MUSEUMS DISCOVERY CENTRE EXPANSION
ENVIRONMENTAL IMPACT STATEMENT

APPENDIX V
ARBORICULTURAL IMPACT STATEMENT

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Arboricultural Impact Assessment

State Significant Development SSD -10472

The Hills Shire Council Planning Proposal - 5/2020/PLP

Proposed Expansion
Museum of Applied Arts and Science - Museum Discovery Centre

2 Green Road Castle Hill NSW

Stand of plantation trees, Castle Hill TAFE

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1. Introduction

The report supports a State Significant Development (SSD) Application for the proposed construction and use of a new building to facilitate the expansion of the Museums Discovery Centre (MDC) site at 2 Green Road, Castle Hill.

The primary objective of the SSD Application is to provide expanded facilities to accommodate the Powerhouse collection including spaces for storage, conservation, research and display and spaces to facilitate increased public access to the collection through education, public programs, workshops, talks, exhibitions and events. The expansion of the existing MDC facility within the site at 2 Green Road Castle Hill will integrate with the existing MDC site located at 172 Showground Road, Castle Hill and its operations on a permanent basis.

The proposal is a type of "*Information and Education Facility*" with a Capital Investment Value (CIV) in excess of $30 million and is classified as SSD under Schedule 1 Clause 13 of the State Environmental Planning Policy (State and Regional Development) 2011 (State and Regional Development SEPP).

Create Infrastructure is the proponent of the SSD Application.

2. Background

The MDC is owned and operated by the Museum of Applied Arts and Sciences (MAAS) and features exhibitions and displays in collaboration with Australian Museum and Sydney Living Museums, who also maintain collection storage and conservation facilities on the site. The MDC is located at 172 Showground Road, Castle Hill. There are six buildings primarily providing collection storage as well as areas for displays and education and public programs, accessible to visitors (Building E). During 2017-2018 a total of 17,481 persons visited the MDC site.

The MDC Expansion is part of the renewal of the Museum of Applied Arts and Sciences, known as the Powerhouse Program, which includes:

- **Powerhouse Parramatta**: A new benchmark in cultural placemaking for Greater Sydney that will be a symbol of a new approach to creative activity and engagement.

- **Powerhouse Ultimo**: The NSW Government recently announced that the Museum's Ultimo site will be retained, and the Museum will operate over four sites across the Greater Sydney area.

- **Powerhouse Collection Relocation and Digitisation Project**: The relocation of the Powerhouse collection and digitisation of around 338,000 objects, enhancing the collection's accessibility for local, national and international audiences.

The MDC expansion is an integral component of the Powerhouse Program and will provide the opportunity to increase visitation to the site, forming an important and significant cultural institution within The Hills Shire. In addition to the storage component of the proposal, the expansion will increase access to the Powerhouse collection through a range of spaces for visible storage, research and viewing of the collection, as well as flexible spaces for education and public programs, workshops, talks, exhibitions and events.

3. Methodology

Visual tree assessments (*VTA*) [1] were carried out from the ground by a Level 5 (AQF) consulting arborist on 12 February 2019 and 9 May 2019. A further site inspection to clarify eucalyptus identification was undertaken on 30 July 2020.

Tree height and age was estimated and Diameter at Breast Height (D.B.H.) was measured 1.4 metres (m.) above ground.

No soil/root exploration, tissue sampling or trench digging was undertaken.

Eucalyptus species were identified from bark, leaves and where possible, fruit and a review of the *Floristic Survey and Vegetation Integrity Plots*, identified in the Tree Replacement Strategy prepared by WSP, July 2020.

A Significance of a Tree Assessment Rating System (STARS) was determined. A STARS rating establishes the contribution a tree has to the overall landscape, amenity qualities or importance due to species, size, historical/cultural planting or significance to the site.

Tree Protection Zones and Protection Methods are referenced from Standard® AS 4970 - 2009 Protection of Trees on Development Sites. [2]

In preparing this report the author is aware of and has taken into account the provisions of;

The Hills Development Control Plan (DCP), 2012, Landscaping Part C Section 3

State Environment Planning Policy (SEPP), 2017, Vegetation in Non-Rural Areas

Department Planning, Industry & Environment, Gateway Determination, PP_2020_THILL_001_00.

The Department of Planning, Industry and Environment have issued Secretary's Environmental Assessment Requirements (SEARs) to the applicant for the preparation of an Environmental Impact Statement for the proposed development.

The report has relied upon the following plan/s and documents and having regard to the SEARs as follows:

Architectural Drawings	Lahznimmo architects	Update for SSDA	10/07/2020
Survey Plan	YSCO Geomatics	98148/14A 1 – 7 sheets	December 2018
Aerial & Vegetation Map	The Hills Mapping	TAFE 2 Green Road	Supplied
Carpark Layout	Lahznimmo architects	SKO4 Revision 2	23/06/2020
Tree Replacement Strategy	WSP	Project PS120245	3 July 2020
SEAR SSD - 10472	The Tree Replacement Strategy addresses the impact on vegetation.		

4. Aims

The aims of this report are to:

Conduct a visual assessment of the subject trees and their growing environment
Review the supplied plans to determine the impact of the construction on the retainable trees
Prepare a site specific tree protection plan and if required a pruning specification to minimise adverse impacts on retainable trees.

5. Site Description

The proposed Building J site is located within the property known as 2 Green Road, Castle Hill which comprises a single lot legally described as Lot 102 DP 1130271. The site is generally square in shape with a splay corner to the intersection of Green Road and Showground Road and a total area of approximately 3.8ha. The site has a primary frontage of approximately 183m to Green Road and a secondary frontage of approximately 186m to Showground Road. Refer to Figure 1.

The location of the proposed new MDC building (to be known as "Building J") is located on the western end of the site and is marked on Figure 1.

Figure 1: Existing site Layout plan and proposed development site. Source: Lahznimmo Architects

The overall site contains large institutional buildings set within a landscaped setting featuring a high tree canopy.

The overall site is a TAFE campus that caters for approximately 400 enrolled students, and provides courses on business and financial services, hospitality, general education, community services, health, nursing, carpentry, building and retail. The site currently includes TAFE buildings, car parking and vegetated open space areas. A dam is situated in the north eastern part of the site.

The MDC site is located immediately west of the existing TAFE site at 172 Showground Road, Castle Hill. A subdivision application (included within this SSD Application) will consolidate the site of the proposed Building J with the existing MDC site. The main public vehicle access to the MDC site is via Windsor Road. There is also a vehicular access point to the MDC on Showground Road. The MDC and TAFE have a longstanding arrangement that permits vehicle access to the MDC site from Green Road, allowing vehicles to traverse across the TAFE site to access the MDC site.

Development surrounding the site to the east, and north consists of established residential neighbourhoods generally comprising two storey detached dwellings. Opposite the site to the south east and south west are a mix of warehouses, industrial units, and large format bulky goods retail premises. Views into the TAFE and MDC site from the surrounding roads is obscured by dense trees and vegetation along the perimeter of the sites.

A public park and children's playground is adjacent to the north of the site that is bound by Sunderland Avenue to the east and Castlegate Place to the west. The dwellings along Sunderland Avenue and the southern side of Pentonville Parade are the nearest residential properties to the proposed Building J site.

6. Overview of Proposed Development

The successful delivery of this SSD project supports a priority cultural infrastructure project and is a NSW Government 2019 election commitment (Powerhouse Precinct at Parramatta). This application will deliver a significant cultural institution for Castle Hill and The Hills Shire.

The proposed Building J will offer many opportunities for public engagement as part of a desire to increase public access to the Powerhouse collection. The renewal of the site offers a range of opportunities to increase public access including visible storage facilities, booked tours, Open Days, public and education programs, workshops, talks and other events.

The facilities in Building J will serve the needs of a variety of user groups including staff, volunteers, education groups, researchers, artists, scientists, industry partners and the general public.

The SSD Application seeks consent for the delivery of the MDC expansion as a single stage, comprising:

- Site preparation works, including the termination/relocation and installation of site services and infrastructure, tree removal (337 trees in total), earthworks, and the erection of site protection hoardings and fencing.
- Demolition of existing car park and vehicle accessway along the eastern and north eastern parts of the site. A new at-grade car park is proposed to be constructed on the eastern side of the TAFE site and will accommodate 24 car parking spaces removed from the Building J site.
- Construction of the proposed new Building J. The proposed new Building J will cater for the following uses:
  - Storage for the Powerhouse collection and archives (both collected archives and institutional archives).
  - Flexibles spaces for education and public programs, workshops, talks, exhibitions and events.
  - Suites of conservation laboratories and collection work spaces.
  - Photography, digitisation and collection documentation facilities.
  - Work space for staff, researchers, industry partners and other collaborators. This will include amenities, meeting and storage rooms, collection research and study areas as well as other ancillary facilities.
  - Components of the image and research library.
  - Object and exhibition preparation, packing, quarantine and holding areas.
- Construction of new vehicle accessways to maintain connectivity to the MDC and TAFE sites.
- Subdivision of the proposed Building J site from the TAFE site including creation of right-of-carriageway easement to facilitate access over the new realigned accessway by TAFE vehicles and consolidation to form a single lot with the existing MDC site.

7. Arboricultural Impact Assessment

New gate with vehicle entrance

North West corner will require removal of Museum tree M *Melaleuca styphelioides* (Prickly Leaved Paperbark).

Loading dock driveway

May require removal of Museum trees, M1 *Eucalyptus cinerea* (Argyle Apple) and M2 *Eucalyptus microcorys* (Tallowwood).

