arboricultural impact assessment proposed development

TX Australia Site (Lot 11 DP 1162507) and Lot 12 DP 1162507, Richmond Ave, Willoughby

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prepared by

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contents

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1. introduction

1.1 background

This report has been prepared to assess the condition and significance of a number of trees on and adjacent to the properties known as the TX Australia Site (Lot 11 in DP 1162507), and Lot 12 DP 1162507, Richmond Ave, Willoughby and assess the potential impact of the proposed development on the identified trees.

The report has been commissioned by Mirvac and site inspections and field work were conducted between the 4th-12th February 2020.

The tree assessments have been carried out using the Visual Tree Assessment (VTA) method (Mattheck & Breloer 2010) and development impact assessments are based upon the Australian Standard, Protection of Trees on Development Sites AS 4970-2009.

1.2 existing & proposed development

The site is predominately developed with the TX Australia site containing the television and communication broadcast tower, a single storey operations building and hard stand areas. To the south of the site, Lot 12 DP 1162507 comprises of an open terraced area with long grass and weeds, which falls away steeply to rock boulder outcrops and native vegetation.

The proposed modification involves decommissioning the broadcast tower and infrastructure, demolition of the built structures and construction of multistorey apartments with basement level carparking as shown on the proposed concept plan modification (Chrofi, 2020).

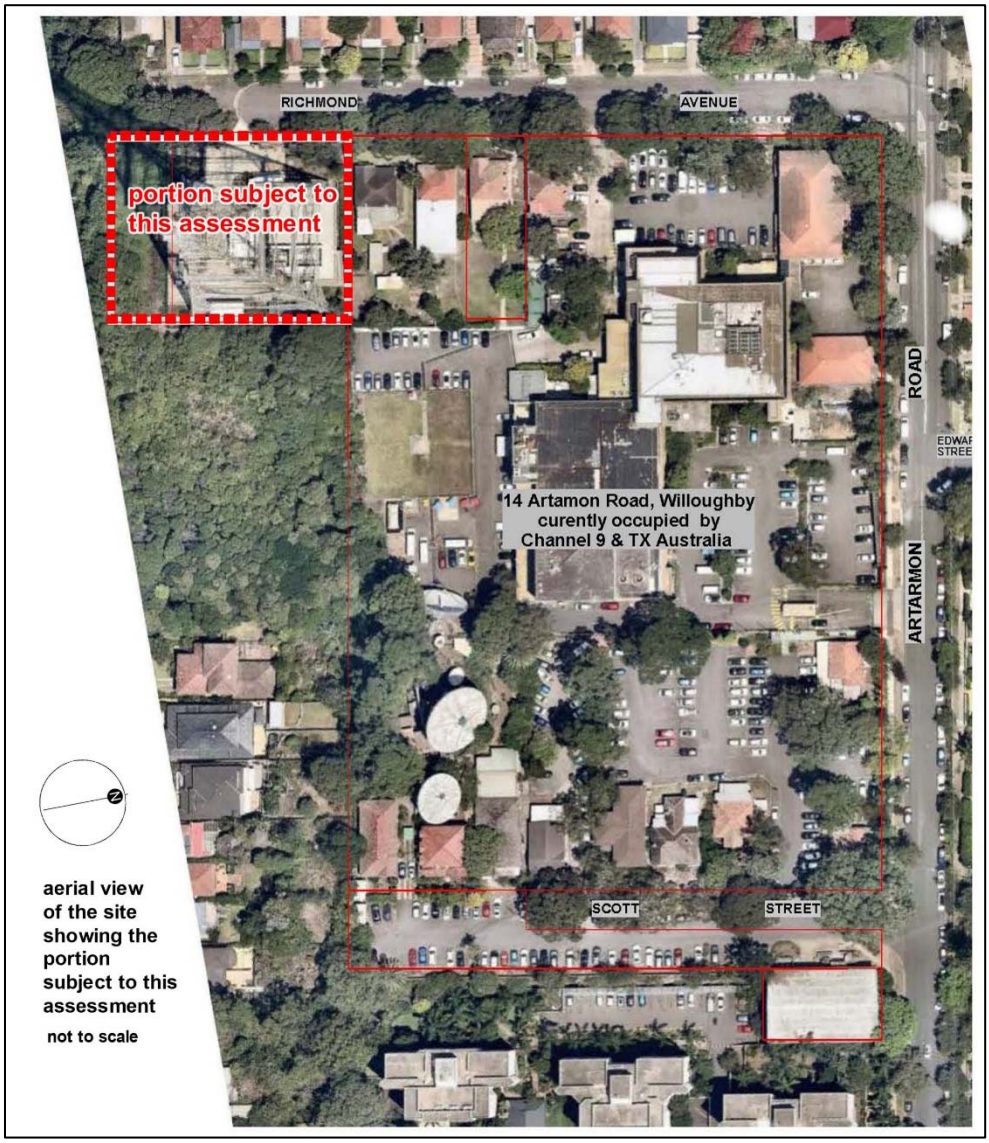
2. the site

2.1 existing trees

The TX Australia site is largely void of vegetation with the exception of 3 planted semi-mature Eucalypts. The vegetation cover over the terraced area of Lot 12 DP 1162507 comprises of exotic grasses, annual weeds and exotic shrubs. Below the terrace the vegetation grades into predominately native vegetation in the steeper more natural habitats.

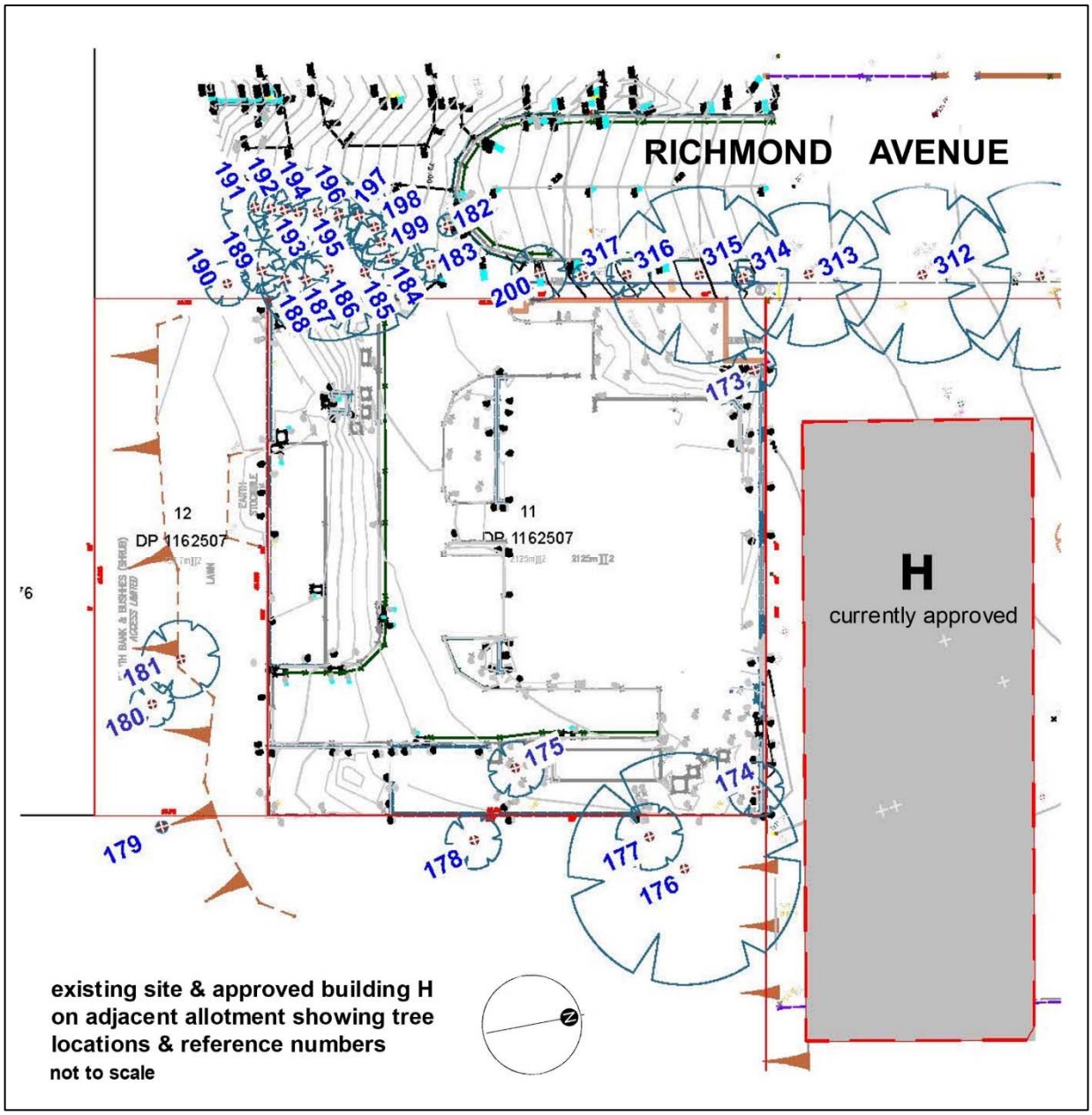
The definition of a tree used in this report is consistent with that referred to in the Willoughby Development Control Plan (2016) being:

> *"a perennial plant having a permanent, woody, self-supporting main stem or trunk, usually growing to a considerable height, and usually developing branches at some distance from the ground*"



2.2 tree locations & reference numbers

The following plan is based on the survey (Veris, 2020) and identifies the locations of the trees on and adjacent the site and the approved building H.



