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Arboricultural Impact Assessment

Client Name: Paul Barrett
Site Address: 135 Seaforth Crescent, Seaforth NSW
Authors Details: Hugh Millington
Email: hugh@hughtheArborist.com.au
Phone: 0426 836 701

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1. INTRODUCTION

1.1 Hugh the Arborist have been instructed by Paul Barrett to provide an Arboricultural Impact Assessment Report for trees located on and adjoining the site in relation to a proposed development.

Table 1: Documents Provided for the Assessment

Title	Author	Date	Reference on document
Survey Plan	Usher and Company	5/10/2012	4575DET
Architectural Plans	Action Plans	1/12/2021	See Schedule Below

SHEET NUMBER	SHEET NAME	DATE PUBLISHED
DA00	COVER	1/12/2021
DA01	NOTATION	1/12/2021
DA02	SAFTEY NOTES	1/12/2021
DA03	SITE ANALYSIS	1/12/2021
DA04	SITE PLAN	1/12/2021
DA05	EXISTING LOWER FLOOR PLAN	1/12/2021
DA06	EXISTING LEVEL 1 & 2 PLAN	1/12/2021
DA07	EXISTING LEVEL 3 & 4 PLAN	1/12/2021
DA08	EXISTING LEVEL 5 PLAN	1/12/2021
DA09	EXISTING LEVEL 6 & ENTRY PLAN	1/12/2021
DA10	EXISTING CARPORT FLOOR PLAN	1/12/2021
DA11	EXISTING CARPORT ROOF PLAN	1/12/2021
DA12	PROPOSED LOWER FLOOR PLAN	1/12/2021
DA13	PROPOSED LEVEL 1 & 2 PLAN	1/12/2021
DA14	PROPOSED STORAGE FLOOR PLAN	1/12/2021
DA15	PROPOSED HARDSTAND FLOOR PLAN	1/12/2021
DA16	NORTH ELEVATION (HOUSE)	1/12/2021
DA17	SOUTH ELEVATION (HOUSE)	1/12/2021
DA18	WEST ELEVATION (HOUSE)	1/12/2021
DA19	LONG SECTION (HOUSE)	1/12/2021
DA20	NORTH ELEVATION (HARDSTAND)	1/12/2021
DA21	SOUTH ELEVATION (HARDSTAND)	1/12/2021
DA22	WEST ELEVATION (HARDSTAND)	1/12/2021
DA23	LONG SECTION (HARDSTAND)	1/12/2021
DA24	AREA CALCULATIONS	1/12/2021
DA25	WINTER SOLSTICE 9 AM	1/12/2021
DA26	WINTER SOLSTICE 12 PM	1/12/2021
DA27	WINTER SOLSTICE 3 PM	1/12/2021
DA28	BASIX COMMITMENTS	1/12/2021

1.2 The site and tree inspections were carried out on 16th March 2021. Access was available to the subject site and adjoining public areas only. No additional site inspection has been carried out as pare to this revision.

2. SCOPE OF THE REPORT

2.1 This report has been undertaken to meet the following objectives.

2.1.1 Conduct a visual assessment from ground level of all significant trees within 5 metres of proposed development works. For the purpose of this report a significant tree is a tree with a height equal to or greater than 5 metres in height.

2.1.2 Determine the trees estimated contribution years and remaining, useful life expectancy and award the trees a retention value.

2.1.3 Provide an assessment of the potential impact the proposed development is likely to cause to the condition of the subject trees in accordance with AS4970 Protection of trees on development sites (2009).

2.1.4 Provide pragmatic recommendations for the management of trees and mitigation of construction impacts on retained trees.

2.1.5 Specify tree protection measures for trees to be retained in accordance with AS 4970-2009.

3. LIMITATIONS

3.1 The observations and recommendations are based on the site inspections identified in section 1 only. The findings of this report are based on the observations and site conditions at the time of inspection.

3.2 All of the observations were carried out from ground level. The accuracy of the assessment of the subject trees structural condition and health is limited to the visibility of the tree at the time of inspection.

3.3 The tree inspections were visual from ground level only. No soil or tissue testing was carried out as part of the tree inspection. None of the surrounding surfaces adjacent to trees were lifted or removed during the tree inspections.

3.4 Root decay can sometimes be present with no visual indication above ground. It is also impossible to know the extent of any root damage caused by mechanical damage such as underground root cutting during the installation of services without undertaking detailed root investigation. Any form of tree failure due to these activities is beyond the scope of this assessment.

3.5 The report reflects the subject tree(s) as found on the day of inspection. Any changes to the growing environment of the subject tree, or tree management works beyond those recommended in this report may alter the findings of the report. There is no warranty, expressed or implied, that problems or deficiencies relating to the subject tree, or subject site may not arise in the future.

3.6 Tree identification is based on accessible visual characteristics at the time of inspection. As key identifying features are not always available the accuracy of identification is not guaranteed. Where tree species is unknown, it is indicated with a spp.

3.7 All diagrams, plans and photographs included in this report are visual aids only and are not to scale unless otherwise indicated.

3.8 Hugh The Arborist neither guarantees, nor is responsible for, the accuracy of information provided by others that is contained within this report.

3.9 While an assessment of the subject trees estimated useful life expectancy is included in this report, no specific tree risk assessment has been undertaken for any of trees at the site.

3.10 The ultimate safety of any tree cannot be categorically guaranteed. Even trees apparently free of defects can collapse or partially collapse in extreme weather conditions. Trees are dynamic, biological entities subject to changes in their environment, the presence of pathogens and the effects of ageing. These factors reinforce the need for regular inspections. It is generally accepted that hazards can only be identified from distinct defects or from other failure-prone characteristics of a tree or its locality.

3.11 Alteration of this report invalidates the entire report.

4. METHODOLOGY

4.1 The following information was collected during the assessment of the subject tree(s).

4.1.1 Tree common name

4.1.2 Tree botanical name

4.1.3 Tree age class

4.1.4 DBH (Trunk/Stem diameter at breast height/1.4m above ground level) - millimetres.

4.1.5 Estimated height - metres

4.1.6 Estimated crown spread (Radius of crown) - metres.

4.1.7 Health

4.1.8 Structural condition

4.1.9 Amenity value

4.1.10 Estimated remaining contribution years (SULE)[1]

4.1.11 Retention value (Tree AZ)[2]

4.1.12 Notes/comments

4.2 An assessment of the trees condition was made using the visual tree assessment (VTA) model (Mattheck & Breloer, 1994).[3]

4.3 Tree diameter was measured using a DBH tape or in some cases estimated. All other measurements were estimations unless otherwise stated. The other tools I used during the assessment were a digital camera, Japanese made 170mm blade digging knife and a Leica DistoD410 digital laser tape.

4.4 All DBH measurements, tree protection zones, and structural root zones were calculated in accordance with methods set out in AS4970 Protection of trees on development sites (2009). See appendices for more information.

4.5 Details of how the observations in this report have been assessed are listed in the appendices.

5. SITE LOCATION & BRIEF DESCRIPTION OF DEVELOPMENT WORKS ASSESSED

5.1 The site is located in the suburb of Seaforth, New South Wales, which is located in the Northern Beaches Council area. All trees at the site are subject to protection under the following policy and legislation.

