ARBORICULTURAL IMPACT ASSESSMENT REPORT

relating to the residential development

HOUSE A
32 BELLARA AVENUE
NORTH NARRABEEN NSW 2101

Prepared for E & J Sanderson
3 July 2024

Revision A

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APPENDICES

1. INTRODUCTION

1.1 This report was commissioned by E & J Sanderson, the owners of 32 Bellara Avenue, North Narrabeen to provide an Arboricultural Impact Assessment (AIA) report relating to the proposed residential development of the site and the existing trees located on the site and on adjoining sites and within close proximity to the works. This report shall accompany a development application submission to Northern Beaches Council involving the construction of a three storey dwelling on the property and a driveway to provide vehicular access on to the site from Bellara Avenue.

1.2 A total of thirty two (32) trees are included in this assessment including twenty seven (27) trees located within the site boundaries and five (5) trees located on a neighbouring property. Generally, a tree is protected in accordance with the Northern Beaches Council Local Environment Plan if it is a height greater than five (5) metres. In some instances a tree may meet the prescribed size, however may not be protected for other reasons such as it being a noxious weed species or a species listed by Council as exempt.

1.3 The purpose of this report is to undertake a visual assessment of the trees, determine the sustainability of the trees in the landscape, determine the impact of the proposed works on the trees and provide recommendations for tree protection measures to be implemented for those trees being retained.

1.4 This report shall reflect the expert opinion of the Arborist. The Arborist is acting independently of and not as the advocate for the owner. The Arborist shall not receive any commission to prune or remove the tree/s which is the subject of this report.

1.5 This report has been prepared in accordance the Australian Standard "*Protection of Trees on Development Sites*" (AS 4970:2009).

1.6 Details shown on the following plans were reviewed in this assessment:

Title	Author	Ref No.	Date
Architectural drawings	Inlet Design Studio	PWD001	1.5.24
Draft Landscape Plan	Peta Gilliland Landscape Design	L001	6.2.24
Topographical survey plan	CMS Surveyors Pty Ltd	10184Ddetail	12.2.24
Stormwater Mgt Plan	Taylor Consulting	STORM1-4	19.12.23

1.7 Key Definitions and Abbreviations used in this report.

- TPZ = Tree Protection Zone. This is the area as defined by AS 4970 – "*Protection of trees on development sites*" and means the typical minimum area above and below ground at a given distance from the trunk to provide for protection of the tree. Most importantly it represents the root zone required to be kept uninjured to maintain a healthy and viable tree. Note, roots will usually extend well beyond this zone, so this represents the minimum remaining root zone required, assuming all others are lost or damaged due to construction. It is typically calculated as a circle centred on the trunk unless existing site conditions can be assessed and indicate otherwise. According to the Australian Standard, a minor encroachment of 10% of the TPZ is allowable, provided the 10% is compensated for elsewhere and contiguous to the TPZ. For the purpose of this report the extent of impact has been broken down to the following categories:
  - 0% of root zone impacted – no impact of significance
  - 0 to 10% of root zone impacted – low level of impact
  - 10 to 15% of root zone impacted – low to moderate level of impact
  - 15 to 20% of root zone impacted – moderate level of impact
  - 20 to 25% of root zone impacted – moderate to high level of impact
  - 25 to 35% of root zone impacted – high level of impact
  - >35% of root zone impacted – significant level of impact
- SRZ = Structural Root Zone. This is the area as defined by AS 4970 – "*Protection of trees on development sites*" and means the area immediately around the base of the tree at a given distance from the trunk. The woody roots and soil cohesion in this area are considered vital to the structural stability of the tree. Damage or removal of soil and roots from this area will typically render the tree unstable and require its removal. It is typically calculated as a circle, centred on the trunk, unless existing site conditions can be assessed and indicate otherwise.

2. METHODOLOGY

2.1 Health and Condition Assessment

A site inspection was undertaken on 12 October 2023 to visually assess the trees in view from ground level. This report is limited to the methods of assessment listed below (and outlined in **Appendix 1**), and does not include any internal probing, compaction testing, drilling, root mapping, aerial inspection or diagnostic testing.

- Tree Species (botanical and common name).
- Tree height and canopy spread was estimated.
- Diameter at Breast Height (DBH) and Diameter at Ground Level (DGL) was measured or estimated.
- Health and vigour assessed, including indicators such as foliage size, colour, extension growth, presence of disease or pest infestation, canopy density, presence of deadwood, dieback, epicormic growth.
- Condition assessed, including visible evidence of structural defects, instability, evidence of previous pruning and physical damage as indicators.
- Life expectancy of the tree was estimated, suitability of the tree to the site and its existing location.
- The photographs included in this report were taken at the time of inspection.
- Assessment was carried out visually from ground level within the property.
- The comments and recommendations in this report are based on findings from the site inspection.

Note: Due to the steep terrain of the site and inaccessibility to some of the trees, the DBH and DGL was not measured for every tree. Approximately half of the trees were measured using a forestry diameter tape. The DBH and DGL for the remaining trees was estimated by making a comparison to those nearby trees that were measured.

2.2 Landscape Significance

The significance of a tree in the landscape is a combination of its environmental, heritage and amenity values. A criteria for the assessment of landscape significance as devised by Andrew Morton (2003) and shown in **Appendix 2** have been applied. Whilst it may be somewhat subjective to assess these values consistently, it is appropriate to assign some measure to assist in determining the overall retention value of a tree.

The rating system which has been applied to the tree and to assist in determining a priority for retention, includes the following categories:

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

2.3 Tree Retention Value

The retention value shown in the Tree Assessment Schedule in **Figure 3** has been determined on the basis of the estimated longevity of the tree and its landscape significance rating, in accordance with Table 1 below.

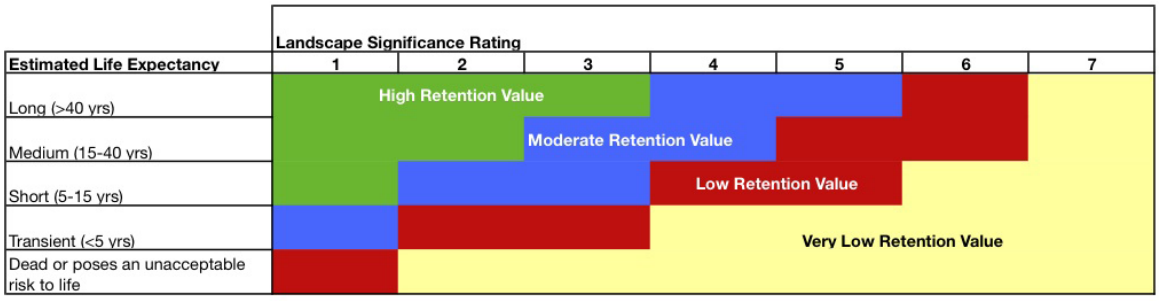

Table 1: Tree Retention Values - assessment methodology (Ref:- Morton, Andrew 2006 modified from Couston, Mark & Howden, Melanie (2001) Footprint Green Pty Ltd, Sydney, Australia)

3. OBSERVATIONS

3.1 The Site

The property is legally identified as Lot 1 in Deposited Plan 1271591 and is located at the end of Bellara Avenue which is a no through road (refer to **Figure 1**). Irregular in shape, the site is a vacant parcel of land with a total site area of 1,516 square metres. The land adjoining the north and eastern boundaries adjoin residential properties that are accessed via Powderworks Road. The land adjoining the southern boundary adjoins residential properties that are accessed via Nareen Parade. The land adjoining the western boundary adjoins residential properties that are accessed via Bellara Avenue.

