

APPENDIX F

'Ecological Constraints Report; University and College Creeks Study
Macquarie University' Prepared by Lesryk Environmental Consultants (2009)



ECOLOGICAL CONSTRAINTS REPORT

UNIVERSITY AND COLLEGE CREEKS STUDY MACQUARIE UNIVERSITY

1. Introduction

At the request of the Macquarie University Office of Major Projects, LesryK Environmental Consultants (LesryK) has undertaken a Preliminary Environmental Investigation (PEI) of those parcels of land that occur adjacent to University and College Creeks (the study area), these drainage lines being located within the grounds of Macquarie University, North Ryde, New South Wales (NSW). The PEI has been conducted to identify any areas within, and adjacent to the study area, that have high, moderate and low ecological significance. Those areas that are identified as having high ecological significance would be highlighted as a "constraint" to any development of that portion of the site, whilst those of low ecological significance would be identified as offering development "opportunities".

It is acknowledged that options are being considered for the "modification" of both University and College Creeks, the overall objective being to reduce the impact of flooding of sections of the campus grounds during heavy rainfall periods.

Once the value of the habitats and vegetation communities present within the area surveyed are identified, general recommendations can be provided that would assist in the:

- Confirmation a suitable design for the modification of those drainage lines present, this design meeting both the overall objectives of the project and the function of those ecological features identified.
- Management and mitigation of potential impacts.

In accordance with the classifications used in the geomorphological study (Coffey Geotechnics 2009), sections of the creek are referred to as Reaches A through to F. These "Reaches" are present in the following locations:

- Reach A: Encompasses that part of University Creek between the southern boundary of the university to approximately 110m north-east;
- Reach B: Extends from the downstream end of Reach A to the footbridge that links the residential colleges to the university;
- Reach C: Extends from the footbridge to University Avenue;
- Reach D: Extends from University Avenue to Research Park Drive;
- Reach E: Extends from Research Park Drive to Innovation Drive; and
- Reach F: Extends from Innovation Drive to Talavera Road.

2. Methods

Literature Review

Previous ecological studies, including those undertaken at the University and in the wider local area and region, were reviewed prior to undertaking field surveys. The identification of known, or potentially occurring, native species within this portion of the Ryde Local Government Area (LGA), particularly those listed under the Schedules to the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*, the NSW *Threatened Species Conservation Act 1995 (TSC Act)* and NSW *Fisheries Management Act 1994 (FM Act)*, permits the tailoring of the field survey strategies to the detection of these animals and plants, their vegetation communities and/or necessary habitat requirements. The undertaking of a literature search also ensures that the results from surveys conducted during different climatic, seasonal and date periods are considered and drawn upon as required. This approach therefore increases the probability of considering the presence of, and possible impacts on, all known and likely native species, particularly any plants and animals that are of regional, state and/or national conservation concern. This approach also avoids issues inherent with a one off "snap-shot" study.

Field Survey

A survey of the study area was undertaken by Stephen Bloomfield (B.App.Sc) and Paul Burcher (B.App.Sc) on the 29th of October, Paul Burcher on the 6th of November and Stephen Bloomfield, Paul Burcher and Deryk Engel (B.Env.Sc [HONS]) on the 11th of November, 2009. The weather conditions experienced during the field investigations varied from overcast skies, warm temperatures (21°C -23°C) and light winds to hot temperatures (29.7°C), clear skies and light southerly winds.

The flora survey was conducted by Paul Burcher and involved:

- Recording the diversity of plants and vegetation communities present using the Random Meander Method;
- Specific searches within appropriate habitats for those threatened plants species, vegetation communities and populations previously recorded in the study area or region; and
- Reviewing the audits of trees undertaken by arborists engaged in the project.

The fauna survey was conducted by Stephen Bloomfield and Deryk Engel and involved:

- Recording the diversity of habitats within the study area with particular reference to habitat features such as the presence of ponds, tree hollows, rocky refuges, feed trees etc;
- The direct observation of those fauna species present within the study area;
- Searches of culverts for sheltering species, particularly cave dependant microchiropterans (insectivorous bats);
- The identification of indirect evidence including scats, scratchings and diggings;
- Litter and ground debris searches for reptiles and amphibians; and
- Recording and identification of those amphibians inhabiting the riparian zone and associated ponds.

3. Results

3.1 Literature review.

3.1.1 Flora.

3.1.1 (a) Vegetation.

Vegetation mapping of the Cumberland Plain, including the Ryde LGA, was completed by the NSW National parks and Wildlife Service in 2002 (NPWS 2002) and updated and refined in 2003 (Tozer 2003). Their mapping does not indicate any remnant vegetation in the study area. However, it does indicate the presence of intact remnants of two communities, Turpentine-Ironbark Forest and Turpentine-Ironbark Margin Forest, in the north of the University's grounds.

Oculus (2001) undertook vegetation mapping and description of bushland in the Ryde Local Government Area. Their mapping was based on aerial photograph interpretation and soil mapping with restricted ground truthing of endangered ecological communities. It indicates the presence of Shale/Sandstone Transition Forest and Blue Gum High Forest within the study area. Shale/Sandstone Transition Forest is listed as an endangered ecological community on both the *TSC* and *EPBC Acts*. Blue Gum High Forest is listed as a critically endangered ecological community on the *TSC* and *EPBC Acts*.

EDAW undertook a preliminary ecological investigation of the University's grounds in 2006 (EDAW 2006). This was limited to limited to the collation and review of existing, readily accessible information. Using the classification of NPWS (2002), they found three vegetation communities in the university grounds. One vegetation community, Sydney Turpentine Ironbark Forest, was found to occur in two locations within the study area (remnants 3 and 4 on Figure 1). EDAW found that these remnants had very little understorey as they are within a mown park-like setting between the residential colleges and the core of the university. This and their small size limited their ecological value and ongoing viability. Nevertheless, EDAW commented that Sydney Turpentine Ironbark Forest is listed as a critically endangered ecological community under the *EPBC Act* and an endangered ecological community under the *TSC Act*, implying that the remnants within the study area qualified as endangered ecological communities under these Acts.

Total Earth Care [TEC] (2008) undertook a flora and fauna assessment of the Cochlear Global Headquarters site as part of the Part 3a application for development of that site. The Cochlear Global Headquarters site is immediately west of the southern section of the study area. Total Earth Care found no native vegetation on the Cochlear site. TEC surveyed EDAW's remnant 3, which is adjacent to the south-east corner of the Cochlear site i.e. on the eastern side of Reach B. TEC found that although degraded by weed invasion it had moderate resilience, with the native understorey strata regenerating due to the cessation of mowing and implementation of weed control. They considered that it conformed to Turpentine-Ironbark Margin Forest as described by Tozer (2003) in his refinement of the NPWS (2002) classifications. TEC considered that the remnant qualified as Sydney Turpentine Ironbark Forest under both the *TSC* and *EPBC Acts*.



Figure 1. Vegetation Mapping of the University by EDAW (2006)

3.1.1 (b) Threatened species.

EDAW (2006) did not review the presence or likelihood of threatened flora species within the University.

TEC (2008) found two threatened flora species occurring on the Cochlear site. These were *Eucalyptus nicholii* (Narrow-leaved Black Peppermint) and *E. scoparia* (Wallangarra White Gum) both of which are native to the NSW Northern tablelands but are widely planted as landscape trees in Sydney and elsewhere.

The EPBC Act Protected matters search tool (DEWHA 2009) and point records of the Atlas of NSW Wildlife (Department of Environment, Climate Change and Water 2009a) were filtered to determine which threatened flora species have been detected or are likely to have habitat within a five-kilometre (km) radius of the study area. Table 1 presents the results of this review.

3.1.2 Fauna.

A review of the DECCW and Environment Australia online databases identified a number of threatened animals that have been recorded within a 5km radius of the study area. Based on a consideration of the habitat needs of these species, combined with the observations made of the project area during the field survey, it is not considered that any would occur as a resident population within this portion of the University grounds. Individuals may traverse over the study area on occasion, particularly the flying animals, as these species move between roosting sites or during their foraging periods. Whilst this is the case, the undertaking of the proposal would not have a significant impact on these animals, their movement patterns or life cycle needs. The works would not erect any barriers to the movement patterns of any native species (both terrestrial and aquatic). Similarly, it would not isolate or further fragment any habitat areas. Post-development, revegetation of the study area and the creation of habitats would ensure that those species recorded or expected within the study area would be present post-development.

As an aside it is noted that, during the course of a recent fauna investigation undertaken as part of the development of the Cochlear facility, this being present adjacent (immediately upslope of) the southern section of University Creek (Reaches A and B), no threatened fauna species were recorded (TEC 2008). The TEC study utilised species specific survey techniques, the use of these not revealing any state or federally listed threatened species (TEC 2008). Native fauna species recorded during the TEC investigation are highlighted on Table 2.

3.2 Survey results.

3.1 Flora investigation.

3.1.1 Plant communities identified.

Three vegetation communities were identified in the study area. In addition to these, most of the study area consists of remnant or planted trees above lawn or landscape planting. A description of each of the communities and the modified areas is provided below. Figure 2 shows the location of the vegetation communities.

Table 1. Locally occurring threatened flora species.**Key**

E – Endangered

V – Vulnerable

X – Extinct

CE – Critically Endangered.

Underlined – not recorded within 5km but habitat predicted to occur by the EPBC protected matters search tool.

Species	Status		Habitat (DECCW 2009b & author's field notes)
	EPBC	TSC	
<i>Acacia bynoeana</i>	V	E	Heath/scrub on clayey ridge-tops and slopes.
<i>Acacia pubescens</i>	V	V	Variety of plant communities, including Cooks River/ Castlereagh Ironbark Forest, Shale/ Gravel Transition Forest and Cumberland Plain Woodland.
<u><i>Caladenia tessellata</i></u>	V	V	Grassy sclerophyll woodland on clay loam or sandy soils.
<i>Callistemon linearifolius</i>	V	V	Rock platforms in dry sclerophyll forest on the coast and adjacent ranges.
<u><i>Cryptostylis hunteriana</i></u>	V	V	Dry sclerophyll woodland on sandy soils.
<i>Darwinia biflora</i>	V	V	Heath/scrub on clayey ridge-tops and slopes.
<i>Deyeuxia appressa</i>	E	E	Record is from 1941. Locally extinct and little known of its ecology.
<i>Epacris purpurascens</i> var. <i>purpurascens</i>	–	V	Deeper shales and near creeks.
<i>Eucalyptus camfieldii</i>	V	V	Heath/scrub on clayey ridge-tops and slopes.
<i>Eucalyptus nicholii</i>	V	V	Northern tablelands species commonly planted in Sydney.
<i>Genoplesium baueri</i>	–	V	Sparse sclerophyll forest and moss gardens over sandstone.
<i>Haloragodendron lucasii</i>	E	E	Very localised in sheltered gullies in Barra Brui.
<i>Leptospermum deanei</i>	V	V	In sandstone scrub near watercourses.
<u><i>Melaleuca biconvexa</i></u>	V	V	Damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects.
<i>Melaleuca deanei</i>	V	V	Heath/scrub on clayey ridge-tops.
<i>Pimelea curviflora</i> var. <i>curviflora</i>	V	V	Heath/scrub on clayey ridge-tops.
<u><i>Prostanthera marifolia</i></u>	X	CE	Unknown. Formerly confined to the Seaforth area.
<i>Tetradlea glandulosa</i>	V	V	Heath/scrub on moderately clayey ridge-tops and slopes.

