EARTHSCAPE HORTICULTURAL SERVICES
Arboricultural, Horticultural and Landscape Consultants

ABN 36 082 126 027

ARBORICULTURAL IMPACT ASSESSMENT REPORT

PROPOSED NEW DWELLING

346-352 WHALE BEACH ROAD, PALM BEACH

February 2019

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1 INTRODUCTION

1.1.1 This report was commissioned by Tzannes Associates on behalf of the applicant to assess the health and condition of seventy-four (74) trees located within or immediately adjacent to 346-352 Whale Beach Road, Palm Beach. The report has been prepared to aid in the assessment of a Development Application (DA) for the demolition of the existing dwelling (at No. 350) and construction of a new dwelling within the property.

1.1.2 The purpose of this report is to assess the potential impact of the proposed development on the subject trees, together with recommendations for amendments to the design or construction methodology where necessary to minimise any adverse impact. The report also provides recommended tree protection measures to ensure the long-term preservation of the trees to be retained where appropriate.

1.1.3 This report has been prepared in accordance with the Northern Beaches Council's *Guidelines for Arborists Reports* as outlined on Council's website, Section 2.4.1 & 2.4.2 of Appendix 9 of the *Pittwater 21 Development Control Plan 2015* (PDCP) and Sections 2.3.2 -2.3.5 of the *Australian Standard for Protection of Trees on Development Sites* (AS 4970:2009).

2 THE SITE

2.1.1 The subject property consists of four residential allotments known as Lots 327, 328, 329 and 330 in DP 16362, being 346 to 352 Whale Beach Road, Palm Beach. For the purposes of this report, the subject allotments will be referred to as 'the site'. The total area of the site is 2,269.6 m². The site is zoned Environmental Living [E4] under the *Pittwater Local Environmental Plan 2014* (PLEP). The site adjoins a public reserve known as 'Annie Wyatt Reserve' to the west. Lot 329 (No. 350) contains an existing dwelling with adjoining paved terraces and decks. Lots 330, 328 and 327 are presently vacant. The vegetation within the site consists of coastal scrub and heath with predominantly locally-indigenous species. Cleared areas around the dwellings also contain a variety of non-local native and exotic (introduced) species.

2.1.2 Soils of this area are typical of the Watagan Soil Landscape Group (as classified in the *Soil Landscapes of the Sydney 1:100,000 Sheet*), consisting of "shallow to deep (300 – 2000 mm) *Lithosols/Siliceous Sands* and *Yellow Podzolic soils* on sandstone and moderately deep (1000 - 2000 mm) *Brown Podzolic soils, Red Podzolic soils* and *Gleyed Podzolic soils* on shales*".* Soil materials are derived from Narrabeen Group sediments with occasional rock outcrop. The landscape is typically rolling to very steep hills and steep colluvial side slopes with occasional sandstone boulders and benches [1]

2.1.3 The original vegetation of this area consisted of coastal heath and woodland [2] typical of the 'Sandstone Crest – Coastal Heaths',[3] subject to some coastal exposure. Most of the original vegetation in surrounding areas has now been cleared for residential development. The dominant locally-indigenous tree species formerly found in this area included *Angophora costata* (Sydney Red Gum), *Eucalyptus umbra* (Bastard Mahogany) and *Eucalyptus racemosa* (Scribbly Gum). Other species found in this vegetation community may include *Allocasuarina torulosa* (Forest Oak), *Syncarpia glomulifera* (Turpentine). *Banksia integrifolia* (Coast Banksia), *Banksia serrata* (Old Man Banksia) and *Eucalyptus botryoides* (Bangalay). *Elaeocarpus reticulatus* (Blueberry Ash), *Ficus rubiginosa* (Port Jackson Fig), *Glochidion ferdinandi* (Cheese Tree), *Syzygium paniculatum* (Magenta Cherry), *Acmena smithii* (Lillypilly), *Livistona australis* (Cabbage Tree Palm) and *Ficus coronata* (Sandpaper Fig) may also be found in sheltered sites and lower slopes.

2.2 SUBJECT TREES

2.2.1 The subject trees were inspected by Earthscape Horticultural Services (EHS) on the 6th April 2018. Each tree has been provided with an identification number for reference purposes denoted on the attached Tree Location Plan (**Appendix 5**), based on the survey prepared by Adam Clerke Surveyors Pty Ltd, Dwg. Ref No. 15204 dated 01/08/2014. The numbers used on this plan correlate with the Tree Assessment Schedule (**Appendix 3**). Tree No.s T2a, T4a, T9a, T11a, T11b, T19a, T21a, T24a, T29a, T29b, T34a, T34b & T34c were not shown on the original survey and have been plotted on the drawing in their approximate positions.

3 HEALTH AND CONDITION ASSESSMENT

3.1 Methodology

3.1.1 An assessment of each tree was made using the Visual Tree Assessment (VTA) procedure.[4] All of the trees were assessed in view from the ground. No aerial inspection or diagnostic testing has been undertaken as part of this assessment.

3.1.2 The following information was collected for each tree:-

- Tree Species (Botanical & Common Name);
- Approximate height;
- Canopy spread; measured using a metric tape and an average taken.
- Trunk diameter (measured at 1.4 metres from ground level);
- Live Crown Size; (measured by subtracting the total height of the tree from the lowest point of the crown and multiplying by the average crown spread to give a value in square metres).
- Health & vigour; using foliage size, colour, extension growth, presence of disease or pest infestation, canopy density, presence of deadwood, dieback and epicormic growth as indicators,
- Condition; using visible evidence of structural defects, instability, evidence of previous pruning and physical damage as indicators.
- Suitability of the tree to the site and its existing location; in consideration of damage or potential damage to services or structures, available space for future development and nuisance issues.

3.1.3 This information is presented in a tabulated form in **Appendix 3**.

3.2 Safe Useful Life Expectancy (SULE)

3.2.1 The remaining Safe Useful Life Expectancy[5] of the tree is an estimate of the sustainability of the tree in the landscape, calculated based on an estimate of the average age of the species in an urban area, less its estimated current age. The life expectancy of the tree has been further modified where necessary in consideration of its current health and vigour, condition and suitability to the site. The estimated SULE of each tree is shown in **Appendix 3.**

3.2.2 The following ranges have been allocated to each tree:-

- Greater than 40 years (Long)
- Between 15 and 40 years (Medium)
- Between 5 and 15 years (Short)
- Less than 5 years (Transient)
- Dead or immediately hazardous (defective or unstable)

3.2.1 SULE ratings are intended to provide a general overview of the long term sustainability of the trees within the site in consideration of these factors. The allocated ranges are not intended to be absolute. This information is useful in guiding future planning by highlighting the probable

lifespan of individual trees, for which a clear pattern may emerge. This information may be helpful in forecasting likely tree senescence and planning for replacement planting to ensure continuity in tree canopy across the site. It should be noted that SULEs *may* be extended or reduced depending on the way trees are managed. Intervention and remedial works may extend the SULE of some trees.

4 LANDSCAPE SIGNIFICANCE

4.1 Methodology for Determining Landscape Significance

4.1.1 The significance of a tree in the landscape is a combination of its environmental, heritage and amenity values. Whilst these values may be fairly subjective and difficult to assess consistently, some measure is necessary to assist in determining the retention value of each tree. To ensure a consistent approach, the assessment criteria shown in **Appendix 1** have been used in this assessment.

4.1.2 A rating has been applied to each tree to give an understanding of the relative significance of each tree in the landscape and to assist in determining priorities for retention, in accordance with the following categories:-

1. **Significant**
2. **Very High**
3. **High**
4. **Moderate**
5. **Low**
6. **Very Low**
7. **Insignificant**

4.2 Environmental Significance

4.2.1 Tree Management Controls

Prescribed Trees within the Northern Beaches (former Pittwater) Local Government Area (LGA) are protected under the provisions under Volume 2, Section B4.22 (Preservation of Trees and Bushland Vegetation) of the *Pittwater 21 Development Control Plan 2014* (PDCP) (as amended 25/11/2015), made pursuant to Clause 5.9 of the *Pittwater Local Environmental Plan* 2014 (PLEP). The PDCP generally protects all trees with a height of five (5) metres or greater and all Bushland Vegetation. Some exemptions apply. The following trees are exempt (not protected) under the provisions of the PDCP 2014:-

Tree No.	Species	Exemption
T2a*#	*Brachychiton acerifolius* (Illawarra Flame Tree)	Exempt species
T16	*Cupressus macrocarpa* 'Aurea' (Golden Monterey Cypress)	Exempt species
T24	*Cupressus macrocarpa* 'Brunniana Aurea' (Golden Brunnings Cypress)	Exempt species
T21a, T24a	*Cotoneaster sp.* (Cotoneaster)	Environmental Weed Species
T3, T6, T8, T13, T15, T32, T37, T52, T53, T54, T58a	*Pittosporum undulatum* (Native Daphne)	Exempt species (less than 8 metres)

11a*, T51	*Glochidion ferdinandi* (Cheese Tree)	Less than the prescribed dimensions
T14	*Macrozamia communis* (Burrawang)	Less than the prescribed dimensions
T45, T46, T48	*Banksia serrata* (Old Man Banksia)	Less than the prescribed dimensions
T36	*Glochidion ferdinandi* (Cheese Tree)	Located within 2 metres of an existing dwelling
T1*#	*Melaleuca armillaris* (Bracelet Honey Myrtle)	Dead tree
T7	*Eucalyptus umbra* (Bastard Mahogany)	Dead tree
T10	*Casuarina cunninghamiana* (River Oak)	Dead tree
T23*	*Allocasuarina littoralis* (Black She-oak)	Dead tree
T39	*Banksia integrifolia* (Coast Banksia)	Dead tree

* Note that these trees are located within the adjoining property.

\# Note that these trees are located within an adjoining property listed as a Heritage Item under the WLEP.

The remainder of the trees are protected under the PDCP 2014.

4.2.2 Wildlife Habitat

Allocasuarina littoralis (Black She-oak) [T22 & T23], *Allocasuarina torulosa* (Forest Oak) [T38], *Banksia integrifolia* (Coast Banksia) [T34c, T39], *Banksia serrata* (Old Man Banksia) [T21, T43, T44, T45, T46, T48 & T62], *Elaeocarpus reticulatus* (Blueberry Ash) [T49], *Eucalyptus umbra* (Bastard Mahogany) [T7, T17, T18, T20, T20a, T28, T31a & T57], *Eucalyptus umbra x resinifera* (Bastard Mahogany) [T31], *Ficus rubiginosa* (Port Jackson Fig) [T19a, T34a, T55], *Glochidion ferdinandi* (Cheese Tree) [T5, T9a, T11a, T11b, T34b, T36, T40, T47, T51 & T60], *Macrozamia communis* (Burrawang) [T14], *Pittosporum undulatum* (Native Daphne) [T3, T6, T8, T13, T15, T32, T37, T52, T53, T54 & T58a] and *Syncarpia glomulifera* (Turpentine) [T9, T25 & T26] are all locally-indigenous species, representative of the original vegetation of the area and would be of benefit to native wildlife. However, none of the trees contain cavities that would be suitable as nesting hollows for arboreal mammals or birds or other visible signs of wildlife habitation.

4.2.3 Noxious Plants & Environmental Weeds

None of the subject trees are scheduled as a potential biosecurity risk (Noxious Weed or 'Priority Weed') within the Northern Beaches LGA under the provisions of the *Biosecurity Act 2015.*

4.2.4 Threatened Species & Ecological Communities

None of the subject trees are listed as Threatened or Vulnerable Species or form part of Endangered Ecological Communities (EECs) under the provisions of the *Threatened Species Conservation Act* 1995 (NSW) or the *Environmental Protection and Biodiversity Conservation Act* 1999.

4.2.5 Biodiversity

The eastern portion of Lot 327 (346 Whale Beach Road) is indicated as containing an area of Biodiversity Significance as indicated on Council's Biodiversity Map forming part of the PDCP 2014. The reason for this is not clear.

4.3 Heritage Significance

4.3.1 Heritage Items

The subject property is *not* listed as a Heritage Item under Schedule 5, Part 1 of the *Pittwater Local Environmental Plan 2014* (PLEP). However, the adjoining property to the north-west (Lot 332 in DP 16362, being 356 Whale Beach Road) is listed as a Heritage Item (Item No 2270014) under the PLEP. This item is described as 'Cox House' (also known as 'Chanen Palm Beach House' and 'Ocean House'), originally constructed in the 1950's for Mr & Mrs Chanen and altered in the 1970's. The dwelling was further altered in 1988-89 to a design by Phillip Cox (The Cox Group) and is considered a good example of contemporary Australian residential architecture. None of the subject trees have any association with this item.

4.3.2 Heritage Conservation Area

The site is *not* located within a Heritage Conservation Area under Schedule 5, Part 2 of the PLEP 2014.

4.3.3 Significant Tree Register

Pittwater Council does *not* currently maintain a Register of Significant Trees.

4.4 Amenity Value

4.4.1 Criteria for the assessment of amenity values are incorporated into **Appendix 1**. The amenity value of a tree is a measure of its live crown size, visual appearance (form, habit, crown density), visibility and position in the landscape and contribution to the visual character of an area. Generally the larger and more prominently located the tree, and the better its form and habit, the higher its amenity value.

5 TREE RETENTION VALUES

5.1.1 The Retention Values shown in **Appendix 3** and **Appendix 5** have been determined on the basis of the estimated longevity of the trees and their landscape significance rating, in accordance with **Table One**. Together with guidelines contained in **Section 7** (Tree Protection Zones) this information should be used to determine the most appropriate position of building footprints and other infrastructure within the site, with due consideration to other site constraints, to minimise the impact on trees considered worthy of preservation.

TABLE 1 – TREE RETENTION VALUES – ASSESSMENT METHODOLOGY

	Landscape Significance Rating						
Estimated Life Expectancy	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Long - Greater than 40 Years	High Retention Value						
Medium- 15 to 40 Years			Moderate Retention Value				
Short - 5 to 15 years				Low Ret. Value			
Transient - Less than 5 Years				Very Low Retention Value			
Dead or Potentially Hazardous							

TABLE 2 – TREE RETENTION PRIORITES.