5.1.1 Warringah Local Environmental Plan (LEP) 2011

5.1.2 Warringah Development Control Plan (DCP) 2011

5.1.1 State Environmental Planning Policy (Vegetation in Non-Rural Areas 2017)

[1] Barrell Tree Consultancy, *SULE: Its use and status into the New Millennium*, TreeAZ/03/2001, http://www.treeaz.com/.

[2] Barrell Tree Consultancy, *Tree AZ version 10.10-ANZ*, http://www.treeaz.com/.

[3] Mattheck, C. & Breloer, H., *The body language of trees - A handbook for failure analysis*, The Stationary Office, London, England (1994).

Image 1: Site Location [4]

[4] https://www.google.com/maps/place/135+Seaforth+Cres,+Seaforth+NSW+2092

5.2 The subject site is not located inside an area containing heritage conservation or subject to any heritage listing.[5]

5.3 The subject site is orientated west (waterside) to east (road side). The site falls significantly from east to west.

5.4 The proposal includes the reconfiguration of the existing driveway and parking arrangements to include a raised parking area and storage below.

6. OBSERVATIONS AND GENERAL INFORMATION IN RELATION TO PROTECTING TREES ON DEVELOPMENT SITES

6.1 **Tree information**: Details of each individual tree assessed, including the observations taken during the site inspection, can be found in the tree inspection schedule in appendix 2, where the indicative tree protection zone (TPZ) and Structural Root Zone (SRZ) has been calculated for each of the subject trees. The TPZ and SRZ should be measured in radius from the centre of the trunk. Each of the subject trees have been awarded a retention value based on the observations using the Tree AZ method. Tree AZ is used to identify higher value trees worthy of being a constraint to development and lower value trees that should generally not be a constraint to the development. The Tree AZ categories sheet (Barrell Tree Consultancy) has been included in appendix 3 to assist with understanding the retention values. The retention value that has been allocated to the subject trees in this report is not definitive and should only be used as a guideline.

6.2 **Site Plan:** In appendix 1 three site plans have been prepared, where the tree information including canopy spread, TPZ and SRZ have been overlaid onto the site plans. The following plans are included in appendix 1.

- Appendix 1: Existing Site Plan
- Appendix 1A: Proposed Site Plan and Tree Protection Plan

[5] https://services.northernbeaches.nsw.gov.au/icongis/index.html

6.3 **Tree protection zone (TPZ):** The TPZ is the principle means of protecting trees on development sites and is an area required to maintain the viability of trees during development. It is commonly observed that tree roots will extend significantly further than the indicative TPZ, however the TPZ is an area identified in AS4970-2009 to be the area where root loss or disturbance will generally impact the viability of the tree. The TPZ is identified as a restricted area to prevent damage to trees either above or below ground during a development. Where trees are intended to be retained proposed developments must provide an adequate TPZ around trees. The TPZ is set aside for the tree's root zone, trunk and crown and it is essential for the stability and longevity of the tree. The TPZ also incorporates the SRZ (see below for more information about the SRZ). The TPZ is calculated by multiplying the DBH by twelve, with the exception of palms, other monocots, cycads and tree ferns, the TPZ of which have been calculated at one metre outside the crown projection.

6.4 **Structural Root Zone (SRZ):** This is the area around the base of a tree required for the tree's stability in the ground. An area larger than the SRZ always needs to be maintained to preserve a viable tree. The SRZ is calculated using the following formula: $(DAB \times 50)^{0.42} \times 0.64$. There are several factors that can vary the SRZ which include height, crown area, soil type and soil moisture. It can also be influenced by other factors such as natural or built structures. Generally, work within the SRZ should be avoided. Soil level changes should also generally be avoided inside the SRZ of trees to be retained. Palms, other monocots, cycads and tree ferns do not have an SRZ. See the appendices for more information about the SRZ.

6.5 **Minor encroachment into TPZ:** Sometimes encroachment into the TPZ is unavoidable. Encroachment includes but is not limited to activities such as excavation, compacted fill and machine trenching. Minor encroachment of up to 10% of the overall TPZ area is normally considered acceptable, providing there is space adjacent to the TPZ for the tree to compensate and the tree is displaying adequate vigour/health to tolerate changes to its growing environment.

6.6 **Major encroachment into TPZ:** Where encroachment of more than 10% of the overall TPZ area is proposed the project Arborist must investigate and demonstrate that the tree will remain in a viable condition. In some cases, tree sensitive construction methods such as pier and beam footings, suspended slabs, or cantilevered sections, can be utilised to allow additional encroachment into the TPZ by bridging over roots and minimising root disturbance. Major encroachment is only possible if it can be undertaken without severing significant size roots, or if it can be demonstrated that significant roots will not be impacted. Root investigations may be required to identify roots that will be impacted during major TPZ encroachment.

7. ASSESSMENT OF CONSTRUCTION IMPACTS

7.1 **Table 2:** In the table below the impact of the proposed development has been assessed.

Tree ID	Species	Retention value	TPZ radius (m)	SRZ radius (m)	TPZ encroachment	Discussion/ Conclusion	Recommendation
1	Sydney Red Gum *(Angophora costata)*	A2	11.4	3.3	Major	Tree 1 is surrounded by the existing driveway and its TPZ area is composed of close to 100% hard surfaces. The proposed works involve the construction of a raised tandem hardstand to extend over the existing hard surface. The hard surfacing below is proposed to be retained and converted into a storage area. The proposed works occupy up to 14% of the Tree Protection Zone and the Structural Root Zone of the tree which is a major encroachment under AS4970 Protection of Trees on Development Sites (2009). The proposed hardstand will be raised over the existing hardstand which will require the installation of piers either on or through the existing reenforced concrete driveway below. This significantly reduces the level of encroachment to only the pier locations which can allow the retention of major tree roots providing the pier locations can be flexible to allow the relocation of a pier in the event a major tree root is located. The proposed layback, according to the section plan provided is entirely suspended from the hard surfacing on the public road to the edge of the boundary and proposed structure. The edge of the proposed hardstand has been modified to allow a minimum 400 millimeters setback from the trunk of the tree. It will also be required for no critical support structures (such as a pier) to be located within one meter of the closest edge of the trunk to allow for concrete cutting in the event more space is required in the future. Due to the suspended crossover having minimal footings, it is likely one pier will need to be located in the eastern side of the Structural Root Zone of the tree. Severance of major tree roots in the SRZ has the potential to cause the tree to decline or become unstable so it must be demonstrated the specifications in section 8.2 can be achieved if the tree is to be retained in a viable condition.	Remove

Tree ID	Species	Retention value	TPZ radius (m)	SRZ radius (m)	TPZ encroachment	Discussion/ Conclusion	Recommendation
2	*Jacaranda mimosifolia*	Z3	3.6	2.1	None	Tree located on a neighboring site. The base of the tree is situated several metres below the proposed works and the canopy is separated by a hardstand. No encroachment or impact is anticipated.	Retain and protect
3	Broad Leaf Paperbark *(Melaleuca quinquenervia)*	A2	6	2.7	Minor	The base of the tree is located several metres below the proposed works and no TPZ encroachment is proposed. Minor canopy pruning may be required to facilitate the structure. The pruning is considered to be minor in nature and will require the removal of one 60 millimeters second order branch. The pruning will equate to less than 10% of the live canopy and will not detract from the tree's health or amenity value.	Retain and protect
4	Cheese Tree *(Glochidion ferdinandi)*	A2	2.8	1.7	None	The base of the tree is situated several metres below the proposed works. No encroachment or impact is anticipated.	Retain and protect

8. CONCLUSIONS

8.1 **Table 3:** Summary of the impact to trees during the development.

