INNER WEST COUNCIL

DEVELOPMENT ASSESSMENT REPORT

Application No.	D/2018/213
Address	Department of Housing Lease, 18A Adolphus Street, BALMAIN NSW 2041
Proposal	Demolition of existing retaining walls and boundary fences and construction of new retaining walls and front boundary walls to the Adolphus and Wallace Street frontages.
Date of Lodgement	27 April 2018
Applicant	Land and Housing Corporation
Owner	Leichhardt Municipal Council and New South Wales Land and Housing Corporation [allows panel members to identify Council applications &/or conflicts]
Number of Submissions	1 objection
Value of works	$150,000
Reason for determination at Planning Panel	Conflict of Interest – Council owned land
Main Issues	Tree removal; Loss of landscape amenity
Recommendation	Approval

LOCALITY MAP

Subject Site		Objectors	
Notified Area		Supporters	

N

Note: Objector is outside the area shown above.

1. Executive Summary

This report is an assessment of the application submitted to Council for 'demolition of existing retaining walls and boundary fences and construction of new retaining walls and front boundary walls to the Adolphus and Wallace Street frontages' at Department of Housing Lease, 18A Adolphus Street, Balmain. The application was notified to surrounding properties and 1 submission was received.

The main issues that have arisen from the application include:

- Tree removal
- Loss of landscape amenity

Notwithstanding the objections noting a previous application for removal of three trees was not supported by Council. Based on the information submitted with this application and the current circumstances of the case, the application is recommended for approval.

2. Proposal

The proposal involves the demolition of existing retaining walls and front fence that have become structurally unsound and unsafe due to inadequate structural reinforcement and horizontal loads from adjoining trees in close proximity. New structurally reinforced retaining walls ranging from 0.55m to 1.4m and open style 1.4m high front fence are proposed to the Adolphus and Wallace Street frontages to match the height and appearance of the existing fence.

As a part of a previous part approval for tree removal under D/2015/731, 6 x *Corymbia maculata* (Spotted Gums) were required to be retained within the front setback to Adolphus Street given their landscape amenity value and inadequate justification for removal.

Based on a Geotechnical Report prepared by Smec Testing Services, dated 11 April 2017, and an Arboricultural Impact Assessment and Tree Protection Plan prepared by Advanced Treescape Consulting, dated 23 March 2018, the current proposal seeks to remove 3 x *Corymbia maculata* (Spotted Gums - Tree No.'s T2, T3 and T4) located within the front setback to Adolphus Street. This is due to specific concerns of foreseeable damage to these trees during demolition of the existing wall and the likelihood of destabilisation of these trees upon removal of the wall given the identified 'low sheer' soil type of the site.

The retention of the remaining 3 x *Corymbia maculata* (Spotted Gums - Tree No.'s T1, T5 and T6) within the front setback is proposed given the potential impacts of the works can be appropriately managed for these trees with suitable tree protection measures.

No tree removal is proposed within the landscaped verge of Adolphus Street fronting the site. Replacement planting with 3 super-advanced (200L pot size) native trees capable of attaining a minimum height of 8m is proposed within the front setback to offset the loss of canopy cover and landscape amenity from the trees to be removed.

The application has been accompanied by land owner's consent from Council's Property Section.

Extracts of the proposed plans are shown in the figures below.

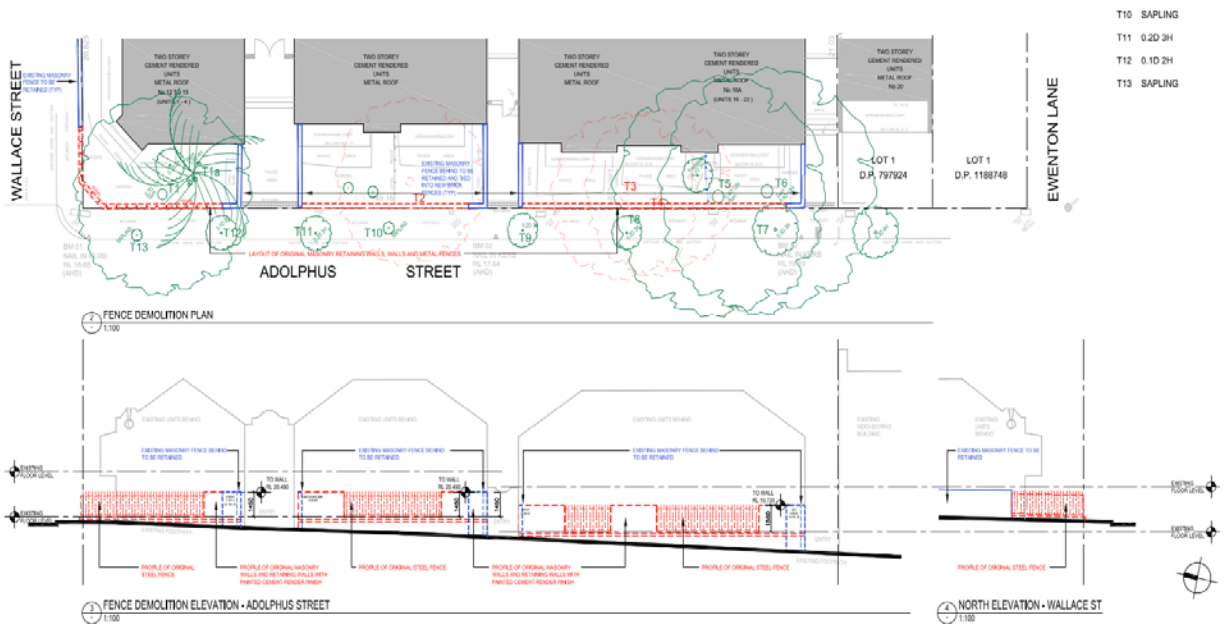


Figure 1: *Proposed tree removal and demolition of retaining wall/ front fence at 18A Adolphus Street, Balmain*

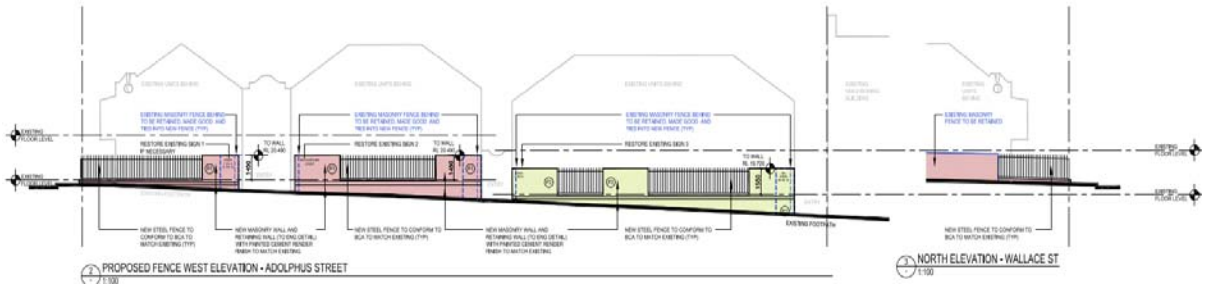


Figure 2: *Proposed new retaining wall / front fence to match existing at 18A Adolphus Street, Balmain*

3. Site Description

The subject site is located on the eastern side of Adolphus street, between Wallace Street and Ewenton Lane. The site consists of one allotment and is generally rectangular with a total area of 1,814sqm and is legally described as Lot 4 Section B DP 396.

The site has a frontage to Adolphus Street of 49m and a secondary frontage of approximate 28m to Wallace Street.

The site supports a number of detached and attached multiple dwellings. The adjoining properties consist of residential developments of single dwellings and attached dwellings.

The subject site is located within a conservation area and is identified as a heritage item (*I110).* However, the buildings and associated front masonry wall do not form part of the item. The site is zoned R1 General Residential.

The following trees are located on the site and within the vicinity.

- 6 x *Corymbia maculata* (Spotted Gums) adjacent to the western (front) boundary of the subject site (Tree No.'s T1 to T6)
- 1 x *Cinnamomum camphora* (Camphor Laurel) located within front setback
- 1 x *Phoenix canariensis* (Canary Island Date Palm) located within front setback

- 1 x *Angophora hispida* (Bush Apple) located in nature strip
- 7 x *Sapium sebiferum* (Chinese Tallow) located in nature strip

4. Background

4(a) Site history

The following section outlines the relevant development history of the subject site and any relevant applications on surrounding properties.

Subject Site

Application	Proposal	Decision & Date
T/2009/189	Removal of 1 x palm and 1 x *Sapium sebiferum*	Approved 11/8/2009
T/2012/97	Removal of 8 trees	Cancelled 10/12/2012
LGA/2015/128	Order 21 for 18A Adolphus St Balmain East	Issued 1/4/2015
LGA/2015/148	Order 21 for 18A Adolphus St Balmain to remove the dangerous walls	Issued 20/5/2015
D/2015/731	Removal of ten *Corymbia maculata* (Spotted Gum) Trees from Adolphus St frontage.	Part Approval for removal of 4 trees only 13/9/2016

4(b) Application history

The following table outlines the relevant history of the subject application.

Date	Discussion / Letter/ Additional Information
30/7/2018	A copy of the draft conditions was sent to the Applicant, being a Crown authority, for approval in accordance with Section 4.33(1)(b) of the Act.

5. Assessment

The following is a summary of the assessment of the application in accordance with Section 4.15 of the Environmental Planning and Assessment Act 1979.

5(a) Environmental Planning Instruments

The application has been assessed against the relevant Environmental Planning Instruments listed below:

- State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017
- Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005
- Leichhardt Local Environmental Plan 2013

The following provides further discussion of the relevant issues:

5(a)(i) State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017

The subject site contains 6 x *Corymbia maculata* (Spotted Gums - Tree No.'s T1 to T6), 1 x *Cinnamomum camphora* (Camphor Laurel), and 1 x *Phoenix canariensis* (Canary Island Date Palm), all located within the front setback adjacent to Adolphus Street. Council's Landscape Officer supports the removal of 3 x *Corymbia maculata* (Spotted Gums - Tree

No.'s T2, T3 and T4) located within the front setback to Adolphus Street due to concerns of foreseeable damage to these trees during demolition of the existing wall and likelihood of destabilisation of these trees upon removal of the wall given the identified 'low sheer' soil type of the site. In addition, removal of the *Cinnamomum camphora* (Camphor laurel tree) located in the garden bed on the corner of Wallace Street and Adolphus Street is also supported given this tree is a not suitable species for the surrounding landscape. However, consent for the removal of the Camphor laurel has not been sought.

No other tree removal is proposed and suitable tree protection measures are proposed for the remaining trees to be retained.

5(a)(ii) State Environmental Planning Policy (Coastal Management) 2018

The subject site is not located within the coastal zone and as such, these provisions are not applicable.

5(a)(iii) Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005

An assessment has been made of the matters set out in Clause 20 of the Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005. It is considered that the carrying out of the proposed development is generally consistent with the objectives of the Plan and would not have an adverse effect on environmental heritage, the visual environmental, the natural environment, and open space and recreation facilities.

5(a)(iv) Leichhardt Local Environment Plan 2013 (LLEP 2013)

The application was assessed against the following relevant clauses of the Leichhardt Local Environmental Plan 2013.

- Clause 1.2 – Aims of the Plan
- Clause 2.3 – Zone objectives and Land Use Table
- Clause 5.10 – Heritage Conservation
- Clause 6.1 – Acid Sulphate Soils

The following provides further discussion of the relevant issues:

Clause 5.10 – Heritage Conservation

The subject site is listed as an item of local heritage significance (I110). The listing relates to a former stone outbuilding (including its interiors) attached to *Clontarf* (located at 4 Wallace Street Balmain). The subject site is also in the vicinity of a number of other heritage items namely, house numbers 3 – 33 Adolphus Street Balmain (a series of stone terrace houses).

Whilst the subject trees are located on a heritage listed site, based on their estimated age, they were most likely planted as part of the public housing development at the end of the late 1980s and as such, would not form part of the original garden setting at 4 Wallace Street.

The trees provide screening of a series of buildings that do not contribute to the setting of the area. However, removal is considered to be justified for three trees that are located where the prevailing environmental conditions are unsuitable and likely to pose a threat to human life or property.

In this instance, the proposal will retain three existing trees and replace the three trees to be removed with super advanced replacement trees capable of reaching a height of at least 8m.

Therefore, it is considered that the proposal will not result in any adverse heritage impacts given the public housing development will continue to be screened by canopy trees.

5(b) Draft Environmental Planning Instruments

Draft State Environmental Planning Policy (Environment) 2018

The NSW government has been working towards developing a new State Environmental Planning Policy (SEPP) for the protection and management of our natural environment. The Explanation of Intended Effect (EIE) for the Environment SEPP was on exhibition from 31 October 2017 until 31 January 2018. The EIE outlines changes to occur, implementation details, and the intended outcome. It considers the existing SEPPs proposed to be repealed and explains why certain provisions will be transferred directly to the new SEPP, amended and transferred, or repealed due to overlaps with other areas of the NSW planning system.

This consolidated SEPP proposes to simplify the planning rules for a number of water catchments, waterways, urban bushland and Willandra Lakes World Heritage Property. Changes proposed include consolidating seven existing SEPPs including Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005. The proposed development would be consistent with the intended requirements within the Draft Environment SEPP.

5(c) Development Control Plans

The application has been assessed and the following provides a summary of the relevant provisions of Leichhardt Development Control Plan 2013.

Part	Compliance
Part A: Introductions	
Section 3 – Notification of Applications	Yes
Part B: Connections	
B1.1 Connections – Objectives	Yes
Part C	
C1.0 General Provisions	Yes
C1.1 Site and Context Analysis	Yes
C1.2 Demolition	Yes
C1.4 Heritage Conservation Areas and Heritage Items	Yes
C1.12 Landscaping	Yes
C1.14 Tree Management	Yes
Part C: Place – Section 2 Urban Character	
Suburb Profile	
C2.2.2.3 Gladstone Park Distinctive Neighbourhood, Balmain	Yes
Part C: Place – Section 3 – Residential Provisions	
C3.1 Residential General Provisions	Yes
C3.2 Site Layout and Building Design	Yes
C3.3 Elevation and Materials	Yes
C3.5 Front Gardens and Dwelling Entries	Yes
C3.6 Fences	No, but considered acceptable given it matches existing
Part D: Energy	

Section 1 – Energy Management	Yes
Section 2 – Resource Recovery and Waste Management	Yes
D2.1 General Requirements	Yes
D2.2 Demolition and Construction of All Development	Yes

The following provides discussion of the relevant issues:

C1.12 – Landscaping

The objectives of C1.12 *Residential Development* are:

O1 Development includes on-site landscaped open space that:
- *a. enhances the visual setting of buildings;*
- *b. contributes to the distinct landscape character within the neighbourhoods and preserves, retains and encourages vegetation and wildlife that is indigenous to the municipality and Sydney;*
- *c. preserves or retains natural features such as rock outcrops that contribute to the landscape of the area;*
- *d. conserves water resources by reducing the need for irrigation;*
- *e. maximises vegetation to regulate and increase rainwater infiltration, thereby increasing nutrient recycling and reducing surface runoff;*
- *f. is compatible with the heritage significance of the place;*
- *g. contributes to the amenity of the residents and visitors;*
- *h. where involving new plantings, benefit the building's energy efficiency;*
- *i. protects and retains existing trees on the subject and surrounding sites, including the street verge; and*
- *j. is designed to encourage the retention and enhancement of green corridors.*

Removal of trees 2, 3, & 4 is supported as it is considered that they are located where the prevailing environmental conditions are unsuitable.

Replacement planting with 3 super-advanced (200L pot size) native trees capable of attaining a minimum height of 8m is proposed within the front setback to offset the loss of canopy cover and landscape amenity from the trees to be removed. These replacement trees, combined with retention of the remaining Spotted Gum trees and Canary Island Date Palm, will create a positive contribution to the surrounding landscape and enhance the visual appeal of the neighbourhood.

C1.14 – Tree Management

The proposed removal of Trees 2, 3, & 4 is consistent with the *Tree Management Control*s under C1.14.7 which provides the criteria under which the removal of a prescribed tree is to be assessed:

- *a. the tree is located where the prevailing environmental conditions are unsuitable;*
- *b. the tree is in a state of irreversible decline or is dead;*
- *c. the tree poses a threat to human life or property;*
- *d. the tree is causing significant damage to public infrastructure which cannot be remediated by any other reasonable and practical means;*
- *e. the replacement of damaged or failed sewer pipes or storm water lines cannot reasonably be undertaken with the retention of the tree;*
- *f. the tree is not deemed to be a tree of landscape significance; and*
- *g. replacement planting can better achieve the objectives of this section of the* Development Control Plan *within a reasonable time.*

The applicant submits that the proposed removal of the subject trees will satisfy part (c) of the above criteria based on the justification provided by a Geotechnical Assessment report, prepared by Laurie Ihnativ from *SMEC TESTING SERVICES*, dated 11/04/2018 in conjunction with the submitted *Arboricultural Impact Assessment and Tree Protection Plan,* prepared by Russell Kingdom from *ADVANCED TREESCAPE CONSULTING*, dated 23/03/2018.

Council's Landscape Assessment Officer has raised no objections to the proposed removal of 3 x *Corymbia maculata* (Spotted Gums trees 2, 3 and 4) to facilitate the demolition and re-construction of a retaining wall alongside the Adolphus street frontage of the site.

In particular, there are concerns of foreseeable physical damage of the three subject trees during demolition due to the close proximity to the existing retaining wall to the trunk flare and suspected structural roots from the above trees.

Photo of the trees proposed to be removed is shown below.

Figure 3: *Photo of existing trees to be removed at 18A Adolphus Street, Balmain*

Further concerns are raised in relation to the possibility of the trees becoming destabilised in their current locations during the demolition of the retaining wall due to fill being identified to be comprising of large sandstone pieces, bricks, gravel and concrete amongst silt and other rubble. These soils are considered low sheer soils "*which have limited ability to hold large trees under heavy loads. These trees would be prone to lodging*".

In addition, the submitted *Geotechnical Assessment Report* has identified that the existing retaining wall has tilted due to not being reinforced combined with the horizontal loads being applied by the subject trees.

Given the above, the removal of the three *Corymbia maculata* (Spotted Gums) is supported subject to conditions, including replacement planting.

The new walls will also enable the on-going retention of the remaining 3 x *Corymbia maculata* (Spotted Gums - Tree No.'s T1, T5 and T6).

Tree protection shall be afforded to the remaining trees on site (including trees located in the nature strip) in accordance with section 6 *Tree Protection Plan* and section 7 *Tree Protection Stages* of the submitted *Arboricultural Impact Assessment and Tree Protection Plan under the supervision of an* AQF level 5 Project Arborist.

Whilst the application does not seek removal of the *Cinnamomum camphora* (Camphor laurel tree) located in the garden bed on the corner of Wallace St and Adolphus St, such removal would be supported in accordance with Section C1.14.7, Control C13(a) of Council's Tree Management Controls.

The applicant shall engage the services of an AQF level 5 Project Arborist to oversee all excavation/demolition and construction works associated with the application as well as all tree planting and landscaping works associated with revegetating the site.

C2.2.2.3 *Gladstone Park Distinctive Neighbourhood*, Balmain

The *Desired Future Character* for *Gladstone Park* requires that the tree coverage on private land is maintained. A high foil of canopy trees, principally Eucalypts as a backdrop, is very important to sustaining the character of this neighbourhood.

Whilst the trees to be removed provide screening and canopy cover, removal is considered to be justified for three trees that are located where the prevailing environmental conditions are unsuitable and likely to pose a threat to human life or property.

In this instance, the proposal will retain three existing trees and replace the three trees to be removed with super advanced replacement trees capable of reaching a height of at least 8m.

Therefore, it is considered that the proposal will not result in any adverse impacts to the character of the streetscape or locality.

C3.6 – Fences

Control C6 requires a maximum height of 1.2m above retaining walls and front fence materials that allow at least 50% transparency. Whilst the height of the proposed front fence exceeds 1.2m by 200mm, this is considered acceptable given it will match the height and appearance of the existing front fence and retaining walls to be replaced. The combination of low masonry walls and open style metal picket will maintain at least 50% transparency. Therefore, the proposed replacement fencing and retaining walls are considered acceptable.

5(d) The Likely Impacts

The assessment of the Development Application demonstrates that, subject to the recommended conditions, the proposal will have minimal impact in the locality.

5(e) The suitability of the site for the development

The site is zoned R1 General Residential. Provided that any adverse effects on adjoining properties are minimised, this site is considered suitable to accommodate the proposed development, and this has been demonstrated in the assessment of the application.

5(f) Any submissions

The application was notified in accordance with Council's Policy for a period of 14 days to surrounding properties. A total of one submission was received.

The following issues raised in submissions have been discussed in this report:

- The trees to be removed are mature native trees of high significance and excellent health and their removal would represent a major impact on the amenity of the area.

In addition to the above issues, the submissions raised the following concerns which are discussed under the respective headings below:

<u>The additional reports add nothing to the discussion addressing alternative options for the retention of the trees to be removed.</u>

Comment: The applicant submits that the proposed removal of the subject trees will satisfy Section C1.14.7, Control C13(c) of Council's Tree Management Controls based on the justification provided by a Geotechnical Assessment report, prepared by Laurie Ihnativ from *SMEC TESTING SERVICES*, dated 11/04/2018 in conjunction with the submitted *Arboricultural Impact Assessment and Tree Protection Plan,* prepared by Russell Kingdom from *ADVANCED TREESCAPE CONSULTING*, dated 23/03/2018.

The additional reports are also considered to satisfy the requirements of Section C1.14.7, Control C14, which requires a report prepared by a Consulting Engineer to establish that the damage to the retaining wall is caused by the trees to be removed. In addition, the new structurally reinforced retaining walls have been designed to withstand the horizontal loads from the on-going retention of the remaining 3 x *Corymbia maculata* (Spotted Gums - Tree No.'s T1, T5 and T6).

Council's Landscape Assessment Officer has raised no objections to the proposed removal of 3 x *Corymbia maculata* (Spotted Gums trees 2, 3 and 4) to facilitate the demolition and re-construction of a retaining wall alongside the Adolphus street frontage of the site.

In particular, there are concerns of foreseeable physical damage of the three subject trees during demolition due to the close proximity to the existing retaining wall to the trunk flare and suspected structural roots from the above trees.

Further concerns are raised in relation to the possibility of the trees becoming destabilised in their current locations during the demolition of the retaining wall due to fill being identified to be comprising of large sandstone pieces, bricks, gravel and concrete amongst silt and other rubble. These soils are considered low sheer soils "*which have limited ability to hold large trees under heavy loads. These trees would be prone to lodging*".

In addition, the submitted *Geotechnical Assessment Report* has identified that the existing retaining wall has tilted due to not being reinforced combined with the horizontal loads being applied by the subject trees.

Given the above, the removal of the three *Corymbia maculata* (Spotted Gums) is supported subject to conditions, including replacement planting.

The NSW Government Land and Housing Corporation (LHC) is legally obliged to be a Model Applicant and to be an exemplar in relation to due process.

Comment: The Application has been made in accordance with the Regulations and has been accompanied with suitable documentation to enable a full and proper assessment of the proposal.

The applicant has resorted to playing the "risk" card and there are many methodologies for eliminating it which the LHC has not addressed

Comment: As noted above, the documentation submitted with the application is considered to satisfy Controls C13(c) and C14, Section C1.14.7 of Leichhardt DCP 2013. Council's Landscape Assessment Officer has reviewed the proposal and raised no objections to the proposed removal of 3 x *Corymbia maculata* (Spotted Gums trees 2, 3 and 4) to facilitate the demolition and re-construction of a retaining wall alongside the Adolphus street frontage of the site. The proposal also provides for the ongoing retention of the remaining trees on-site with a new structurally reinforced retaining wall able to withstand the horizontal loads from the remaining trees to be retained.

5(g) The Public Interest

The public interest is best served by the consistent application of the requirements of the relevant Environmental Planning Instruments, and by Council ensuring that any adverse effects on the surrounding area and the environment are appropriately managed.

The proposal is not contrary to the public interest.

6 Referrals

6(a) Internal

The application was referred to the following internal sections/officers and issues raised in those referrals have been discussed in section 5 above.

- Heritage Officer
- Development Engineer
- Property
- Landscape

6(b) External

The Development Application was not required to be referred to any external body for comment in terms of the assessment.

However as the applicant is NSW Land and Housing Corporation (the Crown), Section 4.33 of the Act is applicable (see below). In accordance with the provisions of Section 4.33(1)(b) Council wrote to the Applicant and advised of the recommended conditions.

4.33 Determination of Crown development applications
(1) A consent authority (other than the Minister) must not:
(a) refuse its consent to a Crown development application, except with the approval of the Minister, or
(b) impose a condition on its consent to a Crown development application, except with the approval of the applicant or the Minister.

(2) If the consent authority fails to determine a Crown development application within the period prescribed by the regulations, the applicant or the consent authority may refer the application:
(a) to the Minister, if the consent authority is not a council, or
(b) to the applicable regional panel, if the consent authority is a council.
(2A) A Crown development application for which the consent authority is a council must not be referred to the Minister unless it is first referred to the applicable regional panel.
(3) An applicable regional panel to which a Crown development application is referred may exercise the functions of the council as a consent authority (subject to subsection (1)) with respect to the application.
(4) A decision by a regional panel in determining a Crown development application is taken for all purposes to be the decision of the council.
(5) If an applicable regional panel fails to determine a Crown development application within the period prescribed by the regulations, the applicant or the panel may refer the application to the Minister.
(6) The party that refers an application under this section must notify the other party in writing that the application has been referred.
(7) When an application is referred under this section to an applicable regional panel or the Minister, the consent authority must, as soon as practicable, submit to the panel or the Minister:
(a) a copy of the development application, and
(b) details of its proposed determination of the development application, and
(c) the reasons for the proposed determination, and
(d) any relevant reports of another public authority.
(8) An application may be referred by a consent authority or applicable regional panel before the end of a relevant period referred to in subsection (2) or (5).

In correspondence dated 13 August 2018 from NSW Land and Housing Corporation, Council was advised that the Applicant accepts the draft conditions of approval. Therefore, approval subject to the recommended conditions may be granted by the consent authority.

7. Section 7.11 Contributions

Section 7.11 contributions are not payable for the proposal.

8. Conclusion

The proposal generally complies with the aims, objectives and design parameters contained in Leichhardt Local Environmental Plan 2013 and Leichhardt Development Control Plan 2013. The development will not result in any significant impacts on the amenity of adjoining premises and the streetscape. The application is considered suitable for approval subject to the imposition of appropriate conditions.

9. Recommendation

A. That Council, as the consent authority pursuant to s4.16 of the Environmental Planning and Assessment Act 1979, grant consent to Development Application No: D/2018/213 for Demolition of existing retaining walls and boundary fences and construction of new retaining walls and front boundary walls to the Adolphus and Wallace Street frontages at Department of Housing Lease, 18A Adolphus Street, BALMAIN NSW 2041 subject to the conditions listed in Attachment A below.

Attachment A – Recommended conditions of consent

CONDITIONS OF CONSENT

1. Development must be carried out in accordance with Development Application No. 2018/213 and the following plans and supplementary documentation, except where amended by the conditions of this consent.

Plan Reference	Drawn By	Dated
Demolition Plan & Elevation, Sheet 1 of 2, Rev. C	BD Architecture Interiors	22/3/2018
Proposed Plan & Elevation, Sheet 2 of 2, Rev. C	BD Architecture Interiors	22/3/2018
S048-S02.00, Plan & Elevation, Rev. C	SPAD Pty Ltd	21/3/2018
S048-S02.01, Details, Rev. C	SPAD Pty Ltd	21/3/2018
Document Title	**Prepared By**	**Dated**
Geotechnical Assessment	Smec Testing Services	11/4/2017
Arboricultural Impact Assessment & Tree Protection Plan	Advanced Treescape Consulting	23/3/2018

In the event of any inconsistency between the approved plans and the conditions, the conditions will prevail.

Where there is an inconsistency between approved elevations and floor plan, the elevation shall prevail.

In the event of any inconsistency between the approved plans and supplementary documentation, the plans will prevail.