3. tree significance

3.1 significance in the environment

Trees need to be considered in the overall environment and are subject to specific legislation and planning instruments such as:

- Biodiversity Conservation Act (NSW) 2016
- Biosecurity Act (NSW) 2015, and
- Development Control Codes.

3.1.1 Biodiversity Conservation Act (NSW) 2016

The Biodiversity Conservation Act lists in its schedules a number of species, populations or ecological communities that are either endangered or vulnerable. The Act requires biodiversity offsets to be made if an activity or development is going to have a significant effect on species, populations or endangered ecological communities listed in the schedules of the Act. Where identified on or adjacent the site, threatened tree species are considered in this report, however no attempt is made to identify trees that are components of a broader threatened ecological community or population.

3.1.2 Biosecurity Act (NSW) 2015

The purpose of the Biosecurity Act is to protect the NSW economy, environment and community from the negative impact of pests, diseases and weeds. In NSW, all plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. The Act identifies weed species under 4 categories being:

- Weeds of National Significance;
- National Environmental Alert Weeds;
- Water Weeds;
- Native Plants Considered to be Weeds.

The Act makes provision for Regional Strategic Weed Management Plans which may include additional weed species that can be managed at a regional or local level.

3.1.3 Development Control Codes

There are a number of environmental pest species that commonly cause problems in developed urban areas or readily spread into natural bushland areas. In urban areas, these species can have aggressive root systems and cause damage to built structures or services. Alternatively, some species can be problematic in natural bushland areas degrading habitats and reducing natural biodiversity. Many of these are recognised by Councils as pest species and are exempt from protection under Council's Development Control Plans (DCP).

3.2 significance in the landscape

Assessment of a tree's significance in the landscape is generally categorised as either:

- Very High Landscape Significance - prominent from a broad landscape perspective;
- High Landscape Significance - prominent from a neighbourhood perspective;
- Moderate Landscape Significance - prominent from adjacent areas surrounding the site, and
- Low Landscape Significance - prominent from a site perspective only.

3.3 tree significance table

Tree No	Genus Species	Common Name	Height (m)	Canopy Spread (m)	Trunk DBH (mm)	Trunk DAB (mm)	Description	Environmental /Landscape Significance	On / Off Site
DBH (trunk Diameter at Breast Height), DAB (trunk Diameter Above Buttress)									
173	*Eucalyptus sp.*	-	12	4	170	250	Semi-mature single trunk tree with an upright forest form; an upright trunk/s and balanced canopy and branch development. . No evidence of significant branch pruning.	Low L/scape Sig.	On site
174	*Eucalyptus sp.*	-	10	5	170	210	Semi-mature single trunk tree with an upright forest form; an upright trunk/s and balanced canopy and branch development. . No evidence of significant branch pruning.	Low L/scape Sig.	On site
175	*Eucalyptus sp.*	-	11	5	170	230	Semi-mature single trunk tree with an upright forest form; an upright trunk/s and balanced canopy and branch development. . No evidence of significant branch pruning.	Low L/scape Sig.	On site
176	*Eucalyptus saligna*	Sydney Blue Gum	20	21	240, 620, 590, 470	1580	Mature multi trunk tree with an upright forest form; an upright trunk/s and balanced canopy and branch development. . No evidence of significant branch pruning.	Very High L/scape Sig.	On adjacent allotment
177	*Cinnamomum camphora*	Camphor Laurel	10	6	180, 170, 200, 270, 190	530	Mature multi trunk tree with an upright clumping form; an upright trunk/s and balanced canopy and branch development. . No evidence of significant branch pruning.	Env. Pest Species - Exempt from Council DCP	On adjacent allotment
178	*Cinnamomum camphora*	Camphor Laurel	11	5	110, 190	260	Mature twin trunk tree with an upright elliptical form; an upright trunk/s and balanced canopy and branch development. . No evidence of significant branch pruning.	Env. Pest Species - Exempt from Council DCP	On adjacent allotment
179	*Glochidion ferdinandi*	Cheese Tree	9	0	270, 240	440	Mature twin trunk tree with an upright clumping form; an upright trunk/s and balanced canopy and branch development. . No evidence of significant branch pruning.	Low L/scape Sig.	On adjacent allotment
180	*Pittosporum undulatum*	Sweet Pittosporum	6	4	120	210	Mature single trunk tree with an upright spreading form; an upright trunk/s and balanced canopy and branch development. . No evidence of significant branch pruning.	Low L/scape Sig.	On site
181	*Pittosporum undulatum*	Sweet Pittosporum	7	7	200, 190, 340	460	Mature multi trunk tree with an upright spreading form; an upright trunk/s and balanced canopy and branch development. . No evidence of significant branch pruning.	Moderate L/scape Sig.	On site
182	*Eucalyptus sp.*	-	4	2	120	150	Semi-mature single trunk tree with an upright forest form; an upright trunk/s and balanced canopy and branch development. . No evidence of significant branch pruning.	Low L/scape Sig.	Within road reserve
183	*Eucalyptus punctata*	Grey Gum	5	3	140	190	Semi-mature single trunk tree with an upright forest form; a slight trunk lean to the and no branches or foliage. north.. No evidence of significant branch pruning.	Low L/scape Sig.	Within road reserve

Tree No	Genus Species	Common Name	Height (m)	Canopy Spread (m)	Trunk DBH (mm)	Trunk DAB (mm)	Description	Environmental /Landscape Significance	On / Off Site
DBH (trunk Diameter at Breast Height), DAB (trunk Diameter Above Buttress)									
184	*Callistemon 'Hanna Ray'*	Hanna Ray Bottlebrush	9	5	240, 170	340	Mature twin trunk tree with an upright spreading form; a slight trunk lean to the north west and majority of canopy and branch development is towards the north west.. No evidence of significant branch pruning.	Low L/scape Sig.	Within road reserve
185	*Alnus jorullensis*	Evergreen Alder	11	11	320, 240, 350	570	Over mature multi trunk tree with a broad spreading form; an upright trunk/s and balanced canopy and branch development. . No evidence of significant branch pruning.	Env. Pest Species - Exempt from Council DCP	Within road reserve
186	*Alnus jorullensis*	Evergreen Alder	11	13	390	420	Over mature single trunk tree with an upright spreading form; an upright trunk/s and balanced canopy and branch development. . No evidence of significant branch pruning.	Env. Pest Species - Exempt from Council DCP	Within road reserve
187	*Banksia integrifolia*	Coastal Banksia	8	4	160	180	Mature single trunk tree with an upright elliptical form; a slight trunk lean to the south and majority of canopy and branch development is towards the south.. No evidence of significant branch pruning.	Low L/scape Sig.	Within road reserve
188	*Banksia integrifolia*	Coastal Banksia	10	4	190	270	Mature single trunk tree with an upright forest form; a slight trunk lean to the south east and majority of canopy and branch development is towards the south east.. No evidence of significant branch pruning.	Low L/scape Sig.	Within road reserve
189	*Eucalyptus punctata*	Grey Gum	5	4	170	260	Semi-mature single trunk tree with an upright forest form; an upright trunk/s and balanced canopy and branch development. . No evidence of significant branch pruning.	Low L/scape Sig.	Within road reserve
190	*Eucalyptus punctata*	Grey Gum	6	4	170	210	Semi-mature single trunk tree with an upright forest form; an upright trunk/s and balanced canopy and branch development. . No evidence of significant branch pruning.	Low L/scape Sig.	Within road reserve
191	*Callistemon 'Hanna Ray'*	Hanna Ray Bottlebrush	10	6	80, 150, 100, 160, 100	320	Mature multi trunk tree with an upright spreading form; an upright trunk/s and majority of canopy and branch development is towards the south west.. No evidence of significant branch pruning.	Low L/scape Sig.	Within road reserve
192	*Callistemon 'Hanna Ray'*	Hanna Ray Bottlebrush	10	4	70, 60, 100	250	Mature multi trunk tree with an upright elliptical form; an upright trunk/s and balanced canopy and branch development. . No evidence of significant branch pruning.	Low L/scape Sig.	Within road reserve
193	*Callistemon 'Hanna Ray'*	Hanna Ray Bottlebrush	10	4	180, 150, 140	310	Mature multi trunk tree with an upright elliptical form; an upright trunk/s and balanced canopy and branch development. . Lower limbs of the tree have been pruned.	Low L/scape Sig.	Within road reserve
194	*Callistemon 'Hanna Ray'*	Hanna Ray Bottlebrush	11	8	210, 180	370	Mature twin trunk tree with an upright elliptical form; a slight trunk lean to the west and majority of canopy and branch development is towards the west.. Lower limbs of the tree have been pruned.	Low L/scape Sig.	Within road reserve
195	*Callistemon 'Hanna Ray'*	Hanna Ray Bottlebrush	11	8	140, 130, 150, 70	330	Mature multi trunk tree with an upright elliptical form; an upright trunk/s and balanced canopy and branch development. . Lower limbs of the tree have been pruned.	Low L/scape Sig.	Within road reserve

