Independent Arboricultural Services

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Arboricultural Impact Assessment

Prepared For: Ebb and Flow c/o Mewing Planning Consultants

Job Date: 10 August 2026

20 Pidgeon Close
West End QLD 4101

IAS22786

Independent Arboricultural Services - Disclaimer

The material contained in this document has been prepared on an independent basis free of any bias and represents the honest opinion of the consulting arborist.

Tissue or soil samples have not been collected nor submitted for testing unless otherwise stated. Excavation is limited to minor earthworks and we submit this assessment on the basis all data is based on visual inspection of the tree/s and its/their location, species, health and condition at the time of writing unless otherwise stated. Measurements and tree locations noted in this report are approximate and have not been determined by survey unless information and analysis has been provided by the consultant, or such information is otherwise noted. Please request a more detailed arborist report if further information and analysis is required. Depending on site requirements, specific alternate specialist advice including engineering consultancy and certification maybe required in combination with this assessment. This assessment contains arborist advice and associated general information only and does not purport to provide other site-specific specialist advice, such as engineering certification unless arrangement to source such advice for inclusion in this assessment has been requested and authorised.

This report contains opinions, advice and recommendations based on information and data gathered from site inspections carried out by personnel from Independent Arboricultural Services as well as information provided by the client and/or its representatives, is to be relied on by the client in that context. It is assumed all such information provided to Independent Arboricultural Services is correct. All recommended arboricultural works detailed in this assessment including pruning of tree canopy or roots, tree removal, tree transplantation or other associated works including stump grinding or the application of any prescribed treatment, shall be carried out in accordance with applicable standards including AS 4373-2007 *Pruning of Amenity Trees* and AS 4970-2025 *Protection of Trees on Development Sites*.

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The invoice for this report will be issued to the person or entity as per the address advised at the time of confirmation of appointment. Assessment in this report is based on plans provided at the time of confirmation of engagement and report preparation. Additional time required for re-assessment of report detail due to subsequent re-issue of plans after report preparation will be subject to an additional fee, which will be charged at our hourly rate. This report shall not be conveyed to any third party including regulatory authority/authorities until full payment of this invoice is received by Independent Arboricultural Services, and a finalised report has been issued, unless agreement to do so has been granted.

Factors including the absence of historical records or local knowledge, recognition of the variability of the integrity of a tree as a naturally living organism, as well as the impact of conditions within its surrounds to which it maybe subject, including the impacts of mechanical force and the occurrence of weather events, do not allow an arborist to guarantee the age of a tree, or the length of time a tree/s may live, or such time as it /they may fail. There is no warranty or guarantee expressed or implied the problems or deficiencies of the plants or property in question may not arise in the future.

Executive Summary

Independent Arboricultural Services have been engaged by Ebb and Flow c/o Mewing Planning Consultants (*The Client)* to assess potential impacts to the nominated vegetation (*Subject Trees)* resulting from proposed development at 20 Pidgeon Close, West End QLD 4101. Stephen Catchpoole (AQF Level 5) attended site on 10 August 2026 to undertake the assessment of the impact of the works.

The assessment of the impacts of proposed development on the identified trees in and around the development envelope within the subject property has been undertaken. Advice on both specific and general tree protection measures and Project Arborist Requirements have been detailed in this report. It is important as the design is refined, further reviews are undertaken by the Project Arborist and protection measures are further specified as required.

As part of the design process and operational works it is recommended that the following is undertaken,

- Ensure all approvals and permits are in place before works commence.
- Refer to Tree Protection Plan for specific requirements on paving and landscaping.
- Tree Protection Fencing is to be erected before works commence and audited by the Project Arborist (Min AQF Level 5).
- For any replacement of fencing, low pressure water excavation is to be utilised for piers and directly supervised by the Project Arborist (AQF Level 5).
- Permeable pavers or similar to be utilised for all paving outside of the building footprints within the NRZ of retained trees.
- Project Arborist (AQF level 5) to supervise all works within the NRZ.
- All required PSO-ARB permissions to be in place before works commence.
- Any works proposed within the TPZ of retained trees requires supervision of a minimum AQF5 Project Arborist.
- Supervision by a Project Arborist (Min AQF Level 5) and Fauna Spotter/Catcher of the approved tree removals.
- Tree removal within the TPZ of retained trees is to be undertaken by a minimum AQF Level 3 Arborist/Team with relevant resources and all stumps are to be ground down.
- Utilise Level 2 Structural Soils for any fill requirements for structural / buildings / infrastructure within TPZ of retained trees and all fill / construction prohibited within SRZ.
- Within NRZ of retained trees with incursion into deep planting areas, manual installation of vegetation is required (ie no machinery and landscape certified organic soil and aged mulch is to be utilised.
- Laydown areas and site shed/office locations are to be identified/finalised and excluded from the Tree Protection Zones of retained trees and minimise public impact.
- Route vehicles and equipment outside of TPZs. If access is required within TPZ, mulch to a depth of 100mm and tree padding needs to be installed with the option of track mats as determined and signed off by a minimum AQF5 Project Arborist.
- Construction materials, spoil, stockpiles, tools and equipment are not permitted within the TPZs of retained trees.

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Document Tracking & Information

Project Name	Arboricultural Impact Assessment		
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Client	Ebb and Flow c/o Mewing Planning Consultants		
Address	20 Pidgeon Close, West End QLD 4101		
IAS Reference	IAS22786	**Revision**	1
Prepared By	Stephen Catchpoole (AQF Level 5)		
Checked By	Mick Maher (AQF Level 5)	**Date**	5 November 2026

All comments and recommendations in this report have been determined in accordance with AS 4373-2007 *Pruning of Amenity Trees* and AS 4970-2025 *Protection of Trees on Development Sites*. All recommended tree work should be carried out in accordance with these standards.



Stephen Catchpoole

Consulting Arborist

Abbreviations

BCC	Brisbane City Council	**TPP**	Tree Protection Plan
DA	Development Application	**TPS**	Tree Protection Specifications
VPO	Vegetation Protection Order	**CMP**	Construction Management Plan
BLE	Building Location Envelope	**VMP**	Vegetation Management Plan
TPZ	Tree Protection Zone	**AS**	Australian Standard
NRZ	Notional Root Zone	**AS 4373-2007**	Pruning of Amenity Trees
SRZ	Structural Root Zone	**AS 4970-2025**	Protection of Trees on Development Sites
RPA	Root Protection Area	**DSH**	Diameter at Standard Height
PA	Project Arborist	**CA**	Consulting Arborist

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Consultant Credentials

Andrew Rankine *Director*	• Diploma Arb. (AQF Level 5) • Arboriculture Australia Registered Professional Arborist • QTRA (Qualified)	• TRAQ (Qualified) • ISA Certified Arborist & Municipal Specialist AU-0269AM • QAA Qualified Member
Roger Rankine *Managing Director*	• Diploma Arb. (AQF Level 5) • Grad Cert Arb. (AQF Level 8) • ISA Board Certified Master Arborist (QL-001A)	• QTRA (Qualified) • TRAQ (Qualified) • QAA Qualified Member
Mick Maher *Business Manager*	• Diploma Arb. (AQF Level 5) • TRAQ (Qualified) • QTRA (Qualified) • Cert IV Project Management	• Cert III Conservation and Land Management • Cert II Horticulture (Turf Management) • QAA Qualified Member
Stephen Catchpoole *Consulting Arborist*	• Diploma Arb. (AQF Level 5) • Doctor of Philosophy in Forestry (PhD) • QTRA (Qualified)	• TRAQ (Qualified) • Bachelor of Science Forestry • Bachelor of Science (Hons Botany) • QAA Qualified Member
Sam Gilbey *Consulting Arborist*	• Diploma Arb. (AQF Level 5) • TRAQ (Qualified) • QTRA (Qualified)	• ISA Certified Arborist • Bachelor of Science in Ecology and Conservation Biology
Kieran Pentland *Consulting Arborist*	• Diploma Arb. (AQF Level 5) • Grad Cert Arb. (AQF Level 8) • MSc. Arb. & Urban Forestry (AQF Level 9) • ISA Board Certified Master Arborist	• QAA Qualified Member • QTRA (Qualified) • TRAQ (Qualified) • Bachelor of Arts in Leisure Management • National Cert in Tree Management • National Cert in Horticulture
Justin Darby *Consulting Arborist*	• Diploma Arb. (AQF Level 5) • Certificate III Arboriculture • TRAQ (Qualified)	• QTRA (Qualified) • Certificate II in ESI
Tom Kennedy *Consulting Arborist*	• Certificate III Arboriculture	• Diploma Arb. (AQF Level 5)
Adam Kriedemann *Consulting Arborist*	• Certificate III Arboriculture • TRAQ (Qualified)	• Diploma Arb. (AQF Level 5)
Peter Sproule *CAD / GIS Drafting Specialist*	• Bachelor of Business (Information Systems)	• Certificate of Technology in Civil Design Drafting
Robert Stoop *Trainee Consulting Arborist*	• Diploma Arb. (AQF Level 5) in progress	

Map



Figure 1: Subject Site (Nearmap® accessed 2026)

Introduction

This report is based on a visual inspection carried out from the ground on 10 August 2026. No soil or tissue sampling has been conducted. Tree assessment and Qualitative Visual Tree Analysis has been carried out in accordance with TRAQ ISA guidelines. Data and information provided to the client by others has been incorporated into this report as appropriate.

All arboricultural recommendations contained in this report have been determined in accordance with AS 4373-2007 *Pruning of Amenity Trees* and AS 4970-2025 *Protection of Trees on Development Sites*.

For the purposes of this report, reference to a Consulting or Project Arborist is held to mean an arboricultural specialist who holds minimum arboricultural qualifications of Diploma of Arboriculture/AQF Level 5, appropriate professional insurances, and has appropriate experience in the protection of trees on construction sites. Where tree work is specified, all recommended tree work is to be carried out in accordance with the above mentioned standards by an appropriately trained and AQF qualified arborist practitioner/s with an up to date record of training and membership of a recognised Australian arboricultural association, e.g. Queensland Arboricultural Association (QAA), Arboriculture Australia (AA), or a recognised international arboricultural association. No climbing spikes are to be used if pruning is to be carried out on live trees, except in the instance of an emergency.

