

Arboricultural Impact Assessment



Figure 1 Tree 1 *Fraxinus species*

Site Address: Feeder 264 Replacement- Beaconsfield to Kingsford (B2K)

Client: Ausgrid

Date: July 2022

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Table of contents

1.0 Summary	3
2.0 Disclaimer.....	5
3.0 Brief	5
4.0 Method	5
4.1. Documents.....	5
5.0 Tree Assessment	7
6.0 Development impact.....	19
7.0 Discussion.....	19
7.1 Tree Protection.....	21
8.0 Conclusions	22
9.0 Recommendations	23
10.0 Appendices.....	25
10.1. Safe Useful Life Expectancy Categories	25
10.2 Concept Plan of proposed Route	26
10.3 Tree protection.....	27
10.4 Trench Detail	28
10.5. References	29
10.6 Qualifications – Ian Hills	29

Table of images

Figure 1 Tree 1 <i>Fraxinus species</i>	1
Figure 2 Small trees will be removed for the send/receive pit in Southern Cross Drive Reserve	24
Figure 3 <i>Acacia saligna</i> west of Gardners Rd may require pruning to provide access	24

1.0 Summary

Accurate Tree Assessment has been commissioned by Ausgrid (the client) to identify areas of encroachment into the Tree Protection Zone of trees located along the proposed route of the Feeder 264 Replacement- Beaconsfield to Kingsford (B2K). Three hundred and fifty-two (352) trees have been identified as being subject to potential TPZ/SRZ encroachment from the proposed works.

This report is to read in conjunction with the:

- shared map view and Excel spreadsheet provided to Daniel Halton on 11 and 12 March 2022.
- Proposed Underground Feeder Locality and Key Plan prepared by Ausgrid, included at Annexure A of this report

Conclusions

Trees 197-198 *Fraxinus angustifolia* located in Southern Cross Drive Reserve exhibit poor health and condition and would be removed during routine tree management regardless of the proposed development. Excavation near trees 197 and 198 for the installation and send/receive pit will exacerbate their decline.

The group of ten (10) immature Eucalyptus species adjacent to the Gardners Road overpass are proposed for removal to accommodate the proposed send/receive pit for the under boring of Southern Cross Drive.

Small trees and shrubs with DBH less than 0.2 metres along the route have not been considered as they are unlikely to be affected by the proposed works due to their setback from the trench or being in the proposed under-bored sections.

In some cases, larger trees will be exposed to major encroachment of the respective Tree Protection Zones (TPZ) caused by excavation of the electrical services trench. The implementation of specific protection measures detailed in section 7.0 and 7.1 of this report will therefore be required to ensure the viability of trees, and gain compliance with the provisions of AS4970-2009, "*Protection of Trees on Development Sites*".

The *Proposed Underground Feeder Locality and Key Plan* shows the proximity of the proposed trench in relation to the subject trees and other existing underground assets present within the roadway.

Where the structural root zone is proposed to be traversed;

1. non-destructive works within the Tree Protection Zone must document the nature (size of roots) and extent (depth) of root material, providing a preliminary assessment of the likelihood of safely passing through the Structural Root Zone.
2. where it may be considered possible, prior to working within the Structural Root Zone of any tree, ground truthing via means of exploratory non-destructive means (hand-digging, hydro-vac) within the proposed alignment at the direction of a suitably qualified arborist will be required.

This will;

1. determine the presence or absence of any significant tree roots and ultimately whether encroachment of the individual tree's Structural Root Zone to facilitate the proposal is possible.
2. ensure each tree is investigated and assessed to the fullest extent possible so a suitable determination can be made as to whether an individual tree can be retained or ultimately needs to be removed.

Following the most recent revision of the proposed route impacts to trees have been reduced. Eleven (11) trees/groups now appear to be subject to major encroachment from the proposed works. Of these six (6) may be retained subject to further investigation during the set out for proposed works.

Five (5) trees/groups appear to be subject to encroachment of the Structural Root Zone and will most likely be removed.

Recommendations

That Trees 196, 197, 217, 324-331 which appear to be subject to encroachment of the Structural Root Zone are approved for removal prior to the commencement of works, removals will only be carried out once it is demonstrated that no option for the preservation of a tree exists.

That evaluation of proposed impacts is investigated on-site prior to undertaking activities that will lead to the removal of trees. This may include exploratory excavation by non-destructive means (hand digging, hydro-vac) to ascertain the size and position of structural roots that conflict with the proposed works, and further assessment by the project arborist.

That further investigation is undertaken during the set out to determine whether Trees 82-85, 215, 216, 264, 265 and 337 which appear to be subject to major encroachment of the Tree Protection Zone can be accommodated in conjunction with the proposed design. This may include exploratory excavation by non-destructive means (hand digging, hydro-vac) to ascertain the size and position of roots that conflict with the proposed works.

That ten (10) immature *Eucalyptus species* adjacent to the Gardners Road overpass are approved for removal subject to the planting of replacement trees of the same species at the completion of works.

That prior to the commencement of any works:

- Tree Protection Zones (TPZ) and Structural Root Zones (SRZ) of retained trees are clearly plotted on all plans and marked on-site,
- The trunks of retained trees are to be protected by the erection of protective barriers at the SRZ perimeter to create an individual exclusion zone for the duration of works in the vicinity.

That where there is no other option, and subject to inspection by an arborist, roots greater than 40 millimetres diameter may be severed between the SRZ and the TPZ where they conflict directly with the conduits using clean sharp hand-tools to minimise tearing.

That if required minor pruning is carried out in accordance with the Workcover Draft Code of Practice for Tree Works and Australian Standard AS4373-2007, "Pruning of Amenity Trees", and the Workcover Code of Practice for the Amenity Tree Industry, 1998.

2.0 Disclaimer

This report is to be read and considered in its entirety. The subject trees were inspected from the ground using Visual Tree Assessment methodology, no aerial investigations; underground or internal investigations were undertaken. It is the responsibility of the client to implement all recommendations contained in this report.

The assessment is made having regard for the prevailing site conditions; and does not account for the effects that extreme weather events may have on trees.

Information contained in this report reflects the condition of the trees at the time of the inspection. As trees are living organisms their condition will change over time, there is no guarantee that problems or deficiencies of the subject trees may not arise in the future. It must be accepted that living near trees involves some level of risk.

This report is for the use of the client and their contractors to assist in determining the tree protection measures to be undertaken in conjunction with the proposed development. Distribution to other parties is not permitted except with the express permission of the author, Ian Hills. No responsibility is taken by the author for unauthorised use of the information contained in this report.

3.0 Brief

Accurate Tree Assessment has been commissioned by Ausgrid (the client) to identify areas of encroachment into the Tree Protection Zone of trees located along the proposed route of the Feeder 264 Replacement- Beaconsfield to Kingsford (B2K). Three hundred and fifty-two (352) trees have been identified as being subject to potential TPZ/SRZ encroachment from the proposed works.

In accordance with the client's specification this report will:

- Identify trees that may be affected by the proposed development
- Provide recommendations for the protection of retained trees based upon the level of encroachment that is expected in accordance with the provisions of AS4970-2009, 'Protection of Trees on Development Sites'

4.0 Method

Site inspections were carried between 4 – 8 March 2022.

Calculation of tree protection zones was carried out in accordance with the Australian Standard AS4970-2009, "Protection of Trees on Development Sites", based on the trunk diameter (DBH) measured using a standard arboricultural diameter tape.

Where trees are share similar characteristics, they have been assessed as groups, in this case establishment of the largest TPZ will provide protection to adjacent trees.

Data for trees subject to assessment has collected using a field data collection app, the resulting maps, schedule of trees of trees and identifying photographs will be provided using a shared link.