Impact	Reason	Category A	Category Z
		A	Z
Trees to be removed	Building/landscape construction, new surfacing and/or proximity, condition or re-landscaping	None	None
Trees to be retained that will be subject to development impact	Removal of existing surfacing/structures and/or installation of new surfacing/structures that may impact the tree	1 One Tree	None
Trees to be retained that will not be subject to TPZ encroachment	Removal of existing surfacing/structures and/or installation of new surfacing/structures will not impact the tree	3,4 Two Trees	2 One Tree

8.2 **Tree Sensitive Construction Specification:** The proposed raised tandem hardstand has the potential to impact the health and stability of Tree 1. To ensure that trees identified for retention are not adversely impacted by the construction, it must be demonstrated the following design and construction specifications can be implemented within the TPZ of the trees. If the construction cannot be completed in accordance with these specifications, the trees may not be viable for retention.

8.2.1 **The proposed layback** from the public road to the western edge of the proposed structure is to be suspended above grade to avoid the Structural Root Zone.

8.2.2 **Tree Sensitive Pier Construction Method:** To ensure Tree 1 is not adversely impacted by the construction, it must be demonstrated the following design and construction specification can be implemented. If the construction cannot be completed in accordance with these specifications, the tree may not be viable for retention. To minimise root loss in the TPZ of the trees, all pier footings for the proposed driveway extension must be located to avoid significant roots. To ensure that significant tree roots are not impacted, it must be demonstrated by the project engineer that the following construction methods can be implemented.

- All excavations for piers must be carried out manually under the supervision of the project Arborist (see section 11 for details of manual excavation and project Arborist). Noting the concrete and reinforcement will require some mechanical assistance.
- The location of piers must be flexible to avoid significant roots (roots greater than 40mm in diameter). All roots greater than 40mm in diameter must be retained unless the project arborist has assessed and approved in writing that severing the root will not impact the condition or stability of the tree.
- The piers should be located a minimum of 200mm from any root to be retained that is greater than 40mm in diameter.

8.2.3 No new structures should be located within 400 millimetres of the closest edge of the tree (1) trunk. Piers and other critical components are recommended to be located a minimum one metre away from the closest edge of the trunk to allow for future modification in the event it is required.

9. PHOTOGRAPHS

Photo A: Tree 1 and existing driveway.

Photo B: Trees 3 and 4 below the proposed works requiring minimal protection.

Photo C: Tree 3 requires minor canopy pruning.

10. RECOMMENDATIONS

10.1 This report assesses the impact of a proposed development at the site to four trees.

10.2 One tree (T1) will be subject to development impact and will require sensitive design, implementation and project Arborist supervision for the installation. Specifications have been provided in section 8.2 of this report.

10.3 In addition to the specifications, it is recommended that the existing hardstand be cut away from the base of the tree at ground level to minimise the current conflict. This is to be carried out in direct supervision of the project Arborist to provide guidance on setbacks and the removal of concrete in direct contact with the tree.

10.4 The remaining three trees will also be retained and protected and will be subject to negligible impacts.

10.5 All trees must be protected in accordance with AS4970-2009 for the duration of the demolition and development works, see section 11 for more information.

10.6 No services plan has been assessed in this report, all services plans should be subject to review by a consulting Arborist. Where possible underground services should be located outside the TPZ of trees to be retained. All underground services located inside the TPZ of any tree to be retained must be installed via tree sensitive techniques in accordance with AS4970-2009, see section 10.11 for more information.

10.7 This report does not provide approval for tree removal or pruning works. All recommendations in this report are subject to approval by the relevant authorities and/or tree owners. This report should be submitted as supporting evidence with any tree removal/pruning or development application.

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11. ARBORICULTURAL WORK METHOD STATEMENT (AMS) AND TREE PROTECTION REQUIREMENTS

11.1 **Use of this report:** All contractors must be made aware of the tree protection requirements prior to commencing works at the site and be provided a copy of this report.

11.2 **Project Arborist:** Prior to any works commencing at the site a project Arborist should be appointed. The project Arborist should be qualified to a minimum AQF level 5 and/or equivalent qualifications and experience and should assist with any development issues relating to trees that may arise. If at any time it is not feasible to carryout works in accordance with this, an alternative must be agreed in writing with the project Arborist.

11.3 **Tree work:** All tree work must be carried out by a qualified and experienced Arborist with a minimum of AQF level 3 in arboriculture, in accordance with NSW Work Cover Code of Practice for the Amenity Tree Industry (1998) and AS4373 Pruning of amenity trees (2007).

11.4 **Initial site meeting/on-going regular inspections:** The project Arborist is to hold a pre-construction site meeting with principal contractor to discuss methods and importance of tree protection measures and resolve any issues in relation to tree protection that may arise. In accordance with AS4970-2009, the project Arborist should carryout regular site inspections to ensure works are carried out in accordance with this document throughout the development process. I recommend regular site inspections on a frequency based on the longevity of the project; this is to be agreed in the initial meeting.

11.5 **Site Specific Tree Protection Recommendations:**

Table 4: Protection Requirements: See appendix 1A for indicative fencing location.

Tree Number	Protection Specification
1	- Trunk and branch protection - Tree sensitive construction techniques and design in accordance with section 8.2 of this report
2 and 4	- Trees are sufficiently isolated from the works. No additional protection required.
3	- Small flexible branches to be tied back where encroaching into scaffolding. - One 60mm branch to be pruned and overseen by the Project Arborist.

11.6 **Tree protection Specifications:** It is the responsibility of the principal contractor to install tree protection prior to works commencing at the site (prior to demolition works) and to ensure that the tree protection remains in adequate condition for the duration of the development. The tree protection must not be moved without prior agreement of the project Arborist. The project Arborist must inspect that the tree protection has been installed in accordance with this document and AS4970-2009 prior to works commencing.

11.6.1 **Protective fencing:** Where it is not feasible to install fencing at the specified location due to factors such restricting access to areas of the site or for constructing new structures, an alternative location and protection specification must be agreed with the project Arborist. Where the installation of fencing in unfeasible due to restrictions on space, trunk and branch protection will be required (see below). The protective fencing must be constructed of 1.8 metre ‘cyclone chainmesh fence’. The fencing must only be removed for the landscaping phase and must be authorised by the project Arborist. Any modifications to the fencing locations must be approved by the project Arborist.

