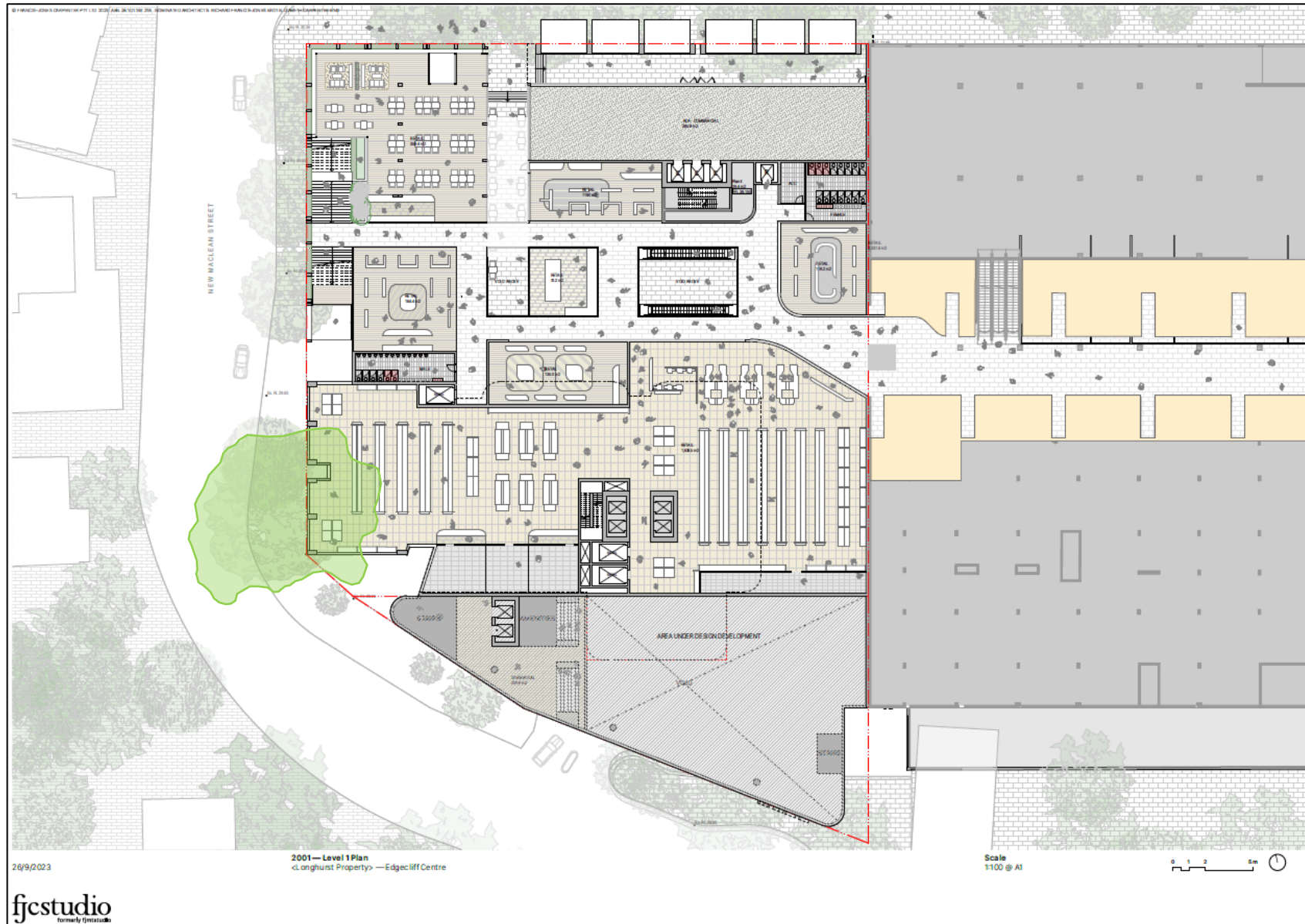


Figure 4-Level 1 Plan.



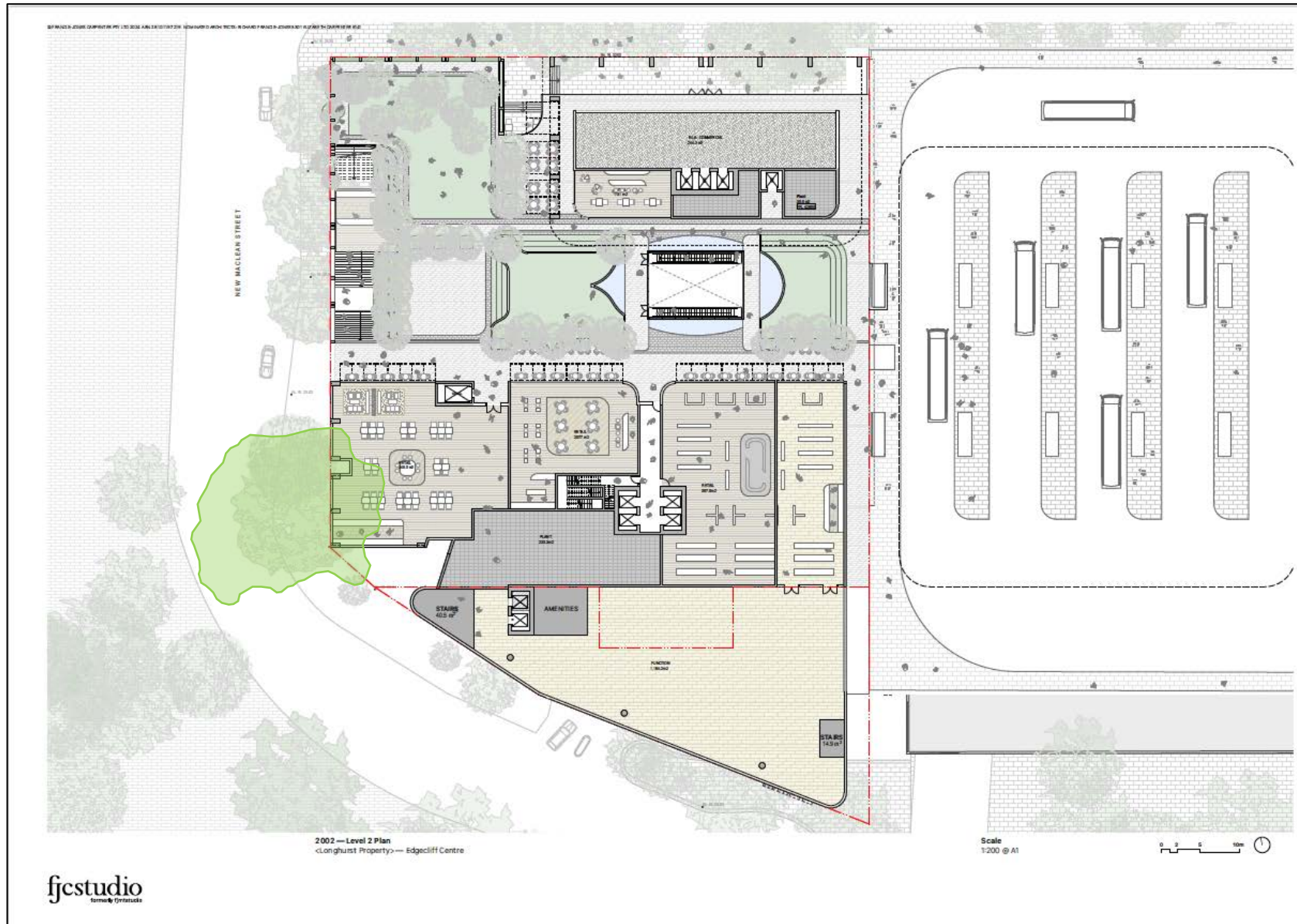


Figure 5 - Level 2 Plan.





Figure 6-Level 3 Plan.



7 TREE SCHEDULE

SEE APPENDIX 3



7.1 TREE LOCATION MAPPING



Figure 7- Tree locations with TPZs (Green) and SRZs (Red).



Figure 8 - Trees in relation to proposed development- Map 1.





Figure 9- Trees seventeen (17) tree canopy conflicts.



8 DISCUSSION

The proposed development consists of the partial demolition of the existing Edgecliff Centre and significant redesign and reconfiguration of the above ground portions of the site.

The existing Edgecliff Train Station beneath the building imposes substantial constraints in relation to potential development of the site, so much of the existing below ground structure will remain essentially the same with minor changes likely to improve functionality.

The basement walls will remain in situ, so there are no below ground construction requirements which may impact upon tree root systems.

The above ground portion of the site will see significant change with the potential expansion of the Southern aspect of the building to integrate into a proposed Community Facility being considered by Woollahra Council. This is still in the early conceptual stage and whilst the potential impacts of this portion of works will be discussed within this report, they will be kept separate and clearly defined where possible to provide delineation between the impacts.

The existing loading dock area and associated driveway access will also require significant modification, and if the Community Facility is integrated into the Edgecliff Centre, the existing truck access would be maintained beneath the elevated plaza.

The ground floor and level 1 of the proposed development will provide an open plaza style with upgraded and modernised retail facilities, whilst level 2 will provide further retail, commercial and open green space areas. It is understood that the open green space area on level 2 is to be extensively landscaped.

Whilst there is limited detail regarding the upper levels, it is understood that the South-western portion of the site will feature a multi-storey residential block. This residential block will impose significant impacts upon trees 15 & 17 through reduced light levels, altered wind dynamics and the extensive canopy modification of tree seventeen (17) due to its spread over the existing structure.

Once scaffolding has been considered tree seventeen (17) stands to lose just over 45% of its existing canopy which is unsustainable. The public domain works around these trees are likely to impose significant impacts due to the large structural root zones and associated soil levels which have been raised by the tree's root systems. It may be possible to integrate these trees into the new streetscape, but it would likely require substantial grade level changes and suspended slab construction within the public domain which would be difficult to integrate without stairs or other solutions which are probably undesirable.

Tree fifteen (15) has poor tree form with an extensive canopy bias to the west which may be further impacted upon by altered wind dynamics. The addition of the residential block may locally increase wind funnelling thereby increasing the loading on the tree canopy, notably from torsional twisting.

Consideration has also been given to the potential overshadowing of Trumper Oval in response to the following: 8.2.3 Solar Access and Overshadowing

Any request for a planning proposal must address solar access impacts on surrounding properties and open space and provide an accurate and comprehensive shadow analysis. In particular, ensuring solar access is maintained to Trumper Park Oval at 10.00am in mid-winter should be a requirement of any development on this site. The Oval requires natural sunlight to ensure turf management is maintained. Any overshadowing would have a significant effect for the community who utilise the oval for sports and recreation.

The shadow diagrams provided in Appendix 4 show negligible impacts of overshadowing to the adjacent Trumper Park Oval.

