AXIOM ARBOR
TREE SERVICES

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Arboricultural Impact Assessment Report

Prepared for: Johnathon Broome

Site: 54 Rangers Retreat Rd. Frenchs Forest 2086

Subject: Arboricultural Impact Assessment

Local Government Authority: Northern Beaches Council

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1 Introduction

Johnathon Broome, Owner of 54 Rangers Retreat Rd. Frenchs Forest has commissioned Louis Putnam Gray of Axiom Arbor Tree Services for an Arboricultural Report for the abovementioned property. The report is to accompany a development Application submission to Northern Beaches Council.

1.1 Scope

The report has been undertaken to meet the following objectives.

- Conduct a visual assessment of all significant trees located within 5m of the development site from ground level. For the purpose of this report, a significant tree is a tree with a height equal to or greater than 5m (DCP)
- Determine the trees estimated contribution years and remaining, Useful Life Expectancy and award the trees a retention value
- Provide an assessment of the potential impact the proposed development is likely to cause to the condition of the subject trees in accordance with AS4970-2009 " The Protection Of Trees On Development Sites"
- Specify tree protection measures in accordance with AS4970-2009

1.2 Limitations

The observations and recommendations are based on the site inspections identified by the sighted plans in section 1.2.1 only. The findings of this report are based on the observations and site conditions at time of inspection.

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

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

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

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

Alteration of this report invalidates the entire report

1.2.1 Plans and Documents sighted

Table 1 – Plans / Documents sighted

Plan / Document	Plan / Document #	Revision	Author	Date
Architectural Set	Sheets 1 – 11	F	Homestead Home Builders	7.5.25
Detail Survey	5399-21	3	Daw and Walton	24.4.25
Landscape Set	101-106	D	Jamie King	6.5.25
Letter of Consent	-	-	Signed by Anne Taylor - Neighbour	10.3.25

1.3 The Site

Currently on site is a single story east facing red brick dwelling with a tile roof on 698.4m^2. A concrete driveway is located on the northern side at the front of the property with a grass area at the front and rear of the property. The property is located on a bend, with a large Council easement to the south, separating the block from bushland.

Under the Warringah Local Environment Plan (LEP) 2011, the site:

- Is Zoned R2 Low Density Residential
- Is located within the bushfire prone land buffer
- Is classified as A – Slope <5 within the landslide risk land map
- Does not form part of a General Conservation Area

1.3.1 Site Soil

As part of the site soil landscape classification groupings, the site falls on the border with both the Lucas Heights residual landscape and Lambert Erosional landscape.

Lucas Heights Soil Landscape groupings contain alternating bands of shale and fine sandstone with yellow hard setting podzolic soils and yellow soloths. Characteristically Lucas Heights sandstones are stony soils with low fertility and low water holding capacity.

Lambert soil landscape groupings are commonly shallow discontinuous Earthy Sands and yellow earths to Leached sands, Grey Earths with localized Yellow Podzolic soils. Limitations include a very high soil erosion hazard, rock outcrops, seasonally perched water tables, shallow, highly permeable soil and very low soil fertility.

1.4 Referred legalities and regulations

- Warringah Local Environment Plan 2011
- Northern Beaches Warringah Development Control Plan 2011
- Northern Beaches Council Tree Regulatory Controls
- State Environmental Planning Policy (Biodiversity and Conservation) 2011
- AS4970-2009 *The Protection of Trees on Development Sites*

Figure 1 - Subject site outlined in red. Image curtesy Nearmap 20.1.25

2 Methodology

On the 23rd of August 2022 and 4th of March 2025 the site was visited by Louis Putnam Gray of Axiom Arbor Tree Services. The trees were inspected visually from ground level to determine their health, structure, for the recording of the Tree Protection Zones (TPZ) and Structural Root Zones (SRZ).

The health and vigor of the trees were assessed by the following:

- Leaf size, colour and shape
- Canopy cover and density
- Amount of deadwood
- Leaf drop
- Epicormic shoots

- Reaction wood formed

The structure of the trees were assessed by the following:

- Trunk and bark anomalies
- Presence of decay and fungal fruit bodies
- The site to where branches were once attached
- Stem and branch junctions
- Crown weight distribution.

The following assessments also took place:

- Tree height was estimated using authors prior experience
- Canopy spread was paced out as an approximation
- The cardinal points were found using the compass on the authors mobile telephone
- Tree A-Z, developed by Jeremy Barrell was used to give the trees a rating within the current landscape and by taking the development footprint into account. The matrix for this landscape is found in the appendix
- Diameter at Breast Height (DBH) was measured using a diameter tape at 1.4m above ground level where possible
- Diameter at Base (DAB) was measured using a diameter tape above the flare of the Root Crown
- Tree Protection Zones and Structural Root Zones have been calculated using formulas proven in the Australian Standards 4970 The Protection of Trees on Development Sites
- The Tree Protection Zone (TPZ) was found using DBH x 12
- The Structural Root Zone (SRZ) was calculated using the formula
  SRZ **radius** = $(D \times 50)^{0.42} \times 0.64$
- For the purpose of this report, major tree roots are defined as being 30mm in diameter or greater
- A Leica Disto x4 Laser measure was used to measure the offset distance from a neighbouring tree to the boundary
- Local maps were obtained using Nearmap
- All photos taken are from the author.

3 Observations and results

A full tree inventory can be found within the appendix

3.1 Development under Proposed Plans

Under the proposed plans, the existing dwelling is to be demolished to make way for a new two-story dwelling with double garage. The proposed dwelling is to be built primarily within the footprint of the existing dwelling. The crossover to be flipped to the opposite side of the property, with the existing to be reinstated as landscaping. To

facilitate the dwelling the site is required to be levelled, with a retaining wall proposed on the northern boundary. Per the landscape plan, the rear yard is to be levelled to just below RL's for the rear of the dwelling requiring a cut of up to 61cm. A new masonry retaining wall is proposed around the periphery of the rear yard, with two rainwater tanks in the south western corner.

3.2 Site Observations

Fourteen (14) trees have been assessed as part of this proposal, including three (3) trees located on the neighbouring property of 52 Rangers Retreat Rd. Through using the Trees AZ method on the 14 trees, six (6) trees have been assigned a category "A" rating. These trees are generally in good health, show good structure and are classified as a protected tree within the controls of the municipality. 8 trees have been assigned a category "Z" rating. These trees are either below the height threshold, exempt species within the controls of the municipality or are in poor health and condition.