Smooth-barked Apple Open Forest

This community occurs on the eastern side of Reach B north of the northern boundary of Morling College. It covers approximately 2000m² is dominated by a canopy of Smooth-barked Apple to 25 metres (m) along with some Blackbutt (*Eucalyptus pilularis*), Turpentine and White Stringybark (*E.globoidea*). There is a sparse to mid-dense shrub layer to 3m of the introduced Lantana (*Lantana camara*) and the native Sweet Pittosporum (*Pittosporum undulatum*), *Ozothamnus diosmifolius* and Sydney Golden Wattle (*Acacia longifolia*). The groundcover is dense and dominated by the introduced Morning Glory (*Ipomoea indica*) and Panic Veldt Grass (*Ehrharta longiflora*) though there is regrowth of native species such Flax-lily (*Dianella caerulea var producta*), Weeping Meadow Grass (*Microlaena stipoides*), Beard-heath (*Leucopogon juniperinus*) and Mat-rushes (*Lomandra* spp). The shrub and groundcover layer strata contain a mix of native and introduced species. Analysis of 1943 aerial photography on the Department of lands Six Viewer website (<http://imagery.maps.nsw.gov.au/>) indicates that this community was at that time restricted to the edge of the creek and has regenerated southward since then.

Canopy trees of this community without an intact understorey continue upstream into Reach A.

Conservation Significance

This community shows characteristics of both Western Sandstone Gully Forest and Turpentine Ironbark Margin Forest of Tozer (2003). Western Sandstone Gully Forest is not an endangered ecological community. Turpentine Ironbark Margin Forest is one of the communities that comprise Sydney Turpentine Ironbark Forest, which is an endangered ecological community on the *TSC Act* and a critically endangered ecological community on the *EPBC Act*.

Red Bloodwood – Sandstone Stringybark Woodland

An approximately 1000m² remnant of woodland occurs in the Station North site adjacent to Herring Road. It is composed of Red Bloodwood (*Corymbia gummifera*) and Sandstone Stringybark to 15m with single specimens of Red Mahogany (*Eucalyptus resinifera*), Scribbly Gum (*E.sclerophylla*) and Sydney Peppermint (*E.piperita*) also present. There is a sparse small tree layer 2-6m in height that includes Narrow-leaved Apple (*Angophora bakeri*), Sweet Pittosporum and Cherry Ballart (*Exocarpus cupressiformis*). The groundcover is a mix of native and introduced species with Agapanthus (*Agapanthus africanus*), Mat-rush (*Lomandra longifolia*), Flax-lily and *Leucopogon juniperinus* being common. Due to its isolation from other remnants, its small size and degree of weed invasion, it is unlikely that this remnant would be viable in the long-term

Conservation Significance

This community corresponds to Sandstone Ridgetop Woodland of Tozer (2003). Whilst there are some elements of the Shale/Sandstone Transition Forest High Sandstone Influence of Tozer (2003) present (Red Mahogany and *Leucopogon juniperinus*), it is considered that this community better corresponds to his Sandstone Ridgetop Woodland due to Red Bloodwood and Sandstone Stringybark being the dominant species. Sandstone Ridgetop Woodland is widespread and well conserved, and not an endangered ecological community listed on the *TSC* or *EPBC Acts*.

Rushland

This community occurs in patches along the creek within Reaches B and E where sediment has dropped. It is composed of dense growth of Cumbungi (*Typha orientalis*) to 1.5m tall fringing, lower growth of Knotweed (*Persicaria lapathifolia*) and Umbrella Sedge (*Cyperus eragrostis*).

Conservation Significance

This community has no particular conservation significance being composed of opportunistic native and introduced species.

Modified Areas

Most of the study area is vegetated with a mix of remnant and planted trees above mown lawn. Most of the trees planted either side of Reaches C and D are River Oak (*Casuarina cunninghamiana*), Flooded Gum (*Eucalyptus grandis*) and Sydney Blue Gum (*E.saligna*) to 30m.

Beside Reach D are Bracelet Honeymyrtle (*Melaleuca armillaris*) and Snow-in summer (*M.linariifolia*) to 6m with Sugar Gum (*Eucalyptus cladocalyx*) and Bottlebrush (*Callistemon viminalis*) beyond Innovation Drive.

Remnant trees within the study area include Turpentine, Smooth-barked Apple, Scribbly Gum, Grey Gum (*Eucalyptus punctata*), Sandstone Stringybark and Red Bloodwood.

Conservation Significance

The planted trees, shrubs and lawns in the study area have no particular conservation significance. Remnant trees or groups of trees without an intact shrub or groundcover strata are part of the Sydney Turpentine Ironbark Forest endangered ecological community. Therefore, those remnant trees within the modified area that are remnants of the pre-existing Sydney Turpentine Ironbark Forest (mostly Turpentines and Smooth-barked Apples) are included in the community for the purposes of the *TSC Act*. However, the *EPBC Act* definition of Sydney Turpentine Ironbark Forest excludes occurrences of isolated single trees or shrubs characteristic of the ecological community.

3.1.2 Flora Species Recorded

No threatened flora species were detected during the field survey. Given the level of disturbance in the study area and the habitat requirements of those threatened species listed in Table 1, it is considered unlikely that any of those species have the potential to occur.

3.2. Fauna.

3.2.1. Fauna species recorded during the field investigations.

By the completion of the field surveys one (1) native mammal, 16 native birds, three (3) reptiles, two (2) amphibians and one (1) native fish had been recorded within, or adjacent to, the study area (Table 2).

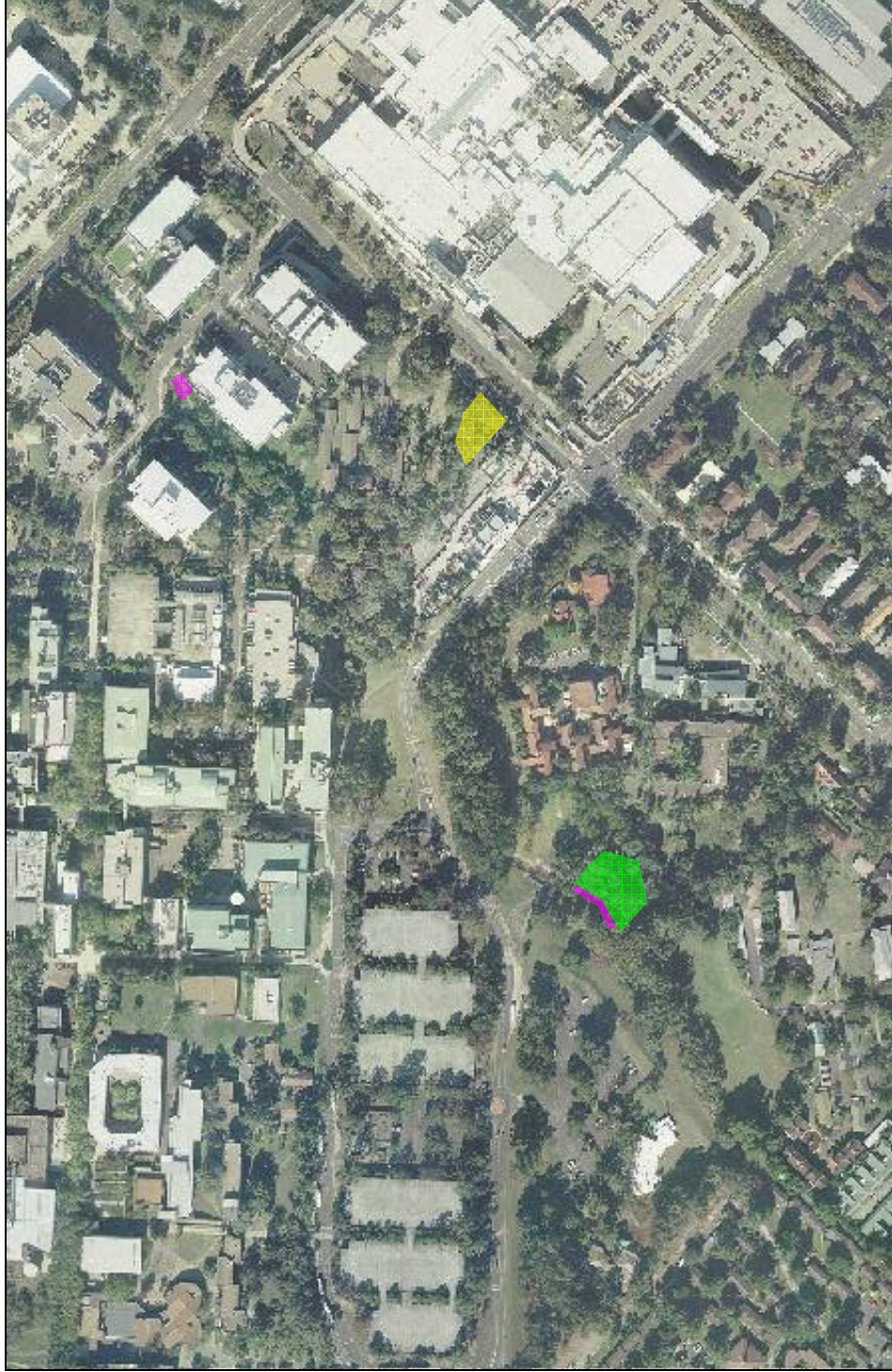


Figure 1. Native Vegetation in the Study Area

Key

Smooth-barked Apple Open Forest

Red Bloodwood



Sandstone Stringybark Woodland

Rushland

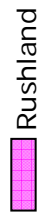


Table 2. Fauna species known to be present within or near the study area.
* - indicates introduced species.

