Horticultural Resources Consulting Group
Consulting Arborists, Functional Ecology and Residential Landscape Design

Arboricultural Implication Assessment and Tree Protection Specification

Concerning proposed new commercial building at

845 PACIFIC HIGHWAY, CHATSWOOD

Prepared for

HYG
Creating The Future

Suite 601, Level 6, 845 Pacific Highway Chatswood NSW 2067

Issue C – 20th September, 2021 by Victor John Molyneaux

B.E.;M.Eng.Sc.;M.B.A.; Diploma Level 5 Arboriculture and Garden Design

Please note: a PDF file of this report is available to by contacting victor@hrcgroup.com.au

Table of Contents

Executive Summary

An arborist assessment of the existing trees and the proposed development activities has been undertaken and found that:-

- The fabric and character of the site screening and streetscape can be retained
- The majority of the boundary screening trees to the east and south will be retained
- All neighbours trees will be retained and adequately protected as specified in the included Arboricultural Methodology Statement (Sections 2 and 3 if this report).
- As far as arboricultural issues are concerned, the development can proceed with the specified tree protection measures that will ensure that the retained trees are sustainable and thrive.

This report has three main subject areas;-

Section 1 details the formal assessment made of the two front trees, categorizes them using internationally accepted approaches and defines their attributes and amenity value.

Section 2 formally assesses the impact of the proposed excavation, building, pipe work hydraulics and landscaping activities on the trees that are to be retained. The findings are that there are likely to be no significant negative effects on the trees to be retained.

Section 3 details the Root Protection Area requirements and all procedures required to safeguard the trees.

Appendix A The **TREE PROTECTION PLAN** which clearly defines the tree locations and tree Protections measures required.

Appendix 2 Photographs of each tree and shrub

SECTION 1 FORMAL ASSESSMENT OF SITE TREES

Introduction

Client details

This report is undertaken on behalf of HYG with offices in Level 6, 845 Pacific Highway Chatswood NSW 2067.

Arborist Details

The site arboricultural survey and report compilation has been carried out by Victor John Molyneaux, Consulting Arborist with the Horticultural Resources Consulting Group. The HRC Group postal address is PO Box 1020 Eastwood NSW 2122. Telephone number (02) 9874 9888 Fax: (02) 9874 989. Email contact (preferred) victor@hrcgroup.com.au mobile number 0410 755 338.

Victor John Molyneaux has a Civil Engineering degree and Master's degrees in Science and Business Administration. Victor is a seasoned Arborist physically working with removal of large trees and progressing with his Arboriculture studies through all level of TAFE certification to Diploma Level 5 and migrating to a consulting Arborist role in his senior years. His extensive engineering background coupled with tree morphology knowledge is valued by project developers and building contractors.

Disclosure of any pecuniary or non-pecuniary interests

Victor John Molyneaux and the HRC Group Pty Ltd have no pecuniary or non-pecuniary interests whatsoever.

Purpose of the report.

This Implication Study and Arboricultural Method Statement has been compiled to assess, manage and safeguard the established trees near and on the site at 845 Pacific Highway, Chatswood. The proposed project will require the demolition of an existing commercial building and the construction of a 38 story office tower with a retail base and lower basement carpark.

The short-term objectives are to assess the condition of each tree and assess their longer-term worth, and then determine their ability and the impact of the proposed development activities. The report then develops practical and implementable measures for the long-term protection and tree stewardship.

Tree Data collection

The site trees were inspected on 12th July, 2020 to undertake the tree survey, start the definition of the recommended trees for retention and appropriate Tree Protection measures and expected distance from any new building positions.

There were sixteen (16) significant trees, surrounding the site that warrant consideration and maybe impacted by the proposed works. These trees are easily located and their tree numbered shown in Appendix 1. A visual tree assessment was undertaken by Arborist, Victor John Molyneaux. These trees were identified and defined with a summary of key measurements and observations summarised in Table 1.

More detailed field notes are available if required and pictures of each tree are included in Appendix 2 so a detailed description is not included in this report.

Status

This is a preliminary report to advance the project planning and define any tree issues. The recommendations of this report are based site observations after a briefing by Tony Zhang and John Zhang of the Vantager Group.

The following documentation was reviewed;

- Twenty four Design sheets by PTW Architects dated 7/22/2021
- A four sheet site survey by Veris Australia dated 20.12.2019 which shows and accurate position of the nearby trees
- A Landscape Sketchbook package by URBIS
- No Stormwater management plans were available at the time this report was compiled

Willoughby City Council and the design team will require an Arboricultural Impact Assessment and Tree Protection Plan to be prepared by an AQF Level 5 arborist to support the project documentation and address the site tree issues.

The Site

The subject property consists of 2038 square metre commercial tower with parklands to the south and main roads to the east and west. The site has an AHD datum elevation of about 105 to 101 metres gradually sloping south-east with no observed areas of water pooling. Average annual rainfall for the localized area is rather good for medium sized trees estimated as being about 1050 mm per annum.

Soils

Soils of this immediate area are typical of the Blacktown Soil Landscape Group (as classified in the Soil Landscapes of the Sydney 1:100,000 Sheet)[1], consisting of shallow to moderately deep (<100 cm) Red and Brown Podzolic Soils shallow to moderately deep Red and Brown Podzoic Soils.

[1] GA Chapman & CL Murphy (1989)
Soil Landscapes of the Sydney 1:100,000 Sheet
Soil Conservation Service of NSW. Sydney

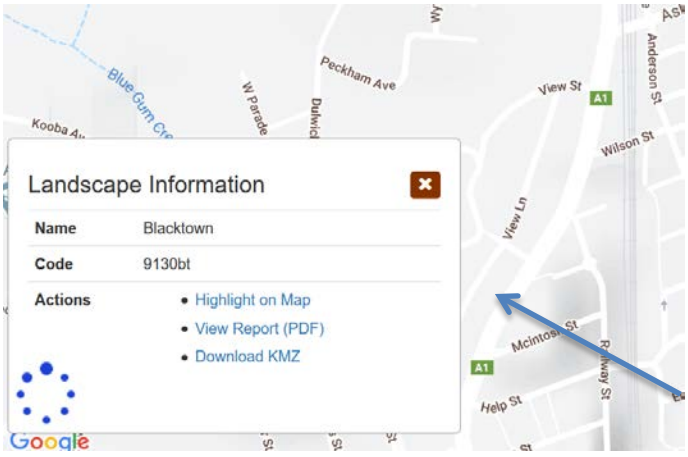
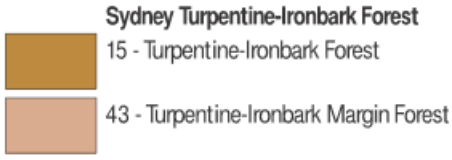
These local soils are known for their moderately reactive highly plastic subsoil, low soil fertility, poor soil drainage.