8.1 IMPACT ASSESSMENT - EDGECLIFF CENTRE

Tree #	Potentially Impacted by	TPZ Encroachment %	Potential Mitigation	Practical to retain
1-5	<ul style="list-style-type: none"> Unaffected by the proposal 	0%	<ul style="list-style-type: none"> Trunk & branch protection & fencing. 	YES
6	<ul style="list-style-type: none"> Potential minor impacts from re-paving works and demolition of existing structures. 	9.8%	<ul style="list-style-type: none"> Maintain existing levels within tree protection zones. Sensitive construction methods. Trunk & branch protection & fencing. 	YES
7	<ul style="list-style-type: none"> Potential impacts from re-paving works and demolition of existing structures. 	16.7%	<ul style="list-style-type: none"> Maintain existing levels within tree protection zones. Sensitive construction methods. Trunk & branch protection & fencing. 	YES
8	<ul style="list-style-type: none"> Potential minor impacts from re-paving works and demolition of existing structures. 	0.5%	<ul style="list-style-type: none"> Maintain existing levels within tree protection zones. Sensitive construction methods. Trunk & branch protection & fencing. 	YES
9	<ul style="list-style-type: none"> Potential minor impacts from re-paving works and demolition of existing structures. 	2.1%	<ul style="list-style-type: none"> Maintain existing levels within tree protection zones. Sensitive construction methods. Trunk & branch protection & fencing. 	YES
10	<ul style="list-style-type: none"> Potential minor impacts from re-paving works and demolition of existing structures. 	3.5%	<ul style="list-style-type: none"> Maintain existing levels within tree protection zones. Sensitive construction methods. Trunk & branch protection & fencing. 	YES
11	<ul style="list-style-type: none"> Potential minor impacts from re-paving works and demolition of existing structures. 	9.2%	<ul style="list-style-type: none"> Maintain existing levels within tree protection zones. Sensitive construction methods. Trunk & branch protection & fencing. 	YES



Tree #	Potentially Impacted by	TPZ Encroachment %	Potential Mitigation	Practical to retain
12-14	<ul style="list-style-type: none"> Removal of existing garden bed housing trees. Repaving works. 	100%	<ul style="list-style-type: none"> No practical mitigation methods possible under current design. Low retention value trees, not worthy of material constraint upon development. 	NO
15	<ul style="list-style-type: none"> Repaving works around tree with potential regrading required due to root buttressing. 	100%	<ul style="list-style-type: none"> No practical mitigation methods possible under current design. The tree has poor form with a strong bias over New Maclean Street. 	NO
16	<ul style="list-style-type: none"> Repaving works around tree with potential regrading required due to root buttressing. 	100%	<ul style="list-style-type: none"> No practical mitigation methods possible under current design. Tree is an exempt species 	NO
17	<ul style="list-style-type: none"> Repaving works around tree with regrading required due to substantial root buttressing. Tree root buttressing has raised the surrounding soil levels extensively. The tree canopy extends approximately 10m over the building line and would conflict with the proposed residential block resulting in the loss of 45% of the tree canopy. 	100%	<ul style="list-style-type: none"> No practical mitigation options exist to retain this tree under the current design. The existing soil levels around this tree appear to be difficult to integrate into the desired design outcome. The tree pruning required would be very detrimental to tree health and structural condition. 	NO

8.2 IMPACT ASSESSMENT- COMMUNITY CENTRE AND PUBLIC DOMAIN

Tree #	Potentially Impacted by	TPZ Encroachment %	Potential Mitigation	Practical to retain
18-21	<ul style="list-style-type: none"> The garden beds housing these trees are likely to be removed or redesigned. Trees would be affected by any future public domain works. 	100%	<ul style="list-style-type: none"> No practical mitigation measures are feasible under the current design. 	NO
22-28	<ul style="list-style-type: none"> Trees are within the footprint of the proposed community centre plaza. 	100%	<ul style="list-style-type: none"> No practical mitigation measures are feasible under the current design. 	NO
29	<ul style="list-style-type: none"> Heavily impacted by the plaza from earthworks and tree canopy conflict. 	32.5%	<ul style="list-style-type: none"> No practical mitigation measures are feasible under the current design. 	NO



Tree #	Potentially Impacted by	TPZ Encroachment %	Potential Mitigation	Practical to retain
30	<ul style="list-style-type: none"> Impacted by the plaza from earthworks and tree canopy conflict by 15%. TPZ encroachment from any public domain works would be highly likely. Tree has poor structure and low retention value. 	15%+	<ul style="list-style-type: none"> No practical mitigation measures are feasible under the current design. 	NO
31-33	<ul style="list-style-type: none"> Unaffected by current design and available detail, however, construction activity in relation to the community centre and any public domain works would likely result in major impacts. Trees are of low retention value and would likely be desired for removal during landscaping upgrades. 	0%	<ul style="list-style-type: none"> Trunk & branch protection & fencing. 	YES
34-38	<ul style="list-style-type: none"> Trees are within the footprint of the proposed community centre plaza. 	100%	<ul style="list-style-type: none"> No practical mitigation measures are feasible under the current design. 	NO
39	<ul style="list-style-type: none"> Heavily impacted by the plaza from earthworks and tree canopy conflict. 	19.2%	<ul style="list-style-type: none"> Unlikely to survive the TPZ encroachments and the tree canopy conflicts would likely prevent the tree from being able to develop a natural form. 	NO
40,41	<ul style="list-style-type: none"> Unaffected by current design and available detail, however, construction activity in relation to the community centre and any public domain works would likely result in major impacts. 	0%	<ul style="list-style-type: none"> Unsuitable for retention due to species and current condition. 	NO
42	<ul style="list-style-type: none"> Heavily impacted by the plaza from earthworks and tree canopy conflict. 	18.8%	<ul style="list-style-type: none"> Tree has poor structural condition and is unsuitable for retention. 	NO
43-46,48	<ul style="list-style-type: none"> Heavily impacted by the plaza from earthworks, public domain works and tree canopy conflict. 	0-100%	<ul style="list-style-type: none"> Trees are all undesirable exotic species of <i>Celtis sinensis</i> and should be removed regardless of the development proposal. 	NO
47	<ul style="list-style-type: none"> Tree is within the footprint of the proposed community centre plaza. 	100%	<ul style="list-style-type: none"> No practical mitigation measures are feasible under the current design. 	NO

Table 2 - Impact Assessment Schedule



9 CONCLUSION

- A total of forty-eight (48) trees were surveyed on 8 March 2023.
- Ten (10) trees were allocated a high retention value in accordance with the STARS system of assessment: 2,3,4,5,6,7,8,9,10,11.
- Five (5) trees were allocated a medium retention value in accordance with the STARS system of assessment: 1,15,17,24,47.
- Thirty-three (33) trees were allocated a low retention value in accordance with the STARS system of assessment: 12,13,14,16,18,19,20,21,22,23,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,48.
- Seventeen (17) trees including one (1) weed species* are located adjacent to the proposed development of the Edgecliff Centre and were assessed as to the likelihood of being impacted, based upon current design, trees 1-17.
- Of these seventeen (17) trees, five (5) trees receive no direct impacts from the development: trees 1-5.
- Five trees are subject to impacts of less than 10% of the TPZ and can be successfully retained using standard tree protection measures: 6,8,9,10,11.
- One (1) tree is subject to encroachment of 16.7% from demolition of existing structures and paving works. The tree is of high retention value and will be retained through sensitive construction/demolition methodologies: 7.
- Trees 15 & 17 are council street trees located on New McLean Street with medium retention values. The trees structural root zones have caused significant displacement and distortion of the surrounding ground levels making their integration into the new streetscape impossible without substantial modification of the existing levels that would likely require raising the existing footpath levels and using suspended slab construction within the root zones.
- Six (6) trees will be subject to significant encroachments and development impacts from the proposal and will require removal: 12,13,14,15,16,17.
- Thirty-one (31) trees are potentially impacted by the proposed Community Facility and associated public domain works: trees 18-48.
- Fifteen (15) trees 22,23,24,25,26,27,28,34,35,36,37,38,44,45,47 are wholly within the footprint of the proposed community centre development area.
- Trees 29,46 & 48 are subject to encroachments of 32.5%,23.8% & 37.9% respectively and would also be subject to significant canopy modification pruning. These trees are unsuitable for retention.
- Trees 30,39 & 42 are subject to encroachments of 15%,19.2% & 18.8% respectively. Trees 39 & 42 would also be subject to significant canopy modification pruning resulting in very poor aesthetic outcomes. Tree 30 has poor and suppressed form and is not worth retaining. These trees are unsuitable for retention.
- Ten (10) trees are unaffected by the direct impacts from the development based on existing detail: 18,19,20,21,31,32,33,40,41,43. Only two of these trees should be considered for retention:20,21. The remaining trees are recommended for removal regardless of design.
- It seems highly likely that if the development goes ahead there would be significant works to modernise the public domain including regeneration of the landscaping and it is highly unlikely that these trees would be desired for retention in any future design, so they are likely to be removed. The trees are all of low retention value.
- Nine (9) trees are considered as weed species and are exempt from the Woollahra Council DCP, these trees should be removed regardless of the development: 16,23,25,41,43,44,45,46,48.
- Eleven (11) trees are suitable for retention in relation to the Edgecliff Centre development and

would need to be retained and protected in accordance with the following recommendations and AS4970: 1,2,3,4,5,6,7,8,9,10,11.

- Based on existing detail two (2) trees are suitable for retention in relation to the Community Centre development and would need to be retained and protected in accordance with the following recommendations and AS4970: 20,21.
- The figures within table 3 below, assume that there will be no additional impacts associated with the project outside of the detail that has been provided to TAT for the purposes of preparing this report. As there is limited detail available, final decisions regarding tree removal should be made once detailed design has been completed.
- This report has considered the future character objectives, specifically Chapter E3 Tree Management of Woollahra DCP 2015.
- The redevelopment of the site will offer opportunities to revamp the streetscape to include the planting of suitable specimens, preferably using strata vaults to increase the available soil volume for any new plantings.
- The shadow diagrams provided and shown in Appendix 4 of this report show that the potential impacts of overshadowing of Trumper Oval imposed by the proposal appear to be negligible and in my opinion are unlikely to impose any significant impact upon turf management of the oval and the future recreational use of the site.

