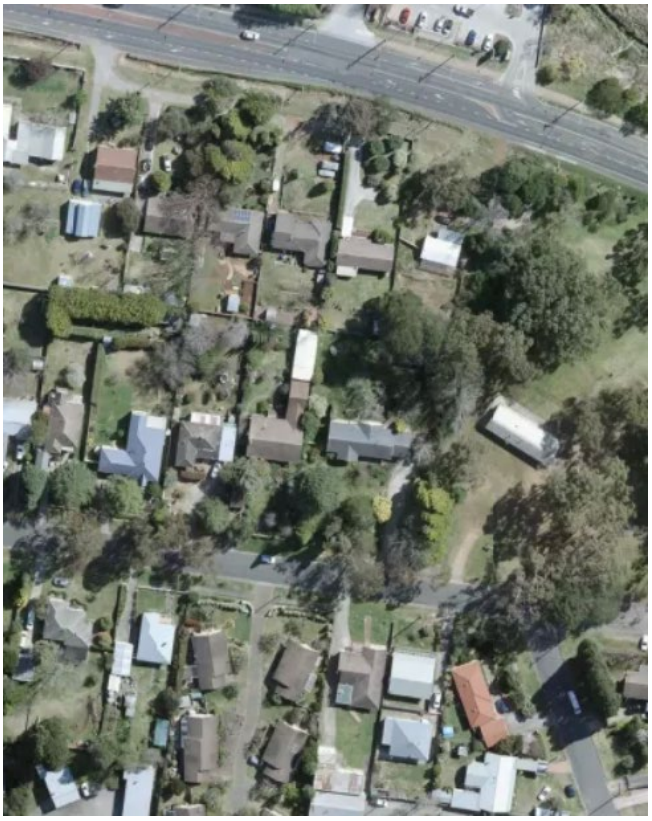

Arboricultural Impact Assessment

1-5 Rainbow Road Mittagong NSW 2575
Lot 141/DP531051,
Lot 142/DP531051 &
Lot 32/DP9299

Prepared for:

Robsea Nominees Pty. Ltd.

Bilgola Beach Pty. Ltd.

Prepared by:

Tom Hare | AQF Level 5 Consulting Arborist
Truth About Trees Pty Ltd
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Date: 12th July 2024
Version: 7.

1 EXECUTIVE SUMMARY

Truth About Trees Pty Ltd have been engaged by Robsea Nominees Pty Ltd & Bilgola Beach Pty Ltd to prepare an Arboricultural Impact Assessment (AIA) report in relation to a proposed development at 1-5 Rainbow Road Mittagong.

The proposal seeks to demolish the existing dwellings within three (3) lots and construct a new multi-occupancy dwelling within the site(s).

The scope of the report was to provide an Arboricultural Impact Assessment (AIA) written in accordance with the requirements of Australian Standard AS4970-2009: The 'Protection of Trees on Development Sites' (Standards Australia, 2009).

Assessment of the trees was undertaken on 1 July 2022 and 1 September 2023 by Tom Hare using elements from the framework of the Visual Tree Assessment procedure (VTA) as prescribed by Mattheck & Breloer (Claus Mattheck, 1994).

Details provided for the trees are as follows:

a) Correct botanical identification and common name
b) Health assessment & rating
c) Basic structural assessment & rating
d) Dimensions: height, crown spread, DBH & DAB
e) TPZ & SRZ calculations
f) Age class
g) Landscape significance assessment & rating
h) Estimated life expectancy
i) Retention value in accordance with the STARS system

Tree Protection Zones and Structural Root Zones were calculated in accordance with AS4970-2009: The 'Protection of Trees on Development Sites' (Standards Australia, 2009).

Tree Retention Values were determined using the Institute of Australian Consulting Arborists' (IACA) 'Significance of a Tree, Assessment Rating System (IACA©, 2010).

Trees within the survey area were geo-located and data collected using a TRIMBLE TDC600 handheld data collector with a DA2 aerial capable of 30cm accuracy in optimal conditions.

The site subject to assessment for the purposes of this report, will be referenced further within this report as 'the site'.

The site is classified as Lots 141 & 142/DP DP531051 & Lot 32/DP9299 to be known as 1-5 Rainbow Road Mittagong NSW 2575.

A total of seventy-six (76) trees were surveyed in the preparation of this report

- No trees were allocated a high retention value in accordance with the STARS system of assessment.
- Twenty-two (22) trees were allocated medium retention values in accordance with the STARS system of assessment.
- Forty-six (49) trees were allocated low retention values in accordance with the STARS system of assessment.
- Five (5) trees were allocated a very low retention value in accordance with the STARS system of assessment.
- Low and very low retention value trees are not generally considered to be worthy of a material constraint upon design or development.
- Forty-seven (47) trees will require removal in order to facilitate the development in its current form.
- Trees:7,8,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,30,32,33,34,35,36,37,38,39,40,44, 45,51,52,53,54,57,58,59,60,61,63,65,66,67; are subject to significant conflict with the

development proposal, mitigation measures are not considered to be feasible under the current design. These trees are to be removed to facilitate the development in its current form. Trees 46,47,55 are subject to minor or no encroachment from the development, however, their health and or structural condition makes them unsuitable for retention.

- Five (5) trees should be removed regardless of the development due to potentially hazardous defects and structural condition.
    - It is recommended that tree 4 is to be assessed by Council, following observations of the trees poor health and compromised structural condition.
    - The remaining four very low retention value trees are located on private land and will be managed by the tree/land owner.

Trees 1,2,3,5,6,9,10,28,29,31,41,42,43,56,64,68,69,70,71,72,73,74,75,76; may be retained and protected in accordance with Australian Standard AS4970-2009: The 'Protection of trees on development sites' (AS4970) and Appendix 2 of this report.

Tree protection will form an essential part of the success of the development and should be prioritised at the earliest of stages.

Should the development application be successful, it is recommended that upon engagement of the principal contractor, a Construction & Environmental Management Plan (CEMP) is prepared by the principal contractor in collaboration with the project Arborist to ensure that trees to be retained are not impacted by the locations of cranes, temporary structures such as amenities and site sheds and access and egress to the site. This should be completed and certified by the project Arborist prior to the construction certificate being provided.

All work within the TPZ(s) of any tree proposed for retention is to be supervised by the PA and undertaken in accordance with AS4970-2009.

Record keeping of all supervision works by the PA is to be completed via a statement of attendance detailing what works were undertaken and certifying that they were undertaken in accordance with the relevant standards i.e., AS4970 & AS4373.

This report does not in any part count for approval of the recommendations contained within. Approval must be sought from the consent authority as part of the development application process.

2 CONTENTS

3 INTRODUCTION & AIM

Truth About Trees Pty Ltd have been engaged by Robsea Nominees Pty Ltd & Bilgola Beach Pty Ltd to prepare an Arboricultural Impact Assessment (AIA) report in relation to a proposed development at 1-5 Rainbow Road, Mittagong.

Mittagong is located in the Southern Highlands and is within the Wingecarribee Shire Council (WSC) Local Government Area (LGA) area shown in figure 1 below.

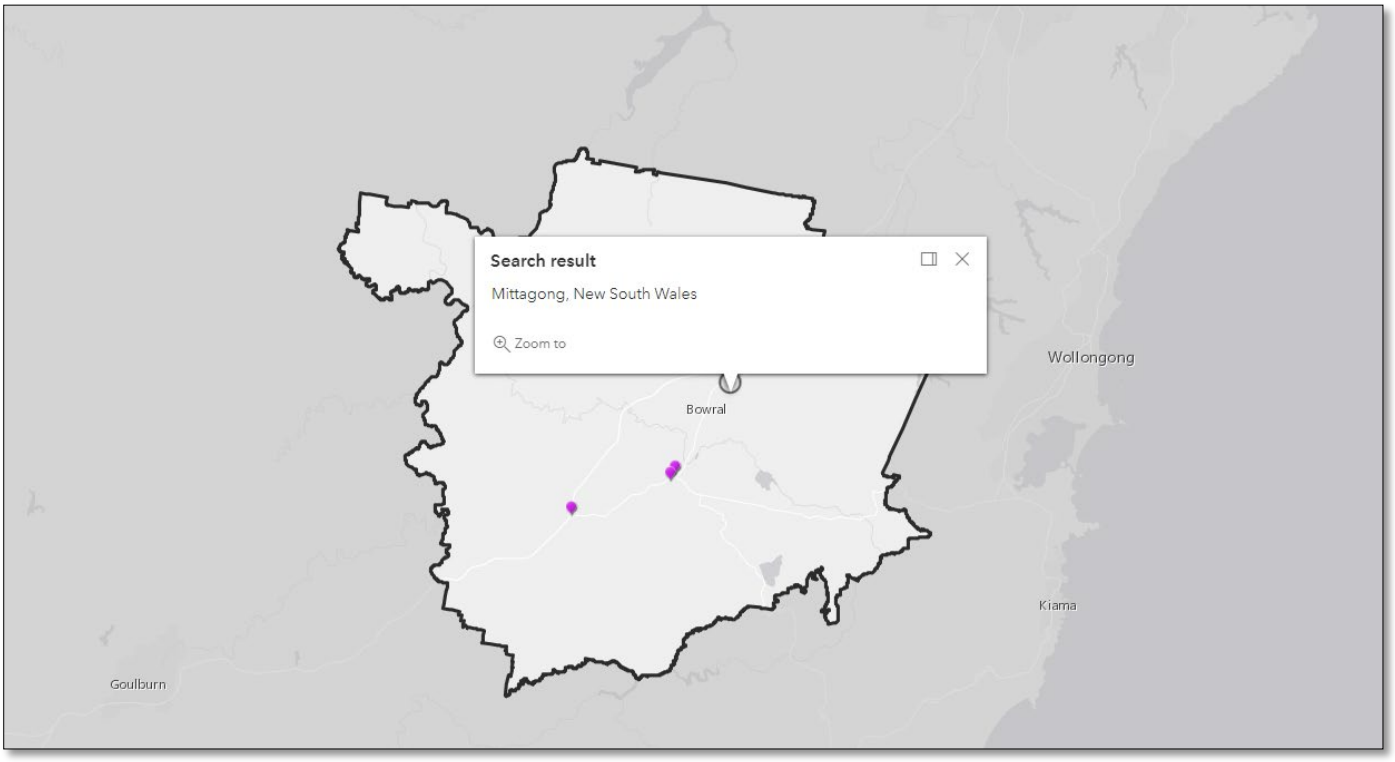

Figure 1 - Showing the suburb of Mittagong within the WSC LGA - ((ArcGIS), 2022)

The proposal seeks to demolish the existing dwellings within three (3) lots and construct a new multi-occupancy dwelling within the site(s).

The scope of the report was to provide an Arboricultural Impact Assessment (AIA) written in accordance with the requirements of Australian Standard AS4970-2009: The 'Protection of Trees on Development Sites' (Standards Australia, 2009).

The assessment was to include all trees within the site boundary and all trees within the neighbouring properties where directly adjacent to, and where observed to be affected by the proposed development.

This report (version 7) is also to respond to recent feedback from Wingecarribee Shire Council (WSC) in relation to some previous ambiguity within version 5 of the report.

WSC also asked for clarification regarding potential impacts imposed on adjacent trees within the neighbouring property to the East.

Additional trees have now been captured within the adjacent site to address this request, however, it should also be noted that the alterations of design to pull the development further away from the North, West and East boundaries has greatly reduced any potential impacts from a construction standpoint. Demolition and earthworks, however, still have the potential to impact these trees.

4 METHODOLOGY

Assessment of the trees was undertaken on 1 July 2022 and 1 September 2023 by Tom Hare using elements from the framework of the Visual Tree Assessment procedure (VTA) as prescribed by Mattheck & Breloer (Claus Mattheck, 1994).

Details provided for the trees are as follows:

a) Correct botanical identification and common name
b) Health assessment & rating
c) Basic structural assessment & rating
d) Dimensions: height, crown spread, DBH & DAB
e) TPZ & SRZ calculations
f) Age class
g) Landscape significance assessment & rating
h) Estimated life expectancy
i) Retention value in accordance with the STARS system

Tree Protection Zones and Structural Root Zones were calculated in accordance with AS4970-2009: The 'Protection of Trees on Development Sites' (Standards Australia, 2009).

Tree Retention Values were determined using the Institute of Australian Consulting Arborists' (IACA) 'Significance of a Tree, Assessment Rating System (IACA©, 2010).

Trees within the survey area were geo-located and data collected using a TRIMBLE TDC600 handheld data collector with a DA2 aerial capable of 30cm accuracy in optimal conditions.

A detailed assessment methodology can be found in Appendix 1 of this report.

Limitations of the report:

- No internal diagnostic testing has been completed.
- No sub surface root testing or soil testing has been completed.
- All observations were made from the ground only.
- Tree height, canopy spreads and trunk diameters have been estimated.
- Assessment was based only on the documents listed in Table 1 below, and from observations made at the time of site inspection only.
- Only trees that had the potential to be impacted by the proposed development were captured, provided they satisfied the definition criteria of a 'protected tree' in accordance with Councils Development Control Plan (DCP).
- Where juvenile trees located on neighbouring properties were deemed to be quarantined within the TPZ(s) of larger, more mature/significant trees, they may not have been individually captured as part of the site assessment.

At the request of the client, this report was produced to provide an AIA assessment of the trees related to the development only.

Assessment of tree health and condition has been included to guide assessment of tree retention aspects only and is based on a basic visual assessment using elements of the VTA method. Tree structure and defects may be discussed briefly within this report; however, this report is not designed to be, nor does it satisfy the requirements of a detailed Arboricultural Risk Assessment report.