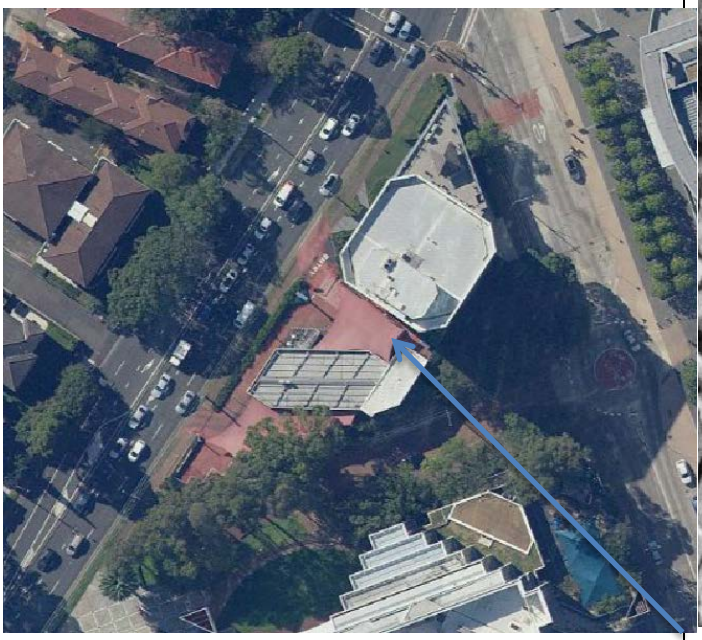
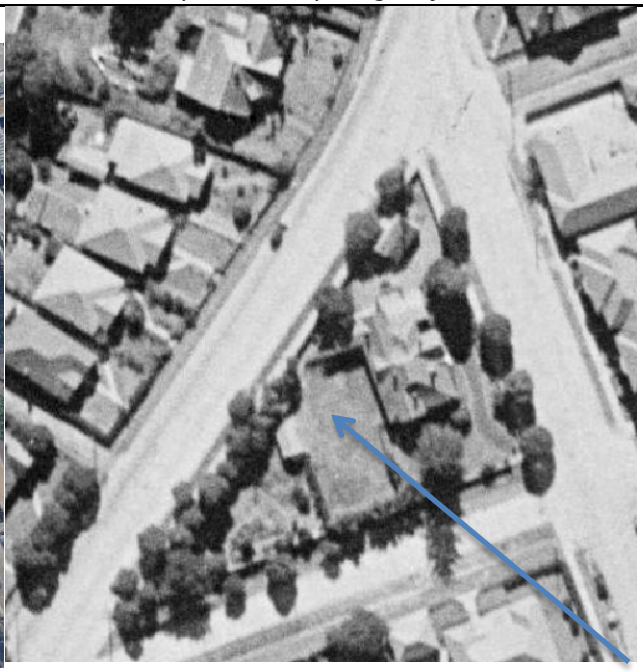
The site soil has been not been significantly disturbed or compacted by paving and roadways with parklands to the south.

This site can therefore sustain large native trees provided supplemental irrigation is available during periods of extended drought.

The Original Vegetation

There are no Endangered Ecological Community (EEC) species on the site as defined by endangered ecological communities of the Cumberland Plain 1:25000 Map (Map 10 of 16) by NSW National Parks and Wildlife Service 2002. The area was previously populated with indigenous species of the Sydney Turpentine-Ironbark Forest. Nowadays council planted street trees and installed Spotted Gums feaure to the east and south.

<table>
<tr>
<td> 
</td>
<td> 
</td>
</tr>
<tr>
<td><u>https://www.environment.nsw.gov.au/eSpade2WebApp</u>
 
</td>
<td>Endangered ecological communities of the Cumberland Plain 1:25000 Map (Map 108 of 16) NSW National Parks and Wildlife Service 2002</td>
</tr>
</table>

	
Recent Six Maps aerial image of site	***1943 aerial image of site - showing a treed estate***

It is important to appreciate the indigenous vegetation which proved over millennia to be the appropriate species of the localized area. However, it is also important to note at this juncture that the annual rainfall is now lower and more variable, further most rainfall on residential blocks is now captured and piped from the site, **so sustaining large native Eucalypts (or other mature large trees) is now not feasible without reliable supplemental irrigation.**

With an appreciation of the above **Soils** and **Original Vegetation** circumstance, we are pleased to note that the proposed Landscape Plant Schedule specifies enduring natives. These are considered sustainable provided they are established with supplemental irrigation and mulching.

TABLE 1 SHRUB and TREES MEASUREMENTS and OBSERVATIONS SUMMARY

Ref. No.			AREA												
Id	Species	Maturity	Height	Spread					DBH	Health	Condition	Age	SULE	Landscape Significance	Retention Value	Initial site opinion
				All	N	S	E	W								
1	***Lophostemon confertus,*** Brush Box	Mature	8		4	4	4	5	360 250	Struggling – thin foliage density Service wires above deformed	Co-dominate Good structure Good pedestrian skirt clearance	40	1b	MED	MED	**REMOVE**
2	***Jacaranda mimosifolia,*** Jacaranda	Semi Mature	6		2	1	2	4	190	Low vitality struggling with exposure and dry conditions - badly pruned wires above	Poor form and shape lacks vitality previously lopped at 2.5M	10	4e	LOW	LOW	**REMOVE**
3	***Lophostemon confertus,*** Brush Box	Mature	12	5					830	Healthy, excellent foliage density tree good vitality and minor deadwood	Good structure – wires through excellent canopy	40	1a	HIGH	HIGH	**RETAIN and PROTECT**
4	***Ulmus parvifolia,*** Chinese Elm	Mature	11		6	3	3	3	340	Good health and leaf density with vitality and decent annual extension growth	Poor form leaning north due to phototropic nature	20	4e	MED	MED	**RETAIN and PROTECT**
5	***Ulmus parvifolia,*** Chinese Elm	Mature	11		7	3	2	4	240	Good health and leaf density with vitality and decent annual	Deformed Poor structure	20	4e	MED	MED	**RETAIN and PROTECT**

										extension growth						
6	***Ulmus parvifolia,*** Chinese Elm	**Mature**	11		7	5	4	5	330	Good foliage density – best vitality	Good structure healthy prospects	20	4e	MED	MED	**RETAIN and PROTECT**
7	***Ulmus parvifolia,*** Chinese Elm	**Mature**	7		4	3	5	3	250	Heavy pruning with overhead wires poor foliage density – unsightly	Poor structure compromised tree shape	20	4e	MED	MED	**RETAIN and PROTECT**
8	 ***Cinnamomum camphora,*** Camphor Laurel	**Over Mature**	17		8	4	9	6	900	Good health but Heavy pruning with overhead wires to south severely asymmetric to north	Very poor structure and surround-ed by paved areas Old and brittle timber	60	4f	HIGH	Low	**REMOVE No chance of this old tree surviving entrance to site activities and severely asymmetric unstable**
9	***Ulmus parvifolia,*** Chinese Elm	**Mature**	8		4	5	3	3	220	Well performing tree in appropriate position good foliage density	Good shape and vitality	15	1a	HIGH	HIGH	**RETAIN and PROTECT**
10	***Corymbia maculata,*** Spotted Gum	**Mature**	24	4					430	Well performed tree on south side of raised enclosed garden bed good health and vitality	Dominate Good shape and vitality	15	1a	HIGH	HIGH	**RETAIN and PROTECT**
11	***Corymbia maculata,*** Spotted Gum	**Mature**	25	4					360	Excellent health and structure - trunk and canopy	Dominate Good canopy	15	1a	HIGH	HIGH	**RETAIN and PROTECT**