4.1. Documents

This assessment relies upon the Proposed Underground Feeder Locality and Key Plan prepared by Ausgrid, drawing No 256207 Sheets 1-26, Dated 15 July 2022. (Annexure A)

A concept plan of the proposed route has been provided by the client and is included at Appendix 10.2

Shared interactive map available at the following link:

<https://www.arcgis.com/home/webmap/viewer.html?url=https://fulcrumapp.io/share/903e0fec85308fb229e3/geoservices/FeatureServer/0>

5.0 Tree Assessment

Tree no(s)	Street address	Species (Common name)	TPZ radius	SRZ radius	Height	Spread	Lowest branch above kerb	Distance behind kerb	TPZ over road	Age class	SULE	Comments	Encroachment /Proposal
1	46 Burrows	Fraxinus sp. (Ash))	4.8	2.47	9	8	4	2	2.8	M	1a	Appears structurally sound	Nil/retain
2	Burrows Rd	Acacia elata (Cedar wattle), Acer negundo (Box Elder)	4.8	2.47	8	8	4	1	3.8	M	1a	Appears structurally sound, small deadwood noted	Nil/retain
3	Burrows Rd	Melaleuca quinquenervia (broad leaved paperbark)	3.6	2.25	6	6	3	1	2.6	M	1a	Appears structurally sound	Nil/retain
4	Burrows Rd	Melaleuca quinquenervia (broad leaved paperbark)	4.2	2.37	6	4	3	1	3.2	M	1a	Appears structurally sound	Nil/retain
5	Burrows Rd	Liquidambar styraciflua (sweet gum)	6	2.67	11	10	4	1	5.0	M	2a	Sparse canopy	Nil/retain
6	Burrows Rd	Angophora costata (Smooth barked apple)	2.4	2	9	2	5	1	1.4	SM	1a	Appears structurally sound	Nil/retain
7	Burrows Rd	Melaleuca quinquenervia (broad leaved paperbark)	7.2	2.85	12	12	5	1	6.2	M	1a	Appears structurally sound	Nil/retain
8	Burrows Rd	Melaleuca quinquenervia (broad leaved paperbark)	8.4	3.01	11	8	4	1	7.4	M	1a	Appears structurally sound	Nil/retain
9	36 Burrows	Melaleuca quinquenervia (broad leaved paperbark)	4.8	2.47	8	5	5	2.5	2.3	M	1a	Appears structurally sound	Minor/retain
10	38 Burrows	Eucalyptus punctata (Grey gum)	3.6	2	8	8	4	1	2.6	SM	2a	Decay in trunk	Minor/retain
11	40 Burrows	Cupaniopsis anacardiodes (Tuckeroo)	3.6	2	6	5	5	1	2.6	M	1a	Appears structurally sound	Minor/retain
12	639 Gardners	Casuarina cunninghamiana (River she oak)	6.8	2.85	20	10	6	4	2.8	M	1a	Appears structurally sound	Nil/retain
13-18	635 Gardners	Platanus x acerifolius (London plane tree)	6	2.67	20	10	6	4	2.0	M	1a	Appears structurally sound	Nil/retain
19-24	629 Gardners	Corymbia maculata (Spotted gum)	2.4	2	14	5	5	1	1.4	SM	1a	Appears structurally sound	Nil/retain
25-27	627 Gardners	Casuarina cunninghamiana (River she oak)	3.6	2	8	5	5	1	2.6	M	1a	Appears structurally sound	Minor/retain

Tree no(s)	Street address	Species (Common name)	TPZ radius	SRZ radius	Height	Spread	Lowest branch above kerb	Distance behind kerb	TPZ over road	Age class	SULE	Comments	Encroachment /Proposal
28	627 Gardners	Melaleuca quinquenervia (broad leaved paperbark)	6	2.67	11	6	6	4	2.0	M	1a	Appears structurally sound	Minor/retain
29	494-504 Gardners	Populus alba (White poplar)	6	2.67	12	5	5	1	5.0	OM	4a	Excessive branch die-back noted	Nil/retain
30-35	494-504 Gardners	Corymbia maculata (Spotted gum)	5.4	2.57	18	10	5	1	4.4	M	1a	Appears structurally sound	Nil/retain
36-39	Gardners	Platanus x acerifolius (London plane tree)	7.2	2.85	20	15	5	3.5	3.7	M	1a	Appears structurally sound	Minor/retain
40-47	601 Gardners	Casuarina cunninghamiana (River she oak)	2.4	2	5	4	4	1	1.4	SM	1a	Appears structurally sound	Nil/retain
54-58	476 Gardners	Corymbia maculata (Spotted gum)	6	2.85	19	12	6	1	5.0	M	1a	Appears structurally sound	Nil/retain
55-56	476 Gardners	Populus alba (White poplar)	4.8	2.47	14	6	5	1	3.8	M	3a	Small deadwood noted	Nil/retain
57-59	55 Ellis	Eucalyptus sideroxylon (red ironbark)	4.2	2.37	9	8	3	1	3.2	M, OM	2a	Small deadwood noted, sparse canopy	Nil/retain
60-70	46- 30 Birmingham	Melaleuca quinquenervia (broad leaved paperbark)	10.8	3.31	15	10	5	1	9.8	M	2a	Appears structurally sound	Minor/retain
71-72	36- 30 Birmingham	Eucalyptus sideroxylon (red ironbark)	3.6	2.25	10	8	5	1	2.6	M	1a	Appears structurally sound, small deadwood noted	Minor/retain
73	26 Birmingham	Melaleuca quinquenervia (broad leaved paperbark)	8.4	3.01	9	9	5	1	7.4	M	1a	Appears structurally sound	Minor/retain
74	26 Birmingham	Lophostemon confertus (Brush box)	4.2	2.37	11	6	6	1	3.2	M	1a	Appears structurally sound	Minor/retain
75	26 Birmingham	Eucalyptus nicholii (narrow-leaved black peppermint)	3.6	2.25	7	6	5	1	2.6	M	1a	Appears structurally sound	Minor/retain
76	20 Birmingham	Melaleuca quinquenervia (broad leaved paperbark)	7.2	2.85	10	8	5	1	6.2	M	1a	Appears structurally sound	Minor/retain

Tree no(s)	Street address	Species (Common name)	TPZ radius	SRZ radius	Height	Spread	Lowest branch above kerb	Distance behind kerb	TPZ over road	Age class	SULE	Comments	Encroachment /Proposal
77	12 Birmingham	Eucalyptus nicholii (narrow-leaved black peppermint)	6	2.67	12	9	8	1	5.0	M	1a	Appears structurally sound	Minor/retain
78-81	2- 8 Birmingham	Melaleuca quinquenervia (broad leaved paperbark)	9.6	3.17	14	12	5	1	8.6	M	1a	Appears structurally sound, small deadwood noted	Minor/retain
82-85	1-9 Birmingham	Melaleuca quinquenervia (broad leaved paperbark)	8.4	3.01	9	8	4	1	7.4	M	1a	Appears structurally sound, small deadwood noted	Major/retain
86	9 Birmingham	Eucalyptus scoparia (Wallangarra White Gum)	2.4	2	12	6	5	1	1.4	SM	3a	Excessive branch die-back noted, sparse canopy	Nil/retain
87	11 Ellis	Cupaniopsis anacardioides (Tuckeroo)	3.6	2	9	9	6	1	2.6	M	1a	Appears structurally sound	Nil/retain
88-95	15- 33 Birmingham	Melaleuca quinquenervia (broad leaved paperbark)	7.2	2.85	14	10	4	1	6.2	M	1a	Appears structurally sound, small deadwood noted	Nil/retain
96-99	35- 39 Birmingham	Melaleuca quinquenervia (broad leaved paperbark)	8.4	3.01	12	10	4.5	1	7.4	M	1a	Appears structurally sound	Nil/retain
100-102	41 Birmingham	Eucalyptus sideroxylon (red ironbark)	3	2.13	10	6	6	1	2.0	SM	1a	Appears structurally sound	Nil/retain
103	1 Birmingham	Melaleuca quinquenervia (broad leaved paperbark)	7.2	2.85	12	10	4	1	6.2	M	2a	Appears structurally sound, small deadwood noted	Minor/retain
104	1 Birmingham	Corymbia eximia (Yellow bloodwood)	2	1.5	5	3	2	1	1.0	SM	1a	Appears structurally sound	Nil/retain
105	Gillespie	Eucalyptus scoparia (Wallnagarra White Gum)	3.6	2.25	10	7	5	1	2.6	M	2a	Appears structurally sound, small deadwood noted	Nil/retain
106	Gillespie	Eucalyptus sideroxylon (red ironbark)	2.4	2.2	11	5	4	1	1.4	SM	1a	Appears structurally sound	Nil/retain
106	Gillespie	Corimbia eximia (Yellow bloodwood)	2	1.5	6	3	5	1	1.0	J	1a	Appears structurally sound	Nil/retain