Proposed Building J footprint

Stand A. *Melaleuca styphelioides* (Prickly Leaved Paperbark), 2 x *Melia azedarach* (White Cedar) and 1 x *Eucalyptus punctata* (Grey Gum) are located in the footprint.

The 27 x Melaleuca trees are remnants of a MAAS plantation established 50 years ago for oil production.

The White Cedar and Grey gum are semi mature trees possibly self-seeded in the stand.

The stand of trees is considered to have low to medium environmental significance.

Stand B consists of predominantly *Corymbia citriodora* (Lemon Scented Gum) interspersed with *Corymbia maculata* (Spotted Gum), also established by MAAS fifty years ago for oil production. The trees are located in the proposed Building J footprint.

The plantation grown trees have forest forms, are tall with narrow spreading crowns that are concentrated towards the top of the trees. As a group they provide site shelter and canopy cover to the area but as individuals are prone to failure because of their form and structure.

Stand B trees being a dedicated plantation do not have a shrub and near -continuous ground cover layer characteristic of CPW. The trees are planted (from stock sources unknown) not remnant tree species.

Proposed Building J footprint and associated Access Landscaping Works

Trees 227 – 305 are lower car park trees *Eucalyptus* sp. (Gum), *Melaleuca styphelioides* (Prickly Leaved Paperbark), *Syncarpia glomulifera* (Turpentine) and Tree 308 *Corymbia citriodora* (Lemon Scented Gum). They are impacted by the Workshop Loading Bay and building footprint or have major encroachment into their TPZs.

Given that the location and distribution of the trees' root systems will be limited by the car park constraints any impact on their TPZs in this location is considered intolerable.

Museum driveway trees M3, M4, M5 and M6 *Eucalyptus sideroxylon* (Mugga Mugga Ironbark) are located on the south western boundary overhanging the site. They will be adversely impacted by the building (plant serving rooms) and associated infrastructure.

The trees are planted natives that will need to be replaced as part of the tree replacement strategy prepared by WSP.

Proposed Carpark

Stand C comprises a plantation of predominantly *Corymbia citriodora* (Lemon Scented Gum) interspersed with *Corymbia maculata* (Spotted Gum) established in the 1940s. They are planted in a grid formation, for oil harvesting purposes. The stand borders an internal driveway between the entry and exit driveways on Green Road.

The trees have poor to average condition, many have succumbed to termite damage and the majority show suppressed form.

40 (live) trees require removal to facilitate new on site car parking to replace 22 removed car spaces. This will impact on up to 40% of the stand of trees, leaving the Green Road frontage trees intact.

8. Conclusions and Recommendations

The report supports a State Significant Development (SSD) Application for the proposed construction and use of a new building to facilitate the expansion of the Museums Discovery Centre (MDC) site at 2 Green Road, Castle Hill.

The primary objective of the SSD Application is to provide expanded facilities to accommodate the Powerhouse collection including spaces for storage, conservation, research and display and spaces to facilitate increased public access to the collection through education, public programs, workshops, talks, exhibitions and events.

The proposed development will involve the clearing of the site vegetation including removal of 337 native trees (species confirmed as predominantly *Corymbia citriodora* (Lemon Scented Gum)).

Of the total trees proposed to be removed 330 are plantation trees. The trees were established by MAAS fifty years ago for oil production.

The plantation grown trees have forest forms, with tall, narrow spreading crowns that are concentrated towards the top of the trees. As a group they provide site shelter and canopy cover to the area but as individuals are prone to failure because of their form and compromised structure.

The trees are planted (from stock sources unknown) not remnant native species.

To mitigate the proposed tree removal, a Tree Replacement Strategy is provided as part of the proposal identifying;

- the ecological values of replacement plantings,
- appropriate planting sites within the Museum Discovery Centre, TAFE and on Council land
- plant species and size
- plant establishment and a five year maintenance regime.

The canopy cover lost to the proposal will, in time, be restored with better performing, more vigorous and varied plantings. A mix of indigenous and native replenishment species will achieve greater, long term biodiversity outcomes than the existing plantation monocultures.

TAFE site trees that are not impacted by the proposal will be protected through all stages of construction, from demolition to final landscaping works.

The Tree Management Plan in this report (refer to Appendices 5, 6, 7 pages 19-23) identifies trees within proximity of the proposal that may be impacted by construction works. Tree protection measures to ensure their safe retention are provided.

Cheryl MacKay

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Qualified Tree Risk Assessor (TRAQ 2016, QTRA 2018, VALID 2018)

Appendix 1	Tree Survey Museum Discovery Centre Expansion								
Tree No.	Genus/species Common Name	Height Spread	D.B.H. mm	Age	Crown Form Condition	Vigour	STARS Sign.	Retention Value	Observations/ Condition of Trees
1	*Eucalyptus punctata* Grey Gum	24 18	500 580 at 1 m.	M	Dominant Symmetrical	Normal	Med	Med	Borer damage, hollow into base of trunk, codominant limbs with compression fork at 1 m. Branch wound at 3 m. Not suitable as stand-alone tree.
2	*Eucalyptus punctata* Grey Gum	11 7	380	M	Intermediate Asymmetrical	Normal	Med	Low	Exposed heartwood, poor occlusion at base, trunk wound 2 sides lower trunk. Inferior to more dominant tree.
3	*Melaleuca styphelioides* Prickly Leaved Paperbark	10 4	220 280 at base	M	Co dominant Asymmetrical	Normal	Med	Med	Group of 4 trees lining northern TAFE boundary, end of car park and a discontinued entry. Multi trunked trees provide screening amenity. Average health and condition.
4	*Melaleuca styphelioides* Prickly Leaved Paperbark	10 3	220 280 at base	M	Co dominant Asymmetrical	Normal	Med	Med	
5	*Melaleuca styphelioides* Prickly Leaved Paperbark	12 5	200 350 at base	M	Co dominant Asymmetrical	Normal	Med	Med	
6	*Melaleuca styphelioides* Prickly Leaved Paperbark	10 6	350 450 at base	M	Co dominant Asymmetrical	Normal	Med	Med	
7	*Eucalyptus elata* River Peppermint	21 14	410	M	Dominant Symmetrical	Normal	High	High	Tree with significant size, showing good overall condition. Holding medium volume small size deadwood
M	*Melaleuca styphelioides* Prickly Leaved Paperbark	11 8	300 300 at 1.2 m.	M	Co dominant Symmetrical	Normal	Med	Med	Tree with average condition located end of Museum Driveway on car park Boundary.
8	*Melaleuca styphelioides* Prickly Leaved Paperbark	9 6	300	M	Co dominant Asymmetrical	Normal	Med	Med	Group of 4 trees lining western TAFE boundary, end of car park. Multi trunked trees provide screening amenity. Average health and condition.
9	*Melaleuca styphelioides* Prickly Leaved Paperbark	11 7	380	M	Co dominant Asymmetrical	Normal	Med	Med	
10	*Melaleuca styphelioides* Prickly Leaved Paperbark	10 7	Multi base	M	Co dominant Asymmetrical	Normal	Med	Med	
M1	*Eucalyptus cinerea* Argyle Apple	8 7	450	OM	Suppressed Asymmetrical	Low	Med	Low	Tree with poor form and declining vigour. Museum tree located on Museum Driveway overhanging TAFE car park.
M2	*Eucalyptus microcorys* Tallowwood	12 13	450	M	Dominant Symmetrical	Normal	High	High	Large tree with good condition, located on edge of Museum driveway, overhanging TAFE car park.
11	*Grevillea robusta* Silky Oak	12 7	310	M	Dominant Symmetrical	Normal	High	High	TAFE tree in garden bed southern end of car park. Significant tree showing good overall condition.

Tree No	Genus/species Common Name	Height Spread	D.B.H. mm	Age	Crown Form Condition	Vigour	STARS Sign.	Retention Value	Observations/ Condition of Trees
T1	*Eucalyptus spp.* Gum	13 14	380	M	Dominant Symmetrical	Normal	High	High	Tall tree within TAFE garden bed, spreading canopy with good form and condition
Stand A 12 - 38	*Melaleuca styphelioides* Prickly Leaved Tea tree	5 – 8 X 4 - 7	100 - 150	M	Co dominant – Suppressed Asymmetrical	Normal	Med	Med	Group of 27 plantation trees. Average condition, shrub like form. Established as a small oil harvesting plantation by MAAS approximately 50 years ago.
Stand A 39	*Melia azedarach* White Cedar	6 6	175	M	Co dominant Symmetrical	Normal	Med	Med	Planted or self-sown small native tree. Good condition
Stand A 40	*Melia azedarach* White Cedar	5 6	180	M	Co dominant Symmetrical	Normal	Med	Med	Planted or self-sown small native tree. Good condition
Stand A 41	*Eucalyptus punctata* Grey Gum	16 9	300	M	Dominant Symmetrical	Normal	High	High	Tall tree possibly seeded from site trees. Good form and condition, near centre of Melaleuca plantation. Active borer infestation.
Stand B 42 - 269	*Corymbia citriodora* Lemon Scented Gum *Corymbia maculata* Spotted Gum	18 - 22 X 6 - 9	150 - 350	M	Co dominant – Suppressed Asymmetrical	Normal	Med	Med - Low	Group of 227 trees 85% Corymbia citriodora, established as a small oil harvesting plantation by MAAS approximately 50 years ago. Trees have forest form canopies and average to good condition.
270	*Eucalyptus elata* River Peppermint	16 9	310	M	Co dominant Asymmetrical	Normal	Med	Med	Edge tree at car park entrance to Discovery Centre site. Good condition
271	*Eucalyptus obliqua* Messmate Stringybark	12 7	250	M	Supressed Asymmetrical	Normal	Low	Low	Suppressed, leaning tree, low retention value.
272	*Corymbia citriodora* Lemon Scented Gum	18 14	300	M	Co dominant Asymmetrical	Normal	Med	Med	Edge tree at car park entrance to Discovery Centre site. Good condition
273	*Corymbia citriodora* Lemon Scented Gum	11 7	280	M	Intermediate Asymmetrical	Normal	Med	Low	Intermediate/suppressed tree with reduced form and condition.
274	*Eucalyptus obliqua* Messmate Stringybark	8 8	200 280 300 from base	M	Intermediate Symmetrical	Normal	Low	Low	Small open canopies tree. Active termite nest at base. 1 of 4 leaders failed from the base, 2nd leader damaged at base. Low retention value regardless of pest treatment.
M3 M4 M5 M6	*Eucalyptus sideroxylon* Mugga Mugga Iron Bark	8 – 9 X 7 - 8	300 - 350	M	Co dominant Asymmetrical	Normal	Med	Med	Trees bordering the Museum Driveway. Average health and condition. Sparse canopies, resilient species.
275	*Eucalyptus resinifera* Red Mahogany	12 9	250 280 at base	M	Intermediate Asymmetrical	Normal	Med	Med	Tall tree, no obvious defects, Suspect previous termite nesting at base.