Common Name	Family and Scientific Name	LesryK	TEC 2008
MAMMALS			
	Phalangeridae		
Common Brushtail Possum	<i>Trichosurus vulpecula</i>	✓	✓
	Leporidae		
* Rabbit	<i>Oryctolagus cuniculus</i>	✓	✓
BIRDS			
	Threskiornidae		
Australian White Ibis	<i>Threskiornis molluca</i>		✓
	Anatidae		
Pacific Black Duck	<i>Anas superciliosa</i>	✓	
Australian Wood Duck	<i>Chenonetta jubata</i>	✓	
	Charadriidae		
Masked Lapwing	<i>Vanellus miles</i>	✓	✓
	Accipitridae		
Brown Goshawk	<i>Accipiter fasciatus</i>	✓	
	Columbidae		
Crested Pigeon	<i>Ocyphaps lophotes</i>	✓	
* Rock Dove	<i>Columba livia</i>	✓	
* Spotted Turtle-dove	<i>Streptopelia chinensis</i>		✓
	Cacatuidae		
Galah	<i>Eolophus roseicapilla</i>	✓	
Sulphur-crested Cockatoo	<i>Cacatua galerita</i>	✓	✓
	Psittacidae		
Rainbow Lorikeet	<i>Trichoglossus haematodus</i>	✓	
	Halcyonidae		
Laughing Kookaburra	<i>Dacelo novaeguineae</i>	✓	✓
	Pardalotidae		
Spotted Pardalote	<i>Pardalotus punctatus</i>	✓	
	Meliphagidae		
Noisy Miner	<i>Manorina melanocephala</i>	✓	✓
	Dicruridae		
Magpie Lark	<i>Grallina cyanoleuca</i>	✓	✓
	Artamidae		
Pied Butcherbird	<i>Cracticus nigrogularis</i>	✓	
Australian Magpie	<i>Gymnorhina tibicen</i>	✓	
Pied Currawong	<i>Strepera graculina</i>	✓	
	Corvidae		
Australian Raven	<i>Corvus coronoides</i>	✓	
	Hirundinidae		
Welcome Swallow	<i>Hirundo neoxena</i>	✓	✓
REPTILES			
	Agamidae		
Eastern Water Dragon	<i>Physignathus lesueurii</i>	✓	
	Scincidae		
Eastern Water Skink	<i>Eulamprus quoyii</i>	✓	
Skink	<i>Lampropholis sp.</i>	✓	
AMPHIBIANS			
	Myobatrachidae		
Common Eastern Froglet	<i>Crinia signifera</i>	✓	✓
Striped Marsh Frog	<i>Limnodynastes peronii</i>	✓	✓
FISH			
	Anguillidae		
Eel	<i>Anguilla sp.</i>	✓	✓
	Poeciliidae		
* Mosquitofish	<i>Gambusia affinis (holbrooki)</i>	✓	

In regards to the conservation status of those native species recorded, none are listed (or currently considered for listing i.e. Preliminary Determinations) under the Schedules to the *EPBC*, *TSC* or *FM Acts*. Similarly none are of regional conservation concern within the Ryde LGA (NSROC 2008).

Given the highly disturbed, modified and altered condition of the study area, and its “parkland” appearance, it is not considered that any species of state or national conservation concern would occur as a resident population in this area.

In regards to the detection of those native species recorded:

- The Common Brushtail Possum (*Trichosurus vulpecula*) was identified through the observation of this species' characteristic scratchings on several of the smooth-barked Eucalypts that occur adjacent to University Creek;
- All of the birds were observed within, adjacent to, or flying over the study area, or identified from their distinct calls;
- The Eastern Water Dragon (*Physignathus lesueurii*), Eastern Water Skink (*Eulamprus leuraensis*) and *Lampropholis species* were all recorded in association with University Creek and its riparian habitat;
- The Striped Marsh Frog (*Limnodynastes peronii*) and Common Eastern Froglet (*Crinia signifera*) were heard calling in association with University Creek; and
- Numerous Eels were seen in University Creek.

Whilst targeted, no cave dependant microchiropterans were observed.

The native species recorded are all protected, as defined by the NSW *National Parks and Wildlife Act 1974*, but considered to be common to abundant throughout the surrounding region. These animals are all commonly recorded in association with urban areas and suburban sites. All of the species recorded would be considered either generalist and/or suburban animals (Catteral *et al.* 1991). These species would not be solely reliant upon those habitats present within the study area such that the removal, modification or further disturbance of these would threaten the local occurrence of these animals. The species recorded are all expected to be present within both the study area and surrounding locality post-development.

Due to their ability to adapt to, and be tolerant of, urban environments, none of the native species recorded would be adversely affected by the undertaking of the proposal such that the viability of a local population of that animal would be placed at risk of extinction.

3.2.2. Habitat types present within the study area.

Three habitat types were recorded within the study area, these being:

- A eucalypt woodland;
- An aquatic environment; and
- A modified area.

For reference, descriptions of each of these are provided. A photographic record of the study area has also been provided.

3.2.2. (a) Eucalypt woodland.

This habitat type occurs in two main locations, these being adjacent to University Creek within the southern limits of the study area and adjacent to Herring Road and the Macquarie University Station (station north development area).

Eucalypt woodland – southern portion study area.

This habitat type was recorded adjacent to Reaches A and B, the canopy of the eucalypt woodland in this location being around 25m to 30m in height and of a sparse to medium density. Several of the trees present are hollow bearing (hollow diameter 70 millimetres). The occasional middle storey species is present, this layer reaching a height of 15m. The understorey is comprised of predominantly native shrubs with a high-density layer of exotic vines, and occurs in patches, reaching heights of 1.5m to 2m. The groundcover is comprised of a mixture of native and exotic species, these reaching a height of 10cm and being of a medium to high density. Accumulations of leaf litter and fallen branches are common.

Eucalypt woodland – northern portion study area.

The eucalypt woodland within the station north development (Reaches D and E) has a canopy that is of a sparse to medium density, the canopy reaching 20m in height. None of the trees observed in this area were hollow bearing. A large area of the understorey of this woodland has been cleared and consists of maintained exotic grassland, other areas being bare. Isolated native landscaped planting to 0.5m high are also present. Where the understorey has not been cleared a sparse to medium dense layer of 2m to 4m high native shrubs is present. In this area the groundcover consists of a mixture of native and exotic species, these reaching a height of 0.5m and being of a medium density. Accumulations of leaf litter and fallen branches are common. Some urban refuse was also observed.

Eucalypt woodland – Remainder of study area.

In addition, a sparse area of open woodland lines portions of University Creek. The tree heights are approximately 20m to 25m. The understorey has been cleared, the groundcover consisting of exotic grasses, herbs and forbs. It is noted that the groundcover is regularly maintained.

One of the mature trees was noted to contain a hollow (hollow diameter 150 millimetres), scratchings indicative of arboreal possums also being evident on a number of eucalypts.

Another hollow bearing tree was observed adjacent to the southern section of Reach C. The occurrence of this tree has been highlighted as one of the hollows present was noted to support a hive of the introduced honeybee (*Apis mellifera*). If, ultimately, this tree requires removal as part of the flood mitigation works, care should be taken to ensure that the works crews are not stung when the hive is disturbed. As an aside it is noted that "competition from feral honeybees" has been listed as a Key Threatening Process under Schedule 3 of the *TSC Act*. This process has been listed under the *TSC Act* due to the impact introduced bees have on indigenous species as a result of, firstly competition for tree hollows, and secondly via competition for floral resources (DECCW 2009c).

Ecological value of the woodlands.

The woodlands were observed to be utilised by a number of highly tolerant and urban adapted native species. Young Australian Wood Ducks (*Chenonetta jubata*), Pied Currawongs (*Strepera graculina*) and Eastern Water Dragons (*Physignathus lesueurii*) were observed during the field surveys, indicating that these animals are breeding within the University grounds. Birds and other native species were also observed foraging and roosting within those environments present. The woodlands are therefore considered to meet the life cycle needs of those species recorded. Whilst this is the case, the animals recorded are all highly tolerant and would be commonly recorded in, and beyond, the university grounds. The undertaking of the proposal may require the disturbance of some woodland areas, though the impact of this on the overall ecology of this locality is considered to be minimal.

3.2.2. (b) Aquatic.

University Creek has an urban catchment that includes Macquarie University itself, and those residential areas that are present to the south of Epping Road. University Creek traverses the study area and flows in a northerly direction where it eventually drains into the Lane Cove River approximately 600m beyond Talavera Road. University Creek contained a slow flowing amount of water at the time of the field survey, some small intermittent riffle sequences being present. Where the creek was not flowing standing pools of water were present. The width of this creek varies between 1m and 4m, the depth also varying between 5cm and 30cm. It is noted that University Creek flows through a number of culverts, the diameters of these varying in size from 40cm to 1.5m. A number of other stormwater inlets feed into the creek at various points. Accumulations of leaf litter, some woody debris and a small amount of urban refuse are present along University Creek. In regards to the nature of the creek banks, substrate and riparian vegetation, it is noted that the southern and northern halves of the creek differ.

The southern half of University Creek (Reaches A to D inclusive) is characterised by earthen banks that are degraded, the substrate being primarily silt and sand, though an area of loose small rocks does occur. Occasional occurrences of emergent aquatic vegetation are present, these being of a medium density and to 2m high. Some other surface aquatic vegetation is also present. The riparian vegetation predominantly consists of exotic grasses, herbs, forbs and sedges. An area of woodland is present adjacent to the study area in the southern limits of the study area. This area is described above under the eucalypt woodland habitat.

The northern half of University Creek (Reaches E and F) has been landscaped and is characterised by a constructed creekline, sandstone boulders replacing what would have been earthen banks. Presumably, as a result of this constructed creek wall higher velocity flows have stripped the sediment back to bare sandstone at points along this portion of this creek line. At the northern limits of University Creek a sedimentation area that is 10m wide is present. Whilst subject to flooding this area was dry at the time of the field investigation and consisted of grasses, herbs and forbs with some macrophytes to 1.5m high. Riparian vegetation consisted of native landscaped plantings, these including isolated trees, shrubs and groundcovers that reach a height of 18m, 2m and 1m, respectively.

Table 2 presents a classification system for fish habitat developed by NSW Fisheries (Fairfull and Witheridge 2003). Under this system, University and College Creeks would qualify as "moderate fish habitat." Fish species observed within these drainage lines during the course of the field investigations were the native Eel (*Anguilla sp.*) and the introduced Mosquito Fish (*Gambusia holbrooki*).

Table 2. Classification Scheme for waterway crossings over different fish habitat types.

Classification	Characteristics Of Waterway
Class 1 - Major Fish Habitat	Major permanently or intermittently flowing waterway (e.g. river or major creek), habitat of a threatened fish species.
Class 2 – Moderate fish habitat	Named permanent or intermittent stream, creek or waterway with clearly defined bed and banks with semi - permanent to permanent waters in pools or in connected wetland areas. Marine or freshwater aquatic vegetation is present. Known fish habitat and/or fish observed inhabiting the area.
Class 3 – Minimal fish habitat	Named or unnamed waterway with intermittent flow and potential refuge, breeding or feeding areas for some aquatic fauna (e.g. fish, yabbies). Semi - permanent pools form within the waterway or adjacent wetlands after a rain event. Otherwise, any minor waterway that interconnects with wetlands or recognised aquatic habitats.
Class 4 – Unlikely fish habitat	Named or unnamed watercourse with intermittent flow during rain events only, little or no defined drainage channel, little or no free standing water or pools after rain event finishes (e.g. dry gully, shallow floodplain depression with no permanent wetland aquatic flora present).