The existing elements (walls, floors etc) shown to be retained on the approved plans shall not be removed, altered or rebuilt without prior consent of the consent authority.

Note: Carrying out of works contrary to the above plans and/ or conditions may invalidate this consent; result in orders, on the spot fines or legal proceedings.

2. Approval is given for the following works to be undertaken to trees on the site:

Tree/location	Approved works
3 x *Corymbia maculata* (Spotted Gums) located in front property (T2, 3 and 4)	Remove
1 x *Cinnamomum camphora* (Camphor laurel tree)located in front property	Remove

Removal or pruning of any other tree (that would require consent of Council) on the site is not approved.

The approved works shall not be carried out unless this letter, or copy of it, is kept on the site. It shall be shown to any authorised Council Officer upon request.

All tree work shall be undertaken by an experienced Arborist with a minimum qualification of Level 3 under the Australian Qualification Framework (AQF). The

work shall be undertaken in accordance with AS4373 – 2007 'Pruning of amenity trees' and in compliance with the Safe Work Australia Code of Practice 'Guide to Managing Risks of Tree Trimming and Removal Work'.

Any works in the vicinity of the Low Voltage Overhead Network (including service lines—pole to house connections) shall be undertaken by an approved Ausgrid contractor for the management of vegetation conflicting with such services. Please contact Ausgrid for further advice in this regard.

3. The trees identified below are to be retained:

Tree/location
3 x *Corymbia maculata* (Spotted Gums) located in front property (T1, 5 and 6).
1x *Angophora hispida* (Dwarf apple) located in nature strip.
7 x *Sapium sebiferum* (Chinese Tallow) located in nature strip.

Details of the trees to be retained must be included on the construction plans

PRIOR TO THE COMMENCEMENT OF WORKS

4. A structural engineering report and plans that address the proposed works in the vicinity of the Adolphus and Wallace Street boundary, prepared by a qualified practicing Structural Engineer, must be provided prior to works commencing. The report and plans must be prepared/ amended to make provision for the following:

   a) All components of any retaining walls, including subsoil drainage, render mesh and render, must be located entirely within the property boundary.

   b) No weep holes are permitted in any wall.

   c) Retaining walls must be entirely self supporting in the event that excavation is undertaken within the road reserve adjacent to the property boundary to the depth of the proposed structure.

   d) Any existing or proposed retaining walls that provide support to the road reserve must be adequate to withstand the loadings that could be reasonably expected from within the constructed road and footpath area, including normal traffic and heavy construction and earth moving equipment, based on a design life of not less than 50 years.

   e) Provide relevant geotechnical/ subsurface conditions of the site, as determined by full geotechnical investigation.

   Details demonstrating compliance with the requirements of this condition are to be included as a part of the construction drawings prior to works commencing.

5. Details of the species and planting locations of the replacement plants must be included on the landscape plan and site plan prior to commencement of works.

   The following replacement trees must be planted:

Tree/species	Quantity	Location
Native specimens capable of attaining a minimum height of 8m upon maturity	3	Existing garden beds located along Adolphus St frontage

The minimum pot size at time of planting will be equivalent to 200 litre (min) containerised stock and shall comply with AS 2303—*Tree Stock for Landscape Use*.

Replacement trees (as specified above) are to be planted prior to completion of works. Council is to be notified when the replacement tree has been planted within the timeframe specified above and an inspection arranged with Council's Tree Assessment Officer. If the replacement is found to be faulty, damaged, dying or dead prior to being protected under the Tree Management Controls of the Leichhardt Development Control Plan 2013, the replacement tree shall be replaced with the same species, which will comply with the criteria above.

Council encourages the uses of replacement trees that are endemic to the Sydney Basin to increase biodiversity in the local environment and provide a natural food source for native birds and marsupials. Note: Any replacement tree species must not be a palm tree species or be a plant declared to be a noxious weed under the Noxious Weeds Act 1993 or tree species listed as an exempt species under Section C1.14 (Tree Management) of the Leichhardt Development Control Plan 2013.

Replacement trees shall not be planted directly into existing fill or stump grindings from trees identified for removal. Site preparation (including imported soil, installation of irrigation systems and usage of fertilizers or soil conditioners) must be under the direction of an appointed AQF level 5 Project Arborist or suitably qualified Horticulturalist with a minimum 5 years demonstrable industry experience with transporting, planting and establishing advanced sized trees in the landscape.

6. To preserve the tree/s nominated for retention no work shall commence until the trunk/s/branches are protected (in accordance with AS4970-*Protection of trees on development sites*) by the placement of appropriate lengths of 50 x 100mm timbers spaced at 150mm centres and secured by wire/hoop strap over suitable protective padding material (i.e. underlay or carpet). The trunk/branch protection shall be maintained intact until the completion of all work on site.

   Requirements of this condition are to be met prior to works commencing.

7. In accordance with Section 34 of the *Building and Construction Industry Long Service Payments Act 1986*, the applicant must pay a long service levy at the prescribed rate of 0.35% of the total cost of the work to either the Long Service Payments Corporation or Council for any work costing $25,000 or more. The Long Service Levy is payable prior to works commencing.

8. A Soil and Water Management Plan must be provided prior to commencement of works. The Soil and Water Management plan must be designed to be compatible with the document Planning for Erosion and Sediment Control on Single Residential Allotments or Managing Urban Stormwater–Soils & Construction Volume 1 (2004) available at www.environment.nsw.gov.au and the Construction Management and

Traffic Management Plan referred to in condition/s of this Development Consent and must address, but is not limited to the following issues:

a) Minimise the area of soils exposed at any one time.

b) Conservation of top soil.

c) Identify and protect proposed stockpile locations.

d) Preserve existing vegetation. Identify revegetation technique and materials.

e) Prevent soil, sand, sediments leaving the site in an uncontrolled manner.

f) Control surface water flows through the site in a manner that:
   i) Diverts clean run-off around disturbed areas;
   ii) Minimises slope gradient and flow distance within disturbed areas;
   iii) Ensures surface run-off occurs at non erodable velocities;
   iv) Ensures disturbed areas are promptly rehabilitated.

g) Sediment and erosion control measures in place before work commences.

h) Materials are not tracked onto the road by vehicles entering or leaving the site.

i) Details of drainage to protect and drain the site during works.

Details demonstrating compliance with the requirements of this condition are to be included as a part of the construction drawings.

9. The approved plans must be submitted to a Sydney Water Quick Check agent to determine whether the development will affect Sydney Water's sewer and water mains, stormwater drains and/or easements, and if further requirements need to be met. For Quick Check agent details please refer to the web site http://www.sydneywater.com.au/SW/plumbing-building-developing/building/quick-check-agents/index.html

   The Land and Housing Corporation must ensure the Quick Check agent/Sydney Water has appropriately stamped the plans prior to works commencing.

   Details demonstrating compliance with the requirements of this condition are to be included as a part of the construction drawings.

10. Prior to works commencing, the applicant must prepare a Construction Management and Traffic Management Plan. The following matters should be addressed in the plan (where applicable):

    a) A plan view of the entire site and frontage roadways indicating:

       i) Dedicated construction site entrances and exits, controlled by a certified traffic controller, to safely manage pedestrians and construction related vehicles in the frontage roadways.

       ii) The locations of work zones (where it is not possible for loading/unloading to occur on the site) in the frontage roadways

accompanied by supporting documentation that such work zones have been approved by the Local Traffic Committee and Council.

iii) Location of any proposed crane and concrete pump and truck standing areas on and off the site.

iv) A dedicated unloading and loading point within the site for construction vehicles, plant and deliveries.

v) The proposed areas within the site to be used for the storage of excavated material, construction materials and waste and recycling containers during the construction period.

b) Noise and vibration
During excavation, demolition and construction phases, noise & vibration generated from the site must be controlled. Refer to other conditions of this consent. If during excavation, rock is encountered, measures must be taken to minimise vibration, dust generation and impacts on surrounding properties. Refer to Environmental Noise Management Assessing Vibration: a technical Guideline (Department of Environment and Conservation, 2006) www.epa.nsw.gov.au for guidance and further information.

c) Occupational Health and Safety
All site works must comply with the occupational health and safety requirements of the New South Wales Work Cover Authority.

d) Traffic control plan(s) for the site
All traffic control plans must be in accordance with the Roads and Maritime Services publication "Traffic Control Worksite Manual"

Approval is to be obtained from Council for any temporary road closures or crane use from public property. Applications to Council shall be made a minimum of 4 weeks prior to the activity proposed being undertaken.

Details demonstrating compliance with the requirements of this condition are to be included as a part of the construction drawings.

11. A Waste Management Plan (WMP) is to be provided in accordance with **Part D – Waste – Development Control Plan 2013**. The Plan must address all issues identified in the DCP including but not limited to:

a) Estimated volume (m3) or weight (t) of materials that are reused, recycled or removed from site.

b) On site material storage areas during construction.

c) Material and methods used during construction to minimise waste.

d) Nomination of end location of all waste and recycling generated from a facility authorised to accept the material type for processing or disposal and retention of waste dockets to be made available to Council Officer on request

e) A clear statement within the Waste Management Plan of responsibility for the transferral of waste and recycling bins within the property and between floors where applicable to the collection point in accordance with DCP 2013.

All requirements of the approved Waste Management Plan must be implemented during the demolition, excavation and construction of the development.

12. Prior to the commencement of demolition works on the subject site, a security deposit and inspection fee as detailed below must be paid to Council to cover the cost of making good any damage caused to any Council property or the physical environment as a consequence of carrying out the works.

Security Deposit (FOOT)	$12,075.00
Inspection fee (FOOTI)	$225.00

Payment will be accepted in the form of cash, bank cheque or EFTPOS/credit card (to a maximum of $10,000) or bank guarantee. Bank Guarantees must not have an expiry date.

The inspection fee is required for Council to determine the condition of the adjacent road reserve & footpath prior to & on completion of the works being carried out.

Should any of Council's property and/or the physical environment sustain damage during the course of the demolition or construction works, or if the works put Council's assets or the environment at risk, Council may carry out any works necessary to repair the damage and/or remove the risk. The cost of these works will be deducted from the security deposit.

A request for release of the security may be made to the Council after all construction work has been completed.

The amount nominated is only current for the financial year in which the consent was issued and is revised each financial year. The amount payable must be consistent with Council's Fees and Charges in force at the date of payment.

Requirements of this condition are to be met prior to works commencing.

13. The person acting on this consent shall submit to the Land and Housing Corporation a dilapidation report including colour photos showing the existing condition of the footpath and roadway adjacent to the site before the commencement of works.

14. The proposed structure(s) to be erected must stand wholly within the boundaries of the subject site. No portion of the proposed structure, including gates and doors during opening and closing operations, shall encroach onto adjoining properties or upon public property.

To ensure that the location of the building satisfies the provision of the approval, the footings and walls within one (1) metre of the property boundaries must be set out by or the location certified by a registered surveyor in accordance with the approved plans, prior to the commencement of works.

15. The site must be secured with temporary fencing prior to any works commencing.

    If the work involves the erection or demolition of a building and is likely to cause pedestrian or vehicular traffic on public property to be obstructed or rendered inconvenient, or building involves the enclosure of public property, a hoarding or fence must be erected between the work site and the public property. Additionally an awning is to be erected, sufficient to prevent any substance from, or in connection with, the work falling onto public property, where necessary.

16. Any person acting on this consent or any contractors carrying out works on public roads or Council controlled lands shall take out Public Liability Insurance with a minimum cover of twenty (20) million dollars in relation to the occupation of, and approved works within those lands. A copy of the Policy must be submitted to Council prior to commencement of the works. The Policy must be valid for the entire period that the works are being undertaken on public property.

17. Prior to the commencement of works, the Land and Housing Corporation shall be notified in writing of the name and contractor licence number of the owner/builder intending to carry out the approved works.

18. The Land and Housing Corporation will notify Council at least forty-eight (48) hours prior to the commencement of works.

19. Prior to the commencement of works, a sign must be erected in a prominent position on the site (for members of the public to view) on which the proposal is being carried out. The sign must state:

    a) Unauthorised entry to the work site is prohibited.

    b) The name of the principal contractor (or person in charge of the site) and a telephone number at which that person may be contacted at any time for business purposes and outside working hours.

    c) The name, address and telephone number of the responsible Land and Housing Corporation officer for the work.

    Any such sign must be maintained while the work is being carried out, but must be removed when the work has been completed.

DURING WORKS

20. Building materials and machinery are to be located wholly on site unless separate consent (Standing Plant Permit) is obtained from Council/ the roads authority. Building work is not to be carried out on the footpath.

    Construction materials and vehicles shall not block or impede public use of the footpath or roadway.

21. All excavations and backfilling associated with the development must be executed safely, properly guarded and protected to prevent them from being dangerous to life or property and in accordance with the design of a suitably qualified structural engineer.

If excavation extends below the level of the base of the footings of a building on an adjoining allotment of land, the person causing the excavation must:

a) Preserve and protect the building from damage.

b) If necessary, underpin and support the building in an approved manner.

c) Give at least seven (7) days notice to the adjoining owner before excavating, of the intention to excavate within the proximity of the respective boundary.

Any proposed method of support to any excavation adjacent to adjoining properties or any underpinning is to be designed by a Chartered Civil Engineer, with National Professional Engineering Registration (NPER) in the construction of civil/structural works. Copies of the design plans must be provided to the relevant adjoining property owner/s prior to commencement of such works. Prior to backfilling, any method of support constructed must be inspected by the designing Engineer with certification provided to all relevant parties.

22. The site must be appropriately secured and fenced at all times during works.

23. All fill used with the proposal shall be virgin excavated material (such as clay, gravel, sand, soil and rock) that is not mixed with any other type of waste and which has been excavated from areas of land that are not contaminated with human made chemicals as a result of industrial, commercial, mining or agricultural activities and which do not contain sulphate ores or soils.

Details demonstrating compliance with the requirements of this condition are to be submitted to the satisfaction of the Land and Housing Corporation.

24. Unless otherwise approved by Council, excavation, demolition, construction or subdivision work shall only be permitted during the following hours:

a) 7:00 am to 6.00 pm, Mondays to Fridays, inclusive (with demolition works finishing at 5pm);
b) 8:00 am to 1:00 pm on Saturdays with no demolition works occurring during this time; and
c) at no time on Sundays or public holidays.

Works may be undertaken outside these hours where they do not create any nuisance to neighbouring properties in terms of dust, noise, vibration etc and do not entail the use of power tools, hammers etc. This may include but is not limited to painting.

In the case that a standing plant or special permit is obtained from Council for works in association with this development, the works which are the subject of the permit may be carried out outside these hours.

This condition does not apply in the event of a direction from police or other relevant authority for safety reasons, to prevent risk to life or environmental harm.

Activities generating noise levels greater than 75dB(A) such as rock breaking, rock hammering, sheet piling and pile driving shall be limited to:

8:00 am to 12:00 pm, Monday to Saturday; and
2:00 pm to 5:00 pm Monday to Friday.

The Proponent shall not undertake such activities for more than three continuous hours and shall provide a minimum of one 2 hour respite period between any two periods of such works.

"Continuous" means any period during which there is less than an uninterrupted 60 minute respite period between temporarily halting and recommencing any of that intrusively noisy work.

Noise arising from the works must be controlled in accordance with the requirements of the *Protection of the Environment Operations Act 1997* and guidelines contained in the New South Wales Environment Protection Authority Environmental Noise Control Manual.

25. In addition to meeting the specific performance criteria established under this consent, the Applicant shall implement all reasonable and feasible measures to prevent and/or minimise any harm to the environment that may result from the demolition, construction or operation/use of the development.

26. Any new information revealed during development works that has the potential to alter previous conclusions about site contamination or hazardous materials shall be immediately notified to the Council and the Land and Housing Corporation.

27. A copy of the approved plans and this consent must be kept on site for the duration of site works. Copies shall be made available to Council Officer's upon request.

28. Sedimentation controls, tree protection measures and safety fencing (where relevant) shall be maintained during works to ensure they provide adequate protection during the course of demolition, excavation and construction works. Materials must be stored in a location and manner to avoid material being washed to drains or adjoining properties.

    The requirements of the Soil and Water Management Plan must be maintained at all times during the works and shall not be removed until the site has been stabilised to the Land and Housing Corporation's satisfaction.

    Material from the site is not to be tracked onto the road by vehicles entering or leaving the site. At the end of each working day any dust/dirt or other sediment shall be swept off the road and contained on the site and not washed down any stormwater pit or gutter.

    The sediment and erosion control measures are to be inspected daily and defects or system failures are to be repaired as soon as they are detected.

29. If tree roots are required to be severed for the purposes of constructing the approved works, they shall be cut cleanly using a sharp and *fit for purpose tool*. The pruning shall be undertaken by a minimum Level 5 (AQF 5) qualified Arborist.

    Details demonstrating compliance with the requirements of this condition are to be submitted by the Arborist undertaking the works to the satisfaction of the Land

and Housing Corporation.

30. The trees to be retained shall be inspected, monitored and treated by a qualified Arborist during and after completion of development works to ensure their long term survival. Regular inspections and documentation from the Arborist to the Land and Housing Corporation are required at the following times or phases of work:

Schedule	
Tree/location	**Time of Inspection**
3 x *Corymbia maculata* (Spotted Gums) located in front property (T1, 5 and 6).	Duration of works

Recommendations to ensure the tree/s long term survival must be carried out immediately upon receipt of the report.

Arborist - for the purpose of this condition a suitably qualified professional shall have as a minimum, Level 5 (Diploma) certification in Arboriculture under the Australian Qualification Framework (AQF).

Details demonstrating compliance with the requirements of this condition are to be submitted by the Arborist undertaking the works to the satisfaction of the Certifying Authority.

31. All excavation within the specified radius of the trunk(s) of the following tree(s) being hand dug:

Schedule	
Tree/location	**Radius in metres**
3 x *Corymbia maculata* (Spotted Gums) located in front property (T1, 5 and 6).	6m

Details demonstrating compliance with the requirements of this condition are to be submitted by the Arborist undertaking the works to the satisfaction of the Land and Housing Corporation.

32. No activities, storage or disposal of materials taking place beneath the canopy of any tree protected under Council's Tree Management Controls at any time.

33. No trees on public property (footpaths, roads, reserves etc) are to be removed or damaged during works unless specifically approved in this consent or marked on the approved plans for removal.

Prescribed trees protected by Council's controls on the subject property and/or any vegetation on surrounding properties must not be damaged or removed during works unless specific approval has been provided under this consent.

PRIOR TO OCCUPATION / COMPLETION OF WORKS

34. The existing stone kerb adjacent to the site is of local heritage value and is to be preserved at no cost to Council. Any damage to the stone kerb will require the replacement of the damaged individual stone units before occupation / completion of works.

35. The existing concrete footpath across the frontage of the site shall be reconstructed in accordance with Council's Standard crossing and footpath specifications and AUS-SPEC#2-"Roadworks Specifications", at no cost to Council and before occupation / final completion of works.

36. You are advised that Council has not undertaken a search of existing or proposed utility services adjacent to the site in determining this application. Any adjustment or augmentation of any public utility services including Gas, Water, Sewer, Electricity, Street lighting and Telecommunications required as a result of the development shall be at no cost to Council and undertaken before occupation / completion of works.

37. Encroachments onto Council's road or footpath of any service pipes, sewer vents, boundary traps, downpipes, gutters, stairs, doors, gates, garage tilt up panel doors or any structure whatsoever shall not be permitted. Any encroachments on to Council road or footpath resulting from the building works will be required to be removed before occupation / completion of works.

38. No weep holes are permitted to Councils footpath. Any weepholes to Council road or footpath resulting from the building works will be required to be removed before occupation / completion of works.

39. Prior to occupation / completion of works, the Land and Housing Corporation must ensure that all works have been completed in accordance with the approved Waste Management Plan referred to in this development consent.

    Proof of actual destination of demolition and construction waste shall be provided to the Land and Housing Corporation prior to occupation / completion of works.

40. Prior to occupation / completion of works, the Land and Housing Corporation must be satisfied that the development complies with:

    - the approved plans;
    - approved documentation (as referenced in this consent); and
    - conditions of this consent.

ONGOING CONDITIONS OF CONSENT

41. The owner/manager of the site is responsible for the removal of all graffiti from the building and fences within seventy-two (72) hours of its application.

42. The canopy replenishment trees required by this consent are to be maintained in a healthy and vigorous condition until they attain a height of 6 metres whereby they will be protected by Council's Tree Management Controls. Any of the trees found faulty, damaged, dying or dead shall be replaced with the same species within 2 months.

PRESCRIBED CONDITIONS

A. Building Code of Australia

All building work must be carried out in accordance with the provisions of the Building Code of Australia.

B. Home Building Act

1) Building work that involves residential building work (within the meaning and exemptions provided in the Home Building Act 1989) must not be carried out unless the Land and Housing Corporation has given Council written notice of the following:

   a) in the case of work for which a principal contractor is required to be appointed:
      i) the name and licence number of the principal contractor, and
      ii) the name of the insurer by which the work is insured under Part 6 of that Act, or
   b) in the case of work to be done by an owner-builder:
      i) the name of the owner-builder, and
      ii) if the owner-builder is required to hold an owner-builder permit under that Act, the number of the owner-builder permit.

2) If arrangements for doing residential building work are changed while the work is in progress so that the information submitted to Council is out of date, further work must not be carried out unless the Land and Housing Corporation has given the Council written notice of the updated information.

C. Site Sign

1) A sign must be erected in a prominent position on any work site on which work involved in the erection or demolition of a building is being carried out:

   a) stating that unauthorised entry to the work site is prohibited;
   b) showing the name of the principal contractor (or person in charge of the work site), and a telephone number at which that person may be contacted at any time for business purposes and outside working hours; and
   c) showing the name, address and telephone number of the Land and Housing Corporation for the work.

2) Any such sign must be maintained while to building work or demolition work is being carried out, but must be removed when the work has been completed.

D. Condition relating to shoring and adequacy of adjoining property

(1) For the purposes of section 4.17(11) of the Act, it is a prescribed condition of development consent that if the development involves an excavation that extends below the level of the base of the footings of a building on adjoining land, the person having the benefit of the development consent must, at the person's own expense:

   (a) protect and support the adjoining premises from possible damage from the excavation, and
   (b) where necessary, underpin the adjoining premises to prevent any such damage.

(2) The condition referred to in subclause (1) does not apply if the person having the benefit of the development consent owns the adjoining land or the owner of the adjoining land has given consent in writing to that condition not applying.

NOTES

1. This Determination Notice operates or becomes effective from the endorsed date of consent.

2. Section 8.2 of the *Environmental Planning and Assessment Act 1979* provides for an applicant to request Council to review its determination. This does not apply to applications made on behalf of the Crown, designated development or a complying development certificate. The

request for review must be made within six (6) months of the date of determination or prior to an appeal being heard by the Land and Environment Court. Furthermore, Council has no power to determine a review after the expiration of these periods. A decision on a review may not be further reviewed under Section 8.2.

3. If you are unsatisfied with this determination, Section 8.7 of *the Environmental Planning and Assessment Act 1979* gives you the right of appeal to the Land and Environment Court within six (6) months of the determination date.

4. Failure to comply with the relevant provisions of *the Environmental Planning and Assessment Act 1979* and/or the conditions of this consent may result in the serving of penalty notices or legal action.

5. Works or activities other than those approved by this Development Consent will require the submission of a new development application or an application to modify the consent under Section 4.55 of the *Environmental Planning and Assessment Act 1979.*

6. This decision does not ensure compliance with the *Disability Discrimination Act 1992.* Applicants should investigate their potential for liability under that Act.

7. This development consent does not remove the need to obtain any other statutory consent or approval necessary under any other Act, such as (if necessary):

   a) Application for any activity under that Act, including any erection of a hoarding.

   b) Application for a Construction Certificate under the *Environmental Planning and Assessment Act 1979.*

   c) Application for an Occupation Certificate under the *Environmental Planning and Assessment Act 1979.*

   d) Application for a Subdivision Certificate under the *Environmental Planning and Assessment Act 1979* if land (including stratum) subdivision of the development site is proposed.

   e) Application for Strata Title Subdivision if strata title subdivision of the development is proposed.

   f) Development Application for demolition if demolition is not approved by this consent.

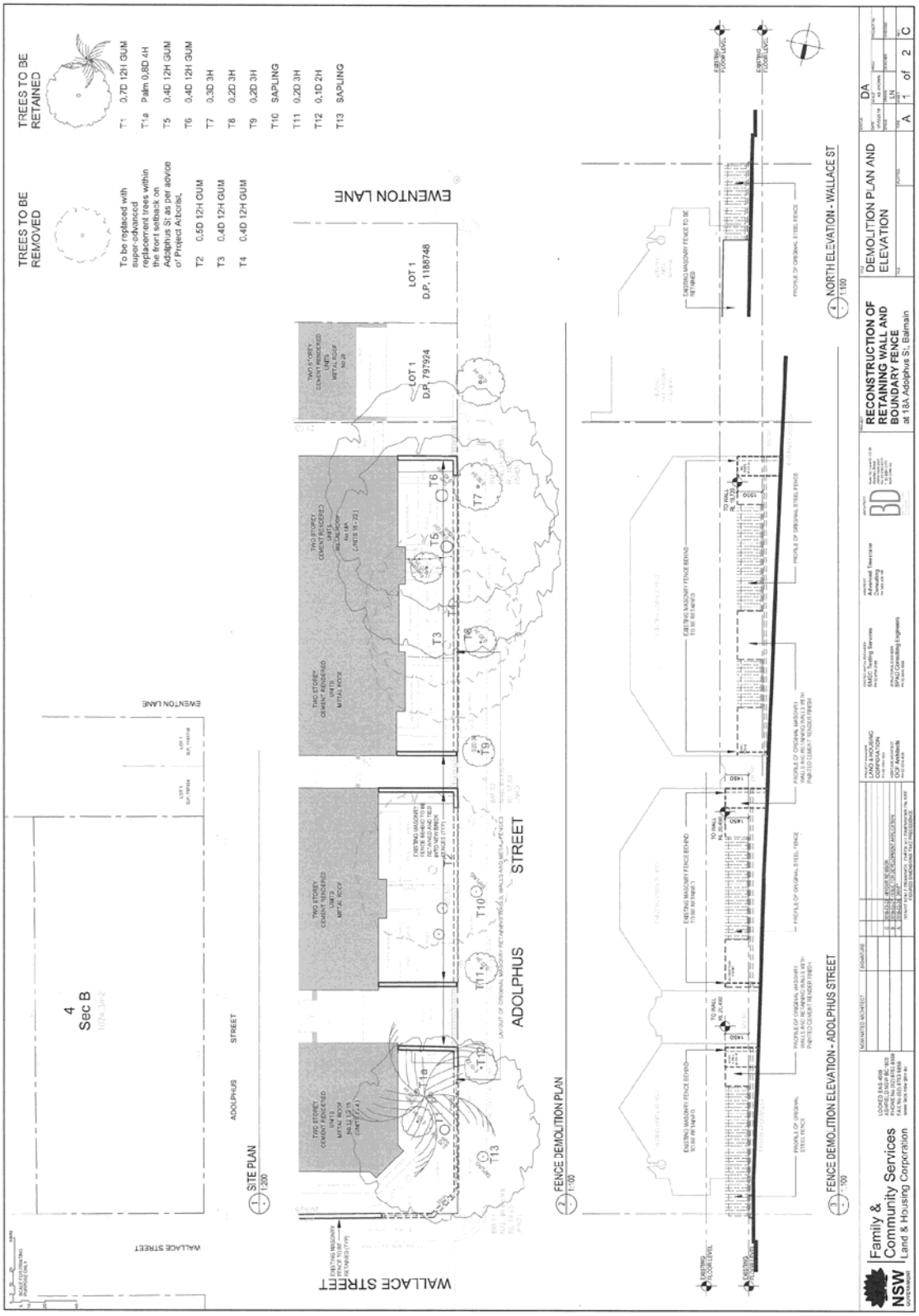
   g) Development Application for subdivision if consent for subdivision is not granted by this consent.