Tree No.	Genus/species Common Name	Height Spread	D.B.H. mm	Age	Crown Form Condition	Vigour	STARS Sign.	Retention Value	Observations/ Condition of Trees
276	*Eucalyptus resinifera* Red Mahogany	16 10	220 300 at base	M	Intermediate Asymmetrical	Normal	Med	Med	Tall tree, no obvious defects, Suspect previous termite nesting at base.
277	*Eucalyptus resinifera* Red Mahogany	16 9	300	M	Intermediate Asymmetrical	Normal	Med	Med	Tall tree, no obvious defects, termite nesting damage at base.
278	*Eucalyptus resinifera* Red Mahogany	16 9	320	M	Intermediate Asymmetrical	Normal	Med	Med	Tall tree, no obvious defects, Suspect previous termite nesting at base.
279	*Eucalyptus resinifera* Red Mahogany	18 9	350	M	Intermediate Asymmetrical	Normal	Med	Med	Tall tree, no obvious defects, Suspect previous termite nesting at base.
280	*Eucalyptus resinifera* Red Mahogany	18 10	300 300 from base	M	Intermediate Asymmetrical	Normal	Med	Med	Tall tree, co dominant from 1.1 m.
281	*Eucalyptus elata* River Peppermint	15 9	350	M	Intermediate Asymmetrical	Normal	Med	Med	Tall tree, wound at base of trunk.
282	*Corymbia citriodora* Lemon Scented Gum	9 8	200	M	Supressed Asymmetrical	Normal	Med	Low	Poor form, suppressed canopy.
283	*Corymbia citriodora* Lemon Scented Gum	12 8	280	M	Supressed Asymmetrical	Normal	Med	Low	Small tree inferior to neighbours.
284	*Corymbia citriodora* Lemon Scented Gum	14 9	300	M	Co dominant Asymmetrical	Normal	Med	Med	Edge tree closest to street. One sided canopy.
285	*Grevillea robusta* Silky Oak	12 7	350	M	Dominant Symmetrical	Normal	Med	High	Tree on bank. Average condition.
286	*Angophora floribunda* Rough Barked Apple	14 7	380	M	Dominant Symmetrical	Normal	Med	Med	Tree on bank. Trunk cavity at 3. 5 m. suppressed, poor form for species type.
287	*Melaleuca styphelioides* Prickly Leaved Paperbark	6 5	multi	M	Intermediate Asymmetrical	Normal	Low	Low	Small shrub like tree.
288	*Eucalyptus bosistoana* *Coast* Grey Box	10 7	200	Y	Forest Symmetrical	Normal	Med	Med	Sapling, tall narrow form.
289	*Eucalyptus bosistoana* *Coast* Grey Box	10 7	210	Y	Forest Symmetrical	Normal	Med	Med	Sapling, tall narrow form.
290	*Eucalyptus bosistoana* *Coast* Grey Box	10 8	200	Y	Forest Symmetrical	Normal	Med	Med	Sapling, tall narrow form.

Tree No.	Genus/species Common Name	Height Spread	D.B.H. mm	Age	Crown Form Condition	Vigour	STARS Sign.	Retention Value	Observations/ Condition of Trees
291	*Melaleuca styphelioides* Prickly Leaved Paperbark	6 7	multi	M	Intermediate Asymmetrical	Normal	Low	Low	Small shrub like tree.
292	*Eucalyptus bosistoana Coast* Grey Box	10 8	200	Y	Forest Symmetrical	Normal	Med	Med	Sapling, tall narrow form.
293	*Eucalyptus tereticornis* Forest Red Gum	16 9	340	M	Co dominant Symmetrical	Normal	Med	Med	Emergent growth, average condition. Retainable as part of a group.
294	*Melaleuca styphelioides* Prickly Leaved Paperbark	6 7	100 180	M	Intermediate Asymmetrical	Normal	Low	Low	Small shrub like tree.
295	*Melaleuca styphelioides* Prickly Leaved Paperbark	6 7	multi	M	Intermediate Asymmetrical	Normal	Low	Low	Small shrub like tree.
296	*Melaleuca styphelioides* Prickly Leaved Paperbark	6 7	150 150	M	Intermediate Asymmetrical	Normal	Low	Low	Small shrub like tree.
297	*Eucalyptus tereticornis* Forest Red Gum	13 7	240	M	Co dominant Symmetrical	Normal	Med	Med	Emergent growth, average condition. Retainable as part of a group.
298	*Eucalyptus tereticornis* Forest Red Gum	17 9	380	M	Co dominant Symmetrical	Normal	Med	Med	Emergent growth, average condition. Retainable as part of a group.
299	*Melaleuca styphelioides* Prickly Leaved Paperbark	6 5	200	M	Intermediate Asymmetrical	Normal	Low	Low	Small shrub like tree.
300	*Melaleuca styphelioides* Prickly Leaved Paperbark	7 7	300	M	Intermediate Asymmetrical	Normal	Low	Low	Small shrub like tree.
301	*Eucalyptus bosistoana Coast* Grey Box	11 9	310	M	Co dominant Symmetrical	Normal	Med	Med	Co dominant failure at 2 m. wound into trunk. Poor form and structurally compromised.
302	*Corymbia citriodora* Lemon Scented Gum	10 7	200	M	Co dominant Symmetrical	Normal	Med	Med	Suppressed, small size crown.
303	*Eucalyptus bosistoana Coast* Grey Box	8 7	200	Y	Forest Symmetrical	Normal	Med	Med	Sapling, tall narrow form.
304	*Eucalyptus bosistoana Coast* Grey Box	8 7	200	Y	Forest Symmetrical	Normal	Med	Med	Sapling, tall narrow form.
305	*Syncarpia glomulifera* Turpentine	6 5	200	M	Co dominant Symmetrical	Normal	Med	Med	Codominant leaders at 1 m. & 1.3 m. Good specimen, developing tree.

Tree No.	Genus/species Common Name	Height Spread	D.B.H. mm	Age	Crown Form Condition	Vigour	STARS Sign.	Retention Value	Observations/ Condition of Trees
306	*Corymbia maculata* Spotted Gum	8 5	150	M	Dominant Symmetrical	Normal	Med	Med	Tall straight, developing tree.
307	*Corymbia maculata* Spotted Gum	8 5	150 175	M	Dominant Symmetrical	Normal	Med	Med	Tall straight, developing tree.
308	*Corymbia maculata* Spotted Gum	9 5	150	M	Dominant Symmetrical	Normal	Med	Med	Tall straight, developing tree.
309	*Corymbia maculata* Spotted Gum	8 3	180	M	Dominant Symmetrical	Normal	Med	Med	Tall straight, developing tree.
310	*Corymbia maculata* Spotted Gum	9 3	100	M	Dominant Symmetrical	Normal	Med	Med	Tall straight, developing tree.
311	*Corymbia maculata* Spotted Gum	8 3	100	M	Dominant Symmetrical	Normal	Med	Med	Tall straight, developing tree.
312	*Eucalyptus bosistoana* Coast Grey Box	9 7	310	M	Co dominant Symmetrical	Normal	Med	Med	Damaged leader at 3 m. reduced form and structural stability.
Stand C 312 - 352	*Corymbia citriodora* Lemon Scented Gum	10 – 18 av. 5 – 9 av.	100 – 350 av.	M - Sen	Co dominant Suppressed Asymmetrical	Low - Normal	Med	Low - Med	Forest form trees with small, sparse canopies at top of trees, on narrow trunks. Some dead, suppressed or showing poor structure. Some trees sprouted from stumps. Edge trees showing better form and size.

Appendix 2

References

1. A Visual Tree Assessment (VTA) is a systematic method of identifying tree characteristics and hazard potential recognised by The International Society of Arboriculture. Journal of Arboriculture, Vol. 22, No. 6, November 1996.