									to leaning north	and foliage density					
12	***Corymbia maculata,*** Spotted Gum	**Mature**	24		7	3	3	2	490	Good foliage density nice feature, needs shaping, some decay	Suppressing other trees slightly Good form	15	1a	HIGH	HIGH	**RETAIN and PROTECT**
13	***Corymbia maculata,*** Spotted Gum	**Mature**	20		5	3	1	6	320	Thin foliage density leaning to west slightly	Smaller structured tree suppressed	15	1a	HIGH	HIGH	**RETAIN and PROTECT**
14	***Corymbia maculata,*** Spotted Gum	**Mature**	20	3					290	Healthy but low foliage density f	Suppressed but good structure –	15	1a	HIGH	HIGH	**RETAIN and PROTECT**
15	***Corymbia maculata,*** Spotted Gum	**Mature**	24	3					350	Excellent health and structure -	Good canopy and foliage density	15	1a	HIGH	HIGH	**RETAIN and PROTECT**
16	***Corymbia maculata,*** Spotted Gum	**Mature**	24	4					450	Healthy canopy with 6 M high skirt excellent feature along pacific highway footpath excellent foliage density tree has vitality and no deadwood	Dominate Good structure – one main leader branches ascending	15	1a	HIGH	HIGH	**RETAIN and PROTECT**

Height is measured in metres from ground level to the highest point of the tree using Bosch PLR50 laser device and clinometers.

Diameter at breast height (DBH) is measured and rounded down to the nearest ten millimeters at 1.4m above ground level using specialist tapes. Where a tree divides into multiple stems below 1.4m it will be measured at a representative point above the root flare to give a clear indication of equivalent trunk mass or the relative dimensions of several trunks are given.

Canopy spread is measured in metres listing North, South East then West extent in metres. Symmetrical canopies have only one entry.

Maturity is divided into young, semi-mature, mature, over mature, and veteran or senescent. This is an indication of which stage a tree is at in its natural life cycle, allowing for an assessment of how energy and growth will be prioritised within a tree. In general, younger trees are more able to cope with disturbance or stress.

Biological health and physiological condition are assessment of the health and vigour of the trees and include an evaluation of the size, colour and density of the foliage. Trees in good physiological condition are better able to cope with disturbance or stress.

Structural health and mechanical condition is an indication of the structural integrity of the tree. This is given as good, average, fair or poor.

Amenity value is a qualitative value sometimes mentioned which is assessed using a combination of factors such as species, size and location, also a tree in a similar group of trees has a higher amenity value.

Initial Category Ratings

Category ratings are now allocated based on the current condition of a tree in its current surroundings **assuming the recommendations of this report are carried out.** No consideration is given to any specific development proposal when allocating category ratings.

Category A – a HIGH tree retention rating is given for trees which have high visual amenity value, are in good structural and physiological condition and are expected to contribute for at least another 40 years.

Category B - **MODERATE tree retention rating for trees** which would be considered as category A trees but which are of lower value, poorer structural condition, or which are expected to contribute for less than 40 years.

Category C - **a LOW tree retention rating** are those which have low amenity value, are in poor condition, or are expected to contribute for less than 20 years.

Category R trees are those which are expected to contribute for less than 10 years due to serious defects. As is common in risk management, where there is doubt, the precautionary principal may be applied. In certain circumstances trees may be considered

of higher value due to cultural or ecological reasons.

TABLE 2 TREES CATEGORY RATINGS AND RECOMMENDED OUTCOMES

#	***Botanical Name/*** **Common Name**	Category	End verdict
1	***Lophostemon confertus,*** Brush Box	CATEGORY C LOW	REMOVE Poor specimen -health will suffer greatly if retained
2	***Jacaranda mimosifolia,*** Jacaranda	CATEGORY R REMOVE	REMOVE Inappropriate street tree species for area Poor shape and form
3	***Lophostemon confertus,*** Brush Box	CATEGORY A HIGH	RETAIN and PROTECT Street tree
4	***Ulmus parvifolia,*** Chinese Elm	CATEGORY B MEDIUM	RETAIN and PROTECT
5	***Ulmus parvifolia,*** Chinese Elm	CATEGORY B MEDIUM	RETAIN and PROTECT
6	***Ulmus parvifolia,*** Chinese Elm	CATEGORY B MEDIUM	RETAIN and PROTECT
7	***Ulmus parvifolia,*** Chinese Elm	CATEGORY B MEDIUM	RETAIN and PROTECT
8	***Cinnamomum camphora,*** Camphor Laurel	CATEGORY B MEDIUM	REMOVE and replace this over mature tree will definitely not survive the proposed site entrance disruptions. It is severely asymmetric and will go into rapid decline and become hazardous.
9	***Ulmus parvifolia,*** Chinese Elm	CATEGORY B MEDIUM	RETAIN and PROTECT
10	***Corymbia maculata,*** Spotted Gum	CATEGORY A HIGH	RETAIN and PROTECT
11	***Corymbia maculata,*** Spotted Gum	CATEGORY A HIGH	RETAIN and PROTECT
12	***Corymbia maculata,*** Spotted Gum	CATEGORY A HIGH	RETAIN and PROTECT
13	***Corymbia maculata,*** Spotted Gum	CATEGORY A HIGH	RETAIN and PROTECT
14	***Corymbia maculata,*** Spotted Gum	CATEGORY A HIGH	RETAIN and PROTECT
15	***Corymbia maculata,*** Spotted Gum	CATEGORY A HIGH	RETAIN and PROTECT
16	***Corymbia maculata,*** Spotted Gum	CATEGORY A HIGH	RETAIN and PROTECT

Final Considerations

Final considerations about the retention value of the trees can now be made. First by appreciating the allocated tree category in the table above before any development implications are considered, then considering the proposed development pressures that will be placed on the trees, with any conservation or remedial measures we can incorporate.

After due consideration of this evaluation process and the proposed development stress imposed on the proposed retained neighbour's trees, it is our professional opinion that all street trees can be safely retained and protected throughout the development cycle.

Recommendations

Recommendation 1
Remove street trees Numbers 1, 2, and 8 for the reasons stated.

Recommendation 2
That a Level 5 Project Arborist be appointed to inspect and document with Certificates of Compliance to the certifying authority as stipulated in SECTION 5 MONITORING AND CERTIFICATION of AS4970-2009

PROJECT PHASE	ACTIVITIES	PROJECT ARBORIST to
Initial Site Preparation	Establish/delineate TPZ Install protective measures and undertake soil rehabilitation for all street trees with Certification.	Project Arborist to mark Tree Protection Zones and install fences, mulch, irrigation and signage **Issue a Certification of Compliance** of tree protection measures being in place and soil rehabilitation undertaken
Construction work	Liaison with site manager, compliance and any deviation from approved plan	Maintain or amend protective measures Supervision and monitoring formal notification of any deviation from approved tree protection plan
Stormwater connection installation through TPZ, Implement hard and soft landscape works	**Supervise** Installation of pipes within tree TPZ	Excavate trench through TPZ under Arborist supervision, install pipework, remove selected protective measures as necessary and perform remedial tree works **Issue a Certificate of Compliance**
Practical completion	Tree vigour and structure assessment and undertake soil rehabilitation for all retained trees.	Remove all remaining tree protection measures **Certification of tree protection and soil rehabilitation for Protected Trees**
Defects liability/ maintenance period	Tree vigour and structure	Undertake any required remedial tree works Certification of tree protection if necessary

Recommendation 4
To proceed with the proposed development layout and apply appropriate tree protection measures for the retained trees which are specified in Sections 2 and 3 of this report.