5.1.2 The following table describes the implications of the retention values on site layout and design.

RETENTION VALUE	RECOMMENDED ACTION
"High"	• These trees considered worthy of preservation; as such careful consideration should be given to their retention as a priority. • Proposed site design and placement of buildings and infrastructure should consider the recommended setbacks as discussed in the following section (refer also **Appendix 2**) to avoid any adverse impact on these trees. • In addition to Tree Protection Zones, the extent of the canopy (canopy drip-line) should also be considered, particularly in relation to high rise developments. Significant pruning of the trees to accommodate the building envelope or temporary scaffolding is generally not acceptable.
"Moderate"	• The retention of these trees is desirable, but not essential. • These trees should be retained as part of any proposed development if possible. However, these trees are considered less critical for retention. • If these trees must be removed, replacement planting should be considered in accordance with Council's Tree Replenishment Policy to compensate for loss of amenity (refer also **Section 9**).
"Low"	• These trees are not considered to worthy of any special measures to ensure their preservation, due to current health, condition or suitability. They do not have any special ecological, heritage or amenity value, or these values are substantially diminished due to their SULE. • These trees should not be considered as a constraint to the future development of the site.
"Very Low"	• These trees are considered potentially hazardous or very poor specimens, or may be environmental or noxious weeds. • The removal of these trees is therefore recommended regardless of the implications of any proposed development.

6 TREE PROTECTION ZONES

6.1.1 The Tree Protection Zone (TPZ) is a radial distance measured from the centre of the trunk of the tree as specified in **Appendix 4**. These have been calculated in accordance with AS 4970-2009 (Protection of Trees on Development Sites).[6]

6.1.2 The intention of the TPZ is to ensure protection of the root system and canopy from the potential damage from construction works and ensure the long-term health and stability of each tree to be retained. Incursions to the root zone may occur due to excavations, changes in ground levels, (either lowering or raising the grade), trenching or other forms or soil disturbance such as ripping, grading or inverting the soil profile. Such works may cause damage or loss of part of the root system, leading to an adverse impact on the tree.

6.2 Structural Root Zone (SRZ)

6.2.1 The Structural Root Zone (SRZ) provides the bulk of mechanical support and anchorage for a tree. This is also a radial distance measured from the centre of the trunk as specified in **Appendix 4**. The SRZ has been calculated in accordance with AS 4970-2009 (Protection of Trees on Development Sites).

6.2.2 Incursions within the SRZ are not recommended as they are likely to result in the severance of woody roots which may compromise the stability of the tree or lead to its decline and demise.

6.3 Acceptable Encroachments to the Tree Protection Zone.

6.3.1 Where encroachment to the TPZ is unavoidable, an incursion to the TPZ of not exceeding 10% of the area of the TPZ and outside the SRZ may be acceptable. Examples of acceptable incursions are shown in **Appendix 2**. Greater incursions to the TPZ may result in an adverse impact on the tree.

6.3.2 Where incursions greater than 10% of the TPZ are unavoidable, exploratory excavation using non-destructive methods may be required to evaluate the extent of the root system affected and determine whether or not the tree can remain viable

6.4 Acceptable Encroachments to the Canopy

6.4.1 The removal of a small portion of the crown (foliage and branches) is generally tolerable provided that the extent of pruning required is less than 10% of the total foliage volume of the tree and the removal of branches does not create large wounds or disfigure the natural form and habit of the tree. All pruning cuts must be undertaken in accordance with AS 4373:2007. This generally involves reduction of the affected branches back to the nearest branch collar at the junction with the parent branch, rather than at an intermediate point. The latter is referred to as "lopping" and is no longer an acceptable arboricultural practice. Generally speaking, the minimum pruning as required to accommodate any proposed works is desirable. Extensive pruning can result in a detrimental impact on tree health and may lead to exposure of remaining branches to wind forces that they were previously sheltered from, leading to a greater risk of branch failure.

6.4.2 Clearance to between the building line and canopy should take into account any projecting structures, such as balconies, awnings and the roofline and any requirement for temporary scaffolding to be erected during construction (typically 1-1.5 metres wide). High structures should preferably be located outside the canopy dripline (as shown indicatively on the attached plans) in order to avoid or minimise canopy pruning.

6.5 Legal Protection

6.5.1 Notwithstanding the above recommendations, Council may require a greater setback from certain types of structures to ensure the on-going legal protection of the tree (i.e. its legal status under Council's Tree Management Controls). In the Northern Beaches LGA, a tree located within two (2) metres of the wall of a dwelling is not protected under the PDCP. As such, if a tree is considered worthy of preservation, Council is unlikely to approve the construction of a dwelling within two (2) metres of the tree (regardless of whether this can be undertaken without having an

adverse impact on its health or longevity). It should be noted that this does not necessarily apply to other structures

7 PROPOSED DEVELOPMENT

7.1.1 The proposed development includes the demolition of the existing dwelling and construction of a new dwelling and in-ground swimming pool within the property.

8 IMPACT ASSESSMENT

8.1.1 The intention of this assessment is to determine the incursions to the root zones and canopies created by the proposed development and evaluate the likely impact of the proposed works on the subject trees. Details shown on the following plans were used in this assessment:-

Title	Author	Dwg No.	Date
Site Plan Existing and Demolition	Tzannes Associates	17018 0101 [B]	31/01/2019
Site Plan Proposed	Tzannes Associates	17018 0102 [B]	31/01/2019
Basement Floor Plan	Tzannes Associates	17018 1100 [B]	31/01/2019
Basement Plant Floor Plan	Tzannes Associates	17018 1101 [B]	31/01/2019
Ground Floor Plan	Tzannes Associates	17018 1102 [B]	31/01/2019
Level 1 Plan	Tzannes Associates	17018 1103 [B]	31/01/2019
Level 2 Plan	Tzannes Associates	17018 1104 [B]	31/01/2019
Roof Plan	Tzannes Associates	17018 1105 [B]	31/01/2019
Elevations Sheet 1	Tzannes Associates	17018 2000 [A]	21/01/2019
Elevations Sheet 2	Tzannes Associates	17018 2001 [A]	21/01/2019
Sections Sheets 1-5	Tzannes Associates	17018 3000 - 3004 [A]	21/01/2019
Landscape Plans	Dangar Barin Smith	DA01-1418 [01/A]	22/01/2019
Stormwater Concept Plan	Taylor Thomson Whitting	181376 C03 [P1]	07/12/2018

8.1.2 A summary of the impact of the proposed development on each tree within the site is shown in **Appendix 5**. The following criteria have been examined as part of this assessment:-

- Existing Relative Levels (R.L.);
- Tree Protection Zone (TPZ);
- Structural Root Zone (SRZ);
- Footprint and envelope of the proposed development and temporary structures (scaffolding, hoardings etc);
- Incursions to the TPZ & SRZ, including estimated cut & fill beyond the building footprint;
- Incursions to the tree canopy from the building envelope and temporary structures; and
- Assessment of the likely impact of the works on existing trees.

8.1.3 The proposed development will necessitate the removal of twenty-two (22) trees of low and very low retention value. These include Tree No.s T32, T37, T52, T53 & T54 (Sweet Pittosporum), T34 (River Oak), T16 (Golden Monterey Cypress), T21a (Cotoneaster), T23 (Black She-oak), T29 (Willow Myrtle), T29a & T29b (Sally Wattle), T36, T47 & T51 (Cheese Tree), T39 (Coast

Banksia), T50 (Blackwood), T44, T46, T48 & T62 (Old Man Banksia) & T61 (Wattle). None of these trees are considered significant or worthy of special measures to ensure their preservation. It should be noted that Trees T13, T16, T21a, T23, T32, T36, T37, T39, T46 & T48 are exempt from Council's tree management controls (refer to Section 5.2.1 of this report).

8.1.4 The proposed development will also necessitate the removal of eight (8) trees of moderate retention value. These include Tree No.s T31a (Bastard Mahogany), T33 (River Oak), T34a (Port Jackson Fig), T34b (Cheese Tree), T34c (Coast Banksia), T35 (Giant White Bird of Paradise), T38 (Forest Oak) and T49 (Blueberry Ash). These trees are not considered significant, but are in good health and condition and make a fair contribution to the amenity of the site and surrounding properties. In order to compensate for loss of amenity resulting from the removal of these trees to accommodate the proposed development, consideration should be given to replacement planting within the site in accordance with Section 11.

8.1.5 The proposed development will also necessitate the removal of two (2) trees of high retention value. These include Tree No.s T25 (Turpentine) and T31 (Large-fruited Red Mahogany). These trees are both locally-indigenous species in good health and condition and make a positive contribution to the amenity of the site. Consideration has been given to the retention of these trees. However, are no feasible options that can be recommended in this instance to preserve these trees given their position within the site and the extent of development proposed. In order to compensate for loss of amenity resulting from the removal of these trees to accommodate the proposed development, consideration should be given to replacement planting with new trees elsewhere within the site in accordance with Section 11.

8.1.6 The proposed dwelling and pool terrace are located within the TPZ of T27 (a Sydney Blue Gum of High Retention Value). Whilst the extent of the encroachment to the TPZ from the proposed works is 17%, which exceeds acceptable limits under AS 4970:2009, there will be no actual incursion to the root zone. The proposed works are located beyond existing large rock outcrops that would form a barrier to root growth in the affected areas. As such, the proposed works will not result in any adverse impact on this tree. In order to avoid any adverse impact on T27, all excavations for the dwelling foundations, pavement sub-grade and any retaining walls associated with the terracing within the TPZs should be undertaken in accordance with Section 10.6. Tree Protection Fencing should also be erected in accordance with Section 10.3.

8.1.7 Proposed pathways, terracing and informal stairs are located within the TPZs of T26 (Turpentine) T27 (Sydney Blue Gum) and T28 (Bastard Mahogany). Level changes associated with the paved areas have the potential to result in some adverse impact on these trees. However, provided that the pavements are placed above existing grade in accordance with Section 10.8, any required excavations for the pavement sub-grade are undertaken in accordance with Section 10.6 and any filling for the pavement and/or terracing is undertaken in accordance with Section 10.9, the proposed works will not result in any adverse impact on these trees. Care should be taken to preserve all woody surface roots emanating from these trees intact, without causing any physical damage, in accordance with Section 10.6.

8.1.8 No other trees will be adversely affected by the proposed development.

9 RECOMMENDED TREE PROTECTION MEASURES

9.1 Tree Protection Plan

9.1.1 The following Tree Protection Measures should be read in accordance with the Tree Protection Plan (**Appendix 6**). The Tree Protection Plan (TPP) indicates the position of tree protection devices and other recommended measures to ensure the protection of trees within the site to be retained as part of the proposed development.

9.2 Prohibited Activities

9.2.1 The following activities should be avoided within specified Tree Protection Zones (refer **Appendix 4 & 6** for extent of the TPZ for each tree):-

- Excavations and trenching (with exception of the approved remediation works, underground services, building foundations or pavement sub-grade);
- Soil disturbance, surface grading, compaction, tyning, ripping or cultivation of soil;
- Mechanical removal of vegetation, including extraction of tree stumps;
- Soil level changes including the placement of fill material (excluding imported validated fill for remediation works or placement of fill for approved works)
- Movement and storage of plant, equipment & vehicles (except within defined temporary haul roads, where ground protection has been installed, or within the footprint of existing floor slabs or paved areas);
- Erection of site sheds (except where approved by the site arborist);
- Affixing of signage, barricades or hoardings to trees;
- Storage of building materials, waste and waste receptacles;
- Stockpiling of spoil or fill;
- Stockpiling of bulk materials, such as soil, sand, gravel, roadbase or the like;
- Stockpiling of demolition waste;
- Disposal of waste materials and chemicals including paint, solvents, cement slurry, fuel, oil and other toxic liquids;
- Other physical damage to the trunk or root system; and
- Any other activity likely to cause damage to the tree.

9.3 Tree Protection Fencing

9.3.1 Trees [**T12, T26 & T27**] shall be protected prior to and during construction from all activities that may result in detrimental impact by erecting a suitable protective fence in the positions as indicated on the Tree Protection Plan (**Appendix 6**). As a minimum, the fence shall consist of temporary chain wire panels of 1.8 metres in height, supported by steel stakes as required and fastened together and supported to prevent sideways movement using corner braces where required. The fence shall be erected prior to the commencement of any work on-site and shall be maintained in good condition for the duration of construction. Where tree protection zones merge together a single fence encompassing the area is deemed to be adequate. Existing site boundary fences may form part of the enclosure.

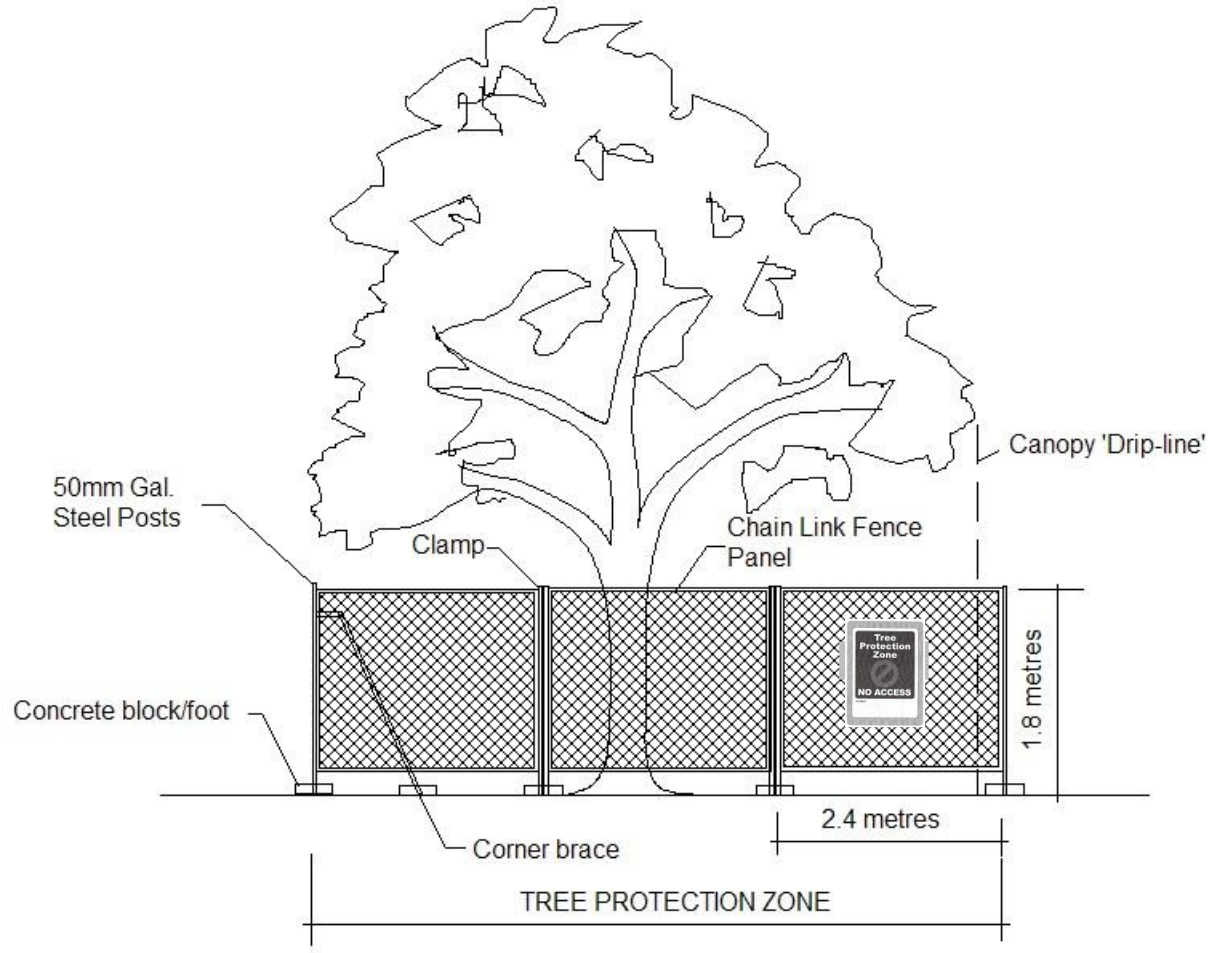

Figure 1 – Detail of Tree Protection Fence

9.4 Tree Protection Signs

9.4.1 Signs shall be installed on the Tree Protection Fence to prevent unauthorised movement of plant and equipment or entry to the Tree Protection Zone. The signs shall be securely attached to the fence using cable ties or equivalent. Signs shall be placed at minimum 10 metre intervals. The wording and layout of the sign shall comply with AS 4970-2009 as shown in **Figure 2**.

