TREE WISE MEN®
AUSTRALIA PTY LTD

Arboricultural Impact Assessment
For
SSD 6617-2014
Remediation
At
EPA Declaration No. 21122
Hickson Road
Millers Point

Prepared for:

Lend Lease (Millers Point) Pty Ltd
Level 4, 30 The Bond
30 Hickson Road
MILLERS POINT NSW 2000

Ref: 2095AIASSD 6617-2014FINAL

February 2015

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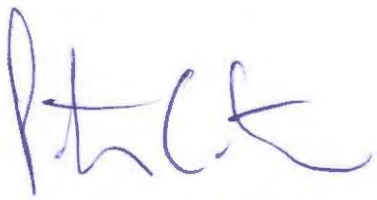

Peter Castor
Director

BSc (For.)
Member: AA, IACA, PIA, LGTRA, MAE (UK)
25 February 2015

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ATTACHMENTS

1. EXECUTIVE SUMMARY

1.1 GENERAL

1.1.1 This Arboricultural Impact Assessment (AIA) determines the likely tree impacts for both the preferred Option 1 (In-Situ) and alternative Option 2 (Ex- Situ) remediation works for SSD 6617-2014 being the Remediation of the Hickson Road portion of the EPA Declaration Area No. 21122.

1.2 TREE IMPACTS - OPTION 1 (IN-SITU)

1.2.1 An assessment has been undertaken of the likely impacts of the potential In-Situ Remediation works (Option 1) on existing trees in the vicinity of the EPA Declaration Area No. 21122 for SSD 6617–2014.

1.2.2 The trees assessed within and adjacent to the EPA Declaration Area No. 21122 are indicated on the Tree Protection Plan (Sheet 1 of 3) (Attachment C) and in the Tree Schedule – Option 1 (Attachment A).

1.2.3 We conclude following assessment of the existing vigour and condition of the subject trees and review of construction works detailed in the supplied *EPA Declaration No.21122, Option 1, Staging Plans,* Issue C, dated 21.08.14 prepared by ARUP that no trees will need to be removed for the preferred in-situ method.

1.2.4 Tree protection/tree management measures are detailed in Section 4 below. If the tree protection measures are implemented, there should be no significant impact on the existing vigour and condition of the retained trees.

1.2.5 If the In-Situ remediation proceeds, ongoing monitoring of tree health will be required given the uncertainty of potential phytotoxicity of the site specific methodology for SSD 6617–2014.

1.3 TREE IMPACTS – OPTION 2 (EX-SITU)

1.3.1 An assessment has been undertaken of the likely impacts of the potential Ex-Situ Remediation works (Option 2) on existing trees in the vicinity of the EPA Declaration Area No. 21122 for SSD 6617-2014.

1.3.2 The trees assessed within and adjacent to the EPA Declaration Area No. 21122 are indicated on The Tree Protection Plan (Sheet 1 of 3) (Attachment D) and in the Tree Schedule - Option 2 (Attachment B).

1.3.3 We conclude following assessment of the existing vigour and condition of the subject trees and review of construction works detailed in the supplied *EPA Declaration No.21122, Option 2, Staging Plans,* Issue C, dated 21.08.14 prepared by ARUP, that the following trees will need to be removed: Trees 13-24 and Trees 46, 47 and 49 for the alternate ex-situ method.

1.3.4 Trees 13-24 and Trees 46, 47 and 49 are Hills Figs, *Ficus microcarpa var. Hillii* located within road reserve of Hickson Road. These trees need to be removed to allow for the bulk excavation and traffic diversion works for SSD 6617–2014 Option 2 Ex-Situ method.

1.3.5 Tree protection/tree management measures are detailed in Section 5 below. If the tree protection measures are implemented there should be no significant impact on the existing vigour and condition of the retained trees.

1.3.6 The removed trees will be replaced with appropriately advanced trees of the same species at the completion of Option 2 works.

2. BACKGROUND

2.1 INTRODUCTION

2.1.1 This Arboricultural Impact Assessment (AIA) was prepared for Lend Lease (Millers Point) Pty Ltd (LL) in relation to SSD 6617–2014, being the Remediation of the Hickson Road portion of the EPA Declaration Area No. 21122.