Edgecliff Centre Development		
Proposed for	Tree number	Total
Trees proposed for removal to enable development in its current form	12,13,14,15,16,17.	6
Trees to be retained	1,2,3,4,5,6,7,8,9,10,11.	11
Community Centre Development		
Proposed for	Tree number	Total
Trees proposed for removal to enable development in its current form	22,23,24,25,26,27,28,29,30,34,35,36,37,38,39,42,44,45,46,47,48.	21
Trees unaffected by the existing design detail	18,19,20,21,31,32,33,40,41,43.	10
Trees which are unaffected by current design and may be suitable for retention depending upon future design detail	20,21.	2

Table 3 - Tree retention & removal requirements

10 REFERENCES

- Australia, M. M. (2023, January 23). *Aerial Imagery*. Retrieved June 22, 2022, from MetroMaps: <https://web.metromap.com.au/map#>
- Claus Mattheck, H. B. (1994). *The Body Language of Trees* (Ninth ed.). London: The Stationary Office.
- Environment, N. D. (2023, January 23). *Biodiversity Values Map*. Retrieved from <https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BOSETMap>
- Environment, N. D. (2023, January 23). *Biodiversity Values Map*. Retrieved from <https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BOSETMap>
- Environment, N. D. (2023, January 23). *ePlanning Spatial Viewer*. Retrieved from NSW Planning Portal: <https://www.planningportal.nsw.gov.au/spatialviewer/#/find-a-property/address>
- IACA©. (2010). *Significance of a Tree, Assessment Rating System (STARS)©*. Institute of Australian Consulting Arboriculturists IACA©.
- Lonsdale, D. (1999). *Principles of Tree Hazard Assessment and Management* (2007 5th ed.). Norwich: The Stationary Office.
- Nelda P Matheny, J. R. (2009). *A Photographic guide to the Evaluation of Hazard Trees in Urban Areas*. Champaign: International Society of Arboriculture.
- NSW Rural Fire Service. (2006). *Planning for Bush Fire Protection*. Granville: State of New South Wales.
- Standards Australia. (2007). *Australian Standard AS4373-2007 Pruning of amenity trees*. Sydney: SAI Global.
- Standards Australia. (2009). *AS4970-2009 - Protection of trees on development sites*. Sydney: SAI Global.
- Standards Australia. (2009). *AS4970-2009 - Protection of trees on development sites*. Sydney: SAI Global.



11 GLOSSARY OF TERMS & ABBREVIATIONS

Age class - Described as Juvenile, Semi-Mature, Mature, Over-Mature. These definitions are variable subject to species and growing environment.

- **Juvenile** - Trees that are generally a sapling, or a new planting, usually within the first two (2) years of their life.
- **Semi-mature** - Tree aged less than <20% of life expectancy, *in situ*
- **Mature** - Tree aged 20-80% of life expectancy, *in situ*.
- **Senescent/ Over Mature** - Tree aged greater than >80% of life expectancy, *in situ*, or *senescent* with or without reduced *vigour*, and declining gradually or rapidly but irreversibly to death

Arboriculture - The science and culture of the growth, planning, management, care and maintenance of trees primarily for amenity and utility purposes.

Arborist - An individual with competence to cultivate, care and maintain trees for *amenity* or utility purposes.

Australian Standard AS4970-2009 (AS4970) - Australian Standard AS4970-2009: 'Protection of trees on development sites' is the underpinning standard to which development-based Arboricultural works and guidance are based upon within Australia.

Australian Standard AS4373-2007 (AS4373) - Australian Standard AS4373-2007: 'Pruning of amenity trees' is the underpinning standard to which practical Arboricultural works are based upon within Australia.

Batter - The process of grading the land in a slope formation away from an excavation or built structure.

Benching - Relatively level strips of earth or rock in a broad step-like formation breaking the continuity of a slope usually for reasons of safety. Depending on soil and rock type a commonly used ratio for vertical to horizontal cutting is 2:1.

Building envelope - Total surface area of ground that is or will be covered by a building.

Building footprint - *See Building envelope.*

Deep soil - Soil to a depth of 1000 mm or more (Craul 1992, p. 32).

Defect - Any feature of a tree that is likely to make it less safe (in the case of a structural defect) or otherwise to reduce its health, longevity, landscape prominence or conservation value for any other reason.

Diameter at Base (DAB) - The diameter of the tree taken at ground level above the root buttress flare

Diameter at Breast Height (DBH) - Measurement of trunk width calculated at a given distance above ground from the base of the tree often measured at 1.4m.

Easement - Areas of land above or below ground, subject to statutory constraints being either public or private provided for access or the location of utilities.

Estimated Life Expectancy (ELE) - Assessed on trees of particular species in the urban environment, including health and structural conditions which may exist.

Footing - Of a building, the lowest part of a structural wall or *pier* (in any form), that rests upon or into the earth. *See also Foundation.*

Foundation - The point at the earth surface upon which a building *footing* rests. *See also Footing.*

Height over Diameter (H/D) - The height of the tree divided by the Diameter at Base (DAB) used to determine structural integrity of trees in relation to windthrow when trees have developed slender form due to competition.

Significance of a Tree Assessment Rating System (STARS) - A methodology produced by the Institute of Australian Consulting Arborists (IACA) for the use in determining tree retention value(s). (IACA©, 2010)

Structural Root Zone (SRZ) -

Tree Protection Zone (TPZ)

Vigour - Physical strength and health. A tree with good vigour has the ability to sustain life processes and is synonymous with good health.

Visual Tree Inspection (VTA) - Is a detailed visual inspection of a tree and surrounding site (Claus Mattheck, 1994)

12 DISCLAIMER

The information contained within this report is to be used solely for the purposes that were specified at the time of engagement.

All attempts have been made to ensure the legitimacy of any information which has been gathered in the process of compiling this report, however Truth About Trees Pty Ltd cannot be held liable for inaccurate or misleading information which has been provided by others.

Any tree inspections or assessments which have been carried out for the purposes of this report are valid only at the time of inspection and are based on what could reasonably be seen or diagnosed from a visual inspection carried out from ground level.

All inspections, unless otherwise stated, are based upon Visual Tree Assessment (VTA) techniques, industry best practice and applied knowledge.

No internal diagnostic testing or below ground investigation has been carried out unless otherwise stated.

Trees are a dynamic living organism and as such they have a finite lifespan the end of which cannot always be predicted or understood, even apparently healthy trees can die suddenly or fall without warning. As such there is no warranty or guarantee provided, or implied, regarding the future risks associated with any tree.

Unless specifically stated within the scope and methodology sections of this report, this report does not constitute a detailed Arboricultural Risk Assessment if relating to construction and development related report types.

Assessment of tree health and condition has been included to guide assessment of tree retention aspects only and is based on a basic visual assessment using elements of the VTA method. Tree defects may be discussed briefly within this report; however, this report does not satisfy the requirements of a detailed Arboricultural Risk Assessment report.

It is noted that upon acceptance and completion of any development, that there may be trees that impose a risk of impacting a target that was not previously present prior to the development.

It is up to the client and the tree owner/manager to determine the risk threshold that they are willing to accept and undertake a suitably detailed Arboricultural risk assessment that identifies potential tree risk(s) and provides tree management recommendations in line with this threshold.

Please feel free to contact me either via telephone or email if you have any questions regarding this report.

13 APPENDIX 1: TREE ASSESSMENT METHODOLOGY

13.1 VISUAL TREE ASSESSMENT (VTA)

The VTA system is based on the theory of tree biology and physiology, as well as tree architecture and structure. This method is used by arborists to identify visible signs on trees that indicate good health, or potential problems. Symptoms of decay, growth patterns and defects are identified and assessed as to their potential to cause whole-tree, part-tree and/or branch failure. This system (represented by the image below) is based around methods discussed in *'The Body Language of Trees'*. (Claus Mattheck, 1994)

For the purpose of this report, elements of the VTA system will be used, along with industry standard literature, and other relevant studies that provide an insight into potential hazards in trees. This assessment is a snapshot of what could be reasonably seen or determined from a basic visual inspection. The VTA system is generally used as a means to identify hazardous trees; however, it is important to realize that for a tree to be hazardous there must be a target; a hazard poses no risk if there is no exposure to the hazard.

13.2 HEALTH & VIGOUR ASSESSMENT

The health and vigour of a tree are assessed by looking at the tree canopy and how it is performing. Certain indicators provide information on which to base the assessment. Abnormally small leaves, chlorosis (yellowing), sparse crown, wilting, and die-back can be signs of ill-health or decline but may also be related to a temporary imbalance due to drought or pest infestations. Epicormic growth can be a sign of stress and low energy reserves but can also be related to increased light levels through the removal or pruning of adjacent trees. Extension growth can be a good indicator of vigour, but this can vary greatly between species and under differing climatic conditions. For these reasons, each individual symptom or observation needs to be assessed with objectivity and consideration of all available information.

13.3 STRUCTURAL ASSESSMENT

The structural assessment of trees is carried out using the basic framework of Visual Tree Assessment. Signs and symptoms of defects are assessed to gauge the likelihood of failure, because not every defect constitutes a hazard e.g., *"...co-dominant stems are a structural defect. The severity of the defect is increased by included bark, large crowns and strong wind."* (Nelda P Matheny, 2009)

If trees were removed purely on the basis that there were defects present without assessing the likelihood of failure or whether practical mitigation measures are available, the urban forest would cease to exist. A basic visual tree assessment is undertaken from ground level, if defects are suspected further investigation may be required and recommended.

"[When using] the Visual Tree Assessment (VTA) procedure for assessing trees, as the suspicion increases that defects are present, the examination becomes more thorough and searching." (Claus Mattheck, 1994)

"Some defects, especially some forms of decay, do not give rise to external signs and therefore tend to escape detection in a purely visual survey. If there is no reason for suspecting a hidden defect to occur within a particular part of the tree, there is no reasonable basis for carrying out a detailed internal assessment. Although in theory an unsuspected defect might be detectable by the use of specialized diagnostic devices, this would be impracticable in the absence of some external sign to indicate the place which should be probed. Also, internal examination without good reason is undesirable, as it usually causes injury to the tree and is unreasonably time consuming and costly." (Lonsdale, 1999)

13.4 TREE PROTECTION ZONE (TPZ) & STRUCTURAL ROOT (SRZ) ZONE CALCULATIONS

In accordance with Australian Standard AS4970-2009 *Protection of trees on development sites* (Standards Australia, 2009), Tree Protection Zone (TPZ) radius is calculated using the following procedure. Diameter of the trunk is measured at approximately 1.4m above ground level; this measurement is referred to as DBH (Diameter at Breast Height). $R_{TPZ} = DBH \times 12$. For multi-stemmed trees the formula used is $R_{TPZ} = \sqrt{[(DBH1)^2 + (DBH2)^2 + (DBH3)^2]}$. The TPZ is measured radially from the centre of the stem and must be protected on all sides.

The Structural Root Zone (SRZ) radius is calculated by measuring the diameter of the stem close to ground level, just above the basal flare. This measurement is taken as D and then used in the following formula: $R_{SRZ} = (D \times 50)^{0.42} \times 0.64$ and becomes the Structural Root Zone, measured radially from the centre of the stem.

It is important to realize that these calculations provide a notional figure only and tree dynamics, form and site conditions will greatly affect these zones, and it is the job of the arborist to interpret the information correctly. For palms, cycads, tree ferns, and similar monocots, the TPZ is positioned at least 1m outside the crown projection. SRZs are not applicable to these plant types.

AS4970-2009 states *"a TPZ should not be less than 2m nor greater than 15m (except where crown protection is required)"* and the minimum radius for an SRZ is 1.5m.