Tree no(s)	Street address	Species (Common name)	TPZ radius	SRZ radius	Height	Spread	Lowest branch above kerb	Distance behind kerb	TPZ over road	Age class	SULE	Comments	Encroachment /Proposal
107	Gillespie	Eucalyptus scoparia (Wallangarra White Gum)	3.6	2	9	6	4	1	2.6	M	2a	Appears structurally sound, small deadwood noted	Nil/retain
108	Botany	Eucalyptus saligna (Sydney blue gum)	7.2	2.85	16	9	6	4	3.2	M	2a	Appears structurally sound, small deadwood noted	Nil/retain
109	Botany	Lophostemon confertus (Brush box)	3.6	2	8	5	5	1	2.6	M	1a	Appears structurally sound	Nil/retain
110	Botany	Platanus x acerifolius (London plane tree)	5.4	2.57	12	18	4	0.5	4.9	M	1a	Appears structurally sound	Nil/retain
111-116	Botany	Lophostemon confertus (Brush box), Platanus sp (plane tree)	3.6	2	7	5	5	1.2	2.4	M	1a	Appears structurally sound	Nil/retain
117	684 Botany	Eucalyptus botryoides (Bangalay)	7.2	2.85	15	12	6	1	6.2	M	1a	Appears structurally sound, small deadwood noted	Nil/retain
118	684 Botany	Eucalyptus botryoides (Bangalay)	7.2	2.85	17	12	7	1	6.2	M	1a	Appears structurally sound, small deadwood noted	Nil/retain
119-121	684 Botany	Eucalyptus sideroxylon (red ironbark)	9.6	3.17	20	16	10	1	8.6	M	1a	Appears structurally sound, small deadwood noted	Nil/retain
122-123	684 Botany	Ficus microcarpa var. hillii (Hills weeping fig)	14.4	3.69	16	18	4	4.5	9.9	M	1a	Appears structurally sound	Minor/retain
124-128	809-821 Botany	Eucalyptus botryoides (Bangalay)	7.2	2.85	19	16	8	1	6.2	M	1a	Appears structurally sound, small deadwood noted	Minor/retain
129	20 Harcourt	Eucalyptus microcorys (Tallowwood)	8.4	3.01	18	18	6	1	7.4	M	1a	Appears structurally sound, small deadwood noted	Nil/retain
130	20 Harcourt	Eucalyptus microcorys (Tallowwood)	7.2	2.85	15	16	6	1	6.2	M	1a	Appears structurally sound, small deadwood noted	Nil/retain

Tree no(s)	Street address	Species (Common name)	TPZ radius	SRZ radius	Height	Spread	Lowest branch above kerb	Distance behind kerb	TPZ over road	Age class	SULE	Comments	Encroachment /Proposal
131	37 Harcourt	Ficus benjamina (weeping fig)	3	2.13	6	6	3	1	2.0	SM	1a	Appears structurally sound	Nil/retain
132	39 Harcourt	Robinia pseudoacacia (black locust)	2.64	2.05	6	4	4	1	1.64	SM	1a	Appears structurally sound	Nil/retain
133-135	30-40 Harcourt	Eucalyptus microcorys (Tallowwood)	7.8	2.93	16.2	16.18	8	1	6.8	M	2a	Appears structurally sound, small deadwood noted	Nil/retain
136-138	Tarakan Reserve	Eucalyptus botryoides (Bangalay)	9.6	3.17	18.2	15.18	6	1	8.6	M	1a	Appears structurally sound, small deadwood noted	Nil/retain
139-140	Tarakan Reserve	Harpephyllum caffrum (Kaffir plum)	10.8	3.31	9	10	5	7	3.8	M	1a	Appears structurally sound	Nil/retain
141-143	Tarakan Reserve	Eucalyptus microcorys (Tallowwood)	8.4	3.01	18	18	6	1	7.4	M	1a	Appears structurally sound, small deadwood noted	Nil/retain
144	73 Harcourt	Cupaniopsis anacardiodes (Tuckeroo)	3.6	2.25	6	6	4	1	2.6	M	1a	Appears structurally sound	Nil/retain
145	68 Harcourt	Eucalyptus microcorys (Tallowwood)	8.4	3.01	17	18	6	1	7.4	M	1a	Appears structurally sound, small deadwood noted	Nil/retain
146	72 Harcourt	Eucalyptus microcorys (Tallowwood)	7.8	2.93	16	16	6	1	6.8	M	2a	Appears structurally sound, small deadwood noted	Nil/retain
147	74 Harcourt	Eucalyptus robusta (Swamp mahogany)	6	2.67	9	8	6	1	5.0	M	2a	Small deadwood noted, sparse canopy	Nil/retain
148-150	85- 87 Harcourt	Callistemon citrinus (Crimson bottlebrush),Cupaniopsis anacardiodes (Tuckeroo)	4.2	2.37	6	5	3	1	3.2	M	1a	Appears structurally sound, small deadwood noted	Nil/retain
151-152	91-93 Harcourt	Callistemon citrinus (Crimson bottlebrush),Cupaniopsis anacardiodes (Tuckeroo)	3	2.13	5	5	3	1	2.0	M	1a	Appears structurally sound	Nil/retain

Tree no(s)	Street address	Species (Common name)	TPZ radius	SRZ radius	Height	Spread	Lowest branch above kerb	Distance behind kerb	TPZ over road	Age class	SULE	Comments	Encroachment /Proposal
153	78 Harcourt	Eucalyptus punctata (Grey gum)	4.8	2.47	9	8	6	1	3.8	M	2a	Appears structurally sound, small deadwood noted	Nil/retain
154-156	21 Dalmeny	Acacia binervia (Coast myall), Melaleuca bracteata (black tea-tree)	3.6	2.25	5	5	3	1	2.6	M	2a	Appears structurally sound, small deadwood noted	Nil/retain
157-158	19 Dalmeny	Melaleuca bracteata (black tea-tree)	3.6	2.25	4	5	3	1	2.6	M	2a	Appears structurally sound	Nil/retain
159-173	86-124 Harcourt	Melaleuca bracteata (black tea-tree)	3.6	2.25	5.6	4.5	2.4	1	2.6	M	1a	Appears structurally sound, small deadwood noted	Nil/retain
174-175	93 Harcourt	Cupaniopsis anacardiodes (Tuckeroo)	3.6	2.25	4	4	2.5	1	2.6	M	2a	Small deadwood noted, sparse canopy	Nil/retain
176-193	95-137 Harcourt	Melaleuca bracteata (black tea-tree)	3.6	2.25	4.5	4.5	3	1	2.6	M	2a	Appears structurally sound, small deadwood noted	Nil/retain
194	Southern Cross Drive Res.	Jacaranda mimosifolia (Jacaranda)	4.8	2.47	8	6	5	0	3.8	M	1a	Appears structurally sound	Nil/retain
195	SCDR	Eucalyptus scias (Large-fruited red mahogany)	5.4	2.57	11	8	6	0	5.4	M	1a	Appears structurally sound	Minor/retain
196	SCDR	Fraxinus angustifolia (Claret Ash)	3	2.13	6	4	1	0	3.0	OM	3b	Excessive branch die-back noted, major asymmetry	Major/remove
197	SCDR	Fraxinus angustifolia (Claret Ash)	2.4	2	8	3	6	0	2.4	OM	3b	Excessive branch die-back noted, major asymmetry	Major/remove
198	SCDR	Fraxinus angustifolia (Claret Ash)	3.6	2.25	8	4	6	0	3.6	OM	3b	Excessive branch die-back noted, major asymmetry	Minor/retain
199-209	Golf course	Ficus microcarpa var. hillii (Hills weeping fig)	12.14	3.69	15	15	5	6	6.14	M	1a	Appears structurally sound	Minor/retain

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210	Tunstall opp 95	Eucalyptus scoparia (Wallangarra White Gum)	6	2.67	10	9	6	2	4.0	OM	3b	Small deadwood noted, excessive branch die-back noted, sparse canopy, major asymmetry	Minor/retain
211-212	Tunstall opp 89	Pinus radiata (Monterey pine)	9.6	3.17	14	14	5	1	8.6	M	2a	Appears structurally sound, small deadwood noted	Minor/retain
212-213	91 Tunstall	Jacaranda mimosifolia (Jacaranda)	4.2	2.37	9	8	5	2	2.2	M	2a	Appears structurally sound, small deadwood noted	Nil/retain
214	87 Tunstall	Robinia pseudoacacia (black locust)	3.6	2.25	8	7	5	2	1.6	M	2a	Appears structurally sound	Nil/retain
215-216	136 Tunstall	Araucaria heterophylla (Norfolk Island pine)	7.2	2.85	18	9	3	1	6.2	M	1a	Appears structurally sound	Major/retain
217	59 Tunstall	Eucalyptus microcorys (Tallowwood)	8.4	3.01	18	16	6	0	8.4	M	1a	Appears structurally sound	Minor/retain
218	4 Tresidder	Eucalyptus scoparia (Wallangarra White Gum)	4.2	2.37	9	6	5	2	2.2	M	2a	Appears structurally sound, small deadwood noted	Minor/retain
219-220	Opp 4 Tresidder	Corymbia eximia (Yellow bloodwood)	3	2.13	6	4	3	1.5	1.5	SM	1a	Appears structurally sound	Nil/retain
221	8 Tresidder	Liquidambar styrachiflua (sweet gum)	9.6	3.17	12	15	4	2	7.6	M	1a	Appears structurally sound	Nil/retain
222	2 Aboud	Agonis flexuosa (Willow myrtle)	3.6	2	6	6	2	1	2.6	M	2a	Appears structurally sound, small deadwood noted, poor form	Nil/retain
223	49 Tresidder	Morus alba (Mulberry)	5.4	2.57	7	4	5	1	4.4	M	2a	Appears structurally sound, small deadwood noted, sparse canopy	Minor/retain