2. Standards Australia (2009), *AS 4970 Protection of trees on development sites*

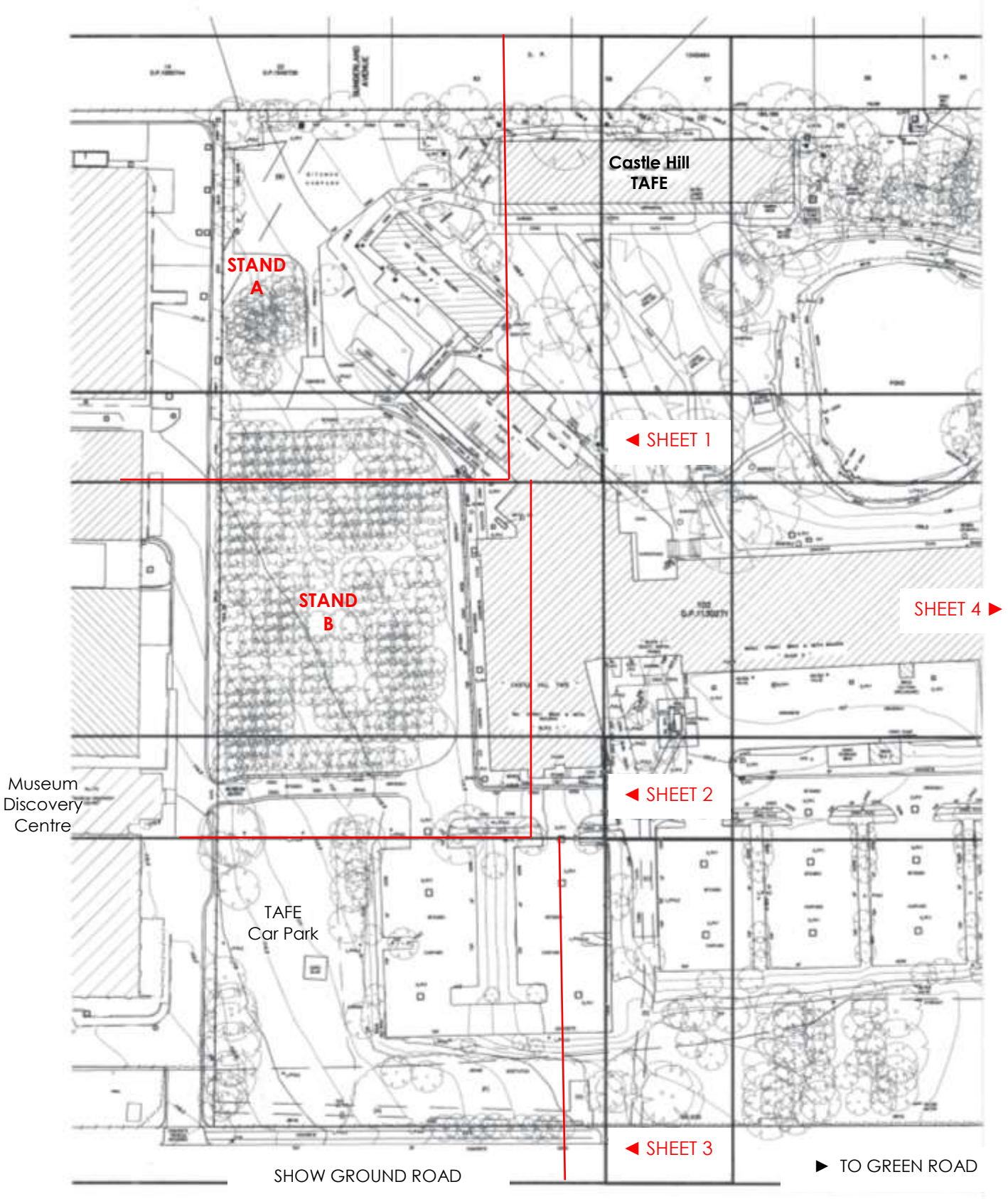
3. Standards Australia (2007), AS-4373 *Pruning of Amenity Trees*

4. Standards Australia (2018) AS-2303 *Tree Stock for Landscape Use*

Appendix 3

Site Plan Indicating Tree Locations

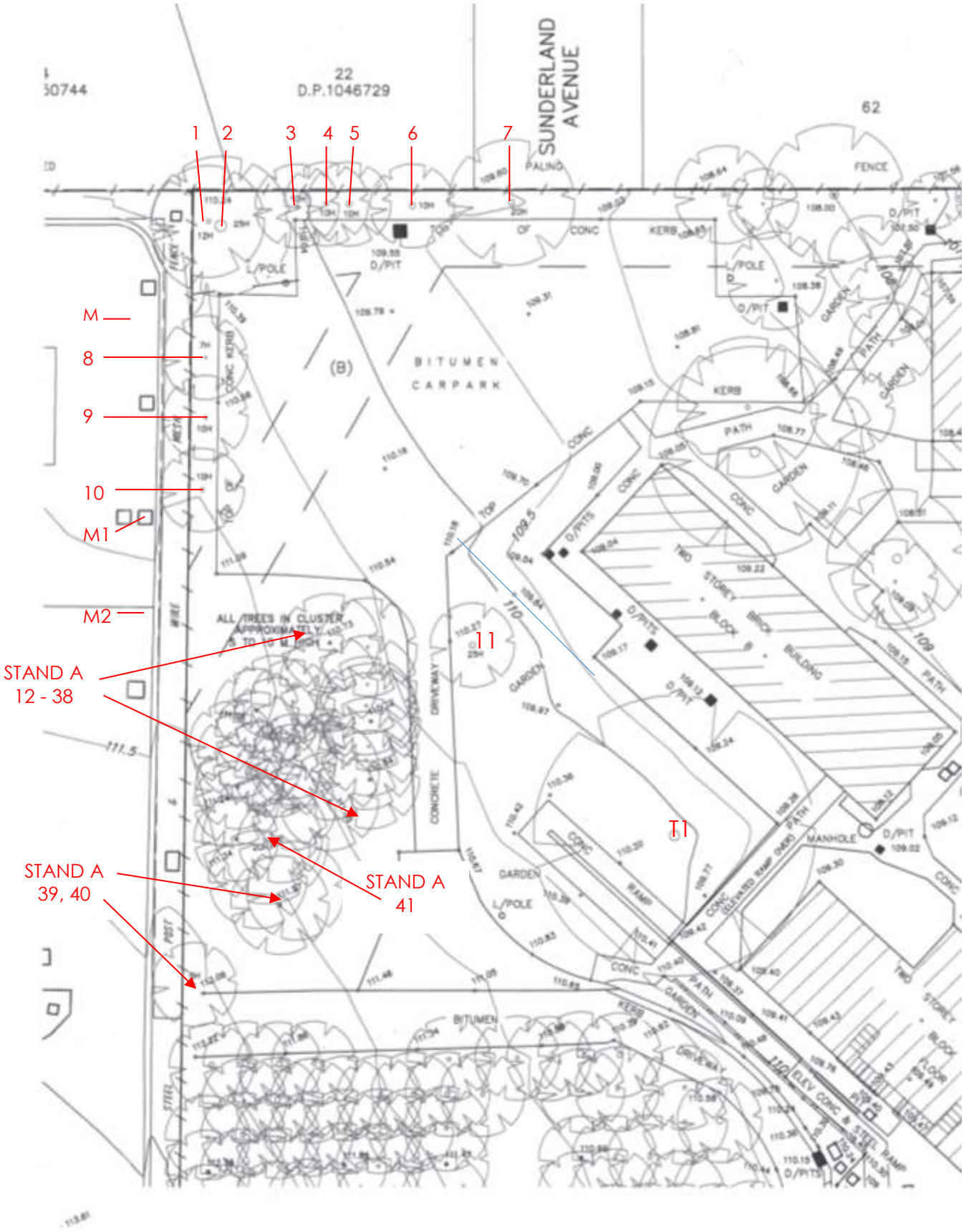
SHEET PLAN



Site Plan Indicating Tree Locations

Canopies are Indicative only.