13.5 REFERENCE DIAGRAMS

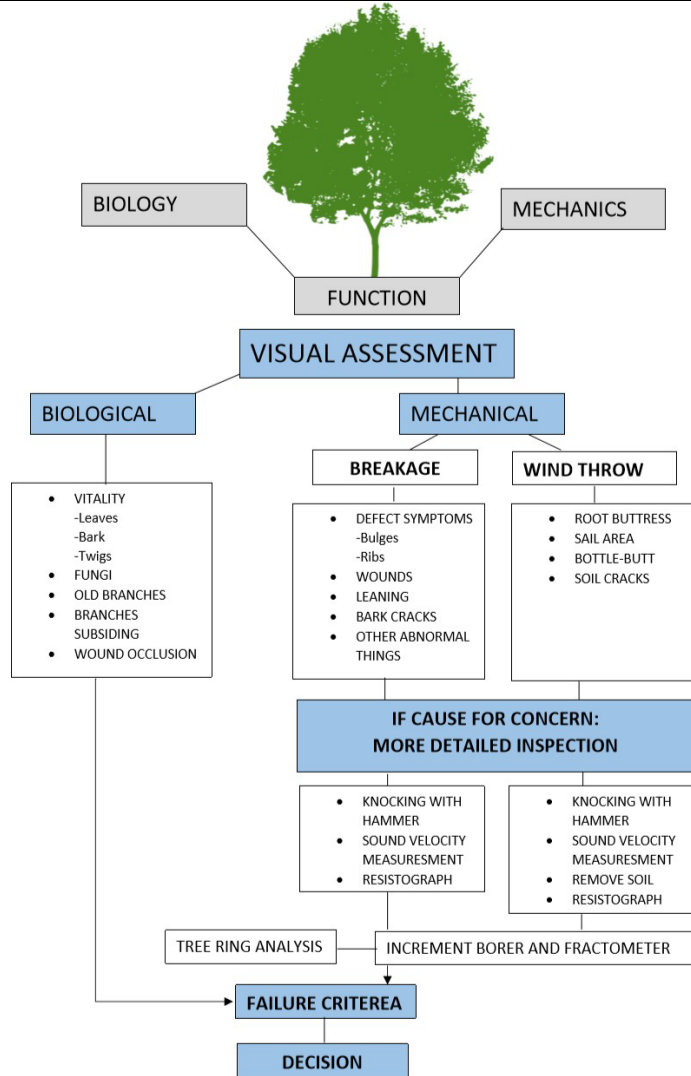


Figure 10 - VTA Procedure flowchart

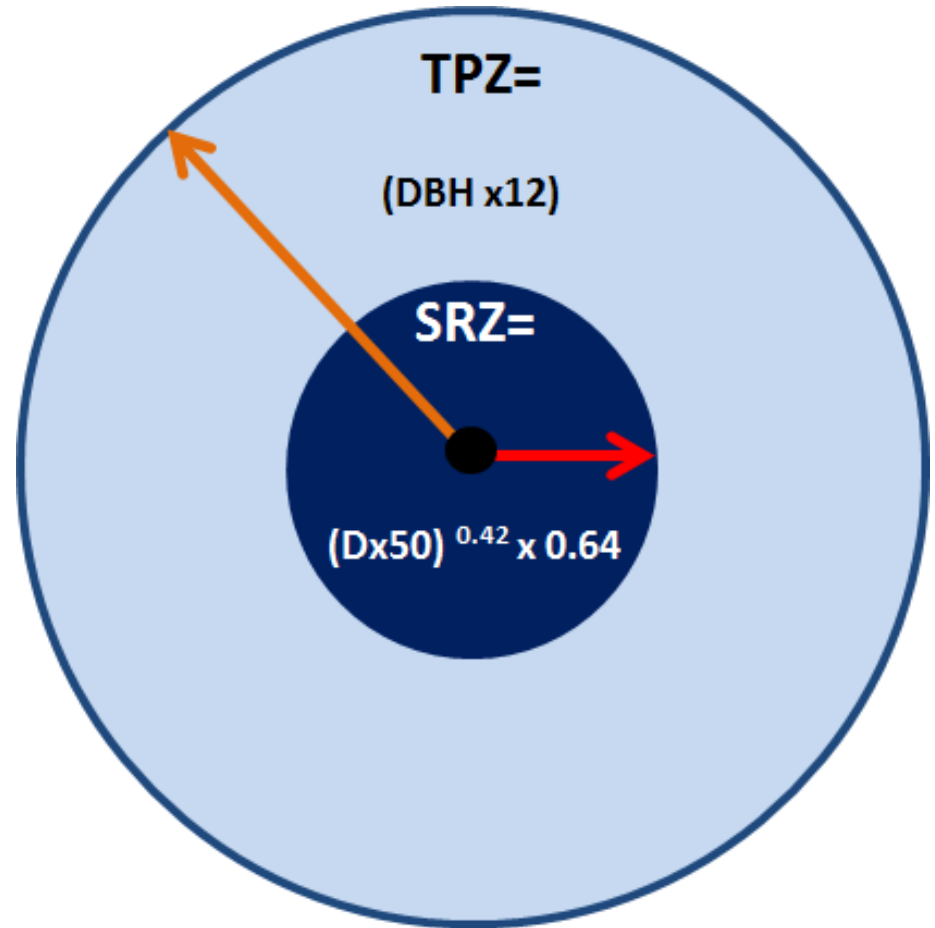


Figure 11 - A representation of TPZ & SRZ calculations



13.5.1 SIGNIFICANCE OF A TREE, ASSESSMENT RATING SYSTEM (STARS)

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

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

The landscape significance of a tree is an essential criterion to establish the importance that a particular tree may have on a site. However, rating the significance of a tree becomes subjective and difficult to ascertain in a consistent and repetitive fashion due to assessor bias. It is therefore necessary to have a rating system utilising structured qualitative criteria to assist in determining the retention value for a tree. To assist this process all definitions for terms used in the *Tree Significance - Assessment Criteria and Tree Retention Value - Priority Matrix*, are taken from the IACA Dictionary for Managing Trees in Urban Environments 2009.

This rating system will assist in the planning processes for proposed works, above and below ground where trees are to be retained on or adjacent a development site. The system uses a scale of *High, Medium and Low* significance in the landscape. Once the landscape significance of an individual tree has been defined, the retention value can be determined. An example of its use in an Arboricultural report is shown as Appendix A.

Tree Significance - Assessment Criteria



1. High Significance in landscape

- The tree is in good condition and good vigour;
- The tree has a form typical for the species;
- The tree is a remnant or is a planted locally indigenous specimen and/or is rare or uncommon in the local area or of botanical interest or of substantial age;
- The tree is listed as a Heritage Item, Threatened Species or part of an Endangered ecological community or listed on Councils significant Tree Register;
- The tree is visually prominent and visible from a considerable distance when viewed from most directions within the landscape due to its size and scale and makes a positive contribution to the local amenity;
- The tree supports social and cultural sentiments or spiritual associations, reflected by the broader population or community group or has commemorative values;
- The tree's growth is unrestricted by above and below ground influences, supporting its ability to reach dimensions typical for the taxa *in situ* - tree is appropriate to the site conditions.

2. Medium Significance in landscape

- The tree is in fair-good condition and good or low vigour;
- The tree has form typical or atypical of the species;
- The tree is a planted locally indigenous or a common species with its taxa commonly planted in the local area
- The tree is visible from surrounding properties, although not visually prominent as partially obstructed by other vegetation or buildings when viewed from the street,
- The tree provides a fair contribution to the visual character and amenity of the local area,
- The tree's growth is moderately restricted by above or below ground influences, reducing its ability to reach dimensions typical for the taxa *in situ*.

3. Low Significance in landscape

- The tree is in fair-poor condition and good or low vigour;
- The tree has form atypical of the species;
- The tree is not visible or is partly visible from surrounding properties as obstructed by other vegetation or buildings,
- The tree provides a minor contribution or has a negative impact on the visual character and amenity of the local area,
- The tree is a young specimen which may or may not have reached dimension to be protected by local Tree Preservation orders or similar protection mechanisms and can easily be replaced with a suitable specimen,
- The tree's growth is severely restricted by above or below ground influences, unlikely to reach dimensions typical for the taxa *in situ* - tree is inappropriate to the site conditions,
- The tree is listed as exempt under the provisions of the local Council Tree Preservation Order or similar protection mechanisms,
- The tree has a wound or defect that has potential to become structurally unsound.

Environmental Pest / Noxious Weed Species

- The tree is an Environmental Pest Species due to its invasiveness or poisonous/ allergenic properties,
- The tree is a declared noxious weed by legislation.

Hazardous/irreversible Decline

- The tree is structurally unsound and/or unstable and is considered potentially dangerous,
- The tree is dead, or is in irreversible decline, or has the potential to fail or collapse in full or part in the immediate to short term.

The tree is to have a minimum of three (3) criteria in a category to be classified in that group.

Note: The assessment criteria are for individual trees only, however, can be applied to a monocultural stand in its entirety e.g. hedge.

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



Table 1.0 Tree Retention Value - Priority Matrix.

		Significance				
		1. High	2. Medium	3. Low		
		Significance in Landscape	Significance in Landscape	Significance in Landscape	Environmental Pest / Noxious Weed Species	Hazardous / Irreversible Decline
Estimated Life Expectancy	1. Long >40 years					
	2. Medium 15-40 Years					
	3. Short <1-15 Years					
	Dead					

Legend for Matrix Assessment



	Priority for Retention (High) - These trees are considered important for retention and should be retained and protected. Design modification or re-location of building/s should be considered to accommodate the setbacks as prescribed by the Australian Standard AS4970 <i>Protection of trees on development sites</i> . Tree sensitive construction measures must be implemented e.g. pier and beam etc if works are to proceed within the Tree Protection Zone.
	Consider for Retention (Medium) - These trees may be retained and protected. These are considered less critical; however their retention should remain priority with removal considered only if adversely affecting the proposed building/works and all other alternatives have been considered and exhausted.
	Consider for Removal (Low) - These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.
	Priority for Removal - These trees are considered hazardous, or in irreversible decline, or weeds and should be removed irrespective of development.

USE OF THIS DOCUMENT AND REFERENCING

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

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

REFERENCES

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

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

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

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

Figure 12- Significance of a Tree Assessment Rating System (STARS) - IACA



14 APPENDIX 2: TREE PROTECTION SPECIFICATION

14.1 INTRODUCTION

- Early identification & protection of important trees on development sites is essential from the outset & will minimise problems associated with retaining inappropriate trees, & in turn focus time, resources & budget on the retention & protection of the most valuable trees on site (Standards Australia, 2009).
- Tree protection will form an essential part of the success of the development & should be prioritised at the earliest stage of the project. Where trees are proposed for retention on site, proper tree protection & management procedures will be crucial in ensuring that the trees remain valuable assets over the long-term.
- The following specification has been developed to provide detailed guidance for tree protection measures & processes associated with the development project.

14.2 TREE PROTECTION ASSESSMENT SCHEDULE

Table 5 below has been provided to identify the key tree protection measures that are applicable to the individual trees, or groups of trees proposed for retention on site.