Qualifications of the report authors include Diploma of Arboriculture/AQF Level 5 and International Society of Arboriculture (ISA) Certified Arborist accreditation. Report authors hold current insurances and memberships, including qualified memberships of Queensland Arboricultural Association (QAA), and Arboriculture Australia (AA) as well as current accreditation and membership of ISA.

Independent Arboricultural Services is a qualified registrant on the QAA Register of Consulting Arborists.

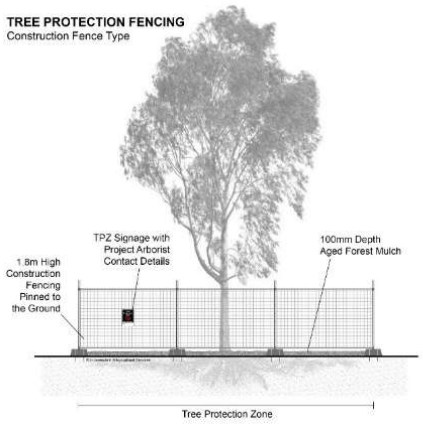
Tree Protection Guidelines

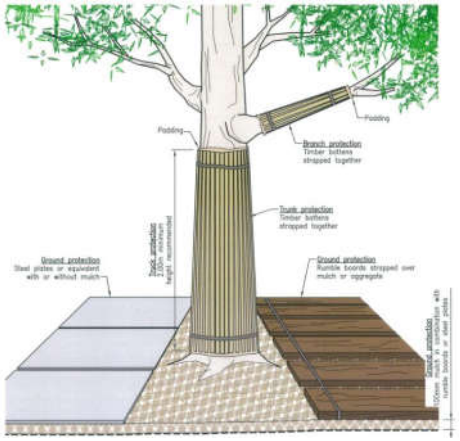
- **Protection of retained trees during construction works**

Protection of Retained Trees During Construction Works

An exclusion zone is to be established along the perimeters of retained trees and cordoned off with a physical barrier of wire mesh fence, 1.8m in height, which is securely anchored. The role of these fences is to prevent any damage to the complete tree/ including root system (SRZ & TPZ/NRZ), stem and branch structure as well as the crown or canopy. Alternatively, and on approval of a minimum AQF Level 5 Project Arborist, plastic mesh fencing, 1.2m in height, secured with star pickets and caps with straining wire can be utilised. All Tree Protection Zone (TPZ) fencing will require appropriate signage to signify the relevant protection zones. This will require audit and sign off prior to operational works onsite.







Tree protection fencing to be utilised. Where works will be undertaken close to and within Tree Protection Zones specific tree protection measures to be utilised a directed by the Project Arborist.

Project Hold Points

Engage a minimum AQF Level 5 Project Arborist during the project life;

- Once tree protection fencing and signage has been established and finalised, Project Arborist (minimum AQF Level 5) to audit and sign off.
- Any works within the Notional Root Zone (NRZ) of retained tree/s is required.
- If tree roots are encountered over 50mm in diameter outside of TPZs of retained tree/s.
- Changes to the plans occur.
- On completion of the project to conduct a final audit and summary.

(Site audits/summary reports will be conducted at each hold point interval by the Project Arborist)

Project Arborist Requirements	
1.	Pre-Start Inspection and audit of tree protection fencing before works commence.
2.	Any required tree works to be undertaken by a minimum AQF Level 3 Arborist under the supervision of the Project Arborist (Min AQF Level 5). Tree services company to be a member of Queensland Arboricultural Association or Arboriculture Australia.
3.	All works within the NRZ of the retained vegetation to be supervised by the Project Arborist (Min AQF Level 5). Audit reports to be completed and submitted by the Project Arborist. Any below ground incursion to be water excavated under low pressure, under the supervision of the Project Arborist.
4.	All works to be excluded from the Structural Root Zone (SRZ) and supervised if located within TPZ.
5.	The Project Arborist to be consulted if changes to plans are made that affect any retained vegetation.
6.	At the completion of works, Project Arborist to undertake a site assessment and an audit report compiled of any further remedial actions required.

Conclusion

For all retained trees, with due care, implementation of appropriate work methodology as noted in this report and isolation of all TPZ's of retained trees from construction works, the potential for ill-effect to retained/affected trees can be minimised in accordance with guidelines of AS4970-2025 *Protection of Trees on Development Sites.*

The following must occur:

All required regulatory approvals must be in place prior to the commencement of any tree work for future construction work. Approvals are required should the Project Arborist prescribe pruning such as crown clean, canopy lift and/or directional pruning;

- Project Arborist must be appointed and engaged to guide the protection of protected tree/s from project commencement, i.e. during design planning and during the construction period until its completion.
- **All Arboricultural reports, TPP, TPS, VMPs & approvals must be included in the CMP.**
- Exploratory low pressure water excavation is to be undertaken as specified.
- Arborist briefing of all engaged persons on their commencement as well as diligent work practices must occur during all approved future construction work.
- Root disturbance must be minimised to prevent accidental injury, compression, and the creation of exposure points which may allow entry of pests and pathogens.
- **All work within any NRZ must be supervised by the Project Arborist.**

All work within NRZs must be carried out with due care to avoid mechanical impact to retained tree/s during the construction phase. Sleeving should be installed to provide an impervious barrier between exposed TPZ perimeter/s and any proposed new concreted areas to prevent chemical leaching into surrounding soil of retained tree/s.

Reactionary processes, such as the emergence of deadwood, dieback etc. may be likely to occur as a result of disturbance and/or injury to any retained tree/s on a construction site. Amended design plans and construction methodology can serve to avoid or minimise the likely emergence of such issues, and therefore their associated future OH&S issues to the future occupants of the new dwellings and/or pedestrian/vehicular traffic within the vicinity of retained tree/s. Any required pruning is to be undertaken by a minimum AQF Level 3 arborist, under the supervision of the appointed Project Arborist (AQF Level 5).

PROJECT ARBORIST REQUIREMENTS

1. Tree Protection Fencing to be erected and audited by the Project Arborist before all works commence.
2. All required pre-start meetings and regulatory permissions to be in place.
3. Plant Health Care program to be implement at the commencement and during civil works for trees with incursion within the TPZ as specified by the Project Arborist (AQF level 5).
4. Project Arborist (AQF level 5) to supervise all works within the NRZ of retained trees.
5. Post works check and audit report to be undertaken by the Project Arborist including a health form and risk assessment.

All required BCC PSO & NALL permissions to be strictly in place before interference within the root zone of adjoining park and reserve trees

HOLD POINT: Low pressure exploratory water excavation to be undertaken as nominated and supervised by the Project Arborist (AQF Level 5).

Tree Protection Fencing

Exploratory water excavation to be undertaken and directly supervised by the Project Arborist (AQF level 5).

APPROXIMATE NRZ, REFER ARBORIST ADVICE

LINE OF EXISTING TREE TRUNK ABOVE

STAGING LINE

EXISTING SEWER

T40 - NRZ/TPZ 6.0 m

T38 - NRZ/TPZ 8.0 m

T37 - NRZ/TPZ 8.0 m

T11 - NRZ/TPZ 15.0 m

T10 - NRZ/TPZ 15.0 m

T9 - NRZ/TPZ 15.0 m

T8 - NRZ/TPZ 15.0 m

T19 - NRZ/TPZ 15.0 m

T25 - NRZ/TPZ 8.3 m

TOWER 1 BASEMENT RL 3.7

TOWER 2 BASEMENT RL 3.7

TOWER 3 BASEMENT 1 RL 3.7

FOYER

SERVICES

LINE OF EXISTING BASEMENT

RIVER DRIVE

DA ISSUE

PROPOSED BASEMENT 1 PLAN

bureau proberts

REV	DESCRIPTION	DATE
8	DA ISSUE	2.11.26
7	DRAFT DA	22.10.26
6	PLANNER DRAFT ISSUE	8.10.26
5	DRAFT DA	11.09.26
4	BASEMENT TREE OVERLAY	28.08.26
3	CERTIFIER ISSUE	8.07.2026
2	COORDINATION SET	5.06.2026

CLIENT: CORNERSTONE
PROJECT: EBB & FLOW, DAVIES PARK WEST END
ADDRESS: 20 PIDGEON CLOSE WEST END, QLD 4101

SCALE: 1 : 500 [A1] | DATE: 2.11.26 | DRAWN: CG | NORTH:
CAD FILE REF: C:_Revit Local\23003_20 PIDGEON CL_ DA_R24_dgibbons.rvt
PROJECT NO: 23003 | PHASE: SD | DRAWING NUMBER: AR 1.302 | REVISION: 8
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PROJECT ARBORIST REQUIREMENTS

1. Tree Protection Fencing to be erected and audited by the Project Arborist before all works commence.
2. All required pre-start meetings and regulatory permissions to be in place.
3. Plant Health Care program to be implement at the commencement and during civil works for trees with incursion within the TPZ as specified by the Project Arborist (AQF level 5).
4. Project Arborist (AQF level 5) to supervise all works within the NRZ of retained trees.
5. Post works check and audit report to be undertaken by the Project Arborist including a health form and risk assessment.

All required BCC PSO & NALL permissions to be strictly in place before interference within the root zone of adjoining park and reserve trees

Tree Protection Fencing

HOLD POINT: Low pressure exploratory water excavation to be undertaken as nominated and supervised by the Project Arborist (AQF Level 5).

Pathways and planters within the NRZ of Trees 8-11are to be strictly slab on grade. A suitable medium to be utilised to line the concrete as agreed with BCC PSO. Permeable paver or similar to be utilised.

All required BCC PSO permissions to be in place and the Project Arborist to supervise all works within the TPZ.