Ecological value of the aquatic environments.

Due to its occurrence within an urban landscape, and being altered and redefined, it is not considered that, from a fauna perspective, the aquatic environments recorded would be of any significant ecological value. Further modification of this habitat type, along with the inclusion of riparian plantings and micro-habitat features, would ensure that those species recorded or expected would be present post-development. Due to their urban tolerance, the species recorded utilising those creeks observed within the study area are all considered to be present post-development.

3.2.2. (c) Modified area.

This habitat type includes those portions of the study area that have been cleared of vegetation and now consist of regularly maintained lawns. The lawns are comprised of exotic grasses, herbs and forbs that reach a height of 10cm. Isolated semi-mature trees and areas of landscape plantings are present within this habitat type. The modified areas also include those roads, lights, signs, fences, bridges and footpaths that occur throughout the study area.

Ecological value of the modified areas.

Being disturbed, modified, maintained and altered, the modified areas are considered to be of limited to no ecological value.

4. Legislative Considerations

4.1 Commonwealth - Environment Protection and Biodiversity Conservation Act 1999.

One endangered ecological community listed under this Act, Sydney Turpentine Ironbark Forest, was recorded in the study area.

No threatened flora or fauna species listed on this Act were recorded and it is considered unlikely that any occur and have been overlooked or were not detectable.

4.2 Environmental Planning and Assessment Act 1979

One endangered ecological community listed on the *TSC Act*, Sydney Turpentine - Ironbark Forest, was recorded in the study area.

No threatened flora or fauna species were recorded and it is considered unlikely that any occur and have been overlooked or were not detectable.

Developments assessed under Part 3A of the *Environmental Planning & Assessment Act (EP&A Act)* are exempt from the provisions of the *TSC Act*. i.e. there is no requirement to undertake seven-part tests (Section 5A of the *EP&A Act*) to determine whether a proposed development would have a significant effect on threatened species, populations or communities, or their habitat.

Instead, draft guidelines for threatened species assessment have been prepared by Department of Environment and Conservation (now DECCW) & Department of Primary Industries (2005). The objective of the assessment process is to provide information to enable decision makers to ensure that developments deliver the following environmental outcomes:

1. Maintain or improve biodiversity values (i.e. there is no net impact on threatened species or native vegetation).
2. Conserve biological diversity and promote ecologically sustainable development.
3. Protect areas of high conservation value (including areas of critical habitat).
4. Prevent the extinction of threatened species.
5. Protect the long-term viability of local populations of a species, population or ecological community.
6. Protect aspects of the environment that are matters of national environmental significance.

4.3 State - Fisheries Management Act 1994.

Based on an assessment of those habitats present, it is not considered that any threatened fish would be present within either of those drainage lines recorded in the study area.

The "Degradation of native riparian vegetation along NSW water courses" has been listed as a Key Threatening Process under Schedule 6 of the *FM Act*. This threatening process applies to all NSW waterways, not only those where listed threatened species are present. Although the proposal may require the removal of some native trees that line those creeks present, it is not considered that the proposal would significantly contribute to this threatening process. Based on the observations made during the course of the field investigations, it is unlikely that the vegetation present adjacent to University and College Creeks would be considered to meet the definition of "native riparian" vegetation.

"Installation and operation of instream structures and other mechanisms that alter natural flow regimes of rivers and streams" is also found under Schedule 6 of the *FM Act*. Post-development flow regimes along University and College Creeks are expected to be equivalent to those currently experienced and therefore do not pose a threat to the current flow regimes within the watercourse.

5. Ecological constraints.

The flora and fauna assessment finds that the Sydney Turpentine-Ironbark Forest in the south of the study area places a high level of constraint on works within the study area. This means that should works be proposed that involve a significant impact on this State listed endangered ecological community, there would be some difficulty in offsetting such impacts to satisfy the "maintain or improve" test and other objectives of the biodiversity assessment process.

In relation to the Commonwealth assessment process, any proposal that was likely to have a significant impact on the community is likely to be a controlled action requiring approval from the Minister for the Environment

Areas of moderate constraint are the Sandstone Ridgetop Woodland near Herring Road and remnant trees of the Sydney Turpentine-Ironbark Forest community that are not within the intact patch of the community in the south of the study area. It is considered that impacts that involve the loss of the Sandstone Ridgetop Woodland and isolated Sydney Turpentine-Ironbark Forest trees could readily be offset elsewhere within the University's grounds. This is complicated by some of the remnant trees being situated amongst planted ones and some Turpentines having been planted.

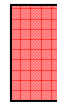
Areas of low constraint include the remainder of the study area, being the creek, plantings of native and introduced species and associated lawns.

Figure 3 indicates the areas of high and moderate constraint. The balance of the study area is of low ecological constraint.

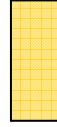


Figure 3. Ecological Constraints

Key



High Ecological Constraint



Moderate Ecological Constraint

6. References

Catterall, C.P, Green, P.J. and Jones, N. I (1991). *Nature Conservation 2: The Role of Corridors*. D.A. Saunders and R.J. Hahs (Eds). Surrey Beatty & Sons.

Coffey Geotechnics (2009) *Geomorphological assessment of University/College Creek, Macquarie University, North Ryde*. Unpublished report prepared for Macquarie University OMP.

Department of Environment, Climate Change and Water (2009a) *Atlas of NSW Wildlife: Point records for the Sydney 1:100,000 map sheet*. NSW Department of Environment and Climate Change, Hurstville, NSW.

Department of Environment, Climate Change and Water (2009b) *Threatened species, populations and ecological communities*. http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/home_species.aspx. [Accessed October 2009].

Department of Environment, Climate Change and Water (2009g) *Competition from feral honeybees – key threatening process listing*. <http://www.environment.nsw.gov.au/determinations/FeralHoneybeesKTPListing.htm> [Accessed October 2009].

Department of Environment and Conservation & Department of Primary Industries (2005) *Draft Guidelines For Threatened Species Assessment*. DEC & DPI.

Department of the Environment, Water, Heritage and Arts (2009) *Environment Protection and Biodiversity Conservation Act Protected Matters search tool*. <http://www.environment.gov.au/erin/ert/epbc/index.html>. [Accessed October 2009].

EDAW (2006). *Macquarie University Preliminary Ecological Assessment*. Unpublished report prepared for Macquarie University.

Fairfull, S. and Witheridge, G. (2003) *Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings*. NSW Fisheries, Cronulla.

NSROC (2008) *Northern Sydney Regional Organisation of Councils: State of the Environment Report 2007/2008*. http://www.ryde.nsw.gov.au/WEB/SITE/RESOURCES/DOCUMENTS/PDF/Environment/2008_NSROC_SoE_Report.pdf

NPWS (2002) *Native Vegetation of the Cumberland Plain, Final Edition*. NSW National Parks and Wildlife Service, Hurstville, NSW.

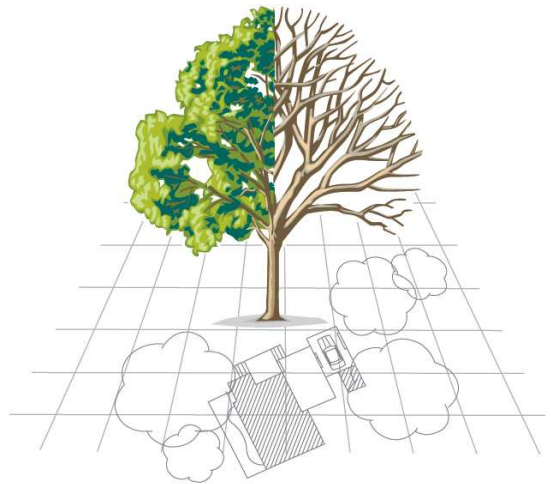
Oculus (2001). *Urban Bushland in the Ryde LGA*. Unpublished report prepared for Ryde City Council.

Tozer, M (2003) The native vegetation of the Cumberland Plain, western Sydney: systematic classification and field identification of communities. *Cunninghamia* 8(1).

APPENDIX G

'University Creek Catchment Area Macquarie park, NSW' prepared by
Naturally Trees Aboricultural Consulting (2009)

Tree Audit



DRAFT

University Creek Catchment Area
Macquarie Park, NSW

Prepared for
Macquarie University Sydney

Naturally Trees Arboricultural Consulting

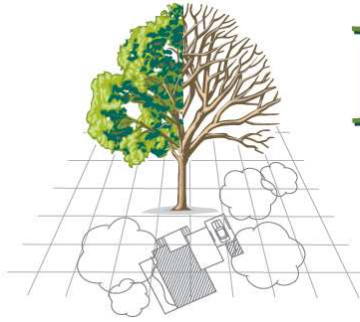
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Naturally Trees

28 Coolangatta Avenue, Elanora Heights NSW 2101
Phone: (02) 9970 6332 Mobile: 0417 250 420

28 October 2009

TREE AUDIT

1. INTRODUCTION

- 1.1 **Summary:** Naturally Trees was commissioned by Definity Group to inspect the surveyed tree population adjacent University Creek Catchment Area, Macquarie Park. The survey was conducted to identify the primary root zones, general age, health, condition, and species of the tree population. Comments of the significance of Australian Natives, in particular Sydney Turpentine Iron Bark community trees will be provided.
- 1.2 **Qualifications and experience:** Conclusions and tree appraisals have been reached in light of my experience and qualifications in arboriculture, a summary of which is included in Appendix 1.
- 1.3 **Documents and information provided:** The following documentation was provided to aid the preparation of this report.
- Survey Plan, Dwg No. 32366DT (Sheets 1 to 3), by Lockley Land Title Solutions dated 24 September 2009.
- 1.4 **Scope of this report:** This report is based upon site observations and information provided by the client. This report is solely concerned with trees of height greater than 3m, located within the study area. The report takes no account of other trees, shrubs or groundcovers within the site unless stated otherwise.



- 1.5 **The study site:** University Creek Catchment Area is located within Macquarie Park (refer figure 1). The site area (creek) runs in an east-west alignment located between University Avenue, to the east, and the grassed football field, to the west.



Figure 1: The location of the subject site (www.Whereis.com.au).

- 1.6 **The subject trees:** The site area consisted of two hundred and twenty one (221) trees of varying size, vigour, structural condition and thus amenity value. The subject trees were of various species including mostly native, endemic and exotic species of differing maturity. The location and numbers of the subject trees have been illustrated within the Survey Plan, Dwg No. 32366DT (Sheets 1 to 3), by Lockley Land Title Solutions dated 24 September 2009.
- 1.7 **Location of dominant tree species:** I have illustrated the dominant tree locations on the Species Location Plan included as Appendix 5. This plan is for illustrative purposes only and it should not be used for directly scaling measurements.