The heading number* provided in column three (3) of Table 5 below, correlates to the applicable section within the following specification.

It is important to note that the below table identifies the key tree protection measures for the individual tree(s) only, and not all that apply. Therefore, it is important that the specification is read in its entirety, and works are guided by the Project Arborist to ensure that all trees are protected in accordance with AS4970.

Tree #	Tree Protection Measure (TPM) Recommendations	Specification Heading Reference
All retained Trees	<ul style="list-style-type: none"> • General physical TPM's i.e., fencing & signage apply, in accordance with AS4970-2009 & Appendix 2 • Restricted activities within the TPZ • Supervision of any & all works within TPZ by Project Arborist • Certification required in accordance with specified hold points & TPM 	<ul style="list-style-type: none"> • 14.8, 14.8.1, 14.8.2 • 14.6.3 • 14.11.1, 14.11.2 • 14.11, 14.5, 14.5.1, 14.5.2
<p>*Note - Select (Control + left-click-mouse-button) each heading number in column 3 to be taken to the applicable section of the specification</p>		

Table 4 - Tree Protection Assessment Schedule

14.2.1 APPLICABLE STANDARDS

14.2.1.1 Australian Standard AS4970-2009: Protection of trees on development sites (Standards Australia, 2009)

14.2.1.2 Australian Standard AS4373-2007: Pruning of amenity trees (Standards Australia, 2007)

- Australian Standards AS4373-2007 & AS4970-2009 are the underpinning documents that Arboricultural practice within Australia is based upon.
- The preparation of this specification has been prepared in accordance with & has been closely aligned with the foundations & principles of these standards.
- As such, this specification & any associated report(s) should be read in conjunction with AS4970 & AS4373.

14.2.2 APPROVAL FROM CONSENT AUTHORITY

- It is important to note that this specification & any associated report(s), do not count as approval for the recommendations contained within. It is vital that approval is obtained from the consent authority prior to following any recommendations provided by Truth About Trees as part of this specification or report.
- Upon approval from the consent authority, it is important that any variation between this specification & the Conditions of Consent (CoC) are identified, discussed & addressed with the Project Arborist, Project Manager & the consent authority to resolve any discrepancies.
- Unless otherwise advised by the consent authority, the CoC shall prevail.

14.3 PLANNING & DESIGN

- In addition to the commonly identified physical tree protection measures, tree protection is most effective when addressed through early-stage planning & design. Ideally this would mitigate the need to encroach on the tree(s) TPZ entirely resulting in only basic physical tree protection measures being required.
- The undertaking of a Preliminary Tree Assessment report is a key step in the process of tree protection. As through consultation between planners, the design team, project managers, the principal contractor & the project arborist; redesign, planning & detailed site management can achieve an outcome that both mitigates impacts to significant trees on site, & maintains the desired outcomes of the development.
- However, this may not always be feasible or have been considered early on in the development. Therefore, tree protection measures become paramount for the development to proceed successfully. At this point, the use of tree sensitive construction methods, combined with physical tree protection measures should be utilised for any part of the development that encroaches the TPZ of a tree proposed for retention.

14.3.1 TREE SENSITIVE CONSTRUCTION METHODS

- Tree sensitive construction methods are methods of construction that minimise the impact(s) to the tree(s) on site. Typically, in the form of minimising impacts associated with the below ground parts of the tree(s) root system.
- Examples of tree sensitive construction methods include, but are not limited to:
 - Pier & Beam style footings
 - Cantilevered Building Sections
 - Contiguous Piling
 - Suspended Slabs
 - Screw Piles
 - Directional under-boring

14.3.2 CONSTRUCTION MANAGEMENT PLAN

- A Construction Management Plan (CMP) should be compiled by the principal contractor in consultation with the Project Arborist in order to address any issues related to aspects such as the access & egress of vehicles and machinery & the storage of site materials.

14.3.3 ORDER OF WORKS

- It is important that works are undertaken with a methodical approach to mitigate conflict during the different stages of construction. When works are undertaken out of sequence, it can result in additional impacts to the tree(s) proposed for retention. **(See Section 15.11)**
- One of the most effective ways to ensure that tree protection measures remain successful, is by ensuring compliance with AS4970 and this specification. **(See Sections 15.3 & 15.4)**

14.4 COMPLIANCE

- Compliance with this specification is best managed through the appointment of a Project Arborist to ensure that works are undertaken in accordance with the recommendations & hold-points detailed within this specification. **(See Section 15.11)**
- This specification should be clearly communicated with the Principal Contractor & Project Manager to ensure that all works are undertaken in accordance with this specification.
- Tree protection measures should form part of the site-specific induction process to ensure that all workers on site are familiar with the requirements set out within the specification.
- The Project Arborist & Project Manager are to be responsible for the monitoring & enforcement of all tree protection measures on site.



14.5 THE PROJECT ARBORIST

14.5.1 PROJECT ARBORIST APPOINTMENT & QUALIFICATIONS

- A Project Arborist (PA) with a minimum Australian Qualification Framework (AQF) Level-5 qualification in arboriculture should be appointed as the Consulting Arborist for the project.
- The PA is to have sufficient experience in managing trees on development sites & must be familiar with the required legislation & standards, & up to date on industry best practice methodologies.
- The PA is to be appointed prior to the start of any works on site, inclusive of tree pruning & removal works & prior to site establishment & occupation.

14.5.2 RESPONSIBILITIES OF THE PROJECT ARBORIST & RECORD KEEPING

- The PA is to be consulted at the design stage to ensure that impacts to valuable trees on site is either mitigated, or effectively managed throughout the project.
- The PA is to attend an on-site meeting with the Project Manager & Principal Contractor to discuss the requirements for tree protection measures for the project. This is to be conducted prior to any works on site & prior to site establishment & occupation.
- The PA is to be responsible for the compliance with the specification, AS4970 & any CoC placed upon the development by the consent authority.
- The PA is to guide all tree pruning & removal works in accordance with AS4970 & AS4373.
- Certification of the installation of tree protection measures and any additional relevant hold-points as detailed within **Sections 15.10 & 15.11** of this specification is to be undertaken by the PA in accordance with the relevant industry standards and reporting requirements.
- The PA is responsible for supervision of any & all works within the TPZ of any tree proposed for retention.
- Record keeping of all supervision works by the PA is to be completed via a statement of attendance, detailing what works were undertaken and certifying that they were undertaken in accordance with the relevant standards e.g., AS4970 & AS4373. **(See Sections 15.10 & 15.11)**
- Whilst the above noted responsibilities are primarily that of the PA, it is the responsibility of the project manager/site manager to contact the PA prior to any works that require Arborist involvement and to assist with direct enforcement of all tree protection measures with all contractors.



14.6 TREE PROTECTION ZONE (TPZ)

14.6.1 TREE PROTECTION ZONE: DEFINITION & PURPOSE

- The Tree Protection Zone (TPZ) is defined within AS4970 as:
“A specified area above and below ground and at a given distance from the trunk set aside for the protection of a tree’s roots and crown to provide for the viability and stability of a tree to be retained where it is potentially subject to damage by development.” (Standards Australia, 2009)
- The TPZ is calculated in accordance with AS4970 by taking the Diameter at Breast Height (DBH) of the subject tree and multiplying it by twelve (12).
- It is important to note that this calculation provides a notional TPZ only, which is indicative of a generalised area that a tree may require to maintain tree health & structure. There are many aspects that contribute to the TPZ, and it is up to the PA to ensure that all aspects have been considered when determining the TPZ as this may differ from the notional TPZ calculation. **(See section 15.6)**

14.6.2 STRUCTURAL ROOT ZONE: DEFINITION & PURPOSE

- The Structural Root Zone (SRZ) is defined within AS4970 as:
‘The area around the base of a tree required for the tree’s stability in the ground. The woody root growth and soil cohesion in this area are necessary to hold the tree upright. The SRZ is nominally circular with the trunk at its centre and is expressed by its radius in metres. This zone considers a tree’s structural stability only, not the root zone required for a tree’s vigour and long-term viability, which will usually be a much larger area.’ (Standards Australia, 2009)

14.6.3 RESTRICTED ACTIVITIES

- It is important to restrict certain activities within the TPZ in order to mitigate any detrimental impacts to the tree(s) health and condition. Some activities may not appear to be of concern, however even indirect impacts can have a long-term and lasting effect on tree health and condition.

Examples of restricted activities as detailed within AS4970 are listed below:

- machine excavation including trenching
- excavation for silt fencing
- cultivation
- storage
- preparation of any chemicals, including cement
- parking of vehicles and plant
- refuelling
- dumping of waste
- wash down and cleaning of equipment
- placement of fill
- lighting of fires
- soil level changes
- temporary or permanent installation of utilities
- physical damage to the tree

14.7 VARIATIONS TO THE TPZ

14.7.1 TPZ ENCROACHMENTS

- Encroachment to the TPZ may at times be a necessity due to site limitations and constraints & are generally decided upon during the planning & Development Application stages. It is imperative that any encroachment to the TPZ is only undertaken with prior approval from the Consent Authority & under the guidance of the PA.
- TPZ encroachments are considered to be items that have a longer-term effect on the TPZ e.g., excavation, trenching, building footings, installation of services etc.
- There are typically two (2) categories of TPZ encroachment which each have their own specific assessment & management processes as detailed below.

14.7.1.1 Minor TPZ Encroachments:

- Where an encroachment is <10% of the trees total TPZ area & provided it is outside of the SRZ, then it is considered to be a minor encroachment.
- A minor encroachment would not generally warrant further, or detailed root investigation.
- Where an encroachment occurs, the TPZ must be adapted to compensate for the loss of area due to the encroachment, the compensated area must be contiguous to the existing TPZ.

14.7.1.2 Major TPZ Encroachments:

- Where an encroachment is >10% of the trees total TPZ area, or if it encroaches the SRZ, then it is considered to be a major encroachment.
- A major encroachment will require assessment by the PA and may require exploratory root investigation works to demonstrate the viability of the tree over the long-term. **(See Sections 15.8.1 & 15.8.2)**
- As with a minor encroachment, where an encroachment occurs, the TPZ must be adapted to compensate for the loss of area due to the encroachment, the compensated area must be contiguous to the existing TPZ.