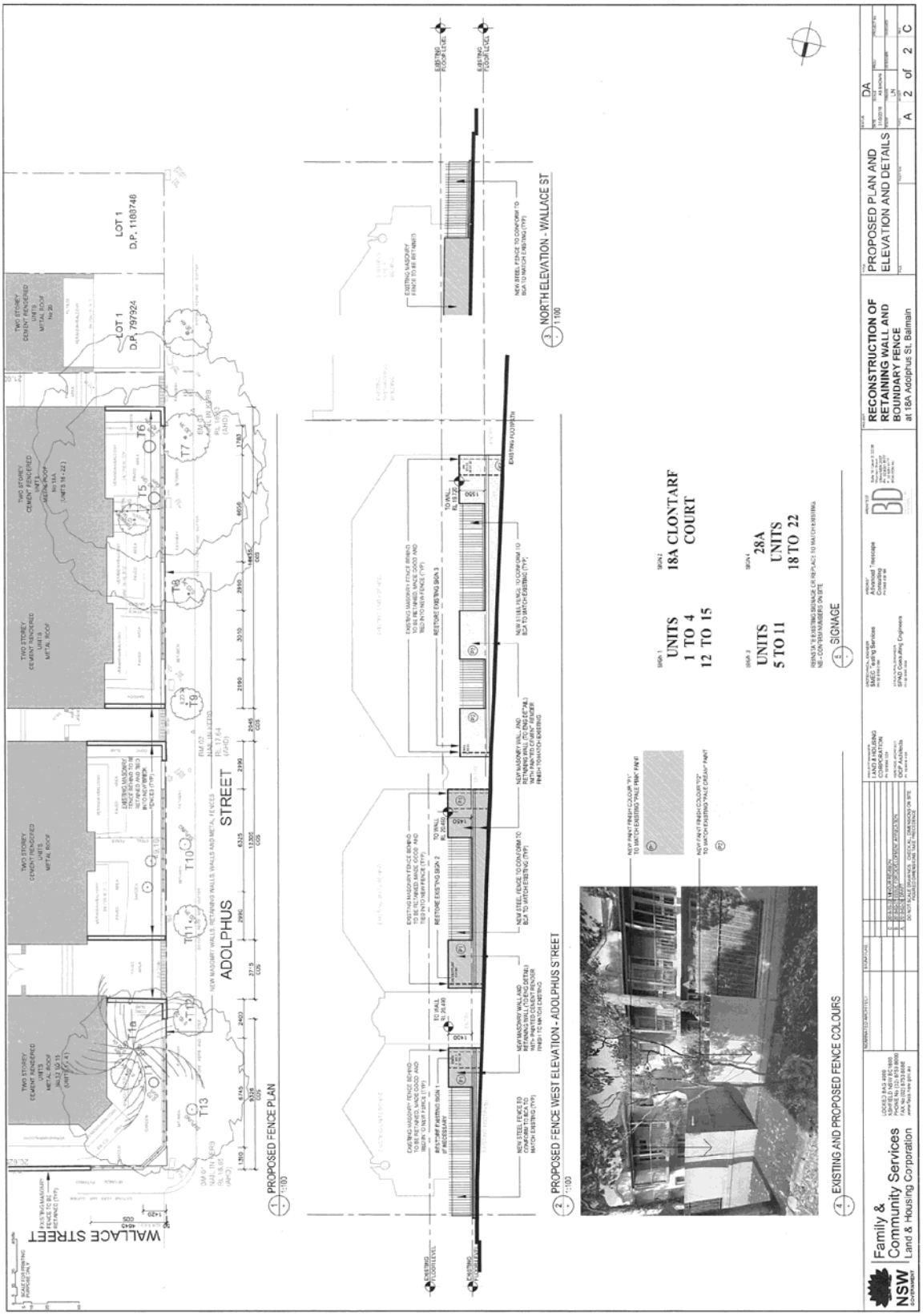
   h) An application under the Roads Act 1993 for any footpath / public road occupation. A lease fee is payable for all occupations.

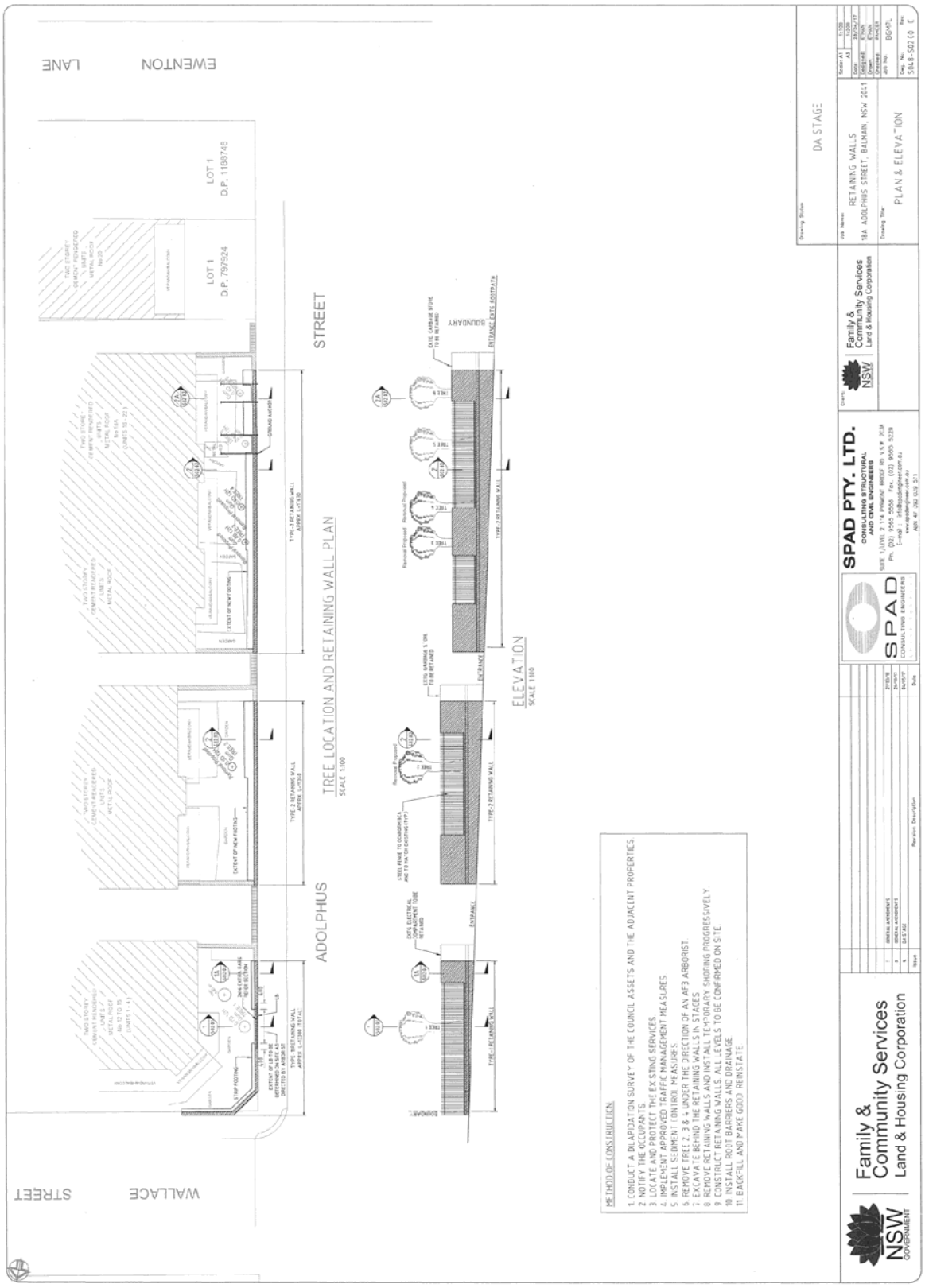
8. Prior to the issue of the Construction Certificate, the applicant must make contact with all relevant utility providers (such as Sydney Water, Energy Australia etc) whose services will be impacted upon by the development. A written copy of the requirements of each provider, as determined necessary by the Certifying Authority, must be obtained.

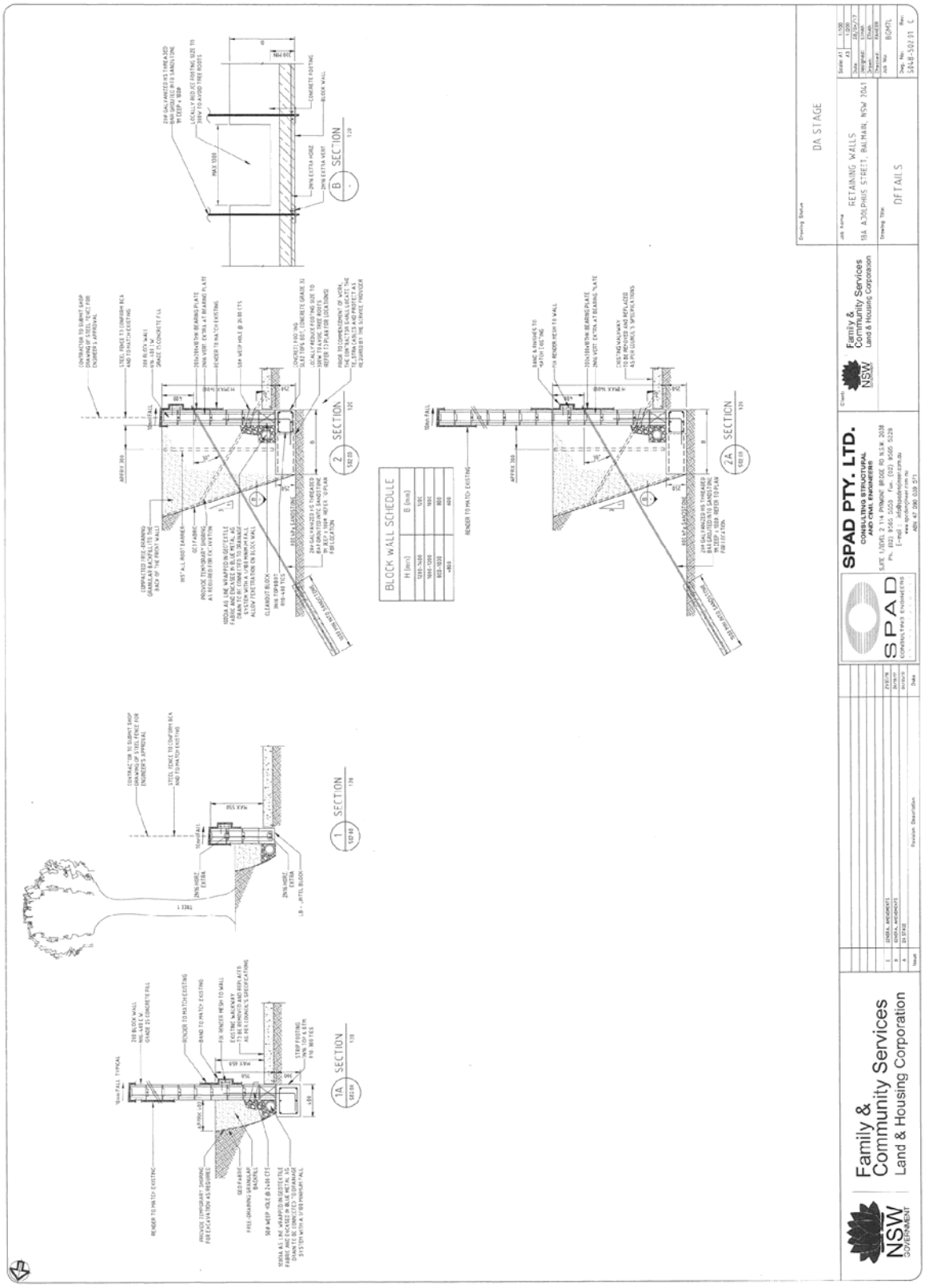
Have you made a political donation?
If you (or an associate) have made a political donation or given a gift to a Councillor, political party or candidate at the local government elections during the last two (2) years you may need to include with your application a full disclosure of this matter. For information go to Council's website at www.leichhardt.nsw.gov.au/Political-Donations.html. If you have made a reportable donation, failure to provide a completed declaration with your application is an offence under the Environmental Planning and Assessment Act, 1979 for which you may be prosecuted.

Attachment B – Plans of proposed development




PROPOSED FENCE PLAN
PROPOSED FENCE WEST ELEVATION - ADOLPHUS STREET
NORTH ELEVATION - WALLACE ST
EXISTING AND PROPOSED FENCE COLOURS
SIGNAGE
ADOLPHUS STREET
WALLACE STREET
UNITS 1 TO 4 12 TO 15
18A CLONTARF COURT
UNITS 5 TO 11
28A UNITS 18 TO 22
RECONSTRUCTION OF RETAINING WALL AND BOUNDARY FENCE
at 18A Adolphus St, Balmain
PROPOSED PLAN AND ELEVATION AND DETAILS
Family & Community Services
Land & Housing Corporation


LANE
EWENTON
LOT 1
D.P. 1168748
LOT 1
D.P. 797924
STREET
ADOLPHUS
TREE LOCATION AND RETAINING WALL PLAN
SCALE 1:100
WALLACE
STREET
ELEVATION
SCALE 1:100
METHOD OF CONSTRUCTION
1. CONDUCT A DILAPIDATION SURVEY OF THE COUNCIL ASSETS AND THE ADJACENT PROPERTIES
2. NOTIFY THE OCCUPANTS
3. LOCATE AND PROTECT THE EXISTING SERVICES
4. IMPLEMENT APPROVED TRAFFIC MANAGEMENT MEASURES
5. INSTALL SEDIMENT CONTROL MEASURES
6. REMOVE TREE 2, 3 & 4 UNDER THE DIRECTION OF AN AF3 ARBORIST
7. EXCAVATE BEHIND THE RETAINING WALLS IN STAGES
8. REMOVE RETAINING WALLS AND INSTALL TEMPORARY SHORING PROGRESSIVELY
9. CONSTRUCT RETAINING WALLS ALL LEVELS TO BE CONFIRMED ON SITE
10. INSTALL ROOT BARRIERS AND DRAINAGE
11. BACKFILL AND MAKE GOOD REINSTATE
SPAD PTY. LTD.
CONSULTING STRUCTURAL AND CIVIL ENGINEERS
SPAD
CONSULTING ENGINEERS
Family & Community Services
Land & Housing Corporation
NSW GOVERNMENT
DA STAGE
RETAINING WALLS
18A ADOLPHUS STREET, BALMAIN, NSW 2041
PLAN & ELEVATION
B0491L


BLOCK WALL SCHEDULE
H1 (mm)
B (mm)
1201-1400
1401-1600
1601-1800
1801-2000
>2000
1A SECTION
1 SECTION
2 SECTION
2A SECTION
B SECTION
SPAD PTY. LTD.
CONSULTING STRUCTURAL AND CIVIL ENGINEERS
Family & Community Services
Land & Housing Corporation
NSW GOVERNMENT
DA STAGE
RETAINING WALLS
19A ALBERMARLE STREET, BALMAIN, NSW 2041
DETAILS

Attachment C – Arboricultural Impact Assessment

ADVANCED TREESCAPE CONSULTING
AQF5 ARBORICULTURIST & HORTICULTURIST
02 4340 2964 0408 439 186 advancedtreescape@bigpond.com
PO Box 7192 KARIONG NSW 2250 ABN: 30 138 200 388

ARBORICULTURAL IMPACT ASSESSMENT & TREE PROTECTION PLAN

Proposed works of Reconstruction of a Retaining Wall at
18A Adolphus Street
BALMAIN NSW 2041
[updated March 2018]

requested by
NSW Land & Housing Corporation
Job number: BGM7L

prepared by
Russell Kingdom
Qualified AQF5

23/03/2018

Principal: Russell Kingdom
Fully Insured: Public Liability $20M, Professional Indemnity $5M & Personal Accident.
Advanced Treescape Consulting is committed to providing a safe working environment for its employees in accordance with The Occupational Health & Safety Act NSW 2000.

INSTITUTE OF AUSTRALIAN CONSULTING ARBORICULTURISTS
IACA
ACCREDITED MEMBER™

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1.0 Proposal

NSW Land & Housing Corporation(LAHC) has commissioned Advanced Treescape Consulting to prepare an Arboricultural Impact Assessment and Tree Protection Plan at 18A Adolphus Street, Balmain. This site is located in the Inner West Local Government Area (formally the Municipality of Leichhardt Local Government Area) where there is a Tree Preservation Order in force.

It is proposed to rebuild retaining wall along Adolphus Street, Balmain.

The subject site was inspected on 21/06/2017. The plans supplied are from STRUC*terre* surveying, SPAD PTY LTD and BD Architecture Interiors. The site plan in Appendix 1 illustrates the location of all surveyed trees.

This assessment has been carried out by Russell Kingdom: Graduate Diploma of Horticulture, Diploma of Horticulture, Diploma in Horticulture/Arboriculture - AQF5 (see Appendix 12).

2.0 Scope of Report

Assess the trees on site and the impact of the proposed works on the trees to be retained then make recommendations to ensure the impact on the retained trees is acceptable and complies with AS 4970-2009 Protection of Trees on Development Sites (Australian Standard®, 2009).

3.0 Site Inspection

The subject site is located in a narrow street in Balmain. There are heritage terrace houses located on the western side of the street and all houses in the surrounding area lie within the target zone of these trees.

There is a row of 7 street trees adjacent to the works area. There are 7 trees growing on the council verge behind the retained wall, which is to be replaced. The trees are growing above the street level, ranging from 300mm – 1.4m.

The property faces the west and is a residential developed block. The land gently slopes from north to south.

The soil properties within the retained area have been described in the report from 'SMEC Testing Services' dated 11/04/2017 – see 'Appendix 13: Geotechnical Assessment'.

Drainage characteristics are considered to be fair.

3.1 Site Assessment

- The microclimate is considered good as all trees appear to have reached their genetic potential.
- There are re-reflected heat load issues from the road and surrounding residences.
- There are no sunlight level issues.
- There is no irrigation visible on the site.
- The site is exposed to all winds

4.0 Method of Assessment

An objective visual inspection was made from the ground of the health and condition of the trees based on the *Visual Tree Assessment* (VTA) technique described by (Mattheck, et al., 1994). The Tree Schedule (provided in Appendix 3) was based upon:

- Estimation of tree heights by Silva Clinomaster/Heightmeter™ plus visual estimates of canopy spreads.
- Distances of trees, etc. are measured using a Leica Disto™ D2 Laser Distance Meter.
- All photographs that appear in this report are unaltered originals which were taken during site inspection (see Appendix 2).
- Hazard ratings for all trees (see Appendix 4) refer to Failure Potential, Size of Defective Part & Target Rating = Hazard Rating is out of 12.
- Significance Rating (see '5.0 Tree Schedule'; '5.1 Assessment of VTA, Recommendations of Impact & Tree Protection Measures required by Proposed Plans' and Appendix 3).
- Calculation of Tree Protection Zones (TPZ) and Structural Root Zones (SRZ) using AS 4970-2009 *Protection of Trees on Development Sites* (Australian Standard®, 2009) (see Appendix 6 and 7).
- The application of TPZs and SRZs using AS 4970-2009 *Protection of Trees on Development Sites* (Australian Standard®, 2009) (see Appendix 8 and 9).
- Glossary (see Appendix 11).

It should be noted that this objective assessment and related VTA assessments are based upon health and condition that were observed at the time of inspection.

The recommendations of this report regarding retention, works or removal are based upon Safe & Useful Life Expectancy (SULE – see Appendix 10) and hazard ratings being applied.

This information has guided the conclusions in this report.

5.0 Tree Schedule

Appendix 3 summarises existing trees upon the site in terms of species, height and canopy spread, structural condition, health, hazard rating and SULE.

Appendix 4 provides explanations of abbreviations and assessment criteria.

The trees contained within the Tree Schedule (see Appendix 3) range from having short to long SULEs. These trees also have a broad range of hazard ratings which limits the retention of such trees within development sites.

5.1 Assessment of VTA, Location of Trees Within Site and Recommendations of Impact & Tree Protection Measures Required by Proposed Works

Accepted tree management practices recommend removal of trees where SULE ratings are 3 (or listed as dead), and/or where hazard ratings are high [where ratings adapted from Matheny and Clark range from low=3 to dangerous=12] (Matheny, et al., 1994). A detailed explanation of SULE ratings is provided in Appendix 10. Height/Diameter Ratio should not exceed 1:30 (Mattheck, et al., 1994).

For Tree Protection Zones for each of the following trees refer to Clause 6.0 or Appendix 6 and 7. It should be noted that distance stated is a radius, not a diameter. AS 4970 states that an intrusion for the TPZ of less than 10% is considered minor. No intrusion into the TPZ is to exceed 20% of total TPZ area.

Note that:

1. **= VTA Assessment**
2. **= Impact of proposed works**
3. **= TPZ Measures**

Tree 1: *Corymbia maculata* (Spotted Gum)

1. This tree passes the VTA. It is suitable to be considered for retention. This tree has a full TPZ of 7.2m, with an SRZ of 3.1m. It is in good health and structural condition. This tree has made extensive damage to retaining wall. Significance Rating: H. SULE: 3B.
2. The proposed works area for the wall is approximately 400mm from the existing wall. The trunk of this tree is 200mm from the existing wall. The intrusion into the SRZ for this tree can be managed. Retain and Protect.
3. Trunk Armour is required as per Appendix 8.

Tree 1a: *Phoenix canariensis* (Canary Island Date Palm)

1. This tree passes the VTA. It is suitable to be considered for retention. This tree has a full TPZ of 3.0m**. It is in good health and structural condition. Significance Rating: L. SULE: 2B.
2. This tree is a juvenile. It is 500mm to retaining wall. The proposed works area for the wall is proximately 400mm from the existing wall and the trunk of the tree is 200mm from the existing wall. The proposed excavation for the retaining wall would be 100mm from the trunk of the tree and it would be able to be retained with the proposed works. It is possible to retain this tree because they grow from a large root ball rather than a root plate. Retain and protect.
3. TPZ fence is required as per Appendix 8.

Tree 2: *C. maculata* (Spotted Gum)

1. This tree passes the VTA. It is suitable to be considered for retention. This tree has a full TPZ of 6.0m, with an SRZ of 2.8m. It is in good health and structural condition but is the only tree in the bed. This tree has a trunk wound @4m with Kino. There is a bark split on the western side. Significance Rating: H. SULE: 2B.
2. The SRZ of this tree is 2.8m. The edge of the cut will be 1.3m from the centre of the trunk of the tree. Roots within the 400mm excavation area will need to be retained which would reduce the impact on this 18m high tree. Exposed root must be wrapped in hessian cloth to prevent sunburn and drying. These works would potentially destabilise this stand-alone tree which is in poor soils. Council requires this tree to be retained. Retention of this tree is not supported.
3. If retained, Trunk Armour is required as per Appendix 8.

Tree 3: *C. maculata* (Spotted Gum)

1. This tree passes the VTA. It is suitable to be considered for retention. This tree has a full TPZ of 4.3m, with an SRZ of 2.4m. It is in good health and structural condition. The crown is over residence No.6. Significance Rating: H. SULE: 2B.
2. The proposed works area for the wall is approximately 400mm from the existing wall. The trunk of this tree is 200mm from the existing wall. The root buttress will be exposed in batter. Retention of this tree is not supported.
3. If retained, Trunk Armour is required as per Appendix 8.

Tree 4: *C. maculata* (Spotted Gum)

1. This tree passes the VTA. It is suitable to be considered for retention. This tree has a full TPZ of 4.3m, with an SRZ of 2.4m. It is in good health and structural condition. His tree shows tropism to the east and the crown is over residence No. 6. Significance Rating: H. SULE: 2B.
2. The proposed works area for the wall is approximately 400mm from the existing wall. The trunk of this tree is 200mm from the existing wall. The root buttress will be exposed in batter. Retention of this tree is not supported.
3. If retained, Trunk Armour is required as per Appendix 8.

Tree 5: *C. maculata* (Spotted Gum)

1. This tree passes the VTA. It is suitable to be considered for retention. This tree has a full TPZ of 4.6m, with an SRZ of 2.5m. It is in good health and structural condition. This tree shows tropism to the east, has some small deadwood and the crown is over the building. Significance Rating: H. SULE: 2B.
2. This tree is located 800mm from the existing retaining wall. The batter for the proposed works is 400mm from the retaining wall. This tree has an SRZ of 2.5m. All works will be conducted within the SRZ of this tree, which is 18m in height. The roots of Tree 9 & 10 will be interlocked and possibly grafted together. If this is the case these trees may be able to be retained during works. Council requires this tree to be retained. Retention of this tree can be supported.
3. TPZ fence is required as per Appendix 8.

Tree 6: *C. maculata* (Spotted Gum)

1. This tree passes the VTA. It is suitable to be considered for retention. This tree has a full TPZ of 4.8m, with an SRZ of 2.6m. It is in good health and structural condition. This tree has the crown over the building. Significance Rating: H. SULE: 2B.
2. This tree is located 1m to the existing retaining wall. The batter for the proposed works requires a 400mm cut from the existing wall. This will be 600mm from the trunk of the tree, requiring structural roots to be removed or exposed. This would be a significant impact on the stability of this 18m high tree. The roots of Tree 9 & 10 will be interlocked and possibly grafted together. If this is the case these trees may be able to be retained during works. Council requires this tree to be retained. Retention of this tree can be supported.
3. TPZ fence is required as per Appendix 8.

Tree 7: *Sapium sebiferum* (Chinese Tallow)

1. This tree passes the VTA. It is suitable to be considered for retention. This tree has a full TPZ of 2.0m, with an SRZ of 1.7m. It is in good health and structural condition. The crown has been reduced for the overhead powerlines. Significance Rating: M. SULE: 2B.
2. This is a street tree. Proposed works will have an acceptable impact on the tree. Retain and protect.
3. Trunk Armour is required as per Appendix 8.

Tree 8: *S. sebiferum* (Chinese Tallow)

1. This tree passes the VTA. It is suitable to be considered for retention. This tree has a full TPZ of 2.0m, with an SRZ of 1.6m. It is in good health and structural condition. The crown has been raised. Proposed works will have an acceptable impact on the tree. Significance Rating: M. SULE: 2B.
2. Proposed works will have an acceptable impact on the tree. Retain and protect.
3. Trunk Armour is required as per Appendix 8.

Tree 9: *S. sebiferum* (Chinese Tallow)

1. This tree passes the VTA. It is suitable to be considered for retention. This tree has a full TPZ of 2.0m, with an SRZ of 1.6m. It is in good health and structural condition. The crown has been raised. Significance Rating: M. SULE: 2B.
2. Proposed works will have an acceptable impact on the tree. Retain and protect.
3. Trunk Armour is required as per Appendix 8.

Tree 10: *Angophora hispida* (Dwarf Apple)

1. This tree passes the VTA. It is suitable to be considered for retention. This tree has a full TPZ of 2.0m, with an SRZ of 1.5m. It is in good health and structural condition. The crown has been raised Significance Rating: M. SULE: 2B.
2. Proposed works will have an acceptable impact on the tree. Retain and protect.
3. Trunk Armour is required as per Appendix 8.

Tree 11: *S. sebiferum* (Chinese Tallow)

1. This tree passes the VTA. It is suitable to be considered for retention. This tree has a full TPZ of 2.0m, with an SRZ of 1.8m. It is in good health and structural condition. The crown has been raised. Significance Rating: M. SULE: 2B.
2. Proposed works will have an acceptable impact on the tree. Retain and protect.
3. Trunk Armour is required as per Appendix 8.

Tree 12: *S. sebiferum* (Chinese Tallow)

1. This tree passes the VTA. It is suitable to be considered for retention. This tree has a full TPZ of 2.0m, with an SRZ of 1.6m. It is in good health and structural condition. The crown has been raised and girdling roots are visible. Significance Rating: M. SULE: 2B.
2. Proposed works will have an acceptable impact on the tree. Retain and protect.
3. Trunk Armour is required as per Appendix 8.

Tree 13: *S. sebiferum* (Chinese Tallow)

1. This tree fails the VTA. It is suitable to be considered for retention. This tree has a full TPZ of 2.0m, with an SRZ of 1.5m. It is in health and structural condition. The crown has been raised and there is 1 epicormic shoot. Significance Rating: L. SULE: 3B.
2. Proposed works will have an acceptable impact on the tree. Retain and protect.
3. Trunk Armour is required as per Appendix 8.