Tree no(s)	Street address	Species (Common name)	TPZ radius	SRZ radius	Height	Spread	Lowest branch above kerb	Distance behind kerb	TPZ over road	Age class	SULE	Comments	Encroachment /Proposal
224-227	1 Aboud	Agonis flexuosa (Willow myrtle)	3.6	2	4	4	2.5	1	2.6	M	2a	Appears structurally sound, small deadwood noted, sparse canopy	Minor/retain
228-231	110 Eastern	Callistemon citrinus (Crimson bottlebrush)	3.6	2	4	4	2.5	1	2.6	M	2a	Appears structurally sound, small deadwood noted	Nil/retain
232	108 Eastern	Syzygium austral (brush cherry)	4.8	2.47	8	5	5	2	2.8	M	1a	Appears structurally sound	Nil/retain
233-236	117 Eastern	Agonis flexuosa (Willow myrtle)	4.8	2.47	6	5	4	1	3.8	M	1a	Appears structurally sound	Nil/retain
237-239	132 Cottenham	Hibiscus tileaceus (Cottonwood)	3.6	2	5	6	3.5	1.5	2.1	M	2a	Appears structurally sound	Nil/retain
240	134 Cottenham	Agonis flexuosa (Willow myrtle)	4.8	2.47	6	4	3	1	3.8	M	2a	Small deadwood noted, sparse canopy	Nil/retain
241	134 Cottenham	Lophostemon confertus (Brush box)	3.6	2.25	6	4	5	1	2.6	M	2a	Small deadwood noted, sparse canopy	Nil/retain
242	138 Cottenham	Syzygium smithii (common lilly pilly)	3	2.13	5	5	3	1	2.0	M	1a	Appears structurally sound	Nil/retain
243	140 Cottenham	Lophostemon confertus (Brush box)	8.4	3.01	12	18	6	1	7.4	M	1a	Appears structurally sound	Minor/retain
244	146 Cottenham	Lophostemon confertus (Brush box)	6	2.85	9	10	6	1	5.0	M	1a	Appears structurally sound	Minor/retain
245-248	81- Cotterham	Lophostemon confertus (Brush box)	6	2.67	10	9	3	1	5.0	M	1a	Appears structurally sound, small deadwood noted	Nil/retain

Tree no(s)	Street address	Species (Common name)	TPZ radius	SRZ radius	Height	Spread	Lowest branch above kerb	Distance behind kerb	TPZ over road	Age class	SULE	Comments	Encroachment /Proposal
249	93 Cotterham	Callistemon salignus (White bottlebrush)	8.4	3.01	8	6	6	1	7.4	M	1a	Appears structurally sound	Nil/retain
250	95 Cotterham	Agonis flexuosa (Willow myrtle)	12	3.44	7	10	4	1	11.0	M	1a	Appears structurally sound, small deadwood noted	Minor/retain
251	97 Cotterham	Lophostemon confertus (Brush box)	3.6	2	4	4	3	1	2.6	SM	1a	Appears structurally sound, small deadwood noted	Nil/retain
252-254	99 Cotterham	Lophostemon confertus (Brush box)	8.4	3.01	10	9	6	1	7.4	M	1a	Appears structurally sound, small deadwood noted	Minor/retain
255-258	97 Cotterham	Lophostemon confertus (Brush box)	7.2	2.85	10	9	6	1	6.2	M	1a	Appears structurally sound, small deadwood noted	Minor/retain
259	3 Borrodale	Lophostemon confertus (Brush box)	6.6	2.76	10	10	7	1	5.6	M	1a	Appears structurally sound, small deadwood noted	Minor/retain
260-262	4- 10 Borrodale	Lophostemon confertus (Brush box)	8.4	3.01	11	9	4	1	7.4	M	1a	Appears structurally sound, small deadwood noted	Minor/retain
263	9 Borrodale	Callistemon citrinus (Crimson bottlebrush)	3	2.13	7	4	3.5	1	2.0	M	2a	Small deadwood noted	Minor/retain
264	253 Doncaster	Lophostemon confertus (Brush box)	9.6	3.17	14	14	4	1	8.6	M	1c	Appears structurally sound	Major/retain
265	316 Doncaster	Lophostemon confertus (Brush box)	8.4	3.01	9	10	5	1	7.4	M	1a	Appears structurally sound, small deadwood noted	Major/retain
266-267	316 Doncaster	Callistemon citrinus (Crimson bottlebrush)	2.4	2	3	3	1.5	1	1.4	M	2a	Appears structurally sound	Nil/retain
268	14 Borrodale	Lophostemon confertus (Brush box)	3.6	2	5	3	5	1	2.6	OM	3b	Sparse canopy, major asymmetry, declining condition	Nil/retain
269-271	14 Borrodale	Hibiscus tileaceus (Cottonwood)	3	2.13	4	4	4	2	1.0	M	1a	Appears structurally sound	Nil/retain

Tree no(s)	Street address	Species (Common name)	TPZ radius	SRZ radius	Height	Spread	Lowest branch above kerb	Distance behind kerb	TPZ over road	Age class	SULE	Comments	Encroachment /Proposal
272	18 Borrodale	Lophostemon confertus (Brush box)	3.6	2	9	6	5	1	2.6	M	2a	Small deadwood noted, sparse canopy	Nil/retain
273-276	20-24 Borrodale	Acacia sp, (Wattle) Lophostemon confertus (Brush box)	3	2.13	5.6	4.5	3	1	2.0	SM	2a	Appears structurally sound	Nil/retain
277	21 Borrodale	Platanus x acerifolius (London plane tree)	6	2.67	10	10	5	1	5.0	M	1a	Appears structurally sound	Minor/retain
278-279	23- 25 Borrodale	Lophostemon confertus (Brush box)	7.2	2.85	10.12	9.1	4	1	6.2	M	1a	Appears structurally sound, small deadwood noted	Minor/retain
280	27 Borrodale	Eucalyptus racemosa (Scribbly gum)	5.4	2.57	12	7	8	1	4.4	M	1a	Appears structurally sound	Nil/retain
281-282	1 Bruce	Agonis flexuosa (Willow myrtle),Eucalyptus racemosa (Scribbly gum)	9.6	3.17	8.1	5.8	3	1	8.6	M	1a	Appears structurally sound, small deadwood noted	Minor/retain
283-294	7 Bruce	Eucalyptus microcorys (Tallowwood)	7.2	2.85	14	12	4	1	6.2	M	1a	Appears structurally sound, small deadwood noted	Minor/retain
295-297	15- 21 Bruce	Schinus molle (peppercorn tree)	3.6	2	6	6	2.5	2	1.6	M	1a	Appears structurally sound, small deadwood noted	Nil/retain
298	22 Bruce	Schinus molle (peppercorn tree)	3.6	2	4	4	1.5	2	1.6	M	1a	Appears structurally sound	Nil/retain
299	12a Bruce	Schinus molle (peppercorn tree)	3.6	2	4	4	1.5	2	1.6	M	1a	Appears structurally sound	Nil/retain
300	8 Bruce	Eucalyptus racemosa (Scribbly gum)	5.4	2.57	10	9	6	1	4.4	M	1a	Appears structurally sound, small deadwood noted	Nil/retain
301	6a Bruce	Corymbia ficifolia (Red flowering gum)	4.8	2.47	7	6	5	1.5	3.3	M	2a	Small deadwood noted,Sparse canopy	Nil/retain
302-303	21 Gardners	Quercus ilex (Holm oak)	7.2	2.85	10	18	3	1.5	4.7	M	2a	Appears structurally sound, small deadwood noted	Nil/retain

Tree no(s)	Street address	Species (Common name)	TPZ radius	SRZ radius	Height	Spread	Lowest branch above kerb	Distance behind kerb	TPZ over road	Age class	SULE	Comments	Encroachment /Proposal
304-305	2-4 Solander	Quercus ilex (Holm oak)	8.4	3.17	12	12	3	2	6.4	M	2a	Appears structurally sound, small deadwood noted	Nil/retain
306	8 Solander	Quercus ilex (Holm oak)	7.2	2.85	10	5	6	2	5.2	OM	3b	Excessive branch die-back noted, sparse canopy, declining condition	Nil/retain
307	8 Solander	Quercus ilex (Holm oak)	8.4	3.17	11	10	4	2	6.4	M	2a	Appears structurally sound, small deadwood noted	Nil/retain
308-309	11 Solander	Quercus palustris (pin oak),Schinus molle (peppercorn tree)	3.6	2.25	7	5	3	2	1.6	M	2a	Appears structurally sound, small deadwood noted	Nil/retain
310-311	23 Gardners	Quercus ilex (Holm oak)	7.2	2.85	12	12	4	3	4.2	M	2a	Appears structurally sound, small deadwood noted	Minor/retain
312-323	2- 12 Colenso	Eucalyptus sp,Jacaranda mimosifolia (Jacaranda),Lophostemon confertus (Brush box)	4.8	2.25	10.12	6.8	4	1	3.8	M	2a	Appears structurally sound, small deadwood noted	Nil/retain
324-331	1-11Colenso	Jacaranda mimosifolia (Jacaranda),Lophostemon confertus (Brush box)	4.8	2.25	10.12	6.8	4	1	3.8	M	2a	Appears structurally sound, small deadwood noted	Major/ removal
332	14 Banks	Platanus x acerifolius (London plane tree)	3.6	2.2	10	10	5	1	2.6	M	1a	Appears structurally sound	Nil/retain
333	1 Col Braund	Eucalyptus microcorys (Tallowwood)	10.8	3.31	14	12	8	5	5.8	M	2a	Appears structurally sound, small deadwood noted	Minor/retain
334	2 Col. Braund	Corymbia maculata (Spotted gum)	4.8	2.47	12	12	6	4	0.8	M	2a	Appears structurally sound, small deadwood noted	Nil/retain