2. METHODOLOGY

- 2.1 **Site visit:** I carried out an unaccompanied site visit on 23 October 2009. All observations were taken from ground level only without detailed investigations. All dimensions were estimated unless otherwise indicated. The weather at the time of inspection was fine and dry, with good visibility.
- 2.2 **Tree Assessment:** Trees were assessed using Visual Tree Assessment (VTA) techniques (Mattheck, 2004). All relevant information regarding specific details of each subject tree is provided within the Tree Schedule at Appendix 2.



3. DISCUSSION

3.1 **General tree population:** A total of 221 trees were identified within the survey area. The majority of the tree population is of an even age, displays good health and structural condition and are worthy of long term retention. Based on the lack of understorey plantings and plant diversity, I assume that the stand of Sydney Blue Gums and River She-Oaks are planted specimens that have not naturalised in the area. The forested area located north-east of the grass football field appears to be naturalised whereas the small strip located between the football field and creek is a mix of naturalised trees and other planted species.

3.2 **Tree population:** The tree population consists of the following tree species:

Botanical name	Common name	Qty.
<i>Angophora costata</i>	Sydney Red Gum	35
<i>Casuarina cunninghamiana</i>	River She-Oak	45
<i>Ceratopetalum gummiferum</i>	NSW Christmas Bush	1
<i>Cinnamomum camphora</i>	Camphor laurel	8
<i>Corymbia gummifera</i>	Red Bloodwood	2
<i>Eucalyptus eugenioides</i>	Thin-leaved Stringy bark	6
<i>Eucalyptus moluccana</i>	Grey Box	1
<i>Eucalyptus pilularis</i>	Blackbutt	8
<i>Eucalyptus punctata</i>	Grey Gum	1
<i>Eucalyptus saligna</i>	Sydney Blue Gum	40
<i>Eucalyptus sp. (DEAD)</i>	Gum	6
<i>Ligustrum sp.</i>	Privet	11
<i>Melaleuca quinquenervia</i>	Large Leaved Paperbark	19
<i>Melia azedarach</i>	White Cedar	1
<i>Pinus radiata</i>	Monterey Pine	8
<i>Pittosporum undulatum</i>	Sweet Pittosporum	6
<i>Syagrus romanzoffianum</i>	Cocus Palm	1
<i>Syncarpia glomulifera</i>	Turpentine	22

The table above suggests that *Eucalyptus saligna*, *Angophora costata* and *Casuarina cunninghamiana* are the dominant species (largest quantities) followed by *Syncarpia glomulifera* and *Melaleuca quinquenervia*.

Undesirable and/or weed species include *Cinnamomum camphora*, *Ligustrum sp.*, *Syagrus romanzoffianum* and *Pinus radiata*.

3.3 **Undesirable species:** *Pinus radiata* has a recognised weed potential both in Australia and overseas. Research to date has demonstrated its invasive potential and its ability to alter structure and species composition of native vegetation. This leads to an impoverished plant community and reduced habitat value for native fauna, particularly where native vegetation is already greatly reduced.



While much is known about establishment and growth of pines in plantations, the ecology of pines invading native vegetation in Australia is less documented. Radiata Pines are known to invade heathland and heathy woodland, lowland grassland and grassy woodland, dry sclerophyll forest and woodland, damp sclerophyll forest, and riparian vegetation (Carr *et al* 1992). Pines have winged seeds which aid their dispersal into bushland where they compete with native species.

Other undesirable trees, *Cinnamomum camphora*, *Ligustrum sp.* and *Syagrus romanzoffianum*, should be removed to prevent them from invading the surrounding vegetation.

- 3.4 **Sydney Turpentine-Ironbark Forest:** The Sydney Turpentine-Ironbark Forest is one of six indigenous forest communities of the Sydney area. This forest community has been classified as Endangered, under the New South Wales *Threatened Species Conservation Act 1995* (TSC Act), with only around 0.5% of its original pre-settlement range remaining. In August 2005, the Sydney Turpentine-Ironbark Forest was reclassified as a "Critically Endangered Ecological Community", under the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), (http://en.wikipedia.org/wiki/Sydney_Turpentine-Ironbark_Forest).

The main canopy trees in this typical forest community are Turpentine (*Syncarpia glomulifera*) and a variety of Ironbark species including Grey Ironbark (*Eucalyptus paniculata*), Narrow-leaved Ironbark (*Eucalyptus crebra*), Red Ironbark (*Eucalyptus fibrosa*), and Grey Gum (*Eucalyptus punctata*). Mountain Mahogany (*Eucalyptus notabilis*) have been noted as being found in association with Turpentine's on the shale caps of the Hornsby plateau.

In higher rainfall and elevation areas, Turpentine-Ironbark forest often intermingles with Blue Gum High Forest and are dominated by Blue Gum (*Eucalyptus saligna*), Mountain Grey Gum (*Eucalyptus cypellocarpa*) or Round-leaved Gum (*Eucalyptus deanei*).

Understorey plants within the community include wattles such as Parramatta Green Wattle (*Acacia parramattensis*) and Sydney Golden Wattle (*Acacia longifolia*), the Common Hop Bush (*Dodenaea triquetra*), as well as native grasses, herbs and flowers such as Kangaroo Grass (*Themeda australis*) and Australian Bluebell (*Wahlenbergia gracilis*).

Species within the site area that are typical to the Sydney Turpentine-Ironbark Forest include (40) *Eucalyptus saligna*, (1) *Eucalyptus punctata* and (22) *Syncarpia glomulifera*.

- 3.5 **Blue Gum High Forest:** The Blue Gum High Forest is listed as a critically endangered ecological community under the EPBC Act. It is also listed as an endangered ecological community in NSW under the NSW TSC Act. Most of



the original forest has been cleared, with less than 5% remaining. The remaining remnant forests can be found within the Hornsby, Ku-ring-gai and Baulkham Hills government areas.

Main canopy trees in this forest community are *Eucalyptus saligna* (Sydney Blue Gum), *Angophora costata* (Sydney Red Gum) and *Eucalyptus pilularis* (Blackbutt).

4. BIBLIOGRAPHY

4.1 List of references:

Australian Standard AS4373-2007 *Pruning of Amenity Trees*.
Standards Australia.

Brooker, M. Kleinig, D (1999) Field guide to eucalypts – South eastern Aust.
Blooming Books, Hawthorn Vic.

Kozlowski, T.T & Pallardy, S.G (1997) Growth Control in Woody Plants
Academic Press, San Diego.

Matheny, N. Clark, J (1999) Arboriculture
Prentice-Hall, Inc. New Jersey 07458

Robinson, L (1994) Field Guide to the Native Plants of Sydney
Kangaroo Press, Kenthurst NSW

Shigo, A (1989) A New Tree Biology
Sherwin Dodge Printers, Littleton, New Hampshire



5. DISCLAIMER

5.1 Limitations on use of this report:

This report is to be utilized in its entirety only. Any written or verbal submission, report or presentation that includes statements taken from the findings, discussions, conclusions or recommendations made in this report, may only be used where the whole of the original report (or a copy) is referenced in, and directly attached to that submission, report or presentation.

ASSUMPTIONS

Care has been taken to obtain all information from reliable sources. All data has been verified insofar as possible: however, Naturally Trees can neither guarantee nor be responsible for the accuracy of information provided by others.

Unless stated otherwise:

- *Information contained in this report covers only those trees that were examined and reflects the condition of those trees at time of inspection: and*
- *The inspection was limited to visual examination of the subject trees without dissection, excavation, probing or coring. There is no warranty or guarantee, expressed or implied, that problems or deficiencies of the subject trees may not arise in the future.*

Yours sincerely



Andrew Scales

Manager/ Consultant
Member NAAA
Dip. Horticulture / Arboriculture

DRAFT



APPENDIX 1

Brief qualifications and experience of Andrew Scales

1. Qualifications:

Associate Diploma Horticulture	Northern Sydney Institute of TAFE	1995-1998
Certificate in Tree Surgery	Northern Sydney Institute of TAFE	1998
Associate Diploma Arboriculture	Northern Sydney Institute of TAFE	1999-2006

2. **Practical experience:** Being involved in the arboricultural/horticultural industry for in excess of 10 years, I have developed skills and expertise recognized in the industry. Involvement in the construction industry and tertiary studies has provided me with a good knowledge of tree requirements within construction sites.

As director of Naturally Trees, in this year alone I have undertaken hundreds of arboricultural consultancy projects and have been engaged by a range of clients to undertake tree assessments. I have gained a wide range of practical tree knowledge through tree removal and pruning works.

3. Continuing professional development:

Visual Tree Assessment (Prof. Dr. Claus Mattheck)	Northern Sydney Institute of TAFE	2001
Wood Decay in Trees (F.W.M.R.Schwarze)	Northern Sydney Institute of TAFE	2004
Visual Tree Assessment (Prof. Dr. Claus Mattheck)	Carlton Hotel, Parramatta NSW	2004
Tree A-Z / Report Writing (Jeremy Barrell)	Northern Sydney Institute of TAFE	2006
Up by Roots – Healthy Soils and Trees in the Built Environment (James Urban)	The Sebel Parramatta NSW	2008
Tree Injection Course (Statement of Attainment)	Northern Sydney Institute of TAFE	2008

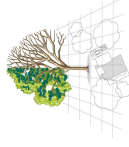
4. Current professional memberships:

NAAA – National Arborists Association of Australia (Approved Consulting Arborist)