2.1.2 The Declaration Area No. 21122 has been found to contain the following gasworks wastes: polycyclic aromatic hydrocarbons (PAHs), benzene, tolvene, ethylbenzene and total xylenes (BTEX), total petroleum hydrocarbons (TPH), ammonia and cyanide. The existing trees in Hickson Road may have roots in contact with some of these contaminants.

2.1.3 This AIA assesses the tree impacts of both potential remediation methods being the In-Situ remediation (Option 1) and the Ex-Situ remediation (Option 2).

2.1.4 Refer to **3.2** for a list of reference documents and plans.

2.1.5 This AIA should be read in conjunction with the earlier Tree Wise Men® Australia Pty Ltd report dated June, 2011[2], for MP10-0087, being the SISCO®/SEPR® Pilot Trial Remediation Project.

2.1.6 The purpose of this AIA is to describe the existing characteristics of the trees in the vicinity and the likely impacts of the SSD 6617-2014 works on those trees. This AIA will form part of the Environmental Assessment required under the Secretary Environmental Assessment Requirement (SEAR) dated 18 August, 2014. This AIA will qualify the tree protection measures identified at *9.7 Impacts to trees* of the Work Plan (AECOM November 2014).

2.1.7 Australian Standard *AS4970-2009 Protection of trees on development sites* has been used as a guiding document in the preparation of this report.

2.1.8 The aims and objectives of the City of Sydney Development Control Plan (2012) Section 3.5.3 Tree Management controls have been acknowledged as all trees assessed are protected under this DCP.

2.2 THE SUBJECT SITE

2.2.1 The SSD 6617-2014 works is comprised of the Hickson Road road reserve. This area is indicated on *Remediation and Land Forming Development Application* SSD 5897-2013 *Locality/Context Plan – Option 1,* Drawing No. BB2_PA1_A003 Rev. A and *Remediation and Land Forming Development Application* SSD 5897-2013 *Locality/Context Plan – Option 2,* Drawing No. BB2_PA1_A004 Rev. A prepared by Lend Lease.

2.2.2 The SSD 6617-2014 work encompasses the Hickson Road part of the EPA Declaration Area No. 21122 the area of adjacent land potentially to be used for staging and the undertaking of proposed works.

2.2.3 The impact on trees of remediation works within Block 4 and Block 5 has been assessed under separate reports prepared by Tree Wise Men® Australia Pty Ltd.

[2] Ref: 2095AIAMP100087TrialFinal.

2.2.4 There are commercial (30 Hickson Rd) and residential (38 Hickson Rd) properties adjoining to the east. Blocks 4 and 5 remediation and site development works are to be undertaken to the west.

2.2.5 Hickson Road is lined with Hills Figs, *Ficus microcarpa var. Hillii* of varying size, age, vigour and condition. Tree 45, a semi-mature, planted Moreton Bay Fig, *Ficus macrophylla* has a portion of its canopy overhanging the subject site.

2.2.6 Refer to the Detail Survey by Rygate and Company Pty Ltd (Ref: 74479, Rev. J 23.02.11) for further detail of the existing site features.

2.2.7 Refer to the geotechnical drawings (*Figures*) contained in the *Specialist Desktop Geotechnical Report*, 5 November, 2014 prepared by Coffey Geotechnics Pty Ltd for further detail on the existing below ground features of the site.

2.3 THE SUBJECT TREES

2.3.1 The general findings and data collected for each of the subject trees within 10 metres of the proposed works are contained in Tree Schedule – Option 1 (Attachment A) and Tree Schedule – Option 2 (Attachment B).

2.3.2 There is no observable detrimental impact on tree health from the reported contamination.

2.3.3 All assessed trees are protected under the City of Sydney Development Control Plan (2012) Section 3.5.3 Tree Management controls.

2.3.4 Tree 10 was previously removed as part of a separate Approval associated with MP10_0023. Trees 9, 11, 30, 35, 36 and 48 have previously been removed from within Hickson Road road reserve.