4.1 DOCUMENT SCHEDULE – CLIENT PROVIDED

The documents listed below have been provided to Truth About Trees by the client and have been relied upon to complete the assessment.

Ref. No.	Document / Drawing Title	Author	Date
CSA Job No. - 610-21-561	Drawing package for 1-5 Rainbow Road. Sheets 1-4, 7-9, 10 & 17 (Issue P)	Coble Stephens Architects	15/12/23
2210	MUSIC MODEL ASSESSMENT & DRAINAGE CONCEPT REPORT	CDS	10/5/2022
2210CD01	CONCEPT DRAINAGE PLAN	CDS	20/04/2022
19103	PLAN OF DETAIL & CONTOURS	Richard Cox Surveyors	July 2019
CSA Job No. - 610-21-561	SITE/GROUND FLOOR PLAN-DA-02P	Coble Stephens Architects	15/12/23
CSA Job No. - 610-21-561	BASEMENT FLOOR PLAN-DA-03P	Coble Stephens Architects	15/12/23
CSA Job No. - 610-21-561	GROUND FLOOR PLAN-DA-04P	Coble Stephens Architects	15/12/23
CSA Job No. - 610-21-561	CUT & FILL PLAN	Coble Stephens Architects	02/07/24
2210_CD01 (ISS_H)	DRAINAGE PLANS- SHEETS 1-5	Civil Development Solutions	12/07/24

Table 1 - Document Register

5 SITE DETAILS

The site subject to assessment for the purposes of this report, will be referenced further within this report as 'the site'.

The site is classified as Lots 141 & 142/DP DP531051 & Lot 32/DP9299 to be known as 1-5 Rainbow Road Mittagong NSW 2575.

The site has an approximate fall from south-north of 3m.

The site is currently zoned as R3 – Medium-density Residential as shown below in Figure 2.

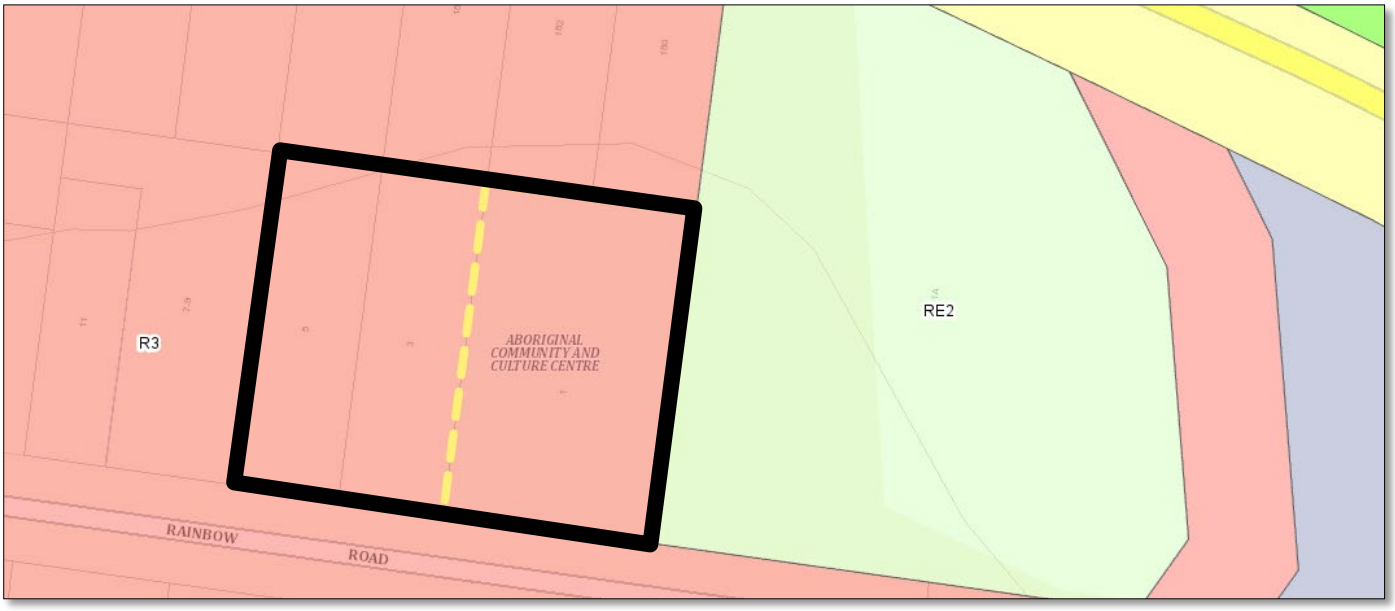

Figure 2 - Showing the subject site with approximate boundary outlined in black and the zoning overlay (Planning, 2022)

The site is not currently mapped on the NSW Department of Planning & Environment (DPE) Biodiversity Values Map, as an area of Biodiversity Value.

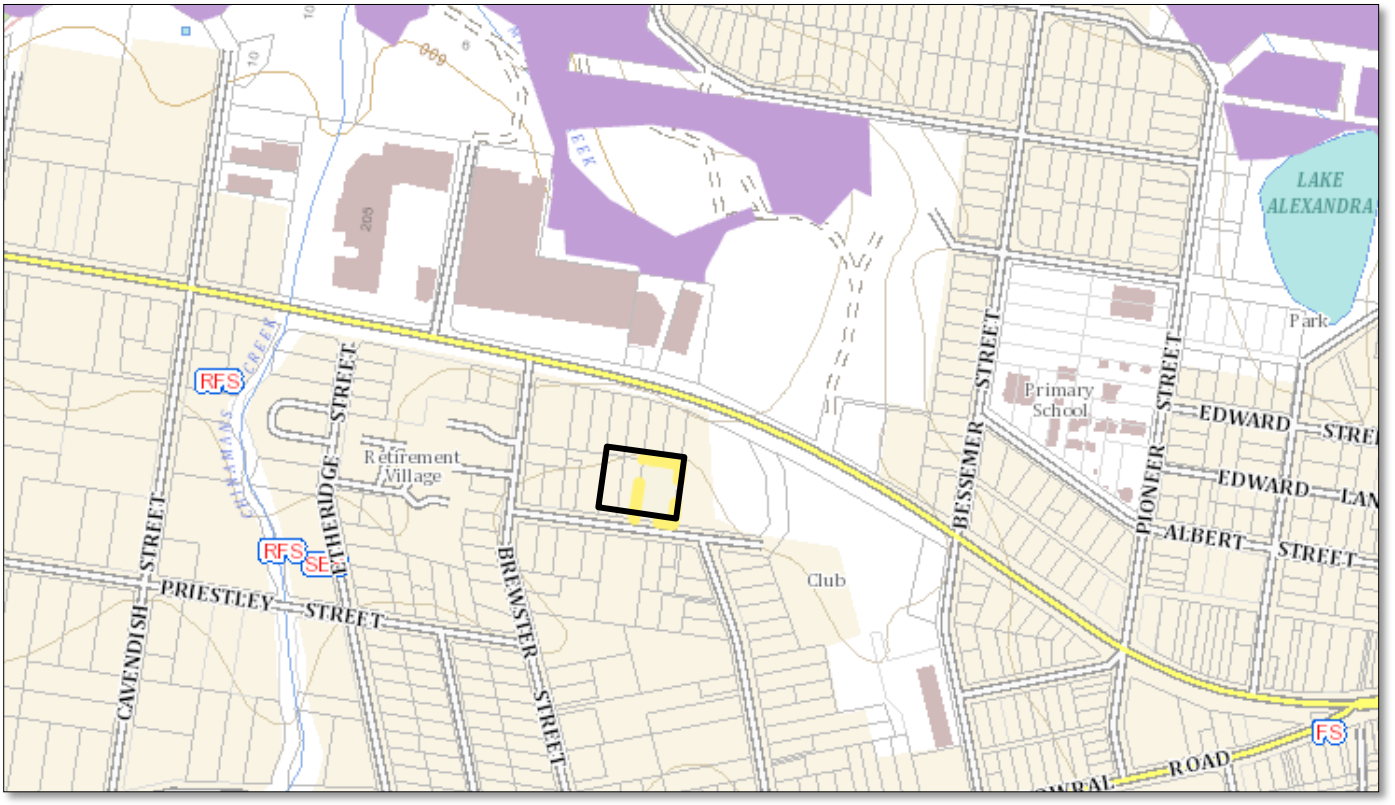

Figure 3 - Showing the site with approximate boundary outlined in black on the NSW DPE Biodiversity Values Map website (Environment, 2022)

6 PROPOSED DEVELOPMENT

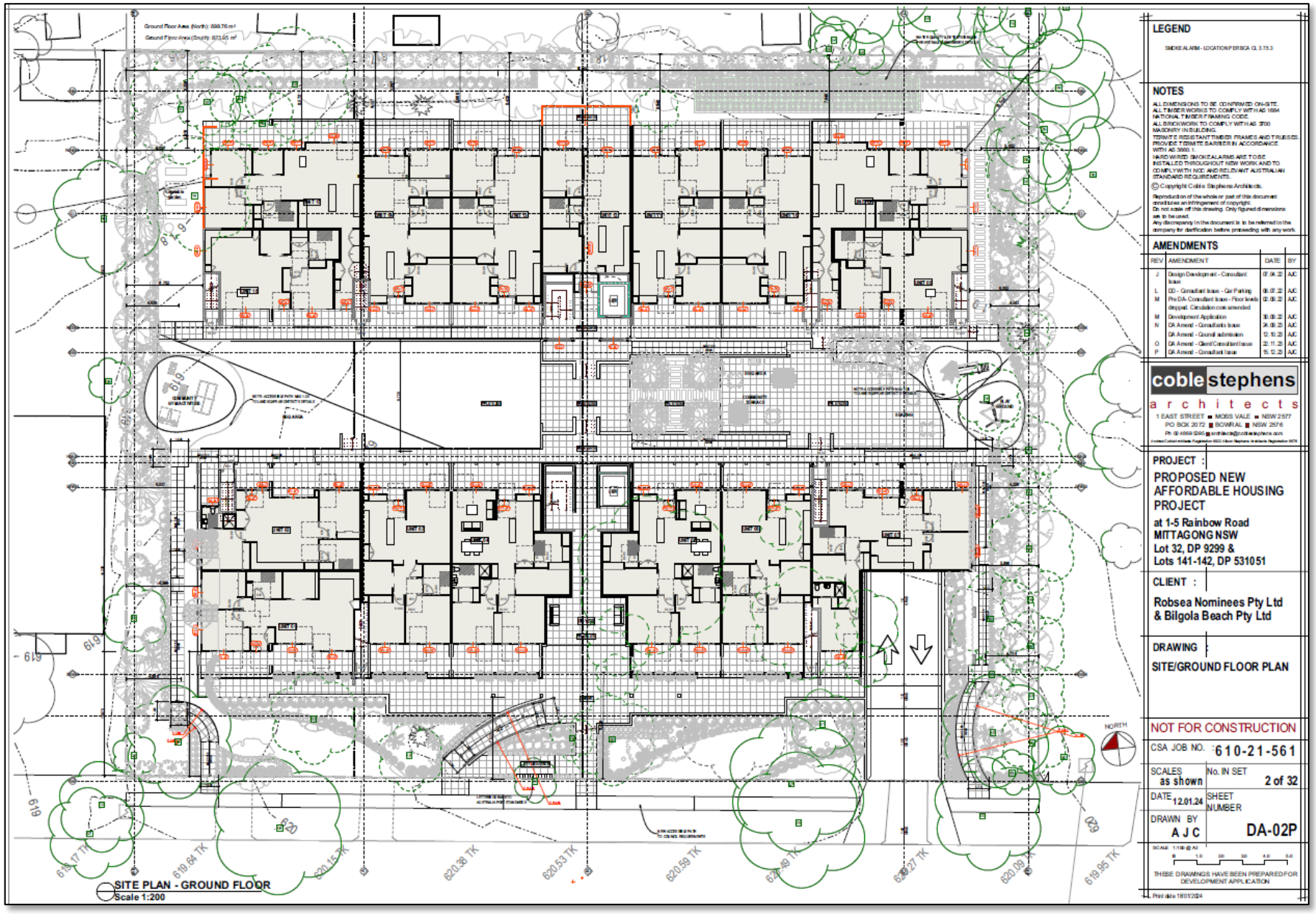

Figure 4 - Showing the proposed Site/Ground Floor Plan.