11.6.2 **TPZ signage:** Tree protection signage is to be attached to the protective fencing, displayed in a prominent position and the sign repeated at 10 metres intervals or closer where the fence changes direction. Each sign shall contain in a clearly legible form, the following information:

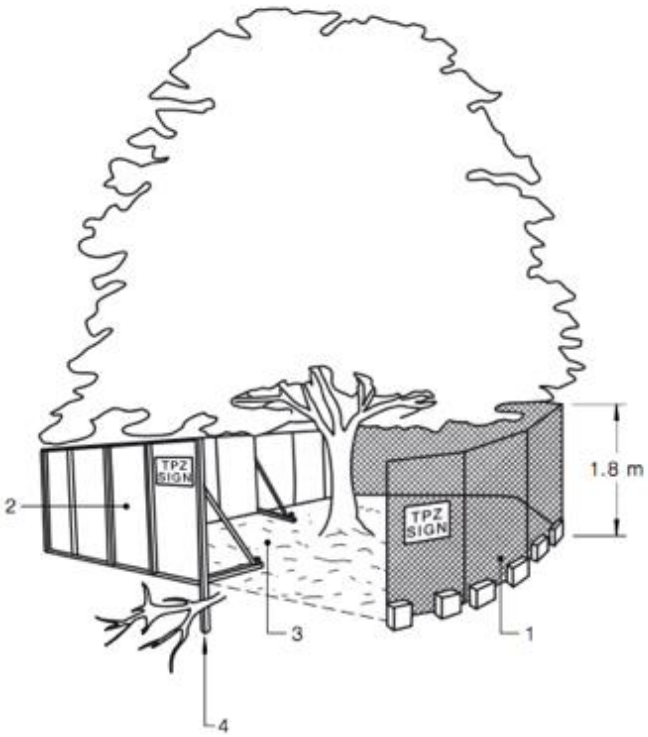
- Tree protection zone/No access.

- This fence has been installed to prevent damage to the tree/s and their growing environment both above and below ground. Do not move fencing or enter TPZ without the agreement of the project Arborist.
- The name, address, and telephone number of the developer/builder and project Arborist

11.6.3 **Trunk and Branch Protection:** The trunk must be protected by wrapped hessian or similar material to limit damage. Timber planks (50mm x 100mm or similar) should then be placed around tree trunk. The timber planks should be spaced at 100mm intervals and must be fixed against the trunk with tie wire or strapping and connections finished or covered to protect pedestrians from injury. The hessian and timber planks must not be fixed to the tree in any instance. The trunk and branch protection shall be installed prior to any work commencing on site and shall be maintained in good condition for the entire development period.

11.6.4 **Mulch:** Any areas of the TPZ located inside the subject site (only trees to be retained directly adjacent to site works) must be mulched to a depth of 75mm with good quality composted wood chip/leaf mulch.

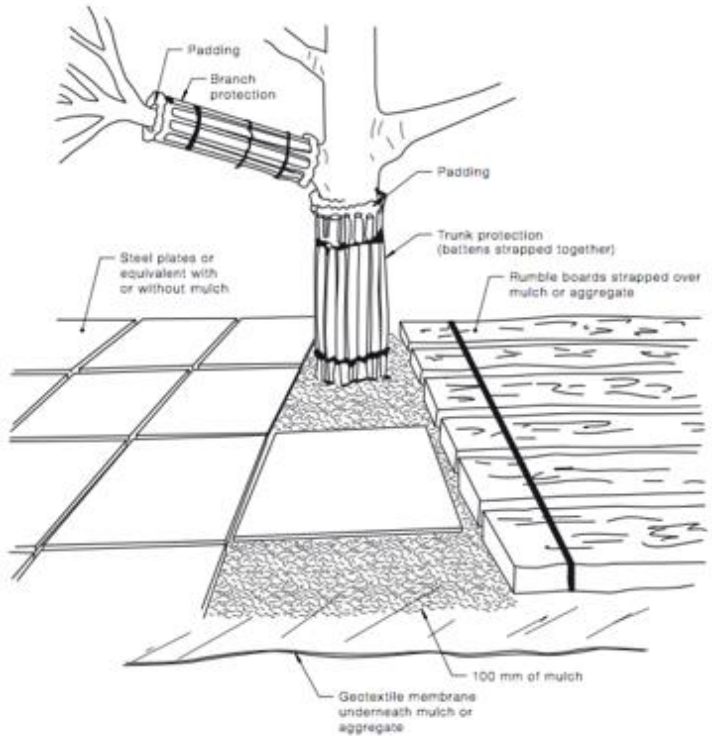
11.6.5 **Ground Protection:** Ground protection is required to protect the underlying soil structure and root system in areas where it is not practical to restrict access to whole TPZ, while allowing space for construction. Ground protection must consist of good quality composted wood chip/leaf mulch to a depth of between 150-300mm, laid on top of geo textile fabric, overlaid with durable timber boards/plywood. If vehicles are to be using the area, additional protection will be required such as rumble boards or track mats to spread the weight of the vehicle and avoid load points. Ground protection is to be specified by the project Arborist as required.



LEGEND:
1 Chain wire mesh panels with shade cloth (if required) attached, held in place with concrete feet.
2 Alternative plywood or wooden paling fence panels. This fencing material also prevents building materials or soil entering the TPZ.
3 Mulch installation across surface of TPZ (at the discretion of the project arborist). No excavation, construction activity, grade changes, surface treatment or storage of materials of any kind is permitted within the TPZ.
4 Bracing is permissible within the TPZ. Installation of supports should avoid damaging roots.

An image from AS4970-2009,[6] with example tree protection.

[6] Council of Standards Australia, *AS4970 Protection of trees on development sites* (2009), page 16.



NOTES:

1 For trunk and branch protection use boards and padding that will prevent damage to bark. Boards are to be strapped to trees, not nailed or screwed.

2 Rumble boards should be of a suitable thickness to prevent soil compaction and root damage.

An image from AS4970-2009,[7] with example tree protection.

11.7 **Restricted activities inside TPZ:** The following activities must be avoided inside the TPZ of all trees to be retained unless approved by the project Arborist. If at any time these activities cannot be avoided an alternative must be agreed in writing with the project Arborist to minimise the impact to the tree.

A) Machine excavation.
B) Ripping or cultivation of soil.
C) Storage of spoil, soil or any such materials
D) Preparation of chemicals, including preparation of cement products.
E) Refueling.
F) Dumping of waste.

[7] Council of Standards Australia, *AS4970 Protection of trees on development sites* (2009), page 17.

G) Wash down and cleaning of equipment.
H) Placement of fill.
I) Lighting of fires.
J) Soil level changes.
K) Any physical damage to the crown, trunk, or root system.
L) Parking of vehicles.

11.8 **Demolition:** The demolition of all existing structures inside or directly adjacent to the TPZ of trees to be retained must be undertaken in consultation with the project Arborist. Any machinery is to work from inside the footprint of the existing structures or outside the TPZ, reaching in to minimise soil disturbance and compaction. If it is not feasible to locate demolition machinery outside the TPZ of trees to be retained, ground protection will be required. The demolition should be undertaken inwards into the footprint of the existing structures, sometimes referred to as the 'top down, pull back' method.