2.3.5 Refer to the Tree Protection Plan – Option 1 (Attachment C) and Tree Protection Plan – Option 2 (Attachment D) for location and Tree Protection Zones of the assessed trees. The nominal Tree Protection Zones for all existing trees are indicated as coloured circles on the Tree Protection Plans. The actual spread of roots is likely to be restricted by existing structures such as kerb and gutters, carriageway and walling at the boundary of Block 4 and Block 5. Large surface roots exist adjacent to the back-of-kerb for many of the mature Hills Figs, *Ficus microcarpa var. Hillii*. These existing restrictions to root spread will need to be considered during the works and acknowledged by the Project Arborist when making specific impact assessments.

2.3.6 Of particular note is the observed concentration of tree roots within the footpath on the western side of Hickson Road. Particular attention will be required during the installation of wells within this zone to avoid damage to roots.

2.3.7 Given the existing constraints to root spread resulting in heavily skewed root arrangement, transplantation of only the smallest of the Hills Figs, *Ficus microcarpa var. Hillii* would be feasible.

2.4 THE PROPOSALS

2.4.1 Soil remediation works under SSD 6617-2014 are being assessed under two alternative Options:

- Option 1 involves the In-Situ ISCO method which will avoid bulk earthworks within Hickson Road. For Option 1 works to proceed, the Trial SISCO®/SEPR® (MP10_0087) will need to be successful.
- Option 2 involves the Ex-Situ, bulk earthwork removal of contaminated soils with associated impacts on tree root systems.

2.4.2 **Option 1 (In-Situ remediation):** If selected as the preferred option following pilot trials the In-Situ works proposed will be undertaken using *In-situ Chemical Oxidation (ISCO)* methodology. The remediation works are as indicated on the *EPA Declaration No. 21122 Option 1 – Staging Plans,* 226463-CCT-SKT-2014 – 2022, dated 21/08/14, prepared by ARUP.

2.4.3 Some of the chemicals used in the ISCO treatment have potential phytotoxicity impacts on existing trees. The ISCO Remediation Overview of the Work Plan states:

> *" .....Oxidants typically used in ISCO are:*
> - *Sodium/potassium permanganate*
> - *Activated persulphate*
> - *Hydrogen peroxide (as Fentons reagent)*
> - *Ozone....."*

As substances are injected into soils in the vicinity of tree roots, there will be alteration to the existing mix of gases (oxygen and carbon dioxide) and water within the soil matrix. The impacts of these In-Situ works will be monitored by the Project Arborist in coordination with Monitoring Plan detailed at 10.0 of the Work Plan (AECOM November 2014).

Refer to Section 10.0 of the *Root Mass Investigation*, November, 2012 prepared by AECOM for the results of a desktop phytotoxicity study. Caution and ongoing monitoring is required during the works.

The report states:

> *"While there is a general lack of literature assessing the specific phytotoxicity of S-ISCO chemicals, case studies in which S-ISCO has been successfully implemented indicate there were no adverse effects to the surrounding environment, including plants." (VeruTEK® 2011b)*

2.4.4 The works to be undertaken within the Tree Protection Zones of the existing trees will be monitored by the Project Arborist. Refer to Section 4 below for tree protection requirements.

2.4.5 Where applicable, the findings from the MP10_0087 Trial SISCO®/SEPR® project will be incorporated into the tree protection monitoring and management for any Full Scale SSD 6617-2014 works.

2.4.6 **Option 2 (Ex-Situ Remediation):** The Ex-Situ works involve the removal of contaminated soil using conventional bulk earthworks techniques. There will be damage to the root systems of the existing trees within the footprint of the bulk earthworks thus necessitating tree removal. Tree removal is indicated at Stage 1 of the works (226463-CCT-SKT-2023/C).

2.4.7 The works to be undertaken within the Tree Protection Zones of the retained adjacent trees will be monitored by the Project Arborist. Refer to Section 5 below for tree protection requirements.

2.4.8 Trees of the same species will be replanted in the same locations as those removed from the Hickson Road area, following completion of works.

3. METHODOLOGY

3.1 DATA COLLECTION

3.1.1 Tree related data for this AIA was collected on:

- 1 October, 18 November and 3 December, 2010
- 3 February and 6 May, 2011
- 7 August and 3 October, 2012
- 21 August, 2014.

The inspection of 3.02.2011 was to identify locations for the test excavations by AECOM so as to determine root growth adjacent to the existing Hickson Road pavement. The inspection of 6.05.2011 was to determine the extent of crown and root pruning required for the MP10_0087 works. The inspection of 21.08.14 was to verify all existing tree data.