Tree no(s)	Street address	Species (Common name)	TPZ radius	SRZ radius	Height	Spread	Lowest branch above kerb	Distance behind kerb	TPZ over road	Age class	SULE	Comments	Encroachment /Proposal
335	4 Col. Braund	Callistemon citrinus (Crimson bottlebrush)	3.6	2	4	3	4	1	2.6	OM	3b	Sparse canopy, major asymmetry, poor form, declining condition	Nil/retain
336	3 Col. Braund	Jacaranda mimosifolia (Jacaranda)	5.4	2.57	9	10	5	1	4.4	M	1a	Appears structurally sound	Minor/retain
337	43 Col. Braund	Eucalyptus botryoides (Bangalay)	6	2.67	12	12	6	0.5	5.5	M	2a	Appears structurally sound, small deadwood noted	Major/retain
338-339	12- 14 Col. Braund	Lophostemon confertus (Brush box)	4.2	2.37	5	6	4	1	3.2	M	2a	Appears structurally sound, small deadwood noted	Nil/retain
340	10 Bunnerong	Eucalyptus microcorys (Tallowwood)	5.4	2.57	14	12	5	4	1.4	M	1a	Appears structurally sound, small deadwood noted	Nil/retain
341	Col. Braund	Washingtonia filifera (Fan palm)	4.2	2.37	7	2	5	2	2.2	M	2a	Appears structurally sound, small deadwood noted	Nil/retain
342	12 Bunnerong	Corymbia citriodora (lemon scented gum)	7.2	2.85	14	16	8	6	1.2	M	2a	Appears structurally sound, sparse canopy	Minor/retain
343-346	62 Bunnerong	Callistemon viminalis, Hibiscus tileaceus	3.6	2	4	4	2	1.5	2.1	M	2a	Small deadwood noted, major asymmetry	Nil/retain
347-351	2 Anderson	Callistemon viminalis, Hibiscus tileaceus	3.6	2	5	5	1.5	1.5	2.1	M	2a	Appears structurally sound, small deadwood noted	Nil/retain
352	10 Anderson	Hibiscus tileaceus (Cottonwood)	4.2	2.37	5	7	1.5	1	3.2	M	1a	Appears structurally sound	Nil/retain

All dimensions are in metres

DBH – Trunk diameter at 1.4 metres

TPZ = Tree Protection Zone (calculated in accordance with AS4970)

SRZ = Structural Root Zone (calculated in accordance with AS4970)

SULE = Useful Life Expectancy (Barrel, J -1993-95) see appendix 12.1

6.0 Development impact

All parts of a tree may be damaged by construction activities, and the effects of damage are often cumulative meaning that seemingly minor damage to the tree can have adverse effects that may not become apparent until well after the project has been completed.

Crown damage often occurs when machinery impacts branches of the tree resulting in a loss of foliage. As the foliage is where the tree produces the sugars required for healthy growth it therefore stands to reason that any loss of foliage will affect the trees' ability to function normally.

In addition, when branches are torn or improperly pruned the trees' ability to recover is affected and pathogens that cause wood decay or disease have an increased opportunity to penetrate the trees natural defenses.

Trunk damage is usually caused by mechanical impact, and again wounding predisposes the tree to infection by pathogens.

Root damage is the most common cause of damage to trees on development sites, and often has the most serious effects as it commonly goes un-noticed for some time. Damage can be caused by mechanical factors such as tearing during excavation, as well as factors such as chemical contamination, changes in hydrology and altering gaseous exchange rates by filling, and compaction during movement of equipment.

Australian Standard 4970, *Protection of Trees on Development Sites* was adopted in 2009 to provide Arborists and the construction industry with a guide to assist in the preservation of retained trees on all types of development sites.

To assist professionals working to protect trees the Standard proposes the following:

Tree Protection Zone - A specified area above and below ground level at a given distance from the trunk set aside for the protection of a tree's roots and crown to provide for the viability and stability of a tree to be retained where it is potentially subject to damage by development.

Structural Root Zone – *The area around the base of a tree required for the tree's stability in the ground. The woody root growth and soil cohesion in this area are necessary to hold the tree upright. The SRZ is nominally circular with the trunk at its centre and is expressed by its radius in metres.*

This zone considers a tree's structural stability only, not the root zone required for a tree's vigour and long-term viability, which will usually be much larger." (Ref. AS4970-2009)

Minor encroachment of the TPZ is sometimes unavoidable and at levels less than 10% of the total TPZ area can be tolerated if there is scope to increase the area of the TPZ contiguously about the unaffected perimeter. Where encroachment exceeds 10% further investigation will be required to determine the measures required to offset the incursion. Encroachment of the SRZ is not recommended as tree health and condition will almost certainly be adversely affected.

7.0 Discussion

Most trees on the route appear in generally good health and vigour with some deadwood and wounding noted, many of the trees exhibit asymmetrical form due to suppression by the larger trees and pruning for service line clearance. None of the trees were noted to contain hollows suitable for habitation by arboreal fauna.

Within Southern Cross Drive Reserve Trees 196-198 *Fraxinus angustifolia* appear in generally poor condition with excessive branch die-back and epicormic growth noted that indicate decline.

Excavation close to the trees for the installation of conduits and the proposed send/receive pit will exacerbate the decline in the trees and they are therefore proposed for removal. The remainder of the installation within the reserve will be carried out by under boring which will include excavation for the send/receive pit before crossing under Southern Cross Drive. The pit will be located west of the Gardners Rd overpass and will necessitate the removal of ten (10) immature *Eucalyptus robusta*, *Eucalyptus crebra* and *Corymbia maculata* and several *Acacia saligna*.

The removal of young Eucalypts is supported subject to the provision of replacement plantings of the same species once works have been completed, the removal of *Acacia saligna* which is generally considered to be an environmental weed species will have a positive impact on biodiversity values in the locality. Several other *Acacia saligna* may require pruning to allow access by heavy machinery from Gardners Rd during the works, this is a minor environmental impact.

The receival pit on the eastern side of Southern Cross Drive will be located within the TPZ of Tree 199 *Ficus microcarpa* var. 'Hillii' which is within the golf course. This species is very resilient to disturbance, but it is recommended that an arborist is on-site during work within the TPZ to assess and manage any roots that may be encountered.

New duct lines will be installed close to the crown of the road as specified in the proposed route layout so that the maximum distance can be achieved from the location of trees which are mainly within the pedestrian footpath.

Trees 196, 197, 217, 324-331 which are shown to be subject to encroachment of the Structural Root Zone are highlighted in red in the Tree Assessment table at Section 5.0. It is likely that these trees will be removed in conjunction with the proposed design.

Ausgrid proposes to retain as many of the subject trees as possible. To achieve this evaluation of proposed impacts will be investigated on-site prior to the removal of trees. This may include exploratory excavation by non-destructive means (hand digging, hydro-vac) and assessment by the project arborist to ascertain the size and position of structural roots that conflict with the proposed conduits.

Removals will only be carried out once it is demonstrated that no option for the preservation of a particular tree exists.

Trees 82-85, 215, 216, 264, 265 and 337 which are shown to be subject to major encroachment of the Tree Protection Zone are highlighted in orange in the Tree Assessment table at Section 5.0. It may be possible to retain some of these trees and it is recommended that further investigation is undertaken during the set out to consider non-destructive excavation methods. Supervision by the project arborist during the proposed works is also recommended to assess roots as they are exposed and whether selective root removal can be undertaken to enable the retention of specific trees.

Remaining trees which are shown to be subject to minor or nil encroachment of the Tree Protection Zone are highlighted in green or yellow in the Tree Assessment table at Section 5.0. It is expected that all trees can be retained without the requirement for further consideration of the impacts of the proposed works.