11.9 **Excavations:** The project Arborist must supervise and certify that all excavations and root pruning are in accordance with AS4373-2007 and AS4970-2009. For continuous strip footings, first manual excavation is required along the edge of the structures closest to the subject trees. Manual excavation should be a depth of 1 metre (or to unfavourable root growth conditions such as bed rock or heavy clay, if agreed by project Arborist). Next roots must be pruned back in accordance with AS4373-2007. After all root pruning is completed, machine excavation is permitted within the footprint of the structure. For tree sensitive footings, such as pier and beam, all excavations inside the TPZ must be manual. Manual excavation may include the use of pneumatic and hydraulic tools, high-pressure air or a combination of high-pressure water and a vacuum device. No pruning of roots greater 30mm in diameter is to be carried out without approval of the project arborist. All pruning of roots greater than 10mm in diameter must be carried out by a qualified Arborist/Horticulturalist with a minimum AQF level 3. Root pruning is to be a clean cut with a sharp tool in accordance with AS4373 Pruning of amenity trees (2007).[8] The tree root is to be pruned back to a branch root if possible. Make a clean cut and leave as small a wound as possible.

[8] Council of Standards Australia, *AS 4373 Pruning of amenity trees* (2007) page 18

11.10 **Landscaping:** All landscaping works within the TPZ of trees to be retained are to be undertaken in consultation with a consulting Arborist to minimize the impact to trees. General guidance is provided below to minimise the impact of new landscaping to trees to be retained.

- Level changes should be minimised. The existing ground levels within the landscape areas should not be lowered by more than 50mm or increased by more 100mm without assessment by a consulting Arborist.
- New retaining walls should be avoided. Where new retaining walls are proposed inside the TPZ of trees to be retained, they should be constructed from tree sensitive material, such as timber sleepers, that require minimal footings/excavations. If brick retaining walls are proposed inside the TPZ, considerer pier and beam type footings to bridge significant roots that are critical to the trees condition. Retaining walls must be located outside the SRZ and sleepers/beams located above existing soil grades.
- New footpaths and hard surfaces should be minimised, as they can limit the availability of water, nutrients and air to the trees root system. Where they are proposed, they should be constructed on or above existing soil grades to minimise root disturbance and consider using a permeable surface. Footpath should be located outside the SRZ.
- Where fill/sub base is used inside the TPZ, fill material should be a coarse granular material that does not restrict the flow of water and air to the root system below. This type of material will also reduce the impact of soil compaction during construction.
- The location of new plantings inside the TPZ of trees to be retained should be flexible to avoid unnecessary damage to tree roots greater than 30mm in diameter.

11.11 **Underground Services:** Where possible underground services should be located outside the TPZ of trees to be retained. All underground services located inside the TPZ of any tree to be retained must be installed via tree sensitive techniques. This should include either directional drilling methods or manual excavations to minimise the impact to trees identified for retention. No roots greater than 30mm in diameter should be severed during the installation of service pipes unless approved in writing by the project Arborist.

11.12 **Sediment and Contamination:** All contamination run off from the development such as but not limited to concrete, sediment and toxic wastes must be prevented from entering the TPZ at all times.

11.13 **Tree Wounding/Injury:** Any wounding or injury that occurs to a tree during the construction process will require the project Arborist to be contacted for an assessment of the injury and provide mitigation/remediation advice. It is generally accepted that trees may take many years to decline and eventually die from root damage. All repair work is to be carried out by the project Arborist, at the contractor's expense.

11.14 **Completion of Development Works:** After all construction works are complete the project Arborist should assess that the subject trees have been retained in the same condition and vigour. If changes to condition are identified the project Arborist should provide recommendations for remediation.

12. HOLD POINTS

12.1 **Hold Points:** Below is a sequence of hold points requiring project Arborist certification throughout the development process**.** It provides a list of hold points that must be checked and certified. All certifications must be provided in written format upon completion of the development. The final certification must include details of any instructions for remediation undertaken during the development.

Hold Point	Stage	Responsibility	Certification	Complete Y/N and date
Project Arborist to hold pre construction site meeting with principal contractor to discuss methods and importance of tree protection measures and resolve any issues in relation to feasibility of tree protection requirements that may arise.	Prior to work commencing.	Principle contractor	Project Arborist	
Project Arborist to assess and certify that tree protection has been installed in accordance with section 10 and AS4970-2009 prior to works commencing at site.	Prior to development work commencing.	Principle contractor	Project Arborist	
In accordance with AS4970-2009 the project arborist should carryout regular site inspections to ensure works are carried out in accordance with the recommendations. I recommend site inspections on a monthly frequency.	Ongoing throughout the development	Principle contractor	Project Arborist	
Project Arborist to supervise all manual excavations and demolition inside the TPZ of any tree to be retained.	Construction	Principle contractor	Project Arborist	

Project Arborist to certify that all pruning of roots greater than 30mm in diameter has been carried out in accordance with AS4373-2007. All root pruning must be carried out by a qualified Arborist/Horticulturalist with a minimum AQF level 3.	Construction	Principle contractor	Project Arborist	
Project Arborist to certify that all underground services including storm water inside TPZ of any tree to be retained have been installed in accordance with AS4970-2009.	Construction	Principle contractor	Project Arborist	
Project arborist to approve relocation of tree protection for landscaping. All landscaping works within the TPZ of trees to be retained are to be undertaken in consultation with the project Arborist to minimize the impact to trees.	Landscape	Principle contractor	Project Arborist	
After all construction works are complete the project Arborist should assess that the subject trees have been retained in the same condition and vigor and authorize the removal of protective fencing. If changes to condition are identified the project Arborist should provide recommendations for remediation.	Upon completion of construction	Principle contractor	Project Arborist	
Any wounding or injury that occurs to a tree during the demolition/construction process will require the project arborist to be contacted for an assessment of the injury and provide mitigation/remediation advice. All remediation work is to be carried out by the project arborist, at the contractor's expense.	Ongoing throughout the development	Principle contractor	Project Arborist	

13. BIBLIOGRAPHY/REFERENCES

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- *Warringah Local Environmental Plan 2011,* https://legislation.nsw.gov.au/#/view/EPI/2011/649, accessed 30 January 2021.
- *Warringah Development Control Plan 2011,* https://eservices.northernbeaches.nsw.gov.au/ePlanning/live/pages/plan/book.aspx?exhibit=DCP, accessed 30 January 2021.
- State Environmental Planning Policy (Vegetation in Non-Rural Areas 2017)

14. LIST OF APPENDICES

The following are included in the appendices:
Appendix 1: Existing Site Plan
Appendix 1A: Proposed Site Plan North
Appendix 2: Tree inspection schedule
Appendix 3 – Health
Appendix 4 – Amenity Value
Appendix 5 – Age Class
Appendix 6 – Structural Condition
Appendix 7 – SULE Categories
Appendix 8 – Retention Values
Appendix 9 – Trees AZ
Appendix 10 – TPZ Encroachment