Palm #12, *Ravenea rivularis* (Majesty palm) was not included on the supplied survey and is located on the neighbouring property. The palm is an exempt species within the NBC Regulatory Controls. Neighbouring consent has been granted for this palm to be assessed as part of the development.

Tree #13, Eucalyptus spp. (Eucalyptus) was measured to be 3.41m to the outside edge of the trunk using a Leica Disto X4 Laser Measure.

T14# *Pittosporum undulatum* (Native Daphne) on the neighbouring property was estimated to be below the height threshold for a protected tree within the Northern Beaches Tree Management Controls. Its DBH and DAB measurements were also estimated as the tree is located on an adjoining property.

3.3 Site Photos

Figure 2 - Subject dwelling - Tree #1

Figure 3 – Trees 2 – 10 in rear garden

Figure 4 - Trees 11 (group and T12

Figure 5 – T13, 3.41m from boundary to edge of trunk

3.4 Impact Assessment Schedule

Table 2 - Impact Assessment Schedule

Tree ID	Species	Retention value	TPZ radius (m)	SRZ radius (m)	TPZ encroachment	Discussion/ Conclusion	Recommendation
1	*Plumeria acutifolia* (Frangipani)	Z1	2.4	1.61	Footprint dwelling	- The tree is located within the footprint of the proposed dwelling. - Tree classifies for removal as it is under the height threshold for a protected tree	Remove and replace
2	*Magnolia x soulangiana* (Saucer Magnolia)	A1	3.72	2.3	45.15% (19.63m^2)	- Excavation for the levelling of the rear yard and construction of the retaining wall (not inclusive of drainage) will result in a 45.15% incursion into the TPZ and SRZ of this tree which is considered major under section 3.3.3 of AS4970-2009. - Works highly likely to affect long term viability of tree - Tree is not retainable under the proposal.	Remove and replace
3	*Camellia sasanqua* (Camellia)	Z1	2 (Min)	1.57	Footprint excavation	- Tree is located within the footprint of the proposed backyard excavation and is not retainable under the proposal	Remove and replace
4	*Gordonia axillaris* (Fried Egg Tree)	A2	4.32	2.46	Footprint excavation	- Tree is located within the footprint of the proposed backyard excavation and is not retainable under the proposal	Remove and replace
5	*Magnolia grandiflora cvs* (Teddy Bear Magnolia)	A2	2 (Min)	1.5 (Min)	Footprint excavation	- Tree is located within the footprint of the proposed backyard excavation and is not retainable under the proposal	Remove and replace
6	*Magnolia grandiflora cvs*	A2	2 (Min)	1.5 (Min)	Major / footprint excavation	- Tree is either located in or extremely close to the footprint of the proposed backyard excavation and is not retainable under the proposal	Remove and replace

Tree ID	Species	Retention value	TPZ radius (m)	SRZ radius (m)	TPZ encroachment	Discussion/ Conclusion	Recommendation
	(Teddy Bear Magnolia)						
7	*Citrus spp* (Lemon / Lime)	Z3	2.04	2.13	Footprint excavation	- Tree is located within the footprint of the proposed backyard excavation and is not retainable under the proposal	Remove and replace
8	*Camellia japonica* (Camellia)	A2	2 (Min)	1.61	Footprint excavation	- Tree is located within the footprint of the proposed backyard excavation and is not retainable under the proposal	Remove and replace
9	*Camellia japonica* (Camellia)	A2	2 (min)	1.82	Footprint excavation	- Tree is either located in or extremely close to the footprint of the proposed backyard excavation and is not retainable under the proposal	Remove and replace
10	*Jacaranda mimosifolia* (Blue Jacaranda)	Z3	5.28	2.45	Footprint excavation	- Tree is either located in or extremely close to the footprint of the proposed backyard excavation and is not retainable under the proposal - Tree is classified as an exempt species within the Northern Beaches Council tree Regulatory Controls.	Remove and replace
11	*Pittosporum tenuifolium* (James Stirling) X 3	Z10	-	-	Footprint excavation	- Within footprint of proposed excavation works - Trees are not retainable under the current proposal	Remove and replace
12	*Ravenea rivularis* (Majesty palm)	Z3	4	-	42.35% 21.29m^2	- Site excavation and installation of the retaining wall will result in a 42.35% encroachment into the TPZ of this palm with is considered major under section 3.3.3 of AS4970-2009. - Palm is located on adjoining land. Owner's consent has been granted for this palm to be considered as part of the proposal. - Palm is classified as an exempt species within the Northern Beaches Council tree Regulatory Controls. - Extent of Excavations would affect long term viability of Palm and would require its removal	Remove and Replace

Tree ID	Species	Retention value	TPZ radius (m)	SRZ radius (m)	TPZ encroachment	Discussion/ Conclusion	Recommendation
13	*Eucalyptus spp* (Eucalyptus)	A2	4.8	2.47	6.27% 4.54m²	- Excavation required to facilitate the development and new boundary fence will result in a 6.27% encroachment into the TPZ of this tree which is considered minor under section 3.3.2 of AS4970-2009. - TPZ fence to replace existing during development	Retain
14	*Pittosporum undulatum* (Native Daphne)	Z3	3	2.13	11.99% 3.39m²	- Excavation to facilitate the development and construction of a new boundary fence will result in an 11.99% encroachment into the TPZ and SRZ of this tree which is considered major under section 3.3.3 of AS4970-2009. - Excavation within this area is to be done via hand tools under supervision of the project arborist, with research from Smiley et.al 2016 noting that a singular linear cut closer than 6x the DBH can cause stress in a tree. Proposed excavations are greater than 6x DBH (1.7m), and by taking into consideration the contiguous TPZ area is free of construction, the likelihood the proposal will negatively impact the long-term viability of the tree is low. - Excavation to be undertaken by hand tools under supervision of a project arborist - TPZ fence to replace existing during development	Retain and supervise

4 Discussion

4.1 Comment on Roots, the Protection of Trees on Development Sites and Considerations under the Standard

Tree roots grow opportunistically in response to their environment with oxygen as their greatest limiting factor. They generally radiate out from the trunk and are shallow to best access water, nutrients and air from above ground. (Gerhold et al, 2003).

A study of tree after storms found a relationship between the trunk diameter and a 'structural root plate' of large diameter woody roots. These roots play a significant role in anchoring the tree in the ground. It was also recognized that for leaning trees, the roots opposite the lean were often larger in diameter and extend further through the soil. It was determined that tensional forces along roots contribute significantly to anchoring the above ground parts of the tree. Through careful excavation, smaller diameter roots were shown to extend beyond the canopy with the fine feeding roots at 5-7 times the height of a tree (Mattheck & Breloer, 1994; Perry ,1982).