The TPZ of grouped trees is calculated from the largest tree in the group and then extrapolated as a line parallel to the existing kerb, which will therefore cover the TPZ of smaller trees in the group. It should be noted that one sided encroachment of the calculated TPZ less than 10% of the total TPZ area is considered minor and acceptable under the provisions of AS4970. This is not to say that encroachment above this level cannot be supported, but major encroachment (>10%) will require closer examination with regard to the protection of specific trees.

The movement of machinery is to be excluded from the SRZ of retained trees by temporary fencing; with under-boring techniques used to install services through the TPZ where necessary. Locations for the storage of

spoil and materials are to be detailed in the CEMP provided by Ausgrid's contractor and marked on all plans and restricted to areas that are already disturbed or away from trees and must not encroach the TPZ area of the subject trees (setbacks are to be marked on-site by an arborist).

Where excavation for the trench will cause an encroachment into the Tree Protection Zone (TPZ) of a retained tree exceeding 10% of the total TPZ area it is considered to be a major encroachment under the provisions of the Australian Standard AS4970-2009, Protection of Trees on Development Sites; and triggers the requirement for the implementation of measures to ensure that the tree will not be adversely affected by the works.

Where excavation is proposed within the TPZ of the subject trees it is to be carried out under close supervision; where roots are encountered that conflict with the location of conduit a consulting arborist is to assess the roots, making recommendations for their ongoing management. Wherever possible roots greater than 40 millimetres diameter are to be retained and protected, this may include excavating by hand around roots and passing the conduits beneath them. Wrapping roots in geo-textile fabric; utilising sandy material around retained roots when backfilling is recommended to protect retained roots from sharp edged filling materials.

Where no other option is available some roots greater than 40 millimetres diameter that conflict with the position of the electrical conduits may be severed within an established TPZ under advice from the consulting arborist using clean sharp hand-tools to minimise tearing, and therefore reducing the risk of incursion by harmful pathogens.

Prior to the commencement and for the duration of the works, the trunks of the subject trees are to be protected from unintended impacts by the erection of temporary fencing at the perimeter of the respective SRZ's or along the edge of the work area (whichever provides a greater set-back) to create an exclusion zone around each of the retained trees. Where space does not permit or where a TPZ fence needs to be temporarily moved for access, the trunks and/or branches of the retained tree will be protected by armouring as detailed in Section 4 of AS4970 (Appendix 12.4.B)

Several over-hanging branches are noted along the route which may be impacted by over-height machinery, branch and bark tearing is to be avoided. Where necessary branches are to be pruned by a suitably qualified contracting arborist in accordance with the Australian Standard AS4373-2007, "Pruning of Amenity Trees", and the Workcover Code of Practice for the Amenity Tree Industry, 1998.

7.1 Tree Protection

The following general measures are to be adopted as applicable to the site:

Site establishment

- significant trees are marked on plans
- staff are to be made aware of tree protection measures during induction to the site

During construction

- no storage of equipment or materials is permitted within the TPZ, no cement wasting, or other pollutants must be allowed to enter the TPZ
- a temporary barrier is to be installed at the SRZ perimeter for the duration of works in the vicinity of individual trees to prevent mechanical damage to the trunk/branches
- excavation is to be carried out by hand within 200 millimetres of roots greater than 40 mm diameter
- if required minor pruning of branches can be undertaken to avoid mechanical impacts that are likely to result in branch or bark tearing
- no roots are to be severed within an established SRZ.

- where roots greater than 40mm diameter are to be severed between the SRZ and TPZ an arborist is to be on-site to supervise the works

Post construction

- protective fencing is to be removed from site
- general maintenance pruning can be undertaken (in accordance with AS4373-2007) to remove deadwood or other defective branches up to 10% of the total canopy area of retained trees if required

8.0 Conclusions

Trees 197-198 *Fraxinus angustifolia* located in Southern Cross Drive Reserve exhibit poor health and condition and would be removed during routine tree management regardless of the proposed development. Excavation near trees 197 and 198 for the installation and send/receive pit will exacerbate their decline.

The group of ten (10) immature Eucalyptus species adjacent to the Gardners Road overpass are proposed for removal to accommodate the proposed send/receive pit for the under boring of Southern Cross Drive.

Small trees and shrubs with DBH less than 0.2 metres along the route have not been considered as they are unlikely to be affected by the proposed works due to their setback from the trench or being in the proposed under-bored sections.

In some cases, larger trees will be exposed to major encroachment of the respective Tree Protection Zones (TPZ) caused by excavation of the electrical services trench. The implementation of specific protection measures detailed in section 7.0 and 7.1 of this report will therefore be required to ensure the viability of trees, and gain compliance with the provisions of AS4970-2009, "*Protection of Trees on Development Sites*".

The *Proposed Underground Feeder Locality and Key Plan* shows the proximity of the proposed trench in relation to the subject trees and other existing underground assets present within the roadway.

Where the structural root zone is proposed to be traversed;

1. non-destructive works within the Tree Protection Zone must document the nature (size of roots) and extent (depth) of root material, providing a preliminary assessment of the likelihood of safely passing through the Structural Root Zone.
2. where it may be considered possible, prior to working within the Structural Root Zone of any tree, ground truthing via means of exploratory non-destructive means (hand-digging, hydro-vac) within the proposed alignment at the direction of a suitably qualified arborist will be required.

This will;

1. determine the presence or absence of any significant tree roots and ultimately whether encroachment of the individual tree's Structural Root Zone to facilitate the proposal is possible.
2. ensure each tree is investigated and assessed to the fullest extent possible so a suitable determination can be made as to whether an individual tree can be retained or ultimately needs to be removed.

Sixteen (16) trees/groups appear to be subject to major encroachment from the proposed works. Of these eight (8) may be retained subject to further investigation during the set out for proposed works.

Eight (8) trees/groups appear to be subject to encroachment of the Structural Root Zone and will most likely be removed.

9.0 Recommendations

That Trees 196, 197, 217, 306, 307, 308, 309, 324-331 and 337 which appear to be subject to encroachment of the Structural Root Zone are approved for removal prior to the commencement of works, removals will only be carried out once it is demonstrated that no option for the preservation of a tree exists.

That evaluation of proposed impacts is investigated on-site prior to undertaking activities that will lead to the removal of trees. This may include exploratory excavation by non-destructive means (hand digging, hydro-vac) to ascertain the size and position of structural roots that conflict with the proposed works, and further assessment by the project arborist.

That further investigation is undertaken during the set out to determine whether Trees 82-85, 215, 216, 252-254, 259, 264, 265, 278, 279, 281 and 282 which appear to be subject to major encroachment of the Tree Protection Zone can be accommodated in conjunction with the proposed design. This may include exploratory excavation by non-destructive means (hand digging, hydro-vac) to ascertain the size and position of roots that conflict with the proposed works.

That ten (10) immature *Eucalyptus species* adjacent to the Gardners Road overpass are approved for removal subject to the planting of replacement trees of the same species at the completion of works.

That prior to the commencement of any works:

- Tree Protection Zones (TPZ) and Structural Root Zones (SRZ) of retained trees are clearly plotted on all plans and marked on-site,
- The trunks of retained trees are to be protected by the erection of protective barriers at the SRZ perimeter to create an individual exclusion zone for the duration of works in the vicinity.

That where there is no other option, and subject to inspection by an arborist, roots greater than 40 millimetres diameter may be severed between the SRZ and the TPZ where they conflict directly with the conduits using clean sharp hand-tools to minimise tearing.

That if required minor pruning is carried out in accordance with the Workcover Draft Code of Practice for Tree Works and Australian Standard AS4373-2007, "Pruning of Amenity Trees", and the Workcover Code of Practice for the Amenity Tree Industry, 1998.



Ian Hills - Principal Arborist
Accurate Tree Assessment



Registered User





Figure 2 Small trees will be removed for the send/receive pit in Southern Cross Drive Reserve



Figure 3 *Acacia saligna* west of Gardners Rd may require pruning to provide access

10.0 Appendices

10.1. Safe Useful Life Expectancy Categories

1: Long SULE: Trees that appeared to be retainable at the time of assessment for more than 40 years with an acceptable level of risk.

- (a) Structurally sound trees located in positions that can accommodate future growth.
- (b) Trees that could be made suitable for retention in the long term by remedial tree care.
- (c) Trees of special significance for historical, commemorative or rarity reasons that would warrant extraordinary efforts to secure their long-term retention.

2: Medium SULE: Trees that appeared to be retainable at the time of assessment for 15–40 years with an acceptable level of risk.

- (a) Trees that may only live between 15 and 40 more years.
- (b) Trees that could live for more than 40 years but may be removed for safety or nuisance reasons.
- (c) Trees that could live for more than 40 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting.
- (d) Trees that could be made suitable for retention in the medium term by remedial tree care.

3: Short SULE: Trees that appeared to be retainable at the time of assessment for 5–15 years with an acceptable level of risk.