There is currently no vehicular or pedestrian access on to the site. A large masonry retaining wall extends along a portion of the western boundary where adjacent to the Bellara Avenue street frontage. The retaining wall includes provision for future driveway access on to the property. A substantial amount of cutting has occurred within the property and adjacent to the retaining wall, presumably to facilitate the retaining wall works. The excavated area has been covered with a geotextile fabric. Construction fencing extends around the excavated area within the site, with some trees installed with trunk protection.

The site has a southerly aspect. The topography of the site is steep, with a level change of approximately 20 metres from the northern boundary down to the southern boundary. Sandstone rock is evident at various locations on the site which is indicative of the geology of the area.

According to Northern Beaches Council zoning map, the site is zoned as C4 Environmental Living, being residential land identified as holding biodiversity and ecological significance. This is reflected in the locally occurring tree species found growing on the site (including tree species such as *Angophora costata*, *Corymbia gummifera* and *Eucalyptus piperitai*). The Biodiversity Values Map in **Figure 2** (https://www.planningportal.nsw.gov.au/) also identifies a large portion of the site holding biodiversity value.

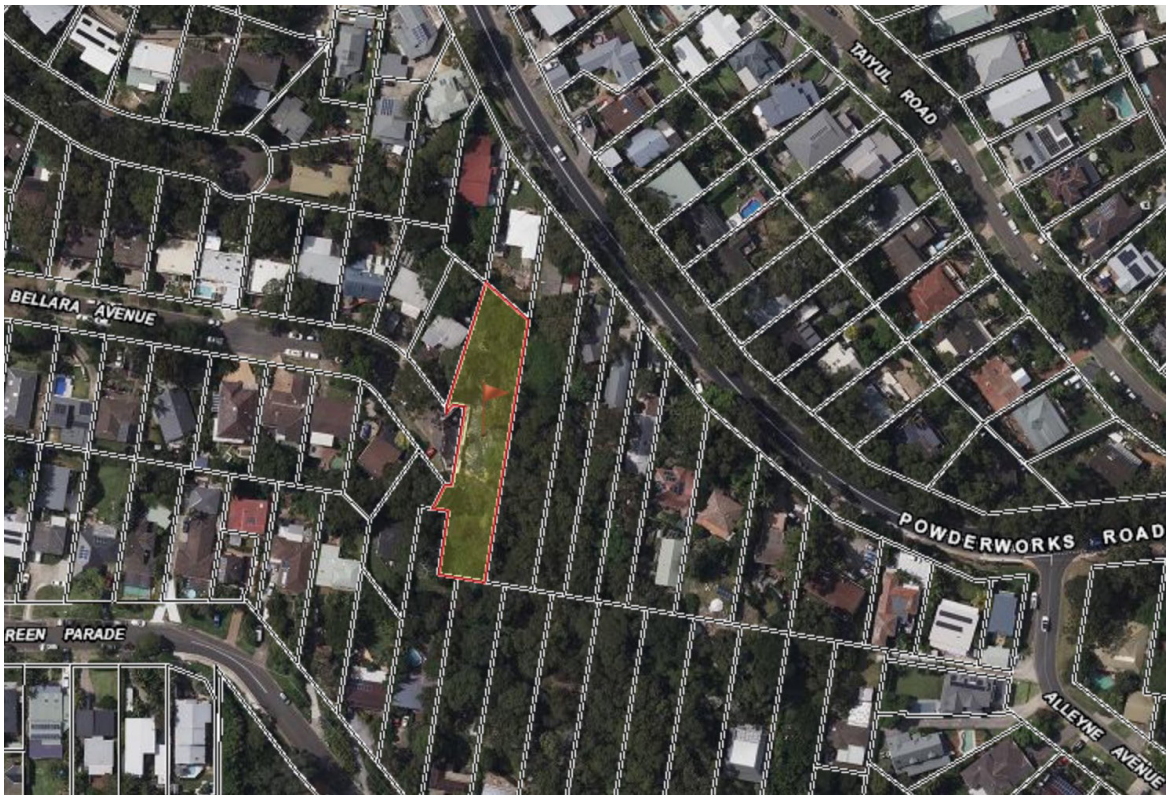

Figure 1: An aerial image of the site with boundary lines highlighted in red (accessed from http://maps.six.nsw.gov.au/ on 2/7/24).

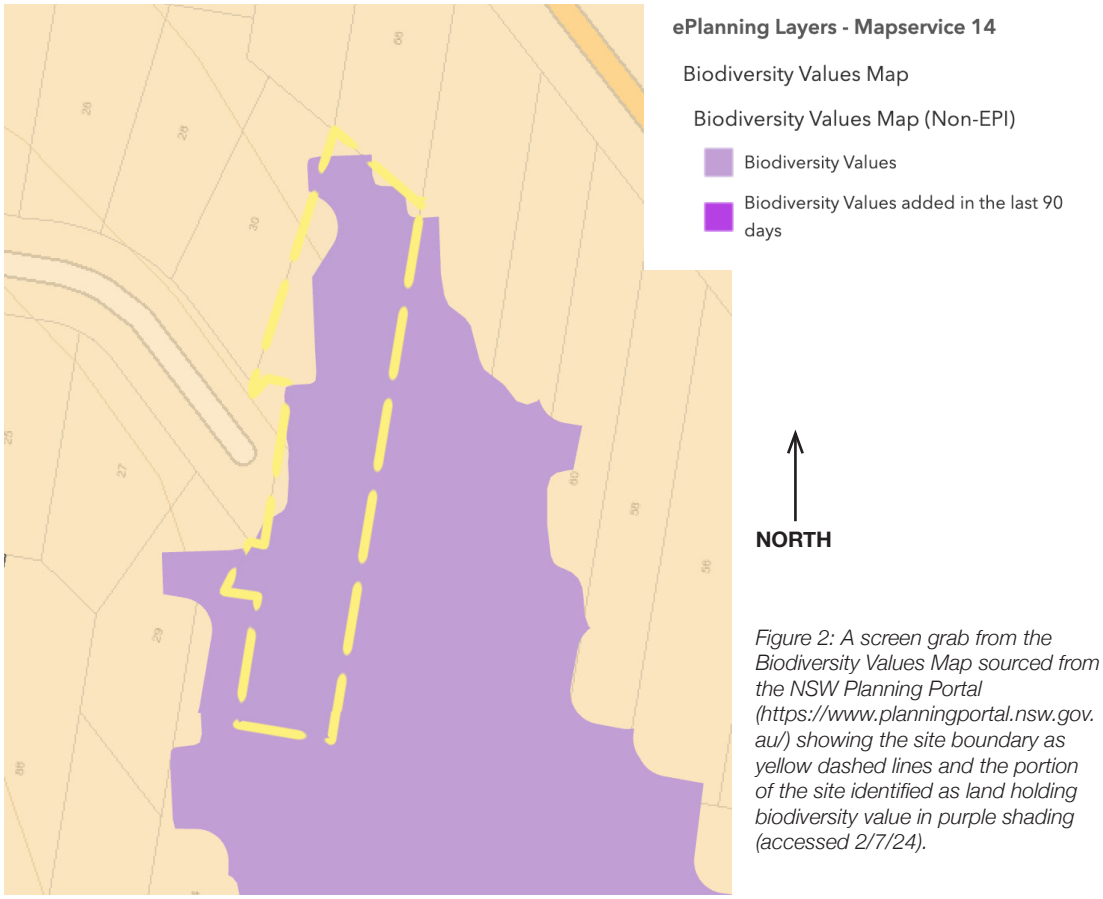

Figure 2: A screen grab from the Biodiversity Values Map sourced from the NSW Planning Portal (https://www.planningportal.nsw.gov.au/) showing the site boundary as yellow dashed lines and the portion of the site identified as land holding biodiversity value in purple shading (accessed 2/7/24).