For trees on development sites, direct physical damage to tree roots such as severing and indirect impacts through soil compaction, soil water changes and soil chemical changes can impact on large sections of the root system and interfere with the long-term health of the tree. As damage occurs closer to the trunk, defence against pathogens and whole tree stability decrease (Fite & Smiley2009; Smiley,2008).

Section 3.3.4 of AS4970-2009 *The Protection of Trees on Development Sites* lists considerations that the assessing arborist can take into account when working within a Protection Zone. These considerations help the arborist into making a determination on the encroachment and whether the development will negatively impact trees that may be affected by the proposal. This includes (but not limited to):

- Tree species, its age, health and tolerance to root disturbance
- Site topography and soil characteristics
- The presence of past or existing obstacles that may affect root development and distribution
- Lean and stability of the tree
- Design factors (pier and beam, suspended or cantilevered slabs, screw piles)
- Location and distribution of roots (found through nondestructive exploratory investigations)

Tree protection zones are applied to trees on construction sites to prevent damage to roots and the above ground parts of trees. The Australian Standards 4970 *protection of*

trees on development sites provides formulas to calculate protection setback distances around trees. These distances are measured as radius from and approximate center of the trunk and are used to infer an area of expected root growth. Site changes within these zones can be possible depending on the type of change and the methods used to make the change (Matheny and Clark, 1998). Further, it is reasonable to consider existing site conditions, and the limitations imposed on a 'typical' spread.

5 Conclusion

This report assesses the impact of a proposed development on the subject site to all significant trees located either side or adjoining the subject site in accordance with the Warringah Local Environment Plan 2011, Northern Beaches Tree Regulatory Controls as well as AS4970-2009 *The Protection of Trees on Development Sites.* Thirteen (14) trees / palms have been assessed as part of this development.

Of the 14 trees assessed, Six (6) Category A trees and six (6) category Z trees are proposed for removal

Category A trees, 2, 4, 5, 6, 8, and 9 are located either within the footprint of or have a major incursion due to the excavation for the rear garden. These trees are not retainable under the proposal

Category "Z" trees, Tree #1, 3 and 7 are located either within the footprint of the dwelling or excavation area required for the leveling of the rear yard. These trees are not retainable under the proposal.

Tree #10, a Jacaranda mimosifolia has been identified as an exempt species under the Northern Beaches Council Tree Regulatory Controls and is proposed for removal.

Tree #12, a group of *Pittosporum tenuifolium* (James Stirling's) for part of a previously lopped screening hedge. These trees have poor structure and fall within the area proposed for excavation.

Tree #13, *Ravenea rivularis* (Majesty palm) is located on the neighbouring property and is an exempt species under the Northern Beaches Regulatory Controls. Consent has been granted by the neighbour (Palm Owner) for this palm to be assessed as part of the development.

Neighbouring trees 13, *Eucalyptus spp* and 14, *Pittosporum undulatum* have a minor and major incursions into the TPZ and SRZ's through excavation and construction of a new boundary fence.

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

Table 3 - Conclusions table

Impact	Reason	Category A		Category Z
		A1	A2	Z
Trees recommended to be removed	Building construction, within footprint, major incursion	2, 4, 5, 6, 8, 9		1, 3, 7, 10, 11, 12
Trees recommended to be removed	Inappropriate species, poor condition, excessive nuisance			
Trees recommended to be retained due to TPZ encroachment greater than 10%	Removal of existing surfacing/structures and/or installation of new surfacing/structures	14		
Trees recommended to be retained due to encroachments of 10% or less	Removal of existing surfacing/structures and/or installation of new surfacing/structures	13		

6 Recommendations

6.1 Assigning a site arborist

Before work commences on site, a site arborist must be appointed. The site arborist must hold a minimum AQF5 level of qualification in Arboriculture. The site arborist will periodically attend the site to gather information needed for the issuing of certificates of compliance for the duration of the build.

Duties of the site arborist include:

- Oversee the correct implementation of tree protection measures listed below

- Recording of tree health and vigor on a quarterly basis, if the trees are in ill health, solutions should be sort after
- Numbering the trees and advising contractors which trees are to be protected and which trees are to be removed

6.2 Tree works

Any pruning or removal of the trees on site must be done by an Arborist with an minimum AQF 3 qualification and be done to standard under AS4373-2007 "*Pruning of Amenity Trees".*

The following trees are proposed for removal:

- 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

All pruning and removal works must have the consent of the Local Governing Authority before they may take place

6.3 Tree Protection Fencing

Fencing should be erected before any machinery or materials be brought onto the site and before the commencement of works unless otherwise outlined. Once erected, protective fencing must not be removed or altered without approval from the site arborist. The location of the Tree Protection Fencing is located on the Tree Protection plan. The fencing shall be

- 1.8m tall
- Chain wire panels without shade cloth
- Held in place by concrete feet
- Placed at ground level
- Fastened together
- Have lockable entry points

Signage identifying the TPZ must be placed on the fencing around the TPZ and must be clearly visible within the development site. The signage shall be

- 400mm high x 400mm wide minimum
- Fastened to the fencing
- Announce the sectioned area as a Tree Protection Zone
- Include the name and contact details of the site arborist
- State the area is prohibited to all persons and activities
- Be of a sturdy material

Fencing and signage is to be installed prior to site establishment

An example of tree protection fencing is found in the appendix

6.4 Excavation at Boundary for retaining walls

The excavation and installation of retaining walls within the Tree Protection Zone of trees 13 and 14 must:

I. Be undertaken via the use of hand tools only under supervision of the project arborist.
II. Roots discovered within this location must be documented by the project arborist for compliance and pruned with a sharp implement. All wall footings must be located wholly within the subject site.
III. Exposed roots shall be protected in accordance with section 4.5.4 of AS4970-2009 *The protection of trees on Development Sites*

6.5 Restricted activities

The tree protection zone is an area designed to protect the roots and the root crowns of trees on development sites, on larger trees is can also encompass parts of the canopy. Works carried in these areas can have detrimental effects to the health, structure and stability of a tree, many of which are irreversible.

The following activities are restricted within tree protection zones.