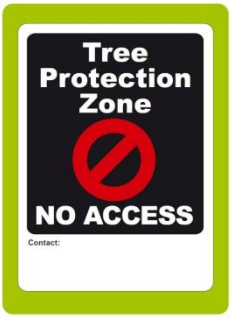

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Figure 2 – Detail of Tree Protection Sign

9.5 Demolition Works within Tree Protection Zones

9.5.1 Demolition of paved areas within the Tree Protection Zones (TPZs) of trees [**T26 & T27**] shall be undertaken under the supervision of a qualified Arborist [Australian Qualification Framework (AQF) Level 5].

9.5.2 Concrete and stone pavements shall be demolished by breaking the slab into manageable sections (using a rock hammer or similar) and asphalt pavements shall be removed by breaking the topcoat into manageable pieces. The broken sections shall be carefully lifted and folded over the remaining paved surface to minimise disturbance and compaction of the underlying soil profile. Special care

shall be taken where underlying woody roots have lifted or displaced the pavement. Any plant or equipment used in demolition work shall operate within the footprint of existing paved areas and avoid traversing soft landscape areas. Where this is unavoidable, suitable ground protection shall first be installed in accordance with **Section 10.14**.

9.5.3 The pavement sub-base within the TPZ shall be gradually removed (where required) in layers of no greater than 50mm thick using a small rubber tracked excavator or alternative approved method to avoid excessive disturbance and compaction of the underlying soil profile and damage to underlying roots and minimise. The machine shall work within the footprint of the existing path footprint to avoid compaction of the underlying soil. The final layer of sub-base material shall be removed using hand tools were required to avoid compaction of the underlying soil profile and avoid damage to any underlying woody roots.

9.5.4 Following removal of the pavement surface and sub-base, clean, friable topsoil shall be used to fill in the excavated area and bring flush with surrounding levels within new landscape areas. Soil shall only be imported and spread when the underlying soil conditions are dry to avoid compaction of the soil profile.

9.5.5 Demolition of existing walls, kerbs and other structures within the TPZ of trees [**T26 & T27**] shall be undertaken under the supervision of a qualified Arborist [AQF level 5]. The structures shall be demolished using equipment on stationed outside the TPZ where possible or within the footprint of existing hardstand areas.

9.5.6 Care shall be taken to avoid the root systems, trunks and lower branches of trees in the vicinity of the structures during demolition works, with special attention required during demolition of the footings and other sub-surface members to avoid damage to woody roots. An observer ('spotter') shall be employed to assist the plant operator in order to detect and avoid damage to underlying woody roots during demolition. Trunk and/or branch protection shall be installed where there is a potential risk of damage to trees in proximity or overhead of the work.

9.6 Excavations within Tree Protection Zones

9.6.1 Prior to any mechanical excavations for building foundations or pavement sub-grade within the TPZs of Trees [**T26, T27 & T28**] exploratory excavation using non-destructive techniques shall be taken along the perimeter of the structure or pavement within the TPZ. Non-destructive excavation techniques may include the use of hand-held implements, air pressure (using an Air-spade® device) or water pressure. The exploratory excavation shall be undertaken along the perimeter of the foundation or pavement (within the TPZ) to the depth of the foundation or to a maximum of 800mm from surface levels, to locate and expose any woody roots prior to any mechanical excavation.

9.6.2 All care shall be undertaken to preserve woody roots intact and undamaged during exploratory excavation. Any roots encountered of less than 50mm in diameter may be cleanly severed with clean sharp pruning implements at the face of the excavation. The root zone in the vicinity of the excavation shall be kept moist following excavation for the duration of construction to minimise moisture stress on the tree. Where large woody roots (greater than 50mm diameter) are encountered during exploratory excavations, further advice from a qualified arborist shall be sought prior to severance.

9.6.3 Where necessary, (to avoid severing large woody roots) consideration should be given to the installation of an elevated structure (e.g. pier and beam footing, suspended slab or floor supported on piers, cantilevered slab, up-turned edge beam etc) in preference to structures requiring a deep edge beam or continuous perimeter strip footing. The beam section of any pier and beam footing

should be placed **above** grade to avoid excavation within the SRZ. Pier footings intersecting large woody roots should be slightly offset where necessary to avoid root severance.

9.6.4 For masonry walls or fences it may be acceptable to delete continuous concrete strip footings and replace with suspended in-fill panels (eg steel or timber pickets, lattice etc) fixed to pillars. For paved areas, consideration should be given to raising the proposed pavement level and using a porous fill material in preference to excavation where large woody roots are found within the sub-base.

9.7 Underground Services

9.7.1 All proposed stormwater lines and other underground services should be located outside TPZs of trees proposed to be retained wherever possible or installed by alternative measures. Alternative measures include suspending pipelines beneath the floor of a building or structure (to avoid excavation with the TPZ), non-destructive excavation methods or Horizontal Directional Drilling (HDD). Where the installation of service lines within TPZs is unavoidable, the pipelines or conduits should be installed as follows.

9.7.2 Trenching for underground services and stormwater pipes within the TPZs of Trees [**any tree nominated for retention**], shall be undertaken using non-destructive excavation in accordance with **Section 10.6**. Where large woody roots are encountered during excavation or trenching (root diameter greater than 50mm), these shall be retained intact wherever possible (e.g. by tunnelling beneath roots and inserting the pipeline or conduit beneath or re-routing the service etc). Where this is not practical and root pruning is the only alternative, proposed root pruning should be assessed by a qualified arborist [AQF 5] to evaluate the potential impact on the health and stability of the subject tree.

9.7.3 Installation of underground services and stormwater pipes within the SRZs of Trees [**any tree nominated for retention**], shall only be undertaken by Horizontal Directional Drilling (HDD) (also referred to as sub-surface boring or Micro-tunnelling for large diameter pipes). The Invert Level of the pipe, plus the pipe diameter, must be lower than the estimated root zone depth as specified. At this site a minimum depth of 1 metre to the invert level of the pipe is specified.

9.8 Pavements

9.8.1 Proposed paved areas within the TPZs of Trees [**T26, T27 & T28**] shall be placed at or slightly above grade where possible to minimise excavations within the root zone and avoid severance and damage of woody roots. The pavement sub-base material should be supplied and installed in accordance with **Section 10.10**.

9.9 Pavement Sub-base

9.9.1 Pavement sub-base material within TPZs of trees [**T26, T27 & T28**] shall be a coarse, gap-graded material such as 20 – 50mm crushed basalt (Blue Metal) or equivalent no-fines gravel material to provide some aeration and moisture permeation to the root zone. Note that road base or crushed sandstone or other similar material containing a high percentage of fines is unacceptable for this purpose. The fill material should be consolidated using a non-vibrating roller or similar to minimise compaction of the underlying soil. A permeable geotextile may be used beneath the sub-base to prevent migration of the stone into the sub-grade and provide greater load capacity.

9.10 Placement of Fill Material

9.10.1 Placement of fill material within the TPZs of Trees [**any tree within the site nominated for retention**] should be avoided wherever possible. Where placement of fill is unavoidable, the

material shall be a well-drained friable material, equivalent in texture to the existing site topsoil material. The fill should be free from rocks, vegetation and other extraneous material complying with AS 4419:2003 (*Soils for Landscaping and Garden Use*).

9.10.2 The fill may be lightly consolidated, but shall not be compacted to engineering standards. No fill material should be placed in direct contact with the trunk.

9.10.3 Plant and equipment used to place and spread fill material should be stationed outside the TPZ where possible. Where not possible, suitable ground protection should be installed in accordance with **Section 10.14** to avoid compaction of the underlying soil profile and root zone.

9.11 Canopy & Root Pruning

9.11.1 Where root pruning of [**any tree nominated for retention**] is required to facilitate construction, roots shall be severed with clean, sharp pruning implements and retained in a moist condition during the construction phase using Hessian material or mulch where practical. Severed roots shall be treated with a suitable root growth hormone containing the active constituents Indol-3-yl-Butric Acid (IBA) and 1-Naphthylacetic Acid (NAA) to stimulate rapid regeneration of the root system. Root pruning (where required) shall be carried out in accordance with Australian Standard 4373-2007 – *Pruning of Amenity Trees*. All pruning work shall be carried out by a qualified and experienced arborist or tree surgeon [Australian Qualification Framework Level 3] in accordance with the NSW WorkCover Code of Practice for the Amenity Tree Industry (1998). No roots of greater than 50mm in diameter should be removed or pruned without further advice from a Consulting Arborist [Australian Qualification Framework Level 5].

9.12 Tree Damage

9.12.1 Care shall be taken when operating cranes, drilling rigs and similar equipment near trees to avoid damage to tree canopies (foliage and branches). Under no circumstances shall branches be torn-off by construction equipment. Where there is potential conflict between tree canopy and construction activities, the advice of the Site Arborist must be sought.

9.12.2 In the event of any tree becoming damaged for any reason during the construction period a consulting arborist [Australian Qualification Framework Level 5] shall be engaged to inspect and provide advice on any remedial action to minimise any adverse impact. Such remedial action shall be implemented as soon as practicable and certified by the arborist.

9.13 Tree Removal

9.13.1 The removal of Trees [**any tree within the site nominated for removal**] shall be carried out by an experienced tree surgeon in accordance with the NSW WorkCover Code of Practice for the Amenity Tree Industry (1998). Care shall be taken to avoid damage to other trees during the felling operation.

9.13.2 Stumps located within the TPZs of trees to be retained shall be grubbed-out where required using a mechanical stump grinder (or by hand where less than 150mm in diameter) without damage to the root system of other trees. Where trees to be removed are within the SRZ of any trees to be retained, consideration should be given to cutting the stump close to ground level and retaining the root crown intact. Stumps within the Tree Protection Zone of other trees to be retained shall **not** be pulled out using excavation equipment or similar.

9.14 Ground Protection

9.14.1 Construction haul routes shall be confined to existing paved areas wherever possible. Where this is not feasible and construction haul routes or access for plant and equipment must traverse soft landscape areas within TPZs of [**any tree nominated for retention**], 20mm thick marine ply sheets or truck mats (such as Envirex Versadeck® access mats) (refer **Figure 6** shall be placed over the top of the ground surface to minimise compaction and disturbance of the underlying soil profile and root zone.

Figure 6 – Showing typical detail for truck mats.

9.14.2 Ground protection shall be installed prior to any site works and maintained in good condition for the duration of the construction period. On completion of the works, ground protection shall be removed without damage or disturbance to the underlying soil profile.

10 REPLACEMENT PLANTING

10.1.1 In order to compensate for loss of amenity resulting from the removal of trees to accommodate the proposed development, a minimum number of ten (10) new trees capable of attaining a height of at least ten (10) metres at maturity should be planted within the allotment.

10.1.2 Replacement trees should preferably include some locally indigenous species. These will be most appropriate to the site conditions and be most valuable in terms of preserving the landscape character and wildlife habitat of the area. The following species are appropriate to the site conditions and could be considered for replacement planting:-

- *Ficus rubiginosa* (Port Jackson Fig)
- *Ficus coronata* (Sandpaper Fig)
- *Syzygium paniculatum* (Magenta Cherry)
- *Acmena smithii* (Lillypilly)
- *Glochidion ferdinandi* (Cheese Tree)
- *Syncarpia glomulifera* (Turpentine)
- *Eucalyptus umbra* (Bastard Mahogany),

- *Angophora costata* (Sydney Red Gum),
- *Corymbia maculata* (Spotted Gum)
- *Allocasuarina torulosa* (Forest Oak)
- *Livistona australis* (Cabbage Tree Palm).

10.1.3 The landscape plan prepared by Dangar Barin Smith indicates 10 new trees to be planted within the site in compliance with these recommendations, including 3 x Sydney Red Gums, 2 x Turpentines and 5 x Cabbage Tree Palms.