SHEET 1



Site Plan Indicating Tree Locations

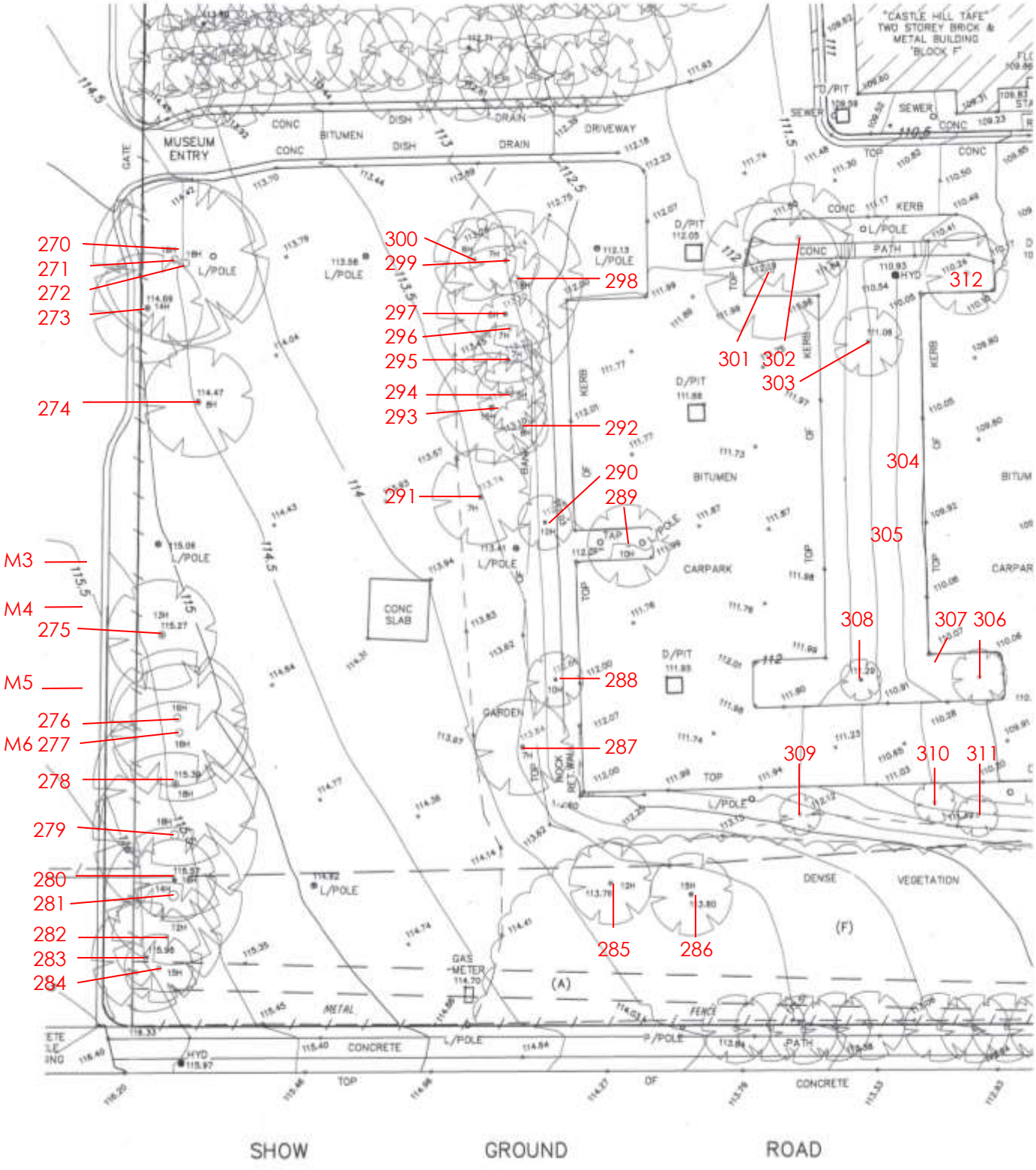
Canopies are Indicative only

SHEET 2

Site Plan Indicating Tree Locations

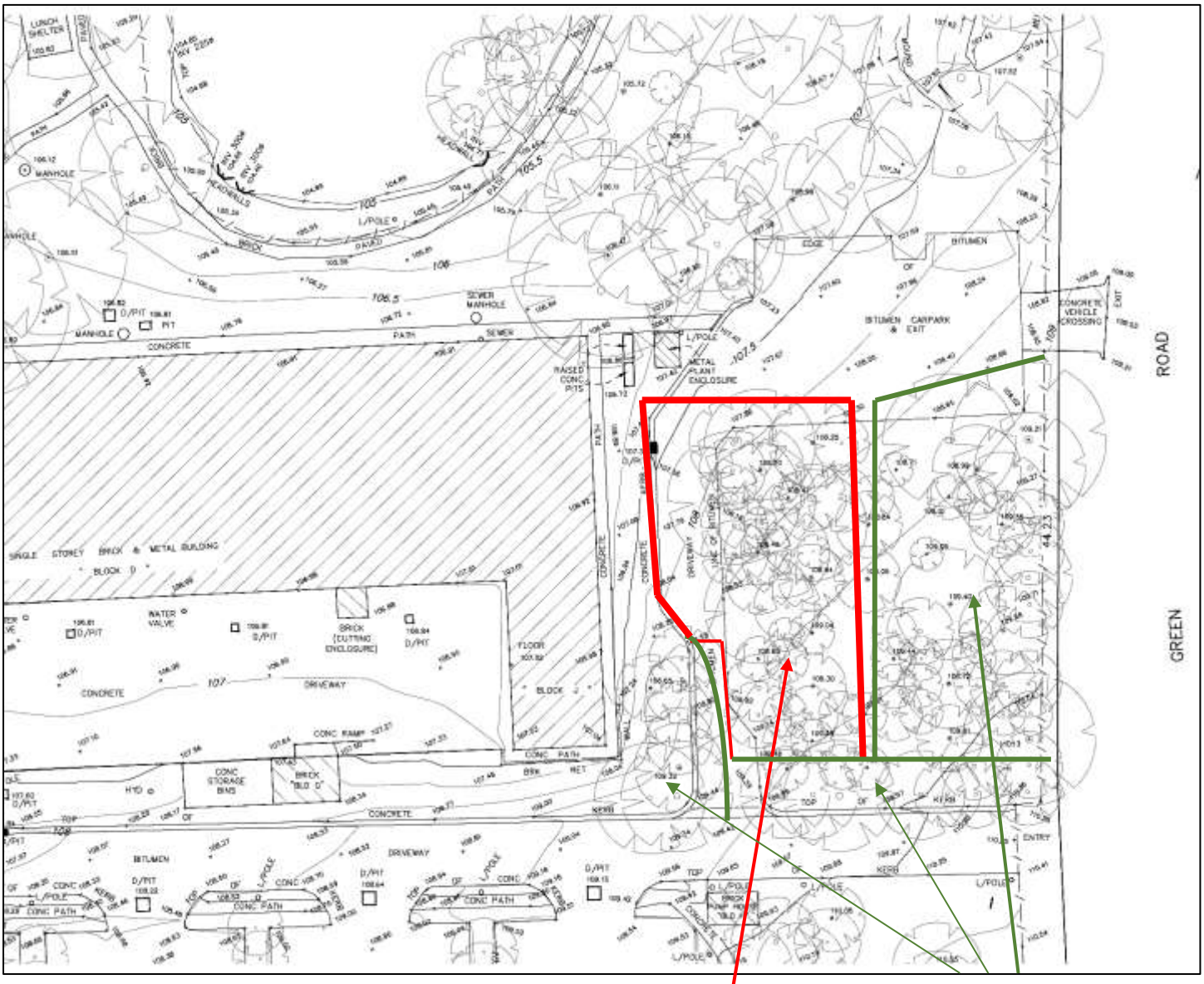
Canopies are Indicative only

SHEET 3



Site Plan Indicating Tree Locations

SHEET 4



Appendix 4

Tree Management Plan

4.1 Trees to be Retained and Protected

The identification of trees as priorities for retention is based upon a number of factors including; species, dimensions, health, maturity and landscape significance.

The following trees are considered to have high to medium environmental and/or landscape significance and can be safely retained as part of the proposal.

Tree No	Scientific Common Name	D.B.H. mm	TPZ radius	SRZ radius	Development Impact Tree Protection Recommendations
1	*Eucalyptus punctata* Grey Gum	500 580	9.2 m.	3.1 m.	Trees lining bitumen car park, northern boundary. Not impacted by the proposal. Area beneath the trees including car parking spaces to be fenced off to create a TPZ, NO GO ZONE. Temporary fencing to isolate trees from works.
2	*Eucalyptus punctata* Grey Gum	380	4.6 m.	2.3 m.	
3 - 6	*Melaleuca styphelioides* (Prickly Leaved Paperbark)	360 av.	4.3 m. av.	2.3 m. av.	
7	*Eucalyptus elata* River Peppermint	410	4.9 m.	2.4 m.	
8 - 10	*Melaleuca styphelioides* (Prickly Leaved Paperbark)	300 av.	3.6 m. av.	4.1 m. av.	Trees lining bitumen car park, north western boundary. Temporary fencing to isolate trees from works and vehicle movement.
11	*Grevillea robusta* Silky Oak	310	3.7 m.	2.2 m.	Fence off tree on edge of garden bed to protect from road widening construction works. One side of TPZ impacted only.
T1	*Eucalyptus sp.* Gum	380	4.6 m.	2.3 m.	Fence off TAFE tree in garden bed to protect from road widening construction works. One side of TPZ impacted only.
306, 307 310, 311 312	*Corymbia maculata* Spotted Gum *Eucalyptus bosistoana* Coast Grey Box	150 av. 310	1.8 m. av. 3.7 m.	1.7 m. av. 2.2 m.	Driveway trees. Trunk protection or fence off car park garden beds.
Part of Stand C	*Corymbia citriodora* Lemon Scented Gum *Corymbia maculata* Spotted Gum	200 av.	3 m. av.	2 m. av.	Stand of native trees between entry & exit driveways on Green Road. Fence off trees to be retained.

4.2 Appointment of Project Arborist

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

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

4.3 Compliance

Contractors and site workers shall receive a copy of these specifications a minimum of 3 working days prior to commencing work on- site.

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

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

4.4 Tree & Vegetation Removal

The trees to be removed shall be removed prior to the establishment of the tree protection measures. Tree removal works shall be undertaken in accordance with the Safe Work Australia Guide for Managing Risks of Tree Trimming and Removal Work (2016).

Tree and vegetation removal shall not damage the trees to be retained.

4.5 Tree Protective Fencing

The trees' TPZs are to be fenced off to prevent any activities, storage or the disposal of materials within the fenced areas.

The fences shall be maintained intact until the completion of all demolition/building work.

A minimum 1.8m high barrier (chain wire mesh panels, plywood or wooden paling fence panels) shall be erected around the perimeters of the TPZs.

Shade cloth or similar should be attached to reduce the transport of dust, other particulate matter and liquids into the protected area. The barrier shall be constructed so as to prevent pedestrian and vehicular entry into the protection zone.

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

4.6 Site Management

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

4.7 Scaffolding

Where possible, scaffolding shall not be located within the TPZ. Scaffolding shall not be in contact with the tree. As necessary, this shall be achieved by erecting scaffolding around branches. Branches shall be tied back and protected as deemed necessary by the Project Arborist. Refer to Typical Tree Protection Details (Appendix 5, page 22).