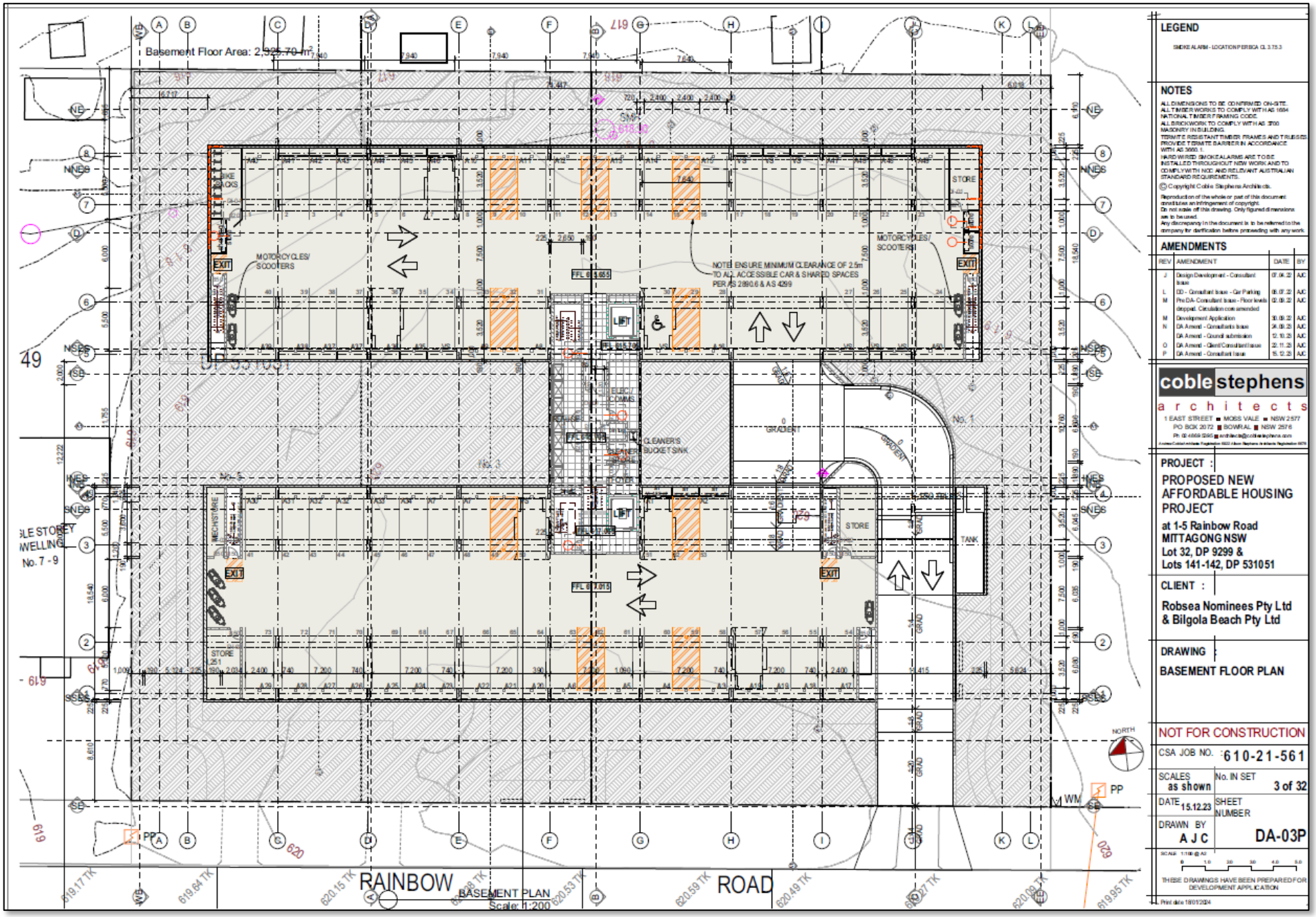

Figure 5- Basement Plan.

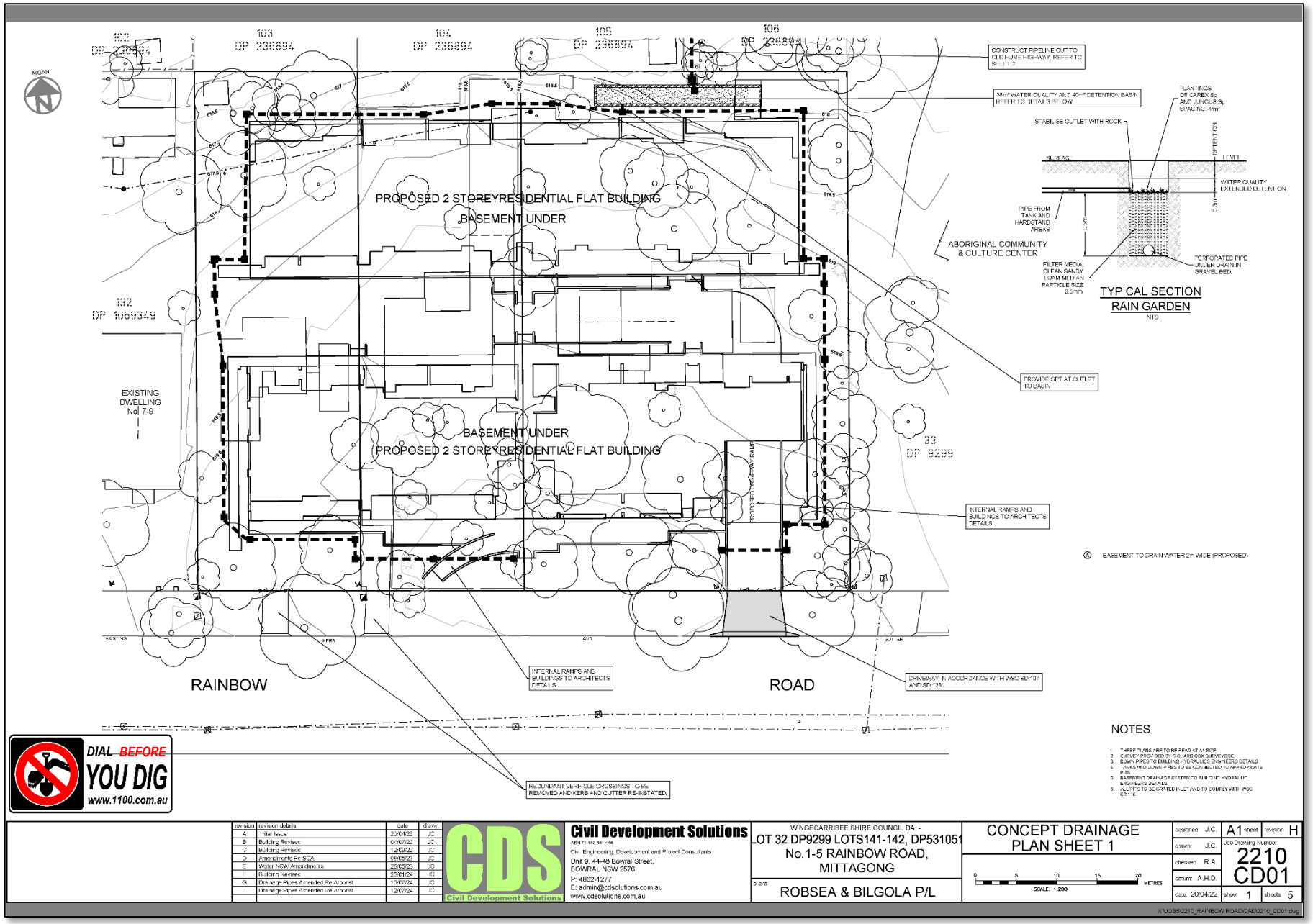

Figure 6- Drainage Plan- Sheet 1.

7 TREE LOCATIONS

Figure 7 - Showing tree locations with aerial imagery overlay.

8 TREE SCHEDULE

SEE APPENDIX 3

9 TREE RETENTION VALUES IN ACCORDANCE WITH STARS.

Retention value	Tree numbers	Total
High	n/a	0
Medium	1, 2, 3, 5, 7, 10, 11, 12, 15, 20, 28, 31, 32, 38, 39, 43, 46, 68, 69, 71, 72, 73	22
Low	6, 8, 9, 13, 14, 16, 17, 18, 19, 21, 22, 23, 24, 25, 26, 27, 29, 30, 33, 34, 35, 36, 37, 40, 41, 42, 44, 45, 47, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 63, 64, 65, 66, 67, 70,74,75,76.	49
Very low	4, 48, 49, 50, 62	5

Table 2 - Tree retention values

10 TREE LOCATIONS WITH GROUND FLOOR PLAN OVERLAY

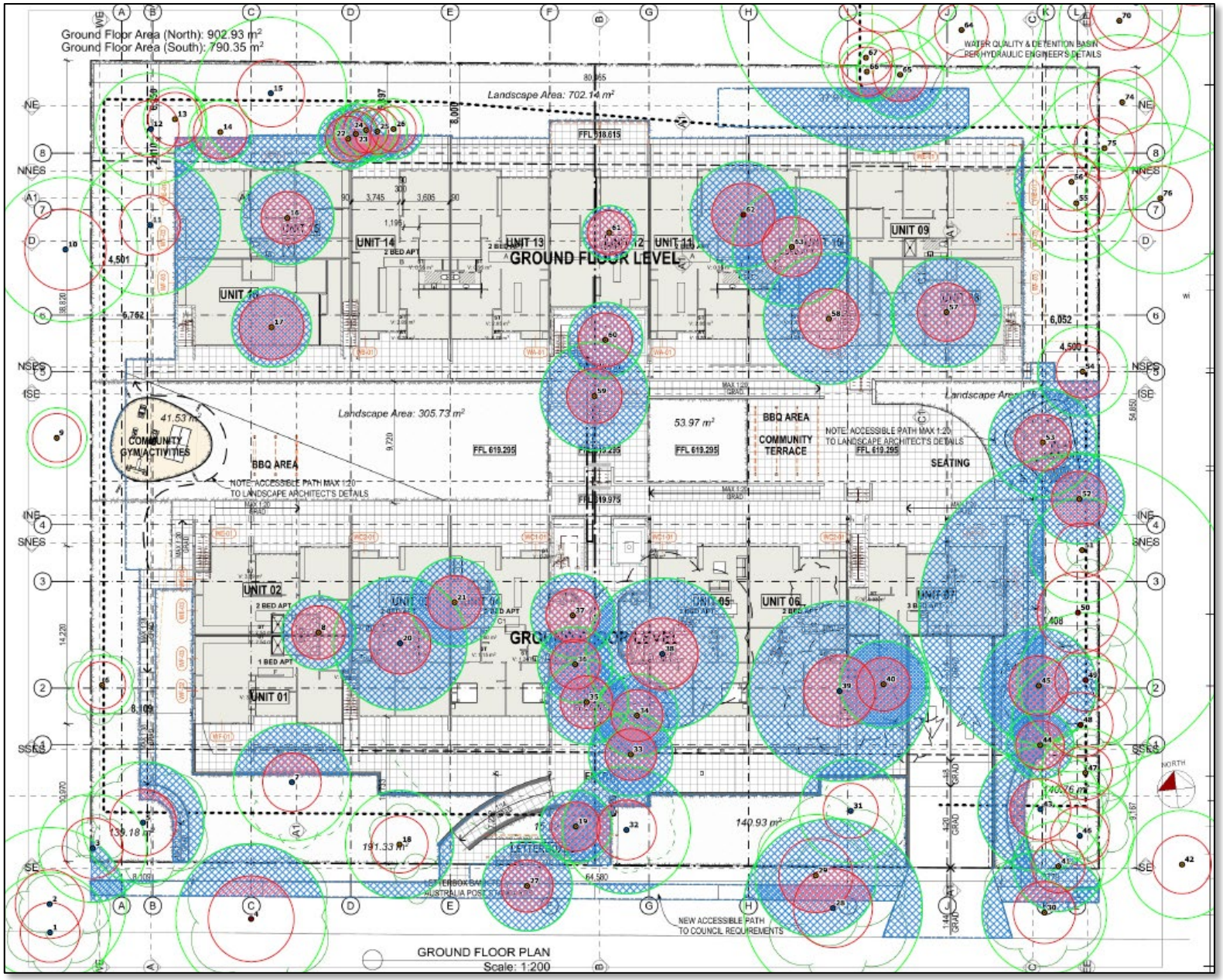

Figure 8 - Showing trees subject to assessment with TPZ & SRZ encroachments on the Ground Floor plan. Please refer to hi-resolution pdfs for greater clarity.

11 TREE LOCATIONS WITH SITE/GROUND FLOOR PLAN OVERLAY

Figure 9 - Showing trees subject to assessment with TPZ & SRZ encroachments on the ground/site plan. Please refer to hi-resolution pdfs for greater clarity.