Andrew Morton
EARTHSCAPE HORTICULTURAL SERVICES
28th February 2019

11 REFERENCES

[1] Chapman, G.A. & Murphy, C. L. (1989)
Soil Landscapes of the Sydney 1:100,000 Sheet
Soil Conservation Service of NSW. Sydney

[2] Benson, Doug & Howell, Jocelyn (1990)
Taken for Granted: the Bushland of Sydney and its Suburbs.
Kangaroo Press & The Royal Botanic Gardens, Sydney, NSW

[3] Pittwater Council
Native Plants for your Garden
Pittwater Council

[4] Mattheck, Dr. Claus & Breloer, Helge (1994) – Sixth Edition (2001)
The Body Language of Trees – A Handbook for Failure Analysis
The Stationery Office, London, England

[5] Barrell, Jeremy (1996)
Pre-development Tree Assessment
Proceedings of the International Conference on Trees and Building Sites (Chicago)
International Society of arboriculture, Illinois, USA

[6] Council of Standards Australia (August 2009)
AS 4970 – 2009 – Protection of Trees on Development Sites
Standards Australia, Sydney

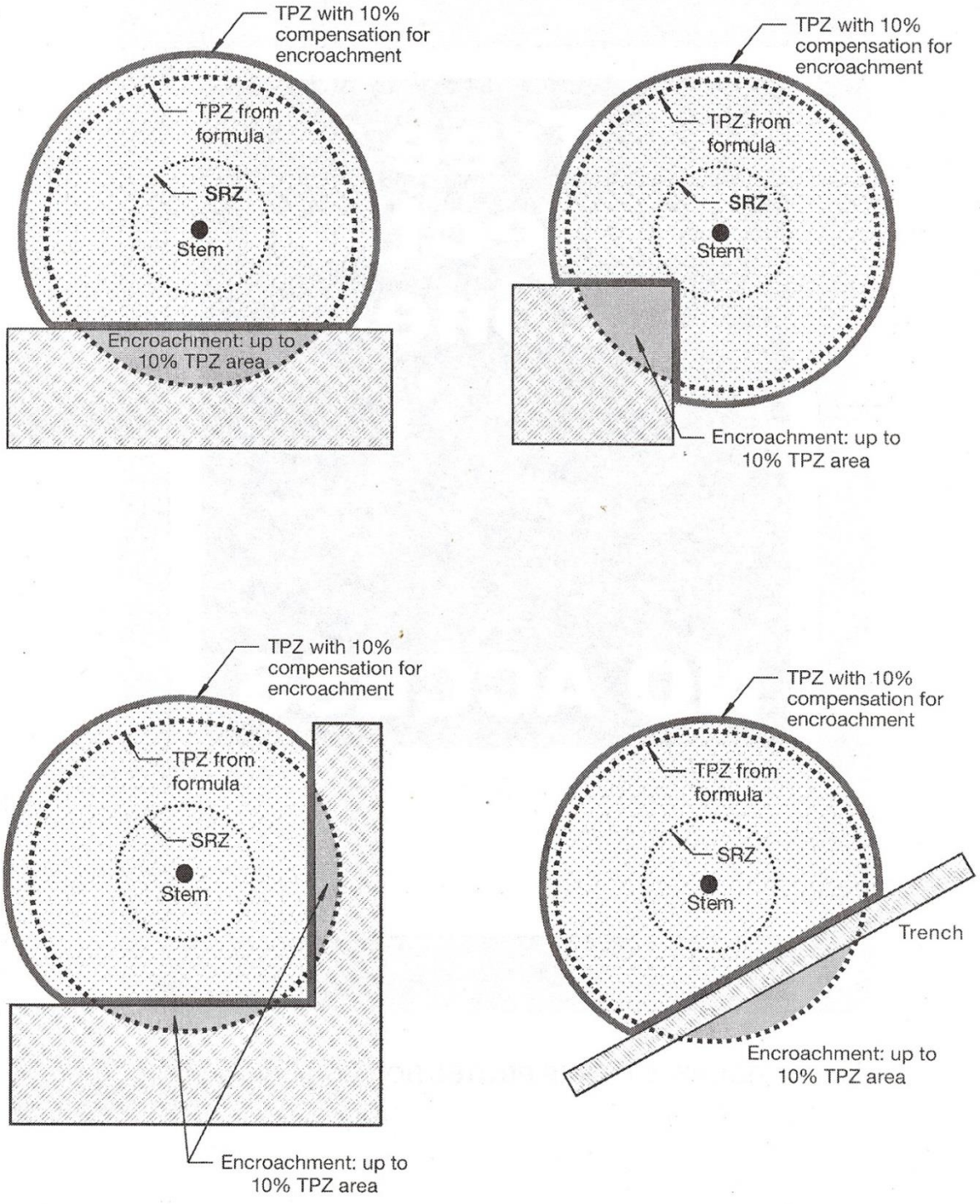
APPENDIX 1 - CRITERIA FOR ASSESSMENT OF LANDSCAPE SIGNIFICANCE

RATING	HERITAGE VALUE	ECOLOGICAL VALUE	AMENITY VALUE
1. SIGNIFICANT	The subject tree is listed as a Heritage Item under the Local Environment Plan (LEP) with a local, state or national level of significance or is listed on Council's Significant Tree Register	The subject tree is scheduled as a Threatened Species as defined under the Threatened Species Conservation Act 1995 (NSW) or the Environmental Protection and Biodiversity Conservation Act 1999	The subject tree has a very large live crown size exceeding 300m² with normal to dense foliage cover, is located in a visually prominent position in the landscape, exhibits very good form and habit typical of the species
	The subject tree forms part of the curtilage of a Heritage Item (building /structure /artefact as defined under the LEP) and has a known or documented association with that item	The tree is a locally indigenous species, representative of the original vegetation of the area and is known as an important food, shelter or nesting tree for endangered or threatened fauna species	The subject tree makes a significant contribution to the amenity and visual character of the area by creating a sense of place or creating a sense of identity
	The subject tree is a Commemorative Planting having been planted by an important historical person (s) or to commemorate an important historical event	The subject tree is a Remnant Tree, being a tree in existence prior to development of the area	The tree is visually prominent in view from surrounding areas, being a landmark or visible from a considerable distance.
2. VERY HIGH	The tree has a strong historical association with a heritage item (building/structure/artefact/garden etc) within or adjacent the property and/or exemplifies a particular era or style of landscape design associated with the original development of the site.	The tree is a locally-indigenous species, representative of the original vegetation of the area and is a dominant or associated canopy species of an Endangered Ecological Community (EEC) formerly occurring in the area occupied by the site.	The subject tree has a very large live crown size exceeding 200m²; a crown density exceeding 70% (normal-dense), is a very good representative of the species in terms of its form and branching habit or is aesthetically distinctive and makes a positive contribution to the visual character and the amenity of the area
3. HIGH	The tree has a suspected historical association with a heritage item or landscape supported by anecdotal or visual evidence	The tree is a locally-indigenous species and representative of the original vegetation of the area and the tree is located within a defined Vegetation Link / Wildlife Corridor or has known wildlife habitat value	The subject tree has a large live crown size exceeding 100m²; The tree is a good representative of the species in terms of its form and branching habit with minor deviations from normal (e.g. crown distortion/suppression) with a crown density of at least 70% (normal); The subject tree is visible from the street and surrounding properties and makes a positive contribution to the visual character and the amenity of the area
4. MODERATE	The tree has no known or suspected historical association, but does not detract or diminish the value of the item and is sympathetic to the original era of planting.	The subject tree is a non-local native or exotic species that is protected under the provisions of this DCP.	The subject tree has a medium live crown size exceeding 40m²;The tree is a fair representative of the species, exhibiting moderate deviations from typical form (distortion/suppression etc) with a crown density of more than 50% (thinning to normal); and
			The tree is visible from surrounding properties, but is not visually prominent – view may be partially obscured by other vegetation or built forms. The tree makes a fair contribution to the visual character and amenity of the area.
5. LOW	The subject tree detracts from heritage values or diminishes the value of a heritage item	The subject tree is scheduled as exempt (not protected) under the provisions of this DCP due to its species, nuisance or position relative to buildings or other structures.	The subject tree has a small live crown size of less than 40m² and can be replaced within the short term (5-10 years) with new tree planting
6. VERY LOW	The subject tree is causing significant damage to a heritage Item.	The subject tree is listed as an Environment Weed Species in the relevant Local Government Area, being invasive, or is a known nuisance species.	The subject tree is not visible from surrounding properties (visibility obscured) and makes a negligible contribution or has a negative impact on the amenity and visual character of the area. The tree is a poor representative of the species, showing significant deviations from the typical form and branching habit with a crown density of less than 50% (sparse).
7. INSIGNIFICANT	The tree is completely dead and has no visible habitat value	The tree is a declared Noxious Weed under the Noxious Weeds Act (NSW) 1993 within the relevant Local Government Area.	The tree is completely dead and represents a potential hazard.

Ref:- Morton, A (2006) **Determining the Retention Value of Trees on Development Sites**

TreeNet - Proceedings of the 7th National Street Tree Symposium 2006 Government of South Australia Department for Transport, Energy and Infrastructure

APPENDIX 2 – ACCEPTABLE INCURSIONS TO THE TREE PROTECTION ZONE (TPZ)



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

REF:- Council of Standards Australia (August 2009)
AS 4970 – 2009 – Protection of Trees on Development Sites
Standards Australia, Sydney

APPENDIX 3 - TREE HEALTH AND CONDITION ASSESSMENT SCHEDULE

Tree Identification No.	Species	Height (m)	Spread (m)	Trunk Diameter (mm)	Live Crown Size (m^2)	Maturity Class	Condition	Previous Pruning	Health		Remaining Safe Useful Life Expectancy (SULE)	Landscape Significance Rating	Retention Value	Location
									Vigour	Pest & Disease				
1	***Melaleuca armillaris*** (Bracelet Honey Myrtle)	4	6	400	0	OM	Stability suspect with poor branching structure. Exhibits a very prominent lean to the north. Growing in horizontal plane from rock face. Crown suppressed south side due crowding.	No Evidence	Dead	No Evidence	Nil	7	Very Low	Adjoining property
2a	***Brachychiton acerifolius*** (Illawarra Flame Tree)	6	4	180	16	SM	Appears stable with poor branching structure. Exhibits multiple elite epicormic sprouts arising from old pruning wound.	Previously topped at 3 metres (crown restored)	Very Good	No Evidence	Short 5-15 Years	6	Very Low	Adjoining property
3	***Pittosporum undulatum*** (Native Daphne)	4	5	220	15	OM	Appears stable with fair branching structure. Exhibits a prominent lean to the north-east. Multiple moderate wounds to PLs & SLs due branch loss (borer damage). 70% deadwood.	No Evidence	Poor with sparse crown	Moderate Pittosporum Borer infestation	Transient (less than 5 years)	6	Very Low	Adjoining property
4	***Strelitzia nicolai*** (Giant White Bird of Paridise)	9	9	150x20	81	M	Appears stable with sound branching structure.	No Evidence	Good	No Evidence	Long - more than 40 years	4	Moderate	Adjoining property
4a	***Casuarina cunninghamiana*** (River Oak)	6	7	200	35	SM	Appears stable with sound branching structure. Some dieback with 10% deadwood. Crown suppressed on south-west side due crowding.	No Evidence	Fair with slightly thinning crown	No Evidence	Medium 15-40 Years	5	Low	Adjoining property
5	***Glochidion ferdinandi*** (Cheese Tree)	6	6	200 + 120	36	SM	Appears stable with sound branching structure.	No Evidence	Fair with slightly thinning crown	Moderate foliar insect infestation.	Medium 15-40 Years	4	Moderate	Adjoining property
6	***Pittosporum undulatum*** (Native Daphne)	4	4	250	0	OM	Stability suspect with poor branching structure.	No Evidence	Dead	No Evidence	Nil	7	Very Low	Adjoining property
7	***Eucalyptus umbra*** (Bastard Mahogany)	4	3	150	0	I	Stability suspect with poor branching structure.	No Evidence	Dead	No Evidence	Nil	7	Very Low	Adjoining property
8	***Pittosporum undulatum*** (Native Daphne)	4	2	80	8	I	Appears stable with sound branching structure.	No Evidence	Fair	No Evidence	Short 5-15 Years	6	Very Low	Adjoining property
9	***Syncarpia glomulifera*** (Turpentine)	8	9	330 + 270	54	M	Appears stable with sound branching structure. Exhibits some dieback with 20% deadwood.	No Evidence	Fair with thinning crown	No Evidence	Short 5-15 Years	4	Low	Adjoining property

APPENDIX 3 - TREE HEALTH AND CONDITION ASSESSMENT SCHEDULE

Tree Identification No.	Species	Height (m)	Spread (m)	Trunk Diameter (mm)	Live Crown Size (m^2)	Maturity Class	Condition	Previous Pruning	Health		Remaining Safe Useful Life Expectancy (SULE)	Landscape Significance Rating	Retention Value	Location
									Vigour	Pest & Disease				
9a	***Glochidion ferdinandi*** (Cheese Tree)	6	6	200	36	M	Appears stable with sound branching structure.	No Evidence	Good	No Evidence	Long - more than 40 years	4	**Moderate**	Nature strip
10	***Casuarina cunninghamiana*** (River Oak)	12	7	350	0	OM	Stability suspect with poor branching structure.	No Evidence	Dead	No Evidence	Nil	7	**Very Low**	Adjoining property
11a	***Glochidion ferdinandi*** (Cheese Tree)	4	4	200	16	SM	Stability suspect with poor branching structure. Exhibits a very prominent lean to the east. Multiple moderate bark inclusions at GL.	No Evidence	Fair with thinning crown	Moderate foliar insect infestation	Short 5-15 Years	6	**Very Low**	Nature strip
11b	***Glochidion ferdinandi*** (Cheese Tree)	5	5	200	25	SM	Appears stable with poor branching structure. Exhibits multiple elite epicormic sprouts at 1.5 metres.	No Evidence	Fair with thinning crown	Moderate foliar insect infestation	Short 5-15 Years	5	**Low**	Nature strip
12	***Melaleuca styphelioides*** (Prickly Paperbark)	7	5	200	15	SM	Appears stable with fair branching structure. Exhibits some dieback with 20% deadwood. Crown suppressed east side due sea breeze.	No Evidence	Fair with thinning crown	No Evidence	Short 5-15 Years	5	**Low**	Adjoining property
13	***Pittosporum undulatum*** (Native Daphne)	5	3	220	15	OM	Stability suspect with poor branching structure. Exhibits a very prominent lean to the west.	No Evidence	Dead	No Evidence	Nil	7	**Very Low**	Adjoining property
14	***Macrozamia communis*** (Burrawang)	1.5	2	200	3	M	Appears stable with sound branching structure.	No Evidence	Very Good	No Evidence	Long - more than 40 years	5	**Moderate**	Adjoining property
15	***Pittosporum undulatum*** (Native Daphne)	5	4	180	20	M	Appears stable with fair branching structure. Exhibits a prominent lean to the east (self-corrected). Exhibits some dieback with 10% deadwood.	Selectively pruned	Fair with thinning crown	No Evidence	Short 5-15 Years	6	**Very Low**	Adjoining property
16	***Cupressus macrocarpa*** **'Aurea'** (Golden Monterey Cypress)	18	14	600	238	OM	Stability suspect with poor branching structure. Exhibits multiple large wounds due previous branch loss (included bark). Substantial dieback in upper crown with 60% deadwood.	Selectively pruned & dead wooded	Poor with sparse crown	No Evidence	Transient (less than 5 years)	6	**Very Low**	On-site
17	***Eucalyptus umbra*** (Bastard Mahogany)	7	5	190 + 220	0	M	Appears stable with sound branching structure. Crown suppressed west side due crowding. Severe dieback with 90% deadwood.	No Evidence	Poor with sparse crown	Severe Possum defoliation	Transient (less than 5 years)	4	**Low**	Adjoining property