**As stated in Section 3, clause 3.2, of AS 4970-2009 *Protection of Trees on Development Sites* (Australian Standard®, 2009), "The TPZ for palms or other monocots, cycads or tree ferns should not be less than 1m outside the crown projection".

In clause 3.35/Note 4 it states that "The RSRZ formula and graph do not apply to palms, other monocots, cycads and tree ferns".

5.2 Discussion

The proposed reconstruction of the retaining wall running along Adolphus Street will require the removal of the existing wall and re-construction of a new wall. Construction details are contained in 'Appendix 1a: Engineering Plan Showing Retaining Wall Construction'. These plans are supplied by 'SPAD PTY LTD' on behalf of the NSW Land & Housing Corporation.

Close inspection of this engineering drawing shows the method of construction and requirements of the work throughout construction of the new retaining wall.

The geotechnical report by 'SMEC Testing Services', dated 11/04/2017, details this information – see 'Appendix 13: Geotechnical Assessment'.

This site is located on a sandstone bedrock and the work site is a raised garden bed which ranges from 400mm to 1.4m deep. It will be necessary to excavate for approximately 400mm from the edge of the existing retaining wall to allow these works to be conducted.

The fill soils identified by 'SMEC Testing Services' are consistent in all pits excavated as detailed below:

> *"There is some clay; some quantities of concrete; sandstone pieces; bricks; some sandstone gravel and silt. The fill was generally moist and typically poorly compacted. These soil conditions would be described as low sheer soils, which have limited ability to hold large trees under heavy environmental loads. These trees would be prone to lodging. It should also be noted that 'SMEC Testing Services' identified the nature of the damage to the walls has been caused by the tree roots providing excessive horizontal loading."*

I would agree with this observation.

The information contained in the 'Appendix 3: Tree Schedule' and clause '5.1: Assessment of VTA', shows that -

- Tree 1 is 300mm from the retaining wall (400mm in height).
- Tree 1a is 500mm from retaining wall (400mm in height).
- Tree 2 is 1.1m from retaining wall (600mm in height).
- Tree 3 & 4 are both 200mm from the retaining wall (at least 800-900mm in height)
- Tree 5 & 6 are 800mm and 1m respectively from the retaining wall (1.4m in height).

All proposed works will be conducted within the structural root zone of these trees. Tree 1-6 have a limited root plate due to the fact that they are a growing on sandstone bedrock, that is between 1.0m & 1.2m below current soil level, and they are contained within a raised garden bed. These trees (Tree 1-6) are in the equivalent of a planter box, the SRZ calculations are shown in Appendix 1: Site Plan with Trees (Showing Structural Root Zones).

The removal of the wall from the garden bed and roots within 400mm of existing retaining wall, will have a negative impact on the trees structural integrity during works, especially on Tree 3 & 4 as identified above. If any of the trees that are currently within the worksite were to fail, they would cause significant damage to the surrounding residences and probably motor vehicles. The footpath has low to moderate levels of usage so this also must be considered in a risk assessment.

The tree species on site are *Corymbia maculata* (Spotted Gum). These trees are large forest trees that are referenced in 'Native Trees and Shrubs of South Eastern Australia' (Costermans, 1981), growing up to 45m in height. These trees are not suited to the highly built-up area in which they have been planted. The genetic potential has apparently not been taken into account in their selection for this site.

Tree 1 is located close to the existing retaining wall, which has been severely damaged. It will be difficult to replace this wall and retain Tree 1. The depth of the retaining wall is only 300mm and will be manageable with limited impact on this tree's stability

Tree 1a is a *Phoenix canariensis* (Canary Island Date Palm). It is located at the base of Tree 1. It is possibly an undesirable species due to the large number of spikes close to its trunk. There is extensive damage to the retaining wall directly adjacent to the trunk of this tree. This tree has a root ball, not root plate - these works will have an acceptable impact on this tree. Canopy (fronds) close to work will need to be reduced to create a safe work place.

Tree 2 will have works 700mm from its trunk. The 400mm batter will probably expose 1st order roots (which must be retained). These works would usually not be permitted as they could potentially destabilise the tree. The existing soil level is 600mm above street level. Any root that is exposed in batter must be retained and protected with hessian. This is the only tree in this raised garden bed. There is no potential of interlocking tree roots to assist with stability issues. This tree should not be retained due to poor soils, height and proximity of the works. Retention is not supported.

Tree 3 and 4 are both located close to the fence. This retaining wall has some damage occurring which is to be expected with trees of this size. Both trees have canopy over the adjacent building. The canopy is touching the roof and would warrant some crown raising works to clear the building line. Both trees are 200mm to the existing retaining wall. The batter for works is 400mm which will expose all of the root buttress. The works on these 2 trees cannot be supported even if there is root plate interlocking or grafting. It is my professional opinion, which is based on 30 years of experience as an arborist, that both of these trees must be removed. The necessary works do not comply with 'AS 4970-2009 Protection of trees on development sites (Australian Standard®, 2009)' guidelines and I cannot compromise my professional standards and insurances by recommending that retention of these two trees. Council will have to reassess if the trees are to be retained. If they are retained, the full liability for their safety must be accepted (by council).

Tree 5 and 6 are located further away from the retaining wall. Both of these trees have canopy that is not touching the roof. The root plates of both of these trees will be interlocked and possibly grafted together. This will ensure the stability of these trees. Both trees are to be retained, but will require suitable supervision of an AQF5 Arborist during the excavation phase of the development.

The 7 street trees (Tree 7 through to 13) are providing significant amenity in the streetscape due to the limited space. It is recommended that they have trunk armour installed on them for the duration of the works. TPZ fencing would have an impact on road and pedestrian access during works.

Tree 7 to 13 will require Trunk Armour to be erected around the trunks of each of these small trees.

The proposed works will have an acceptable impact on these trees.

Suitable replacement tree species are: *Glochidion ferdinandi* (Cheese Tree), *Melaleuca styphelioides* (Prickly-leaved Paperbark), *Cupaniopsis anacardioides* (Tuckeroo) or *Syzygium species* (Lilly Pilly). These trees should be super-advanced (>100 litre container) & *NATSPEC*[1] grown. These trees will provide long-term canopy cover and streetscape amenity at a low level of risk to hard landscaping, property and people.

An AQF5 Arborist should supervise all excavation and tree protection installation, due to:

a. the proximity of the works to the structural root zone of the trees,
b. to ensure access to the footpath and
c. so that the car parking spaces are not reduced in this confined area.
d. to ensure works do not adversely impact tree stability during works.

[1] http://www.natspec.com.au/

5.3 Tree Significance (Appendix 5)

- Tree 1a & 13 listed in this report are of low significance.
- Tree 7, 8, 9, 10, 11 & 12 listed in this report are of medium significance.
- Tree 1, 2, 3, 4, 5 & 6 listed in this report are of high significance.

6.0 Tree Protection Plan

a) Identify Further Potential Impacts on Trees by Proposed Works

- It would be preferable that no fill soils be used in any TPZ unless approved by the Inner West Council (formally Leichhardt Municipal Council).
- Services should not be located in or run through any TPZ unless approved by the Inner West Council (formally Leichhardt Municipal Council).
- Site Office/Toilet, etc., are not to be located in any TPZ unless approved by the Inner West Council (formally Leichhardt Municipal Council).
- Materials are to be stored away from any TPZ unless approved by the Inner West Council (formally Leichhardt Municipal Council).
- Aeration of the soil is managed by the TPZ fencing.
- An area is to be set aside for tradespeople to wash down equipment away from any TPZ. The location of the wash down point should be approved by the Consultant Arboriculturist unless approved by the Inner West Council (formally Leichhardt Municipal Council).

b) Tree Protection Zones using AS 4970-2009 Protection of Trees on Development Sites (Australian Standard®, 2009)

DBH – Diameter at Breast Height (1.4 metres)
DGL – Diameter at Ground Level
TPZ = DBH (stem) x 12 (radius)
SRZ radius = $(D \times 50)^{0.42} \times 0.64$

See Appendix 6 and Appendix 7
Refer to Appendix 3 for TPZ and SRZ details

* Minimum TPZ is 2 metres – Maximum TPZ is 15 metres
\# Minimum SRZ is 1.5 metres

c) Tree Protection Works

- Trunk armour is to be erected around the street trees (Tree 7, 8, 9, 10, 11, 12 & 13) before construction commences (see Appendix 8 & 9).
- This action will greatly reduce the stress on the trees. The trunk armour should be left in place until the landscaping phase of construction begins.
- TPZ signage as per Appendix 8 to be attached to trunk armour.
- TPZ Fencing is to be installed between the works and Tree 1, 1a, 5 & 6.

d) Tree Works

Any tree work is to be carried out by a suitably qualified and insured Arborist (AQF 3) to AS 4373-2007 Pruning of Amenity Trees (Australian Standard®, 2007).

7.0 Tree Protection Stages

a) Works Prior to Demolition

- TPZ fencing to be erected around retained trees (Tree 1, 1a, 5 & 6) as per Appendix 8.
- Trunk armour to be installed on Tree 7 - 13.
- A site inspection by the Project Arborist (AQF5) is to be conducted and Certification of Compliance to be forwarded to the Inner West Council.

b) Works During Demolition

- There are no tree works to be carried out during demolition.
- Tree protection measures are to be maintained during works.

c) Earthworks

There will be earthworks to construct footing etc. Any tree roots encountered within the works area need to be assessed by the Project Arborist (AQF5), who will ensure the correct management of roots. Correctly terminating a root will ensure that the tree roots do not suffer from decay. Exposed roots must be wrapped in hessian cloth to prevent sunburn during works. Exposed batters must be covered with geotechnical material to prevent soil movement and soil dehydration.

d) Construction Works

TPZ fencing and tree root & ground protection measures to remain in place during construction.

e) Landscaping Phase

The TPZ fencing may be removed during the Landscaping Phase.

At the landscaping phase all works are to be supervised by the Project Arborist to ensure that the retained trees will not be impacted.

8.0 Conclusions

These trees that are subject of this report are highly significant in the area and every effort has been made to retain them. The proposed works have the potential to impact the significant trees (Tree 2, 3 & 4) located in the front of the site.

With correct supervision and work practices it is considered that Tree 1, 1a, 5 & 6 will all be able to be retained and should have an acceptable life expectancy.

Trees removed should be replaced with super-advanced (>100 litre container) & *NATSPEC* grown trees. Suitable replacement tree species for the site would be *Glochidion ferdinandi* (Cheese Tree), *Cupaniopsis anacardioides* (Tuckeroo) or *Syzygium species* (Lilly Pilly).

With adequate protection of the trunks, the street trees will have an acceptable impact from the new works.

Planting suitable replacement trees will increase canopy cover and improve the area's amenity. Suitable trees will have a low level of risk of damaging hard landscaping, residences, property and people.

PUBLIC SAFETY AND PROPERTY DAMAGE CONCERNS

The Inner West Council has had arborist reports, geotechnical reports and engineering plans supplied during the assessment of this development. The decisions made by the council to retain these trees is not what was recommended by the consulting arborists engaged to assess the trees. Council will need to accept full liability for their decision.

9.0 Recommendations

Implement all recommendations contained in Clauses 5.1, 5.2, 6.0 & 7.0.

Reason: These recommendations have been developed in accordance with AS 4970-2009 Protection of trees on development sites (Australian Standard®, 2009) to reduce the impact of the proposed works on the retained trees.

Russell Kingdom
AQF5 Arboriculturist & Horticulturist

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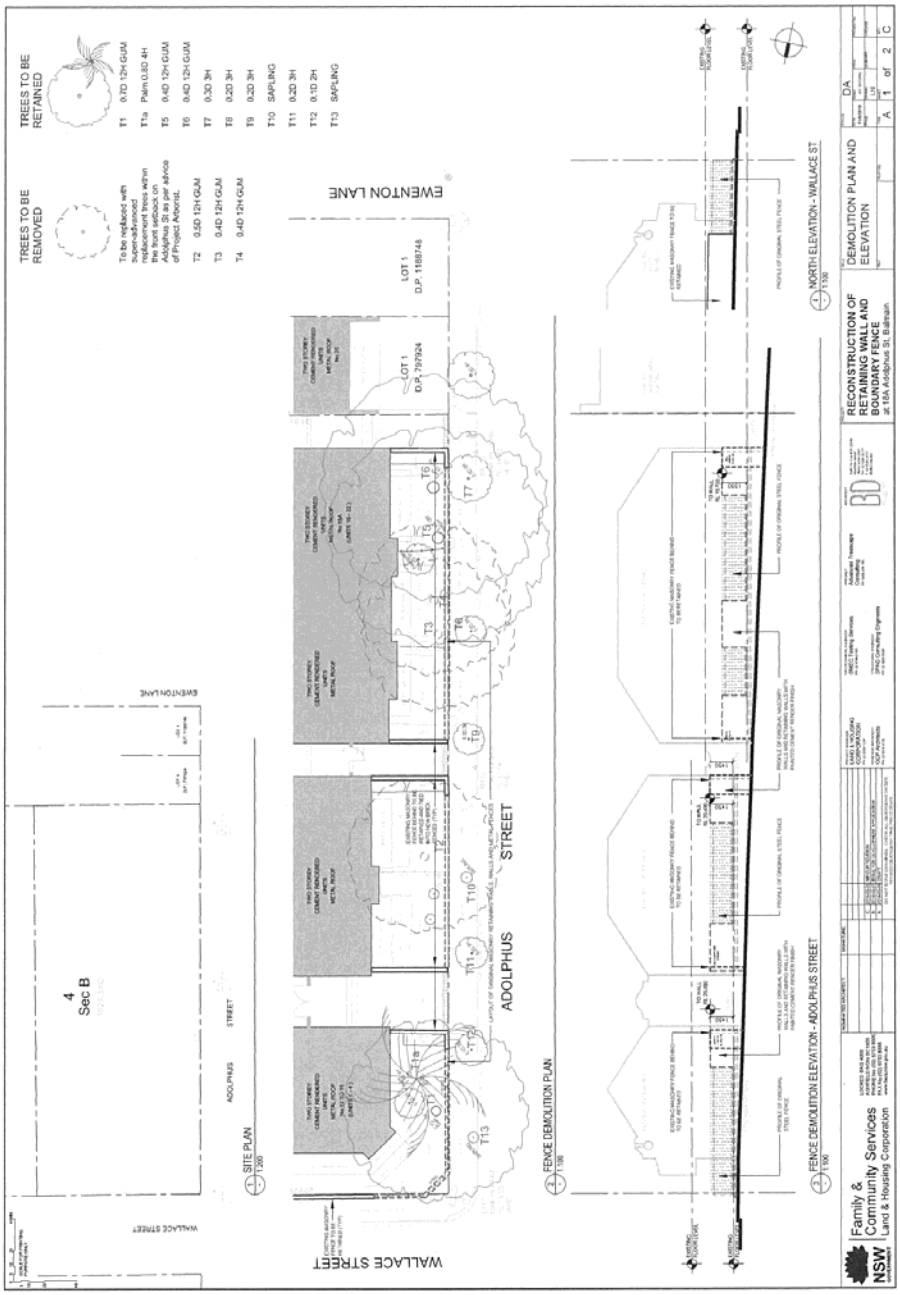
Graduate Diploma of Horticulture | Diploma of Horticulture | Diploma of Horticulture/Arboriculture

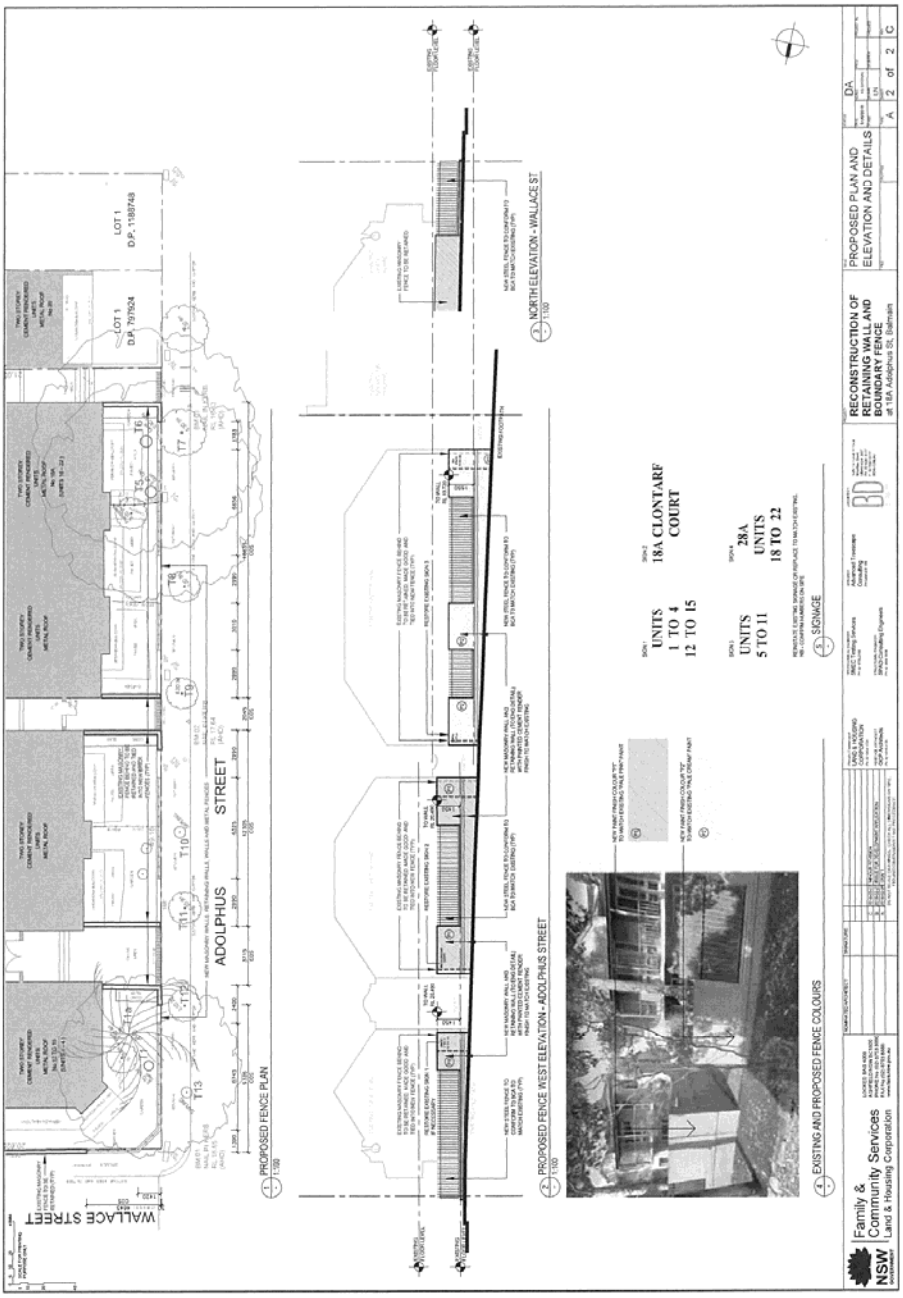
Appendix 1: Engineering Plan Showing Retaining Wall Details

17-157 18A Adolphus Street BALMAIN - final - update 3.docx ADVANCED TREESCAPE CONSULTING [13]

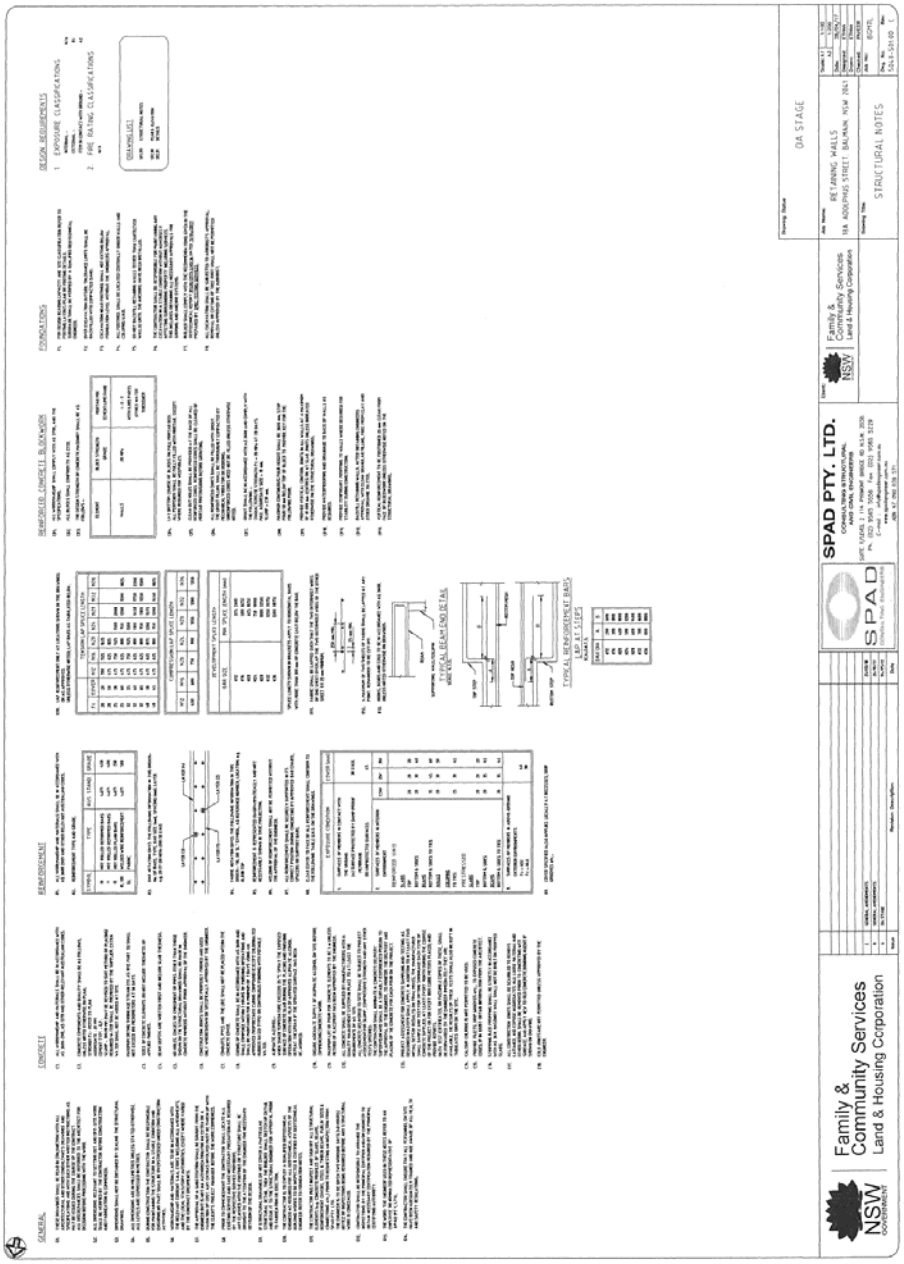
Appendix 1a: Demolition Plan and Elevation



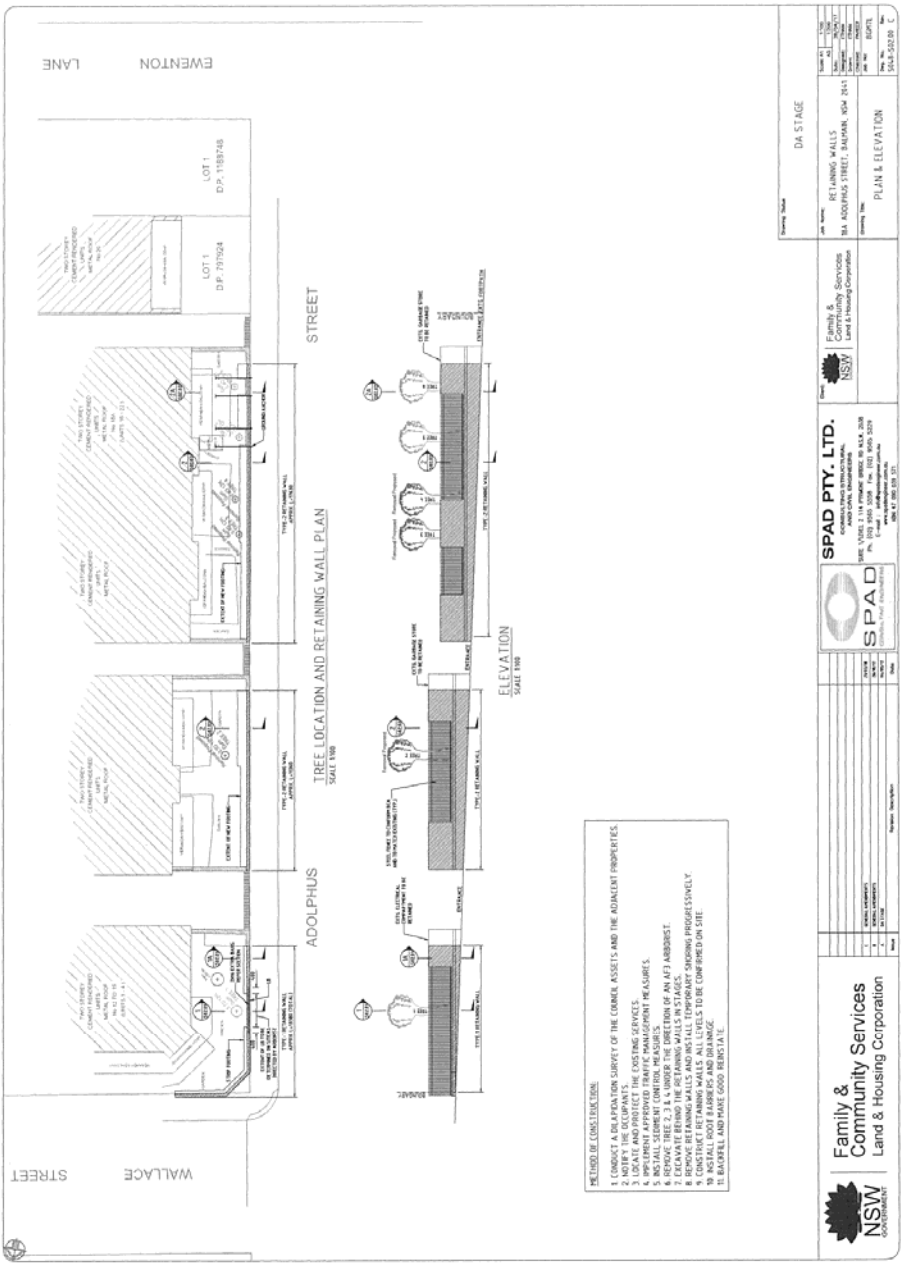
Appendix 1b: Proposed Plan and Elevation Details



Appendix 1c: Engineering Plan Showing Retaining Wall Structural Notes

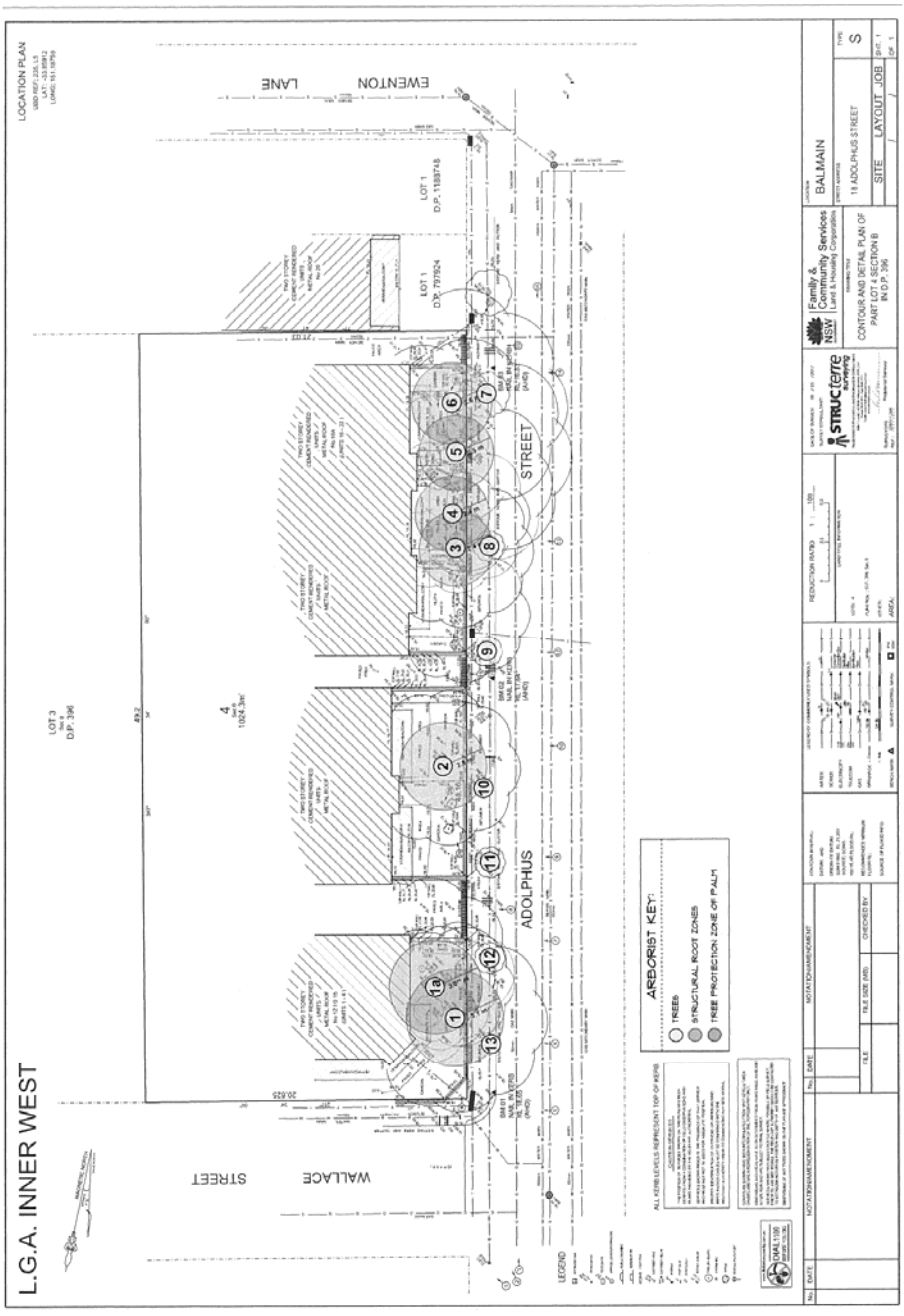


Appendix 1d: Engineering Plan Showing Retaining Wall Plan & Elevation



17-157 18A Adolphus Street BALMAIN - final - update 3.docx ADVANCED TREESCAPE CONSULTING [17]

Appendix 1e: Site Plan with Trees (Showing Structural Root Zones)



Appendix 2: Photographs

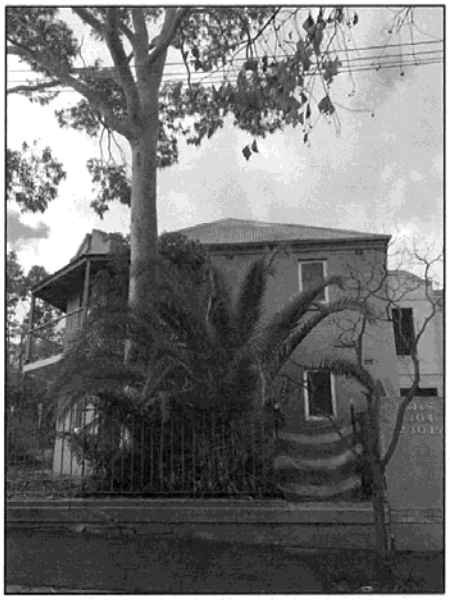


Figure 1: Tree 1 & 1a.