3.1.2 The inspections were ground level, visual tree assessments (VTA)[3]. No aerial (climbing) inspections, woody tissue testing or tree root mapping were undertaken as part of these assessments.

3.1.3 Tree numbering system used in this report and earlier Tree Wise Men® Australia Pty Ltd documents differs from that numbering system used by Arterra Design Pty Ltd (*Routine Street Tree Inspection – Hickson Road, Napoleon Street – Precautionary Review*, dated 15 May 2014). Arterra Design has been engaged by the Barangaroo Development Authority.

3.1.4 Attachments A & B provide definition of terms used in this Report. Tree heights were estimated. Trunk diameter at breast height (DBH) was measured at 1.4 metres above ground level and rounded to the nearest 0.1 metre. Structural Root Zones (SRZ) and Tree Protection Zones (TPZ) were also rounded to the nearest 0.5 metre. The TPZs shown on the Tree Protection Plans are indicative only and do not account for likely root spread constrictions by existing structures such as kerb and gutters and carriageway sub-base.

3.1.5 All tree offsets mentioned in this Report are to centre of trunk unless otherwise stated.

3.2 DOCUMENTS AND PLANS REFERENCED

3.2.1 The following documents have been reviewed in the preparation of this AIA:

- *Secretary's Environmental Assessment Requirements (SEARS) for SSD 6617-2014, Department of Planning & Environment*.
- *EPA Declaration No. 21122 Option 1 – Staging Plans,* 226463-CCT-SKT-2015 - 2022 dated 21.08.14 prepared by ARUP.
- *EPA Declaration No. 21122 Option 2 – Staging Plans,* 226463-CCT-SKT-2015 – 2028, dated 21.08.14 prepared by ARUP.

[3] VTA – Visual Tree Assessment, undertaken by tree professionals, is a recognised (International Society of Arboriculture, Journal of Arboriculture, Vol. 22 No. 6, Nov. 1996) systematic method of identifying tree characteristics and hazard potential. VTA is also an assessment method described by Claus Mattheck in *The Body Language of Trees – A handbook for failure analysis*. The Stationery Office, London (1994)

- *Remediation and Land Forming Development Application* SSD 6617-2014 *Locality/Context Plan,* Drawing No. BB0_PA1_A003 Rev. B, prepared by Lend Lease 17 July, 2014
- *AS4970-2009 Protection of trees on development sites*.
- *Detail Survey, 74479-1, 18.10.10 prepared by Rygate & Company Surveyors.*
- *Detail Survey, 74479 Rev J, 23.02.11 prepared by Rygate & Company Surveyors*.
- *In Situ Soil and Water Impact Assessment*, February, 2015, prepared by AECOM Australia Pty Ltd.
- *Specialist Desktop Geotechnical report, November 2014 prepared by Coffey Geotechnics Pty Ltd*
- *Root Mass Investigation, Hickson Road, Millers Point, NSW*, November, 2012 *AECOM* Australia Pty Ltd.
- *Preliminary Work Plan for In-Situ Chemical Oxidation, Hickson Road Declaration Area, Barangaroo NSW AECOM November 2014.*

3.3 AUSTRALIAN STANDARD *AS4970-2009*

3.3.1 The Australian Standard *AS 4970–2009 Protection of trees on development sites* has been used as a guiding document in the preparation of this AIA. The terminology and impact assessment methodology have been adopted from this document. This AIA complies with *2.3.5 Arboricultural Impact Assessment* of AS4970-2009.

3.3.2 Tree Protection Zone (TPZ) and Structural Root Zone (SRZ) are as per *Section 3* of *AS4970-2009* and are defined in the Definition of Terms attached to the Tree Schedules.

3.3.3 "Construction" for the purpose of this AIA means excavation (greater than 100mm), compacted fill or machine trenching[4]. "Excavation" includes cut batters, boxing–out for the various pavement types and trenching for conduits.

3.3.4 All trees with construction within TPZ offsets will be monitored by the Project Arborist. The tree protection recommendations detailed at Sections 4 and 5 are to be implemented.