3.2 **The Trees**

The information and characteristics of the trees are set out in the Tree Assessment Schedule in **Figure 3.** Each tree has been provided with an identification number for reference purposes which is noted on the Tree Location Plan (**Figure 4**) using the Topographical Survey Plan prepared by CMS Surveyors Pty Ltd as a base layer. The tree identification numbers on the plan correlate with the trees listed on the Tree Assessment Schedule. Site photos can be found in **Figure 5-10**.

Note: For the future convenience of identifying the trees contained in this report, the majority of trees have been tagged. Those tagged trees have a small aluminium tag nailed into the trunk with the identification number etched on the tag. The tags are attached in a visible location on the main trunk and approximately 1-1.5 metres above ground level. In some instances it was too difficult to access the trunk of the tree, therefore the tree was not tagged.

Note: This assessment report is limited to the trees located within the specified site and on adjoining land that is located within close proximity to the proposed works. As part of a separate development application to be submitted to Council by the applicant, the trees located on adjoining properties have also been assessed and tagged by the author. As such, the identification number of the trees included in this report are not necessarily in sequential order.

Tree No.	Plant Name (Species/Common Name)	Age	Tree Height (m)	Average Canopy spread (m)	DBH (m)	DGL (m)	Crown Class	Vigour	Condition	Useful Life Expectancy	Landscape Significance	Tree Retention Value	Observations/ comments	Tree Protection Zone (TPZ) radius in metres	Structural Root Zone (SRZ) radius in metres	Remove or retain?	Impact / Incursion
1	*Allocasuarina littoralis* (Black She-Oak)	mature	13.0	10.0 (bias to N + W)	0.35 0.39	0.40 0.45	dominant	normal	fair	medium (15-40yrs)	moderate	moderate	Locally occurring species indicative of the original vegetation to the area. Two trunks from base, middle trunk lopped. Branch tear on northern side 2m above ground level.	6.2	2.7	retain	TPZ of tree is located well away from proposed dwelling and driveway. Stormwater easement and new drainage lines extend through a small portion of the TPZ.
2	*Allocasuarina littoralis* (Black She-Oak)	mature	13.0	4.0 (bias to W)	0.30 0.32	0.35 0.44	co-dominant	normal	fair	medium (15-40yrs)	moderate	moderate	Locally occurring species indicative of the original vegetation to the area. Trunk lean and canopy bias to west. Two main trunks from base.	5.3	2.6	retain	TPZ of tree is located well away from proposed works.
3	*Glochidion ferdinandi* (Cheese tree)	mature	12.0	8.0 (bias to S + W)	0.25	0.35	dominant	normal	good	long (40yrs+)	moderate	moderate	Locally occurring species indicative of the original vegetation to the area. Upright crown. Hanger visible (small).	3.0	2.1	retain	TPZ of tree is located well away from proposed dwelling and driveway. Stormwater easement and new drainage lines extend through a small portion of the TPZ.
14	*Livistona australis* (Cabbage tree palm)	mature	10.0	5.0	0.32	0.45	suppressed	normal	good	long (40yrs+)	moderate	moderate	Locally occurring species indicative of the original vegetation to the area.	3.5	n/a	retain	TPZ of tree is located well away from proposed works.
15	*Eucalyptus piperita* (Sydney Peppermint)	mature	14.0	8.0 (bias to S + W)	0.59	0.85	co-dominant	normal	fair	medium (15-40yrs)	high	moderate	Locally occurring species indicative of the original vegetation to the area. Decay evident at root buttress, swelling at base. Trunk protection around tree.	7.1	3.1	remove	Proposed level lawn area and associated retaining wall and earth works will necessitate removal of tree.
23	*Pittosporum undulatum** (Sweet Pittosporum)	mature	4.5	4.0	0.16	0.20	suppressed	normal	fair	medium (15-40yrs)	very low (exempt)	very low	Tree is located in rear yard of No. 64 Powderworks Road. Locally occurring species indicative of the original vegetation to the area. Exempt species and less than the prescribed size.	2.0	1.7	remove (exempt)	Tree will be removed to facilitate future driveway as part of a separate development application.
26	*Pittosporum undulatum** (Sweet Pittosporum)	mature	6.5	4.0	0.20	0.25	suppressed	low	poor	transient (< 5 yrs)	very low (exempt)	very low	Tree is located in rear yard of No. 64 Powderworks Road. Less than the prescribed size for the species therefore exempt. Very poor specimen with major deadwood.	2.4	1.8	remove (exempt)	Tree will be removed to facilitate future driveway as part of a separate development application.
27	*Livistona australis* (Cabbage tree palm)	mature	6.0	5.0	0.27	0.30	co-dominant	normal	good	long (40yrs+)	moderate	moderate	Locally occurring species indicative of the original vegetation to the area.	3.5	n/a	remove	Proposed driveway and associated retaining wall works will necessitate removal of palm.
28	*Angophora costata** (Sydney Red Gum)	mature	13.0	8.0	0.34	0.40	dominant	normal	good	long (40yrs+)	moderate	moderate	Tree is located in rear yard of No. 64 Powderworks Road. Locally occurring species indicative of the original vegetation to the area.	4.1	2.3	retain	Proposed driveway and associated retaining wall located in TPZ of tree, representing a minor encroachment of approx. 6%.
40	*Livistona australis** (Cabbage tree palm)	mature	9.0	6.0	0.30	0.40	co-dominant/ partially suppressed	normal	good	long (40yrs+)	high	moderate	Palm is located in rear yard of No. 64 Powderworks Road. Locally occurring species indicative of the original vegetation to the area. Sweep to lower trunk.	4.0	n/a	retain	Proposed dwelling and adjacent retaining wall located in TPZ of palm, representing a major encroachment of approx. 32%.
43	*Angophora costata* (Sydney Red Gum)	mature	15.0	7.0 (bias to W)	0.30	0.36	suppressed	low	poor	medium (15-40yrs)	high	moderate	Locally occurring species indicative of the original vegetation to the area. Large persistent deadwood.	3.6	2.2	remove	Located within footprint of new dwelling (House A).
44	*Glochidion ferdinandi* (Cheese tree)	mature	13.0	10.0	0.26	0.33	suppressed	normal	good	long (40yrs+)	moderate	moderate	Locally occurring species indicative of the original vegetation to the area. Suppressed specimen.	3.1	2.1	remove	Located within footprint of new dwelling (House A).
45	*Acacia spp.* (Wattle)	mature	12.0	6.0	0.24	0.28	suppressed	normal	fair	short (5-15yrs)	low	low	Locally occurring species indicative of the original vegetation to the area. Trunk leaning to the west.	2.9	1.9	remove	Located within footprint of new dwelling (House A).
46	*Angophora costata* (Sydney Red Gum)	mature	12.0	9.0	0.30	0.35	co-dominant	normal	good	long (40yrs+)	moderate	moderate	Locally occurring species indicative of the original vegetation to the area. Good representation for the species.	3.6	2.1	remove	Located within footprint of new dwelling (House A).