Figure 2: Damage to retaining wall (Tree 1).

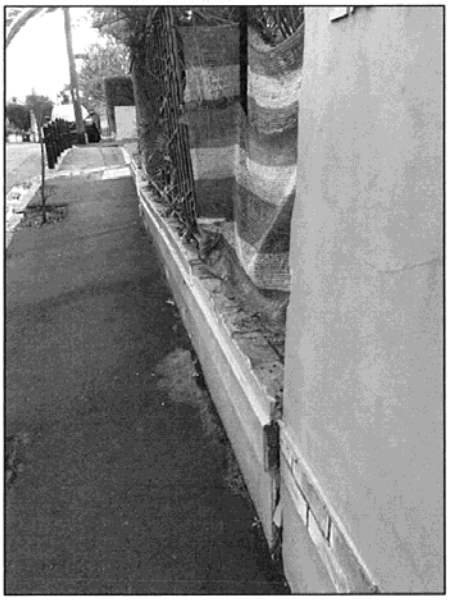


Figure 3: Retaining wall damage (opposite Tree 1 & 1a).

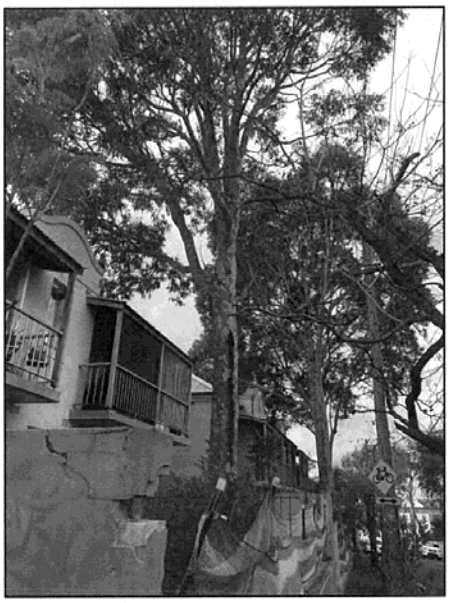


Figure 4: Damage to retaining wall. Showing Tree 2 & 3.

Figure 5: Tree 2.

Figure 6: Further damage to retaining wall opposite Tree 2.

Figure 7: Stump of removed tree.

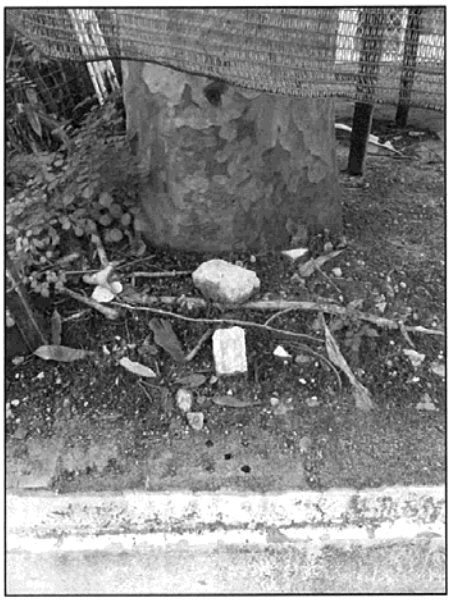


Figure 8: Tree 3.

Figure 9: Showing the crowns of Tree 3, 4, 5, 6 & 7.

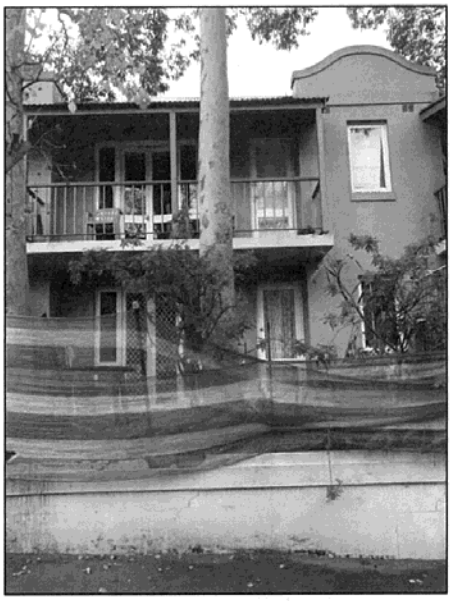


Figure 10: Tree 4.

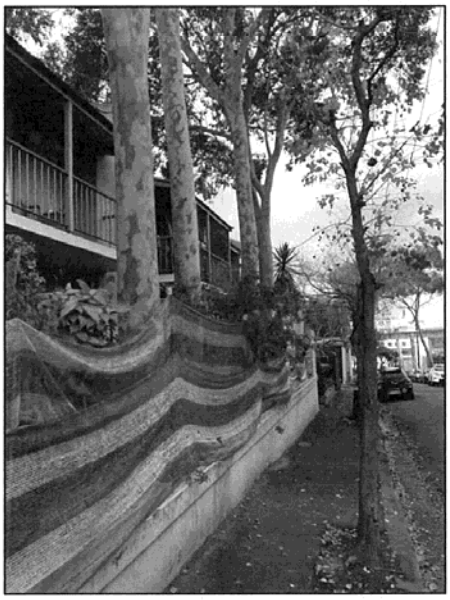


Figure 11: Tree 3, 4, 5, 6 & 7.

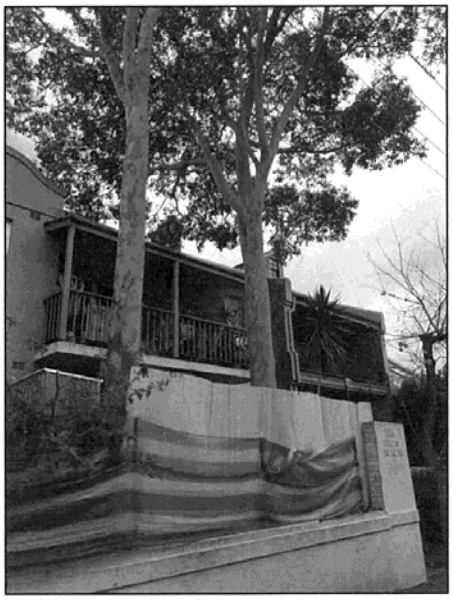


Figure 12: Tree 5 & 6.

Figure 13: Showing wall damage opposite Tree 3, 4, 5 & 7.

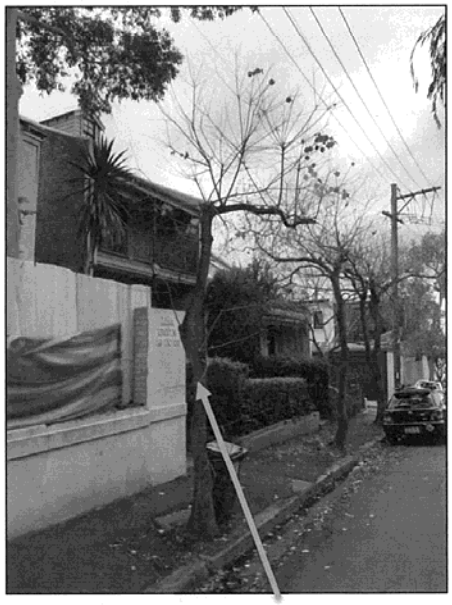


Figure 14: Tree 7.

Figure 15: Tree 8.

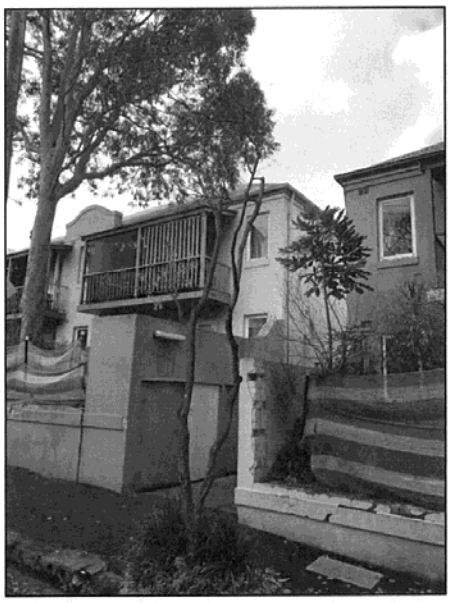


Figure 16: Tree 9.

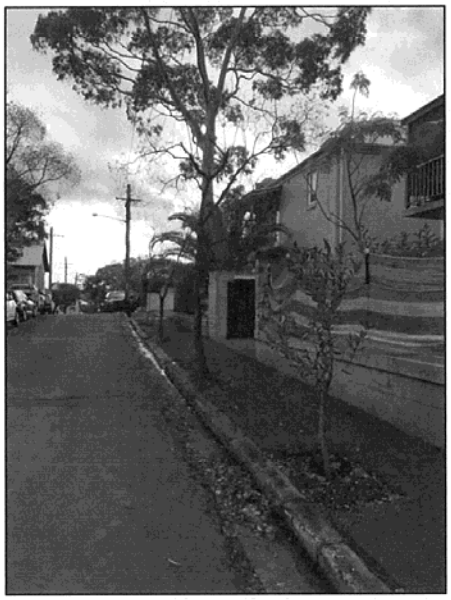


Figure 17: Tree 10 to 13.

Appendix 3: Tree Schedule

ABBREVIATIONS: **m**-metres, **mm**-millimetres, **DBH**-trunk diameter @ 1.4m, **DGL-trunk** diameter at ground level, **VP**-very poor, **P**-poor, **F**-fair, **G**-good, **VG**-very good, **COT**-centre of trunk, **CD**-co-dominant trunk, **TD**-tri-dominant trunk, **QD**-4x trunk, **TL**-trunk lean, **TW**-trunk wound, **Insp**-inspect, **L**-longicorns, **E**-epicormic shoots, **K**-Kino, **FA**-forest architecture, **FR**-Forest Remnant, **dw**-deadwood small, **DW**-deadwood large, **TDB**-tip dieback, **PFS**-previous failure site, **RFS**-recent failure site, **BEW**-branch end weight, **MTU**-multi tree union, **MFU**-main fork union, **IFU**-inclusive fork union, **IMFU**-inclusive main fork union, **IMBU**-inclusive main branch union, **MBA**-Multiple branch attachments, **FB**-fruiting body, **BF**-bracket fungus, **U/C**-under canopy, **Decl**-declining, **B**-borers, **PD**-parrot damage, **LD**-leaf damage, **CMP**-chewing mouthpiece, **RW**-reaction wood, **H/D**-Height/Diameter ratio test (Mattheck, et al., 1994), **J**-juvenile, **YM**-young mature, **SM**-semi mature, **M**-mature, **OM**-over mature, **HFP**-high failure potential, **D**-dangerous, **VD**-very dangerous, **X**-no room to grow/unsuitable, **H**-habitat, **HB**-habitat box, **Rec**.-recommendation, **S**-save, **R**-remove, **T**-transplant, **C**-council determination, **W**-work needed to be carried out, **mon**-monitor, **TPO**-tree preservation order, **HV**-high voltage, **PL**-power lines, **VTA** (P-pass, F-fail) **Hazard Rating-3**=low hazard, **12**=dangerous, **N/A**-not applicable, **SULE**-safe & useful life expectancy.

TREE NO.	SPECIES	HEIGHT (m)	DBH (mm)	DGL (mm)	RADIUS OF FULL TPZ (m)	RADIUS OF FULL SRZ (m)	HEALTH/VIGOUR	STRUCTURAL CONDITION	CANOPY SPREAD (m) N S E W	AGE CLASS	COMMENTS	VTA	SIGNIFICANCE RATING	HAZARD RATING (3 - 12)	SULE	REC.
1	*Corymbia maculata* (Spotted Gum)	18	600	880	7.2	3.1	G	G	6 radial	M	Edge of trunk is 300mm to retaining wall (400mm in height), extensive damage to wall, PL to the west.	P	H	3	2B	S
1a	*Phoenix canoriensis* (Canary Island Date Palm)	3	500	600	3.0**	N/A	G	G	2 radial	J	500mm to retaining wall (400mm in height), PL to the west.	P	L	3	2B	S
2	*C. maculata* (Spotted Gum)	18	500	650	6.0	2.8	G	G	6 6 8 4	M	TW@4m, K, bark split, retaining wall (600mm in height) has extensive damage on western side. 1.1m to edge of retaining wall, PL to the west.	P	H	3	2B	R
3	*C. maculata* (Spotted Gum)	16	360	480	4.3	2.4	G	G	8 2 8 8	M	Crown over residence No.6, 200mm to retaining wall (at least 800-900mm in height), PL to the west.	P	H	3	2B	R
4	*C. maculata* (Spotted Gum)	16	360	460	4.3	2.4	G	G	2 3 8 7	M	Tropism to the east, crown over residence No.6, 200mm to retaining wall (at least 800-900mm in height), PL to the west.	P	H	3	2B	R
5	*C. maculata* (Spotted Gum)	18	380	500	4.6	2.5	G	G	2 2 10 8	M	Tropism to the east, dw, 800mm to retaining wall (1.4m in height), crown over building., PL to the west.	P	H	3	2B	S
6	*C. maculata* (Spotted Gum)	18	400	540	4.8	2.6	G	G	8 10 10 8	M	Crown over building, 1m to retaining wall (1.4m in height), PL to the west.	P	H	3	2B	S
7	*Sapium sebiferum* (Chinese Tallow)	5	100	200	2.0	1.7	G	G	1 radial	YM	Street tree, crown reduced, PL overhead.	P	M	3	2B	S
8	*S. sebiferum* (Chinese Tallow)	4	90	180	2.0	1.6	G	G	1 radial	YM	Street tree, crown reduced, PL overhead.	P	M	3	2B	S
9	*S. sebiferum* (Chinese Tallow)	4	CD 60 70 (90)	180	2.0	1.6	G	G	1 radial	YM	Street tree, crown reduced, PL overhead.	P	M	3	2B	S
10	*Angophora hispida* (Dwarf Apple)	2	50	60	2.0	1.5	G	G	0.5m radial	J	Street tree, crown reduced, PL overhead.	P	M	3	2B	S

ABBREVIATIONS: **m**-metres, **mm**-millimetres, **DBH**-trunk diameter @ 1.4m, **DGL**-trunk diameter at ground level, **VP**-very poor, **P**-poor, **F**-fair, **G**-good, **VG**-very good, **COT**-centre of trunk, **CD**-co-dominant trunk, **TD**-tri-dominant trunk, **QD**-4x trunk, **TL**-trunk lean, **TW**-trunk wound, **Insp**-inspect, **L**-longicorns, **E**-epicormic shoots, **K**-Kino, **FA**-forest architecture, **FR**-Forest Remnant, **dw**-deadwood small, **DW**-deadwood large, **TDB**-tip dieback, **PFS**-previous failure site, **RFS**-recent failure site, **BEW**-branch end weight, **MTU**-multi tree union, **MFU**-main fork union, **IFU**-inclusive fork union, **IMFU**-inclusive main fork union, **IMBU**-inclusive main branch union, **MBA**-Multiple branch attachments, **FB**-fruiting body, **BF**-bracket fungus, **U/C**-under canopy, **Decl**-declining, **B**-borers, **PD**-parrot damage, **LD**-leaf damage, **CMP**-chewing mouthpiece, **RW**-reaction wood, **H/D**-Height/Diameter ratio test (Mattheck, et al., 1994), **J**-juvenile, **YM**-young mature, **SM**-semi mature, **M**-mature, **OM**-over mature, **HFP**-high failure potential, **D**-dangerous, **VD**-very dangerous, **X**-no room to grow/unsuitable, **H**-habitat, **HB**-habitat box, **Rec**.-recommendation, **S**-save, **R**-remove, **T**-transplant, **C**-council determination, **W**-work needed to be carried out, **mon**-monitor, **TPO**-tree preservation order, **HV**-high voltage, **PL**-power lines, **VTA** (P-pass, F-fail) **Hazard Rating**-**3**=low hazard, **12**=dangerous, **N/A**-not applicable, **SULE**-safe & useful life expectancy.

TREE NO.	SPECIES	HEIGHT (m)	DBH (mm)	DGL (mm)	RADIUS OF FULL TPZ (m)	RADIUS OF FULL SRZ (m)	HEALTH/VIGOUR	STRUCTURAL CONDITION	CANOPY SPREAD (m) N S E W	AGE CLASS	COMMENTS	VTA	SIGNIFICANCE RATING	HAZARD RATING (3 - 12)	SULE	REC.
11	*S. sebiferum* (Chinese Tallow)	3	100	220	2.0	1.8	G	G	1 radial	YM	Street tree, crown reduced PL overhead.	P	M	3	2B	S
12	*S. sebiferum* (Chinese Tallow)	3	100	180	2.0	1.6	G	G	1 radial	YM	Girdling roots visible, PL overhead.	P	M	3	2B	S
13	*S. sebiferum* (Chinese Tallow)	1.5	30	50	2.0	1.5	VP	P	0.1m radial	J	1xE, PL overhead.	F	L	3	3B	S

**As stated in Section 3, clause 3.2, of AS 4970-2009 Protection of Trees on Development Sites (Australian Standard®, 2009), "The TPZ for palms or other monocots, cycads or tree ferns should not be less than 1m outside the crown projection".

In clause 3.35/Note 4 it states that "The RSRZ formula and graph do not apply to palms, other monocots, cycads and tree ferns".

Appendix 4: Notes on Tree Assessment

Key	Criteria	Comments
Tree No	Must relate to the number on your site diagram	
Species	Botanical name and common name of Tree	
Diameter of trunk	DBH Diameter at Breast Height (1.4 metres) DGL Diameter at Ground Level	
Height	In metres	
Spread	Average diameter of canopy in metres	
Crown Condition	Overall vigour and vitality 0 Dead 1 Severe decline (<20% canopy; major dead wood) 2 Declining (20-60% canopy density; twig and branch dieback) 3 Average/low vigour (60-90% canopy density; twig dieback) 4 Good (90-100% crown cover; little or no dieback or other problems) 5 Excellent (100% crown cover, no deadwood or other problems)	This requires knowledge of species.
Age class	Y Young = recently planted S Semi-mature (< 20% of life expectancy) M Mature (20-80% of life expectancy) O Over-mature (> 80% of life expectancy)	
Special Significance	A Aboriginal C Commemorative Ha Habitat Hi Historic M Memorial R Rare U Unique form O Other	This may require specialist knowledge.
Services/adjacent structures	Bs Bus stop Bu Building within 3m HVo High voltage open-wire construction HVb High Voltage bundled (ABC) LVo Low Voltage open-wire construction LVb Low Voltage bundled (ABC) Na No services above Nb No services below ground Si Signage Sl Street light T Transmission lines (>33KV) U Underground services O Other	More than one of these may apply.
Defects	B Borers C Cavity D Decay dw Deadwood E Epicormics FA Forest Architecture H/D Height/Diameter ratio I Inclusions L Lopped LDCMP Leaf damage by chewing mouthpiece insects M Mistletoe/Parasites MBA Multiple Branch Attachments PD Parrot Damage	More than one of these may apply. H/D if ratio is higher than 50:1 then tree is defective (Mattheck, et al., 1994).

Key	Criteria	Comments
	PFS Previous Failure Sites S Splits/cracks T Termites TL Trunk Lean TW Trunk Wound O Other	
Root zone	C Compaction D Damaged/wounded roots (eg by mowers) E Exposed roots Ga Tree in garden bed Gi Girdled roots Gr Grass Kb Kerb close to tree L+ Raised soil level L- Lowered soil level M Mulched Pa Paving/concrete/bitumen Pr Roots pruned O Other	More than one of these may apply.
Failure Potential	Identifies the most likely failure and rates the likelihood that the structural defect(s) will result in failure within the inspection period. 1. Low – defects are minor (e.g. dieback of twigs, small wounds with good wound wood development) 2. Medium – defects are present and obvious (e.g. cavity encompassing 10-25% of the circumference of the trunk) 3. High – numerous and or significant defects present (e.g. cavity encompassing 30-50% of the circumference of the trunk, major bark inclusions) 4. Severe – defects are very severe (e.g. heart rot fruiting bodies, cavity encompassing more than 50% of the trunk)	This requires specialist knowledge
Size of defective part	Rates the size of the part most likely to fail. The larger the part that fails, the greater the potential for damage. 1. Most likely failure less than 150mm in diameter 2. Most likely failure 150-450mm in diameter 3. Most likely failure 450-750mm in diameter 4. Most likely failure more than 750mm in diameter	
Target Rating*	Rates the use and occupancy of the area that would be struck by the defective part 1. Occasional use (e.g. jogging/cycle track) 2. Intermittent use (e.g. picnic area, day use parking) 3. Frequent use, secondary structure (e.g. seasonal camping area, storage facilities) 4. Constant use, structures (e.g. year-round use for a number of hours each day, residences)	
Hazard rating*	Failure potential + size of part + target rating Add each of the above sections for a number out of 12	The final number identifies the degree of risk. The next step is to determine a management strategy. A rating in this column does not condemn a tree but may indicate the need for more investigation and a risk management strategy.

Appendix 5: Significance of a Tree, Assessment Rating System (STARS) (IACA)

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 (Draper, et al., 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.

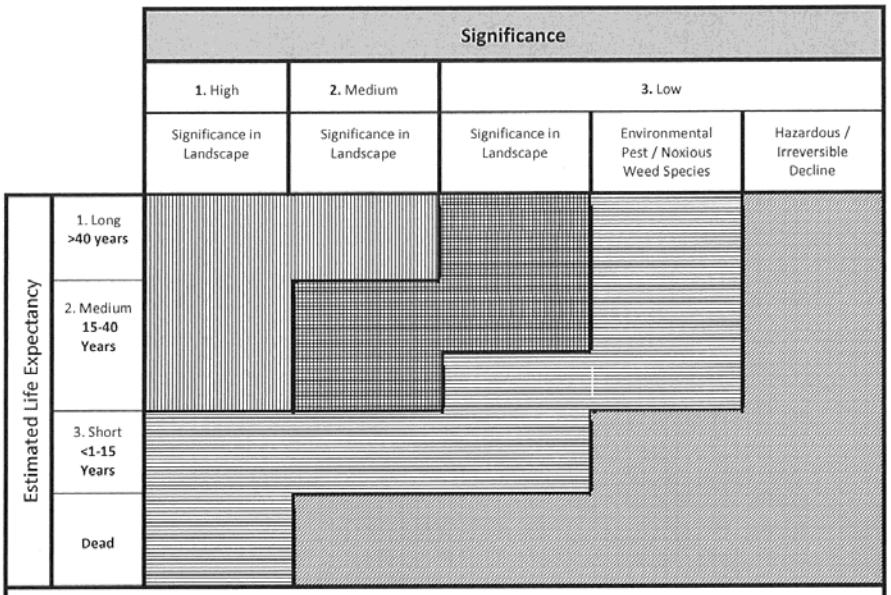
TREE SIGNIFICANCE - ASSESSMENT CRITERIA

1. **High Significance in landscape**
   - The tree is in good condition, or normal vigour and form typical of 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 grand age.
   - The tree is listed as a Heritage Item, Threatened Species or part of a Threatened Community or listed on council's significant tree register.
   - The tree is visually prominent and visible from a considerable distance when viewed from most directions within the landscape by bulk and scale and makes a positive contribution to the local amenity.
   - The tree has been influenced by historic figures, events or part of the heritage development of the place.
   - The tree supports social and cultural sentiments or spiritual associations, reflected by the broader population or community group or has commemorative values. (ICOMOS)
   - The growing environment supports the tree to its full dimensions above and below ground without conflict or constraint.
2. **Medium Significance in landscape**
   - The tree is in fair-good condition, or normal or low vigour and form typical or atypical of the species.
   - The tree is a planted locally indigenous or a common species with its taxa readily 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 area.
   - The tree is moderately constrained by above or below ground influences of the built environment to reach full dimensions.
3. **Low Significance in landscape**
   - The tree is in fair-poor condition, or normal or low vigour and form typical or atypical of the species,
   - The tree is not visible or is partly 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 area.
   - The tree is severely constrained by above or below ground by influences of the built environment and therefore will not reach full dimensions; the tree is inappropriate to the site conditions.
   - The tree is listed as exempt under the provisions of the local Council Tree Preservation Order.
   - The tree has a wound or defect that has the potential to become structurally unsound.

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.

TABLE 1.0 TREE RETENTION VALUE - PRIORITY MATRIX.