Hugh Millington

Diploma of Arboriculture (AQF5)
NC Forestry and Arboriculture III (UK)
RFS Tech. Cert. II (UK)
QTRA Registered User
ISA Tree Risk Assessment Qualification
MAA, MISA

1
DP 387759

INGROUND POOL

BALCONY
RL 55.42

BALCONY
RL 58.03

ROOF

RL 62.33

POOL &
BALCONY
RL 52.81

THREE STOREY
RENDERED RESIDENCE
METAL ROOF
No.137A

ROOF

SILL 59.93
HEAD 61.43

SILL 57.32
HEAD 58.82

RL 62.33

CARSPACE
AT STREET LEVEL

62.91
ROOF

62.39
ROOF

62.58
TELSTRA

62.59

CONC

LEDGE

62.61
TELSTRA

STORAGE
UNDER

(G)

SPIRAL
STEPS

S/STONE

PATH

& STEPS

RET. WALL

BALCONY
RL 43.68

T4

T3

PATH

NOT

203°29'25"
1.72

113°29'25"
13.715

FENCED

T1

CRESCENT

STEPS

S/STONE

S/STONE

CARPORT
METAL ROOF

(G)

(D)

(E)

(D)

(G)

STAIRS

CONCRETE

AREA
291°09'55"
13.715 (G) (C)

5.08

223°40'25"

FENCED

CONCRETE
AREA

BENCH MARK
NAIL IN RAMP
RL 62.76 AHD

FOUR STOREY
TIMBER RESIDENCE
METAL ROOF
No.135

(F)

CAVERN
UNDER ROCK

S/STONE
RET. WALL

MASONRY RAILING

NOT

FENCED

RAIL

FENCE

CONC. BLOCK
RET. WALL

FENCED

METAL
RAIL

(C)

201°09'55"
0.915

T2

291°09'55"
INCLINATOR
7.925

TOP OF
BANK

TIMBER
RET. WALL

CONCRETE PLATFORM

STRIP GRATE

BENCH MARK
NAIL IN CONCRETE
RL 62.87 AHD
(NOW GONE)

SEAFORTH

S/STONE RET. WALL

203°29'25"
6.955

FENCED

NOT

FENCED

BALCONY
TOP OF GUTTER RL 67.98

TOP OF GUTTER RL 63.52

TOP OF GUTTER
RL 66.49

RIDGE RL 68.32

TOP OF GUTTER RL 66.17

BALCONY
RL 60.59

THREE STOREY
RENDERED RESIDENCE
TILE ROOF
No.133

Tree Crown

Tree Protection Zone

Structural Root Zone

0 12m

Hugh The Arborist

hugh@hughthearborist.com.au
www.hughthearborist.com.au
0426836701

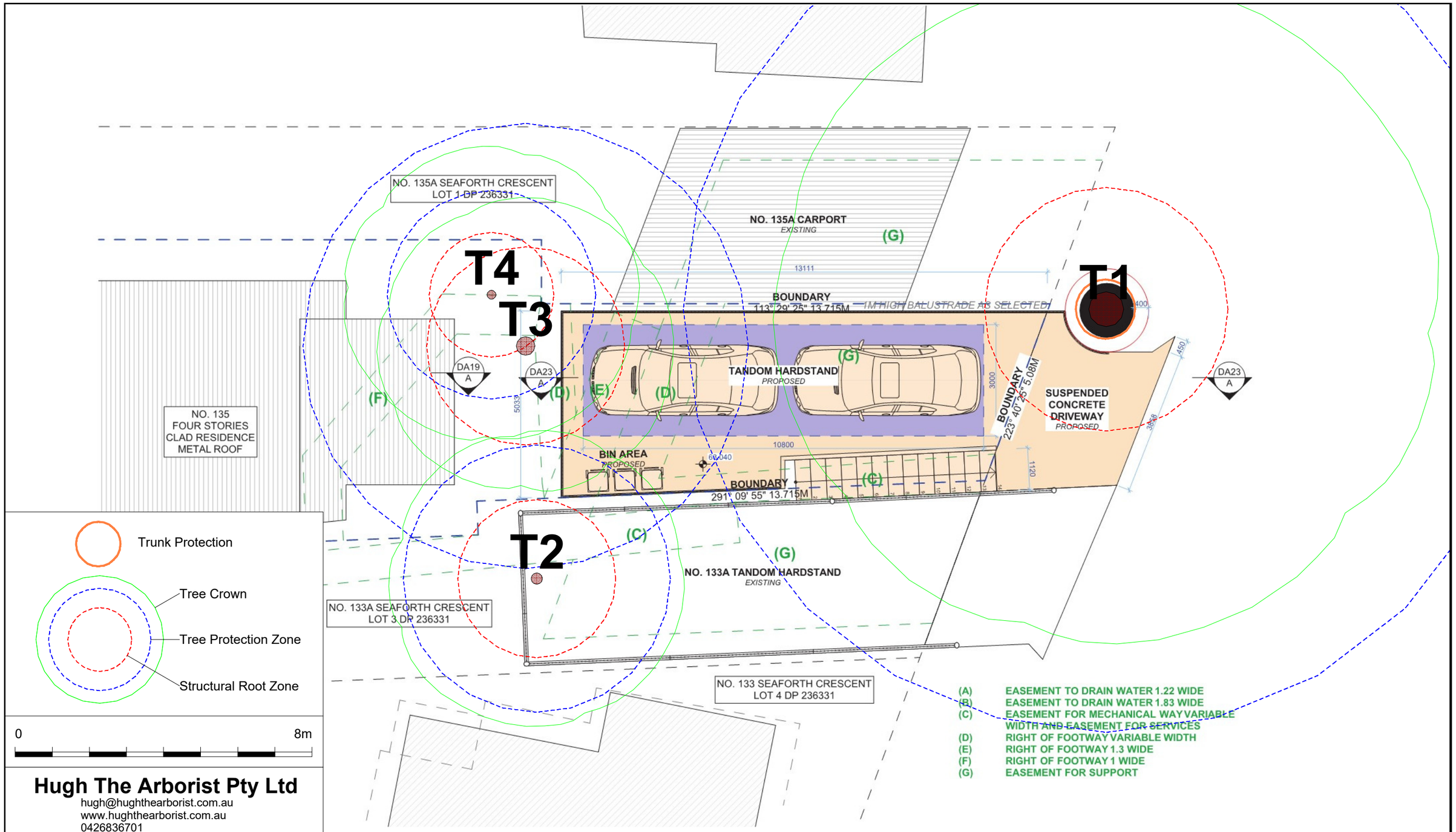
135 Seaforth Crescent Seaforth

SCALE :	DATE :
1 : 100 @ A2	20/03/2021

MAP FILENAME : Appendix 1 - Existing Site Plan

HUGH
THE ARBORIST

Drawn By Hugh Millington
for Paul Barrett



Trunk Protection

Tree Crown

Tree Protection Zone

Structural Root Zone

0 8m

Hugh The Arborist Pty Ltd
hugh@hughthearborist.com.au
www.hughthearborist.com.au
0426836701