SECTION 2 ARBORICULTURAL IMPACT ASSESSMENTS

The Project Manager sought arboricultural advice about neighbouring trees amenity values and the required procedures for protecting the preferred trees for retention.

The geometry of the proposed buildings driveways and stormwater infrastructure i.e. provision for tanks, pits and storm water pipes now reflects a sound development layout that will not adversely impact on the proposed neighboring trees and protected street trees.

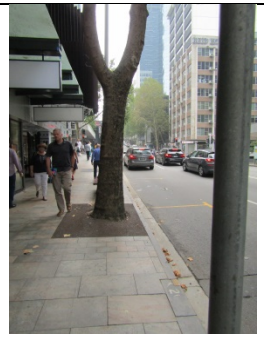
Distances for Tree Protection Zones
The Australian Standard for the Protection of Trees on Development Sites AS 4970-2009 suggests a setback of 12 times the trunk diameter as a guide to a Tree Protection Zone (TPZ). The intent is to avoid damage to major roots by severing or by soil compaction. In ideal situations there should be no excavation or construction within the Tree Protection Area in order to ensure that there is no damage to the root network. There will definitely not be any excavation allowed in the Structural Root Zone as specified in AS4970.

Samples of Tree Protection Signage required

Please note: Waterproof A3 Sized copies these signs are available by contacting HRC group

Table 3 defines the tree protection zone, areas available and incursions into the tree drip-lines. According to the generous allowance preferred by Australian Standard 4970 there would be adequate tree protection areas for the retained trees.

TABLE 3 - AS4970 TREE PROTECTION ZONES AND ROOT AREAS AVAILABLE

#	Name	DBH mm	SRZ M	TPZ M	10% slice M	10% corner m	TPZ sq area	Proposed distance to development and relationship to required TPZ s
1	***Lophostemon confertus,*** Brush Box	360	2.08	3.96	2.72	SRZ	49	Tree proposed to be removed as poor specimen. However consider retention of street tree if Council officers insist No change to TPZ usage Will require care resurfacing public domain within 4.0 M of tree centre Unknown basement excavation as yet – if to existing building footprint no root reduction Need to define trunk surrounds Prefer raised box to softfall  ***TREE PROTECTION FENCE TRUNK PROTECTION***  ***SOFTFALL AROUND TRUNK FINISH OPTION*** No stormwater proposed nearby all OK **Care with demolition required** **ARBORICULTURALLY ACCEPTABLE DESIGN**
3	***Lophostemon confertus,*** Brush Box	830	3.17	10.80	7.42	5.28	366	No change to TPZ usage Will require care resurfacing public domain within 4.0 M of tree centre Unknown basement excavation as yet – if to existing building footprint no root reduction Building surround proposed 7.5 M distant in a half corner configuration so far less than 10% intrusion allowable 7.5 M Need to define trunk surrounds Prefer raised box to softfall No stormwater proposed nearby all OK **Care with demolition required** **ARBORICULTURALLY ACCEPTABLE DESIGN**

4	***Ulmus parvifolia,*** Chinese Elm	340	2.10	4.08	2.80	SRZ	52	Proposed disruption 13 metres distant and all out of TPZ Will require care resurfacing public domain within 3.0 M of tree centre
5	***Ulmus parvifolia,***	240	1.82	2.88	1.98	SRZ	26	Proposed disruption 12 metres distant and all out of TPZ Will require care resurfacing public domain within 3.0 M of tree centre
6	***Ulmus parvifolia,***	330	2.08	3.96	2.72	SRZ	49	Proposed disruption 7 metres distant and all out of TPZ Will require care resurfacing public domain within 4.0 M of tree centre
7	***Ulmus parvifolia,*** Chinese Elm	250	1.85	3.00	2.06	SRZ	28	Proposed disruption 3 metres distant and just out of TPZ Will require care resurfacing public domain within 3.0 M of tree centre
9	***Ulmus parvifolia,*** Chinese Elm	220	1.75	2.64	1.81	SRZ	22	Proposed development well out of TPZ OK 7.5 M distant Will require care resurfacing public domain within 3.0 M of tree centre **Care with demolition required** **ARBORICULTURALLY ACCEPTABLE DESIGN**
10	***Corymbia maculata,*** Spotted Gum	430	2.32	5.16	3.55	2.52	84	Proposed development building surrounds are 5.2 M distant in a slice configuration so just out of TPZ OK **Care with demolition required** **ARBORICULTURALLY ACCEPTABLE DESIGN**
11	***Corymbia maculata,*** Spotted Gum	360	2.15	4.32	2.97	SRZ	59	Proposed development building surrounds are 5.0 M distant in a slice configuration so just out of TPZ OK **Care with demolition required** **ARBORICULTURALLY ACCEPTABLE DESIGN**
12	***Corymbia maculata,*** Spotted Gum	490	2.45	5.88	4.04	2.87	109	Proposed development building surrounds are 6.8 M distant in a half corner configuration so well out of TPZ OK **Care with demolition** **ARBORICULTURALLY ACCEPTABLE DESIGN**
13	***Corymbia maculata,*** Spotted Gum	320	2.05	3.84	2.64	SRZ	46	Proposed development building surrounds are 7.2 M distant in a half corner configuration OK so well out of TPZ **Care with demolition** **ARBORICULTURALLY ACCEPTABLE DESIGN**
14	***Corymbia maculata,*** Spotted Gum	290	1.97	3.48	2.39	SRZ	38	Proposed development well out of TPZ
15	***Corymbia maculata,*** Spotted Gum	350	2.13	4.20	2.89	SRZ	55	Proposed development well out of TPZ
16	***Corymbia maculata,*** Spotted Gum	450	2.37	5.40	3.71	2.64	92	Proposed development well out of TPZ

Development Impact Assessment

The design layout as shown on the plan has been assessed in accordance with British BS5837:2012 Section 6 plus the generous Root Protection Zone areas of AS4970 and the findings are that there are likely to be no significant negative effects on the trees to be retained:-

- The building structures are located outside an acceptable distance for TPZs.
- Absolutely no development activity is required within the Structural Root Zone (SRZ)
- Stormwater pipes installation with TPZs will be supervised by the Project Arborist if within any TPZ.
- Tree drip-lines are not encroached except a slight amount and this is to an acceptable (desirable amenity -shade level).
- The retained tree is a significant distance away from any occupying space and is unlikely to cause undesired or excessive shade to either the house or the usable garden space.
- All services will be excluded from the TPZ except maybe the outlets pipework which will be supervised by the Project Arborist.

SECTION 3 TREE MANAGEMENT AND PRESERVATION

Preparation for development

Protective fencing

The trees recommended for retention are all around the boundaries and in well-defined garden beds. Structured and fenced Tree Protection cages around Brush Box street trees Numbers 3 preferred. The site will have a hoarding that will protect adjacent trees from dust and accidental striking.