APPROXIMATE NRZ, REFER ARBORIST ADVICE

LINE OF EXISTING TREE CANOPY

T19 - NRZ/TPZ 15.0 m

T38 - NRZ/TPZ 8.0 m

T37 - NRZ/TPZ 6.0 m

T40 - NRZ/TPZ 6.0 m

T11 - NRZ/TPZ 15.0 m

T10 - NRZ/TPZ 15.0 m

T9 - NRZ/TPZ 15.0 m

T8 - NRZ/TPZ 15.0 m

T25 - NRZ/TPZ 8.3 m

ADJACENT APPROVED DEVELOPMENT

STAGING LINE

7750 DEDICATION

3750 DEDICATION

ROAD WIDENING - STREETSCAPE DEDICATION

MONTAGUE RD

RIVER DRIVE

PIDGEON CLOSE

BEESLEY ST

DA ISSUE

PROPOSED GROUNDPLANE PLAN

bureau proberts

REV	DESCRIPTION	DATE
10	DA ISSUE	2.11.26
9	DRAFT DA	22.10.26
8	PLANNER DRAFT ISSUE	8.10.26
7	DRAFT DA	11.09.26
6	GROUNDPLANE TO LANDSCAPE	3.08.26
5	GROUND TO LSCP	24.07.26
4	GROUND TO TRAFFIC	22.07.26

CLIENT: CORNERSTONE
PROJECT: EBB & FLOW, DAVIES PARK WEST END
ADDRESS: 20 PIDGEON CLOSE WEST END, QLD 4101

SCALE: 1 : 500 [A1] | DATE: 2.11.26 | DRAWN: CG | NORTH:
CAD FILE REF: C:_Revit Local\23003_20 PIDGEON CL_DA_R24_cjgibbons.rvt
PROJECT NO: 23003 | PHASE: SD | DRAWING NUMBER: AR 1.303 | REVISION: 10
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Tree Locations



Please Note: Tree locations are approximate only and not survey accurate. Circles indicate Notional Root Zones as defined under AS4970-2025 *Protection of Trees on Development Sites.*

Tree Detail

Tree No.	Botanical Name	Common Name	DSH (cm)	SRZ (m)	NRZ (m)	Height (m)	Spread (m)	Health	Form	Comment
1	*Phoenix canariensis*	Canary Island Date Palm	79	3.1	9.5	9	6	Good	Typical	Dead fronds, Habitat Features, Seed pods
2	*Harpullia pendula*	Tulipwood	31	2.2	3.7	6	7	Fair	Poor	Bifurcated, Co-dominant Limbs, Compacted Soil, Deadwood under 50mm, Epicormic Growth
3	*Xanthostemon chrysanthus*	Golden Penda	32	2.1	3.8	8	7	Fair	Typical	Bifurcated, Co-dominant Limbs, Deadwood under 50mm, Encroaching on structure / utilities, Epicormic Growth
4	*Harpullia pendula*	Tulipwood	27	2.0	3.2	6	5	Fair	Typical	Bifurcated, Compacted Soil, Deadwood under 50mm, Encroaching on structure / utilities, Epicormic Growth
5	*Harpullia pendula*	Tulipwood	21	1.9	2.5	6	5	Fair	Typical	Bifurcated, Compacted Soil, Deadwood under 50mm, Encroaching on structure / utilities, Epicormic Growth
6	*Xanthostemon chrysanthus*	Golden Penda	30	2.1	3.6	8	6	Fair	Typical	Bifurcated, Co-dominant Limbs, Compacted Soil, Deadwood under 50mm, Encroaching on structure / utilities, Epicormic Growth
7	*Xanthostemon chrysanthus*	Golden Penda	27	2.1	3.2	8	6	Fair	Typical	Bifurcated, Co-dominant Limbs, Compacted Soil, Deadwood under 50mm, Encroaching on structure / utilities, Epicormic Growth
8	*Ficus benjamina*	Weeping Fig	188	4.5	15.0	12	20	Good	Typical	Neighbouring tree
9	*Ficus benjamina*	Weeping Fig	176	4.3	15.0	12	20	Good	Typical	Neighbouring tree
10	*Ficus benjamina*	Weeping Fig	154	4.2	15.0	14	21	Good	Typical	Neighbouring tree
11	*Cinnamomum camphora*	Camphor Laurel	136	3.8	15.0	16	14	Good	Typical	Neighbouring tree
12	*Various spp.*	Group of Palms						Fair	Typical	12x golden cane cluster

Tree No.	Botanical Name	Common Name	DSH (cm)	SRZ (m)	NRZ (m)	Height (m)	Spread (m)	Health	Form	Comment
13	*Delonix regia*	Royal Poinciana	43	2.4	5.2	7	9	Fair	Typical	Bifurcated, Deadwood under 50mm, Dieback, Epicormic Growth, Poor crown density
14	*Delonix regia*	Royal Poinciana	34	2.2	4.1	5	7	Fair	Typical	Bifurcated, Deadwood under 50mm, Dieback, Epicormic Growth, Poor crown density, Suppressed
15	*Harpullia pendula*	Tulipwood	33	2.2	4.0	7	4	Fair	Typical	Bifurcated, Compacted Soil, Deadwood under 50mm, Dieback, Encroaching on structure / utilities, Epicormic Growth
16	*Jacaranda mimosifolia*	Jacaranda	51	2.6	6.1	6	9	Fair	Typical	Bifurcated, Deadwood under 50mm, Dieback, Encroaching on structure / utilities, Epicormic Growth
17	*Harpullia pendula*	Tulipwood	30	2.2	3.6	8	6	Fair	Typical	
18	*Jacaranda mimosifolia*	Jacaranda	52	2.6	6.2	8	8	Fair	Typical	Deadwood over 50mm, Epicormic Growth, Fungus/Fruiting Bodies
19	*Ficus microcarpa var. hillii*	Hill's Weeping Fig	480	6.5	15.0	15	30	Good	Typical	
20	*Xanthostemon chrysanthus*	Golden Penda	10	1.5	2.0	5	2	Poor	Poor	
21	*Xanthostemon chrysanthus*	Golden Penda	13	1.6	2.0	5	2	Poor	Poor	
22	*Xanthostemon chrysanthus*	Golden Penda	13	1.5	2.0	5	2	Poor	Poor	
23	*Xanthostemon chrysanthus*	Golden Penda	15	1.7	2.0	5	2	Poor	Poor	
24	*Various spp.*	Group of Trees						Poor	Poor	3x golden cane 20x brush cherry
25	*Jacaranda mimosifolia*	Jacaranda	69	2.9	8.3	9	12	Fair	Typical	
26	*Eucalyptus tereticornis*	Forest Red Gum	35	2.3	4.2	15	6	Fair	Typical	
27	*Eucalyptus grandis*	Flooded Gum	65	2.9	7.8	19	10	Good	Typical	Neighbouring property
28	*Xanthostemon chrysanthus*	Golden Penda	21	1.9	2.6	6	4	Fair	Poor	
29	*Xanthostemon chrysanthus*	Golden Penda	17	1.8	2.1	6	4	Fair	Poor	
30	*Xanthostemon chrysanthus*	Golden Penda	11	1.5	2.0	6	4	Fair	Poor	
31	*Syagrus romanzoffiana*	Queen Palm	23	1.9	2.8	10	4	Fair	Typical	Weed species
32	*Syagrus romanzoffiana*	Queen Palm	25	2.0	3.0	10	4	Fair	Typical	Weed species

Tree No.	Botanical Name	Common Name	DSH (cm)	SRZ (m)	NRZ (m)	Height (m)	Spread (m)	Health	Form	Comment
33	*Syagrus romanzoffiana*	Queen Palm	24	2.0	2.9	5	3	Fair	Typical	Weed species
34	*Syagrus romanzoffiana*	Queen Palm	21	1.9	2.5	10	3	Fair	Typical	Weed species
35	*Syagrus romanzoffiana*	Queen Palm	27	2.1	3.2	10	3	Fair	Typical	Weed species
36	*Syagrus romanzoffiana*	Queen Palm	26	2.1	3.1	10	3	Fair	Typical	Weed species
37	*Elaeocarpus grandis*	Blue Quandong	67	2.9	8.0	17	9	Good	Typical	
38	*Araucaria bidwillii*	Bunya Bunya Pine	37	2.3	4.4	13	5	Fair	Poor	
39	*Syagrus romanzoffiana*	Queen Palm	27	2.1	3.2	12	6	Fair	Typical	Weed species
40	*Ficus microcarpa var. hillii*	Hill's Weeping Fig	50	2.6	6.0	7	7	Fair	Typical	
41	*Various spp.*	Group of Palms								
42	*Ficus sp.*	Fig	17	1.8	2.0	4	4	Fair	Typical	Girdling roots
43	*Bauhinia variegata*	Orchid Tree	18	1.8	2.2	5	3	Fair	Typical	
44	*Bauhinia variegata*	Orchid Tree	65	2.9	7.8	9	6	Fair	Typical	Decay, dieback, epicormic growth

Table Legend (where relevant):			
Health	**Form**	**Aged Class**	**Further Detail**
Good: Trees foliage is in exceptional condition and can be considered an excellent specimen of its species. No pests or diseases are present.	Good: Trees structure is exceptional and can be considered an excellent specimen of its species. No visible defects are present.	Juvenile: Tree will generally grow rapidly in this phase of its life cycle.	Diameter at Standard Height (DSH) measured at 1.4m above ground level. Diameter at Root Flare (DRF) measured at the base of the tree, at the trunk / root system transition zone. Diameter = circumference divided by π
Fair: Trees foliar condition is satisfactory but may be exhibiting some signs of stress such as tip dieback or chlorosis, pests or diseases may be present but not adversely affecting the tree.	Typical: Trees structure is normal for the species; some minor structural constraints may be present.	Mature: Tree has reached maturity and is producing flowers, fruits and seeds. Tree continues to grow.	Notional Root Zone (NRZ) defined as metres radius. Calculated being DSH x 12 (minimum 2.0m and no greater than 15m).
Poor: Foliage density is sparse or largely discoloured, tree health is at or approaching a critical value which may be irreversible, pests or diseases are highly prevalent throughout the crown.	Poor: Structure is a poor example of its species and exhibits a combination of structural issues.	Full to Late Maturity: Tree has reached the maximum height for its species, elongation has stopped but the trunk continues to thicken, overall growth rate is starting to slow, foliar density may be starting to thin.	Structural Root Zone (SRZ) displaced as metres radius. Calculation being $(DRF \times 50)^{0.42} \times 0.64$ (never less than 1.5m or greater than 15m).
Dead: Tree is in advanced decline or completely dead.	Dead: Tree is in advanced decline or completely dead.	Senescent: Tree has / is starting to retract in size through dieback and shedding of limbs. Trees in this age class may be ecologically valuable, as their structure contains habitat necessary for native fauna.	TPZ / NRZ – unless otherwise specified the Tree Protection Zone and the Notional Root Zone will be the same dimension.