Legend for Matrix Assessment

	Priority for Retention (High) - These trees are considered important for retention and should be retained and protected. Design modification or relocation of building/s should be considered to accommodate the setbacks as detailed in Table 2. Special construction works must be implemented e.g. pier and beam, etc if works are to proceed within the Tree Protection Zone.
	Consider for Retention (Medium) - These trees may be retained and protected. These are considered less critical; however their retention should remain a priority with removal considered only if adversely affecting the proposed building/works and all other alternatives have been considered and exhausted.
	Consider for Removal (Low) – These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.
	Priority for Removal – These trees are considered hazardous, or in irreversible decline, or weeds and should be removed irrespective of development.

Appendix 6: Extract from AS 4970-2009 Protection of Trees on Development Sites (Australian Standard®, 2009), Section 3: Determining the Tree Protection Zones of the Selected Trees, 3.1 Tree Protection Zone (TPZ)

3.1 TREE PROTECTION ZONE (TPZ)

"The tree protection zone (TPZ) is the principal means of protecting trees on development sites. The TPZ is a combination of the root area and crown area requiring protection. It is an area isolated from construction disturbance so that the tree remains viable.

The TPZ incorporates the structural root zone (SRZ) (refer to Clause 3.3.5)."

3.2 DETERMINING THE TPZ

TPZ for Single Trunked Trees

The radius of the TPZ is calculated for each tree by multiplying its DBH x 12.

TPZ = DBH x 12

TPZ for Multiple Trunked Trees

The radius of the TPZ for multiple-trunked trees is calculated using the following formula:

$$\sqrt{(DBH_1)^2+(DBH_2)^2+(DBH_3)^2} = \text{total DBH} \times 12$$

DBH = trunk diameter measured at 1.4 metres above ground.

Radius is measured from the centre of the stem at ground level.

A TPZ should not be less than 2 metres nor greater than 15 metres (except where crown protection is required).

The TPZ of palms, other monocots, cycads and tree ferns should not be less than 1 metre outside the crown projection.

AS 4970-2009
Refer to page 14 "FIGURE 2 INDICATIVE TREE PROTECTION ZONE" & page 24 "Appendix A – DIAMETER AT BREAST HEIGHT (DBH) (Informative)" in AS 4970-2009 *Protection of Trees on Development Sites* (Australian Standard®, 2009) for more information.

Appendix 7: Extract from AS 4970-2009 Protection of Trees on Development Sites (Australian Standard®, 2009), Section 3: Determining the Protection Zones of the Selected Trees, 3.3.5 Structural Root Zone (SRZ)

3.3.5 Structural root zone (SRZ)

"The SRZ is the area required for tree stability. A larger area is required to maintain a viable tree. The SRZ only needs to be calculated when a major encroachment into a TPZ is proposed. Root investigation may provide more information on the extent of these roots."

Determining the SRZ

Note: The SRZ for trees with trunk diameters less than 0.15 m will be 1.5 m.

AS 4970-2009
Refer to page 13 "FIGURE 1 STRUCTURAL ROOT ZONE CALCULATION" in AS 4970-2009 *Protection of Trees on Development Sites* (Australian Standard®, 2009) **for more information.**

TABLE 2.0 TPZ AND SRZ TABLE

DBH for TPZ (mm)	DGL for SRZ (mm)	TPZ (m)	SRZ (m)	DBH for TPZ (mm)	DGL for SRZ (mm)	TPZ (m)	SRZ (m)	DBH for TPZ (mm)	DGL for SRZ (mm)	TPZ (m)	SRZ (m)
100	100	2.0	1.5	500	500	6.0	2.5	900	900	10.8	3.2
110	110	2.0	1.5	510	510	6.1	2.5	910	910	10.9	3.2
120	120	2.0	1.5	520	520	6.2	2.5	920	920	11.0	3.2
130	130	2.0	1.5	530	530	6.4	2.5	930	930	11.2	3.2
140	140	2.0	1.5	540	540	6.5	2.6	940	940	11.3	3.2
150	150	2.0	1.5	550	550	6.6	2.6	950	950	11.4	3.2
160	160	2.0	1.5	560	560	6.7	2.6	960	960	11.5	3.3
170	170	2.0	1.6	570	570	6.8	2.6	970	970	11.6	3.3
180	180	2.2	1.6	580	580	7.0	2.6	980	980	11.8	3.3
190	190	2.3	1.7	590	590	7.1	2.7	990	990	11.9	3.3
200	200	2.4	1.7	600	600	7.2	2.7	1000	1000	12.0	3.3
210	210	2.5	1.7	610	610	7.3	2.7	1010	1010	12.1	3.3
220	220	2.6	1.8	620	620	7.4	2.7	1020	1020	12.2	3.3
230	230	2.8	1.8	630	630	7.6	2.7	1030	1030	12.4	3.4
240	240	2.9	1.8	640	640	7.7	2.7	1040	1040	12.5	3.4
250	250	3.0	1.9	650	650	7.8	2.8	1050	1050	12.6	3.4
260	260	3.1	1.9	660	660	7.9	2.8	1060	1060	12.7	3.4
270	270	3.2	1.9	670	670	8.0	2.8	1070	1070	12.8	3.4
280	280	3.4	1.9	680	680	8.2	2.8	1080	1080	13.0	3.4
290	290	3.5	2.0	690	690	8.3	2.8	1090	1090	13.1	3.4
300	300	3.6	2.0	700	700	8.4	2.9	1100	1100	13.2	3.4
310	310	3.7	2.0	710	710	8.5	2.9	1110	1110	13.3	3.5
320	320	3.8	2.1	720	720	8.6	2.9	1120	1120	13.4	3.5
330	330	4.0	2.1	730	730	8.8	2.9	1130	1130	13.6	3.5
340	340	4.1	2.1	740	740	8.9	2.9	1140	1140	13.7	3.5
350	350	4.2	2.1	750	750	9.0	2.9	1150	1150	13.8	3.5
360	360	4.3	2.1	760	760	9.1	3.0	1160	1160	13.9	3.5
370	370	4.4	2.2	770	770	9.2	3.0	1170	1170	14.0	3.5
380	380	4.6	2.2	780	780	9.4	3.0	1180	1180	14.2	3.6
390	390	4.7	2.2	790	790	9.5	3.0	1190	1190	14.3	3.6
400	400	4.8	2.3	800	800	9.6	3.0	1200	1200	14.4	3.6
410	410	4.9	2.3	810	810	9.7	3.0	1210	1210	14.5	3.6
420	420	5.0	2.3	820	820	9.8	3.0	1220	1220	14.6	3.6
430	430	5.2	2.3	830	830	10.0	3.1	1230	1230	14.8	3.6
440	440	5.3	2.3	840	840	10.1	3.1	1240	1240	14.9	3.6
450	450	5.4	2.4	850	850	10.2	3.1	1250	1250	15.0	3.6
460	460	5.5	2.4	860	860	10.3	3.1				
470	470	5.6	2.4	870	870	10.4	3.1				
480	480	5.8	2.4	880	880	10.6	3.1				
490	490	5.9	2.5	890	890	10.7	3.2				

Appendix 8: Tree Protection Zones – Standard Procedure

1.0 TREE PROTECTION ZONES - STANDARD PROCEDURE

1.1 The Protective fencing where required may delineate the ***TPZ*** and should be located as determined by the project Arborist either in accordance with the specific Council's guidelines or if no guidelines are given by the Council then using AS 4970-2009 *Protection of Trees on Development Sites* (Australian Standard®, 2009), Section 4, 4.3. *"Fencing should be erected before any machinery or materials are brought onto the site and before the commencement of works including demolition. Once erected, protective fencing must not be removed or altered without approval by the project arborist. The TPZ must be secured to restrict access. AS 4687 Temporary fencing and hoardings specifies applicable fencing requirements. Shade cloth or similar should be attached to reduce the transport of dust, other particulate matter and liquids into the protected area. Fence posts and supports should have a diameter greater than 20 mm and be located clear of roots. Existing perimeter fencing and other structures may be suitable as part of the protective fencing."*

Figure 03 Protective fencing shows examples of such fencing.

1.2 AS 4970-2009 *Protection of Trees on Development Sites* Section 4, Tree protection measures, 4.2 Activities restricted within the TPZ

"Activities generally excluded from the TPZ included but are not limited to-

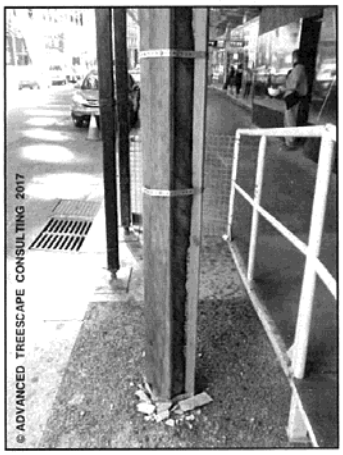
(a) Machine excavation including trenching;
(b) Excavation for silt fencing
(c) Cultivation;
(d) Storage;
(e) Preparation of chemicals, including preparation of cement products;
(f) Parking of vehicles and plant;
(g) Refuelling;
(h) Dumping of waste;
(i) Wash down and cleaning of equipment;
(j) Placement of fill;
(k) Lighting of fires;
(l) Soil level changes;
(m) Temporary or permanent installation of utilities and signs, and
(n) Physical damage to the tree."

AS 4970-2009
Refer to page 15 "4.3 PROTECTIVE FENCING" & page 16 "FIGURE 3 PROTECTIVE FENCING" in AS 4970-2009 *Protection of Trees on Development Sites* (Australian Standard®, 2009) for more information.

1.3 Tree Protection signage is to be attached to each ***Tree Protection Zone*** and displayed from within the development site in accordance with AS 4970-2009 Protection of Trees on Development Sites (Australian Standard®, 2009), Section 4.4 – see example below.

Example of Tree Protection Zone signage

1.4 Where a tree is to be retained and a ***Tree Protection Zone*** cannot be adequately established due to restricted access e.g. tree located alongside an access way, the trunk and branches in the lower crown will be protected by wrapping 2 layers of hessian or carpet underfelt around the trunk and branches for a minimum of 2 m or as lower branches permit, then wire or rope secures 90x50x2000 mm hardwood battens together around the trunk (do not nail or screw to the trunk or branches). The number of battens to be used is as required to encircle the trunk and the planks are to extend to the base of the tree (AS 4970-2009 *Protection of Trees on Development Sites* (Australian Standard®, 2009) – see example below.



Example of Trunk Armour

1.5 If a tree is growing downslope from an excavation, a silt fence located along the contours of the site in the area immediately above the ***Tree Protection Zone*** fencing may need to be installed and regularly maintained to prevent burial and asphyxiation of the roots of the tree. To allow for the maintenance of both fences, the silt fence must be constructed separately to the tree protection fence and the 2 fences must be constructed independently of each other and standalone. To reduce competition with the tree the area within the ***Tree Protection Zone*** is to be kept free of weeds. These are best removed by the application of foliar herbicide with Glyphosate as the active constituent. This is the preferred method rather than removal by the cultivation of the soil within the dripline, to minimise root disturbance to the tree. The removal of woody weeds such as Privet should use the cut and paint method of herbicide application. Weeds are to be controlled within the ***Tree Protection Zone***, for the duration of the project.

1.6 The area of the Tree Protection Zone to be mulched to a depth of 50mm with the organic material being 75% leaf litter and 25% wood, and this being composted material. The depth of mulch and type as indicated, to be maintained for the duration of the project. Where deep excavation will expose the soil profile to drying out the root plate is to be protected by pegging jute matting across the ground surface 2 m back from the edge of the profile and 2 m down the face of the profile and is to be in one continuous sheet or layers up to 5 mm thick and overlapped 300 mm and pegged. Pegs are to be a minimum length of 200 mm and spaced at 500 mm increments in a grid pattern. Once installed mulch is to be placed on top of the jute matting previously described.

1.7 No services either temporary or permanent are to be located within the ***Tree Protection Zone***. If services are to be located within the ***Tree Protection Zone***, special details will need to be provided by a qualified Consulting Arboriculturist for the protection of the tree regarding the location of the service/s. Works within the TPZ should be hand dug or tunnelled.

1.8 A tree will not be fertilised during its protection within the ***Tree Protection Zone***, as this may hasten its decline if it were to decline. If a tree is to be fertilised this should be in consultation with a qualified Consulting Arboriculturist.

1.9 In the event of prolonged dry periods, or where a tree has been transplanted, or where excavation nearby, especially up slope, leads to drying out of a soil profile, or modification to ground water flow, or flows across an existing ground surface to the tree and its growing environment; deep root watering thoroughly at least twice a week is to be undertaken to irrigate the tree. The need for such watering is determined readily by observing the dryness of the soil surface within the dripline of the tree by scraping back some mulch. Mulch is to be reinstated afterwards. In the event of disrupted ground or surface water flows to the tree due to excavation, filling or construction, a reticulated irrigation system may be required to be installed within the ***Tree Protection Zone***. If an irrigation system is to be installed, consideration must be given to volume, frequency, and drainage of water delivered, and this should be in consultation with a qualified Consulting Arboriculturist.

AS 4970-2009
Refer to page 17 "4.5.2 Trunk and branch protection", "4.5.3 Ground protection" & "FIGURE 4 EXAMPLES OF TRUNK, BRANCH AND GROUND PROTECTION" in AS 4970-2009 *Protection of Trees on Development Sites* (Australian Standard®, 2009) for more information.

Appendix 9: Tree Protection on Construction Sites

1.0 TREE PROTECTION ON CONSTRUCTION SITES

Note: Individual protection measures to be applied where stated as applicable.

1.1.0 General notes
1.2.0 Cautionary notes for the protection of retained trees
1.3.0 Demolition of built structures - precautions to protect trees
1.4.0 Excavation and construction close to Tree Protection Zones

1.1.0 **General notes**

1.1.1 The application of any measures for the protection of trees on development sites is determined by the species characteristics of the subject tree, and the existing physical constraints of the growing environment on site both above and below ground.

1.1.2 This report considers where applicable, AS 4970-2009 Protection of Trees on Development Sites (Australian Standard®, 2009).

1.1.3 This report applies the ***Tree Protection Zone - Standard Procedure*** However, this does not restrict the author from applying additional or alternative conditions where it is deemed appropriate by the author for the protection of trees on development sites. Such additional or alternative conditions may be founded upon professional judgement based on:

- the experience of the Consulting Arboriculturist
- scientific research
- new technology
- industry best practice
- consideration of the individual tree species and its relative tolerance to development impacts
- the individual or cumulative factors present or proposed to impact upon the growing environment essential for the trees' survival

1.1.4 Where this report makes reference to the retention of subject trees it is for their incorporation into the landscaping works for the site, and they are to be documented on a Landscape Plan for the site.

1.2.0 **Cautionary notes for the protection of retained trees**

1.2.1 **Installing underground services within TPZ**

If an underground utility service is to be located within the area of the TPZ, AS 4970-2009 Protection of Trees on Development Sites (Australian Standard®, 2009), Section 4, 4.5.5 Installing underground services within TPZ provides the following:

"All services should be routed outside the TPZ. If underground services must be routed within the TPZ, they should be installed by directional drilling or in manually excavated trenches.

The directional drilling bore should be at least 600 mm deep. The project Arborist should assess the likely impacts of boring and bore pits on retained trees.

For manual excavation trenches, the project Arborist should advise on roots to be retained and should monitor the works. Manual excavation may include the use of pneumatic and hydraulic tools. Refer Clause 4.5.3."

1.2.1.1 **Location of services Option B** (Driveway Construction)

If a service is to be located within the area of the dripline of a protected tree or within the Tree Protection Zone, and site conditions such as shallow bedrock or if mass rooting has occurred from multiple trees growing in close proximity to each other, the service trench is to be elevated and positioned above natural ground level within the new driveway structure. The existing driveway surface is to be scabbled and a reinforced concrete topping is to be provided with downturned thickened edges constructed under the kerb edging to prevent lateral movement. A suitable subgrade material to manufacturers' recommendations is to be utilised if and where appropriate. Construction is to occur in a manner so as not to cause damage to the subject trees root system. All works to be in accordance with engineers' details.

1.2.2 **Precautions in Respect of Temporary Work**

For Precautions in respect of temporary work, AS 4970-2009 *Protection of Trees on Development Sites* (Australian Standard®, 2009), Section 4, Tree protection measures, 4.5 Other tree protection measures, provides the following:

*"**4.5.3 Ground protection***

If temporary access for machinery is required within the TPZ ground protection measures will be required. The purpose of ground protection is to prevent root damage and soil compaction within the TPZ. Measures may include a permeable membrane such as geotextile fabric beneath a layer of mulch or crushed rock below rumble boards as per Figure 4. These measures may be applied to root zones beyond the TPZ."

4.5.6 Scaffolding

Where scaffolding is required it should be erected outside the TPZ. Where it is essential for scaffolding to be erected within the TPZ, branch removal should be minimised. This can be achieved by designing scaffolding to avoid branches or tying back branches. The ground below the scaffolding should be protected by boarding (e.g. scaffolding board or plywood sheeting) as shown in Figure 5. Where access is required, a boardwalk or other surface material should be installed to minimise soil compaction. Boarding should be placed over a layer of mulch and impervious sheeting to prevent soil contamination. The boarding should be left in place until the scaffolding is removed."

"Notes:

1 *For trunk and branch protection use boards and padding that will prevent damage to bark. Boards are to be strapped to trees, not nailed or screwed.*
2 *Rumble boards should be a suitable thickness to prevent soil compaction and root damage."*

AS 4970-2009

Refer to page 19 "FIGURE 5 INDICATIVE SCAFFOLDING WITHIN A TPZ" in AS 4970-2009 *Protection of Trees on Development Sites* (Australian Standard®, 2009) **for more information.**

1.3.0 **Demolition of Built Structures - Precautions to Protect Trees**

1.3.1 **Demolition of Existing Buildings**

The demolition of the buildings should be undertaken with access restricted to the driveway and the building platform for each of the existing buildings, or to areas of the land where no trees are growing within 6m of any tree to be retained. Where access or space for a safe working environment is restricted, or where the area of the 6m setback must be compromised, a 100 mm layer of Eucalyptus wood mulch must be laid over the area of encroachment. Where vehicular access is required across the mulch layer further root protection should be provided by laying a temporary pathway over the mulch. The temporary pathway should be constructed of a grated steel material capable of supporting the vehicles used during demolition e.g. similar to ramps used to load vehicles onto the backs of trucks. Trunks of trees are to be protected from vehicular damage as per section 1.2.2 above.

1.3.2 **Demolition of Landscape Structures**

The demolition of walls, driveways retaining walls, paths and pools etc. within 6 m of a tree to be retained should be undertaken manually using hand tools. Where a driveway is to be demolished being of concrete strip or slab type construction, it should be undertaken by working from the end of the driveway closest to the building back towards the street by utilising the driveway as a stable platform to prevent soil compaction. Where a concrete slab driveway passes less than 1 m from the base of a tree and the area beneath the driveway is to be undisturbed and incorporated into the landscape works for the site, the volume of space previously occupied by the driveway must be replaced with local top soil from the site or otherwise a loamy sand, to replace the mass of the concrete on the root plate which may be critical to the ballast and centre of mass for the stability of the tree. If the tree becomes unstable immediately contact the Consultant Arboriculturist.

1.3.3 **Removal of Existing Trees near Trees to be Retained**

Removal of a tree within 6 m of a tree to be retained should be undertaken only by cutting down such a tree without damaging the trees to be retained, and by grinding out its stump. Where possible the structural roots of 20 mm diameter or greater of the tree to be cut down should not be removed, minimise soil disturbance and reduce the impact on the roots of any tree to be retained nearby. Where structural roots are to be removed this should be undertaken manually by the use of non-motorized hand tools after the stump has been ground out when such roots are often easier to locate from the site of the stump from which they have been severed.

1.4.0 **Excavation and Construction close to Tree Protection Zones**

1.4.0.1 Where structural woody roots with a diameter of 20 mm or greater are to be pruned outside the area of the Tree Protection Zone, they are to be excavated manually first by using hand tools to determine their location. A Water knife or Airknife can be used as a mechanised alternative to locate such structural woody roots. Once located those roots to be severed are to be cut cleanly with a final cut to undamaged woody tissue and this will prevent tearing damage to the roots from excavation equipment which can extend beyond the point of excavation back towards the tree.

1.4.0.2 Where a large vigorous tree is to be retained near to a built structure, and dependent upon its taxa, age class and propensity for its roots system to regenerate, it may be prudent to install a root barrier immediately adjacent to the footing of the new building, or to deepen and strengthen the footings themselves to act as a root barrier, but for such structural advice an appropriately qualified chartered structural engineer should be consulted.

1.4.1 **Root Location and Protection where Structures are to be Positioned near a Retained Tree**

1.4.1.1 If walls or a driveway or other structures are to be constructed near a protected tree, careful excavation is to be undertaken manually by using non-motorized hand tools to determine the location of first order and lower order structural roots with a diameter of 20 mm (*structural woody roots*) or greater, without damaging them. Boundary walls or fences should use columns or posts within fill panels, or a wall to be constructed with suspended sections 100 mm clear above or beside any structural woody root or further as required, or any new wall to be built only to the depth of that existing. Structural woody roots to be further protected by utilising the construction techniques of pier or bridge footings, or screw piles between or over them with a minimum clearance above or beside of 100 mm, or further as required to allow for future and on-going growth.

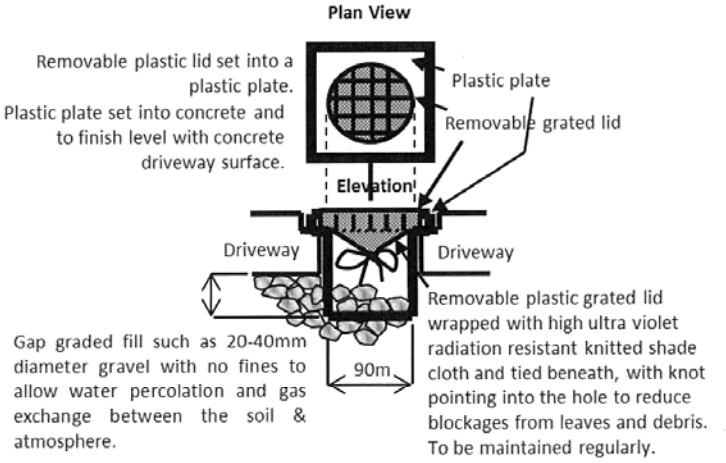
1.4.1.2 Where a driveway or footpath is to pass by the tree a suspended slab is to be constructed or approved similar, to protect the roots that may be encountered at, near, or above ground, and may be constructed on gap graded fill. Where such a driveway or footpath is to be constructed the edge of the structure closest to the tree is to terminate no closer than 0.5 m from the closest edge of trunk, or further depending on the species and its likely further growth to allow for future development and expansion of the trunk, buttresses, and first order and lower order roots as may be advised by a Consultant Arboriculturist. The side of the driveway closest to a tree is to be edged with a concrete kerb of minimum dimensions of 150 x 150 mm, to prevent vehicular collision with the trunk. Here a *Water knife* or an *Airknife* can be used as a mechanised alternative to locate first order and lower order structural woody roots.

1.4.1.3 Alternatively a footpath or driveway may be constructed at ground level without any excavation, removing turf by raking, having sprayed with herbicide first if time permits. Here the path or driveway section is to extend for a distance past the tree equivalent to the lateral spread of the crown of that tree alongside the footpath, or driveway.

1.4.1.4 Watering / Gaseous exchange vents are to be installed in the area of the driveway that passes within the dripline of the tree or the prescribed ***Tree Protection Zone*** area and the number and location are to be determined by a Consultant Arboriculturist and the driveway design approved by a Certified Engineer. Exposed edges of the path are to be concealed with the finished level beside the path equivalent to the top of the path by minimal filling with a sandy soil and turf, or mulch, or a garden bed with minimal cultivation, or other landscape treatments as appropriate. (see image below)

1.4.2 **Root Protection where a Driveway close to a Tree is to be Demolished and a New Driveway Constructed in a Similar Location to a Previous Driveway.**
After demolition of an existing driveway as per 1.3.2, the level of the base for the new driveway should be located at the same existing level as that of the base of the previous driveway, and should extend for a distance past the tree equivalent to the lateral spread of the crown of that tree alongside the driveway. To prevent excavation from damaging the existing roots which may be located at, near or above the surface of the soil beneath the base of the previous driveway, the new driveway may need to be raised by constructing it on pier or bridge footings between or over them (see 1.4.2 for minimum clearances), or based on a gap graded fill and the driveway constructed with any exposed edges concealed to the top of the driveway by minimal filling with a sandy soil and turf, or mulch, or a garden bed with minimal cultivation, or other landscape treatments as appropriate. Where roots have grown to occupy the soil between the concrete strips of a concrete, stone or brick strip driveway, they and the soil may be excavated to the level of the base of the concrete strips, but where such roots have a diameter of 20 mm or greater, a Consulting Arboriculturist should be contacted prior to such works being undertaken. Where roots are to be severed, they are to be cut cleanly with a final cut to undamaged woody tissue.

Irrigation / Gaseous Exchange Vent



NOTE: Such vents can be installed in a grid pattern at 1 per 1 m^2 and their planning and construction utilised in consultation with an appropriate structural or civil engineer.

1.4.3 **Root Protection where a Footpath is to be Constructed close to a Tree.**

1.4.3.1 A footpath may be constructed at ground level without any excavation, by first killing with herbicide the plants to be removed from the pathway area, and then removing that plant material by cutting the trunks of woody shrubs to ground level and by raking all other plant material to expose the topsoil surface without organic matter. This will remove the need for physically disturbing the soil and the roots of the tree. The path section is to extend for a distance past each tree equivalent to the lateral spread of the crown of that tree where it extends alongside the footpath.

1.4.3.2 To prevent excavation from damaging the existing roots which may be located at, near, or above the surface of the soil, a gap graded fill as a fill material of a media as appropriate, to a depth of 100 mm above the soil surface, or above the top of the root of any tree to be retained, or above the soil surface may be utilised as a base treatment to construct the footpath. Any exposed edges to be concealed to the top of the edges of the footpath and tapering back to the base of the trunk of each tree by minimal filling at each trunk of no greater than 100 mm with a sandy soil and turf, or mulch, or a garden bed with minimal cultivation with ground covers, or other landscape treatments as appropriate. A Consultant Arboriculturist should be contacted prior to such works being undertaken or if any structural roots are considered appropriate to be severed being those roots of 20 mm diameter or greater.

1.4.4 **Structural Soil to Accommodate Load Bearing Conditions**
A structural soil should only be considered as a new media into which the trees could be planted if the planting was into a new area where the area surrounding was to be load bearing such as a footpath, driveway or road.

1.4.5 **Gap Graded Fill to Accommodate Compacted Sub Grade and Root Growth**
To further protect woody roots with a diameter of 20 mm or greater, a gap graded fill with no fines such as gravel 40 mm diameter should only be considered as a fill media above existing grade when soil levels are to be increased near existing trees and the roots can utilise the new media to develop on-going and future root growth and provide for gaseous exchange between the soil and the atmosphere.

Appendix 10: SULE

SULE (an acronym for **Safe** & **Useful Life Expectancy**). There are a number of SULE categories that indicate the safe useful life anticipated for each tree. Factors such as the location, age, condition and health of the tree are significant to determining this rating. Other influences such as the tree's effect on better specimens and the economics of managing the tree successfully in its location are also relevant to SULE (Barrell, 1993 - 2009).

SULE Categories and Subgroups

1 = Long SULE OF > 40 years

A Structurally sound trees located in positions that can accommodate future growth.	**B** Storm damaged or defective trees that could be made suitable for retention in the long term by remedial tree surgery.	**C** Trees of special significance for historical, commemorative or rarity reasons that would warrant extraordinary efforts to secure their long-term retention.

2 = Medium SULE of 15-40 years

A Trees that may only live between 15 and 40 more years.	**B** Trees that may live for more than 40 years but would be removed to allow the safe development of more suitable individuals.	**C** Trees that may live for more than 40 years but would be removed during the course of normal management for safety or nuisance reasons.	**D** Storm damaged or defective trees that can be made suitable for retention in the medium term by remedial work.