Additional tree protection measures will be defined onsite if the Project Arborist finds issues or suspect building practices or materials storage that is of concern for the retained trees. In reality the site perimeter hoarding will have a few additional temporary fencing panel enclosure and trees with Tree Protection signage.

A small enclosure to protect T1 will be required (if Council insists on retaining this tree against recommendations to remove). This cage would be one panel wide by one panel deep. See Appendix 1 - Tree Protection Plan for details.

The temporary fencing panels should be constructed in such a way as to exclude construction activity and be appropriate to the degree and proximity of likely works. A minimum of one hundred and eighty centimeter (180 cm) high weld mesh panels securely fixed onto a braced scaffold framework are usually suitable. Standard temporary fencing panels area acceptable. The Project Arborist will be directly involved in the layout of the fencing and indicate where it is to be installed by yellow spray paint.

Care should also be taken to prevent fenced areas being knocked or contaminated with chemical spillages, including petrol, diesel and oils. In addition, water run-off from areas of construction activity should be diverted away from the fenced area.

Unless otherwise specified in this report the fenced protection areas should be considered complete construction exclusion zones; there should be no pedestrians, vehicles, materials, equipment or machinery in the critical root fenced area. There should be adequate signs informing all relevant persons that access is denied.

Tree Protection fencing and signage required

Soil Rehabilitation

The area around and defined by all street tree drip-lines will be rehabilitated on two occasions. Before the commencement of site activities when the DA is approved, when the tree protection fence in installed, once during project construction period and then when the tree protection fence is removed. On all occasions the Project Arborist will:-

- Water thoroughly and apply a soil wetting agent – eco-hydrate preferred.
- Apply *Seasol*® to stimulate and promote new root growth
- Apply mycorrihiza inoculant – beneficial micro- biological organisms so that the existing root system can assimilate high amounts of nutrients – Neutrog juice preferred
- • Fertilize the tree surrounds with (native friendly) soluble nutrients and absorbable nitrogen compounds *Boron, Iron, Copper, Magnesium and potassium trace elements in particular.*
- Monitor for vigour, stability, pest and disease.

The soil moisture surrounding the root ball area shall be monitored on a regular basis. Should an irrigation system be installed advice from the Consulting Arborist shall be sought in regard to volume and frequency of water applied.

Procedures for root protection for stormwater infrastructure and basement excavation within TPZ's

The Project Arborist should be contacted prior to such works being undertaken within shrub and tree driplines.

The Project Arborist must be present during the hand tool excavation for the required stormwater pit and pipes, also basement bulk excavation.

The route of the pipes and location of the pit should be adjusted to avoid TPZ tree roots.

Keep stormwater pipe outflow route out of TPZ - or against - touching building wall foundations if within TPZs to minimize tree root disturbance.

There is ample fall of the pipe grade to re-route away from the tree trunk and any large diameter roots. Roots can and should be tunneled under and preserves not cut to make it easier to dig. Machinery cannot be used in the PZ area.

Where roots are uncovered that have a diameter of 20 mm or less, and are necessary to be removed to allow grade placement of the pipes, they are to be cut cleanly with a final cut to undamaged woody tissue. These species have quickly deep roots and no significant surface roots are expected.

The formwork for the entrance, basement crossover and stormwater pits should be inspected by the Project Arborist before the concrete delivered and installed. A plastic pit structure is preferred. It is extremely important that a layer of builder's plastic be placed under the concrete. Curing concrete is one thousand (1,000) times more caustic that tree roots can tolerate. Living tree tissue will burn and be destroyed if it comes in contact with any cementitious products. Concrete slurry waste should not be left anywhere near protected trees it is more deadly that petrol and oil products.

Builder's plastic (sometimes orange in colour)

The retained trees need to be irrigated regularly to prevent drying out and help recover from the stress of the localised disturbance.

Direct Project Arborist Supervision

Project Arborist supervision will be required for any excavation works for the following trees shown in Table 4.

TABLE 4 PROJECT ARBORIST SUPERVISION REQUIRED for isolated trees

#	Name	TPZ in M from Tree Centre	Proposed development in TPZ and comments
1	***Lophostemon confertus,*** Brush Box If retained (unlikely)	3.96	Any significant works within 4.0 metres of tree centre **Project Arborist to supervise:-** • Ensure Tree Protection Fence and signage • Supervise any excavation for basement and stormwater • Keep stormwater pipe outflow route out of TPZ - against - touching building foundations • Fertilize tree on two occasions before demolition and during construction • Supervise public domain resurfacing and garden bed/box softfall establishment • Monitor tree health and soil moisture • Certification as per schedule
3	***Lophostemon confertus,*** Brush Box	10.80	Any significant works within 10 metres of tree centre **Project Arborist to supervise:-** • Ensure Tree Protection Fence and signage • Supervise any excavation for basement and stormwater • Keep stormwater pipe outflow route out of TPZ - against - touching building foundations • Supervise public domain resurfacing and garden bed/box softfall establishment • Fertilize tree on two occasions before demolition and during construction • Monitor tree health and soil moisture • Certification as per schedule
4,5, 6 &7	***Ulmus parvifolia,*** Chinese Elm	3-4	Any significant works within 4.0 metres of tree centre **Project Arborist to supervise:-** • Ensure Tree Protection signage • Supervise any excavation for basement and stormwater • Install Tree protection fencing of vehicle maneuvering issues arise • Fertilize tree on two occasions before demolition and during construction • Supervise public domain resurfacing and garden bed/box softfall establishment • Monitor tree health and soil moisture Certification as per schedule
9	***Ulmus parvifolia,*** Chinese Elm	2.64	Any significant works within 3.0 metres of tree centre **Project Arborist to supervise:-** • Ensure Tree Protection signage • Supervise any excavation for basement and stormwater • Install Tree protection fencing of vehicle maneuvering issues arise

			• Fertilize tree on two occasions before demolition and during construction • Supervise public domain resurfacing and garden bed/box softfall establishment • Monitor tree health and soil moisture Certification as per schedule
10	***Corymbia maculata,*** Spotted Gum	5.16	Any significant works within 5.0 metres of tree centre **Project Arborist to supervise:-** • Ensure Tree Protection signage • Supervise any excavation for basement and stormwater • Fertilize tree on two occasions before demolition and during construction • Supervise public domain resurfacing a • Monitor tree health and soil moisture Certification as per schedule
11	***Corymbia maculata,*** Spotted Gum	4.32	As for Tree No. 10
12	***Corymbia maculata,*** Spotted Gum	5.88	As for Tree No. 10
13	***Corymbia maculata,*** Spotted Gum	3.84	As for Tree No. 10
14	***Corymbia maculata,*** Spotted Gum	3.48	As for Tree No. 10
15	***Corymbia maculata,*** Spotted Gum	4.20	As for Tree No. 10
16	***Corymbia maculata,*** Spotted Gum	5.40	As for Tree No. 10

Soil Stockpile

The Soil stockpile will be well outside the TPZs of retained to protect tree roots and prevent compaction of the nearby soil profile.