Tree No.	Plant Name (Species/Common Name)	Age	Tree Height (m)	Average Canopy spread (m)	DBH (m)	DGL (m)	Crown Class	Vigour	Condition	Useful Life Expectancy	Landscape Significance	Tree Retention Value	Observations/ comments	Tree Protection Zone (TPZ) radius in metres	Structural Root Zone (SRZ) radius in metres	Remove or retain?	Impact / Incursion
47	*Angophora costata* (Sydney Red Gum)	mature	12.0	6.0	0.26	0.32	co-dominant	normal	fair	long (40yrs+)	moderate	moderate	Locally occurring species indicative of the original vegetation to the area. Some cracks visible at base with kyno evident.	3.1	2.1	remove	Located within footprint of new dwelling (House A).
48	*Livistona australis* (Cabbage tree palm)	mature	4.5	4.0	0.25	n/a	suppressed	normal	good	long (40yrs+)	very low (exempt)	low	Locally occurring species indicative of the original vegetation to the area. Less than the prescribed size therefore exempt.	3.0	n/a	remove (exempt)	Located within footprint of new dwelling (House A).
49	*Angophora costata* (Sydney Red Gum)	semi-mature	9.0	4.5	0.19	0.24	suppressed	normal	fair	long (40yrs+)	moderate	low	Locally occurring species indicative of the original vegetation to the area. Leaning to the west. Deadwood major.	2.3	1.8	remove	Located within footprint of new dwelling (House A).
50	*Allocasuarina littoralis* (Black She-Oak)	mature	7.0	5.0	0.24	0.26	co-dominant/ partially suppressed	normal	fair	medium (15-40yrs)	moderate	low	Locally occurring species indicative of the original vegetation to the area. Damage to upper crown, torn branches evident.	2.9	1.9	remove	Located within footprint of new dwelling (House A).
51	*Angophora costata* (Sydney Red Gum)	mature	10.0	10.0 (bias to N)	0.18	0.22	suppressed	low	good	long (40yrs+)	moderate	moderate	Locally occurring species indicative of the original vegetation to the area.	2.2	1.8	remove	Located within footprint of new dwelling (House A).
53	*Pittosporum undulatum* (Sweet Pittosporum)	mature	5.0	5.0 (bias to W)	0.27	0.29	co-dominant	low	fair	short (5-15yrs)	very low (exempt)	very low	Exempt species.	3.2	2.0	retain	TPZ of tree is located well away from proposed works.
54	*Angophora costata* (Sydney Red Gum)	mature	16.0	15.0	0.60	0.75	dominant	normal	good	long (40yrs+)	high	high	Locally occurring species indicative of the original vegetation to the area. Large specimen tree.	7.2	2.9	retain	Building envelope located in TPZ of tree, representing an encroachment of approx. 10%.
55	*Pittosporum undulatum* (Sweet Pittosporum)	mature	5.0	7.0	0.25	0.29	co-dominant/ partially suppressed	low	poor	short (5-15yrs)	very low (exempt)	very low	Exempt species.	3.0	2.0	retain	TPZ of tree is located well away from proposed works.
56	*Pittosporum undulatum* (Sweet Pittosporum)	mature	5.0	6.0	0.08 0.12	0.25	suppressed	low	poor	transient (< 5 yrs)	very low (exempt)	very low	Exempt species.	2.0	1.8	retain	TPZ of tree is located well away from proposed works.
57	*Auranticarpa rhombifolia* (Diamond leafed Pittosporum)	mature	8.0	2.0	0.15	0.20	suppressed	low	fair	short (5-15yrs)	very low (exempt)	very low	Exempt species.	1.8	1.7	retain	TPZ of tree is located well away from proposed works.
58	*Magnolia grandiflora* (Bull Bay Magnolia)	mature	10.0	18.0	0.6	0.71	dominant	normal	good	long (40yrs+)	high	high	Mature specimen.	7.2	2.9	retain	TPZ of tree is located well away from proposed works.
59	*Pittosporum undulatum* (Sweet Pittosporum)	mature	5.0	5.0	0.19	0.20	suppressed	low	poor	short (5-15yrs)	very low (exempt)	very low	Exempt species.	2.3	1.7	retain	TPZ of tree is located well away from proposed works.
60	*Ligustrum lucidum* (Large leafed Privet)	mature	7.0	8.0	0.3	0.4	suppressed	normal	fair	medium (15-40yrs)	very low (exempt)	very low	Exempt species / Noxious weed.	3.6	2.3	retain	TPZ of tree is located well away from proposed works.
61	*Cinnamomum camphora* (Camphor Laurel)	mature	9.0	9.0	multi-trunked	multi-trunked	suppressed	normal	fair	long (40yrs+)	very low (exempt)	low	Exempt species.	est. 3.7	est. 2.4	retain	TPZ of tree is located well away from proposed works.
62	*Brachychiton acerifolius* (Illawarra Flame tree)	mature	11.0	8.0 (bias to S + W)	0.25	0.3	suppressed	normal	good	long (40yrs+)	very low (exempt)	low	Exempt species.	3.0	2.0	retain	TPZ of tree is located well away from proposed works.
63	*Angophora costata** (Sydney Red Gum)	mature	16.0	8.0 (bias to W)	0.35	0.38	dominant	normal	good	long (40yrs+)	high	moderate	Tree is located on adjoining land at No. 30 Bellara Ave. Locally occurring species indicative of the original vegetation to the area. Some twig dieback.	4.2	2.2	retain	TPZ of tree is located well away from proposed works.
64	*Glochidion ferdinandi* (Cheese tree)	mature	9.0	10.0	0.27	0.32	suppressed	normal	good	long (40yrs+)	moderate	moderate	Locally occurring species indicative of the original vegetation to the area.	3.2	2.1	retain	TPZ of tree is located well away from proposed works.
65	*Pittosporum undulatum* (Sweet Pittosporum)	over mature	4.0	4.0	0.20	0.25	suppressed	low	fair	medium (15-40yrs)	very low (exempt)	low	Exempt species.	2.4	1.8	retain	TPZ of tree is located well away from proposed works.

** Tree is located on adjoining land (also shaded).*

Figure 3: Tree Assessment Schedule continued.