4.8 Works within the Tree Protection Zones

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

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

4.9 Ground Protection

Where deemed necessary by the Project Arborist, machinery movements shall be restricted to areas of existing pavement or from areas of temporary ground protection such as ground mats or steel road plates. Refer to Typical Tree Protection Details (3) (Appendix 6).

4.10 Trunk Protection

Trunk protection shall be installed as deemed necessary by the Project Arborist. Trunk protection shall be installed by wrapping padding (either carpet underlay or 10mm thick jute geotextile mat) around the trunk and first order branches to a minimum height of 2m. Timber battens (90 x 45mm) spaced at 150mm centres shall be strapped together and placed over the padding. Timber battens must not be fixed to the trees.

Branch protection shall be installed as deemed necessary by the Project Arborist.

4.11 Structure & Pavement Demolition

Demolition of existing structures/pavement within the TPZ shall be supervised by the Project Arborist. Machinery is to be excluded from the TPZ unless operating from the existing slabs, pavements or areas of ground protection (refer to Section 1.8). Machinery should not contact the tree's roots, trunk, branches and crown.

The existing pavement shall be carefully lifted to minimise damage to the existing sub-base and to prevent damage to tree roots. Wherever possible, the existing sub-base material shall remain in-situ. Machinery shall work backwards out of the TPZ to ensure machinery remains on un-demolished sections of pavement at all times.

Structures below grade shall be retained to minimise disturbance to the tree's roots. Where this is not possible structures shall be shattered prior to removal with a hand-operated pneumatic/electric breaker. Where the Project Arborist determines that the tree is using underground elements (i.e. footings, pipes, rocks etc.) for support, these structures shall be left in-situ.

If roots (>25mmø) are encountered during the demolition works, these roots must be retained in an undamaged condition and advice sought from the Project Arborist. Exposed roots shall be protected from direct sunlight, drying out and extremes of temperature by covering with a 10mm thick jute geotextile fabric. The geotextile fabric shall be kept in a damp condition at all times.

4.12 Underground Services

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

The installation of underground services shall be located outside of the TPZ. Where this is not possible, they shall be installed using tree sensitive excavation methods (hand/hydrovac/airspade) with the services installed around/below roots (>25mmø, or as determined by the Project Arborist). Excavation using compact machinery (<3.5t) fitted with a flat bladed bucket is permissible where approved by the Project Arborist. Excavation using compact machinery should be undertaken in small increments, guided by a spotter who is to look for and prevent damage to roots (>25mmø).

Alternatively, boring methods may be used for underground service installation where the obvert level (highest interior level of pipe) is greater than 1000mm below existing grade. Excavations for starting and receiving pits for boring equipment should be located outside of the TPZ areas or located to avoid roots (>25mmø) as deemed necessary by the Project Arborist. OSD tanks (where required) should be located outside of the TPZ areas

4.13 Excavations, Root Protection & Root Pruning

Exposed roots shall be protected from direct sunlight, drying out and extremes of temperature by covering with a 10mm thick jute mat, followed by a layer of plastic membrane. Coverings shall be weighted to secure them in place. The mat shall be kept in a damp condition at all times.

No over-excavation, battering or benching shall be undertaken beyond the footprint of any structure unless approved by the Project Arborist. Tree sensitive excavation and root pruning shall be undertaken along the excavation line prior to the commencement of mechanical excavation to prevent tearing and shattering damage to the roots from excavation equipment.

Roots (>25mmø) shall be pruned by the Project Arborist only. Roots (<25mmø) may be pruned by the Principal Contractor. Root pruning shall be undertaken with clean, sharp secateurs or a pruning saw to ensure a smooth wound face, free from tears. Damaged roots shall be pruned behind the damaged tissues with the final cut made to an undamaged part of the root.

Appendix 5

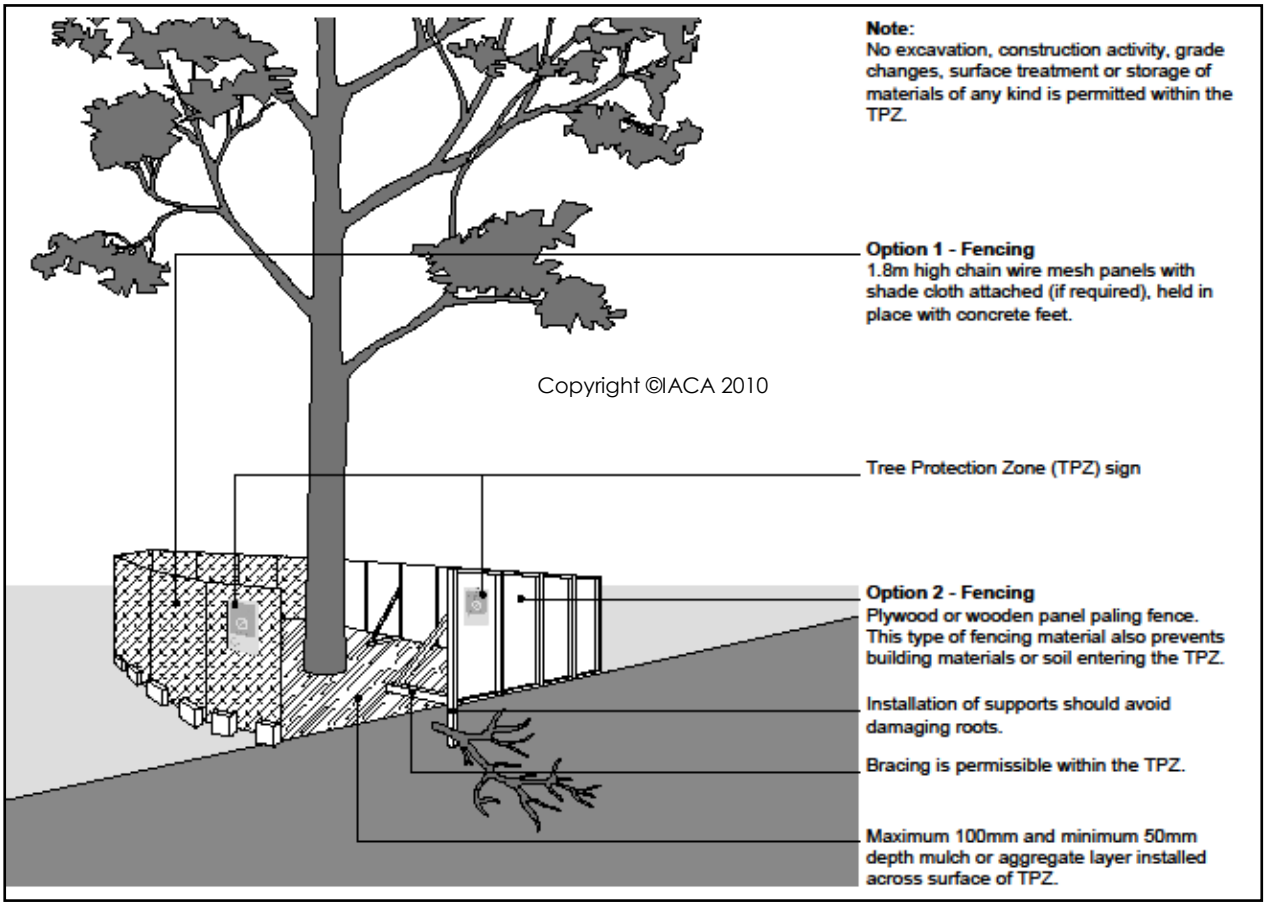
Arborist Construction Hold Points, Inspection and Certification

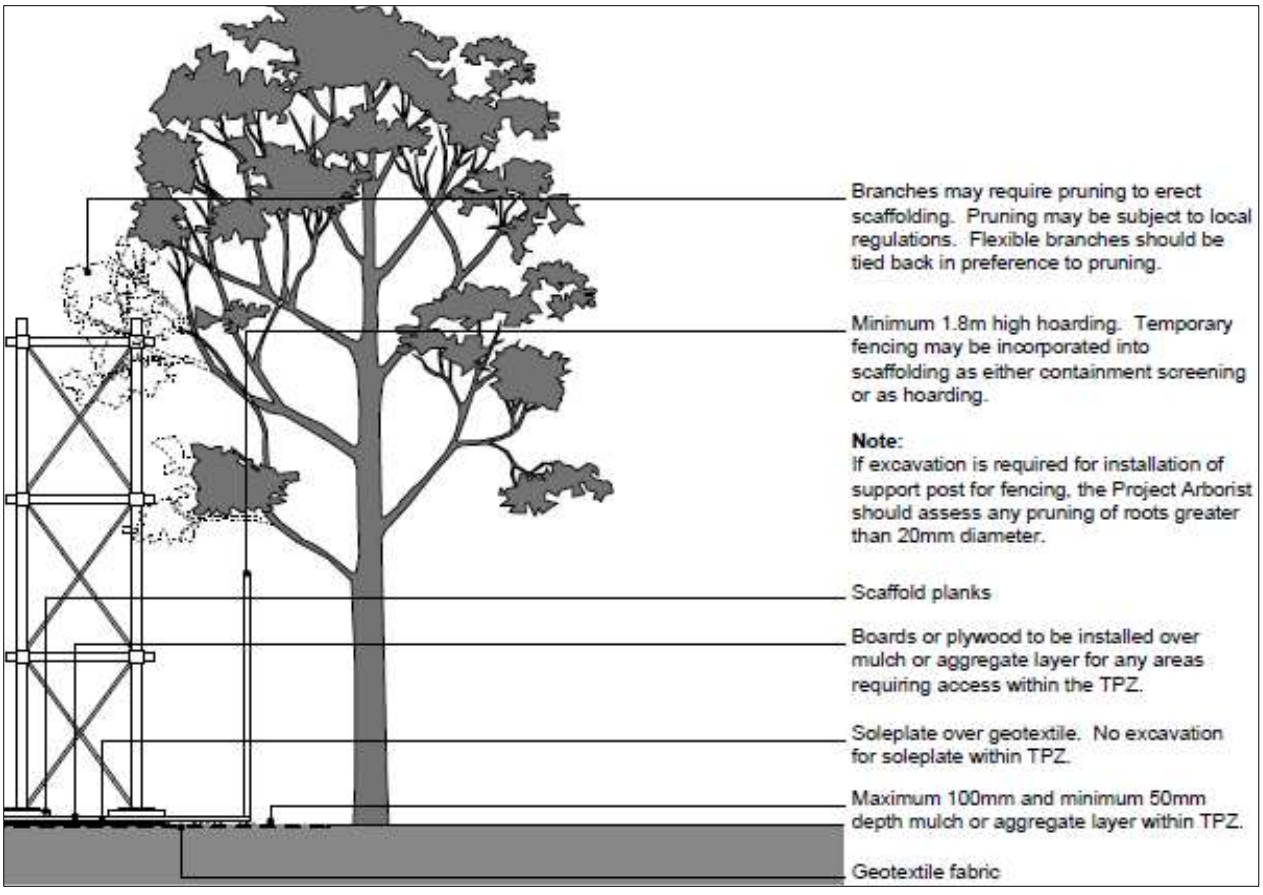
The following pre-determined construction stages are witness points and will require the attendance of a Level 5 Arborist to document the works and certify that the inspection has taken place and that all works are completed in accordance with this Tree Protection Plan and AS 4970 - 2009 Protection of Trees on Development Sites.