Penalty Infringement Notices

Council has introduced a policy of inspections of Tree Protection Fencing on Development Sites. If the fences are not adequately installed and or materials or spoil stockpiles are within the Tree Protection Zone, the council may issue penalty infringement notices to the builder.

Site inspections

A program of Project Arborist inspections, operations and the issue of formal Certificates of Compliance to the certifying authority will be undertaken. Every opportunity should be taken to explain to the builder, sub-contractors and owner the necessity of the tree protection effort.

It is very important that the Project Arborist be present on site when any excavation near

TPZ are undertaken to ensure roots that maybe uncovered are identified and evaluated. Accurate and clinical severing of any tree roots will be necessary in the unlikely event that they are located under the driveway.

Development Phase

The Root Protection Zone (RPZ)
The Root Protection Zone (RPZ) is the area of ground which is desirable to leave undisturbed during development. AS4970 and BS5837:2012 specifies an idealized circle around the tree trunk 10-12 times the tree trunk diameter at breast height.

Table 3 defines the preferred areas set aside for the trees and the indicative Root Protection Zone fencing as does Appendix 1. It is proposed to erect an enclosure around Tree 3 and 5 using standard temporary fencing panels. **The site fencing layout will be defined onsite by the Project Arborist and installed under the Arborist's supervision.**

The Project Arborist will personally erect and place the signage of the fixed Tree Protection fence. Under no circumstances is this fence to be moved to facilitate ease of construction or allow more excavation to install formwork etc. without the Project Arborist present. All sub-contractors are to be briefed about the importance of care in these sensitive locations.

Appendix 1 Shows fenced Root Protection Zones

Changes in ground level
Ground levels should not be lowered within the tree root protection area as this would cause serious damage to tree roots. Soil levels cannot be raised as this will starve the roots of oxygen and nutrients.

Occasionally ground levels may need to be raised within the tree root protection area. This can be achieved by the use of a granular material with a no fines content to allow the vertical diffusion of gasses. A detailed plan agreed by the assigned Project Arborist would be needed in such cases.

Removal of protective fencing
When the development phase is complete, all drainage and service runs are in place, and the main site machinery has been removed, the protective fencing may be dismantled. This must be done with care and should be supervised by the Project Arborist. Any post holes should be filled with river sand. A soil rehabilitation program around the protected trees will be undertaken at this stage.

Post Construction Landscaping
The trees on the site will be subject to landscaping or seeding beneath the canopy after the main development phase has been completed. At this stage, it is inevitable that the protective fencing will have to be removed. In view of this fact, the landscaped works

should be carried out in such a way as to avoid ground level changes or deep digging. Tractor mounted tillers or other mechanised cultivation methods should be avoided near the tree.

No heavy machinery should be brought into the vicinity of trees to be retained. Herbicides should be appropriate for the purpose and should not be used in such a way as will damage any vegetation to be retained. Where possible, it is preferable for the trees to be located within a mulched, shrub planted, garden bed. This minimises long term disturbance or compaction to the tree rooting environment and encourages occasional irrigation by the residents.

During the summer months the protected trees should be irrigated by hand on a weekly basis. Some organic matter and granular material is to be added to the soil to aid water penetration around the protected tree if required to supplement the existing mulched area.

Completion meeting

Upon completion, it is proposed that the Project Arborist and the Certifier and Local Authority's Tree Management officer are invited to meet on site to check that all works are completed satisfactorily and to discuss any remedial works required. A Compliance Certificate will be issued to the Compliance Authority at this time.

I trust this Issue C Arborist report dated, 20th September, 2021, 2020 provides all the required information to progress the project. However, if further advice is needed then please contact me.

Victor John Molyneaux

B.E.;M.Eng.Sc.;M.B.A.; Diploma Level 5 Arboriculture

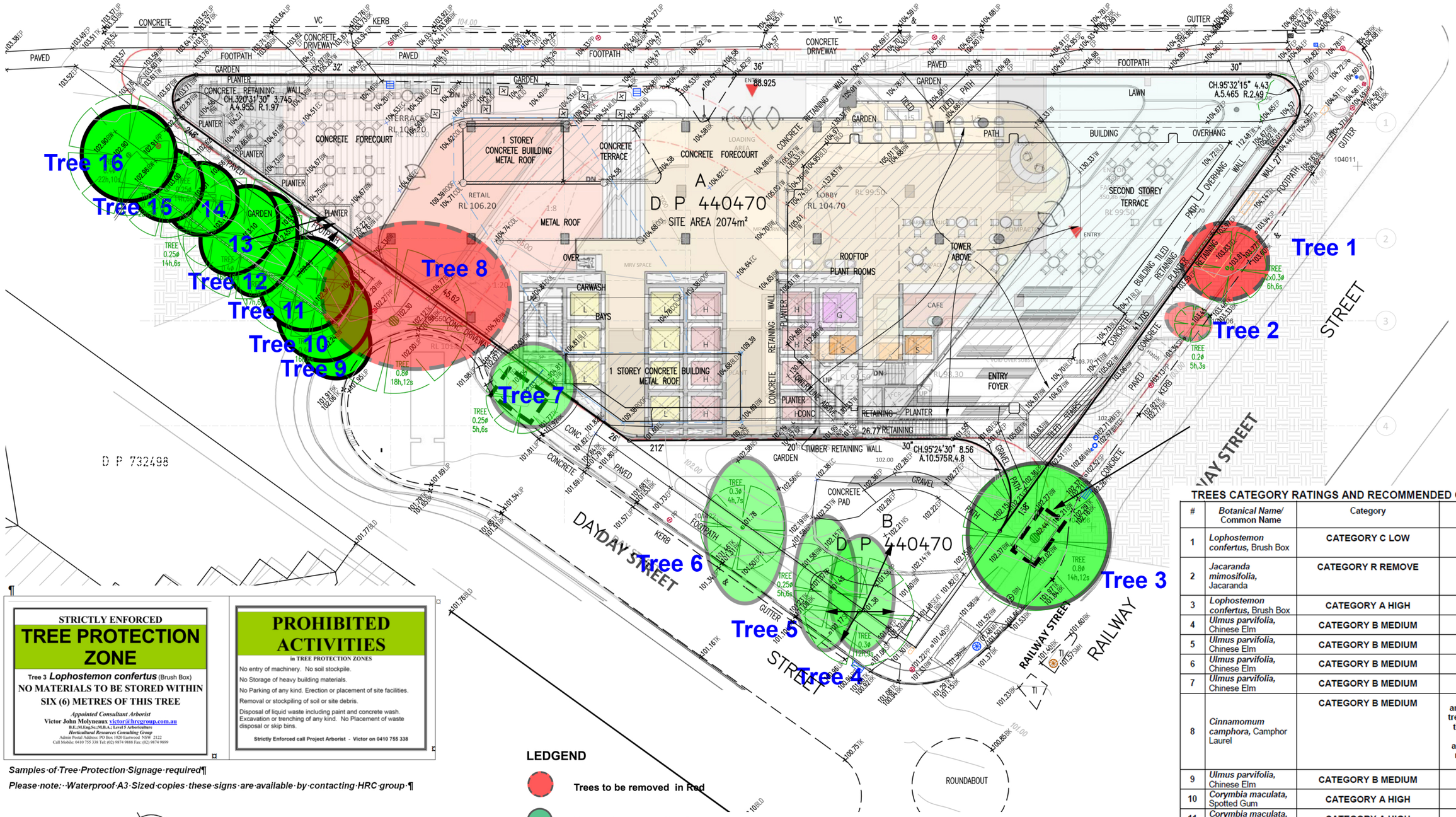
Horticultural Resources Consulting Group

Admin Postal Address: PO Box 1020 Eastwood NSW 2122

General guidance

All tree works should be carried out by suitably qualified, experienced and insured contractors in accordance with Australian Standard 4373-1996 - Pruning of Amenity Trees and the WorkCover Code of Practice for the Amenity Tree Industry.