Tree Recommendations

Tree No.	Botanical Name	Common Name	DSH (cm)	SRZ (m)	NRZ (m)	Impact	Retention Status	Recommendation
1	*Phoenix canariensis*	Canary Island Date Palm	79	3.1	9.5	MAJOR (road widening)	**REMOVE**	• Remove and replace in accordance with landscaping
2	*Harpullia pendula*	Tulipwood	31	2.2	3.7	MAJOR (earthworks and pathway)	**REMOVE**	• Remove and replace in accordance with landscaping
3	*Xanthostemon chrysanthus*	Golden Penda	32	2.1	3.8	MAJOR (earthworks and pathway)	**REMOVE**	• Remove and replace in accordance with landscaping
4	*Harpullia pendula*	Tulipwood	27	2.0	3.2	MAJOR (earthworks and pathway)	**REMOVE**	• Remove and replace in accordance with landscaping
5	*Harpullia pendula*	Tulipwood	21	1.9	2.5	MAJOR (earthworks and pathway)	**REMOVE**	• Remove and replace in accordance with landscaping
6	*Xanthostemon chrysanthus*	Golden Penda	30	2.1	3.6	MAJOR (earthworks and pathway)	**REMOVE**	• Remove and replace in accordance with landscaping
7	*Xanthostemon chrysanthus*	Golden Penda	27	2.1	3.2	MAJOR (earthworks and pathway)	**REMOVE**	• Remove and replace in accordance with landscaping
8	*Ficus benjamina*	Weeping Fig	188	4.5	15.0	MAJOR (Basement cut)	**RETAIN**	• Refer to Tree Protection Plan for specific requirements on paving and landscaping. • Tree Protection Fencing to be erected before works commence. • For any replacement of the fence, low pressure water excavation is to be utilised

								for the piers and directly supervised by the Project Arborist (AQF Level 5). • Permeable paver or similar to be utilised. • Project Arborist (AQF level 5) to supervise works within the NRZ. • All required PSO-ARB permissions to be in place before works commence.
9	*Ficus benjamina*	Weeping Fig	176	4.3	15.0	MAJOR (Basement cut)	**RETAIN**	• Refer to Tree Protection Plan for specific requirements on paving and landscaping. • Tree Protection Fencing to be erected before works commence. • For any replacement of the fence, low pressure water excavation is to be utilised for the piers and directly supervised by the Project Arborist (AQF Level 5). • Permeable paver or similar to be utilised. • Project Arborist (AQF level 5) to supervise works within the NRZ. • All required PSO-ARB permissions to be in place before works commence.
10	*Ficus benjamina*	Weeping Fig	154	4.2	15.0	MAJOR (Basement cut)	**RETAIN**	• Refer to Tree Protection Plan for specific requirements on paving and landscaping. • Tree Protection Fencing to be erected before works commence. • For any replacement of the fence, low pressure water excavation is to be utilised for the piers and directly supervised by the Project Arborist (AQF Level 5). • Permeable paver or similar to be utilised. • Project Arborist (AQF level 5) to supervise works within the NRZ. • All required PSO-ARB permissions to be in place before works commence.

11	*Cinnamomum camphora*	Camphor Laurel	136	3.8	15.0	MAJOR (Basement cut)	**RETAIN**	• Refer to Tree Protection Plan for specific requirements on paving and landscaping. • Tree Protection Fencing to be erected before works commence. • For any replacement of the fence, low pressure water excavation is to be utilised for the piers and directly supervised by the Project Arborist (AQF Level 5). • Permeable paver or similar to be utilised. • Project Arborist (AQF level 5) to supervise works within the NRZ. • All required PSO-ARB permissions to be in place before works commence.
12	*Various spp.*	Group of Palms				MAJOR (earthworks and pathway)	**REMOVE**	• Remove and replace in accordance with landscaping
13	*Delonix regia*	Royal Poinciana	43	2.4	5.2	MAJOR (earthworks and pathway)	**REMOVE**	• Remove and replace in accordance with landscaping
14	*Delonix regia*	Royal Poinciana	34	2.2	4.1	MAJOR (earthworks and pathway)	**REMOVE**	• Remove and replace in accordance with landscaping
15	*Harpullia pendula*	Tulipwood	33	2.2	4.0	MAJOR (earthworks and pathway)	**REMOVE**	• Remove and replace in accordance with landscaping
16	*Jacaranda mimosifolia*	Jacaranda	51	2.6	6.1	MAJOR (earthworks and pathway)	**REMOVE**	• Remove and replace in accordance with landscaping
17	*Harpullia pendula*	Tulipwood	30	2.2	3.6	MAJOR (earthworks and pathway)	**REMOVE**	• Remove and replace in accordance with landscaping

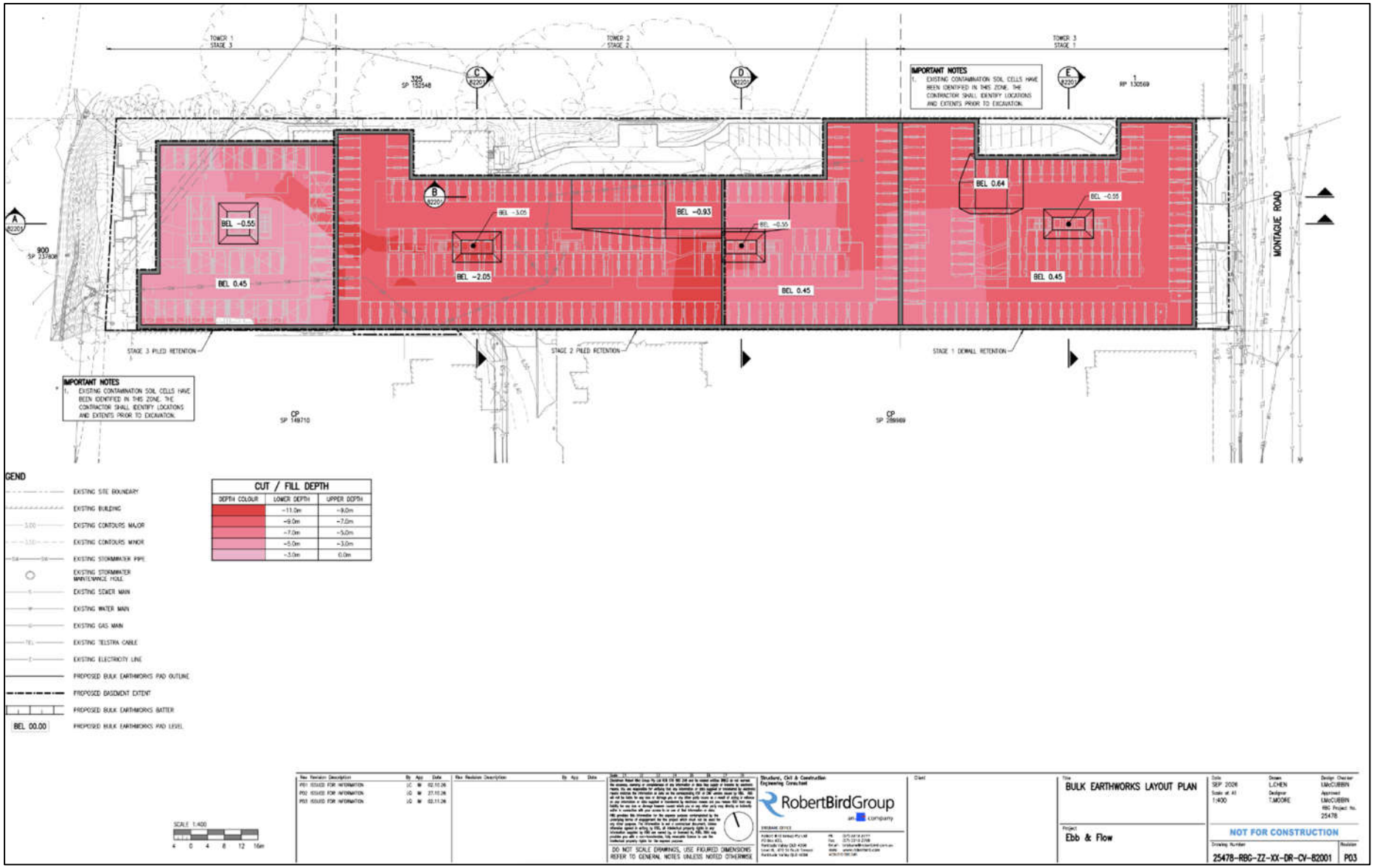
18	*Jacaranda mimosifolia*	Jacaranda	52	2.6	6.2	MAJOR (earthworks and pathway)	**REMOVE**	• Remove and replace in accordance with landscaping
19	*Ficus microcarpa var. hillii*	Hill's Weeping Fig	480	6.5	15.0	MINOR (landscaping structures)	**RETAIN**	• Refer to Tree Protection Plan for specific requirements on paving and landscaping. • Tree Protection Fencing to be erected before works commence. • For any replacement of the fence, low pressure water excavation is to be utilised for the piers and directly supervised by the Project Arborist (AQF Level 5). • Permeable paver or similar to be utilised. • Project Arborist (AQF level 5) to supervise works within the NRZ. • All required PSO-ARB permissions to be in place before works commence.
20	*Xanthostemon chrysanthus*	Golden Penda	10	1.5	2.0	MAJOR (earthworks and pathway)	**REMOVE**	• Remove and replace in accordance with landscaping
21	*Xanthostemon chrysanthus*	Golden Penda	13	1.6	2.0	MAJOR (earthworks and pathway)	**REMOVE**	• Remove and replace in accordance with landscaping
22	*Xanthostemon chrysanthus*	Golden Penda	13	1.5	2.0	MAJOR (earthworks and pathway)	**REMOVE**	• Remove and replace in accordance with landscaping
23	*Xanthostemon chrysanthus*	Golden Penda	15	1.7	2.0	MAJOR (earthworks and pathway)	**REMOVE**	• Remove and replace in accordance with landscaping
24	*Various spp.*	Group of Trees				MAJOR (earthworks and pathway)	**REMOVE**	• Remove and replace in accordance with landscaping

25	*Jacaranda mimosifolia*	Jacaranda	69	2.9	8.3	MAJOR (landscaping structures)	**RETAIN**	• Refer to Tree Protection Plan for specific requirements on paving and landscaping. • Tree Protection Fencing to be erected before works commence. • For any replacement of the fence, low pressure water excavation is to be utilised for the piers and directly supervised by the Project Arborist (AQF Level 5). • Permeable paver or similar to be utilised. • Project Arborist (AQF level 5) to supervise works within the NRZ. • All required PSO-ARB permissions to be in place before works commence.
26	*Eucalyptus tereticornis*	Forest Red Gum	35	2.3	4.2	NIL	**RETAIN**	• Tree Protection Fencing to be erected before works commence.
27	*Eucalyptus grandis*	Flooded Gum	65	2.9	7.8	NIL	**RETAIN**	• Tree Protection Fencing to be erected before works commence.
28	*Xanthostemon chrysanthus*	Golden Penda	21	1.9	2.6	NIL	**RETAIN**	• Tree Protection Fencing to be erected before works commence.
29	*Xanthostemon chrysanthus*	Golden Penda	17	1.8	2.1	NIL	**RETAIN**	• Tree Protection Fencing to be erected before works commence.
30	*Xanthostemon chrysanthus*	Golden Penda	11	1.5	2.0	NIL	**RETAIN**	• Tree Protection Fencing to be erected before works commence.
31	*Syagrus romanzoffiana*	Queen Palm	23	1.9	2.8	NIL	**RETAIN**	• Tree Protection Fencing to be erected before works commence.