Tree No	Genus Species	Common Name	Height (m)	Canopy Spread (m)	Trunk DBH (mm)	Trunk DAB (mm)	Description	Environmental /Landscape Significance	On / Off Site
DBH (trunk Diameter at Breast Height), DAB (trunk Diameter Above Buttress)									
196	*Callistemon 'Hanna Ray'*	Hanna Ray Bottlebrush	10	4	130, 140, 130, 160	390	Mature multi trunk tree with an upright forest form; an upright trunk/s and balanced canopy and branch development. . Lower limbs of the tree have been pruned.	Moderate L/scape Sig.	Within road reserve
197	*Callistemon 'Hanna Ray'*	Hanna Ray Bottlebrush	10	6	200, 170, 110	460	Mature multi trunk tree with an upright elliptical form; an upright trunk/s and majority of canopy and branch development is towards the west.. Lower limbs of the tree have been pruned.	Low L/scape Sig.	Within road reserve
198	*Callistemon 'Hanna Ray'*	Hanna Ray Bottlebrush	9	5	130, 300, 190	420	Mature multi trunk tree with an upright elliptical form; an upright trunk/s and majority of canopy and branch development is towards the west.. Lower limbs of the tree have been pruned.	Low L/scape Sig.	Within road reserve
199	*Callistemon 'Hanna Ray'*	Hanna Ray Bottlebrush	5	5	110, 100, 50	200	Mature multi trunk tree with an upright elliptical form; a slight trunk lean to the north west and balanced canopy and branch development. south west.. No evidence of significant branch pruning.	Low L/scape Sig.	Within road reserve
200	*Callistemon 'Hanna Ray'*	Hanna Ray Bottlebrush	6	5	180, 100, 60	370	Mature multi trunk tree with an upright elliptical form; an upright trunk/s and balanced canopy and branch development. . Lower limbs of the tree have been pruned.	Low L/scape Sig.	Within road reserve
313	*Eucalyptus saligna*	Sydney Blue Gum	15	13	380	570	Mature single trunk tree with an upright forest form; an upright trunk/s and balanced canopy and branch development. . No evidence of significant branch pruning.	Moderate L/scape Sig.	Within road reserve
314	*Eucalyptus sp.*	-	7	2	90	130	Immature single trunk tree with an upright forest form; an upright trunk/s and balanced canopy and branch development. . No evidence of significant branch pruning.	Low L/scape Sig.	Within road reserve
315	*Eucalyptus saligna*	Sydney Blue Gum	15	16	550	780	Mature single trunk tree with an upright forest form; an upright trunk/s and balanced canopy and branch development. . No evidence of significant branch pruning.	High L/scape Sig.	Within road reserve
316	*Callistemon 'Hanna Ray'*	Hanna Ray Bottlebrush	5	4	90, 80, 90, 100, 100, 90	330	Mature multi trunk tree with an upright spreading form; an upright trunk/s and balanced canopy and branch development. . Lower limbs of the tree have been pruned.	Low L/scape Sig.	Within road reserve
317	*Eucalyptus sp.*	-	5	2	60	90	Immature single trunk tree with an upright forest form; an upright trunk/s and balanced canopy and branch development. . No evidence of significant branch pruning.	Low L/scape Sig.	Within road reserve

4. tree condition & life expectancy

4.1 condition

The assessment of the trees condition is undertaken by visual inspection of the trees themselves, surrounding vegetation and the site conditions.

An assessment of each tree is undertaken taking into account the condition of the tree's roots, trunk, branches, foliage, previous pruning works, pests and disease, nesting hollows, fauna scratchings and the surrounding environment that may influence the condition of the tree.

4.2 Safe Useful Life Expectancy (SULE)

The condition information is used to determine the Safe Useful Life Expectancy (SULE) of each tree and takes into account the age of the tree, the 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 not static as it relates to the tree's health and the surrounding conditions. Whilst it is recognised that changes to the tree's condition will affect the assessment, changes to the surrounding environment may result in changes to the SULE assessment.

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

SULE Rating	Category	Description
1	Long	Life span greater than 40 years
2	Medium	Life span from 15 to 40 years
3	Short	Life span from 5 to 15 years
4	Remove	Should be removed within 5 years
5	Transplant	Small, Young or Regularly Pruned, Trees that can readily be moved or replaced.

In addition to the categories listed above, trees that show signs of imminent structural failure are listed as 'Unstable'.

Unstable	Unstable in the ground or have significant trunk damage rendering them structurally hazardous.

4.3 tree condition table

Tree No	Genus Species	Common Name	Height (m)	Canopy Spread (m)	Trunk DBH (mm)	Trunk DAB (mm)	Health & Stability	Foliage Condition	% Canopy Dead Wood	Evidence of Pests, Disease, Cavity, Bracket Fungi, etc.	SULE Rating
DBH (trunk Diameter at Breast Height), DAB (trunk Diameter Above Buttress)											
173	*Eucalyptus sp.*	-	12	4	170	250	The tree appears stable and its branch attachment appears sound. The tree is considered to be in good health and displays good vigour.	Excellent	<5%	None evident	1
174	*Eucalyptus sp.*	-	10	5	170	210	The tree appears stable and its branch attachment appears sound. The tree is considered to be in good health and displays good vigour.	Good	<5%	None evident	1
175	*Eucalyptus sp.*	-	11	5	170	230	The tree appears stable and its branch attachment appears sound. The tree is considered to be in good health and displays good vigour.	Very Good	<5%	None evident	1
176	*Eucalyptus saligna*	Sydney Blue Gum	20	21	240, 620, 590, 470	1580	The tree appears stable and its branch attachment appears sound. The tree is considered to be in good health and displays good vigour.	Very Good	<5%	The tree is a multi-trunk specimen at 3m.	1
177	*Cinnamomum camphora*	Camphor Laurel	10	6	180, 170, 200, 270, 190	530	The tree appears stable and its branch attachment appears sound. The tree is considered to be in good health and displays good vigour.	Good	10%	None evident	1
178	*Cinnamomum camphora*	Camphor Laurel	11	5	110, 190	260	The tree appears stable and its branch attachment appears fair. The tree is considered to be in moderate health and displays fair vigour.	Fair	25%	None evident	1
179	*Glochidion ferdinandi*	Cheese Tree	9	0	270, 240	440	The tree stability is suspect and its branch attachment appears poor. The tree is considered to be in dead and displays no signs of any vigour.	Poor	100%	Dead Tree	Unstable
180	*Pittosporum undulatum*	Sweet Pittosporum	6	4	120	210	The tree appears stable and its branch attachment appears sound. The tree is considered to be in good health and displays good vigour.	Good	10%	None evident	2
181	*Pittosporum undulatum*	Sweet Pittosporum	7	7	200, 190, 340	460	The tree appears stable and its branch attachment appears sound. The tree is considered to be in good health and displays good vigour.	Very Good	10%	None evident	2
182	*Eucalyptus sp.*	-	4	2	120	150	The tree appears stable and its branch attachment appears sound. The tree is considered to be in moderate health and displays fair vigour.	Fair	15%	None evident	2