This report is based upon a visual survey. The consultant shall not be responsible for events which happen after the date of survey due to factors which were not apparent at the time of the survey.



STRICTLY ENFORCED

TREE PROTECTION ZONE

Tree 3 ***Lophostemon confertus*** (Brush Box)

NO MATERIALS TO BE STORED WITHIN SIX (6) METRES OF THIS TREE

Appointed Consultant Arborist
Victor John Molyneaux victor@hrcgroup.com.au
B.E.;M.Eng.Sc.;M.B.A.; Level 5 Arboriculture
Horticultural Resources Consulting Group
Admin Postal Address: PO Box 1020 Eastwood NSW 2122
Call Mobile: 0410 755 338 Tel: (02) 9874 9888 Fax: (02) 9874 9899

PROHIBITED ACTIVITIES

in TREE PROTECTION ZONES

No entry of machinery. No soil stockpile.
No Storage of heavy building materials.
No Parking of any kind. Erection or placement of site facilities.
Removal or stockpiling of soil or site debris.
Disposal of liquid waste including paint and concrete wash. Excavation or trenching of any kind. No Placement of waste disposal or skip bins.

Strictly Enforced call Project Arborist - Victor on 0410 755 338

Samples·of·Tree·Protection·Signage·required¶
Please·note:··Waterproof·A3·Sized·copies·these·signs·are·available·by·contacting·HRC·group·¶

LEDGEND

- Trees to be removed in Red
- Trees to be retained in Green
- Tree Protection Zone boundary (TPZ)
- Tree Protection fence
- TPZ where Project Arborist supervision for any excavation or works required

NORTH

REDUCTION RATIO
0 2 4 6 8 10 12 14 16 18 20
LENGTHS ARE IN METRES

TREES CATEGORY RATINGS AND RECOMMENDED OUTCOMES

#	*Botanical Name*/ Common Name	Category	End verdict
1	*Lophostemon confertus*, Brush Box	CATEGORY C LOW	REMOVE Poor specimen
2	*Jacaranda mimosifolia*, Jacaranda	CATEGORY R REMOVE	REMOVE Inappropriate street tree species for area Poor shape and form
3	*Lophostemon confertus*, Brush Box	CATEGORY A HIGH	RETAIN and PROTECT Street tree
4	*Ulmus parvifolia*, Chinese Elm	CATEGORY B MEDIUM	RETAIN and PROTECT
5	*Ulmus parvifolia*, Chinese Elm	CATEGORY B MEDIUM	RETAIN and PROTECT
6	*Ulmus parvifolia*, Chinese Elm	CATEGORY B MEDIUM	RETAIN and PROTECT
7	*Ulmus parvifolia*, Chinese Elm	CATEGORY B MEDIUM	RETAIN and PROTECT
8	*Cinnamomum camphora*, Camphor Laurel	CATEGORY B MEDIUM	REMOVE and replace this over mature tree will definitely not survive the proposed site entrance disruptions. It is severely asymmetric and will go into rapid decline and become hazardous.
9	*Ulmus parvifolia*, Chinese Elm	CATEGORY B MEDIUM	RETAIN and PROTECT
10	*Corymbia maculata*, Spotted Gum	CATEGORY A HIGH	RETAIN and PROTECT
11	*Corymbia maculata*, Spotted Gum	CATEGORY A HIGH	RETAIN and PROTECT
12	*Corymbia maculata*, Spotted Gum	CATEGORY A HIGH	RETAIN and PROTECT
13	*Corymbia maculata*, Spotted Gum	CATEGORY A HIGH	RETAIN and PROTECT
14	*Corymbia maculata*, Spotted Gum	CATEGORY A HIGH	RETAIN and PROTECT
15	*Corymbia maculata*, Spotted Gum	CATEGORY A HIGH	RETAIN and PROTECT
16	*Corymbia maculata*, Spotted Gum	CATEGORY A HIGH	RETAIN and PROTECT

ISS	DATE	AMENDMENT
C	20.09.2021	DA Issue
B	07.08.2020	Sketchbook edition
A	12.07.2020	Preliminery Issue

ARCHITECT PTW
ARCH. REF :
OWNER HYG Creating The Future
LGA Willoughby City Council

Horticultural Resources Consulting Group
PO Box 1020 Eastwood NSW 2122
Tel: (02) 9874 9888 Fax: (02) 9874 9899
Contact: *Victor@hrcgroup.com.au* Mobil 0410 755 338