- (a) Trees that may only live between 5 and 15 more years.
- (b) Trees that could live for more than 15 years but may be removed for safety or nuisance reasons.
- (c) Trees that could live for more than 15 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting.
- (d) Trees that require substantial remedial tree care and are only suitable for retention in the short term.

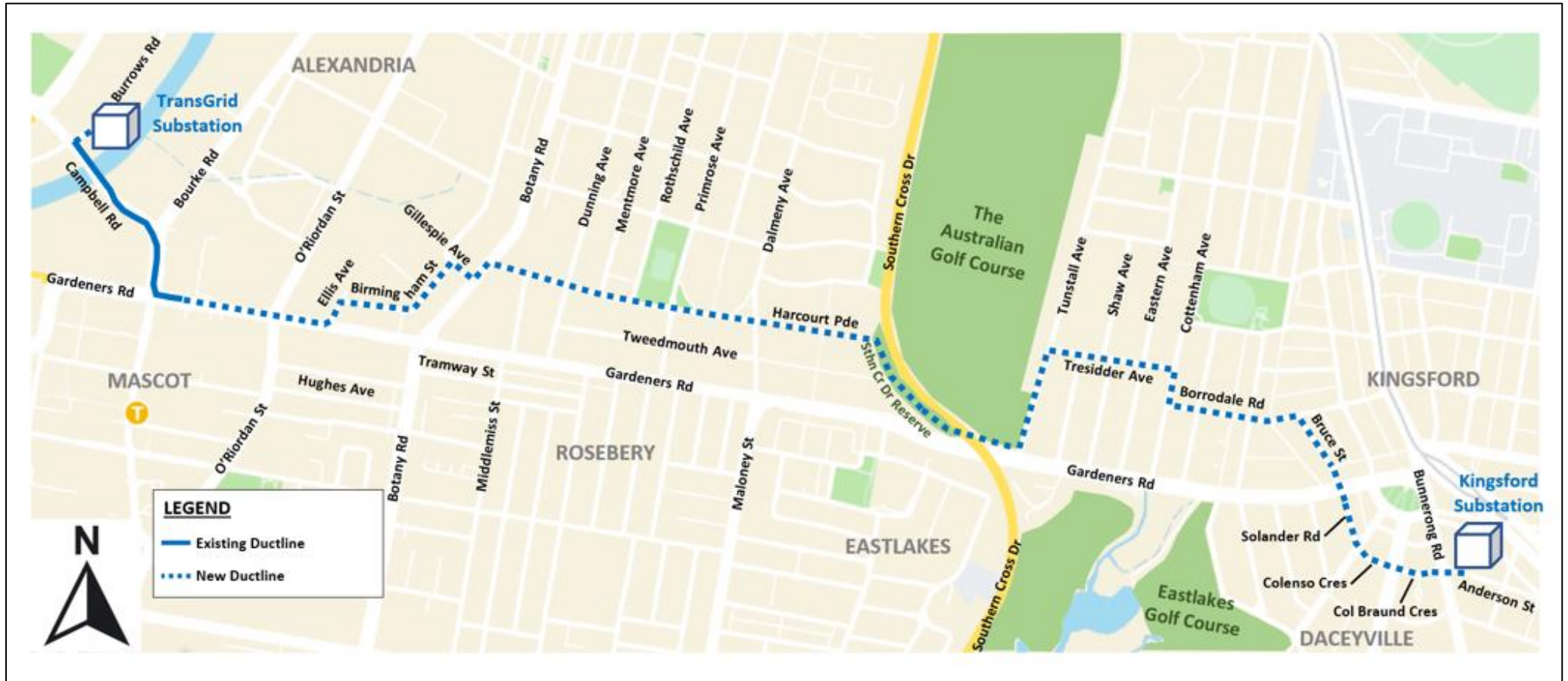
4: Remove: Trees that should be removed within the next 5 years.

- (a) Dead, dying, suppressed or declining trees because of disease or inhospitable conditions.
- (b) Dangerous trees because of instability or recent loss of adjacent trees.
- (c) Dangerous trees because of structural defects including cavities, decay, included bark, wounds or poor form.
- (d) Damaged trees that are clearly not safe to retain.
- (e) Trees that could live for more than 5 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting.
- (f) Trees that are damaging or may cause damage to existing structures within 5 years.
- (g) Trees that will become dangerous after removal of other trees for the reasons given in (a)to(f)
- (h) Trees in categories (a) to (g) that have a high wildlife habitat value and, with appropriate treatment, could be retained subject to regular review.

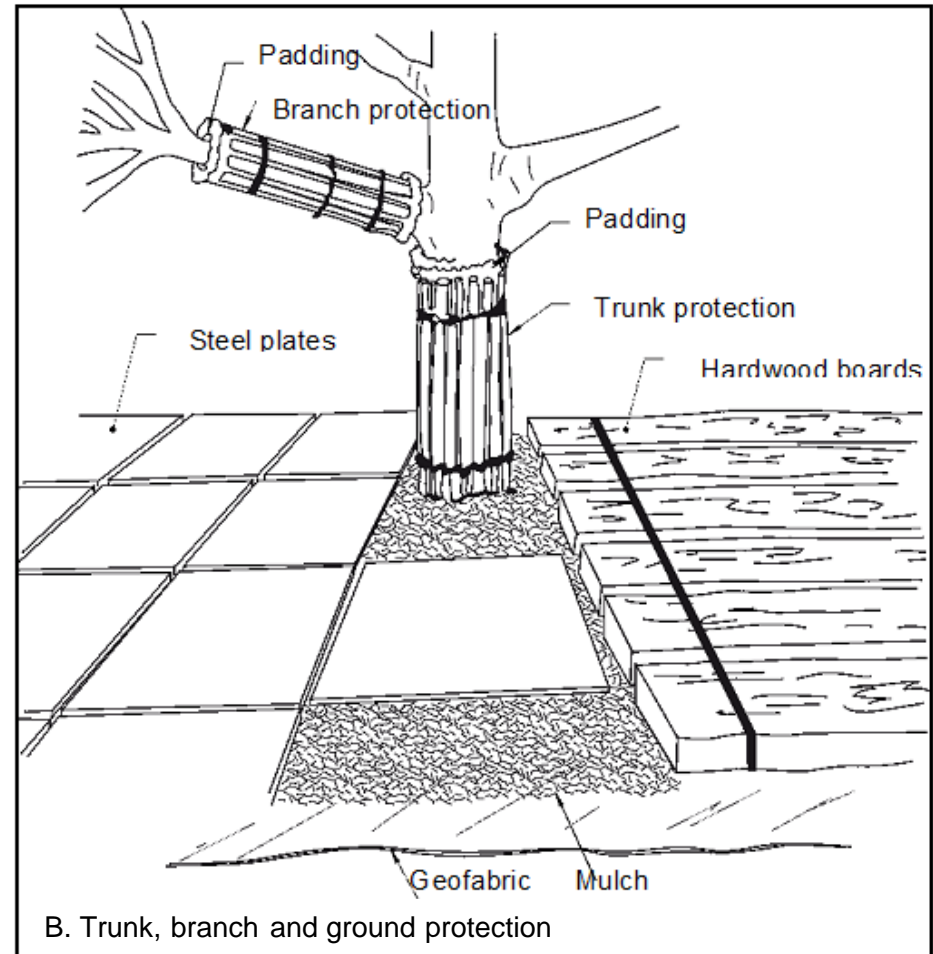
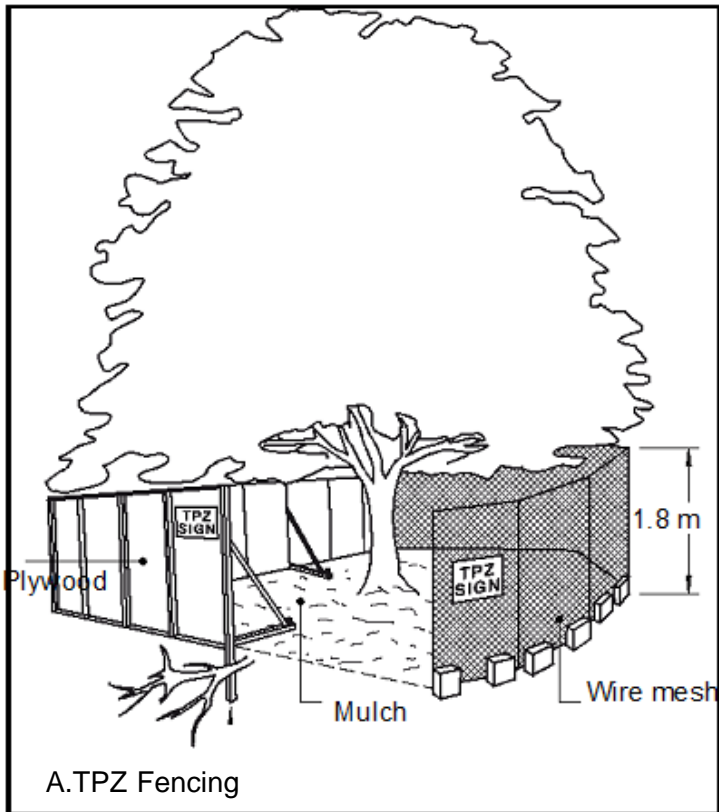
5: Small, young or regularly pruned: Trees that can be reliably moved or replaced.