3 = Short SULE of 1-15 years

A Trees that may only live between 1 and 15 more years.	**B** Trees that may live for more than 15 years but would be removed to allow the safe development of more suitable individuals.	**C** Trees that may live for more than 15 years but would be removed during the course of normal management for safety or nuisance reasons.	**D** Storm damaged or defective trees that require substantial remedial work to make safe, and are only suitable for retention in the short term.

Dead

A Dead trees.	**B** Dying or suppressed and declining trees through disease or inhospitable conditions.	**C** Dangerous trees through instability or recent loss of adjacent trees.	**D** Dangerous trees through structural defects including cavities, decay, included bark, wounds or poor form.	**E** Damaged trees that are considered unsafe to retain.	**F** Trees that will become dangerous after removal of other trees for the reasons given in (a) to (e).

The SULE rating given to any tree in this report assumes that reasonable maintenance will be provided by a qualified Arboriculturist (AQF 3) using the correct and acknowledged techniques. Retained trees are to be protected from root damage. Incorrect tree work practices can significantly accelerate tree decline and increase hazard potential.

Appendix 11: Glossary

All Glossary items adapted from Dictionary for Managing Trees in Urban Environments, Institute of Australian Consulting Arboriculturists (IACA) 2009. (Draper, et al., 2009), unless otherwise cited.

AGE OF TREES

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 (British Standard®, 1991) p.13 & (Harris, et al., 2004) p.262.

Young Tree aged less than <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.

CONDITION OF TREES

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*. The condition can be categorised as *Good Condition*, *Fair Condition*, *Poor Condition* and *Dead*.

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 of, 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 of, 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 of, or contributed to by vigour.

Senescent / Moribund The advanced state of decline, dying or nearly dead.

Dead Tree is no longer capable of performing any of the following processes or is exhibiting any of the following symptoms;

Processes Photosynthesis via its foliage crown (as indicated by the presence of moist, green or other coloured leaves); Osmosis (the ability of the root system to take up water); Turgidity (the ability of the plant to sustain moisture pressure in its cells); Epicormic shoots or epicormic strands in Eucalypts (the production of new shoots as a response to stress, generated from latent or adventitious buds or from a lignotuber);

Symptoms Permanent leaf loss; Permanent wilting (the loss of turgidity which is marked by desiccation of stems leaves and roots); Abscission of the epidermis (bark desiccates and peels off to the beginning of the sapwood).

Removed No longer present, or tree not able to be located or having been cut down and retained on a site, or having been taken away from a site prior to site inspection.

BRANCH

An elongated woody structure arising initially from the trunk to support leaves, flowers, fruit and the development of other branches. A branch may itself fork and continue to divide many times as successive orders of branches with the length and taper decreasing incrementally to the outer extremity of the crown. These may develop initially as a gradually tapering continuation of the trunk with minimal division as in a young tree or a tree of excurrent habit, or in a sapling, or may arise where the trunk terminates at or some distance from the root crown, dividing into first order branches to form and support the foliage crown. In an acaulescent tree, branches arise at or near the root crown. Similarly, branches may arise from a sprout mass from damaged roots, branches or trunk.

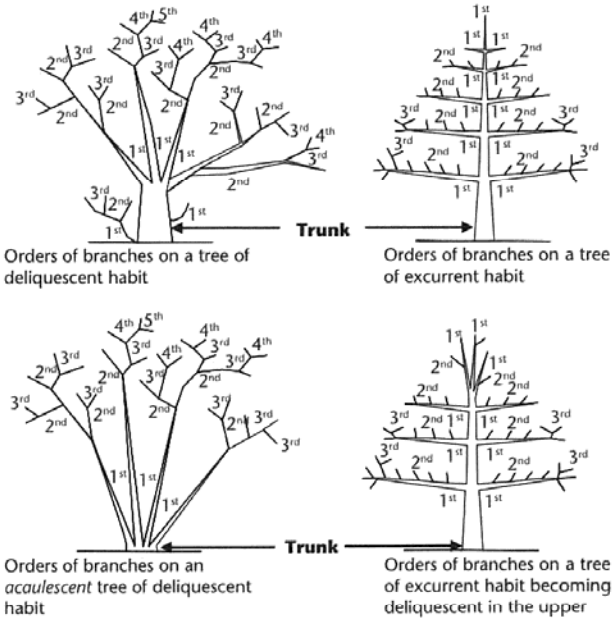


Figure 21 Orders of branches.

Orders of Branches The marked divisions between successively smaller branches (James, 2003)p. 168, commencing at the initial division where the trunk terminates on a deliquescent tree or from lateral branches on an excurrent tree. Successive branching is generally characterised by a gradual reduction in branch diameters at each division, and each gradation from the trunk can be categorised numerically, e.g. first order, second order, third order etc. (See Figure 21.)

Branch tear out Dislodging of a branch from its point of attachment where it is torn away from the branch collar snapping the branch tail causing a laceration, usually to the underside of the branch union of the branch or trunk to which it was attached forming a tear out wound.

Sudden branch drop The failure and collapse of live, usually horizontal branches, seemingly without any noticeable cause in calm hot, dry weather conditions generally after rain. Theorised to be caused by altered moisture content in the branch disturbing the longitudinal pre-stressing of the wood that normally helps support the load as formed by reaction wood in branches tending to horizontal (Lonsdale, 1999)p. 30, or incipient failure from the lengthening of existing internal cracks as the wood cools (Shigo, 1986) p. 248, or influenced by branch creep under its own weight and by wind (Mattheck, et al., 1994) p. 126, or fractures to vascular rays if pulled at right angles to their longitudinal orientation forming from subsidence cracks (Mattheck, et al., 1994)p. 169, or a combination of these factors. Such branch breakages usually occur at some distance from the branch collar leaving a stub. See also *Branch tear out*.

Canopy

1. Of multiple trees, the convergence, or merging in full or part, of the crowns of two or more trees due to their proximity, or where competition for light and space available in a forest environment is limited as each tree develops forming a continuous layer of foliage.
2. Used as a plural for the crown.
3. Sometimes synonymously used for the crown (USA).

Crown Of an individual tree all the parts arising above the trunk where it terminates by its division forming branches, e.g. the branches leaves, flowers and fruit; or the t amount of foliage supported by t branches. The crown of any tre can be divided vertically intc three sections and can be categorised as lower crown, mid crown and upper crown (Figure 8). For a leaning tree these can be divided evenly into crown sections of one-third from the base to apex. The volume of a crown can be categorised as the inner crown, outer crown and outer extremity of the crown.

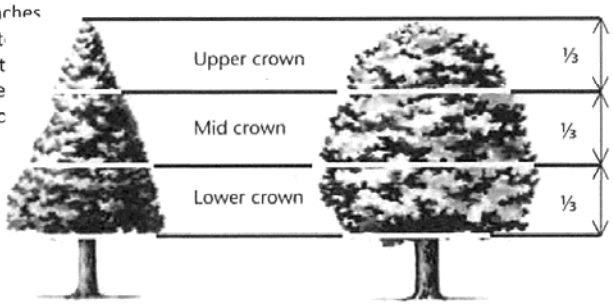


Figure 8 Crown sections.

Lower Crown The proximal or lowest section of a crown when divided vertically into one-third (⅓) increments.

Mid Crown The middle section of a crown when divided vertically into one-third (⅓) increments.

Upper Crown The distal or highest section of a crown when divided vertically into one-third (⅓) increments.

Crown Projection (CP) Area within the dripline or beneath the lateral extent of the crown (Geiger, 2004) p.2.

Dripline A line formed around the edge of a tree by the lateral extent of the crown. Such a line may be evident on the ground with some trees when exposed soil is displaced by rain shed from the crown.

CROWN FORM OF TREES

The shape of the crown of a tree as influenced by the availability or restriction of space and light, or other contributing factors within its growing environment. Crown Form may be determined for tree shape and habit generally as Dominant, Codominant, Intermediate, Emergent, Forest and Suppressed. The habit and shape of a crown may also be considered qualitatively and can be categorised as Good Form or Poor Form.

Good Form Tree of typical crown shape and habit with proportions representative of the taxa considering constraints such as origin e.g. indigenous or exotic, but does not appear to have been adversely influenced in its development by environmental factors in situ such as soil water availability, prevailing wind, or cultural practices such as lopping and competition for space and light.

Poor Form Tree of atypical crown shape and habit with proportions not representative of the species considering constraints and appears to have been adversely influenced in its development by environmental factors in situ such as soil water availability, prevailing wind, cultural practices such as lopping and competition for space and light; causing it to be misshapen or disfigured by disease or vandalism.

Crown Form Codominant Crowns of trees restricted for space and light on one or more sides and receiving light primarily from above e.g. constrained by another tree/s or a building.

Crown Form Dominant Crowns of trees generally not restricted for space and light receiving light from above and all sides.

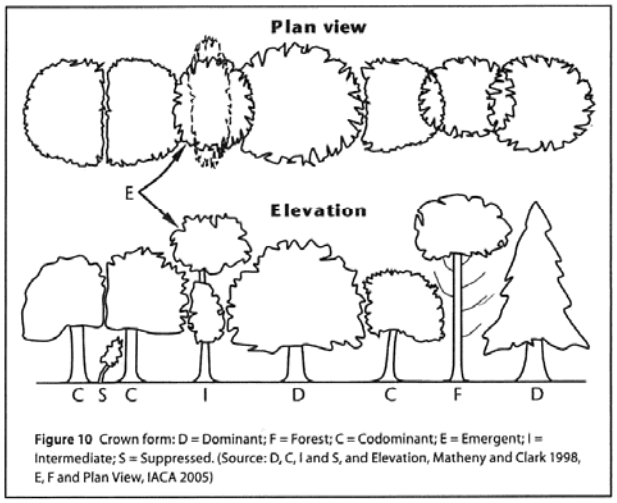


Figure 10 Crown form: D = Dominant; F = Forest; C = Codominant; E = Emergent; I = Intermediate; S = Suppressed. (Source: D, C, I and S, and Elevation, Matheny and Clark 1998, E, F and Plan View, IACA 2005)

Crown Form Emergent Crowns of trees restricted for space on most sides receiving most light from above until the upper crown grows to protrude above the canopy in a stand or forest environment. Such trees may be crown form dominant or transitional from crown form intermediate to crown form forest asserting both apical dominance and axillary dominance once free of constraints for space and light.

Crown Form Forest Crowns of trees restricted for space and light except from above forming tall trees with narrow spreading crowns with foliage restricted generally to the top of the tree. The trunk is usually erect, straight and continuous, tapering gradually, crown often excurrent, with first order branches becoming structural, supporting the live crown concentrated towards the top of the tree, and below this point other first order branches arising radially with each inferior and usually temporary, divergent and ranging from horizontal to ascending, often with internodes exaggerated due to competition for space and light in the lower crown.

Crown Form Intermediate Crowns of trees restricted for space on most sides with light primarily from above and on some sides only.

Crown Form Suppressed Crowns of trees generally not restricted for space but restricted for light by being overtopped by other trees and occupying an understorey position in the canopy and growing slowly.

DEADWOOD

Dead branches within a tree's crown and considered quantitatively as separate to crown cover and can be categorised as Small Deadwood and Large Deadwood according to diameter, length and subsequent risk potential. The amount of dead branches on a tree can be categorised as Low Volume Deadwood, Medium Volume Deadwood and High Volume Deadwood. See also Dieback.

Deadwooding Removing of dead branches by pruning. Such pruning may assist in the prevention of the spread of decay from dieback or for reasons of safety near an identifiable target.

Small Deadwood - dw A dead branch up to 10mm diameter and usually <2 metres long, generally considered of low-risk potential.

Large Deadwood - DW A dead branch >10mm diameter and usually >2 metres long, generally considered of high-risk potential.

DIEBACK

The death of some areas of the crown. Symptoms are leaf drop, bare twigs, dead branches and tree death, respectively. This can be caused by root damage, root disease, bacterial or fungal canker, severe bark damage, intensive grazing by insects, abrupt changes in growth conditions, drought, water-logging or over-maturity. Dieback often implies reduced resistance, stress or decline which may be temporary. Dieback can be categorised as Low Volume Dieback, Medium Volume Dieback and High Volume Dieback.

High Volume Dieback Where >50% of the crown cover has died.

Medium Volume Dieback Where 10-50% of the crown cover has died.

Low Volume Dieback Where <10% of the crown cover has died. See also Dieback, High Volume Dieback and Medium Volume Dieback.

EPICORMIC SHOOTS

Juvenile shoots produced at branches or trunk from epicormic strands in some Eucalypts (Burrows, 2002) pp. 111-131, or sprouts produced from dormant or latent buds concealed beneath the bark in some trees. Production can be triggered by fire, pruning, wounding, or root damage but may also be as a result of stress or decline. Epicormic shoots can be categorised as Low Volume Epicormic Shoots, Medium Volume Epicormic Shoots and High Volume Epicormic Shoots.

High Volume Epicormic Shoots Where >50% of the crown cover is comprised of live epicormic shoots.

Medium Volume Epicormic Shoots Where 10-50% of the crown cover is comprised of live epicormic shoots.

Low Volume Epicormic Shoots Where <10% of the crown cover is comprised of live epicormic shoots.

GENERAL TERMS

Cavity A usually shallow void often localised initiated by a wound and subsequent decay within the trunk, branches or roots, or beneath bark, and may be enclosed or have one or more opening.

Decay The process of degradation of wood by microorganisms (Australian Standard®, 2007) p. 6, and fungus.

Hazard The threat of danger to people or property from a tree or tree part resulting from changes in the physical condition, growing environment, or existing physical attributes of the tree, e.g. included bark, soil erosion, or thorns or poisonous parts, respectively.

Included Bark The bark on the inner side of the branch union, or is within a concave crotch that is unable to be lost from the tree and accumulates or is trapped by acutely divergent branches forming a compression fork. The growth of bark at the interface of two or more branches on the inner side of a branch union or in the crotch where each branch forms a branch collar and the collars roll past one another without forming a graft where no one collar is able to subsume the other. The risk of failure is worsened in some taxa where branching is acutely divergent or acutely convergent and ascending or erect.

Hollow A large void initiated by a wound forming a cavity in the trunk, branches or roots and usually increased over time by decay or other contributing factors, e.g. fire, or fauna such as birds or insects e.g. ants or termites. A hollow can be categorised as an Ascending Hollow or a Descending Hollow.

Kino The extractive polyphenols (tannins) formed in veins in the cambial zone as a defence in response to wounding in eucalypts. Often visible as an exudate when the kino veins rupture or are injured (Boland, et al., 2006) p. 691.

Risk The random or potentially foreseeable possibility of an episode causing harm or damage.

Significant Important, weighty or more than ordinary.

Significant Tree A tree considered important, weighty or more than ordinary. Example: due to prominence of location, or in situ, or contribution as a component of the overall landscape for amenity or aesthetic qualities, or curtilage to structures, or importance due to uniqueness of taxa for species, subspecies, variety, crown form, or as an historical or cultural planting, or for age, or substantial dimensions, or habit, or as remnant vegetation, or habitat potential, or a rare or threatened species, or uncommon in cultivation, or of aboriginal cultural importance, or is a commemorative planting.

Substantial A tree with large dimensions or proportions in relation to its place in the landscape.

Sustainable Retention Index Value (SRIV) A visual tree assessment method to determine a qualitative and numerical rating for the viability of urban trees for development sites and management purposes, based on general tree and landscape assessment criteria using classes of age, condition and vigour. SRIV is for the professional manager of urban trees to consider the tree in situ with an assumed knowledge of the taxon and its growing environment. It is based on the physical attributes of the tree and its response to its environment considering its position in a matrix for age class, vigour class, condition class and its sustainable retention with regard to the safety of people or damage to property. This also factors the ability to retain the tree with remedial work or beneficial modifications to its growing environment or removal and replacement. SRIV is supplementary to the decision made by a tree management professional as to whether a tree is retained or removed (IACA).

Structural Root Zone (SRZ) The minimum radial distance around the base of a tree and its root plate required for its stability in the ground against windthrow, and applied only to trees with a circular root plate (Mattheck, et al., 1994) pp. 77-87.

Tree Protection Zone (TPZ) A combination of the root protection zone (RPZ) and crown protection zone (CPZ) as an area around a tree set aside for the protection of a tree and a sufficient proportion of its growing environment above and below ground established prior to demolition or construction and maintained until the completion of works to allow for its viable retention including stability.

Visual Tree Assessment (VTA) A visual inspection of a tree from the ground based on the principle that, when a tree exhibits apparently superfluous material in its shape, this represents repair structures to rectify defects or to reinforce weak areas in accordance with the Axiom of Uniform Stress (Mattheck, et al., 1994) pp. 12-13, 145). Such assessments should only be undertaken by suitably competent practitioners.

LEANING TREES

A tree where the trunk grows or moves away from upright. A lean may occur anywhere along the trunk influenced by a number of contributing factors e.g. genetically predetermined characteristics, competition for space or light, prevailing winds, aspect, slope, or other factors. A leaning tree may maintain a static lean or display an increasingly progressive lean over time and may be hazardous and prone to failure and collapse. The degrees of leaning can be categorised as Slightly Leaning, Moderately Leaning, Severely Leaning and Critically Leaning.

Slightly Leaning A leaning tree where the trunk is growing at an angle within 0°-15° from upright. - Low Risk.

Moderately Leaning A leaning tree where the trunk is growing at an angle within 15°-30° from upright. - Medium Risk.

Severely Leaning A leaning tree where the trunk is growing at an angle within 30°-45° from upright. - High Risk.

Critically Leaning A leaning tree where the trunk is growing at an angle greater than >45° from upright. - Very High Risk.

Progressively Leaning A tree where the degree of leaning appears to be increasing over time. - Lodging.

Static Leaning A leaning tree whose lean appears to have stabilised over time.

SYMMETRY

Balance within a crown, or root plate, above or below the axis of the trunk of branch and foliage, and root distribution respectively and can be categorised as Asymmetrical and Symmetrical.

Asymmetrical Imbalance within a crown, where there is an uneven distribution of branches and the foliage crown or root plate around the vertical axis of the trunk. This may be due to Crown Form Codominant or Crown Form Suppressed as a result of natural restrictions e.g. from buildings, or from competition for space and light with other trees, or from exposure to the wind, or artificially caused by pruning for clearance of roads, buildings or power lines. An example of an expression of this may be, crown asymmetrical, bias to the west.

Symmetrical Balance within a crown, where there is an even distribution of branches and the foliage crown around the vertical axis of the trunk. This usually applies to trees of Crown Form Dominant or Crown Form Forest. An example of an expression of this may be crown symmetrical.

ROOTS

First Order Roots (FOR) Initial woody roots arising from the root crown at the base of the trunk, or as an adventitious root mass for structural support and stability. Woody roots may be buttressed and divided as a marked gradation, gradually tapering and continuous or tapering rapidly at a short distance from the root crown. Depending on soil type these roots may descend initially and not be evident at the root crown, or become buried by changes in soil levels. Trees may develop 4-11 (Perry, 1982) pp. 197- 221, or more first order roots which may radiate from the trunk with a relatively even distribution, or be prominent on a particular aspect, dependent upon physical characteristics e.g. leaning trunk, asymmetrical crown; and constraints within the growing environment from topography e.g. slope, soil depth, rocky outcrops, exposure to predominant wind, soil moisture, depth of water table etc.

Orders of Roots The marked divisions between woody roots, commencing at the initial division from the base of the trunk, at the root crown where successive branching is generally characterised by a gradual reduction in root diameters and each gradation from the trunk and can be categorized numerically, e.g. first order roots, second order roots, third order roots etc. Roots may not always be evident at the root crown and this may be dependent on species, age class and the growing environment. Palms at maturity may form an adventitious root mass.

Root Plate The entire root system of a tree generally occupying the top 300-600mm of soil including roots at or above ground and may extend laterally for distances exceeding twice the height of the tree (Perry, 1982) pp. 197-221. Development and extent is dependent on water availability, soil type, soil depth and the physical characteristics of the surrounding landscape.

Root Crown Roots arising at the base of a trunk.

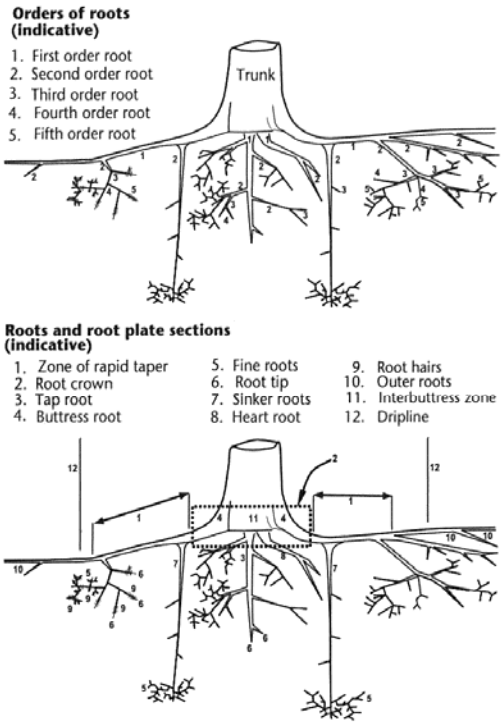


Figure 22 Orders of roots.

Zone of Rapid Taper The area in the root plate where the diameter of structural roots reduces substantially over a short distance from the trunk. Considered to be the minimum radial distance to provide structural support and root plate stability. See also Structural Root Zone (SRZ).

Structural Roots Roots supporting the infrastructure of the root plate providing strength and stability to the tree. Such roots may taper rapidly at short distances from the root crown or become large and woody as with gymnosperms and dicotyledonous angiosperms and are usually 1st and 2nd order roots, or form an adventitious root mass in monocotyledonous angiosperms (palms). Such roots may be crossed and grafted and are usually contained within the area of crown projection or extend just beyond the dripline.

TRUNK

A single stem extending from the root crown to support or elevate the crown, terminating where it divides into separate stems forming first order branches. A trunk may be evident at near the ground or be absent in acaulescent tr deliquescent habit, or may be continuous in tr excurrent habit. The trunk of any caulescent tr be divided vertically into three (3) sections and be categorised as Lower Trunk, Mid Trunk and Upper Trunk. For a leaning tree, these may b divided evenly into sections of one-third along t trunk (Figure 28).

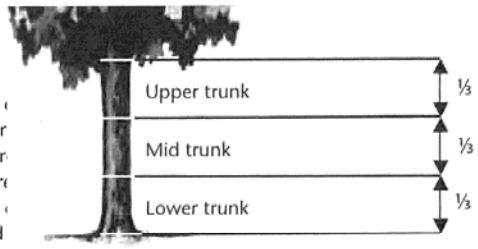


Figure 28 Trunk sections.

Co-Dominant Equal in size and relative importance, usually associated with either trunk/stems or scaffold limbs/branches in the crown; in the context of crown class, trees whose crowns form the bulk of the upper layer of the canopy but which are crowded by adjacent trees (Matheny, et al., 1994).

Diameter at Breast Height (DBH) Measurement of trunk width calculated at a given distance above ground from the base of the tree often measured at 1.4 m. The trunk of a tree is usually not a circle when viewed in cross section, due to the presence of reaction wood or adaptive wood, therefore an average diameter is determined with a diameter tape or by recording the trunk along its narrowest and widest axis, adding the two dimensions together and dividing them by 2 to record an average and allowing the orientation of the longest axis of the trunk to also be recorded. Where a tree is growing on a lean the distance along the top of the trunk is measured to 1.4m and the diameter then recorded from that point perpendicular to the edge of the trunk. Where a leaning trunk is crooked a vertical distance of 1.4m is measured from the ground. Where a tree branches from a trunk that is less than 1.4m above ground, the trunk diameter is recorded perpendicular to the length of the trunk from the point immediately below the base of the flange of the branch collar extending the furthest down the trunk, and the distance of this point above ground recorded as trunk length. Where a tree is located on sloping ground the DBH should be measured at half way along the side of the tree to average out the angle of slope. Where a tree is acaulescent or trunkless branching at or near ground an average diameter is determined by recording the radial extent of the trunk at or near the ground and noting where the measurement was recorded e.g. at ground.

Dominant One of four types of crown class; tree whose crown extends above the height of nearby trees in the stand, receiving light from above and he side

Leader The top most portion of the tree trunk (stem) that is able to grow more than the laterals below. (Harris, et al., 2004)

VIGOUR

The 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 categorised as Normal Vigour, High Vigour, Low Vigour and Dormant Tree Vigour.

Normal Vigour The 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, eg 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 feedlot, 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.

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DISCLAIMER

The author and Advanced Treescape Consulting take no responsibility for actions taken and their consequence if contrary to those expert and professional instructions are given as recommendations pertaining to safety. The conclusions and recommendations contained in this report refer to the tree(s) condition on the inspection day. All care has been taken using the most up-to-date Arboricultural information in the preparation of this report. The report is based on a visual inspection only. Tree health and environmental conditions can change irreversibly at any time due to unforeseen circumstances or events. Due to *Myrtaceae* family hybridisation, some tree species are difficult to accurately identify. Unless trees are in full flower identification is only probable.

Appendix 12: Curriculum Vitae

U W S (Hawkesbury)	Graduate Diploma in Horticulture Diploma in Horticulture
Hortus Australia	Diploma of Horticulture (Arboriculture) (RTF50203-6522-6/12/2005) Qualified AQF5
Ryde School of Horticulture	Tree Surgery Arboriculture Techniques
Central Coast Community College	Excel Module 1 and 2 Excel – Advanced
Workcover	OHS General Induction for Construction Work in NSW (CGI00871464SEQ1) St Johns Ambulance First Aid Certificate

CONFERENCE ATTENDANCE & TRAINING

2016	IACA Root Mapping Seminar - Ryde TAFE IACA Report Writing Seminar - Ryde TAFE IML Resistograph® Users Course - Belmont TAFE
2015	Quantified Tree Risk Assessment System - Estimating Probability of Failure Aboriginal Scar Trees: Significance Conservation and Management of Veteran Eucalypts in the Landscape - Griffith University
2012	Australian Institute of Horticulture Inc. - 'Don Burke Field Day' Professional Development Workshop
2011	Institute of Australian Consulting Arboriculturists (IACA) AS 4970 Forum Ecological Consultants Association of NSW - Impacts of Invasive Species
2010	Root Barrier Field Day
2009	Matheny & Clark: Arboriculture
2008	Quantified Tree Risk Assessment System - Principals and Application
2007	Quantified Tree Risk Assessment System - Principals and Application Quantified Tree Risk Assessment System - A Practitioners Guide to Visual Tree Assessment
2006	Barrell Tree A-Z 2 Day Workshop IML Resistograph® F500S Training Course
2005	Urban Tree Forum – Sydney City Council Urban Tree Risk Management – Treelogic DA Workshop Preparing Development Applications for Local Council –AIH Urban Forest – The New Imperative – Parks and Leisure Australia
2004	Visual Tree Assessment Workshop – Professor Doctor Claus Mattheck
2003	Urban Trees - Our Urban Urgency – Parks and Leisure Australia
1999	Tree Hazard Assessment – Parramatta Park – NAAA
1990	Aero Advanced Climbers Seminar NSW

INDUSTRY BACKGROUND

20th June 2001 to present	*Proprietor* **Advanced Treescape Consulting** (formerly known as RJK Consulting)
2002 - 2005	*Part Time Horticulturist* **Acorn/Bushlands Nursery/Aquarium Centre, Erina Heights**
1997 to present	*Consultant* **Horticulturist**
1997 to present	*Public Speaker* **Horticulturist/Arboriculturist Topics**
1997 - 2001	*Part Time Horticulturist* **Flower Power, Glenhaven**
1991 - 1995	*Proprietor* **KAC Peninsula Firewood** Assembled team to clear backlog of firewood
1990 - 1996	*Proprietor/Climber* **Kingdom's Arbor Care** (until its sale)
1986 - 1990	*Tree Worker* **Arbor 2000 Pro-Climb, Sydney**
1972 to present	*Bonsai enthusiast*

BUSINESS ACHIEVEMENT

Finalist in Central Coast Advocate Community Business Awards 2005 for Specialised Business category.