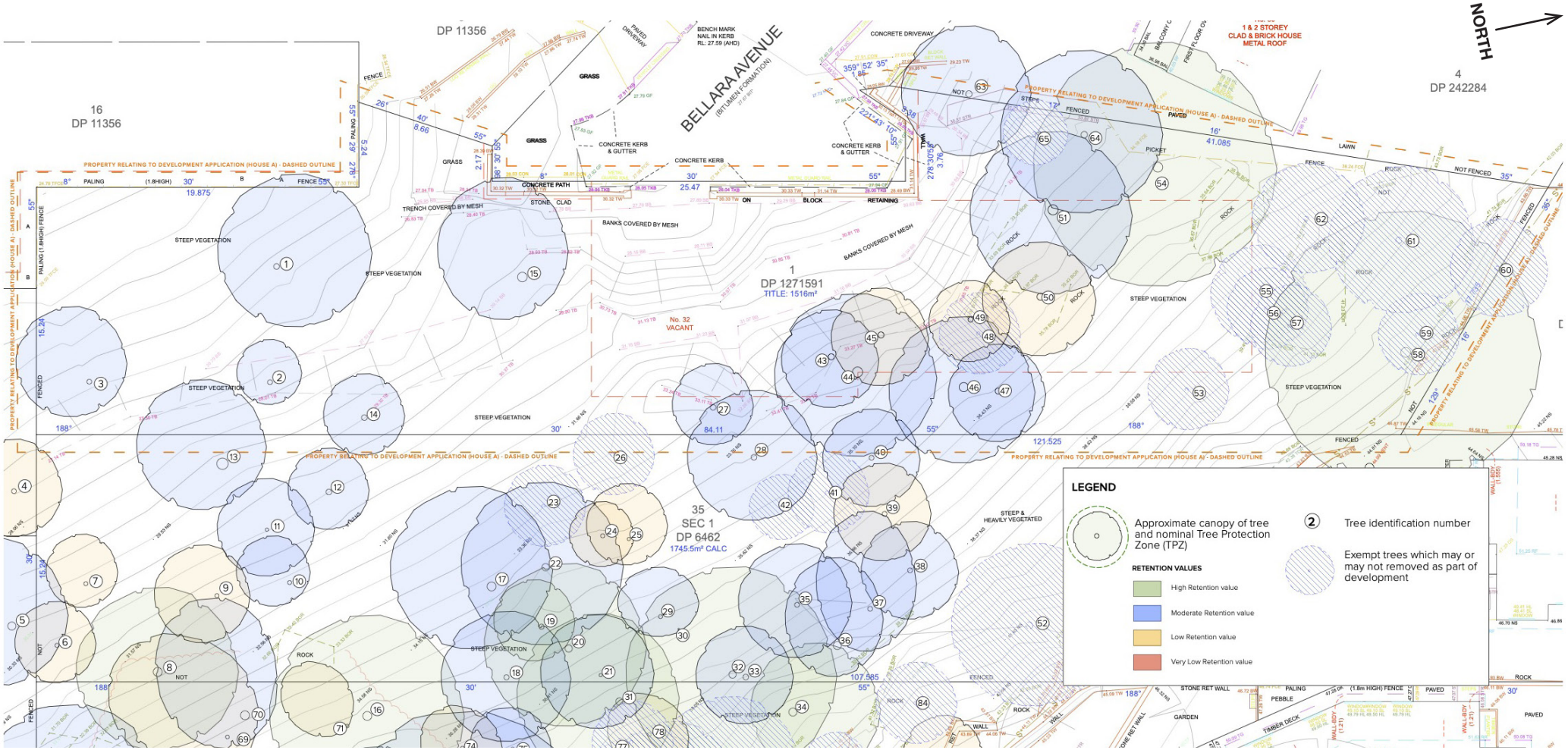

Figure 4: Tree Location Plan showing an overlay of the existing trees located on the site and on adjoining land and within close proximity to the proposed works. The topographical survey plan has been used as a base layer. The retention value of the protected trees is also indicated on the plan using colour shading (refer to legend on plan), as well as those trees that are identified as exempt ie. non-protected. (Note, do not measure from drawings).

Figure 5 (above): Photograph viewing east to the property from Bellara Avenue (Photo: J Willis)

Figure 6 (left): Photograph viewing north to the upper portion of the property from Bellara Avenue. (Photo: J Willis)

Figure 7 (left): Photograph viewing south from the upper portion of the property to the Bellara Avenue frontage. (Photo: J Willis)

Figure 8 (left): Photograph viewing north to the upper portion of the site where the proposed dwelling is located. The geotextile fabric over the previous excavation works is visible. (Photo: J Willis)

Figure 9 (left): Photograph viewing south along the approximate line of the eastern boundary. The trees located on the adjoining site are visible to the left hand side. (Photo: J Willis)

Figure 10 (left): Photograph viewing north along the approximate line of the eastern side boundary. The trunk of Tree No. 40 (Cabbage tree palm) is visible to the right hand side. (Photo: J Willis)

4. DISCUSSION | IMPACT ASSESSMENT

4.1 The intention of this assessment is to determine the level of incursion by the proposed works to the root zones and canopies of the trees located on the site and on adjoining land. Furthermore this assessment shall evaluate the likely impact resulting from the proposed works on the existing trees. The Tree Location Plan (**Figure 4**) indicates the tree locations and the tree retention value of each tree is colour coded. The exempt (or non-protected) trees are also indicated. The Proposed Site Plan (**Figure 11**) indicates the proposed retention or removal of the protected trees. The calculated Tree Protection Zone (TPZ) and Structural Root Zone (SRZ) for the retained trees are indicated as dashed lines around the trees. The extent of encroachment (where applicable) for the retained trees located outside the footprint of the proposed structures is indicated as yellow hatching. The following criteria have been examined as part of this assessment:-

- Existing Relative Levels (RL)
- Tree Protection Zone (TPZ)
- Structural Root Zone (SRZ)
- Footprint of the proposed development and any temporary structures (such as scaffolding)
- Incursions to the TPZ & SRZ, including excavation, filling, and potential above ground impacts to tree canopy;
- Existing structures located in the TPZ of the retained trees; and
- Assessment of the likely impact of the works on the existing trees.

4.2 Summary of existing trees

The site and adjoining land contain numerous ecologically significant trees that are indicative of the original vegetation found in the area. Of the thirty two (32) trees included in this assessment approximately 25% are identified as *Angophora costata* (Sydney Red Gum), 22% are identified as *Pittosporum undulatum* (Sweet Pittosporum), 13% are identified as *Livistona australis* (Cabbage tree palm) and 9% are identified as *Glochidion ferdinandi* (Cheese tree). These species are associated with the vegetation community known as Sydney Coastal Enriched Sandstone Forest, a tall to very tall shrubby schlerophyll open forest found on slightly enriched Hawkesbury Sandstone soils on sheltered slopes (or occasionally crests) on the Sydney coastal sandstone plateaus.

On the basis of the ecological significance of the majority of the trees, they are considered to hold a retention value that is either high or moderate. However as a stand alone tree, in many instances the tree has fair to poor condition and often with a limited crown size due to a co-dominant or suppressed crown class. Of the thirty two (32) trees assessed, two (2) trees are considered to have a high retention value, fifteen (15) trees are considered to have a moderate retention value and fifteen (15) trees are considered to have a low or very low retention value. The author assumes all the trees are self sown, with exception to Tree No. 58 (Bull Bay Magnolia) which is located to the upper portion of the site and adjacent to the northern property boundary.

Of the thirty two (32) trees assessed, twelve (12) trees are identified as exempt (ie. non-protected), including Tree No. 22, 26, 48, 53, 55-57, 59-62 and 65. The exempt trees are identified on the Tree Location Plan (**Figure 4**) and also noted on the tree assessment schedule in **Figure 2**. These trees may be removed without seeking permission from Council providing consent from the owner of the tree is received.