12 TREE LOCATIONS WITH BASEMENT PLAN OVERLAY

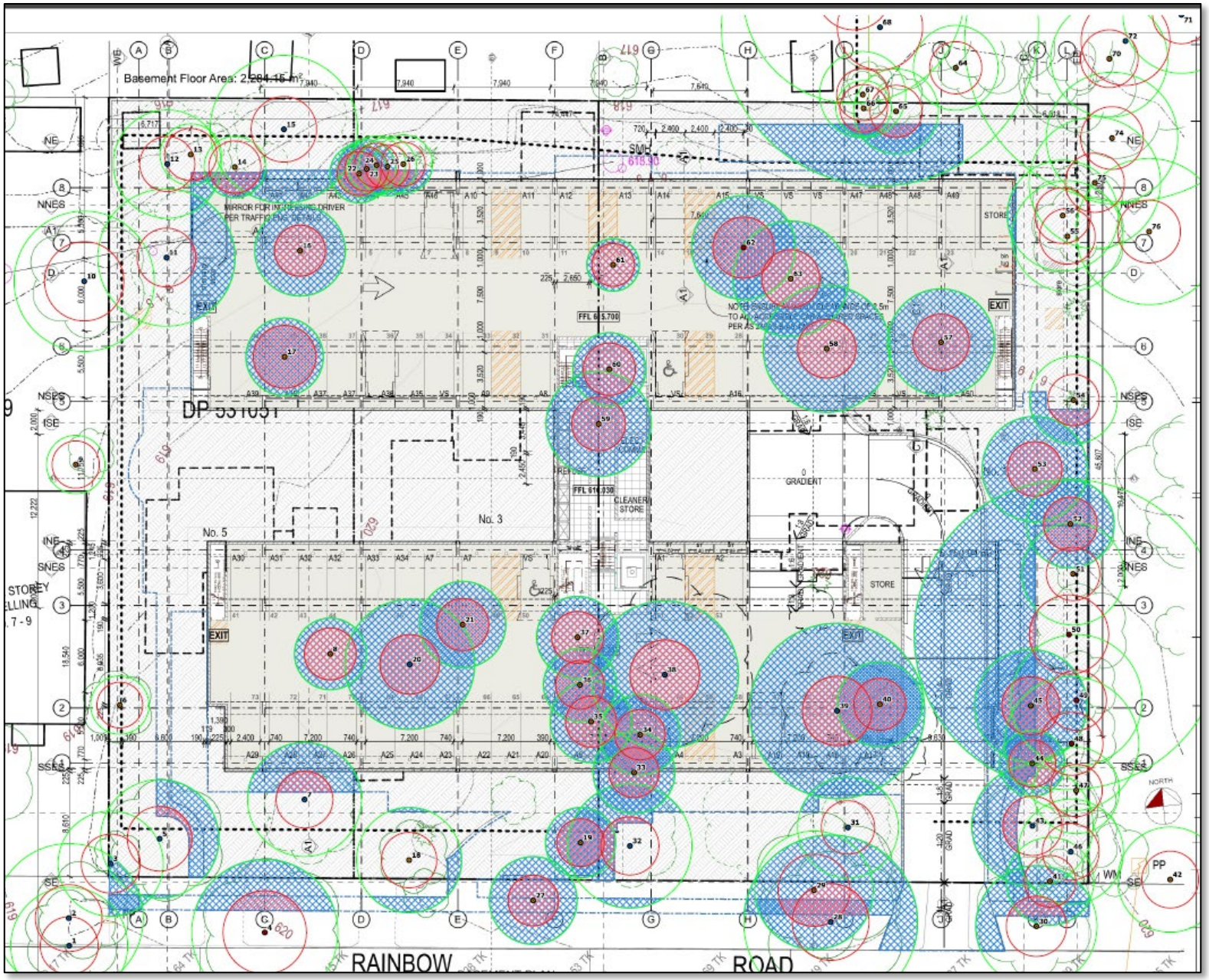

Figure 10- Showing trees subject to assessment with TPZ & SRZ encroachments on the ground/site plan. Please refer to hi-resolution pdfs for greater clarity.

13 IMPACT ASSESSMENT

IMPACT SCHEDULE					
Tree #	Location	Potential Impacted by	Encroachment %	Potential mitigation	Practical to retain
1 - 2	Rainbow Rd frontage Council nature strip	Minor encroachment from public footpath	0.2% + 6.9%	General tree protection measures in accordance with AS4970-2009 & TPP	**Yes**
3	Rainbow Rd frontage SW corner of site	Minor encroachment from public footpath	7.7%	General tree protection measures in accordance with AS4970-2009 & TPP	**Yes**
4	Rainbow Rd Council nature strip	Major encroachment from public footpath Hazardous Tree	31.2%	Tree should be assessed by Council due to observations made of poor health & potentially hazardous structural condition. Tree is subject to major encroachment from the public footpath. Construct footpath on or above existing grade within the TPZ/SRZ using piered footings or screw piles.	**Yes* / No**
5	SW Corner of site	Major encroachment for internal footpath	30.6%	Construct footpath on or above existing grade within the TPZ/SRZ using piered footings or screw piles.	**Yes***
7	SW corner of site – Rainbow Rd frontage	Stormwater services Cut & fill. Building footings	41.6%	Mitigation measures are not feasible under the current design	**No**
8	SW within building footprint	Building footprint	100%	Total encroachment of proposed building footprint Mitigation measures are not feasible under the current design	**No**
11	NW corner of site	Cut & fill. Stormwater services Building footprint	27.7%	Mitigation measures are not feasible under the current design	**No**
12	NW corner of site	Cut & fill. Stormwater services Building footprint	8.6% + fill	General tree protection measures in accordance with AS4970-2009 & TPP. Would require substantial pruning for scaffold and building.	**No**
13	NW corner of site	Cut & fill. Stormwater services Building footprint	7.2% + fill	Mitigation measures are not feasible under the current design	**No**
14	NW corner of site	Cut & fill. Stormwater services Building footprint	38.6%	Mitigation measures are not feasible under the current design	**No**
15	NW corner of site	Cut & fill. Stormwater services Building footprint	16%	Mitigation measures are not feasible under the current design.	**No**
16	NW Building footprint	Building footprint	100%	Mitigation measures are not feasible under the current design	**No**
17	NW Building footprint	Building footprint	100%	Mitigation measures are not feasible under the current design	**No**
18	Rainbow Rd frontage	Public footpath, entrance and building	15.6%	Mitigation measures are not feasible under the current design	**No**
19	Southern end of site	Entranceway	100%	Mitigation measures are not feasible under the current design	**No**

IMPACT SCHEDULE

Tree #	Location	Potential Impacted by	Encroachment %	Potential mitigation	Practical to retain
20-21	Southern end of site	Building footprint	100%	Mitigation measures are not feasible under the current design	**No**
22 - 26	NW corner of site	Cut & fill Stormwater services Building footprint	36%-100%	Mitigation measures are not feasible under the current design	**No**
27	Rainbow Rd frontage within nature strip	Public footpath	100%	Mitigation measures are not feasible under the current design	**No**
28	Rainbow Rd frontage within nature strip	Major encroachment by public footpath	49.1%	Construct footpath on or above existing grade within the TPZ/SRZ using piered footings or screw piles. General tree protection measures in accordance with AS4970-2009 & TPP	**Yes***
29	Rainbow Rd frontage within Council nature strip	Major encroachment by public footpath	39.8%	Construct footpath on or above existing grade within the TPZ/SRZ using piered footings or screw piles. General tree protection measures in accordance with AS4970-2009 & TPP	**Yes***
30	Rainbow Rd frontage within nature strip	Major encroachment by public footpath and driveway	45.5%	Tree is of poor structure with short remaining lifespan. Unlikely to survive the encroachment.	**No**
31	S-SE end of site	Building footprint	14.9%	General tree protection measures in accordance with AS4970-2009 & TPP	**Yes**
32	Southern end of site	Building footprint	47.7%	Mitigation measures are not feasible under the current design	**No**
33-40	Southern end of site	Building footprint	100%	Mitigation measures are not feasible under the current design	**No**
41	South-Eastern corner	Major encroachment from public & internal footpaths.	34.8%	Construct footpath on or above existing grade within the TPZ/SRZ using piered footings or screw piles. General tree protection measures in accordance with AS4970-2009 & TPP	**Yes***
43	SE corner of site	Major encroachment from internal footpaths and driveway	39%	Construct footpath on or above existing grade within the TPZ/SRZ using piered footings or screw piles. General tree protection measures in accordance with AS4970-2009 & TPP	**Yes***
44 - 45	SE corner of site	Internal footpath footprint	100%	Mitigation measures are not feasible under the current design	**No**
46	SE corner of site	Minor encroachment from public footpath	1.2%	Will become exposed to unfamiliar wind patterns following removal of adjacent trees.	**No**
47	SE corner of site	Unaffected by design	0%	Will become exposed to unfamiliar wind patterns following removal of adjacent trees.	**No**
48-50	SE corner of site	Internal footpath Driveway Building footprint	15.7% 12.7% 39.2%	Trees all have hazardous structure.	**No**
51	Eastern boundary	Building footprint	8.3%	Tree has poor health and short remaining lifespan	**No**

IMPACT SCHEDULE					
Tree #	Location	Potential Impacted by	Encroachment %	Potential mitigation	Practical to retain
52-53	Eastern boundary	Footprint of proposed building	100%	Mitigation measures are not feasible under the current design	**No**
54	Eastern boundary	Footprint of proposed building	31.6%	Mitigation measures are not feasible under the current design	**No**
55	Eastern boundary	Footprint of proposed building	1.1%	Tree has poor health and poor structure.	**No**
56	Eastern boundary	Footprint of proposed building	3.5%	General tree protection measures in accordance with AS4970-2009 & TPP	**Yes**
57-63	Northern part of site	Footprint of proposed building	100%	Mitigation measures are not feasible under the current design	**No**
65 - 67	NE corner of site	Detention basin Entry pit for underbore	30.8% 15.4% 9.9%	Mitigation measures are not feasible under the current design. Trees are an Environmental Weed species	**No**
68	SW corner – neighbouring lot	Detention basin. Building footprint Stormwater installation.	12.5%	PA to supervise excavation within the TPZ to ensure that no significant roots are located during excavation. Directional under-boring MUST be utilised to ensure impact to neighbouring trees is mitigated re the installation of the stormwater line. Entry/exit pits are to be located within the subject site and within the area already proposed for excavation associated with the basement and detention basin areas.	**Yes***
73	NW corner – neighbouring lot	Stormwater installation.	3%	Directional under-boring MUST be utilised to ensure impact to neighbouring trees is mitigated re the installation of the stormwater line.	**Yes***
6,9,10 42,47,64 69,70,71 72,74,75, 76.	Various locations	Unaffected by current design	0%	No mitigation measures required. General tree protection measures in accordance with AS4970-2009 & TPP	**Yes**
***Trees are to be retained; however detailed tree protection measures and tree sensitive construction methods will be required to ensure tree retention remains viable.**					

Table 3 - Impact Schedule

14 CONCLUSIONS

- A total of seventy-six (76) trees were surveyed on 1 July 2022 and 1 September 2023.
- No trees were allocated a high retention value in accordance with the STARS system of assessment.
- Twenty-two (22) trees were allocated medium retention values in accordance with the STARS system of assessment.
- Forty-nine (49) trees were allocated low retention values in accordance with the STARS system of assessment.
- Five (5) trees were allocated a very low retention value in accordance with the STARS system of assessment.
- Low and very low retention value trees are not generally considered to be worthy of a material constraint upon design or development.
- Forty-seven (47) trees will require removal in order to facilitate the development in its current form.
- Trees:7,8,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,30,32,33,34,35,36,37,38,39,40,44, 45,51,52,53,54,57,58,59,60,61,63,65,66,67; are subject to significant conflict with the development proposal, mitigation measures are not considered to be feasible under the current design. These trees are to be removed to facilitate the development in its current form.
- Trees 46,47,55 are subject to minor or no encroachment from the development, however, their health and or structural condition makes them unsuitable for retention. Trees 46 & 47 are part of an informal hedge planting of Cupressus macrocarpa. The other three (3) trees which make up the hedge are considered to be hazardous and are to be removed regardless of the development. The removal of these three (3) trees and other surrounding trees will expose the remaining two (2) trees to unfamiliar wind patterns and will increase their likelihood of failure. Given the site context and the scale of the development, it is recommended that these trees (46 & 47) be removed and replaced following construction to facilitate a more appropriate landscape outcome.
- Five (5) trees should be removed regardless of the development due to potentially hazardous defects and structural condition.
    - Tree number 4 is located on Council land.
    - The remaining four very low retention value trees are located on private land and will be managed by the tree/landowner.
- Twenty-four (24) trees may be retained and protected throughout the development.
- Plans showing cut & fill for the proposed buildings have now been provided by the client, however, the exact construction methodology will remain unclear until a principal contractor is engaged. Using standard open-cut excavation methods, over-excavation will generally be required in the form of benching or battering to avoid the potential for soil collapse. It is understood that the soils throughout the site are relatively shallow with sandstone bedrock encountered at nominal depth which would greatly reduce the need for any over-excavation. Even with the normal requirements for over-excavation, the impacts from over-excavation upon any trees recommended for retention appear to be negligible.
- The replacement tree planting strategy has been thoroughly discussed with the client and Landscape designer and includes the addition of *Corymbia maculata* along the Eastern boundary, *Eucalyptus tereticornis* and *Eucalyptus sclerophylla* along the Western boundary and *Eucalyptus elata* and *Eucalyptus melliodora* along the Northern boundary. The species selections have been based upon the species characteristics and suitability for each location and is in my opinion a good outcome for the site with significant numbers of large canopy trees provided within the site. The selection of Eucalyptus species also provides ecological benefits to the proposed development site and the surrounding area by expanding the coverage of naturally occurring native species which will increase nesting and foraging opportunities for native birds and animals.

- The *Corymbia maculata*- Spotted Gum proposed for the Eastern boundary have been selected specifically to tie into the existing property frontage of the adjacent heritage item and will provide aesthetic function through fast growing, high-level screening of the proposed development. This species of tree is also known to be fast growing, relatively pest resistant and generally very structurally sound with low occurrences of live branch failures in comparison to many other common *Eucalyptus/Corymbia* species. This tree is also winter flowering, which is very beneficial for providing enabling year-round foraging for birds and animals. This species is also very important for bees as it provides winter food of high quality.