PL = Primary Limb; SL = Secondary Limb;
TL = Tertiary Limb. GL = Ground Level

APPENDIX 3 - TREE HEALTH AND CONDITION ASSESSMENT SCHEDULE

Tree Identification No.	Species	Height (m)	Spread (m)	Trunk Diameter (mm)	Live Crown Size (m^2)	Maturity Class	Condition	Previous Pruning	Health		Remaining Safe Useful Life Expectancy (SULE)	Landscape Significance Rating	Retention Value	Location
									Vigour	Pest & Disease				
18	***Eucalyptus umbra*** (Bastard Mahogany)	8	7	318	42	M	Appears stable with sound branching structure. Exhibits a very prominent lean to the south. Crown suppressed east side due crowding. Substantial dieback with 80% deadwood & 5% epicormic growth.	No Evidence	Poor with sparse crown	Severe Possum defoliation	Transient (less than 5 years)	4	**Low**	Adjoining property
19	***Podocarpus elatus*** (Brown Pine)	6	5	180	30	I	Appears stable with sound branching structure. Crown suppressed north-east side due salt laden winds. Minor dieback with 5% deadwood.	No Evidence	Fair with slightly thinning crown	No Evidence	Long - more than 40 years	5	**Moderate**	Adjoining property
19a	***Ficus rubiginosa*** (Port Jackson Fig)	4	4	240	16	I	Appears stable with sound branching structure.	No Evidence	Good	No Evidence	Long - more than 40 years	5	**Moderate**	Adjoining property
20	***Eucalyptus umbra*** (Bastard Mahogany)	5	6	120	30	I	Stability suspect with sound branching structure. Exhibits a prominent lean to the south-west. Crown suppressed north-east side due salt laden winds. Growing on rock outcrop - roots absent east side. Exhibits some dieback with 30% deadwood.	No Evidence	Fair with thinning crown	No Evidence	Short 5-15 Years	5	**Low**	Adjoining property
20a	***Eucalyptus umbra*** (Bastard Mahogany)	7	4	180	24	SM	Appears stable with sound branching structure. Exhibits some dieback with 40% deadwood and 10% epicormic growth.	No Evidence	Fair with thinning crown	No Evidence	Medium 15-40 Years	4	**Moderate**	Adjoining property
21	***Banksia serrata*** (Old Man Banksia)	6	5	200	30	M	Appears stable with sound branching structure. Exhibits a prominent lean to the north-east. Crown suppressed on the south-west side. Exhibits some dieback with 10% deadwood.	No Evidence	Fair with thinning crown	No Evidence	Short 5-15 Years	4	**Low**	Nature strip
21a	***Cotoneaster sp.*** (Cotoneaster)	4	8	110x4 + 200	32	M	Appears stable with sound branching structure.	Selectively pruned	Good	No Evidence	Short 5-15 Years	6	**Very Low**	On-site
22	***Allocasuarina littoralis*** (Black She-oak)	9	5	200	35	M	Appears stable with sound branching structure. Exhibits some dieback with 20% deadwood.	No Evidence	Fair with thinning crown	No Evidence	Medium 15-40 Years	4	**Moderate**	Nature strip

APPENDIX 3 - TREE HEALTH AND CONDITION ASSESSMENT SCHEDULE

Tree Identification No.	Species	Height (m)	Spread (m)	Trunk Diameter (mm)	Live Crown Size (m^2)	Maturity Class	Condition	Previous Pruning	Health		Remaining Safe Useful Life Expectancy (SULE)	Landscape Significance Rating	Retention Value	Location
									Vigour	Pest & Disease				
23	***Allocasuarina littoralis*** (Black She-oak)	8	4	200	0	M	Stability suspect with sound branching structure. Exhibits a prominent lean to the east. Located on a narrow sandstone terrace.	No Evidence	Dead	No Evidence	Nil	7	**Very Low**	Nature strip
24	***Cupressus macrocarpa* 'Brunniana Aurea'** (Golden Brunnings Cypress)	12	6	350	60	M	Appears stable with fair branching structure. Exhibits multiple moderate bark inclusions at 0.5 metres. 5% deadwood.	Crown lifted to 2 metres	Good	No Evidence	Medium 15-40 Years	6	**Low**	Nature strip
24a	***Cotoneaster sp.*** (Cotoneaster)	4	6	200	24	M	Stability suspect with sound branching structure. Located on edge of sandstone cliff.	No Evidence	Good	No Evidence	Short 5-15 Years	6	**Very Low**	Nature strip
25	***Syncarpia glomulifera*** (Turpentine)	13	8	400	88	M	Appears stable with sound branching structure.	No Evidence	Good	No Evidence	Long - more than 40 years	3	**High**	On-site
26	***Syncarpia glomulifera*** (Turpentine)	9	6	250	54	M	Appears stable with sound branching structure. Main leader suppressed/distorted due conflict with T27.	No Evidence	Good	No Evidence	Medium 15-40 Years	4	**Moderate**	On-site
27	***Eucalyptus saligna*** (Sydney Blue Gum)	18	15	538	225	M	Appears stable with sound branching structure. Growing in rock cleft. Multiple large woody surface roots visible for 4 metres radius. Roots absent NE side due to rock. Minor dieback in upper crown due to salt laden winds.	No Evidence	Good	No Evidence	Long - more than 40 years	3	**High**	On-site
28	***Eucalyptus umbra*** (Bastard Mahogany)	12	6	300	42	M	Appears stable with sound branching structure. Prominent lean to the NW. Crown suppressed on the east due to salt laden winds. Exhibits substantial dieback with 50% deadwood and 10% epicormic growth.	No Evidence	Fair with thinning crown	No Evidence	Short 5-15 Years	4	**Low**	On-site
29	***Agonis flexuosa*** (WA Willow Myrtle)	10	7	255	56	SM	Appears stable with poor branching structure. Exhibits a prominent lean to the east over house. Crown suppressed on the south-west side. Severe bark inclusion at 3.5 metres at junction of co-dominant PLs.	No Evidence	Good	No Evidence	Short 5-15 Years	4	**Low**	On-site

APPENDIX 3 - TREE HEALTH AND CONDITION ASSESSMENT SCHEDULE

Tree Identification No.	Species	Height (m)	Spread (m)	Trunk Diameter (mm)	Live Crown Size (m^2)	Maturity Class	Condition	Previous Pruning	Health		Remaining Safe Useful Life Expectancy (SULE)	Landscape Significance Rating	Retention Value	Location
									Vigour	Pest & Disease				
29a	***Acacia floribunda*** (Sally Wattle)	7	4	140	20	SM	Appears stable with sound branching structure. Exhibits some dieback with 20% deadwood.	No Evidence	Fair with thinning crown	No Evidence	Short 5-15 Years	5	Low	On-site
29b	***Acacia floribunda*** (Sally Wattle)	6	5	140	20	SM	Stability suspect with sound branching structure. Exhibits some dieback with 20% deadwood. Very prominent lean to the SE Crown suppress on the NW side due overshadowing.	No Evidence	Fair with thinning crown	No Evidence	Short 5-15 Years	5	Low	On-site
30	***Casuarina cunninghamiana*** (River Oak)	15	14	550	168	M	Appears stable with sound branching structure. Growing on a narrow sandstone terrace. Exhibits moderate dieback with 30% deadwood (salt laden winds).	Selectively pruned	Fair with thinning crown	No Evidence	Short 5-15 Years	3	Moderate	Nature strip
31	***Eucalyptus scias*** (Large-fruited Red Mahogany)	15	10	400	90	M	Appears stable with sound branching structure. Exhibits a prominent lean to the north-west. Some dieback on south-east side due salt laden winds with 10% deadwood.	No Evidence	Good	No Evidence	Long - more than 40 years	3	High	On-site
31a	***Eucalyptus umbra*** (Bastard Mahogany)	10	6	223	42	SM	Appears stable with sound branching structure. Exhibits a prominent lean to the east. Crown suppressed on west side due to crowding. Exhibits some dieback with 15% deadwood.	No Evidence	Fair with thinning crown	No Evidence	Medium 15-40 Years	4	Moderate	On-site
32	***Pittosporum undulatum*** (Native Daphne)	6	5	170	25	SM	Appears stable with sound branching structure. Exhibits moderate dieback with 30% deadwood.	No Evidence	Fair with thinning crown	No Evidence	Short 5-15 Years	6	Very Low	On-site
33	***Casuarina cunninghamiana*** (River Oak)	15	9	330	99	M	Appears stable with fair branching structure. Exhibits some dieback with 15% deadwood.	No Evidence	Fair with slightly thinning crown	No Evidence	Short 5-15 Years	3	Moderate	On-site
34	***Casuarina cunninghamiana*** (River Oak)	12	5	255	50	M	Appears stable with sound branching structure. Exhibits substantial dieback with 50% deadwood (salt laden winds).	No Evidence	Fair with thinning crown	No Evidence	Short 5-15 Years	4	Low	On-site
34a	***Ficus rubiginosa*** (Port Jackson Fig)	5	4	100 + 80	20	I	Appears stable with sound branching structure.	No Evidence	Good	No Evidence	Long - more than 40 years	5	Moderate	On-site

APPENDIX 3 - TREE HEALTH AND CONDITION ASSESSMENT SCHEDULE

Tree Identification No.	Species	Height (m)	Spread (m)	Trunk Diameter (mm)	Live Crown Size (m^2)	Maturity Class	Condition	Previous Pruning	Health		Remaining Safe Useful Life Expectancy (SULE)	Landscape Significance Rating	Retention Value	Location
									Vigour	Pest & Disease				
34b	***Glochidion ferdinandi*** (Cheese Tree)	6	5	170	20	SM	Appears stable with sound branching structure.	No Evidence	Good	No Evidence	Long - more than 40 years	5	**Moderate**	On-site
34c	***Banksia integrifolia*** (Coast Banksia)	6	4	160	24	SM	Appears stable with sound branching structure. Exhibits a prominent lean to the east (self-corrected).	No Evidence	Good	No Evidence	Long - more than 40 years	5	**Moderate**	On-site
35	***Strelitzia nicolai*** (Giant White Bird of Paridise)	6	6	150x7	36	SM	Appears stable with sound branching structure.	No Evidence	Very Good	No Evidence	Long - more than 40 years	5	**Moderate**	On-site
36	***Glochidion ferdinandi*** (Cheese Tree)	9	10	315	60	M	Appears stable with fair branching structure. Exhibits a prominent lean to the south-east (self-corrected). High bark inclusion at 2.5 metres. Growing within deck, close to existing dwelling.	Selectively pruned east side to clear house.	Fair with slightly thinning crown	Moderate foliar insect infestation	Medium 15-40 Years	6	**Low**	On-site
37	***Pittosporum undulatum*** (Native Daphne)	6	5	120	25	SM	Appears stable with sound branching structure.	No Evidence	Good	No Evidence	Short 5-15 Years	6	**Very Low**	On-site
38	***Allocasuarina torulosa*** (Forest Oak)	14	7	366	56	M	Appears stable with sound branching structure. Exhibits some dieback with 10% deadwood.	No Evidence	Good	No Evidence	Medium 15-40 Years	4	**Moderate**	On-site
39	***Banksia integrifolia*** (Coast Banksia)	8	7	300	0	OM	Stability suspect with poor branching structure. Exhibits a very prominent lean to the west. Crown suppressed on the east side due to overshadowing.	No Evidence	Dead	No Evidence	Nil	7	**Very Low**	On-site
40	***Glochidion ferdinandi*** (Cheese Tree)	5	5	100 + 160x2	25	M	Appears stable with poor branching structure. Exhibits multiple high bark inclusions at 0.5 metres. Prominent lean to the east. Crown suppressed on the west side due to overshadowing. 10% deadwood.	No Evidence	Fair with thinning crown	Moderate foliar insect infestation	Short 5-15 Years	5	**Low**	On-site
43	***Banksia serrata*** (Old Man Banksia)	6	5	250	20	M	Appears stable with sound branching structure. Crown suppressed om west side due to overshadowing.	No Evidence	Good	No Evidence	Long - more than 40 years	5	**Moderate**	On-site

APPENDIX 3 - TREE HEALTH AND CONDITION ASSESSMENT SCHEDULE

Tree Identification No.	Species	Height (m)	Spread (m)	Trunk Diameter (mm)	Live Crown Size (m^2)	Maturity Class	Condition	Previous Pruning	Health		Remaining Safe Useful Life Expectancy (SULE)	Landscape Significance Rating	Retention Value	Location
									Vigour	Pest & Disease				
44	***Banksia serrata*** (Old Man Banksia)	6	5	300	30	M	Stability suspect with sound branching structure. Exhibits a very prominent lean to the east. Crown suppressed on the west side due overshadowing. Some dieback with 10% deadwood.	No Evidence	Fair with slightly thinning crown	Moderate vine infestation	Short 5-15 Years	4	**Low**	On-site
45	***Banksia serrata*** (Old Man Banksia)	3	4	200	12	SM	Appears stable with sound branching structure. Exhibits a very prominent lean to the east. Crown suppressed on the west side due overshadowing.	No Evidence	Good	No Evidence	Medium 15-40 Years	6	**Low**	On-site
46	***Banksia serrata*** (Old Man Banksia)	4	5	200	20	M	Stability suspect with sound branching structure. Exhibits a very prominent lean to the east. Crown suppressed on the west side due overshadowing.	No Evidence	Good	No Evidence	Medium 15-40 Years	6	**Low**	On-site
47	***Glochidion ferdinandi*** (Cheese Tree)	5	4	160	16	SM	Appears stable with sound branching structure. Exhibits moderate dieback with 30% deadwood.	No Evidence	Fair with thinning crown	No Evidence	Short 5-15 Years	5	**Low**	On-site
48	***Banksia serrata*** (Old Man Banksia)	3	5	200	10	M	Stability suspect with sound branching structure. Growing on rock outcrop. Exhibits a very prominent lean to the north. Crown suppressed on the south side due to overshadowing. 15% deadwood.	No Evidence	Fair with slightly thinning crown	No Evidence	Short 5-15 Years	6	**Very Low**	On-site
49	***Elaeocarpus reticulatus*** (Blueberry Ash)	6	4	120 + 80	20	SM	Appears stable with sound branching structure. Crown suppressed on east side due to salt laden winds.	No Evidence	Good	No Evidence	Long - more than 40 years	5	**Moderate**	On-site
50	***Acacia sp. [melanoxylon]*** (Blackwood)	5	3	120	15	I	Appears stable with poor branching structure. Multiple epicormics at 4 metres.	Previously topped at 4 metres (crown restored)	Good	No Evidence	Medium 15-40 Years	5	**Low**	On-site
51	***Glochidion ferdinandi*** (Cheese Tree)	4	3	80	9	I	Appears stable with sound branching structure.	No Evidence	Fair with slightly thinning crown	Moderate foliar insect infestation	Medium 15-40 Years	6	**Low**	On-site
52	***Pittosporum undulatum*** (Native Daphne)	5	4	100	16	SM	Appears stable with sound branching structure. Exhibits some dieback with 10% deadwood. Exhibits a prominent lean to the north (self-corrected)	No Evidence	Fair with slightly thinning crown	No Evidence	Short 5-15 Years	6	**Very Low**	On-site