- Machine excavation including trenching
- Excavation or silt fencing
- Cultivation
- Storage
- Preparation of chemicals, including cement products
- Parking of vehicles or plant
- Refueling
- Dumping of waste
- Wash down and cleaning of equipment
- Placement or fill
- Lighting of fires
- Soil level changes
- Physical damage to tree

Though some of the above activities are listed as restricted, the council may have approved the building development with the knowledge that some of these activities may occur. The site arborist must be first consulted prior to any works being undertaken within a TPZ to help advise on minimising impacts to the trees. The site arborist must supervise on all activities that take place within a TPZ.

6.6 Site Materials Storage

Providing Tree Protection Zones are not being breached, as well as there is no risk of materials being washed into drains, the site managed can allocate the storage area wherever he deems appropriate.

6.7 Hold Points

Below is a sequence of hold points requiring project arborist certification throughout the development process. It provides a list of hold points that must be checked and certified. All certification must be provided in written format upon completion of the development. The final certification must include details of any instructions and remediation undertaken during the development. The principal contractor should be responsible for implementing all tree protection requirements

Table 4 - Hold Points

Hold Point	Stage	Date completed and signature of project arborist
Project arborist to hold pre construction site meeting with principal contractor to discuss methods and importance of tree protection measures and resolve any issues in relation to feasibility of tree protection requirements that may arise. Project arborist to mark all trees approved for removal under DA consent	Prior to development work commencing	
Project arborist to assess and certify that tree protection has been installed in accordance with AS4970-2009 prior to works commencing on site.	Prior to development work commencing	
In accordance with AS4970-2009 the project arborist should carry out regular site inspections to ensure works are carried out in accordance with the recommendations. Site inspections are recommended on a monthly frequency	On-going throughout the development	
The removal of existing structures inside the TPZ of any tree to be retained, such as existing buildings and hard surfaces must be supervised by the project arborist.	Demolition	
Project arborist must supervise all manual excavations and root pruning inside the TPZ of any tree to be retained. Project arborist to approve all pruning of roots greater that 30mm inside TPZ. All root pruning of roots greater than 30mm in diameter must be carried out by a qualified Arborist/Horticulturalist with an minimum AQF level 3	Construction	
Project arborist to approve relocation of tree protection for installation of services. Project Arborist to certify that all underground services including storm eater inside TPZ of any tree to be retained have been installed in accordance with AS4970-2009	Construction	
Consulting Arborist to approve relocation of tree protection for landscaping. All landscaping works within the TPZ of trees to be retained are to be undertaken in consultation with the project arborist to minimise impact to trees.	Construction/Landscape	
After all demolition, construction and landscaping works are complete the project arborist should assess that the subject trees have been retained in the same condition and vigour. If changes to condition are identified, the project arborist should provide recommendations for remediation.	Under completion of development	

7 References

Australian Standard 4970-2009 – *The Protection of Trees on Development Sites*

Australian Standard 4373-2007 - *The Pruning of Amenity Trees*

Warringah Development Control Plan 2011

Warringah Local Environment Plan 2011

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8 Appendices

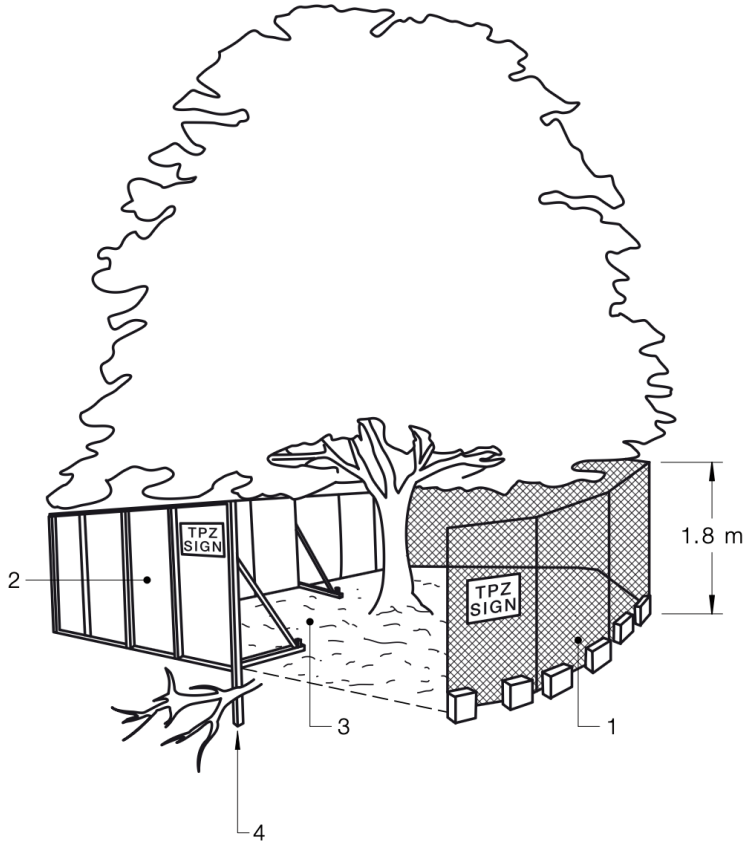
8.1 Health definitions

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

8.2 Structure Definitions

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

8.3 TPZ Fencing Example



LEGEND:

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

Figure – TPZ fencing example

8.4 Trees AZ Definitions

TreeAZ Categories Field Sheet (Version 10.04-USC)

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

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

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

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

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

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

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

Further explanations to assist categorization

Z1	Any existing statutory definitions of trees that are too small to be legally protected should be applied and trees less than those heights or diameters will be Z1. If there are none, then if the tree has been planted for less than 5 years it is Z1. If it is less than 20 feet in height, it will be Z1 unless it is significant, i.e. clearly mature, but small trees are not Z1. If it is greater than 35 feet in height it is not Z1 unless it was planted in the last 5 years. Applying Z1 to trees between 20 and 35 feet is a matter of judgment; the most obvious test being that the tree could be easily and reliably moved or replaced. Ideally, the replacement tree should not be less than 20% of the replaced tree's dimensions.
Z2	Any existing statutory rules that prevent protection of trees within a fixed distance of a structure will allow a tree to be subcategorized as Z2.
Z3	Any existing statutory rules or guidance that prevent protection of trees for reasons other than size and proximity dictate Z3, i.e. invasive or alien species. If none exist, then Z3 cannot be applied.
Z4	This subcategory is for trees that are unlikely to recover from a serious health problem. The condition must be terminal with no obvious potential to recover, i.e. severe crown dieback related to excavation damage or root decay, to the extent that the structural branch framework is compromised. Trees that are likely to recover or improve should not be placed in this subcategory, i.e. trees suffering from a foliar problem that has little impact on the branch framework and varies from year to year.
Z5	Severe means so bad that there is no realistic chance of the tree achieving its full potential and there is a high risk of failure. In many cases, the risk of failure can be reduced by dramatic reduction in tree size, but this has severe health, maintenance cost and amenity implications, so is unlikely to be a sustainable management option. A common example is a severely unbalanced tree within a group that will be particularly vulnerable in adverse weather conditions and the adjacent trees mean there is no hope of remedial works resulting in an improvement. Topped trees do not automatically fit into this subcategory, although there is an obvious temptation. Species prone to decay, such as willow and poplar, often have severe decay at the origin of vigorous re-growth, creating a high risk of failure in adverse weather conditions. Z5 is clearly appropriate for them. However, this needs to be a careful judgment because topping in itself does not necessarily condemn a tree to this