Tree No	Genus Species	Common Name	Height (m)	Canopy Spread (m)	Trunk DBH (mm)	Trunk DAB (mm)	Health & Stability	Foliage Condition	% Canopy Dead Wood	Evidence of Pests, Disease, Cavity, Bracket Fungi, etc.	SULE Rating
DBH (trunk Diameter at Breast Height), DAB (trunk Diameter Above Buttress)											
183	*Eucalyptus punctata*	Grey Gum	5	3	140	190	The tree appears stable and its branch attachment appears sound. The tree is considered to be in moderate health and displays good vigour.	Good	<5%	None evident	2
184	*Callistemon 'Hanna Ray'*	Hanna Ray Bottlebrush	9	5	240, 170	340	The tree appears stable and its branch attachment appears sound. The tree is considered to be in good health and displays good vigour.	Good	10%	The tree appears to be suppressed by the adjacent vegetation	2
185	*Alnus jorullensis*	Evergreen Alder	11	11	320, 240, 350	570	The tree appears stable and its branch attachment appears fair. The tree is considered to be in poor health and displays poor vigour.	Poor	25%	Small cavities are present in the trunk and minor decay is evident. Epicormic growth is present.	4
186	*Alnus jorullensis*	Evergreen Alder	11	13	390	420	The tree appears stable and its branch attachment appears sound. The tree is considered to be in poor health and displays poor vigour.	Poor	30%	Decay is present in previously pruned branch stubs and epicormic growth is present.	4
187	*Banksia integrifolia*	Coastal Banksia	8	4	160	180	The tree appears stable and its branch attachment appears sound. The tree is considered to be in good health and displays good vigour.	Very Good	<5%	None evident	3
188	*Banksia integrifolia*	Coastal Banksia	10	4	190	270	The tree appears stable and its branch attachment appears sound. The tree is considered to be in good health and displays good vigour.	Very Good	<5%	None evident	2
189	*Eucalyptus punctata*	Grey Gum	5	4	170	260	The tree appears stable and its branch attachment appears sound. The tree is considered to be in moderate health and displays fair vigour.	Poor	15%	The tree appears to be defoliated by possums.	2
190	*Eucalyptus punctata*	Grey Gum	6	4	170	210	The tree appears stable and its branch attachment appears sound. The tree is considered to be in moderate health and displays fair vigour.	Good	10%	The tree appears to be defoliated by possums.	2
191	*Callistemon 'Hanna Ray'*	Hanna Ray Bottlebrush	10	6	80, 150, 100, 160, 100	320	The tree appears stable and its branch attachment appears sound. The tree is considered to be in good health and displays good vigour.	Good	<5%	None evident	2
192	*Callistemon 'Hanna Ray'*	Hanna Ray Bottlebrush	10	4	70, 60, 100	250	The tree appears stable and its branch attachment appears sound. The tree is considered to be in moderate health and displays fair vigour.	Good	10%	The tree appears to be suppressed by the adjacent vegetation	3

Tree No	Genus Species	Common Name	Height (m)	Canopy Spread (m)	Trunk DBH (mm)	Trunk DAB (mm)	Health & Stability	Foliage Condition	% Canopy Dead Wood	Evidence of Pests, Disease, Cavity, Bracket Fungi, etc.	SULE Rating
DBH (trunk Diameter at Breast Height), DAB (trunk Diameter Above Buttress)											
193	*Callistemon 'Hanna Ray'*	Hanna Ray Bottlebrush	10	4	180, 150, 140	310	The tree appears stable and its branch attachment appears sound. The tree is considered to be in moderate health and displays fair vigour.	Fair	10%	The tree appears to be suppressed by the adjacent vegetation	3
194	*Callistemon 'Hanna Ray'*	Hanna Ray Bottlebrush	11	8	210, 180	370	The tree displays some signs of instability and its branch attachment appears fair. The tree is considered to be in moderate health and displays fair vigour.	Good	10%	None evident	3
195	*Callistemon 'Hanna Ray'*	Hanna Ray Bottlebrush	11	8	140, 130, 150, 70	330	The tree appears stable and its branch attachment appears sound. The tree is considered to be in good health and displays good vigour.	Good	10%	The tree has twiggy deadwood in the upper canopy and a bark inclusion in the main junction.	2
196	*Callistemon 'Hanna Ray'*	Hanna Ray Bottlebrush	10	4	130, 140, 130, 160	390	The tree appears stable and its branch attachment appears sound. The tree is considered to be in good health and displays good vigour.	Good	10%	Central leader has been removed at 400mm.	2
197	*Callistemon 'Hanna Ray'*	Hanna Ray Bottlebrush	10	6	200, 170, 110	460	The tree appears stable and its branch attachment appears sound. The tree is considered to be in good health and displays good vigour.	Good	<5%	None evident	3
198	*Callistemon 'Hanna Ray'*	Hanna Ray Bottlebrush	9	5	130, 300, 190	420	The tree appears stable and its branch attachment appears sound. The tree is considered to be in good health and displays good vigour.	Good	10%	None evident	3
199	*Callistemon 'Hanna Ray'*	Hanna Ray Bottlebrush	5	5	110, 100, 50	200	The tree appears stable and its branch attachment appears sound. The tree is considered to be in moderate health and displays fair vigour.	Fair	15%	The tree appears to be suppressed by the adjacent vegetation	4
200	*Callistemon 'Hanna Ray'*	Hanna Ray Bottlebrush	6	5	180, 100, 60	370	The tree appears stable and its branch attachment appears sound. The tree is considered to be in good health and displays good vigour.	Good	<5%	The tree appears to be suppressed by the adjacent vegetation. The tree has physical wounds on the lower trunk.	3
313	*Eucalyptus saligna*	Sydney Blue Gum	15	13	380	570	The tree appears stable and its branch attachment appears fair. The tree is considered to be in good health and displays good vigour.	Good	<5%	The tree has a bark inclusion at 2.5m above ground level. The tree has a history of limb failure and has an open sparse branching structure.	2
314	*Eucalyptus sp.*	-	7	2	90	130	The tree appears stable and its branch attachment appears sound. The tree is considered to be in good health and displays good vigour.	Good	<5%	None evident	1

Tree No	Genus Species	Common Name	Height (m)	Canopy Spread (m)	Trunk DBH (mm)	Trunk DAB (mm)	Health & Stability	Foliage Condition	% Canopy Dead Wood	Evidence of Pests, Disease, Cavity, Bracket Fungi, etc.	SULE Rating
DBH (trunk Diameter at Breast Height), DAB (trunk Diameter Above Buttress)											
315	*Eucalyptus saligna*	Sydney Blue Gum	15	16	550	780	The tree appears stable and its branch attachment appears sound. The tree is considered to be in good health and displays good vigour.	Good	10%	The tree is an open branching specimen.	1
316	*Callistemon 'Hanna Ray'*	Hanna Ray Bottlebrush	5	4	90, 80, 90, 100, 100, 90	330	The tree appears stable and its branch attachment appears sound. The tree is considered to be in good health and displays good vigour.	Good	<5%	None evident	3
317	*Eucalyptus sp.*	-	5	2	60	90	The tree appears stable and its branch attachment appears sound. The tree is considered to be in good health and displays good vigour.	Good	<5%	None evident	1

5. general impacts on trees

5.1 tree protection setbacks

Where trees are intended to be retained, development footprints should be located away from trees so as to provide adequate clearances for a tree protection zone.

Disturbance within Tree Protection Zones can be detrimental to the tree's root system and in turn affect the stability, health and condition of the tree. In many cases damage to the root systems is the major cause of tree decline in urban areas.

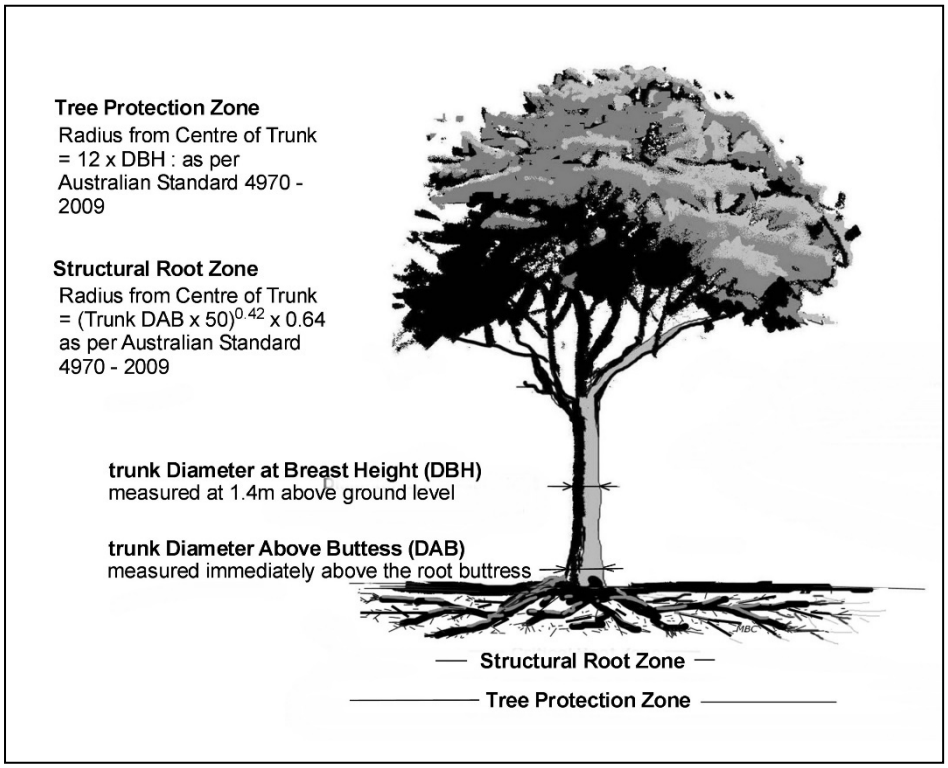


Figure 5.1 Typical diagram of a Tree Protection Zone & Structural Root Zone of a tree based upon AS 4970 – 2009.