MEMBERSHIPS

- Institute of Australian Consulting Arboriculturists
- Australian Institute of Horticulture
- Arboriculture Australia
- Gosford City Council Tree Protection Committee - Committee Member - August 1998 to June 2004.

Appendix 13: Geotechnical Assessment

SMEC TESTING SERVICES

14/1 Cowpasture Place, Wetherill Park, NSW 2164, Australia
(PO Box 6989, Wetherill Park, NSW 2164, Australia)
T +61 2 9756 2166 | F +61 2 9756 1137
www.smectesting.com.au | enquiries@smectesting.com.au
ABN 22 101 164 792 | ACN 101 164 792

April 11, 2017
Project No. 10530/2974
LWI/js

NSW Land & Housing Corporation
Locked Bag 5112
PARRAMATTA NSW 2124

Attention: Brett Wood

SUBJECT: GEOTECHNICAL ASSESSMENT
18 ADOLPHUS STREET, BALMAIN

Dear Sir,

Introduction

This report presents the results of an investigation of the retaining wall that runs along the boundary that fronts onto Adolphus Street, Balmain. The intention of the investigation was to assess the conditions behind the existing retaining wall from a geotechnical point of view and to provide retaining wall design parameters for the construction of a new retaining wall.

This work was commissioned by Brett Wood, Manager Survey and Titling Infrastructure, NSW Land and Housing Corporation.

A number of photographs are referred to in this report; these are attached.

Site Conditions and Geology

The retaining wall in question runs along the western side of the property.

In this area the land falls relatively steeply down to the south towards Johnstones Bay. The wall has been used to provide a generally level rear garden for these properties above the pedestrian foot path.

The retaining wall comprises a double brick wall and it is some 50 metres in total length. The total height of the wall above the footpath level up, varies from 0.4 to 1.2 metres, the height increasing to the south.

SMEC TESTING SERVICES

It is not practical to measure the maximum height of retained soil behind the wall. It would be necessary to excavate the fill behind for the entire length of wall if the maximum retained depth was to be accurately measured. However, a depth of about 1.5 metres is probably the maximum height of retained soil.

There are a number of larger gum trees located within a metre of the retaining wall. The wall has tilted and there are many cracks present. The main cracking coincides with the location of trees.

Reference to the Sydney geological series sheet, at a scale of 1:100,000, shows that the area is underlain by the Triassic age Hawkesbury Sandstone formation. Rocks within this formation comprise fine to medium grained quartz sandstone. Both our previous experience and observations of exposures in the vicinity confirm these conditions.

Fieldwork

The conditions behind the wall were observed in three pits (TP1 to TP3) at the locations shown on Drawing No. 17/2974. Because there was no vehicular access to the property the test pits were excavated by hand on the instructions of the NSW Land and Housing Corporation.

The condition of the backfill encountered behind the wall, in particular the presence of concrete and boulder sized pieces, precluded any practical insitu or laboratory testing of the strength of the fill.

All pits were back filled and the ground surface reinstated after inspection.

Subsurface Conditions

The subsurface conditions observed in the pits are detailed on the attached test pit logs. The attached explanation sheets detail the soil/fill descriptions.

The backfill behind the wall comprised the same material in all pits, namely a silty clay with quantities of concrete, sandstone pieces, bricks, (see attached photos 1 to 3) with some sandstone gravel and silt. The fill was generally moist and typically poorly compacted. Steel reinforcing bars were encountered in TP1. Because of the groundwater present, the fill could not be penetrated in TP3. At the TP1 and TP2, the fill is 1.2 and 0.8 metres thick. In TP2 very stiff sandy clay underlies the fill to a depth of 1.0 metres. Weathered sandstone was encountered in TP1 and TP2 at depths of 1.2 and 1.0 metres, respectively.

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The only groundwater observed was in TP3.

Discussion

The following comments are based on the assumption that the conditions observed in the test pits are representative of the general conditions behind the rest of the brick retaining wall. When making an assessment of the subsurface conditions across a site from a limited number of test locations it should be recognised that variations may occur between these locations. The data derived from the any investigation program are extrapolated across the site to form a geotechnical model and then an engineering opinion is provided about overall subsurface conditions and their likely behaviour. There is always the possibility that previous works in the immediate area have disturbed/changed the typical geotechnical conditions behind the wall.

The damage to the wall is directly related to the growth of the adjacent gum trees. The nature of the distress relates to tilting of the wall because the retaining wall has not been reinforced and the horizontal loads being applied by the trees. The nature of the cracks present are assessed to be due to excessive horizontal loading. There is no evidence to suggest the wall has suffered distress because of settlements which implies the existing wall is founded on the underlying weathered sandstone. An allowable bearing pressure of 800 kPa can be adopted for foundations that bear in the weathered sandstone.

The following wall design parameters are recommended for the design of the replacement wall:

Frictional fill strength (Phi)	- 27 Degrees
Active earth pressure coefficient (K_a)	- 0.4
At rest earth pressure (K_o)	- 0.5
Fill density	- 18 kN/m^3
Frictional interface strength (Between fill and rock foundations)	- 20 Degrees
Wall frictional strength (Between fill and brick work)	- 20 Degrees

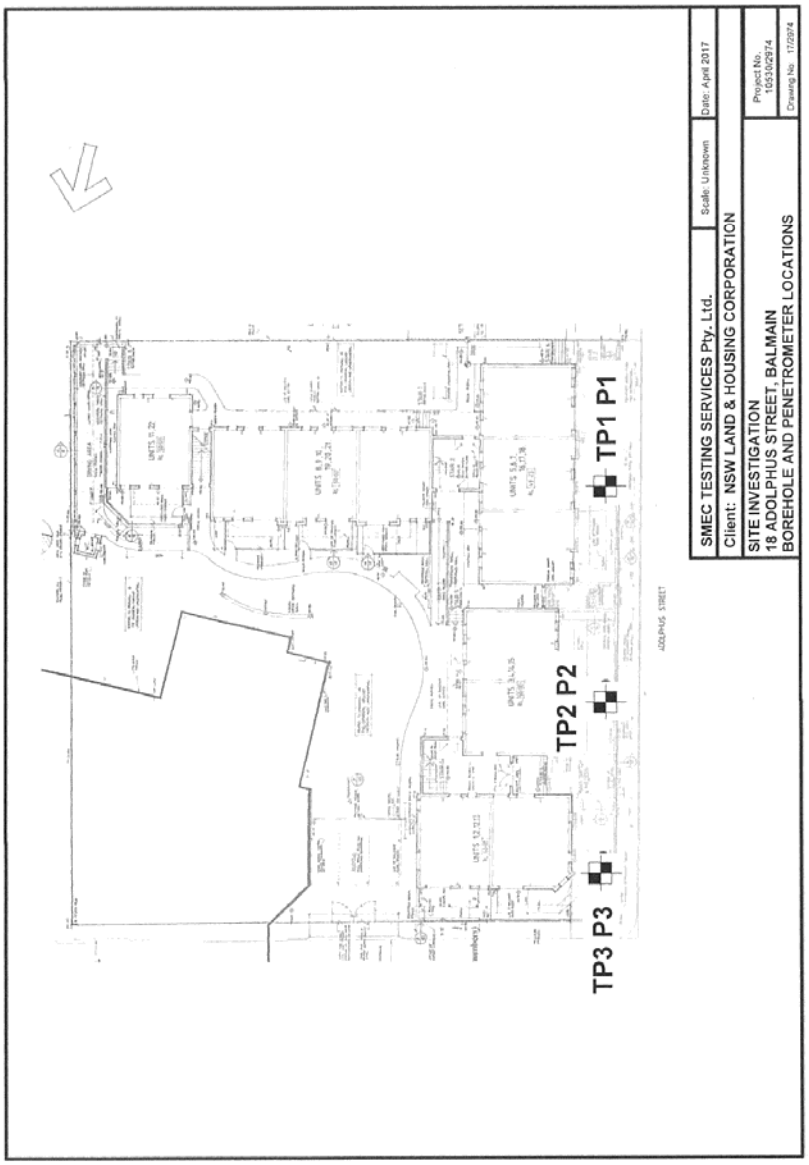
It is considered that it is reasonable to assume a triangular shaped earth pressure distribution on the back of the brick retaining wall. In addition to the loads applied by the retained soil it would be prudent to apply a horizontal load to the wall at each tree location. This should prevent a reoccurrence of the existing damage. We have no experience with determining the magnitude of this type of load. A literature search has failed to reveal any relevant information. We are happy to discuss this issue with the wall designers to reach an appropriate design loading.

SMEC TESTING SERVICES

We trust this meets with your requirements. Should you have any questions, please contact us.

Yours faithfully

Laurie Ihnativ
Principal Geotechnical Engineer


TP1 P1
TP2 P2
TP3 P3
ADOLPHUS STREET
SMEC TESTING SERVICES Pty. Ltd.
Scale: Unknown
Date: April 2017
Client: NSW LAND & HOUSING CORPORATION
SITE INVESTIGATION
18 ADOLPHUS STREET, BALMAIN
BOREHOLE AND PENETROMETER LOCATIONS
Project No. 10530/2974
Drawing No. 17/2974

NOTES RELATING TO GEOTECHNICAL REPORTS

Introduction

These notes have been provided to outline the methodology and limitations inherent in geotechnical reporting. The issues discussed are not relevant to all reports and further advice should be sought if there are any queries regarding any advice or report.

When copies of reports are made, they should be reproduced in full.

Geotechnical Reports

Geotechnical reports are prepared by qualified personnel on the information supplied or obtained and are based on current engineering standards of interpretation and analysis.

Information may be gained from limited subsurface testing, surface observations, previous work and is supplemented by knowledge of the local geology and experience of the range of properties that may be exhibited by the materials present. For this reason, geotechnical reports should be regarded as interpretative rather than factual documents, limited to some extent by the scope of information on which they rely.

Where the report has been prepared for a specific purpose (eg. design of a three-storey building), the information and interpretation may not be appropriate if the design is changed (eg. a twenty storey building). In such cases, the report and the sufficiency of the existing work should be reviewed by SMEC Testing Services Pty Limited in the light of the new proposal.

Every care is taken with the report content, however, it is not always possible to anticipate or assume responsibility for the following conditions:

- Unexpected variations in ground conditions. The potential for this depends on the amount of investigative work undertaken.
- Changes in policy or interpretation by statutory authorities.
- The actions of contractors responding to commercial pressures.

If these occur, SMEC Testing Services Pty Limited would be pleased to resolve the matter through further investigation, analysis or advice.

Unforeseen Conditions

Should conditions encountered on site differ markedly from those anticipated from the information contained in the report, SMEC Testing Services Pty Limited should be notified immediately. Early identification of site anomalies generally results in any problems being more readily resolved and allows re-interpretation and assessment of the implications for future work.

Subsurface Information

Logs of a borehole, recovered core, test pit, excavated face or cone penetration test are an engineering and/or geological interpretation of the subsurface conditions. The reliability of the logged information depends on the drilling/testing method, sampling and/or observation spacings and the ground conditions. It is not always possible or economic to obtain continuous high quality data. It should also be recognised that the volume or material observed or tested is only a fraction of the total subsurface profile.

Interpretation of subsurface information and application to design and construction must take into consideration the spacing of the test locations, the frequency of observations and testing, and the possibility that geological boundaries may vary between observation points.

Groundwater observations and measurements outside of specially designed and constructed piezometers should be treated with care for the following reasons:

- In low permeability soils groundwater may not seep into an excavation or bore in the short time it is left open.
- A localised perched water table may not represent the true water table.
- Groundwater levels vary according to rainfall events or season.
- Some drilling and testing procedures mask or prevent groundwater inflow.

The installation of piezometers and long term monitoring of groundwater levels may be required to adequately identify groundwater conditions.

Supply of Geotechnical Information or Tendering Purposes

It is recommended tenderers are provided with as much geological and geotechnical information that is available and that where there are uncertainties regarding the ground conditions, prospective tenders should be provided with comments discussing the range of likely conditions in addition to the investigation data.

SMEC Testing Services Pty Ltd **ENGINEERING EXCAVATION LOG - TEST PIT**

Client: NSW Land & Housing Corporation	Project No.: 10530/2974	**TEST PIT NO.:**	**TP 1**
Project: 18 Adolphus Street, Balmain	Date : March 23, 2017	Sheet 1 of 1	
Location: Refer to Drawing No. 17/2974	Logged: RB/NP		

WATER TABLE	SAMPLES	DEPTH (m)	DESCRIPTION OF EXCAVATED PRODUCT (Soil type, colour, grain size, plasticity, minor components, observations)	SYMBOL	CONSISTENCY (cohesive soils) or RELATIVE DENSITY (sands and gravels)	MOISTURE
		0.5	SILTY CLAY: grey brown, trace of roots, bricks, concrete, building rubble, steel reinforcing bars, some sand and gravel, tree roots	CL	VARIABLE SOFT AND STIFF	M
		1.0	FILL			
		1.5	HAND AUGER REFUSAL AT 1.2 M ON WEATHERED SANDSTONE			
		2.0				
		2.5				

NOTES: D = disturbed sample; U = undisturbed tube sample; B = bulk sample
WT = level of water table or free water; H = Hand (recovery); M = Machine (recovery)
N = Standard Penetration Test (SPT)

See explanation sheets for meaning of all descriptive terms and symbols

Contractor: STS
Equipment: Hand Tools
Hole Diameter (mm):
Angle from Vertical (°) 0

Form B Date of Issue 11/01/10 Revision 5

SMEC Testing Services Pty Ltd **ENGINEERING EXCAVATION LOG - TEST PIT**

Client: NSW Land & Housing Corporation	Project No.: 10530/2974	**TEST PIT NO.:**	**TP 2**
Project: 18 Adolphus Street, Balmain	Date : March 23, 2017	Sheet 1 of 1	
Location: Refer to Drawing No. 17/2974	Logged: RB/NP		

WATER TABLE	SAMPLES	DEPTH (m)	DESCRIPTION OF EXCAVATED PRODUCT (Soil type, colour, grain size, plasticity, minor components, observations)	SYMBOL	CONSISTENCY (cohesive soils) or RELATIVE DENSITY (sands and gravels)	MOISTURE
		0.5	SILTY CLAY: grey brown, trace of roots, bricks, concrete, building rubble, some sand and gravel, tree roots	CL	VARIABLE SOFT AND STIFF	M
			FILL			
		1.0	SANDY CLAY: yellow brown and light grey, fine grained sand, low plasticity	CL	VERY STIFF	M
		1.5	HAND AUGER REFUSAL AT 1.0 M ON WEATHERED SANDSTONE			
		2.0				
		2.5				

NOTES: D - disturbed sample; U - undisturbed tube sample; B - bulk sample
WT - level of water table or free water; H - Hand (recovery); M - Machine (recovery)
N - Standard Penetration Test (SPT)

See explanation sheets for meaning of all descriptive terms and symbols

Contractor: STS
Equipment: Hand Tools
Hole Diameter (mm):
Angle from Vertical (°) 0

Form I3 Date of Issue 11/01/10 Revision 5

SMEC Testing Services Pty Ltd **ENGINEERING EXCAVATION LOG - TEST PIT**

Client: NSW Land & Housing Corporation	Project No.: 10530/2974	**TEST PIT NO.:**	**TP 3**
Project: 18 Adolphus Street, Balmain	Date : March 23, 2017	Sheet 1 of 1	
Location: Refer to Drawing No. 17/2974	Logged: RB/NP		

WATER TABLE	SAMPLES	DEPTH (m)	DESCRIPTION OF EXCAVATED PRODUCT (Soil type, colour, grain size, plasticity, minor components, observations)	SYMBOL	CONSISTENCY (cohesive soils) or RELATIVE DENSITY (sands and gravels)	MOISTURE
			SILTY CLAY: grey brown, trace of roots, bricks, concrete, building rubble, some sand and gravel, tree roots	CL	VARIABLE SOFT AND STIFF	M
WT		0.5	FILL			
			BOREHOLE DISCONTINUED AT 0.75 M BECAUSE OF SEEPAGE			
		1.0				
		1.5				
		2.0				
		2.5				

NOTES: D - disturbed sample; U - undisturbed tube sample; B - bulk sample; WT - level of water table or free water; H - Hand (recovery); M - Machine (recovery); N - Standard Penetration Test (SPT)

See explanation sheets for meaning of all descriptive terms and symbols

Contractor: STS
Equipment: Hand Tools
Hole Diameter (mm):
Angle from Vertical (°) 0

Form B Date of Issue 11/01/10 Revision 5

SMEC Testing Services Pty Ltd
14/1 Cowpasture Place, Wetherill Park NSW 2164
Phone: (02)9756 2166 Fax: (02)9756 1137 Email: enquiries@smectesting.com.au

Dynamic Cone Penetrometer Test Report

Project: 18 ADOLPHUS STREET, BALMAIN — Project No.: 10530/2974
Client: NSW LAND & HOUSING CORPORATION — Report No.: 17/0923
Address: Locked Bag 4009, Ashfield — Report Date: 5/04/2017
Test Method: AS 1289.6.3.2 — Page: 1 of 1

Site No.	P1	P2	P3			
Location	Refer to Drawing No. 17/2974	Refer to Drawing No. 17/2974	Refer to Drawing No. 17/2974			
Starting Level	Surface Level	Surface Level	Surface Level			
Depth (m)	Penetration Resistance (blows / 150mm)					
0.00 - 0.15	1	1	1			
0.15 - 0.30	1	1	6			
0.30 - 0.45	2	3	5			
0.45 - 0.60	5	6	4			
0.60 - 0.75	13	20/R	20/R			
0.75 - 0.90	20/R					
0.90 - 1.05						
1.05 - 1.20						
1.20 - 1.35						
1.35 - 1.50						
1.50 - 1.65						
1.65 - 1.80						
1.80 - 1.95						
1.95 - 2.10						
2.10 - 2.25						
2.25 - 2.40						
2.40 - 2.55						
2.55 - 2.70						
2.70 - 2.85						
2.85 - 3.00						
3.00 - 3.15						
3.15 - 3.30						
3.30 - 3.45						
3.45 - 3.60						
3.60 - 3.75						

Remarks: * Pre drilled prior to testing

NATA Accredited Laboratory Number 2750
Accredited for compliance with ISO/IEC 17025
The results of tests, calibrations and / or measurements included in this document are traceable to Australian / national standards

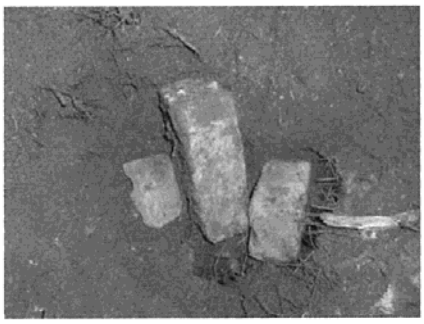
Technician: RB/M.. Approved Signatory..... Laurie Ihnativ - Manager

Form: RPS26 Date of Issue: 01/06/15 Revision: 6

Photo 1

Photo 2

Photo 3



E1. CLASSIFICATION OF SOILS

E1.1 Soil Classification and the Unified System

An assessment of the site conditions usually includes an appraisal of the data available by combining values of engineering properties obtained by the site investigation with descriptions, from visual observation of the materials present on site.

The system used by SMEC in the identification of soil is the Unified Soil Classification system (USC) which was developed by the US Army Corps of Engineers during World War II and has since gained international acceptance and has been adopted in its metricated form by the Standards Association of Australia.

The Australian Site Investigation Code (AS1726-1981, Appendix D) recommends that the description of a soil includes the USC group symbols which are an integral component of the system.

The soil description should contain the following information in order:

Soil composition

- SOIL NAME and USC classification symbol (IN BLOCK LETTERS)
- plasticity or particle characteristics
- colour
- secondary and minor constituents (name estimated proportion, plasticity or particle characteristics, colour

Soil condition

- moisture condition
- consistency or density index

Soil structure

- structure (zoning, defects, cementing)

Soil origin

interpretation based on observation eg FILL, TOPSOIL, RESIDUAL, ALLUVIUM.

E1.2 Soil Composition

(a) Soil Name and Classification Symbol

The USC system is summarized in Figure E1.2.1. The primary division separates soil types on the basis of particle size into.

- Coarse grained soils - more than 50% of the material less than 60 mm is larger than 0.06 mm (60 µm).
- Fine grained soils - more than 50% of the material less than 60 mm is smaller than 0.06 mm (60 µm).

Initial classification is by particle size as shown in Table E1.2.1. Further classification of fine grained soils is based on plasticity.

TABLE E1.2.1 - CLASSIFICATION BY PARTICLE SIZE

NAME	SUB-DIVISION	SIZE
Clay (1)		< 2 µm
Silt (2)		2 µm to 60 µm
Sand	Fine Medium Coarse	60 µm to 200 µm 200 µm to 600 µm 600 µm to 2 mm
Gravel (3)	Fine Medium Coarse	2 mm to 6 mm 6 mm to 20 mm 20 mm to 60 mm
Cobbles (3)		60 mm to 200 mm
Boulders (3)		> 200 mm

Where a soil contains an appropriate amount of secondary material, the name includes each of the secondary components (greater than 12%) in increasing order of significance, eg sandy silty clay.

Minor components of a soil are included in the description by means of the terms "some" and "trace" as defined in Table E1.2.2.

TABLE E1.2.2 - MINOR SOIL COMPONENTS

TERM	DESCRIPTION	APPROXIMATE PROPORTION (%)
Trace	presence just detectable, little or no influence on soil properties	0-5
Some	presence easily detectable, little influence on soil properties	5-12

The USC group symbols should be included with each soil description as shown in Table E1.2.3

TABLE E1.2.3 - SOIL GROUP SYMBOLS

SOIL TYPE	PREFIX
Gravel	G
Sand	S
Silt	M
Clay	C
Organic	O
Peat	Pt

The group symbols are combined with qualifiers which indicate grading, plasticity or secondary components as shown on Table E1.2.4

TABLE E1.2.4 - SOIL GROUP QUALIFIERS

SUBGROUP	SUFFIX
Well graded	W
Poorly Graded	P
Silty	M
Clayey	C
Liquid Limit <50% - low to medium plasticity	L
Liquid Limit >50% - low to medium plasticity	H

(b) Grading

"Well graded" Good representation of all particle sizes from the largest to the smallest.

"Poorly graded" One or more intermediate sizes poorly represented

"Gap graded" One or more intermediate sizes absent

"Uniformly graded" Essentially single size material.

(c) Particle shape and texture

The shape and surface texture of the coarse grained particles should be described.

Angularity may be expressed as "rounded", "sub-rounded", "sub-angular" or "angular".

Particle **form** can be "equidimensional", "flat" or elongate".

Surface texture can be "glassy", "smooth", "rough", pitted" or striated".

(d) Colour

The colour of the soil should be described in the moist condition using simple terms such as:

Black White Grey Red
Brown Orange Yellow Green
Blue

These may be modified as necessary by "light" or "dark". Borderline colours may be described as a combination of two colours, eg. red-brown.

For soils that contain more than one colour terms such as:

- Speckled Very small (<10 mm dia) patches
- Mottled Irregular
- Blotched Large irregular (>75 mm dia)
- Streaked Randomly oriented streaks

(e) Minor Components

Secondary and minor components should be individually described in a similar manner to the dominant component.

E1.3 Soil Condition

(a) Moisture

Soil moisture condition is described as "dry", "moist" or "wet".

The moisture categories are defined as:
Dry (D) - Little or no moisture evident. Soils are running.
Moist (M) - Darkened in colour with cool feel. Granular soil particles tend to adhere. No free water evident upon remoulding of cohesive soils.

In addition the moisture content of cohesive soils can be estimated in relation to their liquid or plastic limit.

(b) Consistency

Estimates of the consistency of a clay or silt soil may be made from manual examination, hand penetrometer test, SPT results or from laboratory tests to determine undrained shear or unconfined compressive strengths. The classification of consistency is defined in Table E1.3.1.

TABLE E1.3.1 - CONSISTENCY OF FINE-GRAINED SOILS

TERM	UNCONFINED STRENGTH (kPa)	FIELD IDENTIFICATION
Very Soft	<25	Easily penetrated by fist. Sample exudes between fingers when squeezed in the fist.
Soft	25 – 50	Easily moulded in fingers. Easily penetrated 50 mm by thumb
Firm	50 – 100	Can be moulded by strong pressure in the fingers. Penetrated only with great effort.
Stiff	100 – 200	Cannot be moulded in fingers. Indented by thumb but penetrated only with great effort.
Very Stiff	200 – 400	Very tough. Difficult to cut with knife. Readily indented with thumb nail.
Hard	>400	Brittle, can just be scratched with thumb nail. Tends to break into fragments.

Unconfined compressive strength as derived by a hand penetrometer can be taken as approximately double the undrained shear strength ($q_u = 2\ c_u$).

(c) Density Index

The insitu density index of granular soils can be assessed from the results of SPT or cone penetrometer tests. Density index should not be estimated visually.

TABLE E1.3.2 - DENSITY OF GRANULAR SOILS

TERM	SPT N VALUE	STATIC CONE VALUE q_c (MPa)	DENSITY INDEX (%)
Very Loose	0 – 3	0 - 2	0 - 15
Loose	3 – 8	2 - 5	15 - 35
Medium Dense	8 – 25	5 - 15	35 - 65
Dense	25 – 42	15 - 20	65 - 85
Very Dense	>42	>20	>85

E1.4 Soil Structure

(a) Zoning

A sample may consist of several zones differing in colour, grain size or other properties. Terms to classify these zones are:

Layer - continuous across exposure or sample
Lens - discontinuous with lenticular shape
Pocket - irregular inclusion
Each zone should be described, their distinguishing features, and the nature of the interzone boundaries.

(b) Defects

Defects which are present in the sample can include:

- fissures
- roots (containing organic matter)
- tubes (hollow)
- casts (infilled)

Defects should be described giving details of dimensions and frequency. Fissure orientation, planarity, surface condition and infilling should be noted. If there is a tendency to break into blocks, block dimensions should be recorded

E1.5 Soil Origin

Information which may be interpretative but which may contribute to the usefulness of the material description should be included. The most common interpreted feature is the origin of the soil. The assessment of the probable origin is based on the soil material description, soil structure and its relationship to other soil and rock materials.

Common terms used are:

"Residual Soil" - Material which appears to have been derived by weathering from the underlying rock. There is no evidence of transport.

"Colluvium" - Material which appears to have been transported from its original location. The method of movement is usually the combination of gravity and erosion.

"Landslide Debris" - An extreme form of colluvium where the soil has been transported by mass movement. The material is obviously distributed and contains distinct defects related to the slope failure.

"Alluvium" - Material which has been transported essentially by water. Usually associated with former stream activity.

"Fill" - Material which has been transported and placed by man. This can range from natural soils which have been placed in a controlled manner in engineering construction to dumped waste material. A description of the constituents should include an assessment of the method of placement.

E1.6 Fine Grained Soils

The physical properties of fine grained soils are dominated by silts and clays.

The definition of clay and silt soils is governed by their Atterberg Limits. Clay soils are characterised by the properties of cohesion and plasticity with cohesion defines as the ability to deform without rupture. Silts exhibit cohesion but have low plasticity or are non-plastic.

The field characteristics of clay soils include:

- dry lumps have appreciable dry strength and cannot be powdered
- volume changes occur with moisture content variation
- feels smooth when moist with a greasy appearance when cut.

The field characteristics of silt soils include:

- dry lumps have negligible dry strength and can be powdered easily
- dilatancy - an increase in volume due to shearing - is indicted by the presence of a shiny film of water after a hand sample is shaken. The water disappears upon remoulding. Very fine grained sands may also exhibit dilatancy.
- low plasticity index
- feels gritty to the teeth

E1.7 Organic Soils

Organic soils are distinguished from other soils by their appreciable content of vegetable matter, usually derived from plant remains.

The soil usually has a distinctive smell and low bulk density.

The USC system uses the symbol Pt for partly decomposed organic material. The O symbol is combined with suffixes "O" or "H" depending on plasticity.

Where roots or root fibres are present their frequency and the depth to which they are encountered should be recorded. The presence of roots or root fibres does not necessarily mean the material is an "organic material" by classification.

Coal and lignite should be described as such and not simply as organic matter.