3.3.5 Refer to the Tree Schedules (Attachments A & B) for detail of proposed crown and root pruning. Where extent of root pruning required beneath pavement is unknown, assessment, treatment and reporting will be undertaken during works. Crown pruning is required for the proposed traffic diversions. The crown pruning indicated, will achieve a 4.3 metres clearance above the existing gutter for tall vehicles.

[4] "Construction" is equivalent to "works" as defined at 1.4.9 of AS4970-2009.

4. TREE MANAGEMENT PLAN – OPTION 1 (IN-SITU)

4.1 IN-SITU REMEDIATION

4.1.1 The In-Situ remediation works are as outlined in the Option 1 Staging Plans, Issue C, dated 18.09.14, prepared by ARUP and the Work Plan (AECOM 11.09.14). The Tree Schedule (Attachment A) and Tree Protection Plan (Attachment C) identify which trees need to be removed and outline the key tree protection measures required during the works. The **Tree Management Requirements** below qualify these key protection measures.

4.1.2 Tree 10 was previously removed as part of a separate Approval associated with MP10_0023. Trees 9, 11, 30, 35, 36 and 48 have also been removed from the Hickson Road, road reserve.

4.2 TREE IMPACTS

4.2.1 **Tree Removal:** No trees will need to be removed:

4.2.2 **Tree Retention:** The following trees will be retained and protected: Trees 1-8, 12-29, 31-34, 37-47 and Trees 49-53.

4.3 TREE MANAGEMENT REQUIREMENTS

4.3.1 **Project Arborist:** An Arborist (the Project Arborist with AQF Level 5 qualifications) experienced in tree protection on construction sites should be engaged prior to the commencement of demolition or Site establishment works. The Project Arborist will monitor and report regularly to the site Supervisor on the condition and protection of the retained trees. The Project Arborist is to monitor any excavation, machine trenching or compacted fill placed within the Tree Protection Zone (TPZ) of the retained trees.

Refer to the Tree Schedule (Attachment A) for TPZ radii.

The schedule of works for the development must acknowledge the role of the Project Arborist and the need to protect the retained trees. Sufficient notice must be given to the Project Arborist where his/her attendance is required. Should the proposed design change from that reviewed, additional arboricultural assessment will be required.

We recommend that the Proponent offer a similar tree protection commitment to Commitment 6.11 of SSD 6617 – 2014:

"An appropriately qualified Arborist (the Project Arborist) will be engaged to identify any required tree protection measures required for the proposed scope of works and to monitor the site establishment works."

4.3.2 **Certification:** The Project Arborist should certify tree protection measures at key stages of the construction. Certification should coincide with the five (5) Stages of the ARUP Staging Plans. Copies of the Certification should be sent to the Site Supervisor.

4.3.3 **Early Works/Site Preparation:** Co-ordination with contractors for ISCO site preparation works is required. The Project Arborist needs to be informed of all potentially damaging or phytotoxic processes.

4.3.4 **Tree Removal**: No tree removal is proposed under Option 1.

4.3.5 **ISCO Methodology:** The Project Arborist is to be informed of all substances/chemicals to be used in the ISCO remediation works to ensure that no unexpected phytotoxic impacts result. The installation of wells within the western footpath area will need particular review so as to avoid road damage. Tree roots have been concentrated in this area by the kerb and gutter and retaining wall at the property boundary.

4.3.6 **Tree Protection Zone (TPZ):** The TPZ is the area requiring tree protection and monitoring. All works within the TPZs are to be monitored. The TPZ of each of the trees is indicated on the Tree Protection Plan (Attachment C). The crown projection (dripline) is included in the TPZ. The TPZs are indicative only. Roots may be confined by existing road pavement or other substantial structures.

4.3.7 **Structural Root Zone (SRZ):** The SRZ is the area around the base of a tree required for the tree's stability in the ground. Refer to the Tree Schedule (Attachment A) for SRZ radii.

4.3.8 **Tree Protection Fencing:** As much as possible of the TPZ area should be fenced to prohibit potentially damaging construction activities. Given the in-situ nature of the works and the requirement for maintenance of existing traffic and pedestrian movements, complete TPZ fencing will not be possible. Tree Protection Fencing is to be installed as indicated on the Tree Protection Plan. Fencing is to comply with Figure 03 of the Tree Protection Plan (Sheet 3 of 3).