Where trees are multi-trunk specimens assessment needs to be made based upon the number of trunks and the diameter of each trunk. Based upon the Australian Standard for Protection of Trees on Development Sites, AS 4970 – 2009, the DBH of multi-trunk trees is calculated by:

$$DBH = \sqrt{(DBH_1)^2 + (DBH_2)^2 + (DBH_3)^2}$$

5.2 development design & Tree Protection Zones

Where trees are intended to be retained, proposed developments must provide an adequate Tree Protection Zone around trees. This Tree Protection Zone is set aside for the tree's root zone and it is essential for the stability and longevity of the tree. Existing soil levels should be retained within the Tree Protection Zone.

Based upon the Australian Standard for Protection of Trees on Development Sites, AS 4970 – 2009, the radius of the Tree Protection Zone (TPZ) is calculated as: TPZ = 12 x DBH.

5.3 developments within the Tree Protection Zone (TPZ)

5.3.1 Minor encroachments into Tree Protection Zones

Based upon AS 4970 – 2009 some development activity can occur within the vicinity of trees and minor encroachments can occur within the calculated Tree Protection Zone provided that:

- no more that 10% of the area (m^2) of the Tree Protection Zone is removed, and
- the area (m^2) to be removed is compensated for by increasing the distance of the Tree Protection Zone in other directions so that there is no net loss in area (m^2) of the calculated Tree Protection Zone.

5.3.2 Major encroachments into Tree Protection Zones

Where the proposed development activity is greater than that described as a minor encroachment (refer above); the activity is considered to be a major encroachment into the Tree Protection Zone.

Where major encroachments are to occur within the Tree Protection Zone of trees intended to be retained, it must be demonstrated that the works or activities will not have a significant impact on the health and condition of the tree. To demonstrate this detailed root mapping investigation by non-invasive methods may be necessary; and other factors such as the age class, health & vigour, trunk lean, disturbance tolerance of the species, and building design may need to be taken into account in the arboricultural assessment.

Where major encroachments are proposed to occur into the Tree Protection Zone the tree's Structural Root Zone should also be taken into account.

5.4 developments within the tree's Structural Root Zone (SRZ)

The Structural Root Zone is the area surrounding the tree where the severance of these roots and excavation is likely to affect the stability of the tree and can have a significant detrimental impact on the health & condition of the tree.

Based upon AS 4970 – 2009 the radius of a tree's Structural Root Zone (SRZ) is determined by measuring the diameter of the trunk immediately above the root buttress (DAB) and calculated by: $SRZ = (DAB \times 50)^{0.42} \times 0.64$.

Developments should not encroach into the tree's Structural Root Zone and existing soil levels must remain. Excavation should not occur within this area unless a detailed arboricultural assessment is undertaken. Fill material in this area is also considered to be detrimental to the health and condition of the tree.

6. proposed development impact on trees

6.1 tree retention & removal and proposed works

Based upon the proposed concept plan modification (Chrofi, 2020) and the landscape concept plan Building K (McGregor Coxall, 2020) the following table indicates the assessment process and identifies trees that can be satisfactorily retained and those that will be impacted upon by works and will need to be removed.

Whilst Tree No.314 is not directly affected by the development removal is required to facilitate subsurface electrical infrastructure upgrades from the verge to the existing substation and provide Ausgrid with future unimpeded access to their asset.

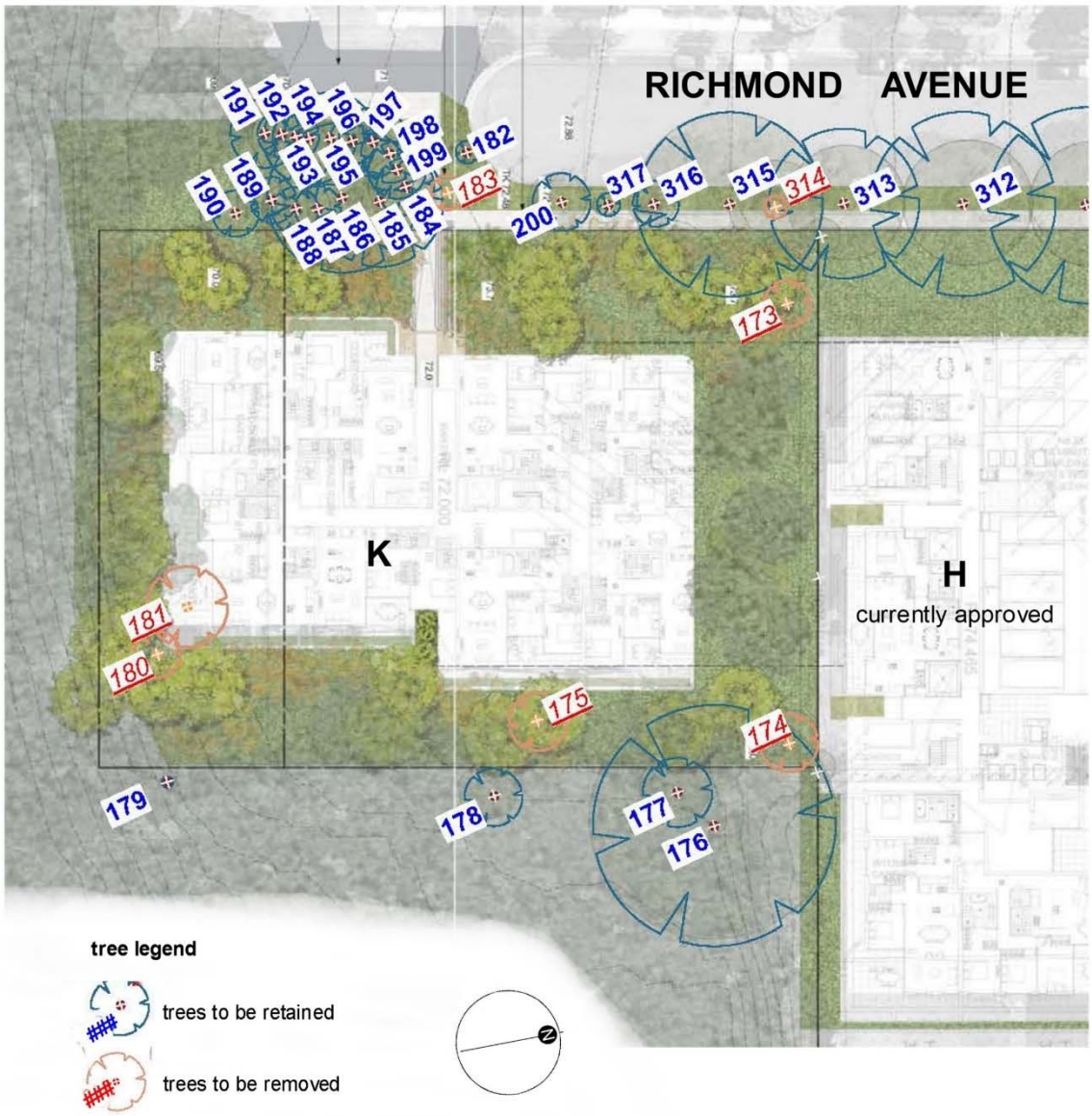
Tree No	Genus Species	DBH (mm)	DAB (mm)	SULE Rating	Landscape Significance	TPZ Radius (m)	TPZ Area (m2)	TPZ 90% Area Radius	SRZ Radius (m)	Adjacent Works	Influence on Tree	Plan Status	On / off site
173	*Eucalyptus sp.*	170	250	1	Low L/scape Sig.	2.00	12.60	1.4	1.8	The proposed Basement Level 1 is within close proximity to the tree.,	Changes to soil levels are likely to involve fill and or excavation effecting a substantial portion of the tree's root system.	To be Removed	On site
174	*Eucalyptus sp.*	170	210	1	Low L/scape Sig.	2.00	12.60	1.4	1.7	The existing built infrastructure is to be demolished adjacent the tree.	Demolition activity is to occur in close proximity to the tree and substantial pruning and damage to the tree is likely to occur.	To be Removed	On site
175	*Eucalyptus sp.*	170	230	1	Low L/scape Sig.	2.00	12.60	1.4	1.8	The existing built infrastructure is to be demolished adjacent the tree.	Demolition activity is to occur in close proximity to the tree and substantial pruning and damage to the tree is likely to occur.	To be Removed	On site
176	*Eucalyptus saligna*	240, 620, 590, 470	1580	1	Very High L/scape Sig.	12.10	460.00	8.5	4	The proposed Building K footprint is within 11.4m (west) of the tree. The proposed Basement Level 1 is within 11.3m (north) of the tree.	No significant impact with appropriate Tree Protection Measures.	Retained with General Tree Protection Measures	On adjacent allotment