32	*Syagrus romanzoffiana*	Queen Palm	25	2.0	3.0	NIL	**RETAIN**	• Tree Protection Fencing to be erected before works commence.
33	*Syagrus romanzoffiana*	Queen Palm	24	2.0	2.9	NIL	**RETAIN**	• Tree Protection Fencing to be erected before works commence.
34	*Syagrus romanzoffiana*	Queen Palm	21	1.9	2.5	NIL	**RETAIN**	• Tree Protection Fencing to be erected before works commence.
35	*Syagrus romanzoffiana*	Queen Palm	27	2.1	3.2	NIL	**RETAIN**	• Tree Protection Fencing to be erected before works commence.
36	*Syagrus romanzoffiana*	Queen Palm	26	2.1	3.1	NIL	**RETAIN**	• Tree Protection Fencing to be erected before works commence.
37	*Elaeocarpus grandis*	Blue Quandong	67	2.9	8.0	MAJOR (DEEP PLANTING)	**RETAIN**	• Tree Protection Fencing to be erected before works commence. • Manual installation of vegetation (ie no machinery) • Landscape certified organic soil and aged mulch is to be utilised only.
38	*Araucaria bidwillii*	Bunya Bunya Pine	37	2.3	4.4	MAJOR (DEEP PLANTING)	**RETAIN**	• Tree Protection Fencing to be erected before works commence. • Manual installation of vegetation (ie no machinery) • Landscape certified organic soil and aged mulch is to be utilised only.
39	*Syagrus romanzoffiana*	Queen Palm	27	2.1	3.2	NIL	**RETAIN**	• Tree Protection Fencing to be erected before works commence.

40	*Ficus microcarpa var. hillii*	Hill's Weeping Fig	50	2.6	6.0	MINOR	**RETAIN**	• Tree Protection Fencing to be erected before works commence.
41	*Various spp.*	Group of Palms				**Refer adjoining development A006885806**		
42	*Ficus sp.*	Fig	17	1.8	2.0	**Refer adjoining development A006885806**		
43	*Bauhinia variegata*	Orchid Tree	18	1.8	2.2	**Refer adjoining development A006885806**		
44	*Bauhinia variegata*	Orchid Tree	65	2.9	7.8	**Refer adjoining development A006885806**		

Plan


TOWER 1
STAGE 3
TOWER 2
STAGE 2
TOWER 3
STAGE 1
IMPORTANT NOTES
1. EXISTING CONTAMINATION SOIL CELLS HAVE BEEN IDENTIFIED IN THIS ZONE. THE CONTRACTOR SHALL IDENTIFY LOCATIONS AND EXTENTS PRIOR TO EXCAVATION.
BEL -0.55
BEL 0.45
BEL -3.05
BEL -2.05
BEL -0.93
BEL -0.55
BEL 0.45
BEL 0.64
BEL -0.55
BEL 0.45
MONTAGUE ROAD
STAGE 3 PILED RETENTION
STAGE 2 PILED RETENTION
STAGE 1 DIAWALL RETENTION
IMPORTANT NOTES
1. EXISTING CONTAMINATION SOIL CELLS HAVE BEEN IDENTIFIED IN THIS ZONE. THE CONTRACTOR SHALL IDENTIFY LOCATIONS AND EXTENTS PRIOR TO EXCAVATION.
GEND
EXISTING SITE BOUNDARY
EXISTING BUILDING
EXISTING CONTOURS MAJOR
EXISTING CONTOURS MINOR
EXISTING STORMWATER PIPE
EXISTING STORMWATER MAINTENANCE HOLE
EXISTING SEWER MAIN
EXISTING WATER MAIN
EXISTING GAS MAIN
EXISTING TELSTRA CABLE
EXISTING ELECTRICITY LINE
PROPOSED BULK EARTHWORKS PAD OUTLINE
PROPOSED BASEMENT EXTENT
PROPOSED BULK EARTHWORKS BATTER
BEL 00.00
PROPOSED BULK EARTHWORKS PAD LEVEL
CUT / FILL DEPTH
DEPTH COLOUR
LOWER DEPTH
UPPER DEPTH
-11.0m
-9.0m
-9.0m
-7.0m
-7.0m
-5.0m
-5.0m
-3.0m
-3.0m
0.0m
SCALE 1:400
4 0 4 8 12 16m
RobertBirdGroup
DO NOT SCALE DRAWINGS, USE FIGURED DIMENSIONS REFER TO GENERAL NOTES UNLESS NOTED OTHERWISE
BULK EARTHWORKS LAYOUT PLAN
Ebb & Flow
NOT FOR CONSTRUCTION
25478-RBG-ZZ-XX-DR-CV-82001
P03