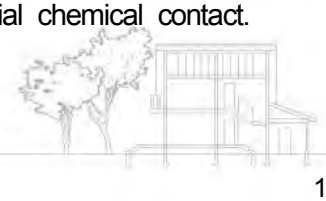
4.3.9 **Trunk, Branch and Ground Protection:** Where works are required within TPZ offsets and fencing cannot be installed, trunk, branch and ground protection may need to be installed. If required, such protection measures are to comply with Figure 04 of the Tree Protection Plan (Sheet 3 of 3) or as directed by the Project Arborist.

4.3.10 **Signs:** Signs are to be placed at regular intervals on the tree protection fencing and site security fencing stating: *Tree Protection Fencing.*

4.3.11 **Hoarding or Scaffolding:** If scaffolding is required, it is to comply with Figure 05 of the Tree Protection Plan (Sheet 3 of 3). If hoarding is required it is to comply with the City of Sydney Hoarding policy: *Policy for the Design of Construction Hoardings*. Crown pruning is to be minimised wherever possible as part of hoarding erection. No crown pruning is to be undertaken without approval from the Project Arborist or the relevant consent authority.

4.3.12 **Prohibited Activities Within Tree Protection Zone (TPZ):** The following potentially damaging activities are to be prohibited within the TPZ offsets unless particular rootzone protection recommendations are provided by the Project Arborist: stockpiling, storage or preparation of materials, parking of machinery, machinery trenching.

4.3.13 **Trenching Within Tree Protection Zone (TPZ):** Trenching may be required for the ISCO infrastructure installation/operation. Wherever possible machinery trenching is to be avoided within TPZ offsets. Where this is not possible, hand excavation or trenchless, direction boring is to be used. Specific assessment of actual TPZ root loss should be sought from the Project Arborist. If trenching is required within TPZ it is to be undertaken by hand with no roots greater than 30mm diameter cut. Conduits are to be feed under or over roots wherever possible. All cut roots are to be logged and recorded by the Project Arborist. Cut roots are to be covered with moist hessian or equivalent biodegradable matting to buffer drying and potential chemical contact. Trenches are to be left open for as short a period as possible.



Where the extent of root pruning is unknown due to existing pavement cover, assessment, treatment and reporting will be undertaken during the works by the Project Arborist.

4.3.14 **Trenching Within Structural Root Zone (SRZ):** No trenching or drilling is currently proposed within the SRZ of any existing trees. Tree stability can be compromised if trenching and root cutting are undertaken within the SRZ. If trenching is required within a SRZ, it is to be undertaken by hand, with specific instructions from Project Arborist. No roots greater than 30mm diameter are to be cut. All cut roots are to be logged and recorded by the Project Arborist for assessment of impact on tree stability. Cut roots are to be covered with moist hessian or equivalent biodegradable matting if potentially damaging substances are to be used within the trench. Trenches are to be left open for as short a period as possible.

4.3.15 **Drilling Within TPZ or SRZ:** The indicative well drilling within the remediation area is outlined on Figure F3 of the Work Plan (AECOM 11.09.14). The location of the wells is to avoid damage to roots greater than 30mm diameter.

4.3.16 **Existing Pavement:** Retain existing road and footpath pavements intact wherever possible within TPZ offsets to protect underlying roots from construction activity. The SSD 6617-2014 works extend to the facades of the existing buildings on the eastern side of Hickson Road. If existing pavement needs to be demolished within TPZ offsets and roots are observed beneath, these roots are to be covered immediately with topsoil, wood mulch or steel plating depending upon construction proposed.

4.3.17 **Traffic Diversion:** All traffic diversion devices are to be installed with adequate rootzone protection as per Fig. 04 of the Tree Protection Plan (Attachment C).

4.3.18 **Crown Pruning:** There is to be no crown pruning on any tree without approval from the Project Arborist or the relevant Consent authority. All approved crown pruning is to comply with *AS4373–2007 Pruning of amenity trees.* All pruning works are to be undertaken by qualified contracting Arborist with minimum arboricultural qualification of AQF Level 3 (Certificate) with monitoring by the Project Arborist.