APPENDIX 2 Tree schedule

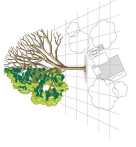
No.	Species	Height	Spread	DBH	TPZ	Age Class	Foliage cover	Location	Services	SULE	Significance	Defects
400	Eucalyptus saligna	35	13	600-700	12000	M	90%	Grass	Nil	Long	H	Nil
401	Eucalyptus saligna	20	9	500-600	12000	M	90%	Dripline disturbance	Road verge	Remove	M	Cavity, Bracket fungi,
402	Eucalyptus saligna	35	12	500-600	7800	M	80%	Grass	Nil	Long	H	Nil
403	Eucalyptus saligna	36	14	800-900	6600	M	90%	Dripline disturbance	Nil	Long	H	Failures,
404	Eucalyptus saligna	15	9	200-300	6600	S	80%	Dripline disturbance	Nil	Long	L	Nil
405	Eucalyptus saligna	26	10	300-400	10200	M	80%	Grass	Nil	Long	M	Nil
406	Eucalyptus saligna	14	7	200-300	3000	M	90%	Grass	Nil	Long	M	Nil
407	Eucalyptus saligna	24	10	300-400	4200	M	80%	Grass	Nil	Long	H	Nil
408	Melaleuca quinquenervia	6	6	200-300	3000	M	90%	Grass	Nil	Long	L	Nil
409	Melaleuca quinquenervia	14	7	400-500	4200	M	90%	Grass	Nil	Long	M	Nil
410	Eucalyptus saligna	19	9	300-400	3000	M	80%	Grass	Nil	Long	H	Nil
411	Eucalyptus saligna	33	11	500-600	5400	M	90%	Grass	Nil	Long	H	Nil
412	Eucalyptus saligna	35	12	400-500	4200	M	90%	Grass	Nil	Long	H	Nil
413	Melaleuca quinquenervia	8	5	200-300	6600	M	90%	Grass	Nil	Long	L	Nil
414	Melaleuca quinquenervia	10	5	200-300	5400	M	80%	Grass	Nil	Long	L	Nil
415	Melaleuca quinquenervia	10	5	300-400	3000	M	80%	Grass	Nil	Long	L	Nil
416	Melaleuca quinquenervia	8	7	300-400	3000	M	80%	Grass	Nil	Long	L	Nil
417	Melaleuca quinquenervia	8	4	100-200	4200	S	90%	Grass	Nil	Long	L	Nil
418	Eucalyptus saligna	34	13	500-600	4200	M	90%	Grass	Nil	Short	H	Initial borer damage, cracking on low bark
419	Eucalyptus saligna	35	10	500-600	2500	M	90%	Grass	Nil	Long	M	Nil
420	Eucalyptus saligna	34	15	500-600	6600	M	90%	Grass	Nil	Long	H	Nil
421	Eucalyptus saligna	14	5	200-300	6600	M	10%	Grass	Nil	Remove	L	Failure of upper crown
422	Melaleuca quinquenervia	6	11	300-400	6600	M	90%	Grass	Nil	Long	M	Nil
423	Melaleuca quinquenervia	12	6	300-400	3000	M	90%	Grass	Nil	Long	M	Nil
424	Eucalyptus saligna	19	11	300-400	4200	M	90%	Grass	Nil	Medium	M	Failures,
425	Eucalyptus saligna	36	13	600-700	4200	M	90%	Grass	Nil	Long	H	Nil
426	Eucalyptus saligna	32	13	400-500	4200	M	90%	Grass	Nil	Long	M	Nil
427	Eucalyptus saligna	9	6	100-200	7800	S	60%	Grass	Nil	Short	L	Nil



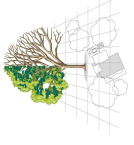
No.	Species	Height	Spread	DBH	TPZ	Age Class	Foliage cover	Location	Services	SULE	Significance	Defects
428	Eucalyptus saligna	25	14	400-500	5400	M	90%	Grass	Nil	Long	M	Nil
429	Syncarpia glomulifera	12	6	300-400	2500	M	90%	Grass	Nil	Long	M	Nil
430	Eucalyptus saligna	22	10	200-300	5400	M	90%	Grass	Nil	Long	M	Nil
431	Eucalyptus saligna	35	12	500-600	4200	M	90%	Grass	Nil	Medium	H	Cavity @ 6m, Inspection required
432	Melaleuca quinquenervia	11	7	300-400	3000	M	80%	Grass	Nil	Long	M	Nil
433	Melaleuca quinquenervia	14	7	400-500	6600	M	90%	Grass	Nil	Long	M	Nil
434	Melaleuca quinquenervia	9	4	300-400	4200	M	80%	Grass	Nil	Long	L	Nil
435	Melaleuca quinquenervia	9	5	200-300	5400	M	80%	Grass	Nil	Long	M	Nil
436	Melaleuca quinquenervia	6	3	100-200	4200	S	80%	Grass	Nil	Long	L	Nil
437	Melaleuca quinquenervia	12	5	300-400	3000	M	80%	Grass	Nil	Long	M	Nil
438	Eucalyptus saligna	35	12	500-600	2500	M	90%	Grass	Nil	Long	H	Nil
439	Eucalyptus saligna	34	15	600-700	4200	M	90%	Grass	Nil	Long	M	Nil
440	Eucalyptus saligna	35	12	600-700	6600	M	90%	Grass	Nil	Long	H	Failures,
441	Eucalyptus saligna	34	14	500-600	7800	M	90%	Grass	Nil	Long	H	Nil
442	Eucalyptus saligna	18	10	300-400	7800	O	70%	Grass	Nil	Remove	L	Cavity, Bracket fungi,
443	Syncarpia glomulifera	13	4	200-300	6600	M	90%	Grass	Nil	Long	M	Nil
444	Eucalyptus saligna	12	9	300-400	4200	M	80%	Dripline disturbance	Road verge	Remove	L	Cavity in trunk base
445	Eucalyptus saligna	26	20	1000	3000	M	90%	Grass	Road verge	Long	H	Nil
446	Syncarpia glomulifera	16	8	500-600	4200	M	90%	Grass	Nil	Long	M	Nil
447	Syncarpia glomulifera	14	8	500-600	6600	M	90%	Grass	Nil	Long	M	Nil
448	Eucalyptus saligna	19	9	400-500	6600	M	90%	Grass	Nil	Short	M	Cavity @ 9m with active bee nest
449	Eucalyptus saligna	32	15	500-600	5400	M	90%	Grass	Nil	Long	H	Nil
450	Eucalyptus saligna	32	16	600-700	6600	M	90%	Grass	Nil	Long	H	Nil
451	Eucalyptus saligna	33	13	600-700	7800	M	90%	Grass	Nil	Long	H	Nil
452	Eucalyptus saligna	16	9	300-400	7800	M	80%	Grass	Nil	Long	M	Nil
453	Syncarpia glomulifera	15	8	500-600	4200	M	90%	Grass	Nil	Long	M	Nil
454	Syncarpia glomulifera	14	7	300-400	6600	M	80%	Grass	Nil	Long	M	Nil
455	Syncarpia glomulifera	13	7	400-500	4200	M	90%	Grass	Nil	Long	M	Nil
456	Casuarina cunninghamiana	20	10	500-600	5400	M	80%	Grass	Nil	Long	H	Nil
457	Casuarina cunninghamiana	20	10	500-600	6600	M	80%	Grass	Nil	Long	H	Nil
458	Casuarina cunninghamiana	20	10	500-600	6600	M	80%	Grass	Nil	Long	H	Nil
459	Casuarina cunninghamiana	20	10	500-600	6600	M	80%	Grass	Nil	Long	H	Nil



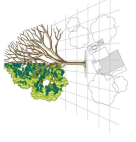
No.	Species	Height	Spread	DBH	TPZ	Age Class	Foliage cover	Location	Services	SULE	Significance	Defects
460	Casuarina cunninghamiana	20	10	500-600	6600	M	80%	Grass	Nil	Long	H	Nil
461	Casuarina cunninghamiana	20	8	300-400	6600	M	80%	Grass	Nil	Long	H	Nil
462	Casuarina cunninghamiana	20	8	300-400	4200	M	80%	Grass	Nil	Long	H	Nil
463	Casuarina cunninghamiana	20	8	300-400	4200	M	80%	Grass	Nil	Long	H	Nil
464	Casuarina cunninghamiana	20	8	300-400	4200	M	80%	Grass	Nil	Long	H	Nil
465	Casuarina cunninghamiana	20	8	300-400	4200	M	80%	Grass	Nil	Long	H	Nil
466	Casuarina cunninghamiana	20	8	300-400	4200	M	80%	Grass	Nil	Long	H	Nil
467	Casuarina cunninghamiana	20	8	300-400	4200	M	80%	Grass	Nil	Long	H	Nil
468	Casuarina cunninghamiana	20	8	300-400	4200	M	80%	Grass	Nil	Long	H	Nil
469	Casuarina cunninghamiana	20	8	300-400	4200	M	80%	Grass	Nil	Long	H	Nil
470	Casuarina cunninghamiana	20	8	300-400	4200	M	80%	Grass	Nil	Long	H	Nil
471	Casuarina cunninghamiana	20	8	300-400	4200	M	80%	Grass	Nil	Long	H	Nil
472	Casuarina cunninghamiana	20	8	300-400	4200	M	80%	Grass	Nil	Long	H	Nil
473	Casuarina cunninghamiana	20	8	300-400	4200	M	80%	Grass	Nil	Long	H	Nil
474	Casuarina cunninghamiana	20	8	300-400	4200	M	80%	Grass	Nil	Long	H	Nil
475	Casuarina cunninghamiana	20	8	300-400	4200	M	80%	Grass	Nil	Long	H	Nil
476	Casuarina cunninghamiana	20	7	200-300	4200	M	80%	Grass	Nil	Medium	M	Nil
477	Casuarina cunninghamiana	20	7	200-300	3000	M	80%	Grass	Nil	Medium	M	Nil
478	Casuarina cunninghamiana	20	7	200-300	3000	M	80%	Grass	Nil	Medium	M	Nil
479	Casuarina cunninghamiana	20	7	200-300	3000	M	80%	Grass	Nil	Medium	M	Nil
480	Casuarina cunninghamiana	20	7	200-300	3000	M	80%	Grass	Nil	Medium	M	Nil
481	Casuarina cunninghamiana	18	6	300-400	3000	M	80%	Grass	Nil	Medium	M	Nil
482	Casuarina cunninghamiana	18	6	300-400	4200	M	80%	Grass	Nil	Medium	M	Nil
483	Casuarina cunninghamiana	18	6	300-400	4200	M	80%	Grass	Nil	Medium	M	Nil
484	Casuarina cunninghamiana	18	6	300-400	4200	M	80%	Grass	Nil	Medium	M	Nil
485	Casuarina cunninghamiana	18	6	300-400	4200	M	80%	Grass	Nil	Medium	M	Nil
486	Casuarina cunninghamiana	18	6	300-400	4200	M	80%	Grass	Nil	Medium	M	Nil
487	Syncarpia glomulifera	16	10	500-600	4200	M	80%	Grass	Nil	Long	M	Nil
488	Casuarina cunninghamiana	18	8	300-400	6600	M	80%	Grass	Nil	Medium	M	Nil
489	Casuarina cunninghamiana	18	6	300-400	4200	M	80%	Grass	Nil	Medium	M	Nil
490	Casuarina cunninghamiana	20	7	500-600	4200	M	80%	Grass	Nil	Medium	M	Nil
491	Casuarina cunninghamiana	20	7	500-600	6600	M	80%	Grass	Nil	Medium	M	Nil
492	Casuarina cunninghamiana	20	7	500-600	6600	M	80%	Grass	Nil	Medium	M	Nil
493	Casuarina cunninghamiana	20	7	500-600	6600	M	80%	Grass	Nil	Medium	M	Nil