14.7.2 CANOPY PROTECTION

- As well as the below-ground parts, the above-ground parts of the tree also require protection throughout development.
- On occasion, the notional TPZ calculation may be located within the tree canopy, therefore, the TPZ will require adjustment to 1m outside of the dripline to ensure that the tree canopy is properly protected.
- This will generally require the TPZ and associated fencing to be extended to a distance of 1m outside the perimeter of the tree canopy dripline as a minimum. *(See section 15.7.1)*
- In some cases, site space & constraints may result in the requirement for tree branches to be pruned. In this instance, a pruning specification may be required & must be undertaken in accordance with the relevant standards & under the guidance of the PA. *(See sections 15.1.2.2 & 15.9.1)*

14.7.3 ADDITIONAL CONSIDERATIONS

- Variations to the TPZ may also be required where the PA has demonstrated that one of the following (or other) aspects are impacting the likely TPZ requirement for the subject tree:
 - Existing or historical structures that are likely to have impacted the location of tree roots
 - The future growth requirements of the tree, including both above & below ground parts
 - Tree health
 - Tree structure
 - The characteristics of the individual tree species & its ability to tolerate development impacts
 - Site topography & soil type

14.8 PHYSICAL TREE PROTECTION MEASURES

14.8.1 TPZ FENCING & SIGNAGE

- TPZ fencing will be required for all trees proposed for retention, unless there is an existing structure that acts as physical barrier to access of the tree.
 - Fencing must be erected in accordance with AS4970 & AS4687 & should be positioned to the perimeter of the TPZ.
 - Where the notional TPZ is located within or below the tree canopy, the fencing should be extended to a minimum of 1m outside of the dripline.
 - Access to, or relocation of the TPZ fencing must only be acted upon following guidance from the PA.
 - Signage must be attached to the TPZ fencing in a position that is clearly visible from within the site.
 - Signage must be a minimum of A4 paper size & must be weather-proofed (laminated) & securely attached to the fencing in a way that ensures it remains in place throughout the development.
- (See section 15.12)*

14.8.2 TRUNK & BRANCH PROTECTION

- Trunk & branch protection may be required where there is likely to be an impact to the tree from the access & egress of vehicles & machinery on site & will be advised by the PA.
- Where trunk & branch protection is required, it should comply with AS4970 & consist of:
 - Wrapping a fabric layer (hessian/geotextile) around the tree trunk/branches,
 - Placing timber battens (90mm x 45mm) spaced at 150mm & to a height of 2m above-grade around the tree.
 - Timbers are not to be attached directly to the tree. *(See section 15.12)*

14.8.3 GROUND PROTECTION

- Ground protection is to be utilised where temporary access & egress of vehicles & machinery is required into any part of the TPZ to prevent soil compaction & root damage.
- Unless otherwise specified, ground protection should consist of a layer of geotextile fabric, well composted native woodchip mulch to a depth of 75mm-100mm & timber rumble boards placed on top. *(See section 15.12)*

14.9 CONSTRUCTION PROCESSES & TREE SENSITIVE METHODOLOGIES

14.9.1 ROOT INVESTIGATIONS

- Where a major encroachment occurs root investigation may be required in order to ensure that any impacts to significant roots are mitigated, and tree health & structure remains viable.
- This should be completed and documented prior to the start of any works on site.
- Root investigation can be conducted using a number of methods, each with their own benefits & constraints. Whilst all methods should be non-destructive, some methods are considered to be less invasive than others such as Ground Penetrating Radar (GPR).
- The investigation should be focused along the proposed line of construction.
- However, accuracy of the results can vary depending on characteristics of the individual site. As such, the PA will need to advise as to the most appropriate & effective method of investigation. Site constraints may impact upon the feasibility of a particular method & therefore site-specific recommendations will be required.
- Regardless of the method utilised, the following aspects should be assessed & documented as part of the investigation:
 - Method used
 - Date, time & location of works.
 - Individual tree identifying reference
 - Location, size, depth & direction of travel of all roots observed.
 - Summary of the estimated significance of the observed roots
 - Recommendations for construction processes to mitigate significant impacts to the roots (generally to be included as part of AIA reporting)

14.9.2 EXPLORATORY EXCAVATION

- Exploratory excavation is a method that can be utilised as part of a root investigation to guide design & construction. However, due to its invasive nature it is imperative that it is conducted in a way that minimises impacts to the tree.
- Exploratory excavation must be undertaken in accordance with the aspects detailed above in; **section 15.8.1.**
- Exploratory excavation must be undertaken in accordance with the aspects detailed below in; **section 15.8.3.**

14.9.3 EXCAVATION WITHIN THE TPZ

- Any excavation within the TPZ must only be undertaken following approval from the consent authority & under the supervision & guidance of the PA.
- Works must be undertaken using non-destructive measures such as hand digging, AirSpade or a Dry Vac*
*Note that a Dry Vac differs from a regular Hydro Vac. The Dry Vac uses air pressure to break up the soil profile, rather than a water jet, reducing the likelihood of tree roots being damaged by the high-pressure water jet.
- Works must be documented & certified by the PA (**See section 15.10**)

14.9.3.1 Root Protection

- Where roots are likely to be exposed for an extended period of time, it is important that they are adequately protected to prevent them from drying out.
- This can be achieved by wrapping the roots in hessian & ensuring that they remain moist throughout the works.
- The hessian wrap must be removed & the area back-filled with a suitable material as soon as practicable upon completion of the works.

14.9.4 ROOT PRUNING

- Root Pruning must only be undertaken under the guidance & supervision of the PA.
- Pruning cuts should be made using a fit-for-purpose & sharp tool to ensure that cuts are made cleanly and back to a suitable point in accordance with AS4373. (**See Section 15.1.2.2**)
- No roots greater than 25mm in diameter are to be pruned unless demonstrated viable by the PA.

14.9.5 GRADE CHANGES WITHIN THE TPZ

- Grade changes within the TPZ will require prior approval by the consent authority & the PA. They will generally consist of a raise in soil level only & not a reduction in grade.
- Where grade changes are permitted, they will generally be restricted to a maximum fill of 200mm above existing grade.
- The fill material must be a non-compacted material that is coarser than the existing soil & must be inspected & approved by the PA.

14.9.6 UNDERGROUND SERVICES

- Where feasible, all underground services should be located outside of the TPZ.
- In situations where site limitations dictate the location of service within the TPZ, then they would ideally be installed using directional under-boring to minimise disturbance to the TPZ. **(See Section 15.8.7)**
- Should under-boring not be feasible, then the services must be installed in accordance with **sections 15.8.1, 15.8.2 & 15.8.3** of this specification.

14.9.7 DIRECTIONAL UNDER-BORING

- Directional under-boring is undertaken using specialist equipment that can bore below ground to avoid conflict with trees, structures & infrastructure. Whilst it is a highly beneficial method for minimising impacts with trees, there are certain aspects that must still be considered to successfully mitigate any significant impact with tree root systems.
- Entry/exit pits - The directional drilling equipment requires an entry & exit pit in order to start the drilling process, the size may vary depending on the make/model of equipment, but 2m² should be considered as a minimum requirement. It is important to ensure that the entry/exit pit is located outside of the TPZ where possible. Where the entry or exit pit must be within the TPZ of a tree, the PA is to assess the viability of the proposal and the entry/exit pit is to be excavated using non-destructive means.
- Drilling depth - different machines are capable of drilling to different depths, and different soil types or bedrock may guide the desired depth of the bore, but generally speaking most machines are capable of drilling to a depth that avoids conflict with the tree's root system. The PA is to provide guidance on the minimum depth required based on soil type, tree species and site conditions.

14.9.8 ABOVE-GROUND SERVICES & STRUCTURES

14.9.8.1 Scaffolding

- Should scaffolding be required within the TPZ, it should be designed to mitigate impacts with the tree canopy.
- Where there is no alternative but to place scaffolding within the TPZ, it should be constructed in a way that mitigates the requirement for tree pruning where feasible.
- Should pruning be required, it should be guided by the PA in accordance with AS4373 & the relevant DCP. Note that a pruning Specification may also be required. **(See section 15.9.2)**
- Scaffolding within the TPZ will also require adequate ground protection to minimise soil compaction & damage to the tree roots. This can be achieved by utilising the methods detailed in **section 15.7.3**.
- A layer of impervious black plastic or similar must be utilised instead of geotextile to assist in preventing chemical spills from entering the soil.
- Additionally, scaffold boards or similar can be utilised on top of the mulch.

14.9.8.2 Building Alignment

- Where feasible, building alignments should be positioned outside of the TPZ & must consider the future growth of the trees above & below ground parts. This should be considered at the design stage to avoid encroachment into the TPZ. **(See Section 15.2)**
- Where the building alignment is to be positioned within the trees TPZ, it must be done so only after consultation & assessment with the PA and following approval from the consent authority. **(See Sections 15.3 & 15.4)**
- Tree sensitive design & construction methods will need to be utilised to minimise impacts and the PA is to supervise all works within the TPZ. **(See sections 15.2.1 & 15.4)**

14.9.8.3 Above-ground services - pruning spec

- Consideration needs to be given at the design stage to the location of above-ground services to minimise conflict with the trees canopy. **(See Section 15.2)**
- Where services are to pass near to, or within the tree canopy, consultation with the PA will be required.
- A pruning specification may be required to guide the installation of the service(s) and the tree(s). **(See Section 15.9.2)**

14.10 TREE REMOVAL & PRUNING WORKS

14.10.1 GENERAL

- No tree pruning or removal works should be undertaken without prior approval from the consent authority and without consultation with the PA.
- Tree pruning and removal works are to be undertaken by a suitably qualified, experienced and insured Arboricultural contractor with a minimum AQF level 3 qualification in Arboriculture.

Works should be undertaken in accordance with the following:

- (AS4373 – 2007) Pruning of Amenity Trees (*See Section 15.1.2.2*)
- NSW Code of Practice for the Amenity Tree Industry 1998
- NSW Code of Practice for Work Near Overhead Power Lines 2006
- NSW Work Health & Safety Act & Regulations 2011
- Safe Work Guide to managing Risks of Tree Trimming and Removal Work 2016

14.10.2 PRUNING SPECIFICATION

- A pruning specification may be required where the proposed works exceed the allowances within the applicable DCP exemptions.
- The PA will advise when this is required, & the pruning specification must be compiled in accordance with AS4373 & AS4970. (*See Section 15.1.2*)
- The pruning specification should clearly identify which branches require pruning & the suitable reduction point(s) that they should be pruned back to in order to ensure that tree health, form & condition are maintained.
- The pruning specification should be provided to the consent authority for approval as required & the document available on site during the pruning works.
- The PA should be advised by the Project Manager when pruning is to be undertaken, & consultation between the PA & the Arboricultural contractor that is undertaking the works, should occur prior to the works commencing.

14.11 MONITORING & CERTIFICATION

14.11.1 SUPERVISION

- This refers to the supervision of any works within the TPZ of a tree proposed for retention.
- Supervision should be undertaken by the PA or a suitably qualified & experienced AQF Lvl-5 Arborist.
- The primary purpose of supervision is to ensure that the PA is on site during works within the vicinity of the TPZ(s), to ensure that damage to the subject tree(s) is avoided by ensuring that works in these areas are undertaken in accordance with AS4970 & industry best practice.
- A secondary purpose of supervision is to ensure that the PA is present during works to provide guidance & advice should tree roots be encountered, or otherwise unforeseen tree related matters arise during the works.
- All supervision works should be documented & certified as detailed below.