Photos



Tree 1



Tree 2



Tree 3



Tree 4



Tree 5



Tree 6



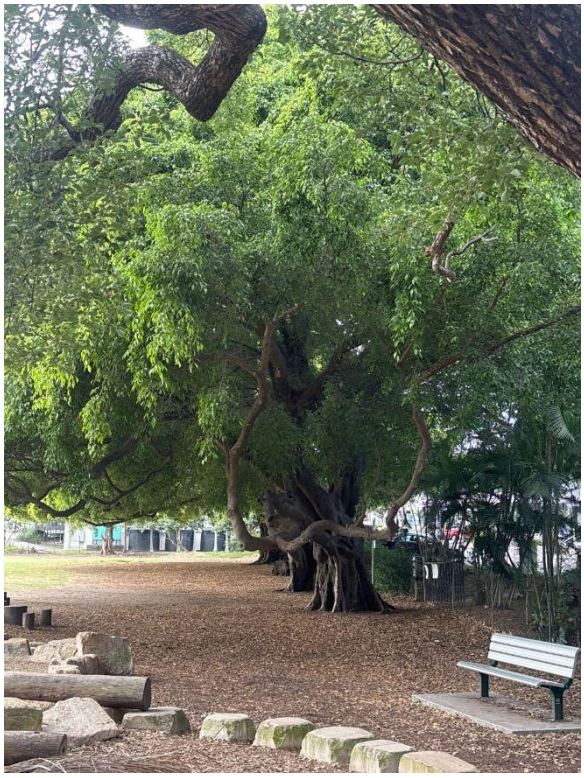
Tree 7



Tree 8



Tree 9



Tree 10



Tree 11



Tree 12



Tree 13



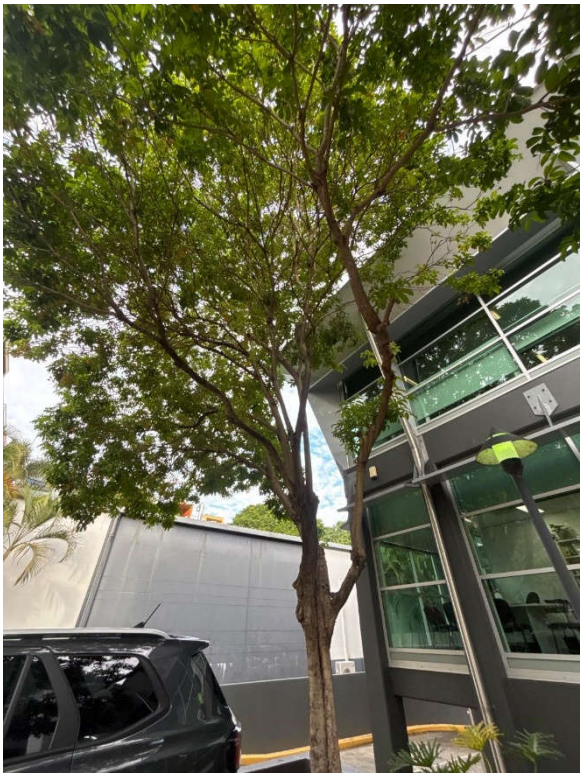
Tree 14



Tree 15



Tree 16



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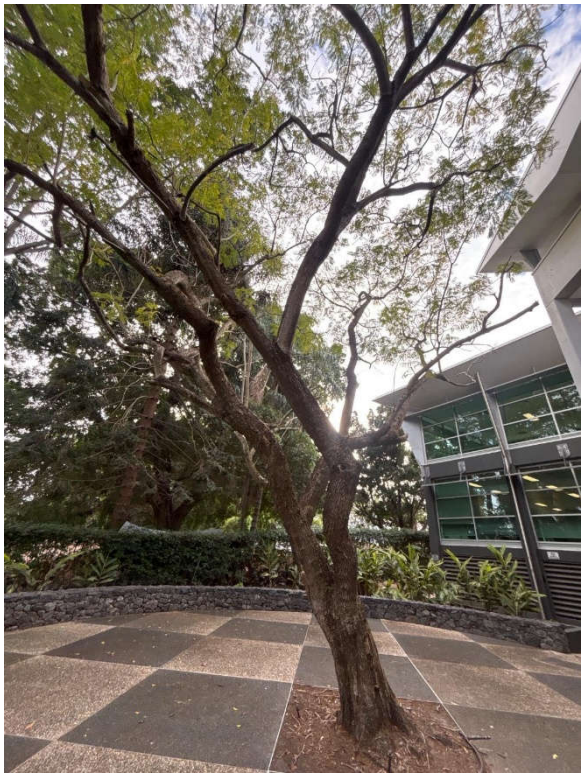
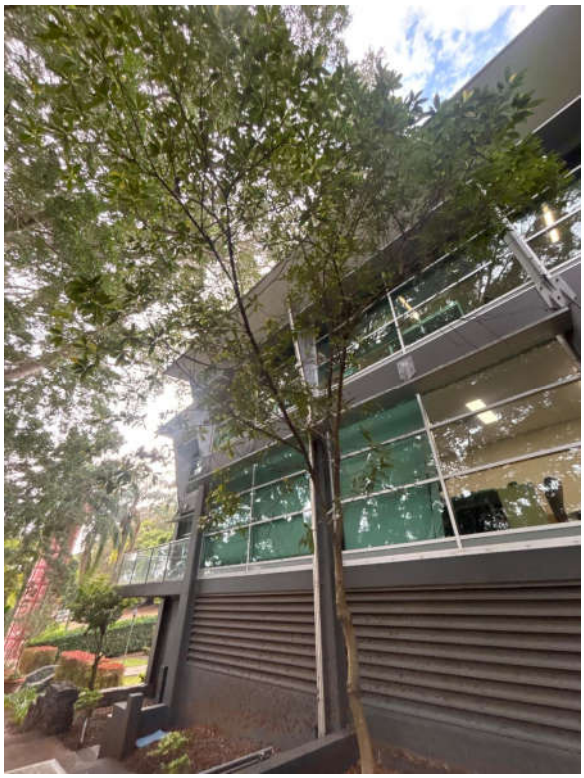


Tree 18



Tree 19



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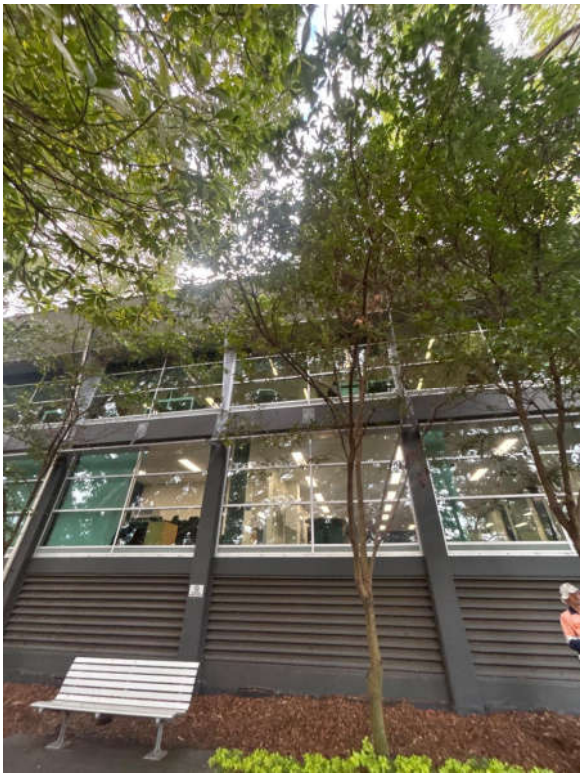
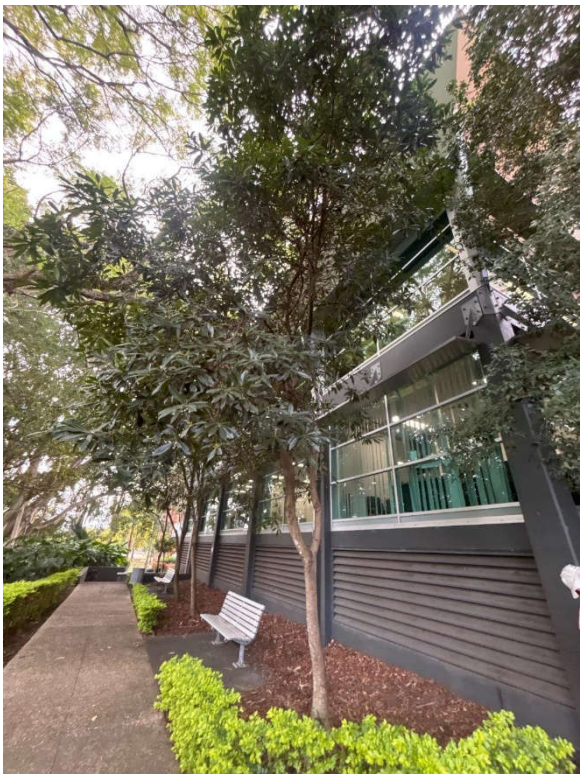