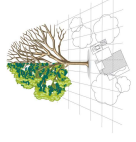
No.	Species	Height	Spread	DBH	TPZ	Age Class	Foliage cover	Location	Services	SULE	Significance	Defects
494	Casuarina cunninghamiana	25	13	500-600	6600	O	70%	Grass	Nil	Short	H	Nil
495	Casuarina cunninghamiana	25	9	500-600	6600	M	80%	Grass	Nil	Long	H	Nil
496	Eucalyptus saligna	25	16	600-700	6600	M	90%	Grass	Nil	Remove	H	Cavity, Bracket fungi,
497	Eucalyptus saligna	24	15	600-700	7800	M	80%	Grass	Road verge	Long	H	Failures,
498	Eucalyptus saligna	25	16	600-700	7800	M	70%	Grass	Road verge	Remove	H	Included Bark, Failure @ 7m, Inspection required
499	Casuarina cunninghamiana	22	12	500-600	7800	M	80%	Grass	Nil	Medium	M	Nil
500	Casuarina cunninghamiana	22	8	300-400	6600	M	80%	Grass	Nil	Medium	M	Nil
501	Casuarina cunninghamiana	22	12	500-600	4200	M	80%	Grass	Nil	Medium	M	Nil
502	Casuarina cunninghamiana	25	13	600-700	6600	M	70%	Grass	Nil	Medium	H	Nil
503	Syncarpia glomulifera	15	7	300-400	7800	M	80%	Grass	Nil	Medium	L	Nil
504	Syncarpia glomulifera	14	8	400-500	4200	M	80%	Grass	Nil	Long	M	Nil
505	Melaleuca quinquenervia	14	4	200-300	5400	M	60%	Grass	Nil	Short	L	Nil
506	Melaleuca quinquenervia	9	5	200-300	3000	M	70%	Grass	Nil	Medium	L	Nil
507	Melaleuca quinquenervia	12	6	300-400	3000	M	70%	Grass	Nil	Medium	L	Nil
508	Melaleuca quinquenervia	9	7	400-500	4200	M	80%	Grass	Nil	Medium	M	Nil
509	Casuarina cunninghamiana	25	15	600-700	5400	M	70%	Grass	Nil	Medium	H	Nil
510	Syncarpia glomulifera	17	13	800-900	7800	M	80%	Grass	Road verge	Long	H	Moderate Included Bark,
511	Syncarpia glomulifera	17	13	700-800	10200	M	80%	Grass	Nil	Long	H	Nil
512	Syncarpia glomulifera	18	14	>1000	9000	M	80%	Grass	Nil	Long	H	Moderate Included Bark, Co-dominant
513	Syncarpia glomulifera	9	6	200-300	12000	M	90%	Grass	Nil	Long	M	Nil
514	Syncarpia glomulifera	12	6	300-400	3000	M	90%	Grass	Nil	Long	M	Nil
515	Syncarpia glomulifera	12	5	200-300	4200	M	80%	Grass	Nil	Long	M	Nil
516	Casuarina cunninghamiana	26	13	600-700	3000	M	70%	Grass	Nil	Medium	H	Nil
517	Cinnamomum camphora	17	13	500-600	7800	O	60%	Grass	Nil	Short	M	Dieback in canopy
518	Eucalyptus sp.	16	10	800-900	6600	O	10%	Grass	Nil	Unstable	M	Cavity, Termite, Failures,
519	Angophora costata	20	17	700-800	10200	M	80%	Grass	Nil	Long	H	Nil
520	Syncarpia glomulifera	17	17	1000	9000	M	90%	Grass	Nil	Long	H	Co-dominant
521	Syncarpia glomulifera	14	9	500-600	6600	M	90%	Dripline disturbance	Nil	Long	M	Nil
522	Syncarpia glomulifera	17	9	500-600	6600	M	80%	Grass	Nil	Long	M	Nil
523	Syncarpia glomulifera	16	9	300-400	4200	M	80%	Grass	Nil	Medium	M	Co-dominant



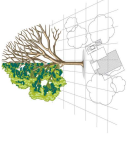
No.	Species	Height	Spread	DBH	TPZ	Age Class	Foliage cover	Location	Services	SULE	Significance	Defects
524	Angophora costata	23	14	400-500	5400	M	90%	Natural ground	Nil	Long	H	Nil
525	Angophora costata	23	14	400-500	5400	M	90%	Natural ground	Nil	Long	H	Nil
526	Angophora costata	23	14	400-500	5400	M	90%	Natural ground	Nil	Long	H	Nil
527	Angophora costata	25	14	500-600	6600	M	90%	Natural ground	Nil	Long	H	Nil
528	Eucalyptus eugeniooides	9	5	100-200	2500	S	80%	Natural ground	Nil	Medium	L	Nil
529	Angophora costata	16	12	200-300	3000	M	80%	Natural ground	Nil	Long	H	Nil
530	Eucalyptus pilularis	28	20	>1000	12000	M	80%	Natural ground	Nil	Long	H	Arboreal termites
531	Cinnamomum camphora	11	6	100-200	2500	M	70%	Natural ground	Nil	Remove	L	Nil
532	Cinnamomum camphora	11	6	100-200	2500	M	70%	Natural ground	Nil	Remove	L	Nil
533	Cinnamomum camphora	11	6	100-200	2500	M	70%	Natural ground	Nil	Remove	L	Nil
534	Eucalyptus sp.	12	1	200-300	3000	O	0%	Natural ground	Nil	Unstable	L	Borer,
535	Angophora costata	24	15	500-600	6600	M	90%	Natural ground	Nil	Long	H	Nil
536	Angophora costata	23	14	400-500	5400	M	90%	Natural ground	Nil	Long	H	Nil
537	Angophora costata	23	13	400-500	5400	M	90%	Natural ground	Nil	Long	H	Nil
538	Angophora costata	23	10	400-500	5400	M	90%	Natural ground	Nil	Long	H	Nil
539	Angophora costata	24	14	400-500	5400	M	90%	Natural ground	Nil	Long	H	Nil
540	Corymbia gummifera	15	4	200-300	3000	M	70%	Natural ground	Nil	Medium	L	Nil
541	Angophora costata	23	14	400-500	5400	M	90%	Natural ground	Nil	Long	H	Failures,
542	Corymbia gummifera	20	7	400-500	5400	O	40%	Natural ground	Nil	Remove	M	Borer,
543	Angophora costata	15	3	100-200	2500	M	50%	Natural ground	Nil	Remove	L	Nil
544	Angophora costata	22	8	300-400	4200	M	70%	Natural ground	Nil	Medium	M	Nil



No.	Species	Height	Spread	DBH	TPZ	Age Class	Foliage cover	Location	Services	SULE	Significance	Defects
545	Angophora costata	20	6	400-500	5400	M	60%	Natural ground	Nil	Short	M	Nil
546	Angophora costata	20	6	400-500	5400	M	60%	Natural ground	Nil	Remove	M	Co-dominant Cavity, Failures,
547	Angophora costata	23	14	500-600	6600		90%	Natural ground	Nil	Long	H	Nil
548	Angophora costata	23	10	300-400	4200		90%	Natural ground	Nil	Long	H	Nil
549	Angophora costata	24	13	300-400	4200		90%	Natural ground	Nil	Long	H	Nil
550	Angophora costata	9	5	100-200	2500	M	70%	Natural ground	Nil	Short	L	Failures,
551	Eucalyptus eugeniooides	17	11	400-500	5400	O	70%	Natural ground	Nil	Short	M	Epicormic shoots,
552	Angophora costata	17	12	400-500	5400	M	80%	Natural ground	Nil	Long	H	Nil
553	Ceratopetalum gummiferum	8	6	200-300	3000	M	70%	Natural ground	Nil	Medium	L	Nil
554	Angophora costata	17	12	400-500	5400	M	80%	Natural ground	Nil	Long	H	Nil
555	Angophora costata	22	17	700-800	9000	M	80%	Natural ground	Nil	Long	H	Nil
556	Angophora costata	23	14	500-600	6600	M	90%	Natural ground	Nil	Long	H	Nil
557	Angophora costata	24	14	600-700	7800	M	80%	Natural ground	Nil	Short	H	Cavity @ 9m
558	Angophora costata	18	12	500-600	6600	M	90%	Natural ground	Nil	Long	H	Nil
559	Eucalyptus saligna	19	9	300-400	4200	M	80%	Natural ground	Nil	Long	M	Nil
560	Angophora costata	25	13	700-800	9000	M	80%	Natural ground	Nil	Long	H	Nil
561	Angophora costata	13	5	200-300	3000		90%	Natural ground	Nil	Long	M	Nil
562	Cinnamomum camphora	8	6	200-300	3000	M	50%	Natural ground	Nil	Remove	L	Failures,
563	Eucalyptus sp.	8	1	600-700	7800	O	0%	Natural ground	Nil	Unstable	L	Failures, Decay,
564	Ligustrum sp.	6	4	100-200	2500	M	100%	Natural ground	Nil	Remove	L	Nil
565	Eucalyptus pilularis	10	5	200-300	3000	M	80%	Natural ground	Nil	Medium	L	Nil



No.	Species	Height	Spread	DBH	TPZ	Age Class	Foliage cover	Location	Services	SULE	Significance	Defects
566	Eucalyptus pilularis	27	14	700-800	9000	M	90%	Natural ground	Nil	Long	H	Nil
567	Eucalyptus pilularis	14	7	200-300	3000	M	80%	Natural ground	Nil	Medium	L	Nil
568	Eucalyptus paniculata	28	17	600-700	7800	M	90%	Natural ground	Nil	Long	H	Nil
569	Pittosporum undulatum	6	6	100-200	2500	M	80%	Natural ground	Nil	Medium	L	Nil
570	Angophora costata	13	12	300-400	4200	M	90%	Natural ground	Nil	Medium	M	Nil
571	Eucalyptus punctata	20	12	400-500	5400	M	80%	Natural ground	Nil	Medium	H	Nil
572	Cinnamomum camphora	9	6	200-300	3000	M	80%	Natural ground	Nil	Remove	L	Nil
573	Ligustrum sp.	6	4	100-200	2500	M	90%	Natural ground	Nil	Remove	L	Nil
574	Ligustrum sp.	6	4	100-200	2500	M	90%	Natural ground	Nil	Remove	L	Nil
575	Angophora costata	13	9	200-300	3000	M	80%	Natural ground	Nil	Medium	M	Nil
576	Angophora costata	18	16	700-800	9000	M	90%	Natural ground	Nil	Long	H	Nil
577	Eucalyptus sp.	10	2	400-500	5400	O	0%	Natural ground	Nil	Unstable	L	Cavity, Decay, Borer,
578	Pittosporum undulatum	7	6	200-300	3000	M	90%	Natural ground	Nil	Medium	L	Failures,
579	Eucalyptus pilularis	15	8	300-400	4200	M	80%	Natural ground	Nil	Medium	M	Nil
580	Ligustrum sp.	6	3	100-200	2500	S	90%	Natural ground	Nil	Remove	L	Nil
581	Angophora costata	8	5	100-200	2500	M	80%	Natural ground	Nil	Short	L	Cavity,
582	Angophora costata	16	10	300-400	4200	M	80%	Natural ground	Nil	Medium	M	Nil
583	Eucalyptus pilularis	28	16	>1000	12000	M	80%	Natural ground	Nil	Long	H	Nil
584	Angophora costata	11	5	300-400	4200	M	80%	Natural ground	Nil	Short	M	Cavity in trunk base
585	Eucalyptus pilularis	18	13	500-600	6600	M	80%	Natural ground	Nil	Long	H	Nil
586	Eucalyptus sp.	13	1	200-300	3000	O	0%	Natural ground	Nil	Unstable	L	Borer,