	subcategory. Some trees, such as plane, oak and lime, are particularly good at coping with this treatment and often are able to mature with a low risk of failure. If remedial works will allow the tree to be retained with no significant adverse impact on amenity, health or maintenance costs, then it does not fit here.
Z6	Trees can become poorly anchored because of soil erosion through climatic factors , i.e. water or wind, wear from traffic, i.e. pedestrian or vehicular, changing soil conditions, i.e. increasing wetness, sudden and severe physical stress from storms and root damage such as decay or severance reducing root strength. In some cases, i.e. storm induced instability, there may be a realistic chance of recovery and a subcategorization of Z6 may be premature. However, if excessive remedial work is required, it is likely that Z6 is a defensible subcategory. Alterations to tree exposure to the wind occurs because of changes in the shelter provided by adjacent objects such as buildings or trees. This often applies to groups of trees where one large dominant individual will be lost because of poor health or a structural problem, which then dramatically exposes the remaining trees.
Z7	• **Establishing thresholds of acceptable levels of inconvenience:** In its broadest sense, inconvenience is the interference with the authorized use of land. In relation to trees, it can be in the form of roots disrupting landscaping and hard surfacing, parts of trees physically preventing land use, tree debris such as leaves and fruit falling and tree crowns causing excessive shade. The principles for establishing what are acceptable levels of inconvenience are the same irrespective of the cause. In a community context, it is generally accepted that trees provide a significant benefit to society and it is reasonable for individuals to tolerate some level of inconvenience from their presence. However, the precise location or value of these thresholds is not always obvious and is often a subjective interpretation rather than a definitive point. There will always have to be a balancing of the benefit to the community weighed against the inconvenience suffered by the individual. What is an acceptable, tolerable or reasonable level of inconvenience is often a matter of judgment for each specific situation, tempered by experience and common sense. This, should be guided by court, tribunal and planning decisions that have made informed judgments on these issues. • **Common examples:** Very large trees near existing occupied buildings can dominate to the extent that the disbenefit from the anxiety of the occupants outweighs the benefit of the tree. Regular and severe staining caused by fallen debris to a swimming pool surround may be unacceptable because the stark contrast in colours creates a dirty impression whereas the same staining on a path or drive surface may be more acceptable. In contrast, falling leaves blocking gutters causing them to be cleaned once a year is not that much of a local inconvenience in the context of the wider benefits that trees impart. • **Making the decision:** Assessing inconvenience is almost entirely a subjective judgment, based on experience and understanding of what is perceived as being reasonable and unreasonable for a normal person. As with all these judgments, a simple test is to imagine a court hearing where a judge has to decide if the levels of inconvenience are intolerable. If they are, then the tree is Z11; if they are not that bad, then the tree belongs in another subcategory.
Z8	Where more serious damage occurs to property from root action, then court/tribunal judgments on liability help to focus on what level of damage is deemed tolerable by society. A common example is direct damage from roots, trunks and branches to structures and surfacing. Repairs to walls may require such extensive excavation and cutting of roots that the tree cannot be retained. However, the use of innovative techniques may reduce root damage, but still produce a viable boundary, allowing the tree to be retained. Root damage to surfacing is often a sustainable reason for removal if rectifying the damage will significantly adversely affect the tree. In contrast, the potential for roots to deform surfacing would be a less reliable basis for allocation to this subcategory because it is so unpredictable. As a general rule, there would need to be good evidence for ongoing damage, with little scope for remedial works, before a tree could be reliably allocated to this subcategory.
Z9	This is a similar subcategory to Z5, but where the defect is not so severe that remedial works have to be extensive and immediate. Quite often, there are less severe defects that are so bad there is no realistic potential for the tree to improve, but it could be retained in the short term with some significant remedial works. This would only be seen as a temporary measure because to continue applying the same principle would not be cost-effective compared to replacement. A typical example would be a tree with a large and progressive cavity that will clearly prevent it ever improving its condition or contribution to amenity. However, substantial thinning and reduction would allow it to be retained in the short term to allow other replacement trees to develop to buffer its inevitable loss. The benefit of retaining it in the short term might outweigh the cost of doing the works as a one-off, but not on a regular basis.
Z10	It is common to find trees that are obviously not good enough for long term retention because they look unhealthy or are so unbalanced or so tall and thin or that they will never improve. However, the problems are not so severe that there is a high risk of death or failure, and they cannot be discounted for that reason. This subcategory is for those trees and relies on the principle of sustained amenity to justify the allocation. Trees with no potential to improve are taking up space where new trees could be growing, which would be enhancing the desirable objective of an uneven age class structure. The replacements would obviously be small trees and these would then fall into the Z1 subcategory. As set out in the Z1 explanations, the precise location on the site is not often that critical, so these trees would not generally be considered worthy of being a material constraint.
Z11	This applies to trees in groups where one individual is destructively interfering with another. The judgment of which is the better tree is obviously subjective and would be informed by which tree had the best potential for sustainable retention. An obvious example is one tree growing up through another and directly rubbing, causing damage. Retaining both would probably result in the loss of each, whereas removing one may allow the other to achieve its full potential. Another example would be one tree shading and preventing the sustainable development of a neighbour to the extent that both trees would be prematurely removed if left alone. The removal of one tree may be justified if it allowed the remaining tree to reach its full potential. If both trees could be retained as a group and achieve their full potential, then they should not be included in this subcategory.
Z12	This is a matter of judgment and may vary widely. It primarily applies to existing trees that are not suited to their location, but there is resistance to their replacement. As a general principle, all trees will incur some management costs and these would normally not be a valid reason for removal. However, as those costs increase, their acceptability decreases to a point where it will be more cost-effective to plant a new tree more suited to the location rather than incur the burden of repeated and excessive costs indefinitely. Typical examples include topped trees with excessive decay, pollarded trees to reduce subsidence risk, trees beneath power lines and trees close to buildings, roads and paths. All these examples will require high levels of maintenance that may not be financially acceptable unless the benefits that arise from retaining the trees are particularly high.
A1	Trees that do not require any specific remedial works above those that would be required for normal maintenance.
A2	Trees with minor defects likely to recover from remedial works to be retainable in the long term, i.e. pollards with little decay.
A3	'Special' means unusual, rare or uncommon, i.e. a tree of some historical/cultural significance, etc.
A4	Trees can be a habitat that may be protected by legislation, which may be a material constraint on the type and timing of changes that can occur on a site. If an ecological assessment has not been carried out by the time of the survey, and the arborist suspects there may be habitat issues, the tree should be identified as A4, and specialist assessment should be sought.