DWG TITLE
TREE MANAGEMENT PLAN
PROJECT TITLE
No. 845 PACIFIC HIGHWAY, CHATSWOOD

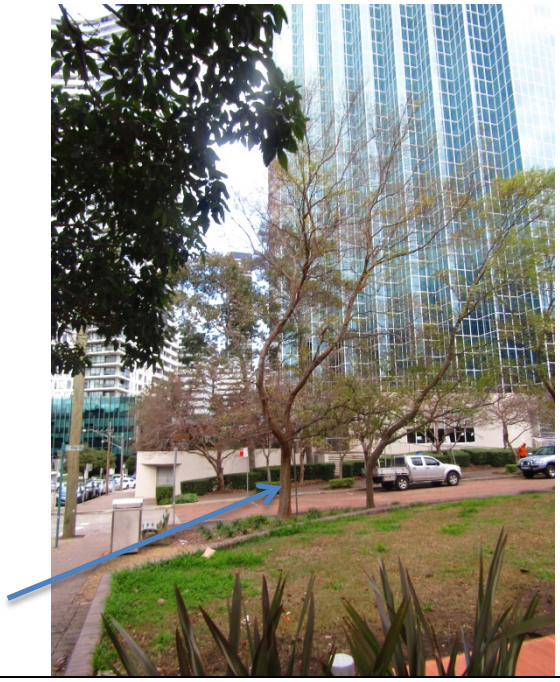
Drawn by Victor John Molyneaux

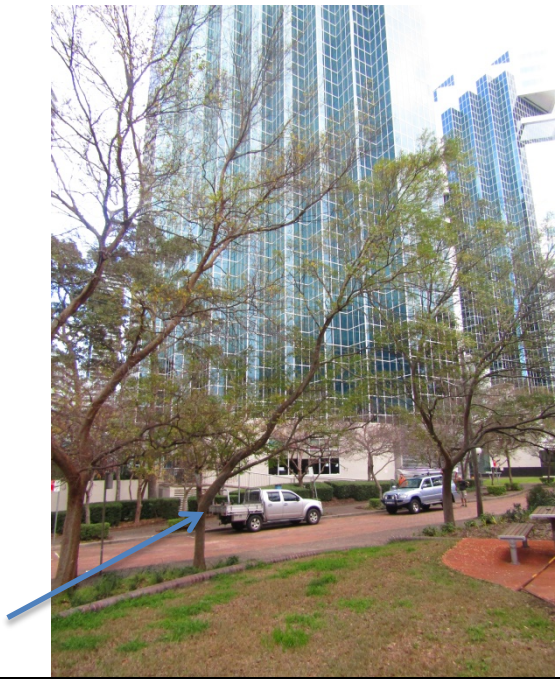
APPENDIX 1

JOB No	DWG No	No IN SET	ISSUE
	TMP1	1	C

APPENDIX 2 TREE PICTURES

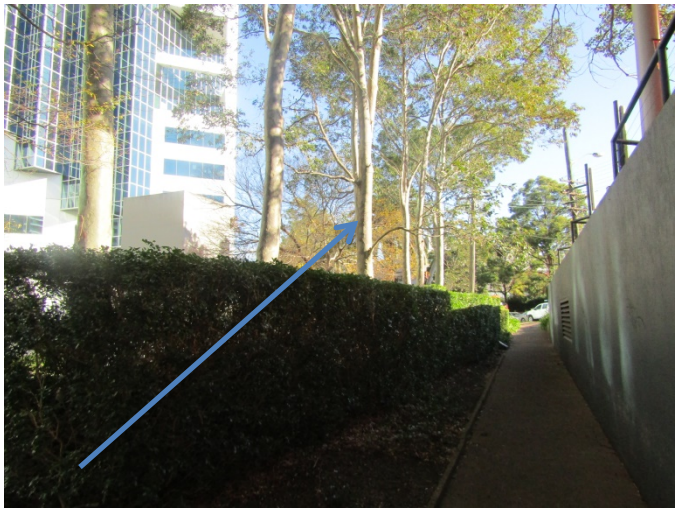
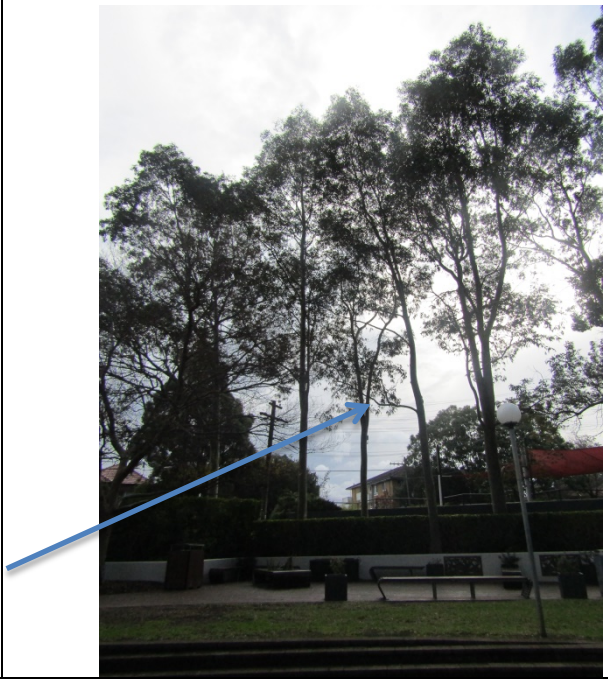
#	***Botanical Name*** **Common Name**	**PICTURE**
1	***Lophostemon confertus,*** Brush Box	
2	***Jacaranda mimosifolia,*** Jacaranda	

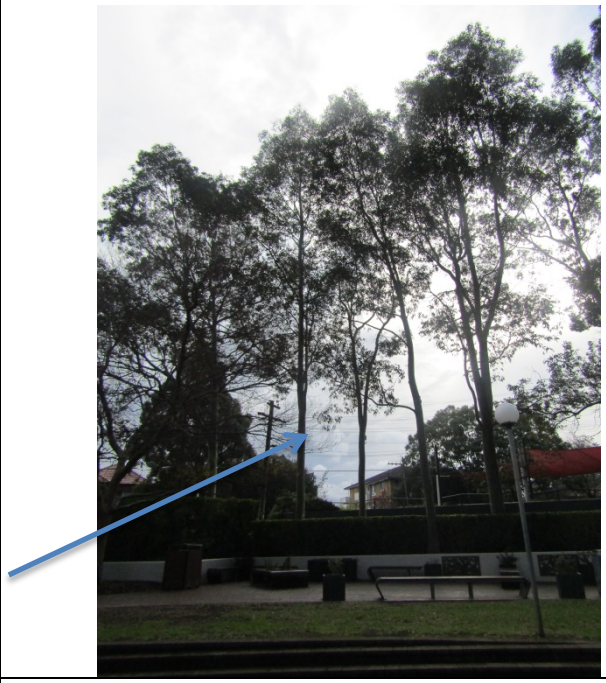
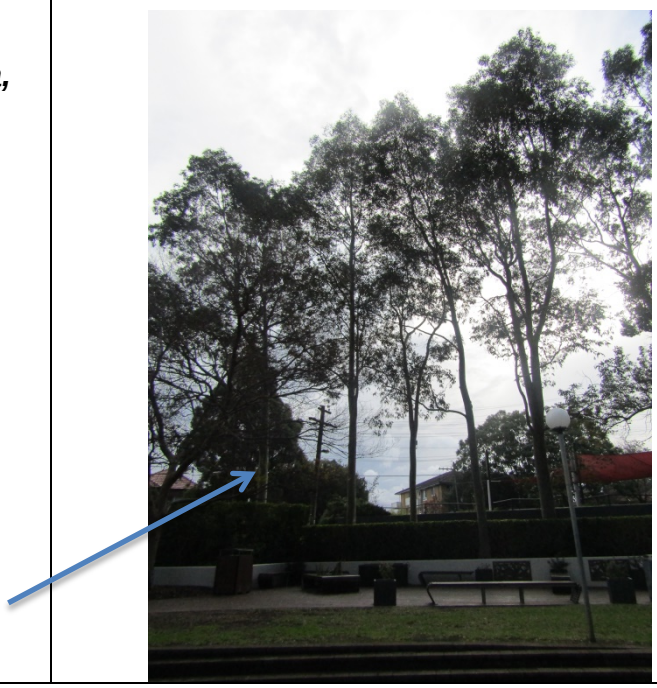
3	***Lophostemon confertus,*** Brush Box	
4	***Ulmus parvifolia,*** Chinese Elm	

5	***Ulmus parvifolia,*** Chinese Elm	
6	***Ulmus parvifolia,*** Chinese Elm	

7	***Ulmus parvifolia,*** Chinese Elm	
8	 ***Cinnamomum camphora,*** Camphor Laurel	

9	***Ulmus parvifolia,*** Chinese Elm	
10	***Corymbia maculata,*** Spotted Gum	

11	***Corymbia maculata,*** Spotted Gum	
12	***Corymbia maculata,*** Spotted Gum	
13	***Corymbia maculata,*** Spotted Gum	

14	***Corymbia maculata,*** Spotted Gum	
15	***Corymbia maculata,*** Spotted Gum	

16	***Corymbia maculata,*** Spotted Gum