APPENDIX 3 - TREE HEALTH AND CONDITION ASSESSMENT SCHEDULE

Tree Identification No.	Species	Height (m)	Spread (m)	Trunk Diameter (mm)	Live Crown Size (m^2)	Maturity Class	Condition	Previous Pruning	Health		Remaining Safe Useful Life Expectancy (SULE)	Landscape Significance Rating	Retention Value	Location
									Vigour	Pest & Disease				
53	***Pittosporum undulatum*** (Native Daphne)	5	4	100	16	SM	Appears stable with sound branching structure. Exhibits some dieback with 10% deadwood. Exhibits a prominent lean to the north (self-corrected)	No Evidence	Fair with slightly thinning crown	No Evidence	Short 5-15 Years	6	Very Low	On-site
54	***Pittosporum undulatum*** (Native Daphne)	5	4	100	16	SM	Appears stable with sound branching structure. Exhibits some dieback with 10% deadwood.	No Evidence	Fair with slightly thinning crown	No Evidence	Short 5-15 Years	6	Very Low	On-site
55	***Ficus rubiginosa*** (Port Jackson Fig)	6	7	200	42	SM	Appears stable with sound branching structure. Growing on rock outcrop.	No Evidence	Good	No Evidence	Long - more than 40 years	5	Moderate	On-site
56	***Eucalyptus sp.*** (Gum)	12	7	250	56	SM	Appears stable with sound branching structure. Crown suppressed on NE side due to salt burn. Exhibits moderate dieback with 30% deadwood.	No Evidence	Fair with thinning crown	No Evidence	Short 5-15 Years	4	Low	On-site
57	***Eucalyptus umbra*** (Bastard Mahogany)	7	8	250	48	SM	Appears stable with sound branching structure. Exhibits some dieback with 20% deadwood.	No Evidence	Fair with slightly thinning crown	No Evidence	Medium 15-40 Years	4	Moderate	On-site
58	***Acacia sp.*** (Wattle)	5	6	120x3	30	M	Appears stable with sound branching structure.	No Evidence	Good	No Evidence	Medium 15-40 Years	5	Low	On-site
58a	***Pittosporum undulatum*** (Native Daphne)	4	4	100x2	16	SM	Appears stable with sound branching structure.	No Evidence	Good	No Evidence	Short 5-15 Years	6	Low	On-site
59	***Cyathea cooperi*** (Rough Tree Fern)	4	3	100	6	M	Appears stable with sound branching structure.	No Evidence	Fair with thinning crown	No Evidence	Medium 15-40 Years	5	Low	Nature strip
60	***Glochidion ferdinandi*** (Cheese Tree)	5	3	100	15	SM	Appears stable with sound branching structure.	No Evidence	Good	No Evidence	Long - more than 40 years	5	Moderate	On-site
61	***Acacia sp.*** (Wattle)	4	3	100	9	SM	Appears stable with sound branching structure.	No Evidence	Very Good	No Evidence	Long - more than 40 years	5	Moderate	Nature strip

APPENDIX 3 - TREE HEALTH AND CONDITION ASSESSMENT SCHEDULE

Tree Identification No.	Species	Height (m)	Spread (m)	Trunk Diameter (mm)	Live Crown Size (m^2)	Maturity Class	Condition	Previous Pruning	Health		Remaining Safe Useful Life Expectancy (SULE)	Landscape Significance Rating	Retention Value	Location
									Vigour	Pest & Disease				
62	***Banksia serrata*** (Old Man Banksia)	6	4	300	24	M	Stability suspect with sound branching structure. Exhibits a very prominent lean to the east. Crown suppressed on the west side due overshadowing. Some dieback with 10% deadwood.	No Evidence	Fair with thinning crown	No Evidence	Short 5-15 Years	4	**Low**	Nature strip

PL = Primary Limb; SL = Secondary Limb;
TL = Tertiary Limb. GL = Ground Level

APPENDIX 4 - IMPACT ASSESSMENT SCHEDULE

Tree Identification No.	Species	Construction Tolerance	Tree Protection Zone (m R)	Structural Root Zone (m R)	TPZ (m^2)	Incursions To Root Zone &/or Canopy	Likely Impact	Recommendation
1	***Melaleuca armillaris*** (Bracelet Honey Myrtle)	P	4.8	2.3	72.3	No proposed works within TPZ.	No adverse impact.	To be retained - no special tree protection measures required.
2a	***Brachychiton acerifolius*** (Illawarra Flame Tree)	M	2.2	1.6	14.6	No proposed works within TPZ.	No adverse impact.	To be retained - no special tree protection measures required.
3	***Pittosporum undulatum*** (Native Daphne)	M	2.6	1.8	21.9	No proposed works within TPZ.	No adverse impact.	To be retained - no special tree protection measures required.
4	***Strelitzia nicolai*** (Giant White Bird of Paridise)	G	4.8	2.3	72.3	No proposed works within TPZ.	No adverse impact.	To be retained - no special tree protection measures required.
4a	***Casuarina cunninghamiana*** (River Oak)	M	3.5	1.7	38.5	No proposed works within TPZ.	No adverse impact.	To be retained - no special tree protection measures required.
5	***Glochidion ferdinandi*** (Cheese Tree)	M	3.0	1.8	28.3	No proposed works within TPZ.	No adverse impact.	To be retained - no special tree protection measures required.
6	***Pittosporum undulatum*** (Native Daphne)	M	3.0	1.8	28.3	No proposed works within TPZ.	No adverse impact.	To be retained - no special tree protection measures required.
7	***Eucalyptus umbra*** (Bastard Mahogany)	P	1.8	1.5	10.2	No proposed works within TPZ.	No adverse impact.	To be retained - no special tree protection measures required.
8	***Pittosporum undulatum*** (Native Daphne)	M	1.5	1.1	7.1	No proposed works within TPZ.	No adverse impact.	To be retained - no special tree protection measures required.
9	***Syncarpia glomulifera*** (Turpentine)	M	5.4	2.4	91.6	No proposed works within TPZ.	No adverse impact.	To be retained - no special tree protection measures required.

APPENDIX 4 - IMPACT ASSESSMENT SCHEDULE

Tree Identification No.	Species	Construction Tolerance	Tree Protection Zone (m R)	Structural Root Zone (m R)	TPZ (m^2)	Incursions To Root Zone &/or Canopy	Likely Impact	Recommendation
9a	***Glochidion ferdinandi*** (Cheese Tree)	M	3.0	1.7	28.3	No proposed works within TPZ.	No adverse impact.	To be retained - no special tree protection measures required.
10	***Casuarina cunninghamiana*** (River Oak)	M	4.2	2.1	55.4	No proposed works within TPZ.	No adverse impact.	To be retained - no special tree protection measures required.
11a	***Glochidion ferdinandi*** (Cheese Tree)	M	2.4	1.7	18.1	No proposed works within TPZ.	No adverse impact.	To be retained - no special tree protection measures required.
11b	***Glochidion ferdinandi*** (Cheese Tree)	M	2.4	1.7	18.1	No proposed works within TPZ.	No adverse impact.	To be retained - no special tree protection measures required.
12	***Melaleuca styphelioides*** (Prickly Paperbark)	M	2.4	1.7	18.1	No proposed works within TPZ.	No adverse impact.	To be retained - no special tree protection measures required.
13	***Pittosporum undulatum*** (Native Daphne)	M	2.6	1.8	21.9	Proposed pool surround (& associated retaining wall) offset 1.9 metres south-east at RL58.50 (800mm above grade). Excavations for wall foundations within TPZ. Minor encroachment to TPZ = 6%.	Extent of encroachment to root zone is less than 10% of the TPZ, which is considered within acceptable limits under AS 4970:2009. No adverse impact.	To be retained - no special tree protection measures required.
14	***Macrozamia communis*** (Burrawang)	G	2.4	1.7	18.1	No proposed works within TPZ.	No adverse impact.	To be retained - no special tree protection measures required.
15	***Pittosporum undulatum*** (Native Daphne)	M	2.2	1.6	14.6	No proposed works within TPZ.	No adverse impact.	To be retained - no special tree protection measures required.
16	***Cupressus macrocarpa*** **'Aurea'** (Golden Monterey Cypress)	M	7.2	2.7	162.8	Located within footprint of proposed pool/pool surround.	Proposed work will necessitate removal.	Remove tree.

APPENDIX 4 - IMPACT ASSESSMENT SCHEDULE

Tree Identification No.	Species	Construction Tolerance	Tree Protection Zone (m R)	Structural Root Zone (m R)	TPZ (m^2)	Incursions To Root Zone &/or Canopy	Likely Impact	Recommendation
17	***Eucalyptus umbra*** (Bastard Mahogany)	P	3.6	2.0	40.7	No proposed works within TPZ.	No adverse impact.	To be retained - no special tree protection measures required.
18	***Eucalyptus umbra*** (Bastard Mahogany)	P	3.8	2.0	45.9	Proposed new sandstone flag pathway offset 2.6 metres south at RL? (assumed close to existing grade). Excavations for path foundations within TPZ. Minor encroachment to TPZ (<5%)	Extent of encroachment to root zone is less than 10% of the TPZ, which is considered within acceptable limits under AS 4970:2009. No adverse impact.	To be retained - no special tree protection measures required.
19	***Podocarpus elatus*** (Brown Pine)	M	3.0	1.6	28.3	No proposed works within TPZ.	No adverse impact.	To be retained - no special tree protection measures required.
19a	***Ficus rubiginosa*** (Port Jackson Fig)	M	2.9	1.8	26.0	No proposed works within TPZ.	No adverse impact.	To be retained - no special tree protection measures required.
20	***Eucalyptus umbra*** (Bastard Mahogany)	P	3.0	1.4	28.3	No proposed works within TPZ.	No adverse impact.	To be retained - no special tree protection measures required.
20a	***Eucalyptus umbra*** (Bastard Mahogany)	P	3.0	1.6	28.3	No proposed works within TPZ.	No adverse impact.	To be retained - no special tree protection measures required.
21	***Banksia serrata*** (Old Man Banksia)	M	2.5	1.7	19.6	No proposed works within TPZ.	No adverse impact.	To be retained - no special tree protection measures required.
21a	***Cotoneaster sp.*** (Cotoneaster)	M	3.6	2.0	40.7	Proposed pool surround (& associated retaining wall) offset 0.8 metres south-west at RL58.50 (3.5 metres above grade). Excavations for wall foundations within SRZ/ TPZ. Minor encroachment to TPZ = 20%.	Extent of encroachment toTPZ exceeds acceptable limits under AS 4970:2009. To be removed to accommodate new landscape works (dead tree).	Remove tree.

APPENDIX 4 - IMPACT ASSESSMENT SCHEDULE

Tree Identification No.	Species	Construction Tolerance	Tree Protection Zone (m R)	Structural Root Zone (m R)	TPZ (m^2)	Incursions To Root Zone &/or Canopy	Likely Impact	Recommendation
22	***Allocasuarina littoralis*** (Black She-oak)	M	2.5	1.7	19.6	No proposed works within TPZ.	No adverse impact.	To be retained - no special tree protection measures required.
23	***Allocasuarina littoralis*** (Black She-oak)	M	2.4	1.7	18.1	No proposed works within TPZ.	To be removed to accommodate new landscape works (dead tree).	Remove tree.
24	***Cupressus macrocarpa* 'Brunniana Aurea'** (Golden Brunnings Cypress)	M	4.2	2.1	55.4	No proposed works within TPZ.	No adverse impact.	To be retained - no special tree protection measures required.
24a	***Cotoneaster sp.*** (Cotoneaster)	M	3.0	1.7	28.3	No proposed works within TPZ.	No adverse impact.	To be retained - no special tree protection measures required.
25	***Syncarpia glomulifera*** (Turpentine)	M	4.8	2.3	72.3	Located within footprint of proposed terrace path and stairs.	Proposed works will necessitate removal. Given the position of tree within the site and the extent of work proposed within the TPZ, there are no feasible options that can be recommended that would permit the retention of this tree.	Undertake replacement planting with a new tree elsewhere within the site to compensate for loss of amenity in accordance with Section 11.
26	***Syncarpia glomulifera*** (Turpentine)	M	3.5	1.8	38.5	Proposed stepping stone path and slab stairs offset 1.9 metres east. Some disturbance required within TPZ for path and stair foundations. Potential encroachment to TPZ = 19%.	The stepping stone path & slab steps will result in some soil disturbance within TPZ, with the potential to damge woody roots. However, provided that the work is undertaken by placing the stair slabs and stonework carefully on site to avoid woody surface roots (as recommended) the proposed works will not result in any adverse impact on this tree.	Retain in accordance with recommended Tree Protection Measures (Section 10). Install Tree Protection Fence in accordance with Section 10.3. Undertake all excavations for the path and stair foundations within the TPZ in accordance with Section 10.6. Place all stonework and stair slabs with care to avoid severance or damage of any visible woody surface roots. Place pavement slightly above grade (where possible) to minimise excavation within the TPZ/SRZ in accordance with Section 10.8.