8.5 SULE Definitions

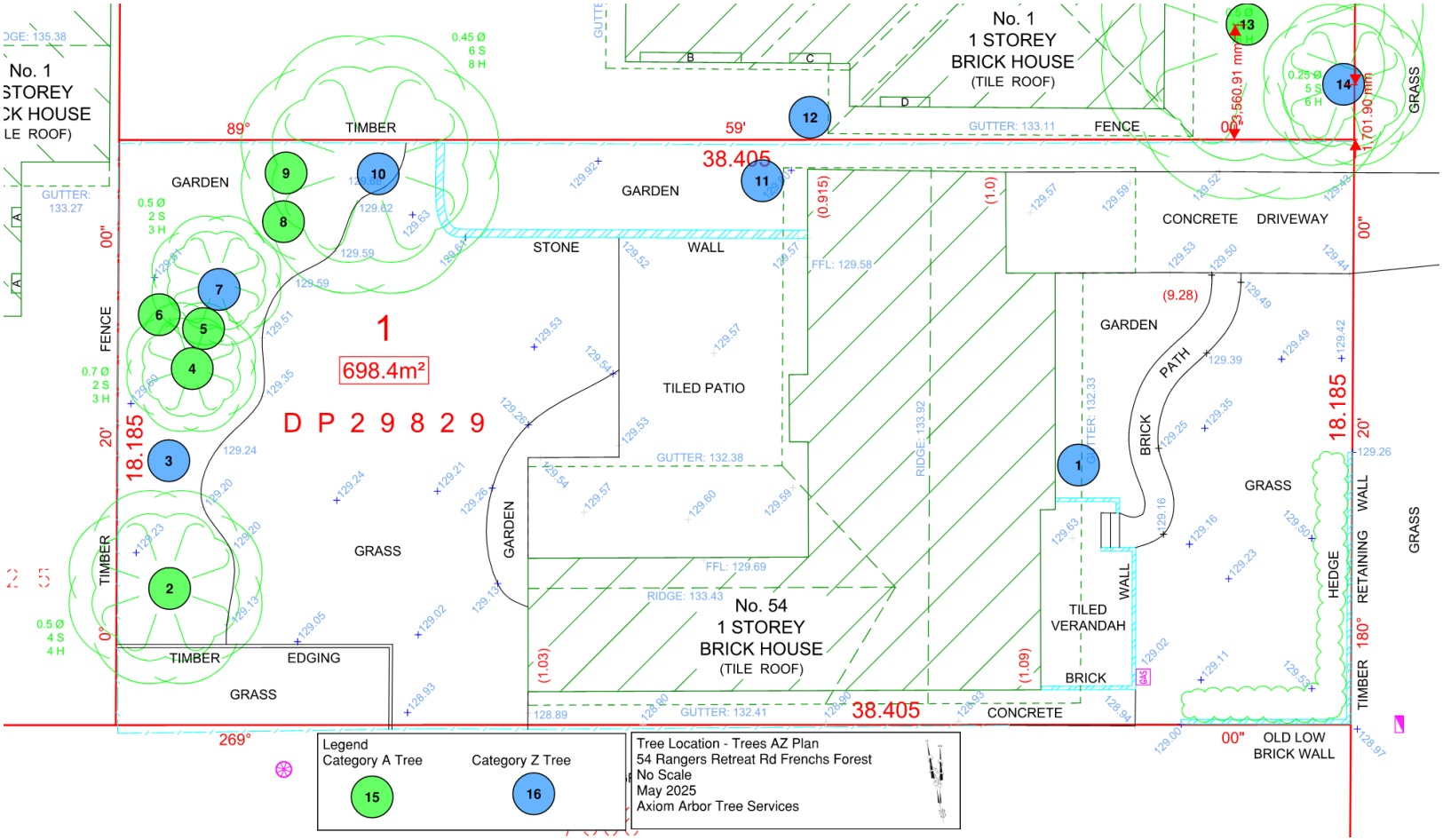
Appendix - Useful Life Expectancy (SULE), (Barrel, 2001