Tree No	Genus Species	DBH (mm)	DAB (mm)	SULE Rating	Landscape Significance	TPZ Radius (m)	TPZ Area (m2)	TPZ 90% Area Radius	SRZ Radius (m)	Adjacent Works	Influence on Tree	Plan Status	On / off site
177	*Cinnamomum camphora*	180, 170, 200, 270, 190	530	1	Env. Pest Species - Exempt from Council DCP	5.50	95.00	3.8	2.5	The proposed Building K footprint is within 8.4m (west) of the tree.	No significant impact with appropriate Tree Protection Measures.	Retained with General Tree Protection Measures	On adjacent allotment
178	*Cinnamomum camphora*	110, 190	260	1	Env. Pest Species - Exempt from Council DCP	2.60	21.20	1.8	1.9	The proposed Building K footprint is within 8.6m (west) of the tree.	No significant impact with appropriate Tree Protection Measures.	Retained with General Tree Protection Measures	On adjacent allotment
179	*Glochidion ferdinandi*	270, 240	440	Unstable	Low L/scape Sig.	4.30	58.10	3	2.3	No proposed works within the tree's Tree Protection Zone.	No significant impact with appropriate Tree Protection Measures.	Retained with General Tree Protection Measures	On adjacent allotment
180	*Pittosporum undulatum*	120	210	2	Low L/scape Sig.	2.00	12.60	1.4	1.7	The proposed building footprint is within 2.1m (north) of the tree.	Construction activity is to occur in close proximity to the tree and substantial pruning and damage to the tree is likely to occur.	To be Removed	On site
181	*Pittosporum undulatum*	200, 190, 340	460	2	Moderate L/scape Sig.	5.30	88.20	3.7	2.4	The proposed building footprint spatially conflicts with the location of the tree.	Not applicable	To be Removed	On site
182	*Eucalyptus sp.*	120	150	2	Low L/scape Sig.	2.00	12.60	1.4	1.5	The proposed pedestrian path is within 1.2m (south) of the tree.	No significant impact with designed tree protection.	Retained with Designed & General Tree Protection Measures	Within road reserve
183	*Eucalyptus punctata*	140	190	2	Low L/scape Sig.	2.00	12.60	1.4	1.6	The proposed pedestrian path is within 0.1m (south) of the tree.	Changes to existing soil levels involve fill and/or excavation affecting a substantial portion of the tree's Tree Protection Zone	To be Removed	Within road reserve
184	*Callistemon 'Hanna Ray'*	240, 170	340	2	Low L/scape Sig.	3.50	38.50	2.4	2.2	The proposed pedestrian path is within 1.5m (north) of the tree.	No significant impact with designed tree protection.	Retained with Designed & General Tree Protection Measures	Within road reserve
185	*Alnus jorullensis*	320, 240, 350	570	4	Env. Pest Species - Exempt from Council DCP	6.40	128.70	4.5	2.6	The proposed pedestrian path is within 3.5m (north) of the tree.	No significant impact with designed tree protection.	Retained with Designed & General Tree Protection Measures	Within road reserve

Tree No	Genus Species	DBH (mm)	DAB (mm)	SULE Rating	Landscape Significance	TPZ Radius (m)	TPZ Area (m2)	TPZ 90% Area Radius	SRZ Radius (m)	Adjacent Works	Influence on Tree	Plan Status	On / off site
186	*Alnus jorullensis*	390	420	4	Env. Pest Species - Exempt from Council DCP	4.70	69.40	3.3	2.3	The proposed pedestrian path is within 6.0m (north) of the tree.	No significant impact	Retained with General Tree Protection Measures	Within road reserve
187	*Banksia integrifolia*	160	180	3	Low L/scape Sig.	2.00	12.60	1.4	1.6	No proposed works within the tree's Tree Protection Zone	No significant impact	Retained with General Tree Protection Measures	Within road reserve
188	*Banksia integrifolia*	190	270	2	Low L/scape Sig.	2.30	16.60	1.6	1.9	No proposed works within the tree's Tree Protection Zone	No significant impact	Retained with General Tree Protection Measures	Within road reserve
189	*Eucalyptus punctata*	170	260	2	Low L/scape Sig.	2.00	12.60	1.4	1.9	No proposed works within the tree's Tree Protection Zone	No significant impact	Retained with General Tree Protection Measures	Within road reserve
190	*Eucalyptus punctata*	170	210	2	Low L/scape Sig.	2.00	12.60	1.4	1.7	No proposed works within the tree's Tree Protection Zone	No significant impact	Retained with General Tree Protection Measures	Within road reserve
191	*Callistemon 'Hanna Ray'*	80, 150, 100, 160, 100	320	2	Low L/scape Sig.	3.30	34.20	2.3	2.1	The proposed pedestrian path is within 1.3m (west) of the tree.	No significant impact with designed tree protection.	Retained with Designed & General Tree Protection Measures	Within road reserve
192	*Callistemon 'Hanna Ray'*	70, 60, 100	250	3	Low L/scape Sig.	2.00	12.60	1.4	1.8	The proposed pedestrian path is within 1.3m (west) of the tree.	No significant impact with designed tree protection.	Retained with Designed & General Tree Protection Measures	Within road reserve
193	*Callistemon 'Hanna Ray'*	180, 150, 140	310	3	Low L/scape Sig.	3.30	34.20	2.3	2	The proposed pedestrian path is within 1.6m (west) of the tree.	No significant impact with designed tree protection.	Retained with Designed & General Tree Protection Measures	Within road reserve
194	*Callistemon 'Hanna Ray'*	210, 180	370	3	Low L/scape Sig.	3.30	34.20	2.3	2.2	The proposed pedestrian path is within 1.7m (west) of the tree.	No significant impact with designed tree protection.	Retained with Designed & General Tree Protection Measures	Within road reserve
195	*Callistemon 'Hanna Ray'*	140, 130, 150, 70	330	2	Low L/scape Sig.	3.00	28.30	2.1	2.1	The proposed pedestrian path is within 1.8m (west) of the tree.	No significant impact with designed tree protection.	Retained with Designed & General Tree Protection Measures	Within road reserve