4.3 Summary of proposed works (refer to **Figure 11**)

The proposed architectural drawings indicate a multiple (three) storey dwelling located to the upper portion of the site. The proposal includes a double garage at the lower ground floor level. The proposed driveway will provide vehicular access on to the site to provide a connection from Bellara Avenue to the garage. To provide pedestrian access on to the property, the landscape plan indicates thick sandstone stepping pads to extend up the embankment, leading to the entrance of the dwelling. The proposed cut into the slope will result in new retaining walls adjacent to the southern side of the dwelling and driveway. A level lawn area and associated retaining wall is proposed to the southern side of the driveway.

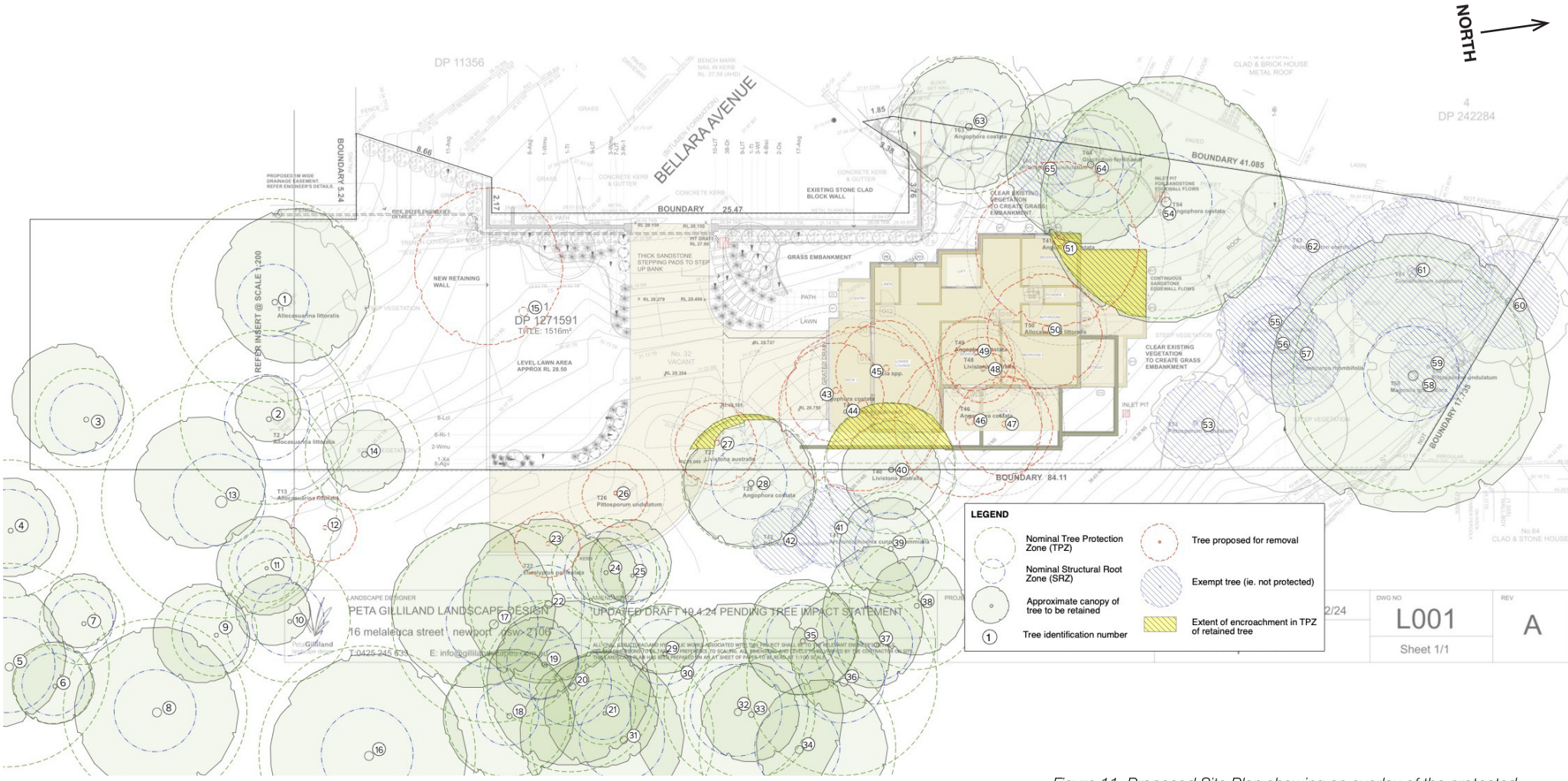

Figure 11: Proposed Site Plan showing an overlay of the protected and exempt trees using the proposed landscape plan as a base layer. The Tree Protection Zone (TPZ) and Structural Root Zone (SRZ) for the protected retained trees are indicated. The extent of proposed encroachment within the TPZ is indicated as yellow hatching. (Note, do not measure from drawings).

4.4 Proposed tree removal

The proposed development involves the removal of ten (10) protected trees located within the site boundaries including Tree No. 15, 27, 43-47 and 49-51. The identified trees for removal are protected species that hold ecological significance. As such, Council permission must be sought prior to their removal. The trees proposed for removal include seven (7) trees of moderate retention value and three (3) trees of low retention value. A breakdown of the proposed structures/works and associated tree removal is as follows:

i) Tree removal to accommodate the driveway

The proposed driveway will necessitate the removal of Tree No. 27 (Cabbage tree palm).
Note: Tree No. 23 and No. 26 (both exempt trees) are located on the adjoining property at No. 64 Powderworks Road. The architectural drawings indicate the driveway will continue into the neighbouring property and Tree No. 23 and 26 will be removed as part of future driveway works and a separate development application relating to a subdivision and new residential dwelling. Both trees are exempt due to height and species. The removal of these trees will be addressed in a separate development application.

ii) Tree removal to accommodate the new dwelling

The proposed three storey dwelling will necessitate the removal of eight (8) protected trees that are located within the building footprint. These trees include Tree No. 43-47 and 49-51. The exempt palm (No. 48) is also located within the building footprint and will be removed as part of the works.

iii) Tree removal to accommodate the level lawn area and associated retaining wall

It is proposed to construct a retaining wall across the width of the site to the south of the driveway to create a level lawn area on the property. The proposed works will involve excavation below existing levels which will render Tree No. 15 (Sydney Peppermint) unviable.

4.5 Encroachment in TPZ of Tree No. 54 (Sydney Red Gum) - refer to **Figure 11**

The proposed dwelling footprint is located in the TPZ of Tree No. 54 (Sydney Red Gum) representing an encroachment of approximately 10%, which is considered to be just within the acceptable threshold. Based on the architectural drawings the first floor level will be RL 35.00. With consideration to the existing levels within the TPZ of Tree No. 54, the floor level will be set above the existing ground level within the TPZ. The author assumes the extent of excavation will be limited to footings only and existing levels within the TPZ and outside the building footprint will remain unchanged.

The storm water drawings indicate a continuous sandstone edge wall to intercept and redirect outlet flows to the site drainage system. An inlet pit for the sandstone edge wall flow is indicated within the SRZ of Tree No. 54. The storm water works may result in a high to significant level of impact upon the tree. The proposed excavation required in the SRZ may result in the severance of large woody roots that are providing anchorage and stability for the tree. If the storm water works are approved in its current form, the extent of encroachment is above acceptable limits and would render the tree unviable. To ensure the safe retention of the tree, the storm water design would need to be amended to shift the inlet pit outside the TPZ of the tree.