PL = Primary Limb; SL = Secondary Limb;
TL = Tertiary Limb. GL = Ground Level

APPENDIX 4 - IMPACT ASSESSMENT SCHEDULE

Tree Identification No.	Species	Construction Tolerance	Tree Protection Zone (m R)	Structural Root Zone (m R)	TPZ (m^2)	Incursions To Root Zone &/or Canopy	Likely Impact	Recommendation
27	***Eucalyptus saligna*** (Sydney Blue Gum)	P	9.0	2.6	254.3	Proposed pool surround offset 2.7 metres north-east at RL 58.50 (200-300mm below grade). Excavations for pavement sub-grade within TPZ (mostly beyond existing rock outcrop). Encroachment to TPZ = 14% (no incursion to root zone). Stepping stone path and slab stairs offset 2.8 metres east. Excavations for pavement sub-grade within TPZ.	Extent of encroachment to TPZ exceeds acceptable limits under AS 4970:2009. However the proposed pool and pool surround will not result in any actual incursion to the root zone due to the presence of an existing rock outcrop that limit root growth in these areas. The stepping stone path & slab steps will result in some soil disturbance within TPZ, with the potential to damage woody roots. However, provided that the work is undertaken by placing the stair slabs and stonework carefully on site to avoid woody surface roots (as recommended) the proposed works will not result in any adverse impact on this tree.	Retain in accordance with recommended Tree Protection Measures (Section 10). Install Tree Protection Fence in accordance with Section 10.3. Undertake all excavations for the building foundations and pavement sub-grade for the pool surround within the TPZ in accordance with Section 10.6. Place all stonework and stair slabs with care to avoid severance or damage of any visible woody surface roots. Place pavement slightly above grade (where possible) to minimise excavation within the TPZ/SRZ in accordance with Section 10.8.
28	***Eucalyptus umbra*** (Bastard Mahogany)	P	3.6	2.0	40.7	Proposed new sandstone flag pathway offset 0.4 metres south-west at RL? (assumed close to existing grade). Excavations for path foundations within TPZ/SRZ.	Extent of encroachment to TPZ exceeds acceptable limits under AS 4970:2009. Excavations for pavement sub-grade will result in some disturbance required within TPZ, with potential for root damage.	Retain in accordance with recommended Tree Protection Measures (Section 10). Undertake all excavations for the pavement sub-grade within the TPZ in accordance with Section 10.6. Place pathway slightly above grade (where possible) to minimise excavation within the TPZ/SRZ in accordance with Section 10.8.
29	***Agonis flexuosa*** (WA Willow Myrtle)	P	4.0	1.9	50.2	Located within footprint of proposed dwelling (Level 2).	Proposed work will necessitate removal.	Remove tree.
29a	***Acacia floribunda*** (Sally Wattle)	M	3.0	1.4	28.3	Located within footprint of proposed dwelling (Level 2).	Proposed work will necessitate removal.	Remove tree.

APPENDIX 4 - IMPACT ASSESSMENT SCHEDULE

Tree Identification No.	Species	Construction Tolerance	Tree Protection Zone (m R)	Structural Root Zone (m R)	TPZ (m^2)	Incursions To Root Zone &/or Canopy	Likely Impact	Recommendation
29b	***Acacia floribunda*** (Sally Wattle)	M	3.0	1.4	28.3	Located within footprint of proposed dwelling (Level 2).	Proposed work will necessitate removal.	Remove tree.
30	***Casuarina cunninghamiana*** (River Oak)	M	6.6	2.6	136.8	Proposed new pathway (& associated retaining wall) offset 5.7 metres south-west at ≈ RL55.00 (1.5 metres above grade). Excavations for retaining wall foundations within TPZ (beyond existing rock outcrop). No actual incursion to root zone.	No adverse impact.	To be retained - no special tree protection measures required.
31	***Eucalyptus scias*** (Large-fruited Red Mahogany)	P	7.0	2.3	153.9	proposed new pathway (& associated retaining wall) offset 0.6 metres south-west at ≈ RL56.10 (2.6 metres above grade). Excavations for retaining wall foundations within SRZ. Proposed basement offset 3.1 metres south-east at RL 46.50 (6.5 metres below grade). Excavations for basement within TPZ. Encroachment to TPZ = 16%. Proposed terrace 3.4 metres west and 4.9 metres souuth-west at RL 57.00 (1 to 1.3 metres above grade (within footprint of proposed paved area). Encroachment to TPZ = 32%.	Extent of encroachment to TPZ exceeds acceptable limits under AS 4970:2009. Proposed works are likely to result in an adverse impact. Given the position of tree within the site and the extent of work proposed within the TPZ, there are no feasible option that can be recommended that would permit the retention of this tree.	Undertake replacement planting with a new tree elsewhere within the site to compensate for loss of amenity in accordance with Section 11.
31a	***Eucalyptus umbra*** (Bastard Mahogany)	P	4.0	1.8	50.2	proposed new pathway (& associated retaining wall) offset 1.4 metres south-west at ≈ RL56.10 (2.6 metres above grade). Excavations for retaining wall foundations within SRZ. Proposed basement offset 2.5 metres south-east at RL 46.50 (6.5 metres below grade). Excavations for basement within TPZ. Encroachment to TPZ = 27%.	Extent of encroachment to TPZ exceeds acceptable limits under AS 4970:2009. Proposed works are likely to result in an adverse impact.	Undertake replacement planting with a new tree elsewhere within the site to compensate for loss of amenity in accordance with Section 11.
32	***Pittosporum undulatum*** (Native Daphne)	M	2.5	1.6	19.6	Located within footprint of proposed pathway.	Proposed work will necessitate removal.	Remove tree.

PL = Primary Limb; SL = Secondary Limb; TL = Tertiary Limb. GL = Ground Level

APPENDIX 4 - IMPACT ASSESSMENT SCHEDULE

Tree Identification No.	Species	Construction Tolerance	Tree Protection Zone (m R)	Structural Root Zone (m R)	TPZ (m^2)	Incursions To Root Zone &/or Canopy	Likely Impact	Recommendation
33	***Casuarina cunninghamiana*** (River Oak)	M	4.0	2.1	49.2	Located within footprint of proposed dwelling/terrace.	Proposed work will necessitate removal.	Undertake replacement planting with a new tree elsewhere within the site to compensate for loss of amenity in accordance with Section 11.
34	***Casuarina cunninghamiana*** (River Oak)	M	3.1	1.9	29.4	Located within footprint of proposed dwelling (basement).	Proposed work will necessitate removal.	Remove tree.
34a	***Ficus rubiginosa*** (Port Jackson Fig)	G	2.0	1.5	12.6	Located within footprint of proposed dwelling.	Proposed work will necessitate removal.	Undertake replacement planting with a new tree elsewhere within the site to compensate for loss of amenity in accordance with Section 11.
34b	***Glochidion ferdinandi*** (Cheese Tree)	M	3.0	1.6	28.3	Located within footprint of proposed dwelling.	Proposed work will necessitate removal.	Undertake replacement planting with a new tree elsewhere within the site to compensate for loss of amenity in accordance with Section 11.
34c	***Banksia integrifolia*** (Coast Banksia)	P	2.5	1.5	19.6	Located within footprint of proposed dwelling.	Proposed work will necessitate removal.	Undertake replacement planting with a new tree elsewhere within the site to compensate for loss of amenity in accordance with Section 11.
35	***Strelitzia nicolai*** (Giant White Bird of Paridise)	G	4.0	2.3	50.2	Located within footprint of proposed dwelling.	Proposed work will necessitate removal.	Undertake replacement planting with a new tree elsewhere within the site to compensate for loss of amenity in accordance with Section 11.
36	***Glochidion ferdinandi*** (Cheese Tree)	M	6.0	2.0	113.0	Located within footprint of proposed paved terrace area.	Proposed work will necessitate removal.	Remove tree.
37	***Pittosporum undulatum*** (Native Daphne)	M	3.0	1.4	28.3	No proposed works within TPZ.	To be removed to accommodate new landscape works (poor specimen)	Remove tree.
38	***Allocasuarina torulosa*** (Forest Oak)	M	4.4	2.2	60.6	Located within footprint of proposed dwelling (external access Level 2).	Proposed work will necessitate removal.	Undertake replacement planting with a new tree elsewhere within the site to compensate for loss of amenity in accordance with Section 11.

PL = Primary Limb; SL = Secondary Limb;
TL = Tertiary Limb. GL = Ground Level

APPENDIX 4 - IMPACT ASSESSMENT SCHEDULE

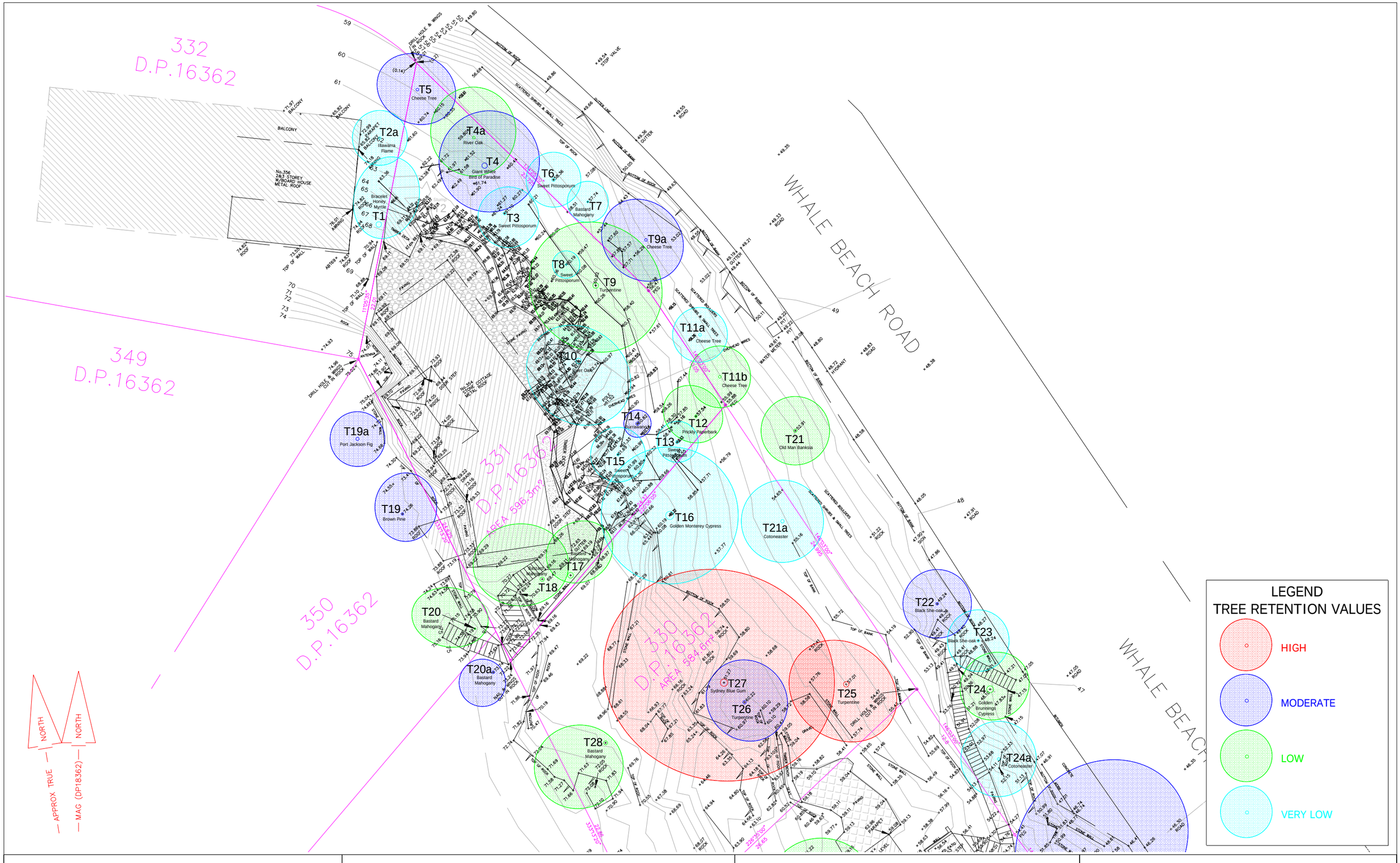
Tree Identification No.	Species	Construction Tolerance	Tree Protection Zone (m R)	Structural Root Zone (m R)	TPZ (m^2)	Incursions To Root Zone &/or Canopy	Likely Impact	Recommendation
39	***Banksia integrifolia*** (Coast Banksia)	P	4.0	2.0	50.2	Located within footprint of proposed dwelling (external access Level 2).	Proposed work will necessitate removal.	Remove tree.
40	***Glochidion ferdinandi*** (Cheese Tree)	M	3.0	1.8	28.3	No proposed works within TPZ.	No adverse impact.	To be retained - no special tree protection measures required.
43	***Banksia serrata*** (Old Man Banksia)	P	3.0	1.8	28.3	No proposed works within TPZ.	No adverse impact.	To be retained - no special tree protection measures required.
44	***Banksia serrata*** (Old Man Banksia)	M	3.6	2.0	40.7	Proposed new 225mm diameter stormwater pipeline and headwall offset 0.9 metres south-west at IL49.50 (2.5 metres below grade). Trenching for stormwater line within SRZ.	Proposed work will necessitate removal.	Remove tree.
45	***Banksia serrata*** (Old Man Banksia)	P	3.0	1.7	28.3	No proposed works within TPZ.	No adverse impact.	To be retained - no special tree protection measures required.
46	***Banksia serrata*** (Old Man Banksia)	P	3.0	1.7	28.3	Proposed paved area and stairs offset 1.4 metres north-west at RL? Excavations for pavement sub-grade and stair foundations within TPZ/SRZ. Encroachment to TPZ = 21%	Extent of encroachment to TPZ exceeds acceptable limits under AS 4970:2009. Proposed works are likely to result in an adverse impact.	Remove tree.
47	***Glochidion ferdinandi*** (Cheese Tree)	M	2.5	1.5	19.6	Proposed paved area and stairs offset 1.4 metres north-west at RL? Excavations for pavement sub-grade and stair foundations within TPZ/SRZ. Encroachment to TPZ = 18%. Proposed stairs offset 0.7 metres west. Excavations for stair foundations within SRZ.	Extent of encroachment to TPZ exceeds acceptable limits under AS 4970:2009. Proposed works are likely to result in an adverse impact.	Remove tree.

APPENDIX 4 - IMPACT ASSESSMENT SCHEDULE

Tree Identification No.	Species	Construction Tolerance	Tree Protection Zone (m R)	Structural Root Zone (m R)	TPZ (m^2)	Incursions To Root Zone &/or Canopy	Likely Impact	Recommendation
48	***Banksia serrata*** (Old Man Banksia)	P	2.4	1.7	18.1	Located within footprint of proposed paved terrace area.	Proposed work will necessitate removal.	Remove tree.
49	***Elaeocarpus reticulatus*** (Blueberry Ash)	M	1.8	1.5	10.2	Located within footprint of proposed paved terrace area.	Proposed work will necessitate removal.	Undertake replacement planting with a new tree elsewhere within the site to compensate for loss of amenity in accordance with Section 11.
50	***Acacia sp. [melanoxylon]*** (Blackwood)	M	2.0	1.4	12.6	Proposed stairs offset 0.9 metres north. Excavations for stair foundations within SRZ. Proposed to be removed for Asset Protection Zone (APZ).	Proposed work will necessitate removal.	Remove tree.
51	***Glochidion ferdinandi*** (Cheese Tree)	M	2.0	1.1	12.6	Proposed to be removed for Asset Protection Zone (APZ).	Proposed work will necessitate removal.	Remove tree.
52	***Pittosporum undulatum*** (Native Daphne)	M	2.0	1.3	12.6	Proposed stairs offset 1.2 metres north. Excavations for stair foundations within SRZ. Proposed to be removed for Asset Protection Zone (APZ).	Proposed work will necessitate removal.	Remove tree.
53	***Pittosporum undulatum*** (Native Daphne)	M	2.0	1.3	12.6	Proposed to be removed for Asset Protection Zone (APZ).	Proposed work will necessitate removal.	Remove tree.
54	***Pittosporum undulatum*** (Native Daphne)	M	2.0	1.3	12.6	Proposed to be removed for Asset Protection Zone (APZ).	Proposed work will necessitate removal.	Remove tree.
55	***Ficus rubiginosa*** (Port Jackson Fig)	M	3.5	1.7	38.5	No proposed works within TPZ.	No adverse impact.	To be retained - no special tree protection measures required.