Tree No	Genus Species	DBH (mm)	DAB (mm)	SULE Rating	Landscape Significance	TPZ Radius (m)	TPZ Area (m2)	TPZ 90% Area Radius	SRZ Radius (m)	Adjacent Works	Influence on Tree	Plan Status	On / off site
196	*Callistemon 'Hanna Ray'*	130, 140, 130, 160	390	2	Moderate L/scape Sig.	3.40	36.30	2.4	2.2	The proposed pedestrian path is within 1.9m (west) of the tree.	No significant impact with designed tree protection.	Retained with Designed & General Tree Protection Measures	Within road reserve
197	*Callistemon 'Hanna Ray'*	200, 170, 110	460	3	Low L/scape Sig.	3.40	36.30	2.4	2.4	The proposed pedestrian path is within 1.9m (west) and 3.2m (north) of the tree.	No significant impact with designed tree protection.	Retained with Designed & General Tree Protection Measures	Within road reserve
198	*Callistemon 'Hanna Ray'*	130, 300, 190	420	3	Low L/scape Sig.	4.50	63.60	3.2	2.3	The proposed pedestrian path is within 3.0m (west) and 1.8m (north) of the tree.	No significant impact with designed tree protection.	Retained with Designed & General Tree Protection Measures	Within road reserve
199	*Callistemon 'Hanna Ray'*	110, 100, 50	200	4	Low L/scape Sig.	2.00	12.60	1.4	1.7	The proposed pedestrian path is within 1.3m (north) of the tree.	Construction activity is to occur in close proximity to the tree and substantial pruning and damage to the tree is likely to occur.	To be Removed	Within road reserve
200	*Callistemon 'Hanna Ray'*	180, 100, 60	370	3	Low L/scape Sig.	2.60	21.20	1.8	2.2	No proposed works within the tree's Tree Protection Zone	No significant impact	Retained with General Tree Protection Measures	Within road reserve
313	*Eucalyptus saligna*	380	570	2	Moderate L/scape Sig.	4.60	66.50	3.2	2.6	The proposed building footprint is within 9.4m (east) of the tree.	No significant impact with appropriate Tree Protection Measures.	Retained with General Tree Protection Measures	Within road reserve
314	*Eucalyptus sp.*	90	130	1	Low L/scape Sig.	2.00	12.60	1.4	1.6	Access is required by Ausgrid services and maintenance to the adjacent substation.	The tree spatially conflicts with access to the adjacent substation.	To be Removed	Within road reserve
315	*Eucalyptus saligna*	550	780	1	High L/scape Sig.	6.60	136.80	4.6	3	No proposed works apart from landscaping within the tree's Tree Protection Zone.	No significant impact with appropriate Tree Protection Measures.	Retained with General Tree Protection Measures	Within road reserve
316	*Callistemon 'Hanna Ray'*	90, 80, 90, 100, 100, 90	330	3	Low L/scape Sig.	2.70	22.90	1.9	2.1	No proposed works apart from landscaping within the tree's Tree Protection Zone.	No significant impact with appropriate Tree Protection Measures.	Retained with General Tree Protection Measures	Within road reserve
317	*Eucalyptus sp.*	60	90	1	Low L/scape Sig.	2.00	12.60	1.4	1.2	No proposed works apart from landscaping within the tree's Tree Protection Zone.	No significant impact with appropriate Tree Protection Measures.	Retained with General Tree Protection Measures	Within road reserve

6.2 plan of the development footprint & tree retention / removal



proposed building K & approved building H on adjacent allotment, showing tree retention & removal
not to scale

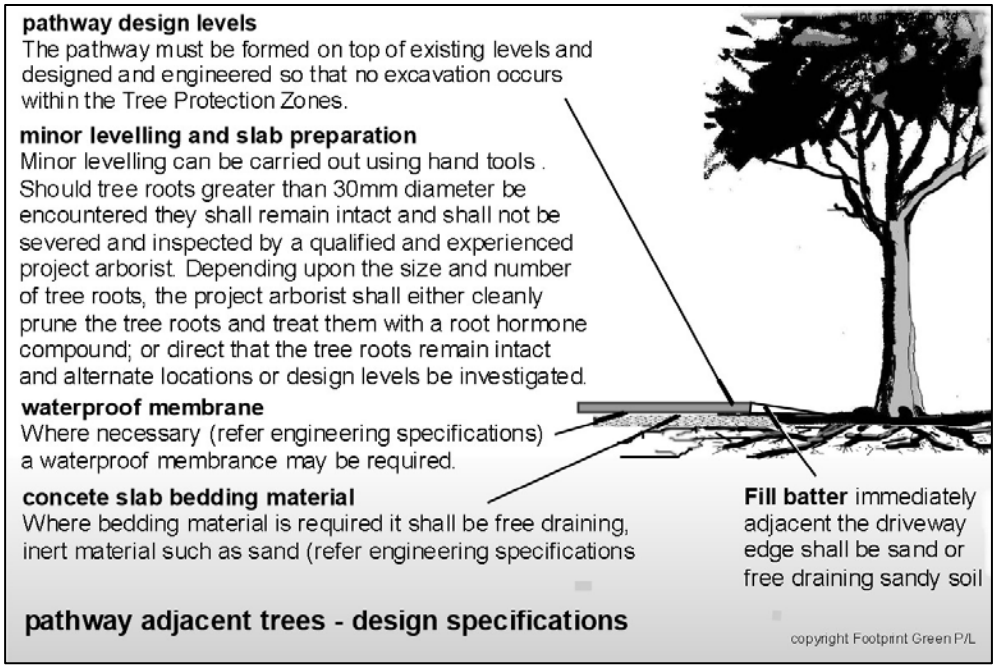
7. tree protection measures

7.1 designed tree protection

7.1.1 proposed pedestrian path in Richmond Ave

The proposed pedestrian path at the lower end of Richmond Avenue is within the Tree Protection Zones of Tree No's 182, 184, 185, 191, 192, 193, 194, 195, 196, 197 & 198. Excavation within the Tree Protection Zones could result in severance of significant trees roots affecting the health and stability of these trees.

To minimise disturbance to the root zone of these trees the proposed pedestrian path must be designed and constructed at or above existing levels and in accordance with the specification below.



7.2 detailed tree protection plan

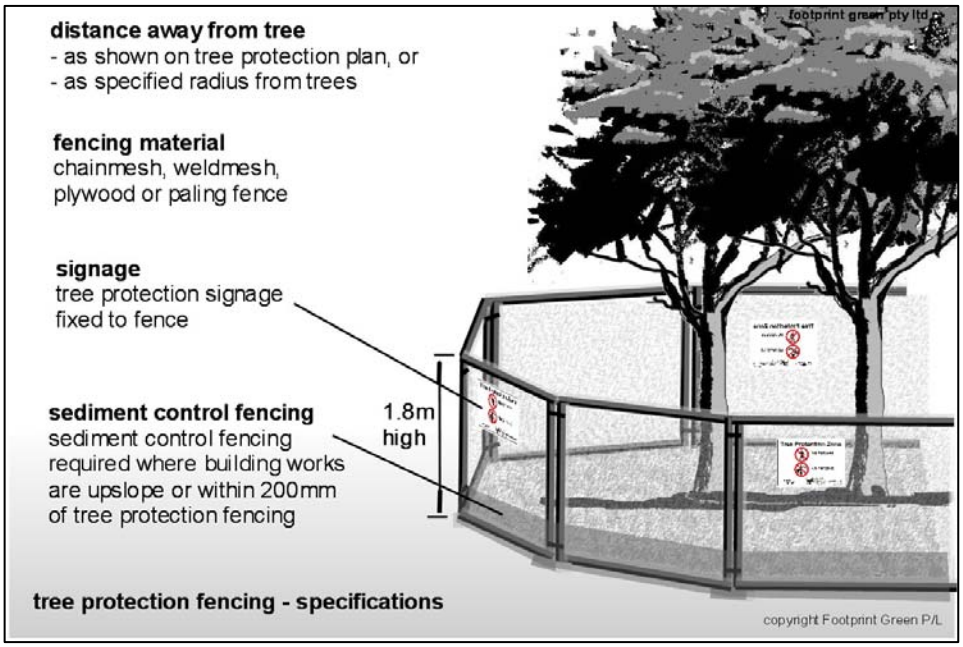
Once detailed development plans are available, a detailed Tree Protection Plan will need to be prepared based on, but not limited to the following specifications.

7.3 tree removal

Trees identified as being removed shall be removed ensuring that no damage occurs to the root system, trunk, branches or foliage of trees identified as being retained.

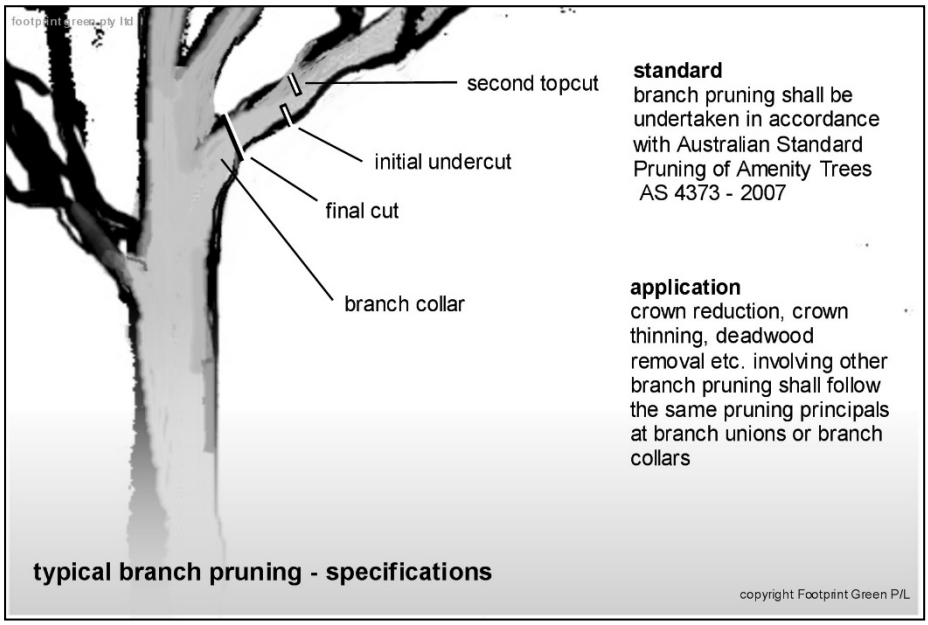
7.4 tree protection fencing

Tree protection fencing will need to be installed across the lower portion of the site to protect native vegetation on the steeper slopes. Fencing should be installed as per the specification below.