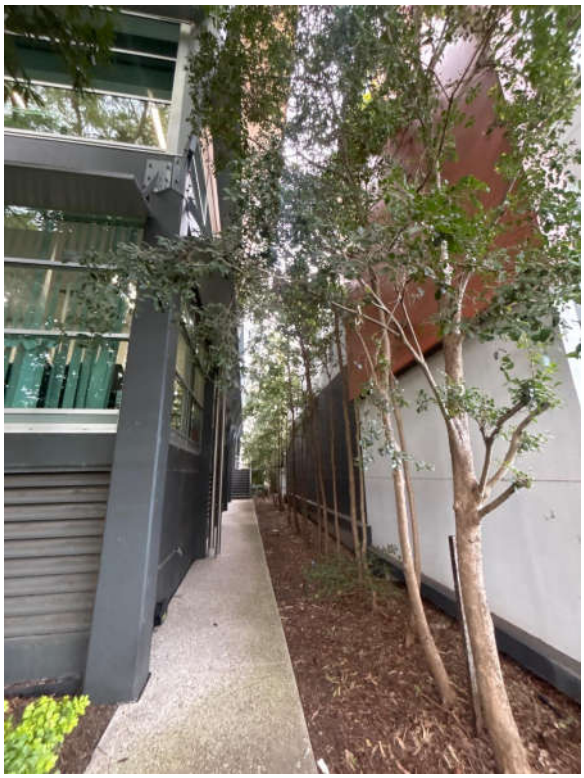
Tree 21



Tree 22



Tree 23



Tree 24



Tree 25



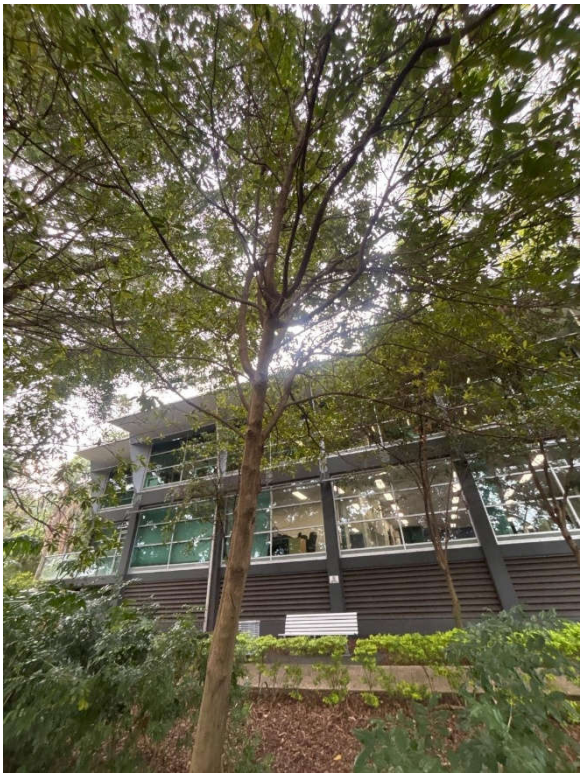
Tree 26



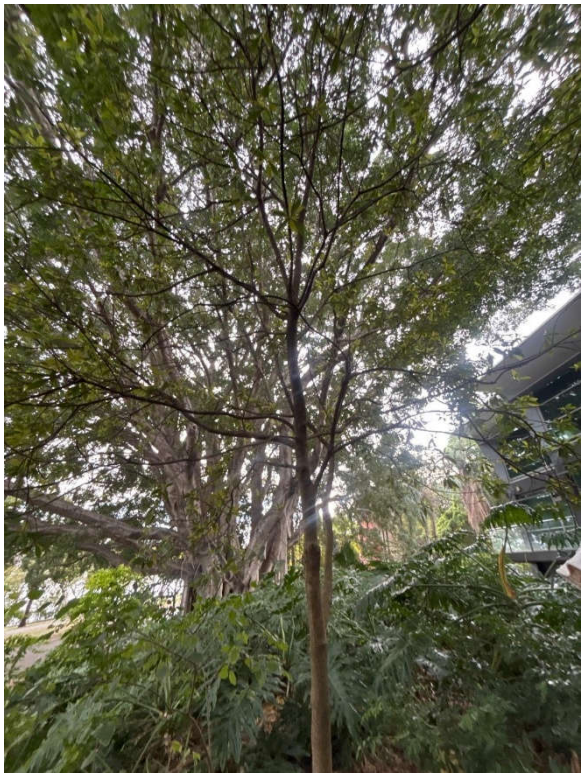
Tree 27



Tree 28



Tree 29



Tree 30



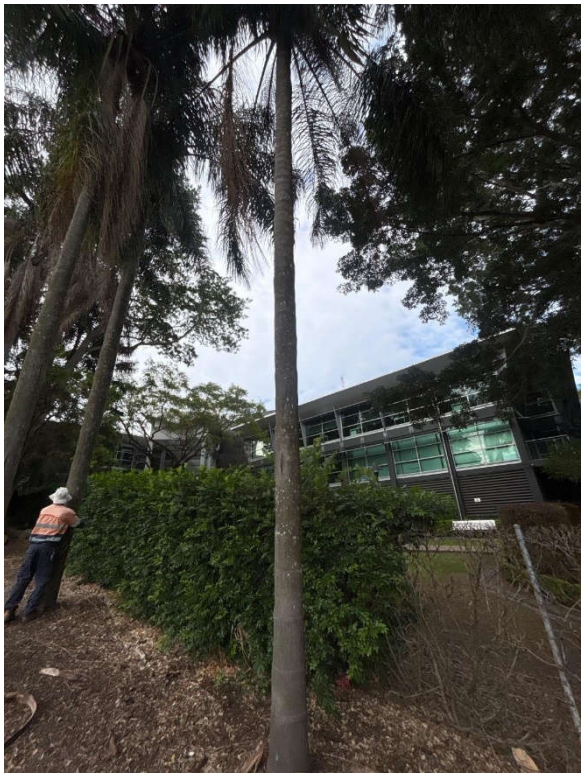
Tree 31



Tree 32



Tree 33



Tree 34



Tree 35



Tree 36



Tree 37



Tree 38



Tree 39



Tree 40



Tree 41



Tree 42

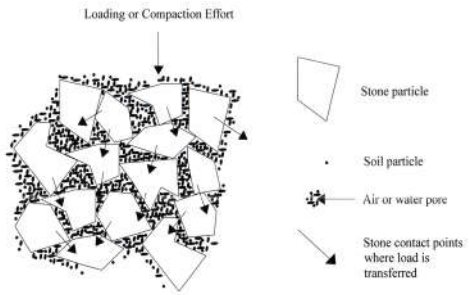


Tree 43



Tree 44

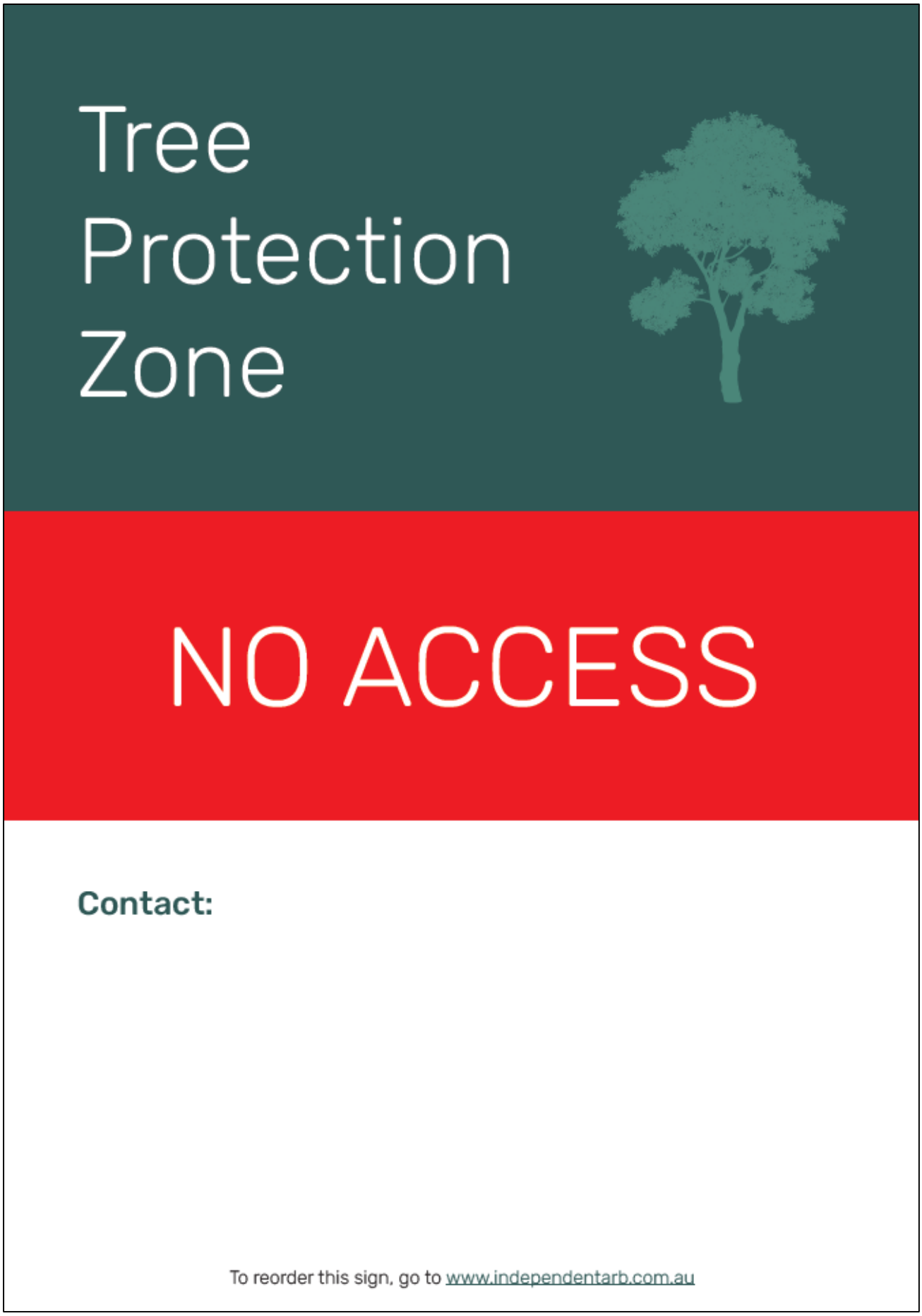
Appendix 1: Examples of Protection Measures

Examples	Photos
The use low pressure water excavation for the installation of conduits	 
The use of black plastic to line pier holes	
The use of black plastic to line concrete	 
The use of Structural Soil. Structural Soils – (*Source: Cornell University*)	  

Appendix 2: Tree Management Plan (TMP) – Works Progress: Development Phase

Stage	Tasks	Specific Outcomes
Pre-construction Phase		
Prepare and finalise Arboricultural Impact Assessments (AIA) for submission to Council	Project Arborist to be appointed. Review tree details in all approved arboricultural reports following any new issue of plans.	Submit arboricultural reports, including Arboricultural Impact Assessment for final Council approval.
Project Arborist to conduct Prestart Meeting with all representatives involved in construction	Prior to meeting: TPZ temporary protection/fencing installed **Arboricultural Report, TPP (including TPS) & Council approval copies to be included in Construction Management Plan (CMP)** and made available to onsite crews.	Prestart Certification and approvals in place & available onsite with Construction Management Plan (CMP).
Commencement - Construction Phase		
Initial Site Preparation	Project Arborist to supervise all tree work. **Construction crew or others are not to remove any part of a tree** prior to arborist prestart site inspection.	Compliance Certification of arboricultural works for lodgement to Council. Arborist certification of TPZ measures.
Prestart Toolbox Meeting	All relevant onsite crews to be briefed by Project Arborist prior to commencement of each work phase. Project Arborist must be notified and onsite at all times when construction works are within or close to NRZ. Note: Onsite attendance of Project Arborist is a condition for issue of Arboricultural Site Audit Statement/s.	Arborist Site Audit Reporting system to be in place. Copies of Arboricultural report to be retained onsite. Arboricultural Site Audit Statement/s will not be issued retrospectively.
Construction Phase		
Site Establishment	Project Arborist to monitor tree health during establishment phase, including bulk earthworks, changes in hydrology etc.	Initiate remedial tree care measures, if required.
Construction work	Site Manager to liaise with and ensure Project Arborist is advised in time, to allow them to be present for all work carried out within NRZ area including any work likely to affect identified tree/s. Any deviation/s from approved plans is to be approved by Project Arborist. **Project Arborist to provide ongoing Site Audit Certification of all work within NRZ.**	Any remedial tree works to be carried out by qualified arborists under supervision of the Project Arborist. Project Arborist is responsible for issue of Arborist Site Audit Reports.
Practical Completion	Project Arborist to carry out review of tree health and vigour and TPZ fencing.	On Project Arborist approval, carry out removal of remaining temporary tree protection measures.
Post Construction Phase		
Final Arborist inspection	Carry out tree health review and provide recommendations for required tree care.	Issue of final Arborist Site Audit Compliance Statement for inclusion in final DA documentation and sealing.

Appendix 3: Tree Protection Signage



Appendix 4: Explanation of Terminology

Definition	Process Description
Removal	Complete tree removal leaving stump as close as possible to ground level. Recommended process will include chipping of all foliage limbs and timber and reinstatement of work site. Recommendation typically based on tree being assessed as representing a health and safety concern [dead, dying, structurally unsound, unstable, poor form].
Remove and Grind	Complete tree removal to include grinding of stump to a depth of 75 millimetres, unless otherwise specified. Recommended process will include chipping of all foliage limbs and timber and reinstatement of work site. Stump site will be cleaned of all grinding debris and sawdust and backfilled with premium topsoil free from weeds.
Crown Clean (Deadwood)	Removal of all major/significant deadwood and dead branches up to [and including] 30 millimetres in diameter in trees overhanging pedestrian or vehicular areas or removal of dead branches > 50mm diameter in canopy of trees located in parkland or similar area unless otherwise specified.
Crown Clean (General pruning)	Recommended pruning process will include removal of broken, crossing, rubbing, diseased, stressed or dying branches or limbs with poor attachment. Additional work process may include pruning to define leaders, balance the crown, reduce weight load, or clear the tree from obstructions. In summary, to rectify, as far as is possible, any structural defects and eliminate undesirable growth or deadwood.
Crown Reduction (Canopy reduction)	Recommended pruning process may include light and general pruning typically to encompass removal of up to 15% but no more than 20% of the leaf-bearing crown. By definition the unique shape and form of the tree will not be altered or compromised by the pruning process. Typically, the consulting arborist will nominate the reduction percentage [%] appropriate to species, condition and assessment.
Crown Raising (Canopy lift)	Pruning processes maybe involve the raising of the tree's lower canopy to a height specified in metres. Typically, the process is performed to provide for pedestrian and or vehicular clearance and unless otherwise specified the default parameters will be to provide 2 metres clearance from ground level or as specified by Local or State Government regulation. From time to time pruning requirements may be altered to accommodate various site-specific requirements as advised by the consulting arborist.
Crown Restoration	Pruning process will encompass crown restoration and remedial works where the tree has been previously lopped or otherwise damaged. Crown restoration is not feasible when a tree has extensive decay and should only be considered when there is evidence of healthy regrowth. When performed correctly the process of remedial pruning will most likely take several years to complete.
Hanger Limb / Unattached Branch	Pruning process may be restricted to the removal of any hanger/s or dangerous/dead/dying limbs and will typically involve the removal of a single limb. In some instances, removal of an individual limb may be necessary to accommodate an obstruction and the consulting arborist will advise accordingly.
Directional Pruning	Pruning process will be restricted to pruning canopy away from buildings/service wires/property boundary and will typically be performed to avoid future growth in these areas. Where appropriate, future growth will be directed away from any obstacles through select pruning, to encourage the development of the growth of new leaders.
Habitat Pruning	When pruning deadwood from trees, simple techniques and methods can be employed to achieve hazard reduction whilst leaving food and habitat for tree dwelling fauna. Long pieces of deadwood can be reduced in length to limit potential hazard but still retain food for the insects and microorganisms. Stubs that have been left by old pruning or