14.11.2 HOLD POINTS & MONITORING

- Monitoring of the project is essential in order to ensure that tree protection measures remain in place & all tree protection & tree sensitive construction methods are undertaken in accordance with the specification & CoC.
- This can be achieved by ensuring compliance with the hold points detailed below in *Section 15.11*.
- All hold points will require certification by the PA.
- Certification is generally provided in a memo style certification letter, that will clearly identify & document the following items as a minimum:
 - Date, time & location of assessment/works & details of the person(s) and company(s) involved,
 - Applicable standards and or assessment methodology,
 - Detailed description of the works/assessment & detail of the involvement of the PA,
 - Description & location of trees subject to assessment,
 - Description of subject trees health & condition,
 - Photographic evidence that clearly shows examples of the works processes,
 - Items of non-compliance are clearly identified, documented & remediation recommendations provided.
 - Confirmation that any areas of non-compliance requiring remediation have been rectified (as required),
 - Signed acknowledgement of complying works and standards to which they have been assessed by.
- Certification will be provided to the client & will be the responsibility of the client to ensure that the certification is provided to the relevant consent authority & certifier as required.



14.12 HOLD-POINT INSPECTION SCHEDULE

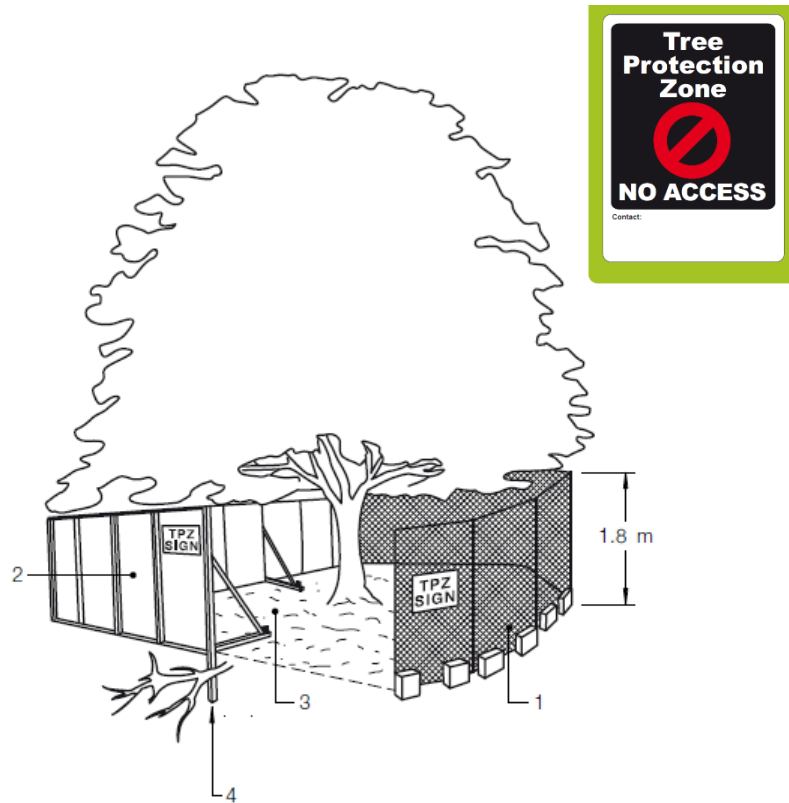
Hold-Point	Description	Applicable Stage of Development	Required Actions
1	Installation of tree protection measures	Prior to site establishment & occupation & prior to any work activities commencing on site.	<ul style="list-style-type: none"> Confirm that tree protection measures have been installed in accordance with the: <ul style="list-style-type: none"> Conditions of Consent Tree Protection Specification & Tree Protection Plan/Drawing AS4970-2009 Ideally installed prior to tree pruning/removal to ensure TPZ's are not unnecessarily encroached by tree contractor vehicles & equipment
2	Tree Protection Certification	Following tree pruning & removal works & prior to site work activities commencing.	<ul style="list-style-type: none"> Inspect and assess the installation of all tree protection measures Confirm that have been installed in accordance with: <ul style="list-style-type: none"> Conditions of Consent Tree Protection Specification & Tree Protection Plan/Drawing AS4970-2009 Provide letter of certification in accordance with <i>section 15.10</i> of this specification
3	Tree Pruning & Removal	Following the installation of all tree protection measures & prior to site establishment & occupation	<ul style="list-style-type: none"> Confirm that tree pruning & removal works are undertaken in accordance with the: <ul style="list-style-type: none"> Conditions of Consent Tree Protection Specification & Tree Protection Plan/Drawing Pruning Specification (where applicable) AS4373-2007
4	<p>Construction & Landscaping Within the TPZ</p> <p>Supervision of all access, demolition, construction & landscaping works within the TPZ</p> <p>Periodic site inspections to provide ongoing monitoring of the subject trees and compliance with tree protection measures</p>	<p>Following tree protection certification</p> <p>Periodically throughout demolition & construction.</p> <p>At any time that access or works are required within the TPZ, temporary or otherwise.</p>	<ul style="list-style-type: none"> Assess tree health & condition Ensure that tree protection measures remain in situ Ensure that all works are complying with: <ul style="list-style-type: none"> Conditions of Consent Tree Protection Specification & Tree Protection Plan/Drawing AS4970-2009 Provide letter of certification in accordance with <i>section 15.10</i> of this specification
5	<p>Post Works Certification</p> <p>Final inspection of the site & trees</p>	Following project completion to assess tree health & condition post-development	<ul style="list-style-type: none"> Confirm that all tree protection measures have been removed Undertake an assessment of the health & condition of all trees and recommend remedial works if required Provide letter of certification in accordance with <i>section 15.10</i> of this specification

Table 5 - Hold-point Inspection Schedule



14.13 REFERENCE DIAGRAMS

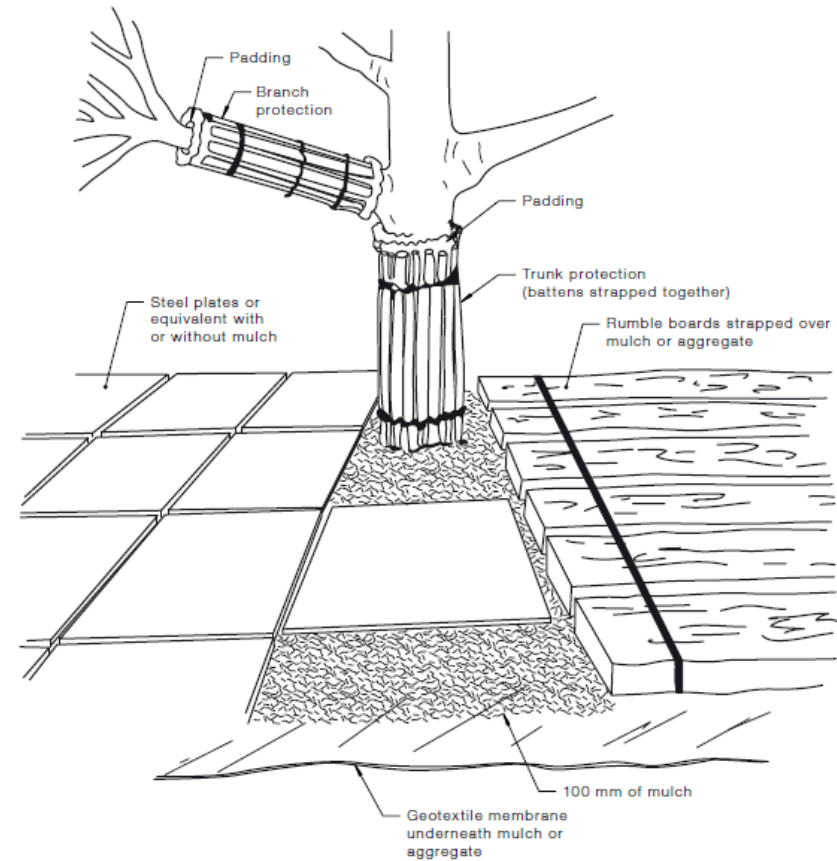
Figure 13-TPZ Sign Example



LEGEND:

- 1 Chain wire mesh panels with shade cloth (if required) attached, held in place with concrete feet.
- 2 Alternative plywood or wooden paling fence panels. This fencing material also prevents building materials or soil entering the TPZ.
- 3 Mulch installation across surface of TPZ (at the discretion of the project arborist). No excavation, construction activity, grade changes, surface treatment or storage of materials of any kind is permitted within the TPZ.
- 4 Bracing is permissible within the TPZ. Installation of supports should avoid damaging roots.

Figure 14 - Tree protection fencing example - Image: (Standards Australia, 2009)



NOTES:

- 1 For trunk and branch protection use boards and padding that will prevent damage to bark. Boards are to be strapped to trees, not nailed or screwed.
- 2 Rumble boards should be of a suitable thickness to prevent soil compaction and root damage.

Figure 15 - Trunk, branch & ground protection example - Image: (Standards Australia, 2009)

15 APPENDIX 3: TREE SCHEDULE

Tree No.	Botanical Name	Height (m)	Canopy Spread (m)	DBH (mm)	DAB (mm)	TPZ (mm)	SRZ (mm)	Health	Age	Structure	Landscape	ELE	Retention Value
1	<i>Jacaranda mimosifolia</i> -Jacaranda	12	10	370	405	4440	2264	Good	Mature	Fair	Medium	Medium	Medium
2	<i>Eucalyptus microcorys</i> - Tallowwood	16	8	420	465	5040	2399	Good	Mature	Fair	High	Medium	High
3	<i>Eucalyptus microcorys</i> - Tallowwood	16	9	395	450	4740	2366	Good	Mature	Fair	High	Medium	High
4	<i>Eucalyptus microcorys</i> - Tallowwood	15	6	340	390	4080	2228	Good	Mature	Fair	High	Medium	High
5	<i>Eucalyptus microcorys</i> - Tallowwood	16	8	355	420	4260	2299	Good	Mature	Fair	High	Medium	High
6	<i>Eucalyptus microcorys</i> - Tallowwood	18	7	455	545	5460	2565	Fair	Mature	Fair	High	Medium	High
7	<i>Eucalyptus microcorys</i> - Tallowwood	18	11	555	695	6660	2840	Good	Mature	Fair	High	Medium	High
8	<i>Eucalyptus microcorys</i> - Tallowwood	19	8	400	755	4800	2941	Good	Mature	Fair	High	Medium	High
9	<i>Eucalyptus microcorys</i> - Tallowwood	12	6	400	490	4800	2453	Fair	Mature	Fair	High	Medium	High
10	<i>Eucalyptus microcorys</i> - Tallowwood	11	6	365	415	4380	2287	Fair	Mature	Fair	High	Medium	High
11	<i>Eucalyptus microcorys</i> - Tallowwood	12	8	395	535	4740	2545	Good	Mature	Fair	High	Medium	High
12	<i>Callistemon viminalis</i> - Weeping Bottlebrush	4	4	125	195	2000	1666	Fair	Semi-mature	Fair	Low	Short	Low
13	<i>Melaleuca bracteata</i> - Black Tea-Tree	7	5	245	300	2940	1996	Good	Semi-mature	Fair	Low	Medium	Low
14	<i>Callistemon salignus</i> - White Bottlebrush	6	5	180	300	2160	1996	Fair	Semi-mature	Fair	Low	Short	Low
15	<i>Eucalyptus saligna x botryoides</i> - Wollongong Woollybutt	14	20	490	450	5880	2366	Good	Mature	Poor	Medium	medium	Medium
16	<i>Celtis sinensis</i> - Chinese Hackberry	8	5	300	340	3600	2104	Fair	Mature	Poor	Low	Short	Low
17	<i>Eucalyptus saligna x botryoides</i> - Wollongong Woollybutt	23	21	1350	1550	15000	3978	Good	Mature	Fair	Medium	Medium	Medium
18	<i>Acacia binervia</i> - Coast Myall	5	3	110	125	2000	1500	Fair	Semi-mature	Fair	Low	Short	Low
19	<i>Duranta erecta</i> - Pidgeon Berry	4	4	160	260	2000	1879	Good	Mature	Fair	Low	Short	Low
20	<i>Araucaria heterophylla</i> - Norfolk Island Pine	10	4	200	240	2400	1817	Good	Semi-mature	Good	Low	Medium	Low
21	<i>Jacaranda mimosifolia</i> - Jacaranda	8	4	200	255	2400	1864	Good	Semi-mature	Fair	Low	Medium	Low
22	<i>Fraxinus griffithii</i> - Evergreen Ash	7	4	165	235	2000	1801	Good	Semi-mature	Fair	Low	Medium	Low