7.5 branch pruning

Should branch pruning be required, all pruning works including the removal of deadwood are to be undertaken in accordance with Australian Standard AS 4373-2007 Pruning of Amenity Trees and the work is to be undertaken by an experienced and qualified arborist.



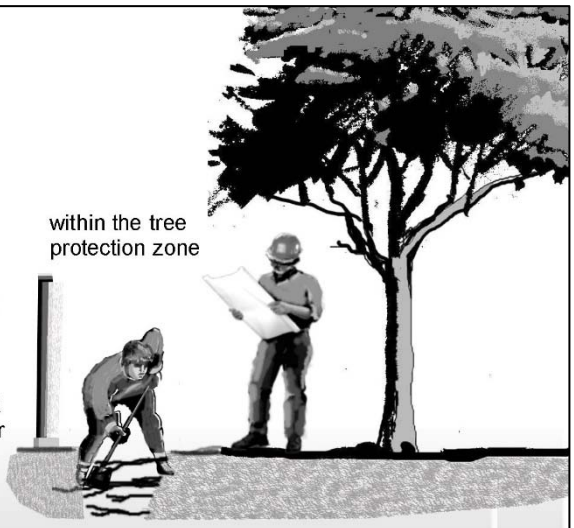
7.6 installation of services through tree protection zones

Should installation of services be required to be installed they shall be installed using hand tools or using trenchless technology

hand tools
Include the use of shovels, crowbars. (mattocks & axes shall not be used).

retention of tree roots
Excavation is to be conducted under the supervision of the project arborist. Tree root >30mm dia. shall be exposed, left intact and not severed or damaged

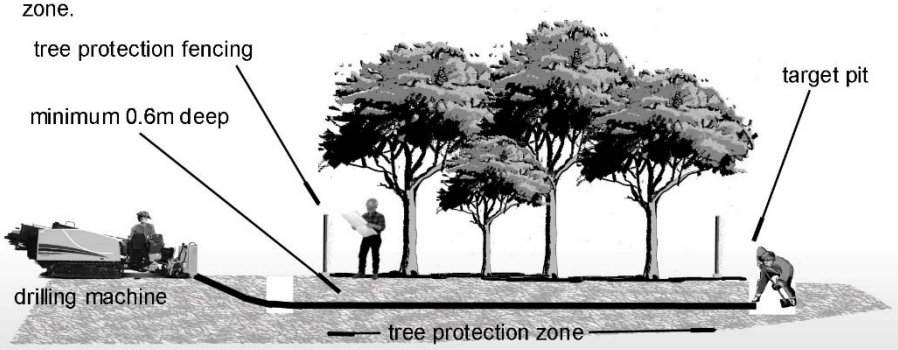
inspection of tree roots
Where tree roots spatially conflict with the fall line of the service, depending upon the number and size of the tree roots, the project arborist shall either:
- cleanly prune the tree roots and treat them with root hormone compound,or
- provide instructions to leave the tree roots intact and backfill the excavation and investigate alternate locations



excavation for services using hand tools within Tree Protection Zones - specifications

directional drilling & auger boring

- machinery is to be located and operated outside tree protection zones,
- drilling and target pits are to be located outside tree protection zones unless authorised by the project arborist and pits must be excavated using hand tools;
- drilling or boring must be a minimum 0.6m deep within tree protection zones;
- debris, soil, slurry or other waste material must not be discharged into the tree protection zone.



trenchless installation of services within Tree Protection Zones - specifications

7.7 soft landscape works

Outside the approved building footprints or retaining walls, landscape works in the vicinity of the trees must be sympathetic to tree retention and existing ground levels within the Tree Protection Zones must remain unchanged.

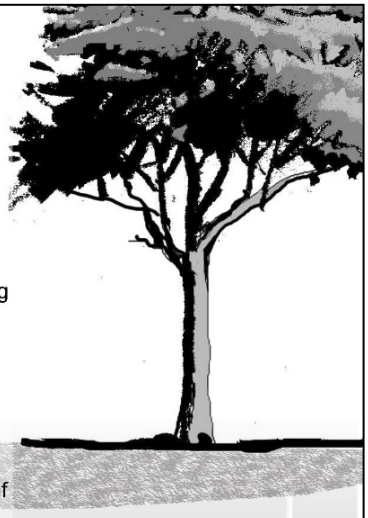
within tree protection zones
soil decompaction or rotary hoes should not occur within tree protection zones.

existing soil levels must remain unchanged be incorporated into finished landscape design levels. exceptions can occur to finished design levels where new turf is to be laid or garden beds established provided that a free draining soil base is used and the new soil base is no greater than 50mm in depth.

in turf areas the landscape design should consider utilising an established mowing edge to prevent ongoing damage to trunks from whipper snippers

the landscape design should not encourage regular pedestrian thoroughfare access across tree protection zones unless permeable pavements are provided

the tree protection zone or areas surrounding the trunks of established trees should ideally be mulched to minimise damage to the basal area of the tree and root buttresses



soft landscape works within Tree Protection Zones - specifications

8. summary

8.1 Conclusion

This report has been prepared to assess the condition and significance of a number of trees on and adjacent the properties known as the TX Australia Site (Lot 11 in DP 1162507) and Lot 12 DP 1162507, Richmond Ave, Willoughby and assess the potential impact of the proposed development on the identified trees.

The report has been commissioned by Mirvac and site inspections and field work were conducted between the 4th-12th February 2020.

The site is predominately developed with the TX Australia site containing the television and communication broadcast tower, a single storey operations building and hard stand areas. To the south of the site, Lot 12 DP 1162507 comprises of an open terraced area with long grass and weeds, which falls away steeply to rock boulder outcrops and predominately native vegetation.

The proposed modification involves decommissioning the broadcast tower and infrastructure, demolition of the built structures and construction of multistorey apartments with basement level carparking as shown on the proposed concept plan modification (Chrofi, 2020).

Based on the assessment of trees in conjunction with the Chrofi Concept Plan (Chrofi, 2020) and the landscape concept plan Building K (McGregor Coxall, 2020) 5 trees are proposed to be removed on the site and 2 trees within the Richmond Avenue road reserve.

The 5 trees to be removed on the TX Australia site consist of:

- 3 planted semi-mature Eucalypts (Tree No's 173, 174 & 175), and
- 2 Pittosporum (Pittosporum undulatum) (Tree No's 180 & 181).

The 2 trees to be removed outside the TX Australia site, within the road reserve, consist of:

- 1 planted semi-mature Eucalypts (Tree No. 183) impacted by the proposed pedestrian path, and
- 1 planted semi-mature Eucalypt (Tree No. 314) to be removed to facilitate subsurface electrical infrastructure upgrades from the verge to the existing substation and provide Ausgrid with future unimpeded access to their asset.

Of the 7 trees that are identified to be removed:

- 6 trees (Tree No's 173, 174, 175, 180, 183 & 314) are considered to be of Low Landscape Significance, and
- 1 tree (Tree No. 181) is considered to be of Moderate Landscape Significance.

No trees of High or Very High Landscape Significance, that are prominent in the local and broader landscape, are proposed to be removed.

Provided that the designed and general tree protection measures are implemented and the works are carried out in a sensitive manner, the proposed development will not have a significant impact on the trees identified as being retained.

references

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Barrell, J. (1995) Pre-development Tree Assessment in: Trees and Building Sites, *Proceedings of an International Workshop on Trees and Buildings.* (ed. Watson, G. and Neely, D). International Society of Arboriculture, Illinios, 132-142.

Barrell, J. (2001) SULE II – Presentation of Data, *Management of Mature Trees, Proceedings of the 4th NAAA Tree Management Seminar*. National Arborists Association of Australia.

Chrofi (2020) Project One – Willoughby 6-30 Artarmon Road & 15 Richmond Avenue, Willoughby Urban Design Report – Concept Plan Modification.

McGregor Coxall (2020) Schematic Design Building K, Sheet No. LD-SK-05, McGregor Coxall, Manly, NSW

Veris (2020) Plan Showing Tree Locations at Artarmon Road, Willoughby, Ref.No.202080, Issue 1, Dated 21/02/20, Veris Australia Pty Ltd, Surry Hills, NSW