135 Seaforth Crescent, Seaforth NSW

SCALE :	DATE :
1 : 100 @ A3	20/12/2021
MAP FILENAME : Appendix 1A - Proposed Site Plan and tree Protection Plan	

HUGH THE ARBORIST

Prepared by Hugh Millington for Paul Barrett

Appendix 2 - Tree Inspection Schedule

Tree no.	Tree Species	Age Class	DBH (MM)	DAB (MM)	Height (M)	Spread (M)	TPZ radius(M)	SRZ radius(M)	Health	Structure	Amenity Value	SULE	Retention Value	Notes/comments
1.	Sydney Red Gum *(Angophora costata)*	M	950	980	15	9	11.4	3.3	Good	Good	High	1.Long	A2	Surrounded by 100% hard surfaces, response growth extending out over the concrete driveway.
2.	*Jacaranda mimosifolia*	M	300	350	12	4	3.6	2.1	Good	Good	Low	1.Long	Z3	None.
3.	Broad Leaf Paperbark *(Melaleuca quinquenervia)*	M	500	600	15	4	6	2.7	Good	Good	Medium	1.Long	A2	None.
4.	Cheese Tree *(Glochidion ferdinandi)*	M	180/ 150	200	10	4	2.8	1.7	Good	Good	Medium	1.Long	A2	None.

Table Notes.
Tree species - Botanical name followed by common name in brackets. Where species is unknown it is indicated with an '*spp'*.
Age class - Over mature (OM), Mature (M), Early mature (EM), Semi mature (SM), Young (Y), Dead (D).
Diameter at Breast Height (DBH) - Measured with a DBH tape at approximately 1.4m above ground level. Where DBH has been estimated it is indicated with an 'est'. The (x) indicates the diameter above buttresses (DAB) for calculating the SRZ. All measurements calculated in accordance with AS4970-2009 definition.
Height - Height from ground level to top of crown. All heights are estimated unless otherwise indicated.
Spread - Radius of crown at widest section. All tree spreads are estimated unless otherwise indicated.
Tree Protection Zone (TPZ) - DBH x 12. Measured in radius from the centre of the trunk. Rounded to nearest decimal place. For monocots, the TPZ is set at 1 metre outside the crown projection.
Structural Root Zone (SRZ) - (DAB*50)^0.42*0.64. Measured in radius from the centre of the trunk. Rounded up nearest decimal place.
Health and structure - Good/Fair/Poor
Safe useful life expectancy (SULE) - 1. Long (40+years), 2. Medium (15 - 40 years), 3. Short (5 - 15 years), 4. Remove (under 5 years), 5. Small/young, 6. Unstable.
Amenity Value (Landscape Value) - Very High/High/Medium/Low/Very Low.
Retention Value - Barrell Tree Consultancy, *Tree AZ version 10.10-ANZ*, http://www.treeaz.com/.
Approximate measurement ranges for groups - R

Survey on trees at: 135 Seaforth Crescent, Seaforth NSW
Prepared for: Paul Barrett
Prepared by: Hugh Millington, hugh@hughthearborist.com.au
Date of survey: 16/3/2021

Appendix 3 - Health/Physiological condition

Category	Example condition	Summary
Good	• Crown has good foliage density for species. • Tree shows no or minimal signs of pathogens that are unlikely to have an effect on the health of the tree. • Tree is displaying good vigour and reactive growth development.	• The tree is in above average health and condition and no remedial works are required.
Fair	• The tree may be starting to dieback or have over 25% deadwood. • Tree may have slightly reduced crown density or thinning. • There may be some discolouration of foliage. • Average reactive growth development. • There may be early signs of pathogens which may further deteriorate the health of the tree. • There may be epicormic growth indicating increased levels of stress within the tree.	• The tree is in below average health and condition and may require remedial works to improve the trees health.
Poor	• The may be in decline, have extensive dieback or have over 30% deadwood. • The canopy may be sparse or the leaves may be unusually small for species. • Pathogens or pests are having a significant detrimental effect on the tree health.	• The tree is displaying low levels of health and removal or remedial works may be required.
Dead	• The tree is dead or almost dead.	• The tree should generally be removed.

Appendix 4 - Amenity value

To determine the amenity value of a tree we assess a number of different factors which include but are not limited to the information below.

- The visibility of the tree to adjacent sites.
- The relationship between the tree and the site.
- Whether the tree is protected by any statuary conditions.
- The habitat value of the tree.
- Whether the tree is considered a noxious weed species.

Appendix 5 - Age class

If can be difficult to determine the age of a tree without carrying out invasive tests that may damage the tree, so we have categorised there likely age class which is defined below.

Category	Description
Young/Newly planted	• Young or recently planted tree.
Semi Mature	• Up to 20% of the usual life expectancy for the species.
Early mature/Mature	• Between 20% - 80% of the usual life expectancy for the species.
Over mature	• Over 80% of the usual life expectancy for the species.
Dead	• Tree is dead or almost dead.

Appendix 6 - Structural condition

Category	Example condition	Summary
Good	• Branch unions appear to be strong with no sign of defects. • There are no significant cavities. • The tree is unlikely to fail in usual conditions. • The tree has a balanced crown shape and form.	• The tree is considered structurally good with well developed form.
Fair	• The tree may have minor structural defects within the structure of the crown that could potentially develop into more significant defects. • The tree may a cavity that is currently unlikely to fail but may deteriorate in the future. • The tree is an unbalanced shape or leans significantly. • The tree may have minor damage to its roots. • The root plate may have moved in the past but the tree has now compensated for this. • Branches may be rubbing or crossing.	• The identified defects are unlikely cause major failure. • Some branch failure may occur in usual conditions. • Remedial works can be undertaken to alleviate potential defects.
Poor	• The tree has significant structural defects. • Branch unions may be poor or weak. • The tree may have a cavity or cavities with excessive levels of decay that could cause catastrophic failure. • The tree may have root damage or is displaying signs of recent movement. • The tree crown may have poor weight distribution which could cause failure.	• The identified defects are likely to cause either partial or whole failure of the tree.

Appendix 7 - Safe Useful Life Expectancy (SULE), (Barrel, 2001)

A trees safe useful life expectancy is determined by assessing a number of different factors including the health and vitality, estimated age in relation to expected life expectancy for the species, structural defects, and remedial works that could allow retention in the existing situation.

Category	Description
1. Long	Useful life expectancy over 40 years
2. Medium	Useful life expectancy 15 to 40 years
3. Short	Useful life expectancy 5 to 15 years
4. Remove	Useful life expectancy under 5 years
5. Small/Young	Trees that could be transplanted or replaced with similar specimen.
6. Unstable	Tree has become hazardous or structurally unstable.

Appendix 8 - Retention value

The retention value that has been allocated to each tree in this report is not definitive and should only be used as a guideline by the client. We have assigned the retention value after assessing the combined SULE, structural condition, health, and amenity value of the tree. Any heritage listing that may apply to the tree has not been considered in this value, although if it has been identified it is included in the notes for the tree. Each tree has been assessed individually and consideration has not been given to value of the tree within a group.