Tree No.	Botanical Name	Height (m)	Canopy Spread (m)	DBH (mm)	DAB (mm)	TPZ (mm)	SRZ (mm)	Health	Age	Structure	Landscape	ELE	Retention Value
23	<i>Celtis sinensis</i> - Chinese Hackberry	7	4	165	245	2000	1833	Good	Semi-mature	Fair	Low	Medium	Low
24	<i>Eucalyptus saligna x botryoides</i> - Wollongong Woollybutt	19	21	500	665	6000	2788	Fair	Mature	Poor	Medium	Medium	Medium
25	<i>Celtis sinensis</i> - Chinese Hackberry	9	7	215	300	2580	1996	Good	Semi-mature	Fair	Low	Medium	Low
26	<i>Duranta erecta</i> - Pidgeon Berry	4	4	100	210	2000	1718	Good	Mature	Fair	Low	Short	Low
27	<i>Morus alba</i> - White Mulberry	4	6	160	195	2000	1666	Fair	Semi-mature	Fair	Low	Medium	Low
28	<i>Eucalyptus botryoides</i> - Bangalay	12	10	335	370	4020	2180	Fair	Semi-mature	Poor	Low	Medium	Low
29	<i>Ficus coronata</i> - Sandpaper Fig	5	10	215	325	2580	2064	Good	Mature	Fair	Low	Medium	Low
30	<i>Eucalyptus botryoides</i> - Bangalay	8	8	210	255	2520	1864	Good	Semi-mature	Poor	Low	Short	Low
31	<i>Casuarina glauca</i> - Swamp Oak	8	3	270	300	3240	1996	Good	Semi-mature	Fair	Low	Short	Low
32	<i>Morus alba</i> - White Mulberry	5	4	160	240	2000	1817	Poor	Semi-mature	Fair	Low	Short	Low
33	<i>Callistemon viminalis</i> - Weeping Bottlebrush	5	3	75	200	2000	1683	Poor	Semi-mature	Fair	Low	Short	Low
34	<i>Acacia binervia</i> - Coast Myall	5	2	45	80	2000	1500	Poor	Semi-mature	Fair	Low	Short	Low
35	<i>Ulmus parvifolia</i> - Chinese Elm	8	13	290	335	3480	2091	Good	Semi-mature	Fair	Low	Medium	Low
36	<i>Casuarina glauca</i> - Swamp Oak	19	5	300	345	3600	2117	Fair	Mature	Fair	Medium	Short	Low
37	<i>Casuarina glauca</i> - Swamp Oak	12	3	165	200	2000	1683	Fair	Semi-mature	Fair	Low	Short	Low
38	<i>Casuarina glauca</i> - Swamp Oak	15	2	100	130	2000	1500	Fair	Semi-mature	Fair	Low	Short	Low
39	<i>Ulmus parvifolia</i> - Chinese Elm	8	9	260	285	3120	1953	Good	Semi-mature	Fair	Low	Short	Low
40	<i>Eucalyptus scoparia</i> - Wallangarra White Gum	9	7	285	355	3420	2142	Fair	Senescent	Fair	Low	Short	Low
41	<i>Syagrus romanzoffiana</i> - Cocos Palm	5	3	200	255	2400	1864	Good	Mature	Good	Low	Short	Low
42	<i>Lophostemon confertus</i> - Brushbox	12	8	360	460	4320	2388	Good	Mature	Poor	Medium	Short	Low
43	<i>Celtis sinensis</i> - Chinese Hackberry	7	6	200	275	2400	1924	Good	Semi-mature	Poor	Low	Medium	Low
44	<i>Celtis sinensis</i> - Chinese Hackberry	6	5	140	300	2000	1996	Good	Semi-mature	Poor	Low	Medium	Low
45	<i>Celtis sinensis</i> - Chinese Hackberry	6	5	140	300	2000	1996	Good	Semi-mature	Poor	Low	Medium	Low
46	<i>Celtis sinensis</i> - Chinese Hackberry	6	5	140	300	2000	1996	Good	Semi-mature	Poor	Low	Medium	Low



Tree No.	Botanical Name	Height (m)	Canopy Spread (m)	DBH (mm)	DAB (mm)	TPZ (mm)	SRZ (mm)	Health	Age	Structure	Landscape	ELE	Retention Value
47	<i>Casuarina cunninghamiana</i> - River She-Oak	22	13	475	605	5700	2680	Good	Mature	Good	Medium	Medium	Medium
48	<i>Celtis sinensis</i> - Chinese Hackberry	5	4	160	200	2000	1683	Good	Semi-mature	Poor	Low	Short	Low





Retention Value Key	
High	
Medium	
Low	
Very Low	

Table 6 - Tree Schedule

15.1 TREE RETENTION VALUES

Retention value	Tree numbers	Total
High	2, 3, 4, 5, 6, 7, 8, 9, 10, 11.	10
Medium	1, 15, 17, 24, 47	5
Low	12, 13, 14, 16, 18, 19, 20, 21, 22, 23, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 48	33
Very low	n/a	0

Table 7 - Showing tree retention values & colours



16 APPENDIX 4- OVERSHADOWING PLANS



Figure 16- Shadow diagrams.



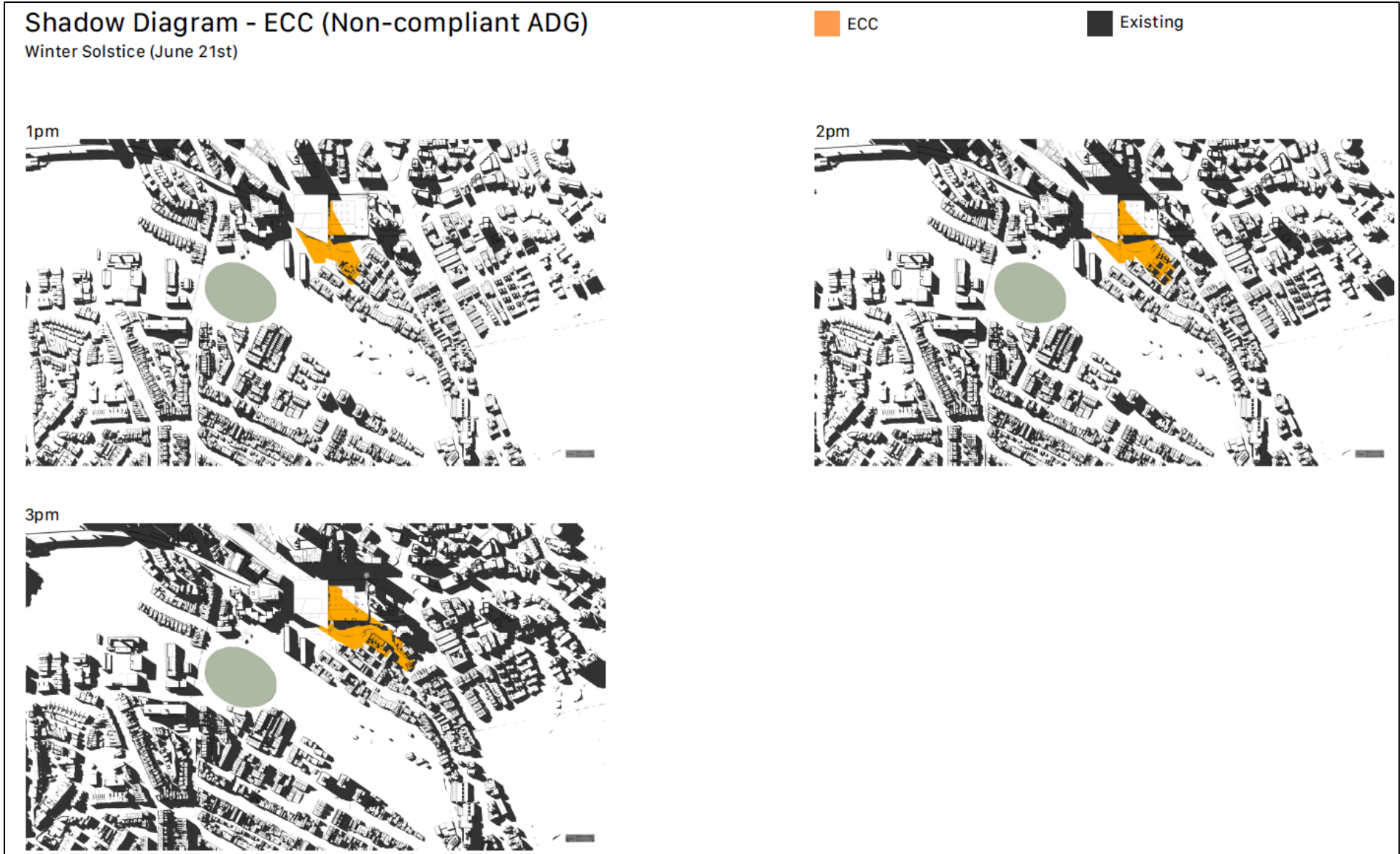


Figure 17- Shadow diagrams.





Figure 18- Shadow diagrams.



Figure 19- Shadow diagrams.

Shadow Diagram - Comparison

Winter Solstice (June 21st)

ECC PP Indicative Scheme Existing & Overlap between ECC & PP
PP Envelope

10am



11am



12pm



Figure 20- Shadow diagrams.



Shadow Diagram - Comparison

Winter Solstice (June 21st)

Legend:

- ECC (Orange square)
- PP Indicative Scheme (Blue square)
- Existing & Overlap between ECC & PP (Black square)
- PP Envelope (Red line)



Figure 21- Shadow diagrams.