Drilling for various wells is proposed within the crown spread of Trees 16, 17, 18, 21, 22, 24, 44 and Tree 47. The Project Arborist is to liaise with the drilling contractor, to minimise the crown pruning.

Hoarding erection may require minor crown pruning on Trees 13-25. Limbs are to be retained and wrapped (as per Fig. 04 of the Tree Protection Plan) wherever possible.

As the height of machinery to be used is not yet known, an accurate assessment cannot be made of the amount (if any) crown pruning that is required over the in-situ works. Further assessment of actual pruning will be required at part of construction documentation.

The crown pruning required above the existing gutter to provide a 4.3 metres vehicular clearance for temporary diversion is indicated in the Tree Schedule (Attachment A). The diameter indicated is at nearest branch collar.

5. TREE MANAGEMENT PLAN – OPTION 2 (EX-SITU)

5.1 EX-SITU REMEDIATION

5.1.1 The Ex-Situ remediation works are as outlined in the Option 2 Staging Plans, Issue C dated 21.08.14, prepared by ARUP. The Tree Schedule – Option 2 (Attachment B) and Tree Protection Plan – Option 2 (Attachment D) identify which trees need to be removed and outline the key tree protection measures for retained trees. The **Tree Management Requirements** below qualify these key protection measures.

5.1.2 Tree 10 was previously removed as part of a separate Approval associated with MP10_0023. Trees 9, 11, 30, 35, 36 and 48 have also been removed from the Hickson Road, road reserve.

5.2 TREE IMPACTS

5.2.1 **Tree Removal**: The following trees will need to be removed: Trees 13-24 and Trees 46, 47 and 49.

Trees 13-24 and Trees 46, 47 and 49 are Hills Figs, *Ficus microcarpa var. Hillii* located on Hickson Road.

Trees 13-24 and Trees 46, 47 and 49 are within the footprint of the Declaration Area No. 21122.

5.2.2 **Tree Retention:** The following trees will be retained and protected: Trees 1-8, 12, 25-29, 31-34, 37-45 and Trees 50-53.

5.3 TREE MANAGEMENT REQUIREMENTS

5.3.1 **Project Arborist:** An Arborist (the Project Arborist) with AQF Level 5 qualifications experienced in tree protection on construction sites should be engaged prior to the commencement of demolition or site establishment works. The Project Arborist will monitor and report regularly to the Site Supervisor on the condition and protection of the retained trees. The Project Arborist is to monitor any excavation, machine trenching or compacted fill placed within the Tree Protection Zone (TPZ) of the retained trees.

Refer to the Tree Schedule (Attachment B) for TPZ radii.

The schedule of works for the development must acknowledge the role of the Project Arborist and the need to protect the retained trees. Sufficient notice must be given to the Project Arborist where his/her attendance is required. Should the proposed design change from that reviewed, additional arboricultural assessment will be required.

We recommend that the Proponent offer a similar tree protection commitment to Commitment 6.11 of SSD-6617-2014:

> *"An appropriately qualified Arborist (the Project Arborist) will be engaged to identify any required tree protection measures required for the proposed scope of works and to monitor the site establishment works."*

5.3.2 **Certification:** The Project Arborist should certify tree protection measures at key stages of the construction. Certification should coincide with the six (6) Stages of the ARUP Staging Plans. Copies of the Certification should be sent to the Site Supervisor.

5.3.3 **Early Works/Site Preparation:** Co-ordination with remediation works contractors for site preparation works is required. The Project Arborist needs to be informed of all potentially damaging construction processes.

5.3.4 **Tree Removal:** The Project Arborist is to direct the approved tree removal works and liaise with the contracting Arborist. Approval is required under the City of Sydney Development Control Plan (2012) Section 3.5.3 Tree Management controls. Tree removal is to comply with WorkCover NSW Code of Practice for the Amenity Tree Industry 1998. Tree removal works are to be undertaken by qualified contracting Arborist with minimum arboricultural qualification of AQF Level 3 (Certificate).

5.3.5 **Tree Protection Zone (TPZ):** The TPZ is the area requiring tree protection and monitoring for retained trees. All works within the TPZs are to be monitored. The TPZ of each of the trees is indicated on the Tree Protection Plan – Option 2 (Attachment D). The crown projection (dripline) is included in the TPZ. The TPZs are indicative only. Roots may be confined by existing road pavement or other substantial structures. The depth of the root zone may be confined by bedrock in particular locations.