Proposed for	Tree number	Total
Trees proposed for removal to enable development in its current form	7,8,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,30,32,33,34,35,36,37,38 39,40,44,45,46,47,51,52,53,54,55,57,58,59,60,61,63,65,66,67.	47
Trees proposed for removal regardless of the development due to hazardous condition	**4***, 48, 49, 50 & 62	5
Trees which may be retained	1,2,3,5,6,9,10,28,29,31,41,42,43,56,64,68,69,70,71,72,73,74,75,76.	24
*** Tree assessed as potentially hazardous located on Council land – to be assessed by Council**		

Table 4 - Trees proposed for retention & removal

Proposed tree removal(s) by retention Value	Tree number(s)	Total
High	n/a	0
Medium	7,11,12,15,20,32,38,39,46.	9
Low	8,13,14,16,17,18,19,21,22,23,24,25,26,27,30,33,34,35,36,37,40,44,45,47, 51,52,53,54,55,57,58,59,60,61,63,65,66,67.	38
Very Low	**4***, 48, 49, 50 & 62	5
*** Tree assessed as potentially hazardous located on Council land – to be assessed by Council**		

Table 5 - Tree removals by retention value

15 RECOMMENDATIONS

- Trees:7,8,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,30,32,33,34,35,36,37,38,39,40,44, 45,46,47,51,52,53,54,55,57,58,59,60,61,63,65,66,67; are recommended for removal due to unsustainable impacts from the proposed development.
- Trees: 4,48,49,50 & 62 should be removed regardless of the development due to the potentially hazardous nature of the subject trees.
    - It is recommended that tree 4 is to be assessed by Council following observations of the trees poor health and compromised structural condition.
    - Were council to desire the trees retention, the public footpath would need to be constructed above grade on piers or screw piles to facilitate the trees retention.
- Trees 1,2,3,5,6,9,10,28,29,31,41,42,43,56,64,68,69,70,71,72,73,74,75,76.; may be retained and protected in accordance with Australian Standard AS4970-2009: The 'Protection of trees on development sites' (AS4970) and Appendix 2 of this report.
- Trees: 5,28,29,41,43,68,73 are subject to site specific tree protection and tree sensitive construction measures, it is important that these measures are accepted and adhered to in order to ensure the trees remain viable over the long term.

  Mitigation measures have been detailed in Table 3, and should be undertaken in accordance with AS4970-2009, Appendix 2 of this report, and under the guidance of the Project Arborist.
- Trees 65,66,68 & 73 stand to be impacted by the installation of the stormwater services running north out of the site. As such under-boring will be required to ensure that tree retention remains viable, and impacts are suitably mitigated.

  The exact methodology of the under-boring process will be confirmed by the contractor undertaking the works; however, the process will require an entry and exit pit north and south of the proposed stormwater alignment. Refer to Section 21 **of this report** for further detail.
- All tree pruning and removal works are to be undertaken by a suitably qualified, experienced and insured Arboricultural contractor with a minimum AQF level 3 qualification in Arboriculture.

  Tree removal works should be undertaken in accordance with the following:
    - *(AS4373 – 2007) Pruning of Amenity Trees*
    - *NSW Code of Practice for the Amenity Tree Industry 1998*
    - *NSW Code of Practice for Work Near Overhead Power Lines 2006*
    - *NSW Work Health & Safety Act 2011*
    - *NSW Work Health and Safety (WHS) Regulations 2011*
    - *Safe Work Guide to managing Risks of Tree Trimming and Removal Work 2016*
- All tree pruning and removal works are to be guided by the Project Arborist (PA) with a minimum qualification of AQF Level 5 in Arboriculture.
- All work within the TPZ(s) of any tree proposed for retention is to be supervised by the PA and undertaken in accordance with AS4970-2009.

  Detailed procedures for excavation works can be found in Appendix 2 of this report. Should any significant roots be found during excavation, the PA is to advise on the best course of action regarding root pruning any effects on tree health and structure. The process is to be guided, supervised, documented and certified by the PA.
- Record keeping of all supervision works by the PA is to be completed via a statement of attendance detailing what works were undertaken and certifying that they were undertaken in accordance with the relevant standards i.e., AS4970 & AS4373.
- Tree protection will form an essential part of the success of the development and should be prioritised at the earliest of stages.

- Should the development application be successful, it is recommended that upon engagement of the principal contractor, a Construction & Environmental Management Plan (CEMP) is prepared by the principal contractor in collaboration with the project Arborist to ensure that trees to be retained are not impacted by the locations of cranes, temporary structures such as amenities and site sheds and access and egress to the site etc. This should be completed and certified by the project Arborist prior to the construction certificate being provided.
- This report does not in any part count for approval of the recommendation contained within. Approval must be sought from the consent authority as part of the development application process.

16 REFERENCES

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17 DISCLAIMER

The information contained within this report is to be used solely for the purposes that were specified at the time of engagement.

All attempts have been made to ensure the legitimacy of any information which has been gathered in the process of compiling this report, however Truth About Trees Pty Ltd cannot be held liable for inaccurate or misguiding information which has been provided by others.

Any tree inspections or assessments which have been carried out for the purposes of this report are valid only at the time of inspection and are based on what could reasonably be seen or diagnosed from a visual inspection carried out from ground level.

All inspections, unless otherwise stated, are based upon Visual Tree Assessment (VTA) techniques, industry best practice and applied knowledge.

No internal diagnostic testing or below ground investigation has been carried out, unless otherwise stated.

Trees are a dynamic living organism and as such they have a finite lifespan the end of which cannot always be predicted or understood, even apparently healthy trees can die suddenly or fall without warning. As such there is no warranty or guarantee provided, or implied, regarding the future risks associated with any tree.

Please feel free to contact me either via telephone or email if you have any questions regarding this report.

18 APPENDIX 1: TREE ASSESSMENT METHODOLOGY

VISUAL TREE ASSESSMENT (VTA)

The VTA system is based on the theory of tree biology and physiology, as well as tree architecture and structure. This method is used by arborists to identify visible signs on trees that indicate good health, or potential problems. Symptoms of decay, growth patterns and defects are identified and assessed as to their potential to cause whole-tree, part-tree and/or branch failure. This system (represented by the image below) is based around methods discussed in `*The Body Language of Trees*'[10].

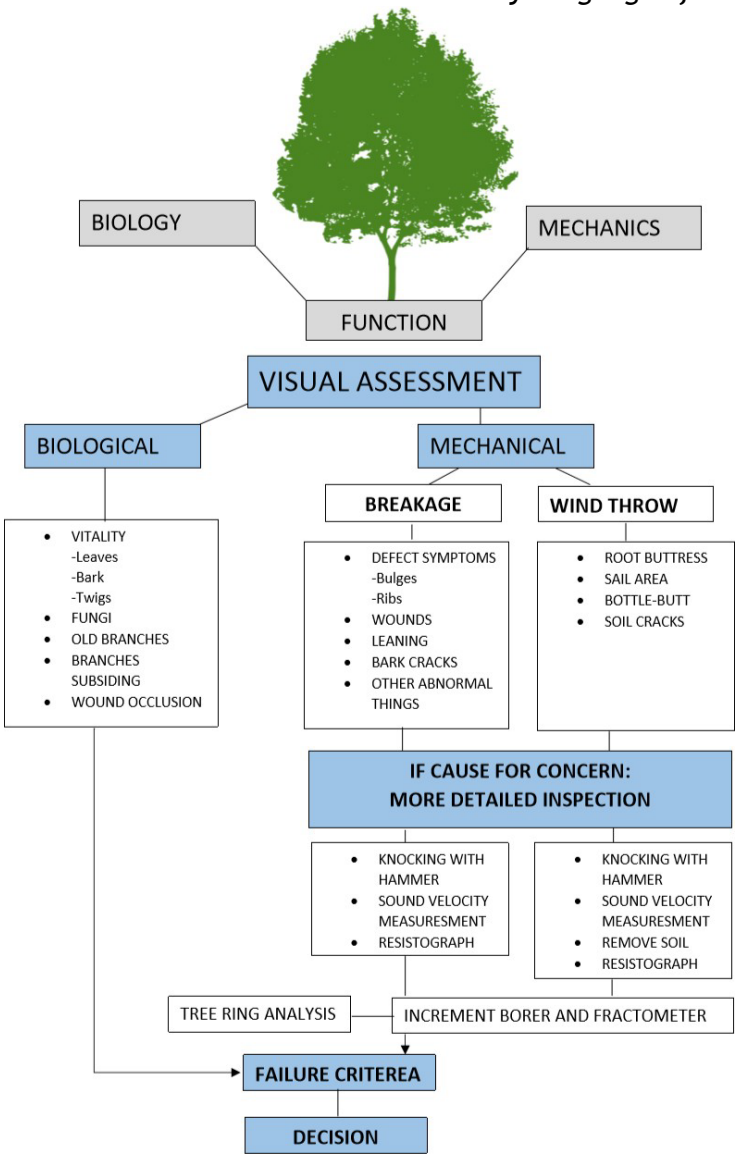


Figure 11-The Visual Tree Assessment Procedure.

For the purpose of this report, elements of the VTA system will be used, along with industry standard literature, and other relevant studies that provide an insight into potential hazards in trees. This assessment is a snapshot of what could be reasonably seen or determined from a basic visual inspection. The VTA system is generally used as a means to identify hazardous trees; however it is important to realize that for a tree to be hazardous there must be a target; a hazard poses no risk if there is no exposure to the hazard.

12 Mattheck, C. & Breloer, H. 1994. *The Body Language of Trees.*

HEALTH AND VIGOUR ASSESSMENT

The health and vigour of a tree are assessed by looking at the tree canopy and how it is performing. Certain indicators provide information on which to base the assessment. Abnormally small leaves, chlorosis (yellowing), sparse crown, wilting, and die-back can be signs of ill-health or decline but may also be related to a temporary imbalance due to drought or pest infestations. Epicormic growth can be a sign of stress and low energy reserves but can also be related to increased light levels through the removal or pruning of adjacent trees. Extension growth can be a good indicator of vigour, but this can vary greatly between species and under differing climatic conditions. For these reasons, each individual symptom or observation needs to be assessed with objectivity and consideration of all available information.

STRUCTURAL ASSESSMENT

The structural assessment of trees is carried out using the basic framework of Visual Tree Assessment. Signs and symptoms of defects are assessed to gauge the likelihood of failure, because not every defect constitutes a hazard e.g. *"…co-dominant stems are a structural defect. The severity of the defect is increased by included bark, large crowns and strong wind."*[11] If trees were removed purely on the basis that there were defects present without assessing the likelihood of failure or whether practical mitigation measures are available, the urban forest would cease to exist. A basic visual tree assessment is undertaken from ground level, if defects are suspected further investigation may be required and recommended. *"[When using] the Visual Tree Assessment (VTA) procedure for assessing trees, as the suspicion increases that defects are present, the examination becomes more thorough and searching."*[1]

"Some defects, especially some forms of decay, do not give rise to external signs and therefore tend to escape detection in a purely visual survey. If there is no reason for suspecting a hidden defect to occur within a particular part of the tree, there is no reasonable basis for carrying out a detailed internal assessment. Although in theory an unsuspected defect might be detectable by the use of specialized diagnostic devices, this would be impracticable in the absence of some external sign to indicate the place which should be probed. Also, internal examination without good reason is undesirable, as it usually causes injury to the tree and is unreasonably time consuming and costly."[12]

10 Matheny, N. & Clark, J. 1994. *A Photographic Guide to the Evaluation of Hazard Trees in Urban Areas.*
11 Lonsdale. 1999. *Principles of Tree Hazard Assessment and Management.*

TREE PROTECTION ZONE (TPZ) & STRUCTURAL ROOT ZONE (SRZ) CALCULATIONS

In accordance with Australian Standard *AS4970-2009 Protection of trees on development sites*[13], Tree Protection Zone (TPZ) radius is calculated using the following procedure. Diameter of the trunk is measured at approximately 1.4m above ground level; this measurement is referred to as DBH (Diameter at Breast Height). R_{TPZ} = ***DBH X 12***. For multi-stemmed trees the formula used is $R_{TPZ} = \sqrt{[(DBH1)^2 + (DBH2)^2 + (DBH3)^2]}$. The TPZ is measured radially from the centre of the stem and must be protected on all sides.

The Structural Root Zone (SRZ) radius is calculated by measuring the diameter of the stem close to ground level, just above the basal flare. This measurement is taken as ***D*** and then used in the following formula: $R_{SRZ} = (Dx50)^{0.42} \times 0.64$ and becomes the Structural Root Zone, measured radially from the centre of the stem.

It is important to realize that these calculations provide a notional figure only and tree dynamics, form and site conditions will greatly affect these zones, and it is the job of the arborist to interpret the information correctly.

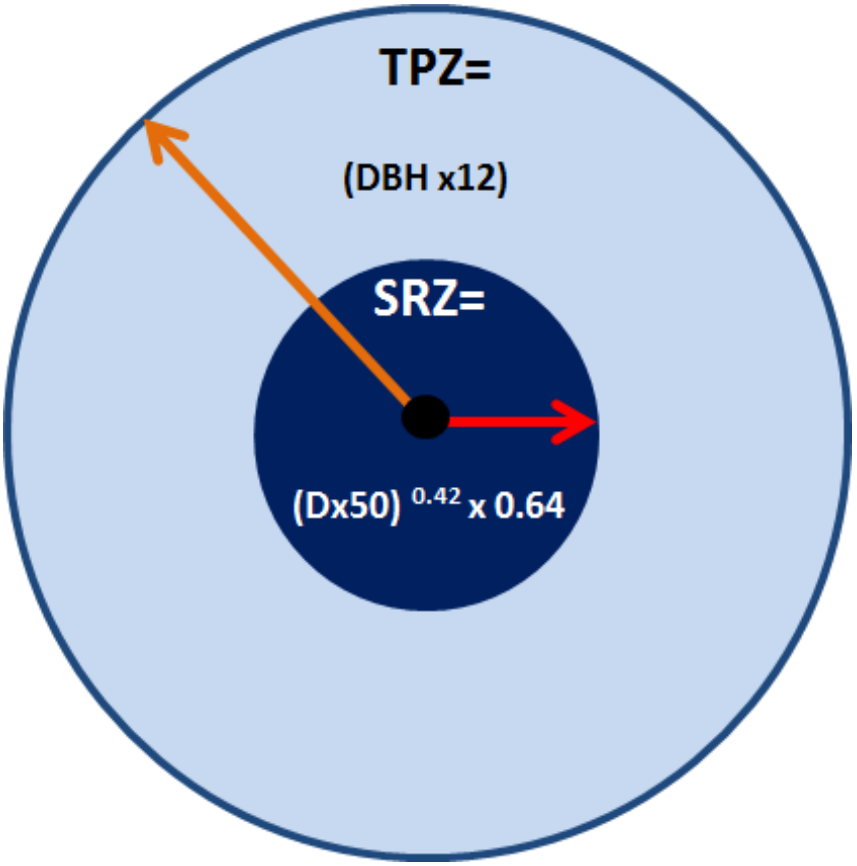


Figure 12- A representation of TPZ & SRZ calculations.