- (a) Small trees less than 5m in height.
- (b) Young trees less than 15 years old but over 5m in height.
- (c) Formal hedges and trees intended for regular pruning to artificially control growth.

10.2 Concept Plan of proposed Route



10.3 Tree protection



10.4 Trench Detail

TRENCH SECTION A
INVERTED TREFOIL ARRANGEMENT

TR = 1.2	CABLE SIZE = 1200mm ²
DEPTH OF COVER (mm)	CIRCUIT SEPARATION (mm) *X*
750*	570
1000**	670
1250	870
1500	300
1750***	1370
2000	1670
2250	2070
2500	2570

TR = 1.5	CABLE SIZE = 1200mm ²
DEPTH OF COVER (mm)	CIRCUIT SEPARATION (mm) *X*
750*	570
1000**	870
1250	1170
1500	1570
1750***	1970
2000	2570
2250	3370
2500	4170

TR = 1.8	CABLE SIZE = 1200mm ²
DEPTH OF COVER (mm)	CIRCUIT SEPARATION (mm) *X*
750*	670
1000**	1070
1250	1470
1500	1970
1750***	2770
2000	3570
2250	4870
2500	6370

* STANDARD TRENCH SECTION D.O.C.
** RMS CLASSIFIED STATE ROADS D.O.C.
*** FUTURE LIGHT RAIL CORRIDOR (ANZAC PDE) D.O.C.

TRENCH SECTION B
DUAL FLAT ARRANGEMENT

TR = 1.2	CABLE SIZE = 1200mm ²	
DEPTH OF COVER (mm)	CIRCUIT SEPARATION (mm) *X*	CONDUIT SEPARATION (mm) *Y*
500*	230	230
750	230	230
1000	230	230
1200	290	290
1500	230	230
1750	330	230
2000	530	230
2250	330	330
2500	430	330

TR = 1.5	CABLE SIZE = 1200mm ²	
DEPTH OF COVER (mm)	CIRCUIT SEPARATION (mm) *X*	CONDUIT SEPARATION (mm) *Y*
500*	230	230
750	230	230
1000	230	230
1250	230	230
1500	430	230
1750	330	330
2000	430	330
2250	630	330
2500	430	430

TR = 1.8	CABLE SIZE = 1200mm ²	
DEPTH OF COVER (mm)	CIRCUIT SEPARATION (mm) *X*	CONDUIT SEPARATION (mm) *Y*
500*	230	230
750	230	230
1000	230	230
1250	330	230
1500	630	230
1750	430	330
2000	630	330
2250	530	430
2500	530	530

* APPROVAL REQUIRED FOR D.O.C. (LESS THAN 750mm, ADDITIONAL PROTECTION ALSO REQUIRED (STEEL PLATES, MARKERS ETC))

TRENCH SECTION C
SINGLE TREFOIL ARRANGEMENT

TRENCH SECTION D
SINGLE FLAT ARRANGEMENT

LEGEND - TRENCH SECTIONS

	132kV 1200mm ² CU 1C XLPE CABLE IN Ø150mm (Ø160mm O.D.) CONDUIT
	72 FIBRE USFO CABLE IN Ø63mm (Ø63mm O.D.) CONDUIT
	SPARE Ø63mm (Ø63mm O.D.) CONDUIT
	CONDUIT SPACER - PE015/002B
	CONDUIT SPACER - DE016/001C
	CONDUIT SPACER - DE016/012
	CONDUIT SPACER - PT029/003
	WARNING TAPE, 150mm WIDE
	POLYMERIC CABLE COVER, 300mm WIDE
	AC14 ROAD SURFACE
	DGB20 ROAD BASE (TR41,2kN/W AT 0% MC)
	TSS (TR40,8kN/W @ 0% M.C.) MAX COMPRESSIVE STRENGTH SWPs
	NATURAL BACKFILL TO NS130 (TR41,2kN/W AT 0% M.C.)

NOTES:

- ALL RESTORATION, MATERIALS & TESTING IN ACCORDANCE WITH RMS SPECIFICATION M209 & ASSOCIATED RMS SPECIFICATIONS.
- PHASE & CIRCUIT SEPARATIONS TO BE INCREASED IN 100mm INCREMENTS USING ITEM 4 WHERE PRACTICAL.
- WHERE THE DEPTH OF COVER LIES BETWEEN GIVEN VALUES, USE THE GREATER CIRCUIT & CONDUIT SEPARATION FIGURES.
- REFER ALL SITUATIONS NOT COVERED BY THESE 132KV TRENCH SECTIONS TO AUSGRID MAINS DESIGN FOR ADVICE.
- CLEARANCE TO EXISTING SERVICES SHOULD BE TO THE RELEVANT UTILITIES REQUIREMENTS (min 300mm)
- DEPTH OF COVER IS RELATIVE TO PROPOSED ROAD DESIGN LEVELS NOT EXISTING SURFACE LEVELS.

ITEM	DESCRIPTION	STOCK CODE
9	COVER - CABLE, POLYMERIC, 300mm WIDE	151032
8	TAPE - WARNING, 150mm WIDE	71233
7	SPACER - CONDUIT, (ASP PLASTICS - PT029/003)	
6	SPACER - CONDUIT, (ASP PLASTICS - DE016/012)	
5	SPACER - CONDUIT, (ASP PLASTICS - DE016/001C)	
4	SPACER - CONDUIT, (ASP PLASTICS - PE015/002B)	
3	CONDUIT - Ø63mm (Ø63mm O.D.) - (2 x FUTURE DT'S)	
2	CONDUIT - Ø63mm (Ø63mm O.D.) - (2 x COMMS, 2 x FUTURE)	181361
1	CONDUIT - Ø150mm (Ø160mm O.D.) - (6 x POWER)	178771

DRAFT - 21/06/2022

ASSOCIATED DRAWINGS

CABLE PULLING	SHEET 26
JOINT BAY LAYOUT	SHEET 25
ROUTE PLAN	SHEET 23
NOTES & LEGEND	SHEET 3
CHAINAGE & JOINT BAY LOCATIONS	SHEET 2
LOCALITY SKETCH & KEY PLAN	SHEET 1

145 NEWCASTLE ROAD
WALLSEND NSW 2287

DESIGNED	J.BROOKS
DRAWN	P.RIDG
CHECKED	
AUTHORISED	
DATE	
SCALE	1:15
MAP REF.	LE94-MAA21
LGA	SYDNEY-RANDWICK
PROJECT No.	S-401234
PROJ/TRAK No.	PP2022545

ITEM	DESCRIPTION	STOCK CODE
9	COVER - CABLE, POLYMERIC, 300mm WIDE	151032
8	TAPE - WARNING, 150mm WIDE	71233
7	SPACER - CONDUIT, (ASP PLASTICS - PT029/003)	
6	SPACER - CONDUIT, (ASP PLASTICS - DE016/012)	
5	SPACER - CONDUIT, (ASP PLASTICS - DE016/001C)	
4	SPACER - CONDUIT, (ASP PLASTICS - PE015/002B)	
3	CONDUIT - Ø63mm (Ø63mm O.D.) - (2 x FUTURE DT'S)	
2	CONDUIT - Ø63mm (Ø63mm O.D.) - (2 x COMMS, 2 x FUTURE)	181361
1	CONDUIT - Ø150mm (Ø160mm O.D.) - (6 x POWER)	178771

DESIGNED	J.BROOKS	PROJECT No.	S-401234
DRAWN	P.RIDG	PROJ/TRAK No.	PP2022545
CHECKED			
AUTHORISED			
DATE			
SCALE	1:15		
MAP REF.	LE94-MAA21		
LGA	SYDNEY-RANDWICK		

BEACONSFIELD TS - KINGSFORD ZS 132kV FEEDER 264 PROPOSED UNDERGROUND FEEDER TRENCH SECTIONS	SHEET No	256207	SHEETS	24 of 26	APP.	0
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10.5. References

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10.6 Qualifications – Ian Hills

Associate Diploma Horticulture	Ryde TAFE 1984
AQF3 Horticulture (Arboriculture)	Ourimbah TAFE 1998
AQF5 Diploma Horticulture (Arboriculture)	Kurri Kurri TAFE 2009 (Dux) Cert No. 5934155
QTRA Registered User 2083	December 2013
QTRA Advanced User 4469	March 2018
Working with Children Check Number	WWC1780469E
National Coordinated Criminal History Check Certificate	CAD5579CB8
QTRA Advanced User 4469	March 2020