No.	Species	Height	Spread	DBH	TPZ	Age Class	Foliage cover	Location	Services	SULE	Significance	Defects
587	<i>Syncarpia glomulifera</i>	13	9	400-500	5400	O	0%	Natural ground	Nil	Unstable	M	Nil
588	<i>Eucalyptus eugeniooides</i>	16	13	500-600	6600	M	80%	Natural ground	Nil	Medium	M	Nil
589	<i>Pittosporum undulatum</i>	8	7	300-400	4200	M	80%	Natural ground	Nil	Medium	L	Nil
590	<i>Ligustrum sp.</i>	8	4	200-300	3000	M	80%	Natural ground	Nil	Remove	L	Nil
591	<i>Eucalyptus eugeniooides</i>	15	11	400-500	5400	O	40%	Natural ground	Nil	Remove	M	Cavity, Termite,
592	<i>Ligustrum sp.</i>	8	4	200-300	3000	M	80%	Natural ground	Nil	Remove	L	Nil
593	<i>Pittosporum undulatum</i>	8	7	300-400	4200	M	80%	Natural ground	Nil	Medium	L	Nil
594	<i>Eucalyptus sp.</i>	15	10	500-600	6600	O	0%	Natural ground	Nil	Unstable	M	Nil
595	<i>Ligustrum sp.</i>	7	4	100-200	2500	M	80%	Natural ground	Nil	Remove	L	Nil
596	<i>Angophora costata</i>	17	12	500-600	6600	M	80%	Natural ground	Nil	Long	H	Nil
597	<i>Syncarpia glomulifera</i>	11	7	200-300	3000	M	90%	Natural ground	Nil	Long	M	Nil
598	<i>Ligustrum sp.</i>	7	4	100-200	2500	M	80%	Natural ground	Nil	Remove	L	Nil
599	<i>Ligustrum sp.</i>	7	4	100-200	2500	M	80%	Natural ground	Nil	Remove	L	Nil
600	<i>Eucalyptus eugeniooides</i>	19	13	500-600	6600	M	80%	Natural ground	Nil	Medium	M	Nil
601	<i>Pittosporum undulatum</i>	8	7	300-400	4200	M	80%	Natural ground	Nil	Medium	L	Nil
602	<i>Melia azaderach</i>	9	9	300-400	4200	M	80%	Natural ground	Nil	Medium	M	Nil
603	<i>Cinnamomum camphora</i>	9	4	200-300	3000	O	20%	Natural ground	Nil	Remove	L	Nil
604	<i>Eucalyptus eugeniooides</i>	18	14	600-700	7800	M	80%	Natural ground	Nil	Medium	H	Nil
605	<i>Syagrus romanzoffianum</i>	8	4	300-400	4200	M	90%	Natural ground	Nil	Long	L	Nil
606	<i>Cinnamomum camphora</i>	7	1	200-300	3000	O	0%	Natural ground	Nil	Unstable	L	Nil
607	<i>Ligustrum sp.</i>	7	3	100-200	2500	M	80%	Natural ground	Nil	Remove	L	Nil



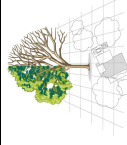
No.	Species	Height	Spread	DBH	TPZ	Age Class	Foliage cover	Location	Services	SULE	Significance	Defects
608	Eucalyptus moluccana	15	12	500-600	6600	M	80%	Natural ground	Nil	Long	H	Nil
609	Pittosporum undulatum	7	7	200-300	3000	M	80%	Natural ground	Nil	Medium	L	Nil
610	Ligustrum sp.	6	3	100-200	2500	M	70%	Natural ground	Nil	Remove	L	Nil
611	Pinus radiata	15	8	400-500	5400	O	60%	Natural ground	Nil	Short	M	Nil
612	Pinus radiata	15	10	500-600	6600	O	60%	Natural ground	Nil	Short	M	Nil
613	Pinus radiata	19	11	600-700	7800	O	60%	Natural ground	Nil	Short	M	Nil
614	Eucalyptus saligna	22	14	600-700	7800	M	90%	Grass	Nil	Long	H	Nil
615	Eucalyptus saligna	22	14	600-700	7800	M	90%	Grass	Nil	Long	H	Nil
616	Pinus radiata	17	7	300-400	4200	O	60%	Natural ground	Nil	Short	M	Nil
617	Pinus radiata	10	5	200-300	3000	O	60%	Natural ground	Nil	Short	M	Nil
618	Pinus radiata	20	10	400-500	5400	O	60%	Natural ground	Nil	Short	M	Nil
619	Pinus radiata	20	13	400-500	5400	O	60%	Natural ground	Nil	Short	M	Nil
620	Pinus radiata	20	14	400-500	5400	O	60%	Natural ground	Nil	Short	M	Nil



Explanatory Notes

- **Measurements/estimates:** All dimensions are estimates unless otherwise indicated. Measurements taken with a tape or clinometer are indicated with a '*'. Less reliable estimated dimensions are indicated with a '?'.
 - **Species:** The species identification is based on visual observations and the botanical name. In some instances, it may be difficult to quickly and accurately identify a particular tree without further detailed investigations. Where there is some doubt of the precise species of tree, it is indicated with a '?' after the name in order to avoid delay in the production of the report. The botanical name is followed by the abbreviation sp if only the genus is known. The species listed for groups and hedges represent the main component and there may be other minor species not listed.
 - **Tree number:** relates to the reference number used on site diagram/report.
 - **Height:** Height is estimated to the nearest metre.
 - **Spread:** The average crown spread is visually estimated to the nearest metre from the outermost tips of the live lateral branches.
 - **DBH:** These figures relate to 1.2m above ground level and are recorded in millimetres. If appropriate, diameter is measured with a diameter tape. 'M' indicates trees or shrubs with multiple stems.
 - **Foliage Cover:** Percent of estimated live foliage cover for particular species range.
 - **Age class:**

Y	Young = recently planted
S	Semi-mature (<20% of life expectancy)
M	Mature (20-80% of life expectancy)
O	Over-mature (>80% of life expectancy)
 - **Significance:** A tree's significance/value in the landscape takes into account its prominence from a wide range of perspectives. This includes, but is not limited to neighbour hood perspective, local perspective and site perspective. The significance of the subject trees has been categorized into three groups, such as: High, Moderate or Low significance.
 - **SULE:** See reference for SULE ratings in Appendix 3.
 - **TPZ:** See reference for Tree Protection Zone (TPZ) in Appendix 4.
 - **Defects:** See reference for defects in Appendix 4.



APPENDIX 3

SULE

During our inspections, surrounding environmental impacts and site conditions are also taken into account. Each assessment observes the condition of the tree's overall canopy, including foliage condition and coverage, branch attachments, trunk structure and possible pests and disease that may be present.

1.0 Safe Useful Life Expectancy (SULE)

The information collected from each tree is then used to determine the Safe Useful Life Expectancy (SULE) of each tree and takes into account the tree's age, the species type and life span of the species, local environment conditions, estimated life expectancy, the location of the tree and safety aspects.

The SULE method takes into account whether a tree can be retained with an acceptable level of risk based on the information available at the time of inspection. A SULE assessment is variable as it relates to the tree's health and the surrounding conditions. Whilst it is recognized that changes to the tree's condition will effect the assessment, changes to the surrounding environment may result in changes to the SULE assessment.

Table 1: Safe Useful Life Expectancy (SULE), (Barrell, 2001)

Category	Description
Long	Long, remaining life span greater than 40 years
Medium	Medium, remaining life span from 15 to 40 years
Short	Short, remaining life span from 5 to 15 years
Remove	Remove, Should be removed within 5 years
Small	Small, Young or regularly pruned, Trees that can readily be moved or replaced
<i>In addition to the categories listed above, trees that show signs of imminent structural failure are listed as 'Unstable'.</i>	
Unstable	Unstable in the ground or have significant trunk damage rendering them structurally hazardous.



APPENDIX 4

Glossary of arboricultural terms

Borer damage: Insects that bore into wood not only cause defects in wood quality but their galleries also reduce wood strength (Shigo1989). Holes in the bark and stains or oozing liquid on limbs or trunks are common borer damage symptoms. Foliage often discolors and wilts, and limbs may break. Borers mostly attack stressed or damaged trees and vigorous, well-watered trees are rarely attacked. The subject tree is stressed in its former location.

Extensive larval feeding at the inner bark-cambium-xylem interface can effectively girdle the tree. Trees at this stage of infestation are characterized by a thin canopy with wilted or dry leaves; the bark is cracked and packed with larval excrement. Infested trees are often killed in a matter of a few weeks. Resprouting may occur from the tree base and upper canopy.

Bracket fungi: Bracket fungi are the visual fruiting bodies of decaying organisms within a tree. Decay is caused by a succession of fungi that digest cell wall components. This in turn weakens the structure of the tree resulting in a hazardous structure. Unless confined by compartmentalization, decay fungi can invade heartwood for considerable vertical distances, regardless of openings. The decay progress is believed to be more rapid in old, declining trees than in young, vigorous trees (Matheny, N. Clark, J 1999).

Cavities: Hollowing of the trunk or large external wound that is sufficient to cause an increase in stresses and possible limb/tree failure. As the walls become increasingly thin, the danger of shell buckling increases. Bending stress is only to be expected when a cavity occupies more than 70% of the stem diameter.

Co-dominant stems/trunk: These forked branches or trunks of nearly the same size in diameter and lacking a normal branch union.

Dead wooding: The removal of dead branches from a tree's canopy, usually of a specified size (in diameter).

Epicormic: Fast growing, weakly attached shoots/branches that grow as a response to stress factors upon a tree

Included bark: Bark that becomes embedded in a crotch between branch and trunk or between co-dominant stems and causes a weak structure.

Leader: The primary terminal shoot or trunk of a tree.

Tree Protection Zone (TPZ): The Australian Standard for protecting trees suggests the TPZ, the minimal critical area that is required so a tree can be preserved during development, should be set out at a set distance based on the species tolerance, trunk diameter, age and vigour of the tree.

The TPZ represents the radius of a circle measured from trunk centre.

The TPZ can generally accommodate one impact within the suggested protection set out. Impact can occur on one tangent of the set out and must be supervised by a qualified Arborist (AQF5). Impacts can occur in the TPZ provided that 90% of the total TPZ remains undisturbed. Variations to these guides cannot be altered unless detailed assessment and specific tree protection measures are considered.



APPENDIX 5
Species location plan

-refer attached Species Location Plan, Dwg No. SLP01,
by Naturally Trees dated 28 October 2009

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