Category	Example recommendation
Very high	Every effort should be made to preserve and retain trees in this category.
High	The trees in this category should be retained if it is reasonably possible.
Medium	The trees in this category should be retained if they do not constrain the development on the site.
Low	The trees in this category should not cause a constraint on the development proposals. They should be retained only if they do not or will not cause a risk to people or property.
Very low	The tree should generally be removed unless they do not or will not cause a risk to people or property.

TreeAZ Categories (Version 10.04-ANZ)

CAUTION: TreeAZ assessments must be carried out by a competent person qualified and experienced in arboriculture. The following category descriptions are designed to be a brief field reference and are not intended to be self-explanatory. They must be read in conjunction with the most current explanations published at www.TreeAZ.com.

Category Z: Unimportant trees not worthy of being a material constraint

Local policy exemptions: Trees that are unsuitable for legal protection for local policy reasons including size, proximity and species	
Z1	Young or insignificant small trees, i.e. below the local size threshold for legal protection, etc
Z2	Too close to a building, i.e. exempt from legal protection because of proximity, etc
Z3	Species that cannot be protected for other reasons, i.e. scheduled noxious weeds, out of character in a setting of acknowledged importance, etc
High risk of death or failure: Trees that are likely to be removed within 10 years because of acute health issues or severe structural failure	
Z4	Dead, dying, diseased or declining
Z5	Severe damage and/or structural defects where a high risk of failure cannot be satisfactorily reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, overgrown and vulnerable to adverse weather conditions, etc
Z6	Instability, i.e. poor anchorage, increased exposure, etc
Excessive nuisance: Trees that are likely to be removed within 10 years because of unacceptable impact on people	
Z7	Excessive, severe and intolerable inconvenience to the extent that a locally recognized court or tribunal would be likely to authorize removal, i.e. dominance, debris, interference, etc
Z8	Excessive, severe and intolerable damage to property to the extent that a locally recognized court or tribunal would be likely to authorize removal, i.e. severe structural damage to surfacing and buildings, etc
Good management: Trees that are likely to be removed within 10 years through responsible management of the tree population	
Z9	Severe damage and/or structural defects where a high risk of failure can be temporarily reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, vulnerable to adverse weather conditions, etc
Z10	Poor condition or location with a low potential for recovery or improvement, i.e. dominated by adjacent trees or buildings, poor architectural framework, etc
Z11	Removal would benefit better adjacent trees, i.e. relieve physical interference, suppression, etc
Z12	Unacceptably expensive to retain, i.e. severe defects requiring excessive levels of maintenance, etc

NOTE: Z trees with a high risk of death/failure (Z4, Z5 & Z6) or causing severe inconvenience (Z7 & Z8) at the time of assessment and need an urgent risk assessment can be designated as ZZ. ZZ trees are likely to be unsuitable for retention and at the bottom of the categorization hierarchy. In contrast, although Z trees are not worthy of influencing new designs, urgent removal is not essential and they could be retained in the short term, if appropriate.

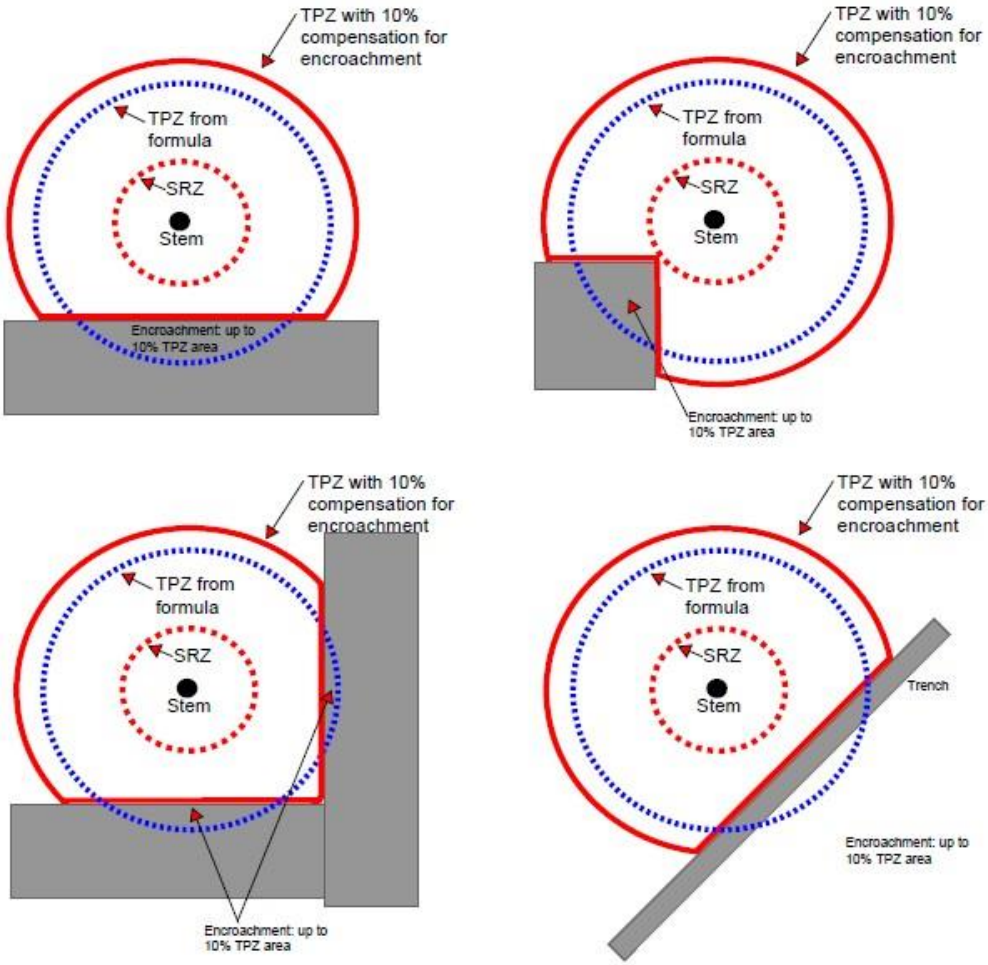
Category A: Important trees suitable for retention for more than 10 years and worthy of being a material constraint

A1	No significant defects and could be retained with minimal remedial care
A2	Minor defects that could be addressed by remedial care and/or work to adjacent trees
A3	Special significance for historical, cultural, commemorative or rarity reasons that would warrant extraordinary efforts to retain for more than 10 years
A4	Trees that may be worthy of legal protection for ecological reasons (Advisory requiring specialist assessment)

NOTE: Category A1 trees that are already large and exceptional, or have the potential to become so with minimal maintenance, can be designated as AA at the discretion of the assessor. Although all A and AA trees are sufficiently important to be material constraints, AA trees are at the top of the categorization hierarchy and should be given the most weight in any selection process.

Appendix 10 – Examples of TPZ Encroachment

Encroachment into the Tree Protection Zone is sometimes unavoidable. The following diagram shows examples of acceptable levels of encroachment and how they may be compensated for by providing additional space contiguous to the TPZ area.



Note: Less than 10% TPZ area and outside SRZ. Any loss of TPZ compensated for elsewhere.