APPENDIX 4 - IMPACT ASSESSMENT SCHEDULE

Tree Identification No.	Species	Construction Tolerance	Tree Protection Zone (m R)	Structural Root Zone (m R)	TPZ (m^2)	Incursions To Root Zone &/or Canopy	Likely Impact	Recommendation
56	***Eucalyptus sp.*** (Gum)	M	4.0	1.8	50.2	No proposed works within TPZ.	No adverse impact.	To be retained - no special tree protection measures required.
57	***Eucalyptus umbra*** (Bastard Mahogany)	P	4.0	1.8	50.2	No proposed works within TPZ.	No adverse impact.	To be retained - no special tree protection measures required.
58	***Acacia sp.*** (Wattle)	M	3.0	1.6	28.3	No proposed works within TPZ.	No adverse impact.	To be retained - no special tree protection measures required.
58a	***Pittosporum undulatum*** (Native Daphne)	M	2.0	1.5	12.6	No proposed works within TPZ.	No adverse impact.	To be retained - no special tree protection measures required.
59	***Cyathea cooperi*** (Rough Tree Fern)	G	1.5	1.3	7.1	No proposed works within TPZ.	No adverse impact.	To be retained - no special tree protection measures required.
60	***Glochidion ferdinandi*** (Cheese Tree)	M	2.0	1.3	12.6	No proposed works within TPZ.	No adverse impact.	To be retained - no special tree protection measures required.
61	***Acacia sp.*** (Wattle)	M	2.0	1.3	12.6	Proposed driveway and associated retaining wall offset 0.5 metres north. Excavations for pavement foundations within SRZ.	Proposed work will necessitate removal.	Remove tree.
62	***Banksia serrata*** (Old Man Banksia)	M	3.6	2.0	40.7	Located within footprint of proposed driveway and associated kerb/retaining wall.	Proposed work will necessitate removal.	Remove tree.



APPENDIX 5
TREE LOCATION PLAN SHOWING
TREE RETENTION VALUES

346-354 Whale Beach Road, PALM BEACH

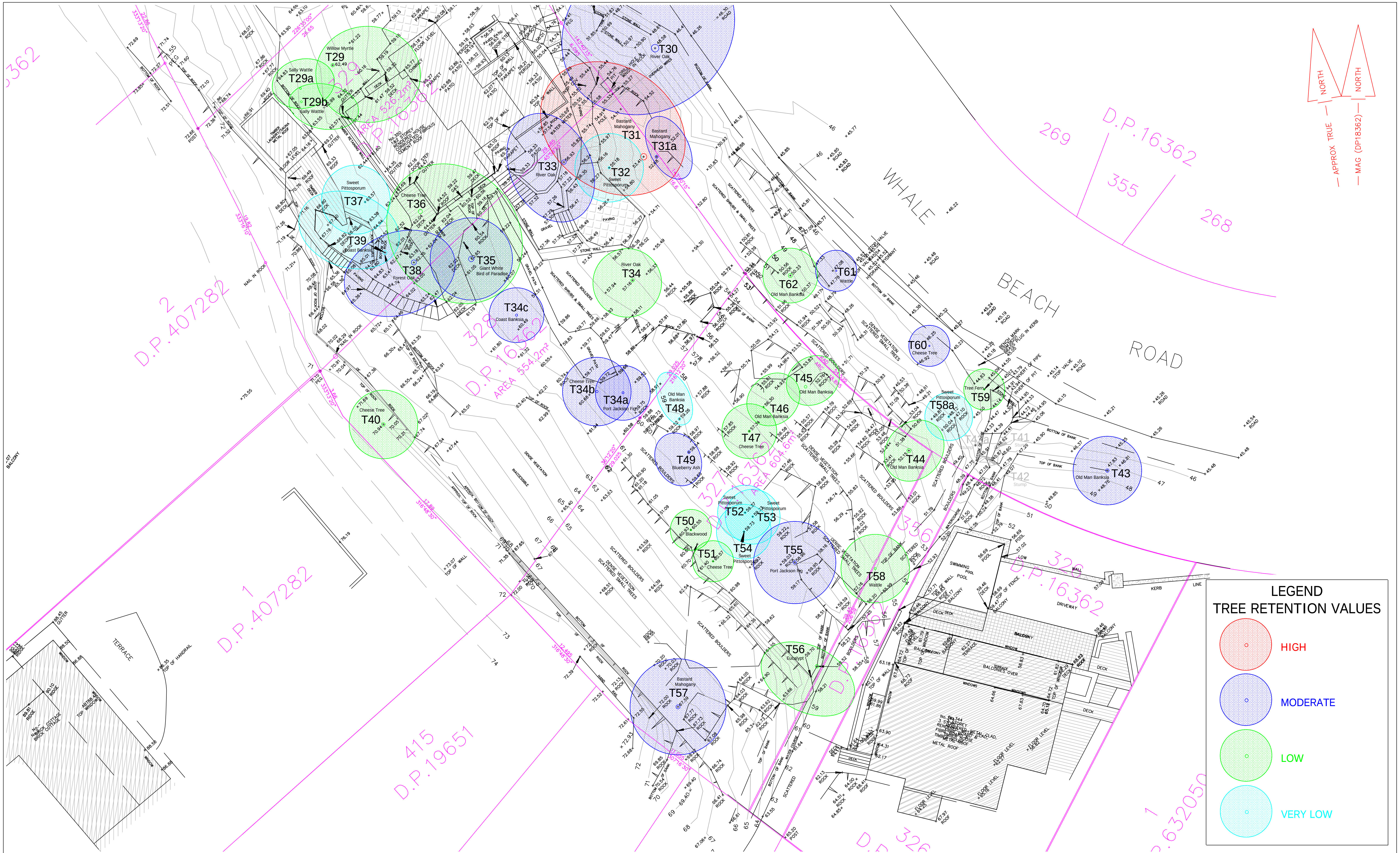
Earthscape Horticultural Services
Arboricultural and Horticultural Consultants
PO Box 364
BEROWRA NSW 2081
Ph: 02 9456 4787
Fax: 02 9456 5757 e: earthscape@iinet.net.au

Based on the conglomerate Survey Drawing
prepared by Adam Clerke Surveyors Pty Ltd
Dwg Ref No. 15204 dated 01/08/2014
and 1218 dated 02/03/2018

DWG No. T18-041201 [A]

SHEET 1

DATE: 12/04/2018



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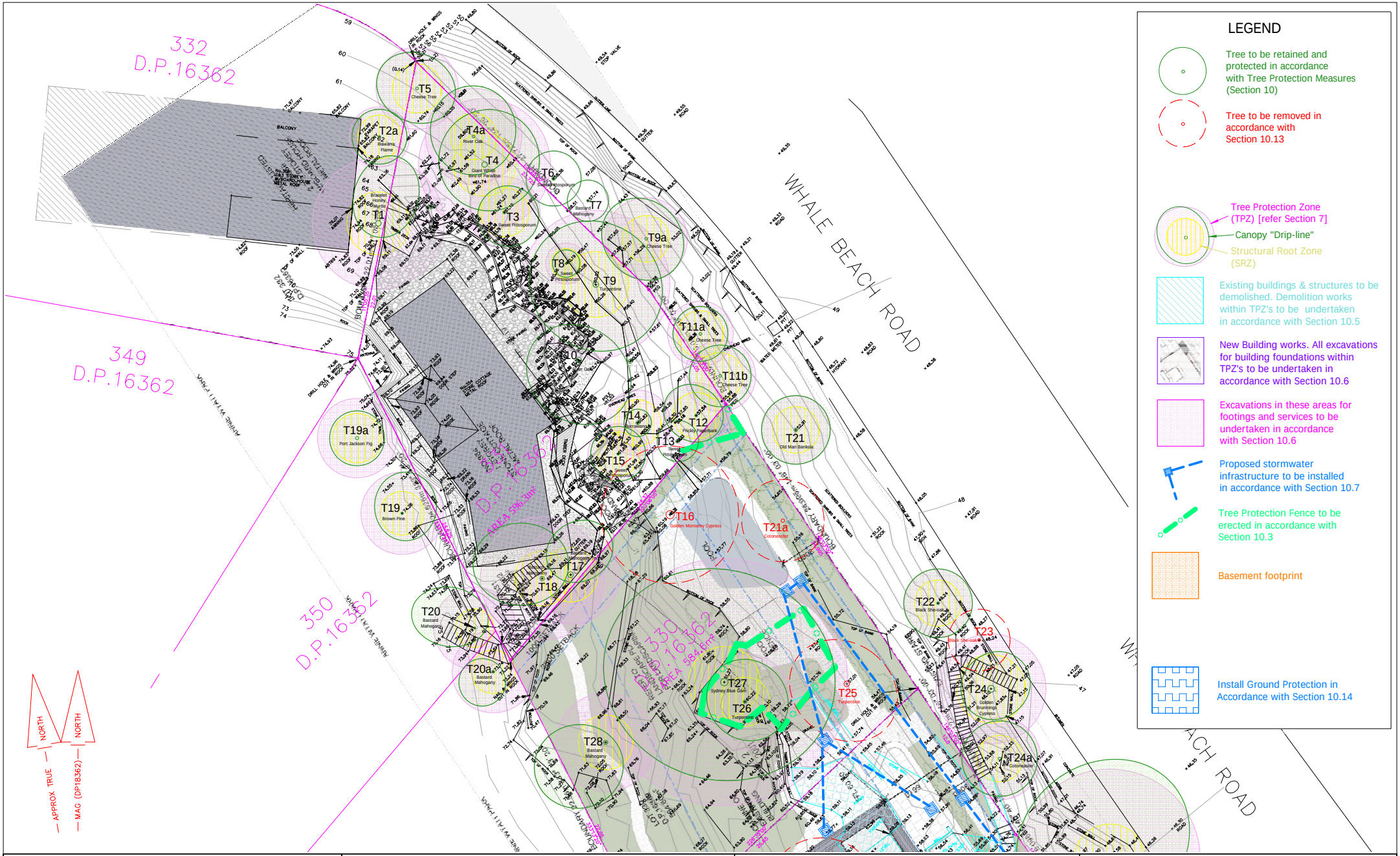
SHEET 2

DATE: 12/04/2018



APPENDIX 6
TREE PROTECTION PLAN

346-352 Whale Beach Road, PALM BEACH

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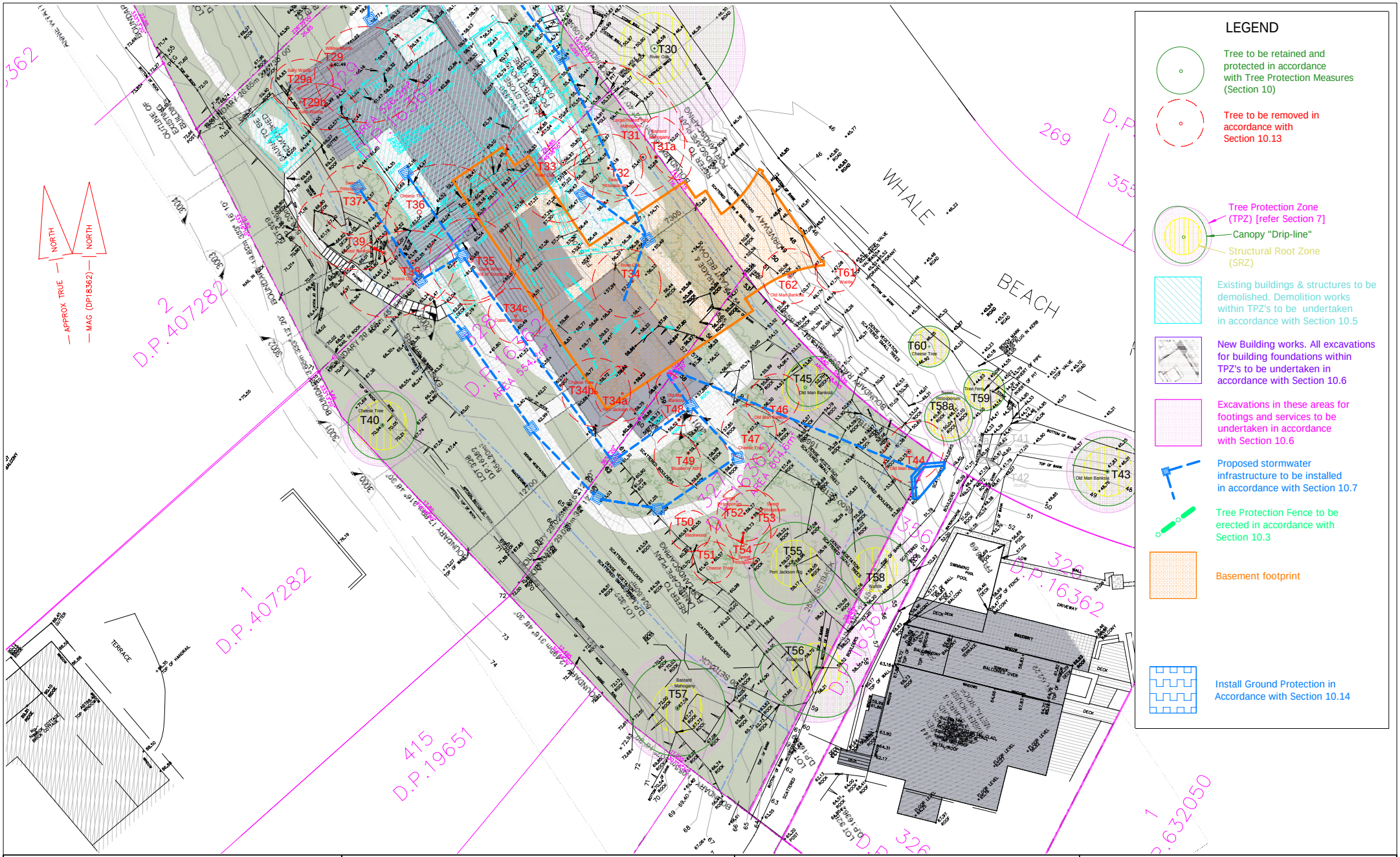
DWG No. T18-041201 [F]

SHEET 1

DATE: 01/02/2019



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SHEET 2

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