Witness Points for Site Arborist Inspection and Certification				
Hold Point	Task	Responsibility	Certification	Inspection Timing
1	Appoint a Project Arborist	Principal Contractor	Project Arborist	Prior to issue of a Construction Certificate
2	Following Installation of Protective Fencing	Principal Contractor	Project Arborist	Prior to site establishment
3	Witnessing pruning of any branches or roots greater than 40 mm in diameter	Principal Contractor	Project Arborist	During Construction, ground works or at any time during construction.
4	At any time fencing is required to be removed or altered	Principal Contractor	Project Arborist	At any time during construction.

Appendix 6

Typical Tree Protection Details – Tree Fencing and Scaffolding within a Tree Protection Zone





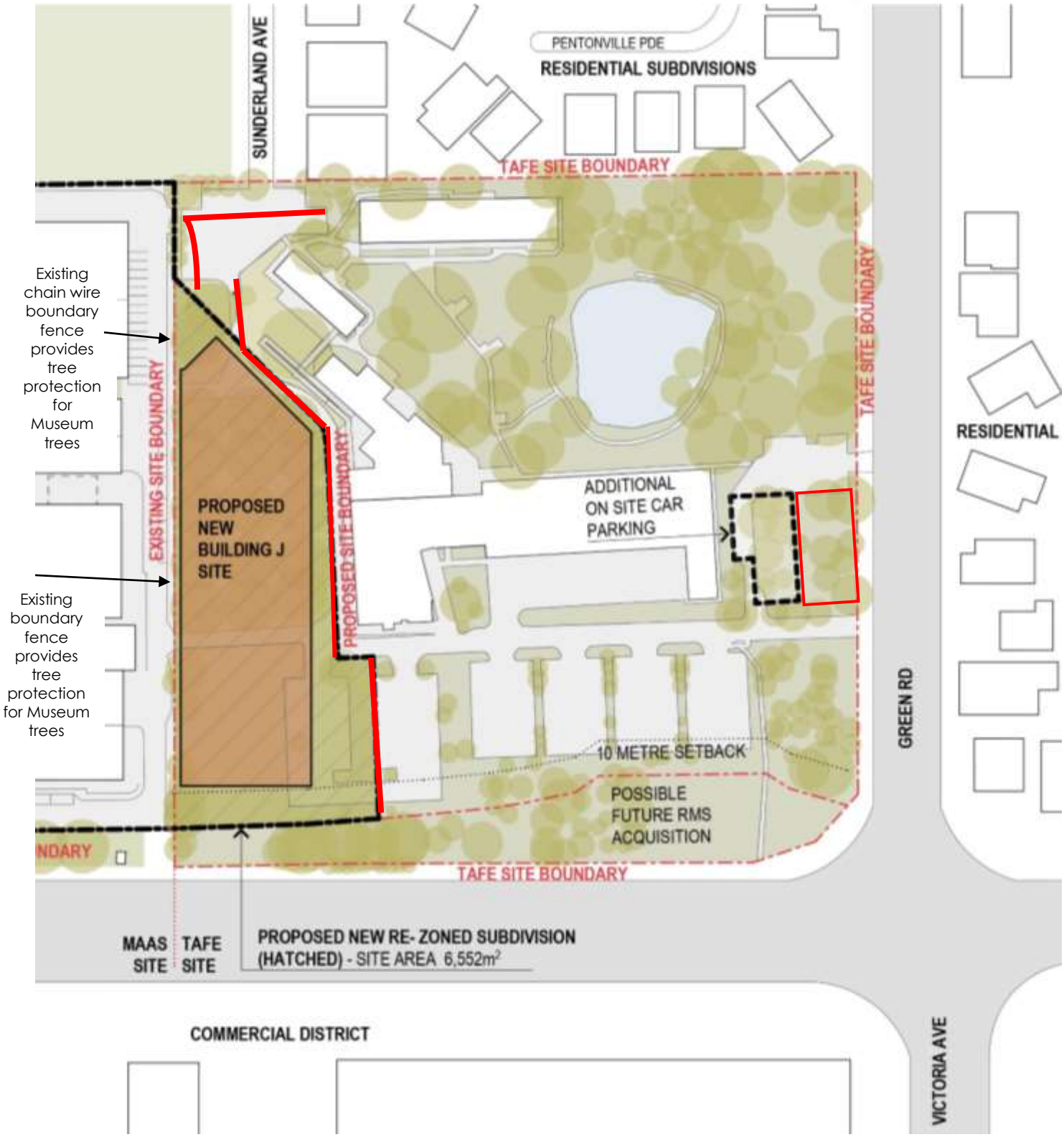
Appendix 7

Tree Protection Plan

Museum Discover Centre Expansion

Existing site Layout plan. Source: Lahznimmo Architects

Indicative Tree Protection – Fenced Off No Go Zones



Appendix 8

Tree Protection Zone Calculations - Tree to be Retained

Diameter (Ø) at Breast Height (D.B.H.) was measured 1.4 metres (m.) above ground (unless indicated otherwise).

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

Diameter at Root Base (DRB) is estimated at 10% greater than DBH.

TREE NO	Ø 1	Ø 2	DBH (cm)	DRB (cm)	TPZ radius (m)	TPZ area (m^2)	SRZ radius (m)
1	50	58	77	85	9.2	268	3.1
2	38		38	42	4.6	65	2.3
3	22	28	36	40	4.3	59	2.3
4	22	28	36	40	4.3	59	2.3
5	20	35	41	45	4.9	76	2.4
6	35	45	58	65	7.0	152	2.8
7	41		41	45	4.9	76	2.4
8	30		30	33	3.6	41	2.1
9	30		30	33	3.6	41	2.1
10	32		32	36	3.8	46	2.2
11	31		31	35	3.7	43	2.2
T1	38		38	42	4.6	65	2.3
306 307 310 311	15		15	20	1.8	10	1.7
312	31		31	35	3.7	43	2.2

Appendix 9

Tree Protection Zone (TPZ)

The tree protection zone (TPZ) is the principal means of protecting trees on development sites. The TPZ is a combination of the root area and crown area requiring protection. It is an area isolated from construction disturbance, so that the tree remains viable.

Determining the TPZ

The radius of the TPZ is calculated for each tree by multiplying its D.B.H. x 12.
TPZ = D.B.H. x 12 where D.B.H. = trunk diameter measured at 1.4 m above ground from the centre of the trunk.

Structural Root Zone (SRZ)

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

Determining the SRZ

SRZ radius = $(D \times 50)^{0.42} \times 0.64$ where D = trunk diameter, in metres, measured above the root buttress.

Note: The SRZ for trees with trunk diameters less than 0.15 m will be 1.5 m.

Appendix 10

General Tree Protection Measures

Tree Protection Fencing

The Protective fencing where required may delineate the TPZ and should be located as determined by the project or council arborist.
Fencing should be erected before any machinery or materials are brought onto the site and before the commencement of works including demolition.
Once erected, protective fencing must not be removed or altered without approval by the project or council arborist.
The TPZ must be secured to restrict access.

AS 4687 Temporary fencing and hoardings specifies applicable fencing requirements.
Shade cloth or similar should be attached to reduce the transport of dust, other particulate matter and liquids into the protected area.
Fence posts and supports should have a diameter greater than 20 mm and be located clear of roots.
Existing perimeter fencing and other structures may be suitable as part of the protective fencing.
Chain wire mesh panels with shade cloth attached, held in place with concrete feet.
Alternative plywood or wooden paling fence panels. The fencing material also prevents building materials or soil entering the TPZ.
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.

Appendix 11

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

Source: Institute of Australian Consulting Arborists 2010©

from an original concept by; Footprint Green Tree Significance & Retention Value Matrix, June 2001.

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.