4.6 Encroachment in TPZ of Tree No. 40 (Cabbage tree palm) - refer to **Figure 11**

The proposed dwelling footprint and associated retaining wall located to the northern side of the building is located in the TPZ of neighbouring Tree No. 40 (Cabbage tree palm). The proposed excavation work relating to the new structures represent an encroachment of approximately 32%, which is considered to be well above the acceptable threshold. The root system of a palm is much simpler in form to that of a tree. Rather than a woody root system, palms have adventitious roots that are composed of numerous, small to medium sized non-woody roots (that form a root mass) and arise independently from the base of the trunk. As such, potential severance of these non-woody roots may not be detrimental to the longevity of the palm in comparison to severance of woody roots of a tree. Providing the line of excavation does not extend beyond the retaining wall, it is the author's opinion that the proposed works within the TPZ of the palm should not compromise the long term preservation of the palm.

4.7 Driveway encroachment in TPZ of trees (refer to **Figure 11**)
The proposed driveway area and associated retaining wall is located within the TPZ of the neighbouring Tree No. 28 (Sydney Red Gum) representing an encroachment of approximately 6%. The extent of encroachment is considered to be within acceptable limits and should not result in any long term impact upon the tree.

4.8 Proposed drainage easement
The storm water drawings indicate a proposed 1 metre wide drainage easement to the lower portion of the site to allow for the installation of new storm water lines for the property. The trenching for new storm water lines extends through a small portion of the TPZ of Tree No. 1 (She-Oak) and No. 3 (Cheese tree). The extent of encroachment within the TPZ is less than 5% and is considered to be minor. As such, the works should not result in any adverse impact upon the trees.

4.9 Canopy pruning
The proposed development should not result in any canopy pruning to the retained trees. If minor clearance pruning is required to Tree No. 54 and No. 64, the extent of pruning is estimated to be less than 10% of the tree's crown volume.

5. CONCLUSION | RECOMMENDATIONS

5.1 A total of thirty two (32) trees are included in this assessment including twenty seven (27) trees located within the site boundaries and five (5) trees located on the adjoining land. The site is vacant (free of any structures), steeply sloping and contains numerous trees. The identified trees are consistent with the locally occurring vegetation in the area which holds high ecological value - Council's zoning of the site as C4 Environmental Living, being land identified as holding biodiversity and ecological significance. Furthermore, the land is identified as holding biodiversity value on Council's Biodiversity Vales Map.

5.2 The development application relates to the construction of a new multiple storey dwelling, new driveway and retaining wall works. The proposed structures are positioned to the upper portion of the site. The owner is seeking permission from Council to remove ten (10) protected trees as part of the application. The trees are located within the site boundaries and include Tree No. 15, 27, 43-47 and 49-51. The above mentioned trees are considered to hold either a moderate or low retention value. To compensate for the tree removal, it would be appropriate to undertake compensatory tree planting on the site using the same tree species or a locally occurring tree species.

5.3 The proposed building and driveway works are located in the TPZ of three (3) retained trees (including Tree No. 28, 40 and 54). Overall, it is the author's opinion the extent of encroachment will not result in any compromise in the long term preservation of the trees (refer to section 4.5-4.7 of this report). To ensure the protection and long term preservation of the retained trees identified in this report, it is recommended an experienced and qualified consulting arborist (AQF Level 5) is engaged to oversee the approved activities located in the TPZ of the identified trees. The arborist should prepare a tree protection plan relating to tree protection measures of the retained trees, including a pruning specification for the applicable trees. The specified tree protection measures are to be adhered to during the course of the works. The consulting arborist should be engaged for the duration of the project and certify that all tree protection measures have been adhered to in accordance with the prepared tree protection plan.

5.4 **Retention of Tree No. 54 (Smooth-barked Apple)**

The below recommendations relate to Tree No. 54 (Sydney Red Gum) which should be protected and retained as part of the future development of the site. The following considerations should be addressed within the TPZ of the tree:

i) Footing design/layout should consist of isolated piers in the TPZ (ie. avoid the use of continuous strip footings). Excavation for piers/footings should be undertaken by non-destructive root investigation methods (such as hand digging or hydro excavation) unless rock is encountered. The final location of all piers and footings must ensure there is no cutting of any woody roots greater than 30mm diameter. Where woody roots greater than 30mm diameter are encountered and the foundation cannot be relocated, further advice must be sought from a qualified Arborist prior to root severance. Any roots less than 30mm in diameter shall be cut cleanly with sharp pruning implement.

ii) The final location of the sandstone edge wall and inlet pit to the rear of the dwelling should be amended to ensure it is not located within the TPZ of the retained trees. It is imperative the inlet pit is shifted well away from the SRZ of Tree No. 54. If the pit cannot be located outside the TPZ of the tree, it is recommended preliminary hand digging is undertaken to ensure the final pit location does not result in any severance of large woody roots.

5.5 It is assumed all future underground services will extend directly along side the proposed structures and where possible, utilise the undercroft areas beneath the building footprint. This will minimise any disturbance to the root systems of the retained trees. If additional trenching is required through the TPZ of the retained trees, the applicant should seek further advice from a qualified arborist.

5.6 Written approval from Council will be required to undertake tree removal of protected trees. Tree removal and pruning works is only to be undertaken by a qualified arborist (ISAAC member under the supervision of a person with AQF Level 3 or above).

If you have any questions regarding this report please do not hesitate to contact the undersigned.

Joanne Willis
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Member of I.A.C.A. (Institute of Australian Consulting Arborists)
Member of I.S.A (International Society of Arboriculture)

Assumptions

Care has been taken to obtain all information from reliable sources. All data has been verified as far as possible. However Joanne Leigh – Consulting Arborist can neither guarantee nor be responsible for the accuracy of information provided by others.
Unless stated otherwise:
- Information contained in this report covers only the tree that was examined and reflects the condition of the tree at the time of inspection: and
- The inspection was limited to visual examination of the subject tree without dissection, excavation, probing or coring. There is no warranty or guarantee, expressed or implied, that problems or deficiencies of the subject tree may not arise in the future.

6. REFERENCES

- Draper, Danny B. and Richards, Peter A (2009) “Dictionary for Managing Trees in Urban Environments”. CSIRO Publishing, Collingwood, VIC Australia
- Harris, R.W; Clark, J.R; & Matheny, N.P (2004) Arboriculture; Integrated Management of Landscape Trees, Shrubs & Vines 4th Edition, Prentice Hall, New Jersey.
- Mattheck, Claus (2007) “Updated Field Guide for Visual Tree Assessment”. Karlsruhe Research Centre, Germany.
- Standards Australia (2009) AS2970-2009 “Protection of Trees on Development Sites”, Sydney.
- Council’s relevant tree planning documents.

APPENDIX 1: TREE INSPECTION INVENTORY NOTES

The values for terminology provided below are sourced from SRIV© Sustainable Retention Index Value © From Draper BD and Richards PA 2009, Dictionary for Managing Trees in Urban Environments, Institute of Australian Consulting Arboriculturists (IACA), CSIRO Publishing, Collingwood, Victoria, Australia.