For palms, cycads, tree ferns, and similar monocots, the TPZ is positioned at least 1m outside the crown projection. SRZs are not applicable to these plant types.

AS4970-2009[3] states "*a TPZ should not be less than 2m nor greater than 15m (except where crown protection is required*" and the minimum radius for an SRZ is 1.5m.

12 Standards Australia. 2009. *AS4970-2009 Protection of trees on development sites.*

SIGNIFICANCE OF A TREE, ASSESSMENT RATING SYSTEM (STARS)

IACA Significance of a Tree, Assessment Rating System (STARS)© (IACA 2010)©

In the development of this document IACA acknowledges the contribution and original concept of the Footprint Green Tree Significance & Retention Value Matrix, developed by Footprint Green Pty Ltd in June 2001.

The landscape significance of a tree is an essential criterion to establish the importance that a particular tree may have on a site. However, rating the significance of a tree becomes subjective and difficult to ascertain in a consistent and repetitive fashion due to assessor bias. It is therefore necessary to have a rating system utilising structured qualitative criteria to assist in determining the retention value for a tree. To assist this process all definitions for terms used in the *Tree Significance - Assessment Criteria* and *Tree Retention Value - Priority Matrix*, are taken from the IACA Dictionary for Managing Trees in Urban Environments 2009.

This rating system will assist in the planning processes for proposed works, above and below ground where trees are to be retained on or adjacent a development site. The system uses a scale of *High*, *Medium* and *Low* significance in the landscape. Once the landscape significance of an individual tree has been defined, the retention value can be determined. An example of its use in an Arboricultural report is shown as Appendix A.

Tree Significance - Assessment Criteria

1. High Significance in landscape

- The tree is in good condition and good vigour;
- The tree has a form typical for the species;
- The tree is a remnant or is a planted locally indigenous specimen and/or is rare or uncommon in the local area or of botanical interest or of substantial age;
- The tree is listed as a Heritage Item, Threatened Species or part of an Endangered ecological community or listed on Councils significant Tree Register;
- The tree is visually prominent and visible from a considerable distance when viewed from most directions within the landscape due to its size and scale and makes a positive contribution to the local amenity;
- The tree supports social and cultural sentiments or spiritual associations, reflected by the broader population or community group or has commemorative values;
- The tree's growth is unrestricted by above and below ground influences, supporting its ability to reach dimensions typical for the taxa *in situ* - tree is appropriate to the site conditions.

2. Medium Significance in landscape

- The tree is in fair-good condition and good or low vigour;
- The tree has form typical or atypical of the species;
- The tree is a planted locally indigenous or a common species with its taxa commonly planted in the local area
- The tree is visible from surrounding properties, although not visually prominent as partially obstructed by other vegetation or buildings when viewed from the street,
- The tree provides a fair contribution to the visual character and amenity of the local area,
- The tree's growth is moderately restricted by above or below ground influences, reducing its ability to reach dimensions typical for the taxa *in situ*.

3. Low Significance in landscape

- The tree is in fair-poor condition and good or low vigour;
- The tree has form atypical of the species;
- The tree is not visible or is partly visible from surrounding properties as obstructed by other vegetation or buildings,
- The tree provides a minor contribution or has a negative impact on the visual character and amenity of the local area,
- The tree is a young specimen which may or may not have reached dimension to be protected by local Tree Preservation orders or similar protection mechanisms and can easily be replaced with a suitable specimen,
- The tree's growth is severely restricted by above or below ground influences, unlikely to reach dimensions typical for the taxa *in situ* - tree is inappropriate to the site conditions,
- The tree is listed as exempt under the provisions of the local Council Tree Preservation Order or similar protection mechanisms,
- The tree has a wound or defect that has potential to become structurally unsound.

Environmental Pest / Noxious Weed Species

- The tree is an Environmental Pest Species due to its invasiveness or poisonous/ allergenic properties,
- The tree is a declared noxious weed by legislation.

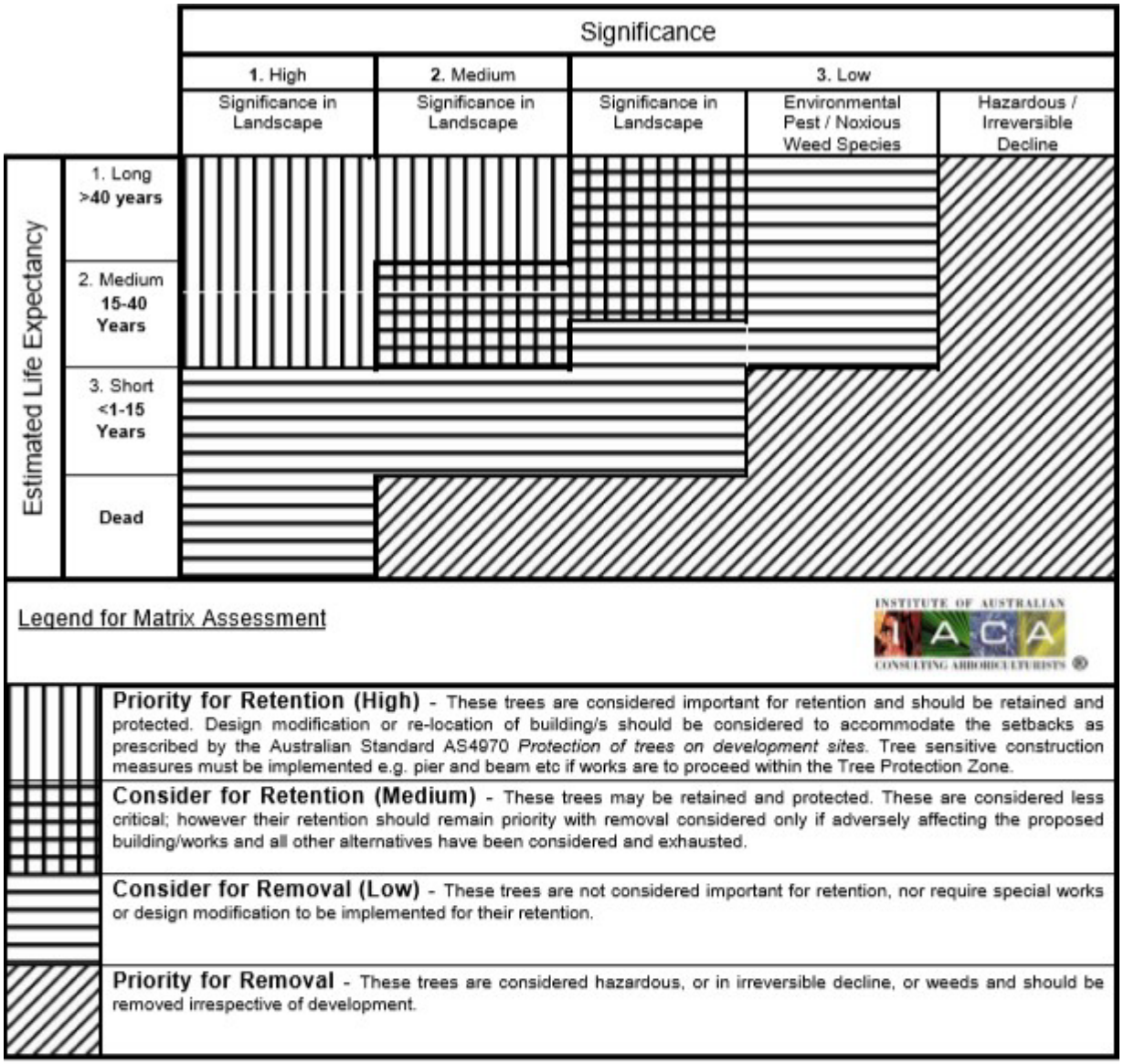
Hazardous/Irreversible Decline

- The tree is structurally unsound and/or unstable and is considered potentially dangerous,
- The tree is dead, or is in irreversible decline, or has the potential to fail or collapse in full or part in the immediate to short term.

The tree is to have a minimum of three (3) criteria in a category to be classified in that group.

Note: The assessment criteria are for individual trees only, however, can be applied to a monocultural stand in its entirety e.g. hedge.

IACA 2010, *IACA Significance of a Tree, Assessment Rating System (STARS)*, Institute of Australian Consulting Arboriculturists, www.iaca.org.au



USE OF THIS DOCUMENT AND REFERENCING

The IACA Significance of a Tree, Assessment Rating System (STARS) is free to use, but only in its entirety and must be cited as follows:

IACA, 2010, *IACA Significance of a Tree, Assessment Rating System (STARS)*, Institute of Australian Consulting Arboriculturists, Australia, www.iaca.org.au

REFERENCES

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Figure 13- Significance of a Tree Assessment Rating System (STARS) - IACA

19 APPENDIX 2: TREE PROTECTION MEASURES

The following tree protection guidance notes have been comprised to give specific guidance, recommendations and methodologies to ensure adequate management, industry best practices and standards are followed.

Where practicable these guidance notes should be followed in the sequence within which they have been written. The TPP is to be followed without deviation from the prescribed measures.

Where unforeseen changes on site may arise during construction that require a breach of this plan, the Project Arborist (PA) is to be consulted prior to any site activities being made or altered within the TPZs and will advise on the best course of action.

TREE PROTECTION ZONES

Trees to be retained shall be protected prior to site occupation and will be maintained for the duration of works until handover and final certification is complete.

Tree Protection zones shall exclude the following activities unless supervised by the PA;

a) Storage of materials, plant, equipment or site sheds.
b) Temporary or permanent location of services, or the works required for their installation.
c) Preparation of building materials, refuelling or disposal of waste materials and chemicals.
d) Movement of pedestrians, machinery or vehicular access.
e) Any other activity that may cause damage to the tree.

All works in the TPZ shall be supervised by the project Arborist or an AQF-5 Arborist.

THE PROJECT ARBORIST

- A project Arborist (Minimum AQF-5) shall be engaged prior to the commencement of work on-site.
- A prestart meeting with the project manager and project Arborist shall be conducted to discuss the establishment of tree protection measures prior to the handover to the principal contractor (developer/Builder).
- Tree protection shall be installed and then inspected and certified by the project arborist, a written document that certifies the tree protection and documents the current status of the subject trees is to be issued to the project Manager and principal certifying authority prior to the handover of the site to the developer/builder.

COMPLIANCE

- All contractors and site workers shall be familiar with these specifications prior to commencing work on-site. All works conducted within the Tree Protection Zones shall be supervised by the PA or an AQF-5 qualified Arborist.
- The project Arborist shall undertake regular site inspections and certify that works are being undertaken in accordance with this specification.
- Compliance documentation shall be prepared by the project Arborist following each site inspection. Compliance documentation shall include documentary evidence of compliance with the tree protection measures and methods as outlined within this specification.
- Where compliance has been breached, the project manager and principal contractor will be notified in writing, a ‘Hold Point’ will be issued to the principal contractor until tree protection has been established and or damage to subject trees has been remediated under direction from the Project Arborist.
- The Project Arborist shall conduct a final assessment of the subject trees to assess any adverse influences from the development and complete a final certification once works have been completed, with future recommended management strategies implemented as required.

TREE REMOVAL & PRUNING

- Trees to be pruned or removed shall be managed prior to the establishment of Tree Protection Measures.
- All Tree Protection Zones should be adhered to with no machinery and equipment other than foot traffic within the subject site.
- Tree pruning and removal works shall be conducted by a competent and qualified AQF-3 Arborist in accordance with:
  - (AS4373–2007) Pruning of Amenity Trees.
  - SafeWork NSW Code of Practice for the Amenity Tree Industry 1998.
  - Work Health and Safety (WHS) Regulations 2011.
  - Safe Work Guide to managing Risks of Tree Trimming and Removal Work 2016.
  - State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017
- Tree pruning and removal works shall not damage trees to be retained.

TPZ FENCING

- Tree protection fencing shall be installed to perimeter of all trees proposed for retention.
- Tree protection fencing is to comply with the below image and be fastened together to limit removal.
- Fencing setback distances may be reduced for construction access with approval from the project Arborist and where ground protection is installed. The exact location will be confirmed through consultation between the principal contractor/project manager and the Project Arborist.

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 6- TREE PROTECTION FENCING AND SIGNAGE REQUIREMENTS-IMAGE FROM AS4970-2009[4]

TPZ fencing must be 1.8m tall chainmesh temporary fencing, secured with brackets and held in place with concrete feet. Shade cloth may be attached to the fencing if required to reduce the spread of particulate matter. Soil erosion and sediment fencing may be incorporated and attached to this fencing if so desired. There is to be no excavation within the tree protection zones for erosion and sediment control, this must be managed using alternative methods such as coir logs, hay bales or other above ground controls. All temporary fencing must comply with AS4687-2007- Temporary Fencing and Hoardings.[5]

Figure 14 - Showing TPZ fencing requirements

SIGNANGE

- Signs identifying the TPZ should be placed around the edge of the TPZ and be visible from within the development site.
- Fencing must have Tree Protection Signage installed, signage must be visible from all approach angles to the TPZ's.
- Shall be laminated (weatherproof) and fixed to fencing with wire or zip ties.