Appendix 12

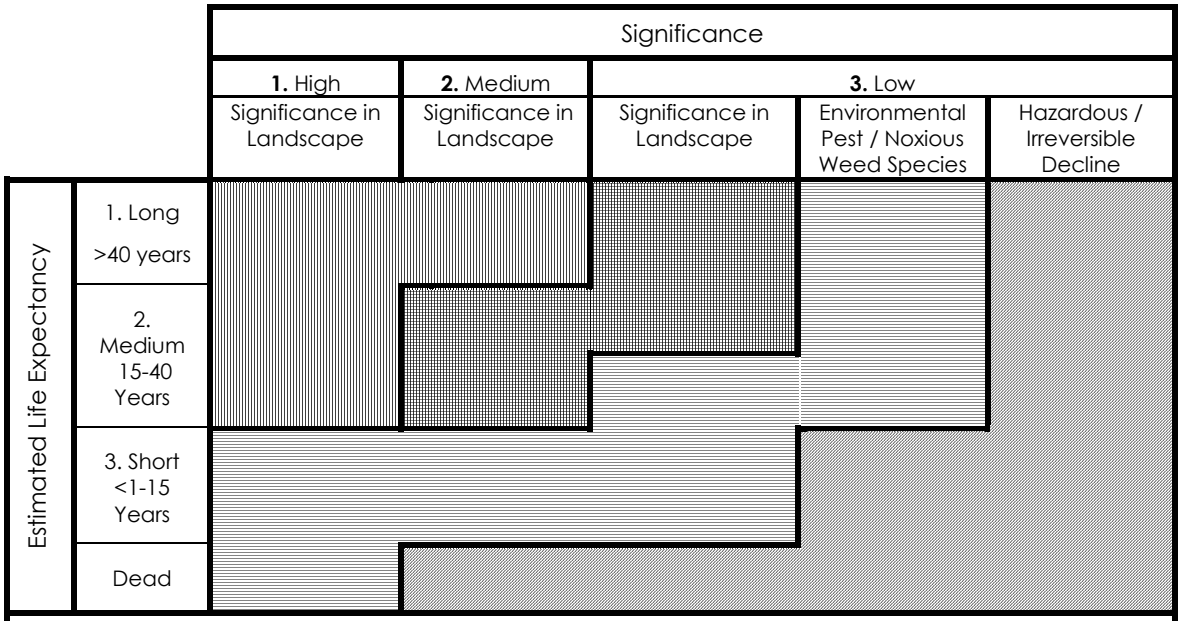
Tree Retention Value - Priority Matrix.

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



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 *Protection of trees on development sites*. 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.

Appendix 13

Matrix - Sustainable Retention Index Value (SRIV) ©

Institute of Australian Consulting Arboriculturists, Australia, 2010, Sustainable Retention Index Value (SRIV), Version 4.
A visual method of objectively rating the viability of urban trees for development sites and management, based on general tree and landscape assessment criteria.

The matrix is to be used with the value classes defined in the Glossary for Age / Vigour / Condition.
An index value is given to each category where ten (10) is the highest value.

Age Class	Vigour Class and Condition Class					
	Good Vigour & Good Condition (GVG)	Good Vigour & Fair Condition (GVF)	Good Vigour & Poor Condition (GVP)	Low Vigour & Good Condition (LVG)	Low Vigour & Fair Condition (LVF)	Low Vigour & Poor Condition (LVP)
	Able to be retained if sufficient space available above and below ground for future growth. No remedial work or improvement to growing environment required. May be subject to high vigour. Retention potential - Medium – Long Term.	Able to be retained if sufficient space available above and below ground for future growth. Remedial work may be required or improvement to growing environment may assist. Retention potential - Medium Term. Potential for longer with remediation or favourable environmental conditions.	Able to be retained if sufficient space available above and below ground for future growth. Remedial work unlikely to assist condition, improvement to growing environment may assist. Retention potential - Short Term. Potential for longer with remediation or favourable environmental conditions.	May be able to be retained if sufficient space available above and below ground for future growth. No remedial work required, but improvement to growing environment may assist vigour. Retention potential - Short Term. Potential for longer with remediation or favourable environmental conditions.	May be able to be retained if sufficient space available above and below ground for future growth. Remedial work or improvement to growing environment may assist condition and vigour. Retention potential - Short Term. Potential for longer with remediation or favourable environmental conditions.	Unlikely to be able to be retained if sufficient space available above and below ground for future growth. Remedial work or improvement to growing environment unlikely to assist condition or vigour. Retention potential - Likely to be removed immediately or retained for Short Term. Potential for longer with remediation or favourable environmental conditions.
(Y) Young	YGVG - 9 Index Value 9 Retention potential - Long Term. Likely to provide minimal contribution to local amenity if height <5 m. High potential for future growth and adaptability. Retain, move or replace.	YGVF - 8 Index Value 8 Retention potential - Short – Medium Term. Potential for longer with improved growing conditions. Likely to provide minimal contribution to local amenity if height <5 m. Medium-high potential for future growth and adaptability. Retain, move or replace.	YGVP - 5 Index Value 5 Retention potential - Short Term. Potential for longer with improved growing conditions. Likely to provide minimal contribution to local amenity if height <5 m. Low-medium potential for future growth and adaptability. Retain, move or replace.	YLVG - 4 Index Value 4 Retention potential - Short Term. Potential for longer with improved growing conditions. Likely to provide minimal contribution to local amenity if height <5 m. Medium potential for future growth and adaptability. Retain, move or replace.	YLVF - 3 Index Value 3 Retention potential - Short Term. Potential for longer with improved growing conditions. Likely to provide minimal contribution to local amenity if height <5m. Low-medium potential for future growth and adaptability. Retain, move or replace.	YLVP - 1 Index Value 1 Retention potential - Likely to be removed immediately or retained for Short Term. Likely to provide minimal contribution to local amenity if height <5 m. Low potential for future growth and adaptability.
(M) Mature	MGVG - 10 Index Value 10 Retention potential - Medium - Long Term.	MGVF - 9 Index Value 9 Retention potential - Medium Term. Potential for longer with improved growing conditions.	MGVP - 6 Index Value 6 Retention potential - Short Term. Potential for longer with improved growing conditions.	MLVG - 5 Index Value 5 Retention potential - Short Term. Potential for longer with improved growing conditions.	MLVF - 4 Index Value 4 Retention potential - Short Term. Potential for longer with improved growing conditions.	MLVP - 2 Index Value 2 Retention potential - Likely to be removed immediately or retained for Short Term.
(O) Over-mature	OGVG - 6 Index Value 6 Retention potential - Medium - Long Term.	OGVF - 5 Index Value 5 Retention potential - Medium Term.	OGVP - 4 Index Value 4 Retention potential - Short Term.	OLVG - 3 Index Value 3 Retention potential - Short Term. Potential for longer with improved growing conditions.	OLVF - 2 Index Value 2 Retention potential - Short Term.	OLVP - 0 Index Value 0 Retention potential - Likely to be removed immediately or retained for Short Term.

Appendix 14

Glossary of Terms

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

Adaptive Wood
Additional load bearing wood formed in response to mechanical stresses and gravitational force upon the vascular cambium to provide a uniform distribution of loading.

Age
Most trees have a stable biomass for the major proportion of their life.
The estimation of the age of a tree is based on the knowledge of the expected lifespan of the taxa in situ divided into three distinct stages of measurable biomass, when the exact age of the tree from its date of cultivation or planting is unknown and can be categorized as *Young*, *Mature* and *Over-mature* (British Standards 1991, p. 13, Harris *et al*, 2004, p. 262).

Young Tree aged less than <20% of life expectancy, *in situ*.

Mature Tree aged 20-80% of life expectancy, *in situ*.

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.

Senescent Tree of advanced old age, or over mature leading towards death.

Condition of Trees
A tree's *crown form* and growth habit, as modified by its *environment* (aspect, suppression by other trees, soils), the *stability* and *viability* of the *root plate*, trunk and structural branches (first (1st) and possibly second (2nd) order branches), including structural defects such as wounds, cavities or hollows, *crooked* trunk or weak trunk/branch junctions and the effects of predation by pests and diseases. These may not be directly connected with *vigour* and it is possible for a tree to be of *normal vigour* but in *poor condition*.

Can be categorized as Good Condition, Fair Condition, Poor Condition or Dead.

Crown Form
The shape of the crown of a tree as influenced by the availability or restriction of space and light, or other contributing factors within its growing environment.
Crown form may be determined for tree shape and habit generally as *dominant*, *co dominant*, intermediate, *emergent*, *forest* and *suppressed*. It may also be categorised as good form or poor form.

Dominant
Crowns of trees generally not restricted for space and light, receiving light from above and on all sides

Codominant
Crowns of trees restricted for space and light on one or more sides and receiving light primarily from above e.g. constrained by another tree/s or a building.

Emergent
Crowns of trees restricted for space on most sides receiving most light from above until the *upper crown* grows to protrude above the canopy in a stand or forest environment. Such trees may be *crown form dominant* or transitional from *crown form intermediate* to *crown form forest* asserting both *apical dominance* and *axillary dominance* once free of constraints for space and light.

Forest
Crowns of trees restricted for space and light except from above forming tall trees with narrow spreading crowns with foliage restricted generally to the top of the tree. The trunk is usually erect, straight and continuous, tapering gradually, crown often excurrent, with first order branches becoming structural, supporting the live crown concentrated towards the top of the tree, and below this point other first order branches arising radially with each *inferior* and usually temporary, divergent and ranging from horizontal to ascending, often with internodes exaggerated due to competition for space and light in the *lower crown*.

Suppressed
Crowns of trees generally not restricted for space but restricted for light by being *overtopped* by other trees and occupying an understorey position in the canopy and growing slowly.