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

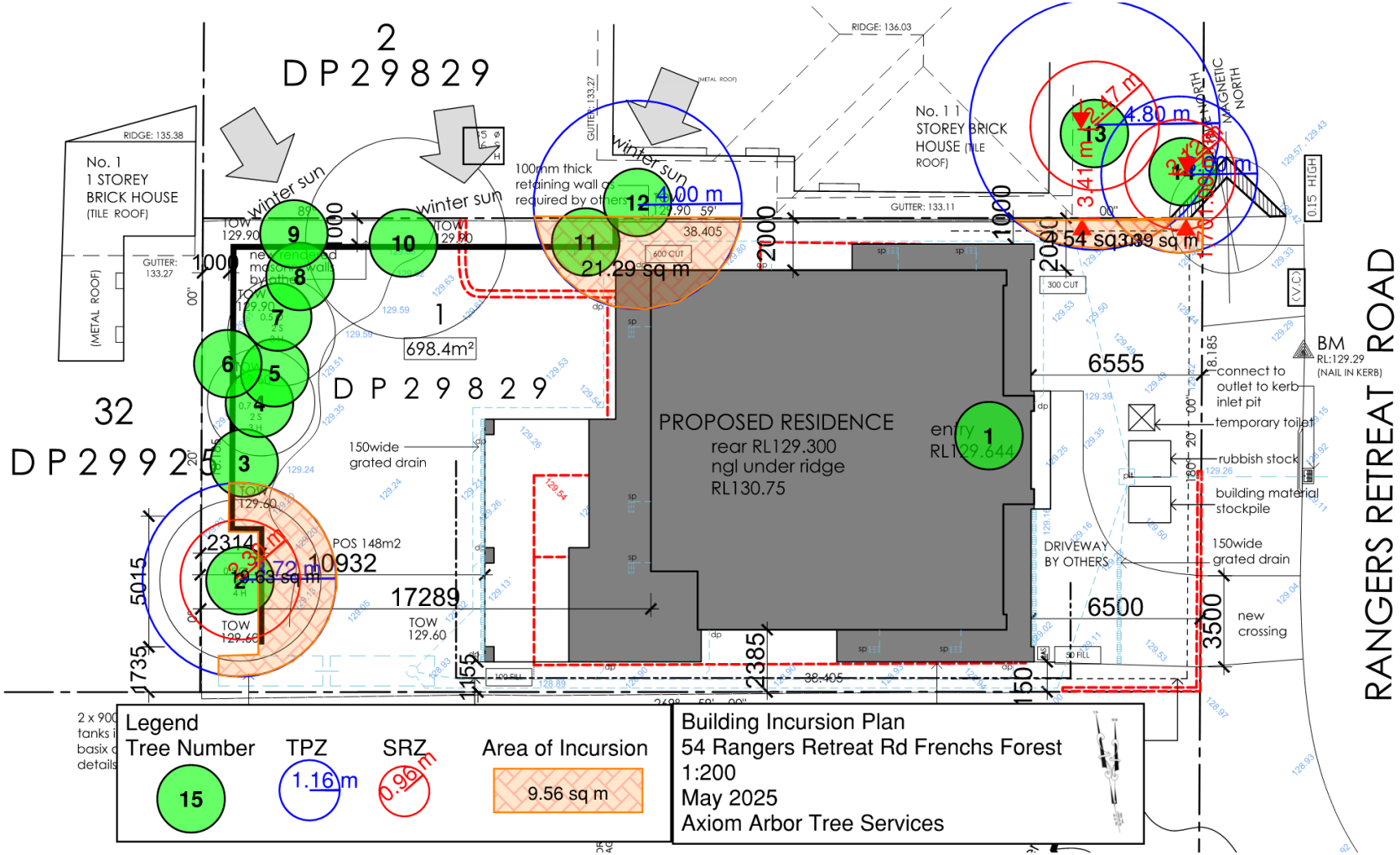
Category	Description
1. Long - Over 40 years	(a) Structurally sound trees located in positions that can accommodate future growth. (b) Trees that could be made suitable for retention in the long term by remedial tree care. (c) Trees of special significance for historical, commemorative or rarity reasons that would warrant extraordinary efforts to secure their long-term retention.
2. Medium - 15 to 40 years	(a) Trees that may only live between 15 and 40 more years. (b) Trees that could live for more than 40 years but may be removed for safety or nuisance reasons. (c) Trees that could live for more than 40 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting. (d) Trees that could be made suitable for retention in the medium term by remedial tree care.
3. Short - 5 to 15 years	(a) Trees that may only live between 5 and 15 more years. (b) Trees that could live for more than 15 years but may be removed for safety or nuisance reasons. (c) Trees that could live for more than 15 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting. (d) Trees that require substantial remedial tree care and are only suitable for retention in the short term.
4. Remove - Under 5 years	(a) Dead, dying, suppressed or declining trees because of disease or inhospitable conditions. (b) Dangerous trees because of instability or recent loss of adjacent trees. (c) Dangerous trees because of structural defects including cavities, decay, included bark, wounds or poor form. (d) Damaged trees that are clearly not safe to retain. (e) Trees that could live for more than 5 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting. (f) Trees that are damaging or may cause damage to existing structures within 5 years. (g) Trees that will become dangerous after removal of other trees for the reasons given in (a) to (f). (h) Trees in categories (a) to (g) that have a high wildlife habitat value and, with appropriate treatment, could be retained subject to regular review.
5. Small/Young	(a) Small trees less than 5m in height. (b) Young trees less than 15 years old but over 5m in height. (c) Formal hedges and trees intended for regular pruning to artificially control growth.