GROUND PROTECTION

- Ground protection shall be installed where machinery or vehicles are required to enter any area of the TPZ.
- Ground protection as a minimum will consist of a layer of geotextile membrane, with a layer of composted wood chip mulch to a depth of 75-100mm.

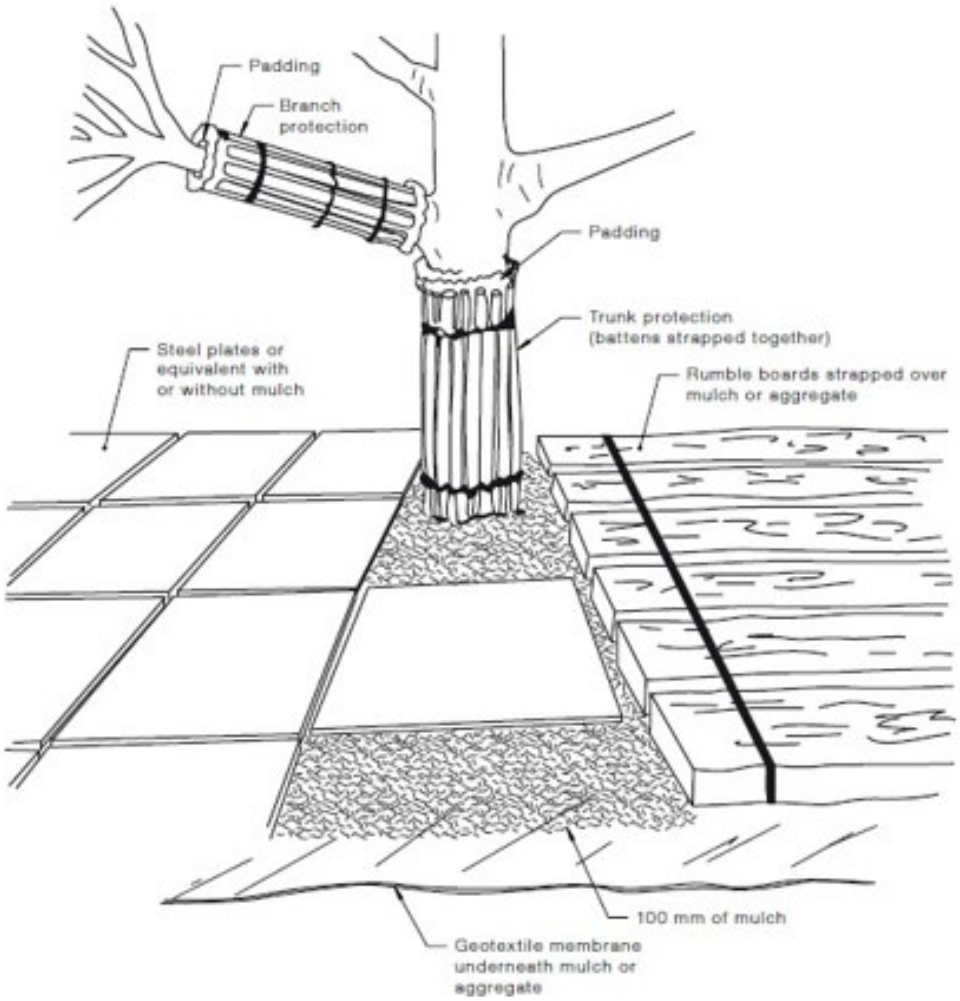

Figure 15 - Example of Ground Protection

GRADE CHANGES WITHIN THE TPZ

- Where a grade change is to occur within a TPZ, these shall be under consultation with the Project Arborist to assess adverse impacts to the subject trees.
- Grade changes within the TPZ, shall be restricted to a maximum 200mm depth above current grade.

EXPLORATORY EXCAVATION

- This is to be completed primarily using tree sensitive excavation measure such as hand tool excavation, DryVac truck fitted with an AirSpade and under the direct supervision of the PA.
- A record of the exploratory excavation will be made using photographic, drawings & text data to be referenced during excavation to note any significant roots found, and any roots pruned for the purposes of the works.
- Root locations will be marked out on the ground with line marking paint that will clearly show the locations of all roots >50mm in diameter.

EXCAVATION WITHIN THE TPZ

- Excavation within the TPZ is prohibited beyond the scope of works specified within the body of this report and TPP.
- All excavation works are to be supervised by the PA or an AQF level 5 arborist.
- Approved excavation works within the TPZs of trees are to be carried out using non-destructive measures i.e., Dry Vac* or hand tool excavation.
    - **Note that a Dry Vac truck differs from a regular Hydro Vac truck. Since the Dry Vac uses air pressure to break up the soil profile, rather than a water jet, it largely removes the likelihood of tree roots being damaged by the high-pressure water jet.*
- Roots located during excavation should be retained wherever possible, some pruning of roots <50mm in diameter may be permitted, however all root pruning will need to be approved by the PA.
- Where excavation is to occur within the TPZ(s) of any tree near to existing hard standing, works should be conducted using small machinery only and carefully removed to expose the soil profile beneath.
- Excavation of the soil to the required depth, should then be undertaken using tree sensitive measures such as hand excavation, AirSpade, or DryVac truck under the supervision of the PA.

DIRECTIONAL UNDERBORING

- Directional under-boring is undertaken using specialist equipment that can bore below ground to avoid conflict with trees, structures & infrastructure. Whilst it is a highly beneficial method for minimising impacts with trees, there are certain aspects that must still be considered to successfully mitigate any significant impact with tree root systems.
- Entry/exit pits – The directional drilling equipment requires an entry & exit pit in order to start the drilling process, the size may vary depending on the make/model of equipment, but $2m^2$ should be considered as a minimum requirement.

  It is important to ensure that the entry/exit pit is located outside of the TPZ where possible. Where the entry or exit pit must be within the TPZ of a tree, the PA is to assess the viability of the proposal and the entry/exit pit is to be excavated using non-destructive means.
- Drilling depth – different machines are capable of drilling to different depths, and different soil types or bedrock may guide the desired depth of the bore, but generally speaking most machines are capable of drilling to a depth that avoids conflict with the tree's root system. The PA is to provide guidance on the minimum depth required based on soil type, tree species and site conditions.

HOLD-POINT INSPECTION REQUIREMENTS

ARBORICULTURAL ACTION	PROGRAMMING	EXTENT OF ARBORICULTURAL INPUT	SIGNED OFF (Project Arborist)
Pre-start meeting with Project Manager and Design team to discuss any emerging design issues, tree removal, pruning works and tree protection establishment.	Before any activities start onsite.	▪ Meeting with relevant members of the project managers team to explain the extent of tree constraints, i.e. Architect, Site Manager, engineer, landscape architect, etc. ▪ Review working space requirements to consider fencing and ground protection adjustments to improve site functionality. ▪ Review site setup i.e. site office, equipment storage, plant, cranes. ▪ Review works proposed in TPZ's. ▪ Review post consent layout changes that may affect trees. ▪ Confirm tree protection measures will be acceptable.	
Tree removal and/or pruning works	Before tree protection is established	▪ Project Arborist to provide pruning specification if required. ▪ Project Arborist to supervise tree removal or pruning works conducted by an AQF-3 Arborist.	
Installation of tree protection measures as per this site specification for agreement with the consent authority.	Post tree removals or tree pruning and prior to contractor site occupation.	▪ Tree protection such as hessian wraps and timber trunk wrap to be installed by an AQF-2 Minimum Arborist in accordance with this specification. ▪ Site fencing can be installed by the contractor as per this specification.	
HOLD POINT 1		▪	
Tree protection certification.	Before hand over to contractor and site occupation.	▪ Project Arborist to inspect all tree protection measures. ▪ Conduct a VTA of all surveyed trees to assess and record Health, Vigour and Condition. ▪ Produce a certification document outlining observations.	
HOLD POINT 2		▪	
Pre-demolition and construction meeting with contractor.	Before hand over to contractor and site occupation.	▪ Meeting with project managers team i.e. Architect, Site Manager, engineer, landscape architect, etc. and Contractor to explain the extent of tree constraints ▪ Review site setup i.e. site office, equipment storage, plant, cranes. ▪ Review works proposed in TPZ's. ▪ Review post consent layout changes that may affect trees.	
Site Inspections	During the demolition or construction phases	▪ Project Arborist to conduct inspections of the site to conduct compliance checks.	
Tree Protection Measures removed	Post construction prior to handing over the project completed.	▪ Removal of tree protection to be approved by the Project Arborist.	
HOLD POINT 3		▪	
Final Certification		▪ Project Arborist to conduct a final certification ▪ Conduct a VTA of all surveyed trees to assess and record Health, Vigour and Condition. ▪ Produce a certification document outlining observations.	

Figure 16 - Generic hold-point inspections

20 APPENDIX 3: TREE SCHEDULE

Tree no.	Species	Height (m)	Spread(m)	DBH (mm)	DAB (mm)	TPZ (mm)	SRZ (mm)	Health	Age	Condition	Defects	Landscape sig.	Life Expectancy	Retention value
1	Eucalyptus haemastoma | Scribbly Gum	11	9	400	455	4800	2377	Fair	Mature	Poor	Poor tree form	Medium	Medium	Medium
2	Eucalyptus mannifera | Brittle Gum	14	9	510	640	6120	2744	Fair	Mature	Fair		Medium	Medium	Medium
3	Cupressus torulosa | Bhutan Cypress	14	4	360	475	4320	2421	Good	Mature	Good		Medium	Medium	Medium
4	Eucalyptus sp. | Eucalypt	11	12	500	1085	6000	3425	Poor	Mature	Hazard	Deadwood 10cm plus diam. | Cavity(s) | Crack(s)/split(s) | Decay | Dieback-general | Epicormic growth | Wound(s)	Medium	Remove	Very Low
5	Eucalyptus haemastoma | Scribbly Gum	18	8	405	590	4860	2652	Good	Mature	Fair	Poor tree form | Wound(s)	Medium	Medium	Medium
6	Prunus sp. | Cherry	5	5	200	260	2400	1879	Fair	Mature	Fair		Low	Short	Low
7	Cedrus deodara | Himalayan Cedar	14	9	390	435	4680	2333	Good	Mature	Fair	Girdling root(s)	Medium	Medium	Medium
8	Callistemon viminalis | Weeping Bottlebrush	6	5	245	350	2940	2129	Good	Mature	Poor	Included bark | Poor tree form	Low	Short	Low
9	Prunus sp. | Cherry	4	6	200	280	2400	1939	Fair	Mature	Fair		Low	Short	Low
10	Schinus areira | Peppercorn	10	14	480	960	5760	3253	Fair	Mature	Poor	Poor tree form	Medium	Medium	Medium
11	Magnolia grandiflora | Bull Bay	9	9	470	470	5640	2410	Good	Mature	Fair		Medium	Medium	Medium
12	Liquidamber styraciflua | Sweet Gum	13	13	370	405	4440	2264	Fair	Mature	Fair		Medium	Medium	Medium
13	Acer palmatum | Japanese Maple	4	6	210	355	2520	2142	Fair	Mature	Fair		Low	Short	Low
14	Acer palmatum | Japanese Maple	4	6	210	355	2520	2142	Fair	Mature	Fair		Low	Short	Low
15	Quercus rubra | Red Oak	20	15	505	610	6060	2689	Good	Mature	Fair		Medium	Medium	Medium
16	Malus floribunda | Japanese Flowering Crab Apple	5	8	310	335	3720	2091	Good	Mature	Fair		Low	Medium	Low
17	Prunus cerasifera | Cherry Plum	4	6	265	550	3180	2575	Good	Mature	Poor		Low	Short	Low
18	Cupressus sp. | Cypress	6	8	360	410	4320	2276	Fair	Mature	Poor	Poor tree form	Low	Medium	Low
19	Ulmus parvifolia | Chinese Elm	8	5	240	285	2880	1953	Fair	Mature	Fair		Low	Medium	Low
20	Cedrus atlantica | Atlas Cedar	14	9	445	485	5340	2442	Good	Mature	Fair		Medium	Medium	Medium