Age: Most trees have a stable biomass for the major proportion of their life. The estimation of the age of a tree is based on the knowledge of the expected lifespan of the taxa in situ divided into three distinct stages of measurable biomass, when the exact age of the tree from its date of cultivation or planting is unknown and can be categorized as Young, Mature and Over-mature.
Young - Tree aged less 20% of life expectancy, in situ.
Mature - Tree aged 20-80% of life expectancy, in situ.
Over-mature - Tree aged greater than >80% of life expectancy, in situ, or senescent with or without reduced vigour, and declining gradually or rapidly but irreversibly to death.

Height: In metres (estimated)

Spread: Average diameter of canopy in metres (estimated)

Crown class:
(D) Dominant (crown extends above general canopy; not restricted by other trees)
(C) Co-dominant (crown forms the bulk of the general canopy but crowded by other trees)
(I) Intermediate (crown extends into dominant/codominant canopy but quite crowded on all sides)
(S) Supressed (crown development restricted from overgrowing trees)

Vigour: Ability of a tree to sustain its life processes. This is independent of the condition of a tree but may impact upon it. Vigour can appear to alter rapidly with change of seasons (seasonality) e.g. dormant, deciduous or semi-deciduous trees. Vigour can be categorized as:
Normal Vigour Ability of a tree to maintain and sustain its life processes. This may be evident by the typical growth of leaves, crown cover and crown density, branches, roots and trunk and resistance to predation. This is independent of the condition of a tree but may impact upon it, and especially the ability of a tree to sustain itself against predation.
High Vigour Accelerated growth of a tree due to incidental or deliberate artificial changes to its growing environment that are seemingly beneficial, but may result in premature aging or failure if the favourable conditions cease, or promote prolonged senescence if the favourable conditions remain, e.g. water from a leaking pipe; water and nutrients from a leaking or disrupted sewer pipe; nutrients from animal waste, a tree growing next to a chicken coop, or a stock feed lot, or a regularly used stockyard; a tree subject to a stringent watering and fertilising program; or some trees may achieve an extended lifespan from continuous pollarding practices over the life of the tree.
Low Vigour Reduced ability of a tree to sustain its life processes. This may be evident by the atypical growth of leaves, reduced crown cover and reduced crown density, branches, roots and trunk, and a deterioration of their functions with reduced resistance to predation. This is independent of the condition of a tree but may impact upon it, and especially the ability of a tree to sustain itself against predation.
Dormant Tree Vigour Determined by existing turgidity in lowest order branches in the outer extremity of the crown, with good bud set and formation, and where the last extension growth is distinct from those most recently preceding it, evident by bud scale scars. Normal vigour during dormancy is achieved when such growth is evident on a majority of branches throughout the crown.

Useful Life Expectancy: The life span of a tree in the urban environment may often be reduced by the influences of encroachment and the dynamics of the environment and can be categorized as Immediate, Short Term, Medium Term and Long Term.
Short Term - Period of time less than 15 years.
Medium Term - Period of time 15 - 40 years.
Long Term - Period of time greater than >40 years.

Condition: A tree's crown form and growth habit, as modified by its environment (aspect, suppression by other trees, soils), the stability and viability of the root plate, trunk and structural branches (first (1st) and possibly second (2nd) order branches), including structural defects such as wounds, cavities or hollows, crooked trunk or weak trunk/branch junctions and the effects of predation by pests and diseases. These may not be directly connected with vigour and it is possible for a tree to be of normal vigour but in poor condition. Condition can be categorized as:
Good Condition - Tree is of good habit, with crown form not severely restricted for space and light, physically free from the adverse effects of predation by pests and diseases, obvious instability or structural weaknesses, fungal, bacterial or insect infestation and is expected to continue to live in much the same condition as at the time of inspection provided conditions around it for its basic survival do not alter greatly. This may be independent from, or contributed to by vigour.
Fair Condition - Tree is of good habit or misshapen, a form not severely restricted for space and light, has some physical indication of decline due to the early effects of predation by pests and diseases, fungal, bacterial, or insect infestation, or has suffered physical injury to itself that may be contributing to instability or structural weaknesses, or is faltering due to the modification of the environment essential for its basic survival. Such a tree may recover with remedial works where appropriate, or without intervention may stabilise or improve over time, or in response to the implementation of beneficial changes to its local environment. This may be independent from, or contributed to by vigour.
Poor Condition - Tree is of good habit or misshapen, a form that may be severely restricted for space and light, exhibits symptoms of advanced and irreversible decline such as fungal, or bacterial infestation, major die-back in the branch and foliage crown, structural deterioration from insect damage e.g. termite infestation, or storm damage or lightning strike, ring barking from borer activity in the trunk, root damage or instability of the tree, or damage from physical wounding impacts or abrasion, or from altered local environmental conditions and has been unable to adapt to such changes and may decline further to death regardless of remedial works or other modifications to the local environment that would normally be sufficient to provide for its basic survival if in good to fair condition. Deterioration physically, often characterised by a gradual and continuous reduction in vigour but may be independent of a change in vigour, but characterised by a proportionate increase in susceptibility to, and predation by pests and diseases against which the tree cannot be sustained. Such conditions may also be evident in trees of advanced senescence due to normal phenological processes, without modifications to the growing environment or physical damage having been inflicted upon the tree. This may be independent from, or contributed to by vigour.

APPENDIX 2: CRITERIA FOR ASSESSMENT OF LANDSCAPE SIGNIFICANCE

The level of landscape significance has been determined using the following key criteria as a guide:

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
• The subject tree forms part of the curtilage of a Heritage Item (building /structure /artifact as defined under the LEP) and has a known or documented association with that item; or
• 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 scheduled as a Threatened Species or is a key indicator species of an Endangered Ecological Community as defined under the Threatened Species Conservation Act 1995 (NSW) or the Environmental Protection and Biodiversity Conservation Act 1999; or
• 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; or
• The subject tree is a Remnant Tree, being a tree in existence prior to development of the area; or
• The subject tree has a very large live crown size exceeding 300m2 with normal to dense foliage cover, is located in a visually prominent in the landscape, exhibits very good form and habit typical of the species and 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; or
• 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/artifact/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; or
• The subject tree is listed on Council's Significant Tree Register; or
• 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 very large live crown size exceeding 200m2; a crown density exceeding 70% Crown Cover (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; or
• The tree is a locally-indigenous species and representative of the original vegetation of the area; or
• The subject tree has a large live crown size exceeding 100m2; and
• The tree is a good representative of the species in terms of its form and branching habit with minor deviations from normal (eg crown distortion/suppression) with a crown density of at least 70% Crown Cover (normal); and
• 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 subject tree has a medium live crown size exceeding 40m2; and
• 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% Crown Cover (thinning to normal); and
• The tree makes a fair contribution to the visual character and amenity of the area; 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 has no known or suspected historical association

5. LOW
• The subject tree has a small live crown size of less than 40m2 and can be replaced within the short term with new tree planting; or
• 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% Crown Cover (sparse); and
• 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.

6. VERY LOW
• The subject tree is listed as an Environment Weed Species in the relevant Local Government Area, being invasive, or a nuisance species.
• The subject tree is scheduled as exempt (not protected) under the provisions of the local Council's Tree Preservation Order due to its species, nuisance or position relative to buildings or other structures.

7. INSIGNIFICANT
• The tree is a declared Noxious Weed under the Noxious Weeds Act (NSW) 1993

Ref:- Morton, Andrew (2003) Criteria for Assessment of Landscape Significance Earthscape Horticultural Services. Sydney, Australia