8.6 Site Plans

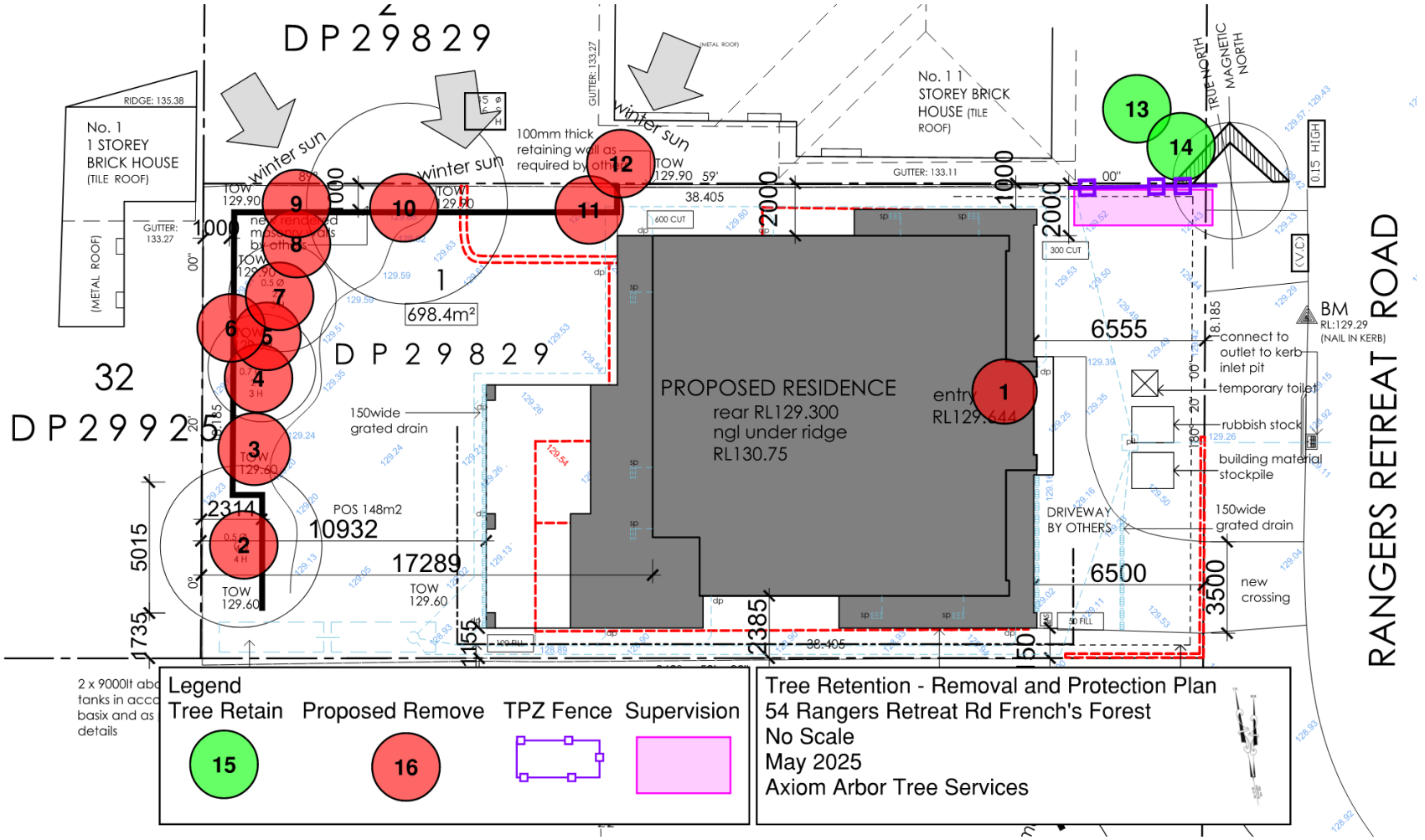
8.6.1 Tree Location – Trees AZ Plan



8.6.2 Building Incursion Plan



8.6.3 Tree Protection Plan



8.7 Tree inventory

TREE INVENTORY											
#	**Tree species**	**Height Spread (M)**	**DBH & DAB (cm)**	**TPZ (M)**	**SRZ (M)**	**Incursion %**	**Health Structure**	**Age Class**	**ULE (yrs.)**	**Tree A-Z rating**	**Comments**
1	*Plumeria acutifolia* (Frangipani)	4 x 3	10, 11, 11, 8 18	2.4	1.61	Footprint dwelling	G – G	M	40+	Z1	- Small tree front of property
2	*Magnolia x soulangiana* (Saucer Magnolia)	5 x 6	11, 15, 12, 13, 17 42	3.72	2.3	45.15% (19.63m²)	G – G	M	40+	A1	- Common example of species
3	*Camellia sasanqua* (Camellia)	2.5 x 2	8, 9, 8 17	2 (Min)	1.57	Footprint excavation	G – F	M	15-40	Z1	- Topiary ball
4	*Gordonia axillaris* (Fried Egg Tree)	5 x 4	20, 13, 14, 15, 18 49.5	4.32	2.46	Footprint excavation	G – F	M	15-40	A2	- repeatedly lopped to maintain height
5	*Magnolia grandiflora cvs* (Teddy Bear Magnolia)	7 x 1	7 9	2 (Min)	1.5 (Min)	Footprint excavation	G – F	SM	15-40	A2	- Growing in congested space
6	*Magnolia grandiflora cvs* (Teddy Bear Magnolia)	7 x 2	9 13	2 (Min)	1.5 (Min)	Major / footprint excavation	G – F	SM	15 – 40	A2	- Growing in congested space
7	*Citrus spp* (Lemon / Lime)	4 x 4	11, 8, 7, 7 35	2.04	2.13	Footprint excavation	G – F	M	15 – 40	Z3	- Continually lopped to maintain height - Exempt under Northern Beaches Council Tree Regulatory Controls
8	*Camellia japonica* (Camellia)	5 x 3	10, 11 18	2 (Min)	1.61	Footprint excavation	G – F	M	15 – 40	A2	- Continually lopped
9	*Camellia japonica* (Camellia)	5 x 2	6, 6, 6, 7, 7 24	2 (min)	1.82	Footprint excavation	G – F	M	15-40	A2	- Continually lopped
10	*Jacaranda mimosifolia* (Blue Jacaranda)	14 x 12	44 49	5.28	2.45	Footprint excavation	G – G	M	40+	Z3	- Common example of species - Exempt under Northern Beaches Council Tree Regulatory Controls
11	*Pittosporum tenuifolium* (James Stirling) X 3	6 x 2	Multi stemmed	-	-	Footprint excavation	G – P	M	5-15	Z10	- Lopped as hedge. - Canopy comprises of established epicormic growth

12	*Ravenea rivularis* (Majesty palm)	10 x 6	40* -	4m	-	42.35% 21.29m²	G – G	M	40+	Z3	- Neighbouring palm on boundary - Exempt species per Northern Beaches Council Tree Regulatory Controls
13	*Eucalyptus spp* (Eucalyptus)	15 x 8	40* 50*	4.8	2.47	6.27% 4.54m²	F / P – F	M	5 - 15	A2	- Neighbouring tree - Dieback in crown
14	*Pittosporum undulatum* (Native Daphne)	7 x 5	25* 35*	3	2.13	11.99% 3.39m²	G/F – F	M	5 – 15	Z3	- Dimensions estimated - below height for protected tree per NBC tree Management Controls

Explanatory notes

Tree Species – Botanical name. Where tree species is unknown it is indicated with an '*spp*'
Height/Spread – Height of the tree and spread of the canopy as inspected from ground level
DBH – Diameter at Breast Height. Measured at approximately 1.4m above ground level by use of diameter tape. Measurement used for TPZ calculation
DAB – Diameter at Base. Measured slightly above root flare at base of tree using a diameter tape. Measurement used for SRZ calculation
TPZ – Tree Protection Zone. DBH x 12 measured in radius from the centre of the trunk
SRZ - Structural Root Zone – (DABx50) 0.42 x 0.64. Measured in radius from the centre of the trunk
Incursion % - incursion of proposed development into TPZ
Health/ Structure – Good/Fair/Poor/Dead
Age Class – Over mature (OM), Mature (M), Semi-mature (SM), Young (Y)
ULE –Useful Life Expectancy of the tree in its current environment at time of assessment.
TREE A-Z Rating – Recognised rating method developed by Jeremy Barrell used to categorize trees. Specific values explained in detail in appendix
*** -** Dimension estimated due to access issues
Palm TPZ - The TPZ of palms, other monocots, cycads and tree ferns should not be less than 1 m outside the crown projection.