	previous branch failure can be retained, and with the use of a hole-saw or chainsaw they may also be bored out to create a nesting hollow for native birds or small mammals. *Source: Mosman Council*
Deadwood	Deadwood is a naturally occurring feature of most tree species and comprises dead or decaying branches within the canopy of a tree. Deadwood may have habitat value and require removal only when target and occupancy risk is unacceptable i.e. high use pedestrian area or damage to adjacent infrastructure.
Decay	The biological process of degradation of woody tissues by micro-organisms.
Compaction	Results from loads or stress forces applied to the soil as well as shear forces. Both foot traffic and vehicle traffic exert both forces on soils. Vehicle traffic may cause significant compaction at depths of 150–200 mm (the area in which most absorbing roots are located). The degree of compaction will depend on weight of vehicles, number of movements, soil moisture levels and clay content. Soil handling, stockpiling and transporting also tend to lead to the breakdown of soil structure and create compaction. Vibration resulting from frequent traffic or adjacent construction activities may also compact soil.
Co-dominant Structure	Stems or trunks on or about the same size and originating from the same position of the main stem. When the stem bark ridge turns upward the union is strong; when the ridge turns inward the union is weak, a likely point of failure in storm or windy weather conditions, or where increased load causes undue stress on the defective union.

Source: AS4373-2007 *Pruning of Amenity Trees &* AS 4970-2025 *Protection of Trees on Development Sites.*

Appendix 5: Normal Function of a Tree

Background Note: The following diagrams and explanatory notes are useful to illustrate the structure of a tree in a normal growing environment. This information is taken from AS4970-2025 *Protection of Trees on Development Sites* which has been released subsequently to AS4373-2007 *Pruning of Amenity Trees.*

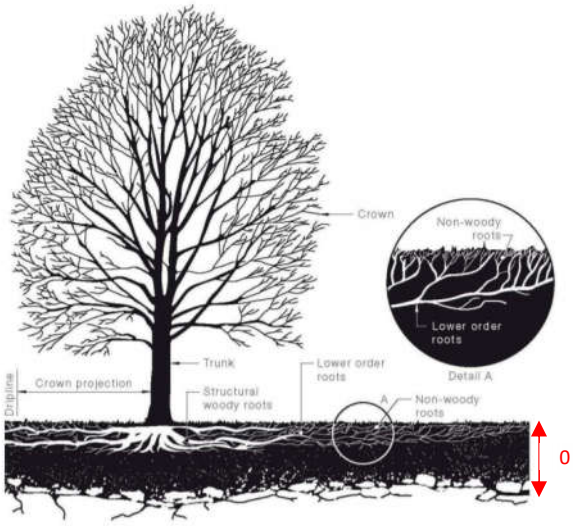


Figure 2: Structure of a tree in a normal growing environment

Leaves
The main function of leaves is photosynthesis, that is, the production of sugars. The sugars produced by the leaves (and any other green tissue) are the source of chemical energy for all living cells in the entire plant and as such are essential for the normal functioning and survival of the tree. Anything that directly or indirectly damages the leaves will interfere with photosynthesis.

Trunks and branches
Branches and trunks are composed of many tissues with specialized functions including the bark (protection), phloem (transport of sugars from the leaves), vascular cambium (growth of new transport tissues), sapwood (transport of water and nutrients from the roots), heartwood (strength and structural support) and rays (internal transport and storage of sugars). Damage to branches or trunks may allow infection by plant pathogens (disease causing organisms), disrupt the movement of vital materials and structurally weaken the tree.

Roots
The main functions of roots include the uptake of water and nutrients, anchorage, storage of sugar reserves and the production of some plant hormones required by the shoots. For roots to function, they must be supplied with oxygen from the soil. The root system of trees consists of several 'types' of roots found in different parts of the soil and is generally much more extensive than commonly thought. The importance of roots is easily overlooked because they are not visible, that is 'out of sight, out of mind'. Damage to the root system is a common cause of tree decline and death and is the most common form of damage associated with development sites.

Root systems consist of three main parts:

1. The structural woody roots (anchorage, storage and transport);
2. Lower order roots (anchorage, storage and transport); and
3. Non-woody roots (absorption of water and nutrients, extension, synthesis of amino acids and growth regulators) (see Figure).

In addition to lateral root spread being underestimated, root depth in trees has also been grossly exaggerated. Deep root systems or taproots are the exception rather than the rule. Most roots of most trees are found in the very top of the soil. The vast majority of these roots are small non-woody absorbing roots which grow upward into the very surface layers of the soil and leaf litter. This delicate, non-woody system, because of its proximity to the surface, is very vulnerable to injury."

Explanatory Note: The importance of gas exchange in soils

The fact that tree roots require oxygen to function is often misunderstood. Accessibility to available oxygen and water within the soil structure is dependent on the integrity of soil structure within their surrounds; when soils are compacted there is little space between soil aggregates with soil volume and total pore space, especially macropore space diminished. In turn, good soil oxygenation and gas exchange (Lonsdale) levels allow for successful function of tree roots. Oxygen levels in soils will typically decrease as soil depth increases and /or soils are heavily compacted.

Macropore is the term used to describe the relatively large space between soil particles that is usually air filled and allows for water movement and root penetration. Micropore is the term used to describe the space between soil particles that is relatively small and likely to be water filled.

Compaction results from loads or stress forces applied to the soil as well as shear forces. When soil within the root zone of a plant, including a tree, is compacted through either pedestrian or vehicular traffic, or by the heavy weight of stored materials or machinery, the ability of water and oxygen to penetrate the soil around the roots of living plants is compromised. Whilst tree roots are typically found in the top 600mm of the soil horizon, vehicle traffic, in particular may cause significant compaction at depths of 150–200 mm (the area in which most absorbing roots are located). (Refer Tree Function Note above).

The degree of soil compaction will depend on weight of vehicles, number of movements, soil moisture levels and clay content. Soil handling, stockpiling and transporting also tend to lead to the breakdown of soil structure and thus to soil compaction. Vibration, as a result of frequent traffic or adjacent construction activities, will also cause compaction of soil.

Contrary to the commonly held myth that all trees have tap roots, tree roots are typically located within the top 600mm of soil. Just as leaves perform the vital function of photosynthesis, tree roots are vital for the primary functions of anchorage, storage, absorption and conduction. Larger tree roots fulfil the main functions of anchorage, storage and conduction and smaller more fibrous tree roots, which grow primarily at the end of the main woody roots, fulfil a vital role in absorbing oxygen, essential mineral elements and moisture from the soil, often through a symbiotic relationship with soil borne fungi referred to as Mycorrhizae; the extent of root loss has the potential to jeopardise any or all of these main functions and most importantly may compromise the structural integrity of an established tree and its associated potential OH&S risk of failure occurring; any OH&S risk of potential failure in a high use area such as public roads, is noteworthy for all the wrong reasons and should be of major concern and avoided at all times. (Refer Appendix 2, Tree Function Note).

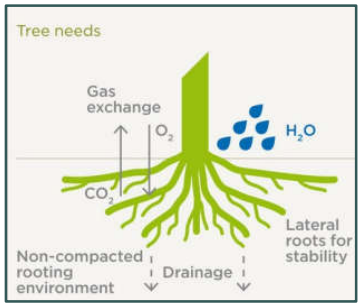


Figure 3: Gas exchange in woody tissues: the diffusion of gases into and out of a particular region (Jaluzot)

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Company Details

Independent Arboricultural Services

Independent Arboricultural Services, incorporated in May 2007, offers a completely independent arborist consulting and reporting service. Its directors and associated consultants bring extensive arboricultural knowledge gained over many years to this company. All consulting staff hold a minimum AQF Level 5 (Diploma of Arboriculture). Specialised advice when required, such as provision of survey mapping or engineering advice and certification is sourced from reputable professional providers according to site requirements as per AS 4970-2025 *Protection of Trees on Development Sites*.

Statement of Goal

To deliver continual improvement through the use of world's best arboricultural practices, supported by ongoing education and exposure to leading industry experts and research throughout the world.

Mission Statement

To provide timely, relevant and actionable consulting advice and practice based on the latest available and best scientific arboricultural knowledge.

Environmental Statement

Independent Arboricultural Services supports long term environmental sustainability sustainable sourced paper and ensuring all inks cartridges are recycled where possible.

Independent Arboricultural Services actively seeks to maintain a positive carbon footprint status and to that end is committed to protecting and preserving the environment, continuing to carry out tree planting, transplanting and replacement planting where practical, having planted in excess of 4000 trees in the first 2 years after its inception in May 2007 alone. Arboricultural recommendations, involving the removal of tree/s, will include replanting at a minimum ratio of 2 trees for any tree removed where possible. All arboricultural recommendations are made in accordance with world's best arboricultural practice and AS 4373-2007 *Pruning of Amenity Trees* and AS 4970-2025 *Protection of Trees on Development Sites* so as to ensure optimal outcomes for all living trees.

Independent Arboricultural Services acknowledges the benefits of healthy trees with good vigour and vitality and actively promotes better understanding in the general community of the contribution that trees make to reducing greenhouse gasses, the contribution of trees to better water retention, prevention of soil erosion, the ability of trees to provide protection to infrastructure by diffusing strong winds in weather events, and the contribution of trees to general liveability within the urban environment.

It is an acknowledged fact that air temperature beneath a tree canopy can be in excess of 7° Celsius lower than the surrounding ambient air temperature thereby reducing reliance on greenhouse gas producing air conditioners and coal fired power sources.