Tree no.	Species	Height (m)	Spread(m)	DBH (mm)	DAB (mm)	TPZ (mm)	SRZ (mm)	Health	Age	Condition	Defects	Landscape sig.	Life Expectancy	Retention value
21	Chamaecyparis sp| Cypress	8	4	295	355	3540	2142	Poor	Mature	Poor	Included bark | Poor tree form	Low	Short	Low
22	Cupressus sempervirens 'Stricta' | Pencil Pine	7	1	200	235	2400	1801	Good	Semi-mature	Good		Low	Medium	Low
23	Cupressus sempervirens 'Stricta' | Pencil Pine	7	1	200	235	2400	1801	Good	Semi-mature	Good		Low	Medium	Low
24	Cupressus sempervirens 'Stricta' | Pencil Pine	7	1	200	235	2400	1801	Good	Semi-mature	Good		Low	Medium	Low
25	Cupressus sempervirens 'Stricta' | Pencil Pine	7	1	200	235	2400	1801	Good	Semi-mature	Good		Low	Medium	Low
26	Cupressus sempervirens 'Stricta' | Pencil Pine	7	1	200	235	2400	1801	Good	Semi-mature	Good		Low	Medium	Low
27	Prunus cerasifera | Cherry Plum	5	4	300	330	3600	2077	Fair	Mature	Fair		Low	Medium	Low
28	Eucalyptus haemastoma | Scribbly Gum	14	11	595	890	7140	3151	Good	Mature	Fair		Medium	Medium	Medium
29	Eucalyptus haemastoma | Scribbly Gum	15	7	405	765	4860	2957	Poor	Mature	Fair		Medium	Short	Low
30	Eucalyptus scoparia | Wallangarra White Gum	15	10	415	500	4980	2474	Fair	Mature	Poor	Bracket fungi | Bleeding/sap flow | Poor tree form | Previous failures	Medium	Short	Low
31	Sequoiadendron giganteum | Giant Sequoia	14	6	345	375	4140	2192	Good	Semi-mature	Good		Medium	Medium	Medium
32	Cupressus torulosa | Bhutan Cypress	15	6	425	460	5100	2388	Good	Mature	Good		Medium	Medium	Medium
33	Dead Tree | Dead tree	7	4	280	320	3360	2051	Dead	Dead	Poor		Low	Dead	Low
34	Fraxinus excelsior 'Aurea' | Golden Ash	9	6	275	325	3300	2064	Good	Mature	Fair		Low	Medium	Low
35	Camellia japonica | Camellia	5	6	280	335	3360	2091	Good	Mature	Fair		Low	Medium	Low
36	Dead Tree | Dead tree	6	4	250	300	3000	1996	Dead	Dead	Poor		Low	Dead	Low
37	Dead Tree | Dead tree	6	4	280	350	3360	2129	Dead	Dead	Poor		Low	Dead	Low
38	Cedrus deodara | Himalayan Cedar	20	13	505	700	6060	2849	Good	Mature	Good		Medium	Medium	Medium
39	Sequoia sempervirens | Californian Redwood	12	7	600	700	7200	2849	Good	Semi-mature	Fair		Medium	Medium	Medium
40	Chamaecyparis obtusa 'Crippsii | Golden Hinoki Cypress	11	6	290	350	3480	2129	Good	Mature	Fair		Low	Medium	Low
41	Ulmus parvifolia | Chinese Elm	11	5	300	345	3600	2117	Fair	Mature	Good		Low	Medium	Low

Tree no.	Species	Height (m)	Spread(m)	DBH (mm)	DAB (mm)	TPZ (mm)	SRZ (mm)	Health	Age	Condition	Defects	Landscape sig.	Life Expectancy	Retention value
42	Eucalyptus haemastoma | Scribbly Gum	12	8	360	435	4320	2333	Fair	Mature	Fair		Low	Medium	Low
43	Quercus coccinea | Scarlet Oak	15	20	415	480	4980	2431	Good	Mature	Fair		Medium	Medium	Medium
44	Dead Tree | Dead tree	8	3	225	280	2700	1939	Dead	Dead	Fair		Low	Dead	Low
45	Ulmus glabra 'Lutescens' | Golden Scotch Elm	10	12	385	455	4620	2377	Good	Mature	Poor	Decay | Included bark | Poor tree form	Medium	Short	Low
46	Cupressus macrocarpa I Golden Cypress	10	7	360	435	4320	2333	Good	Mature	Fair		Medium	Medium	Medium
47	Cupressus macrocarpa I Golden Cypress	9	3	295	355	3540	2142	Good	Mature	Fair		Low	Medium	Low
48	Cupressus macrocarpa I Golden Cypress	13	7	460	555	5520	2584	Good	Mature	Hazard	Included bark	Medium	Remove	Very Low
49	Cupressus macrocarpa I Golden Cypress	13	7	450	495	5400	2463	Good	Mature	Hazard	Hanger(s)|Included bark	Medium	Remove	Very Low
50	Cupressus macrocarpa I Golden Cypress	15	10	1060	960	12720	3253	Good	Mature	Hazard	Included bark	Medium	Remove	Very Low
51	Cupressus sempervirens | Italian Cypress	10	5	350	375	4200	2192	Poor	Mature	Fair		Low	Short	Low
52	Acer palmatum | Japanese Maple	5	6	300	380	3600	2204	Fair	Mature	Poor	Included bark	Low	Medium	Low
53	Betula nigra | River Birch	12	8	360	395	4320	2240	Fair	Mature	Fair		Low	Medium	Low
54	Cupressus sempervirens 'Stricta' | Pencil Pine	13	2	300	340	3600	2104	Good	Mature	Good		Low	Medium	Low
55	Acer negundo | Box Elder Maple	8	8	380	415	4560	2287	Poor	Mature	Poor		Low	Short	Low
56	Cupressus torulosa | Bhutan Cypress	11	6	380	415	4560	2287	Good	Mature	Fair		Low	Medium	Low
57	Prunus serrulata | Japanese Flowering Cherry	4	8	365	425	4380	2310	Poor	Mature	Poor		Low	Short	Low
58	Prunus serrulata | Japanese Flowering Cherry	6	8	435	465	5220	2399	Good	Mature	Fair		Low	Short	Low
59	Eriobotrya japonica | Loquat	6	7	360	380	4320	2204	Good	Mature	Fair		Low	Medium	Low
60	Pittosporum undulatum | Sweet Pittosporum	5	5	250	355	3000	2142	Good	Mature	Poor		Low	Short	Low
61	Fortunella japonica | Cumquat	4	4	180	220	2160	1752	Good	Mature	Fair		Low	Medium	Low

Tree no.	Species	Height (m)	Spread(m)	DBH (mm)	DAB (mm)	TPZ (mm)	SRZ (mm)	Health	Age	Condition	Defects	Landscape sig.	Life Expectancy	Retention value
62	Prunus armeniaca | Apricot	6	6	355	520	4260	2515	Fair	Mature	Hazard	Crack(s)/split(s)|Decay | Included bark	Low	Remove	Very Low
63	Fraxinus oxycarpa 'Raywood' | Claret Ash	6	5	395	455	4740	2377	Fair	Mature	Poor	Cavity(s)|Decay | Included bark	Low	Medium	Low
64	Populus alba | White Poplar	12	5	290	355	3480	2142	Good	Semi-mature	Fair		Low	Medium	Low
65	Populus alba | White Poplar	12	5	290	355	3480	2142	Good	Semi-mature	Fair		Low	Medium	Low
66	Populus alba | White Poplar	8	5	190	285	2280	1953	Good	Semi-mature	Poor	Poor tree form	Low	Short	Low
67	Populus alba | White Poplar	11	5	295	355	3540	2142	Good	Semi-mature	Fair		Low	Medium	Low
68	Pinus radiata | Monterey Pine	21	14	1085	1145	13020	3503	Good	Mature	Fair		Medium	Medium	Medium
69	Pinus radiata | Monterey Pine	21	10	760	840	9120	3076	Good	Mature	Fair		Medium	Medium	Medium
70	Eucalyptus tereticornis | Forest Red Gum	13	11	400	450	4800	2366	Fair	Mature	Poor	Abnormal lean | Poor tree form	Low	Short	Low
71	Eucalyptus tereticornis | Forest Red Gum	13	11	400	450	4800	2366	Fair	Mature	Fair		Low	Medium	Medium
72	Eucalyptus tereticornis | Forest Red Gum	24	23	1100	1260	13200	3647	Fair	Mature	Fair		Medium	Medium	Medium
73	Eucalyptus saligna | Sydney Blue Gum	15	20	1100	1265	13200	3653	Fair	Mature	Poor	Poor pruning | Poor tree form | Previous failures	Medium	Medium	Medium
74	Populus alba| White Poplar	17	5	450	550	5400	2575	Good	Mature	Poor	Environmental weed	Low	Medium	Low
75	Populus alba| White Poplar	17	5	450	480	5400	2431	Good	Mature	Poor	Environmental weed	Low	Medium	Low
76	Populus alba| White Poplar	18	8	500	550	6000	2575	Good	Mature	Poor	Environmental weed | English Ivy	Low	Medium	Low

Table 6 - Tree Schedule

RETENTION VALUE KEY

HIGH
MEDIUM
LOW
VERY LOW

21 Appendix 4: Underboring Process

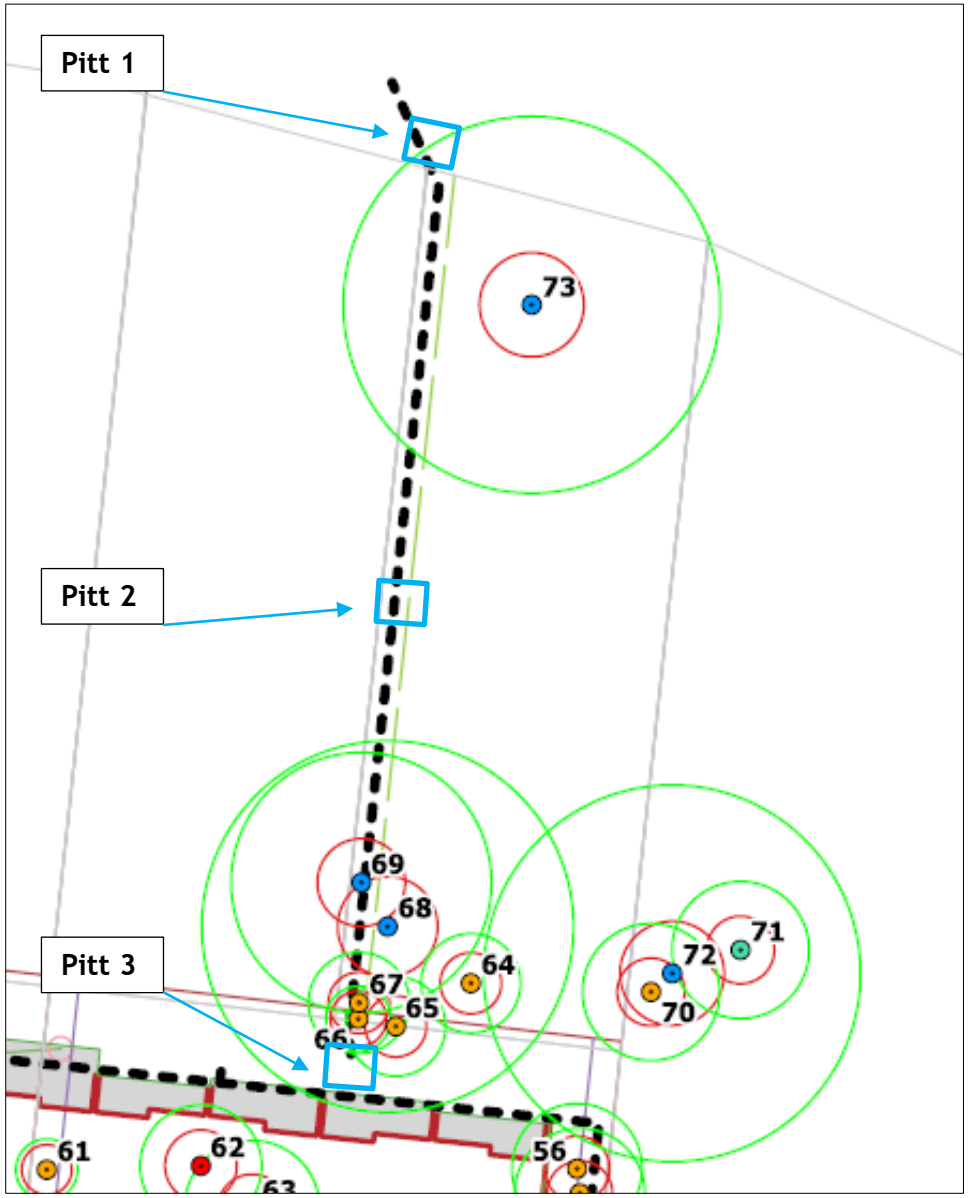

Figure 17 - Showing the proposed entry/exit pits for the underboring process

General Info

- Directional under-boring is undertaken using specialist equipment that can bore below ground to avoid conflict with trees, structures & infrastructure. Whilst it is a highly beneficial method for minimising impacts with trees, there are certain aspects that must still be considered to successfully mitigate any significant impact with tree root systems.
- Entry/exit pits – The directional drilling equipment requires an entry & exit pit in order to start the drilling process, the size may vary depending on the make/model of equipment, but 2m² should be considered as a minimum requirement.

  It is important to ensure that the entry/exit pit is located outside of the TPZ where possible. Where the entry or exit pit must be within the TPZ of a tree, the PA is to assess the viability of the proposal and the entry/exit pit is to be excavated using non-destructive means.
- Drilling depth – different machines are capable of drilling to different depths, and different soil types or bedrock may guide the desired depth of the bore, but generally speaking most machines are capable of drilling to a depth that avoids conflict with the tree's root system. The PA is to provide guidance on the minimum depth required based on soil type, tree species and site conditions.

Site Specific

- Due to the location of the subject trees, and the length of the underboring required, it may be possible that three (3) entry/exit pits are required.
- The locations of the proposed pits have been indicatively shown on the adjacent image.
- The southern pit has an encroachment into the TPZ of tree 68, however this encroachment will have already existed due to the works for the detention basin. Works will be undertaken in accordance with AS4970 and therefore no additional impacts are anticipated, and all impacts will be managed to ensure the tree remains viable.
- The northern entry/exit pit will have a minor (3%) encroachment to the TPZ of tree 73. In accordance with AS4970, provided a compensatory TPZ allowance is available contiguous with the existing then no further detailed TP measures are required for a minor encroachment of <10%.