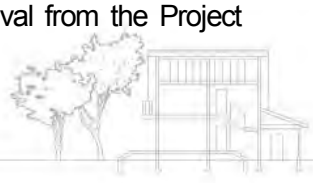
5.3.6 **Structural Root Zone (SRZ):** The SRZ is the area around the base of a tree required for the tree's stability in the ground. Refer to the Tree Schedule (Attachment B) for SRZ radii.

5.3.7 **Tree Protection Fencing:** As much as possible of the TPZ area should be fenced to prohibit potentially damaging construction activities. Given the ex-situ nature of the works and the requirement for maintenance of existing traffic and pedestrian movements, complete TPZ fencing will not be possible. Tree Protection Fencing is to be installed as indicated on the Tree Protection Plan – Option 2. Fencing is to comply with Figure 03 of the Tree Protection Plan – Option 2 (Sheet 3 of 3).

5.3.8 **Trunk, Branch and Ground Protection:** Where works are required within TPZ offsets and fencing cannot be installed, trunk, branch and ground protection may need to be installed. If required such protection measures are to comply with Figure 04 of the Tree Protection Plan – Option 2 (Sheet 3 of 3) or as directed by the Project Arborist.

5.3.9 **Signs:** Signs are to be placed at regular intervals on the tree protection fencing and site security fencing stating: *Tree Protection Fencing.*

5.3.10 **Hoarding or Scaffolding:** If scaffolding is required it is to comply with Figure 05 of the Tree Protection Plan – Option 2 (Sheet 3 of 3). If hoarding is required it is to comply with the City of Sydney Hoarding policy: *Policy for the Design of Construction Hoardings*. Crown pruning is to be minimised wherever possible as part of hoarding erection. No crown pruning is to be undertaken without approval from the Project Arborist or the relevant consent authority.



5.3.11 **Prohibited Activities Within Tree Protection Zone (TPZ):** The following potentially damaging activities are to be prohibited within the TPZ offsets unless particular rootzone protection recommendations are provided by the Project Arborist: stockpiling, storage or preparation of materials, parking of machinery, machinery trenching.

5.3.12 **Trenching Within Tree Protection Zone (TPZ):** Wherever possible, machinery trenching is to be avoided within TPZ offsets. Where this is not possible, hand excavation or trenchless direction boring is to be used. Specific assessment of actual TPZ root loss should be sought from the Project Arborist. If trenching is required within TPZ it is to be undertaken by hand with no roots greater than 30mm diameter cut. Conduits are to be feed under or over roots wherever possible. All cut roots are to be logged and recorded by the Project Arborist. Cut roots are to be covered with moist hessian or equivalent biodegradable matting to buffer drying and potential chemical contact. Trenches are to be left open for as short a period as possible.

Where the extent of root pruning is unknown due to existing pavement cover, assessment, treatment and reporting will be undertaken during the works by the Project Arborist.

5.3.13 **Trenching Within Structural Root Zone (SRZ):** No trenching is currently proposed within the SRZ of any existing trees. Tree stability can be compromised if trenching and root cutting are undertaken within the SRZ. If trenching is required within a SRZ, it is to be undertaken by hand, with specific instructions from Project Arborist. No roots greater than 30mm diameter are to be cut. All roots cut are to be logged and recorded by the Project Arborist for assessment of impact on tree stability. Cut roots are to be covered with moist hessian or equivalent biodegradable matting if potentially damaging substances are to be used within the trench. Trenches are to be left open for as short a period as possible.

5.3.14 **Existing Pavement:** Retain existing road and footpath pavements intact wherever possible within TPZ offsets to protect underlying roots from construction activity. The SSD 6617 – 2014 works extent to the facades of the existing buildings on the eastern side of Hickson Road. If existing pavement needs to be demolished within TPZ offsets and roots are observed beneath, these roots need to be covered immediately with topsoil, wood mulch or steel plating depending upon works proposed.

5.3.15 **Traffic Diversion:** All traffic diversion devices (Stage 4 and Stage 7) are to be installed with adequate rootzone protection as per Fig. 04 of the Tree Protection Plan – Option 2 (Attachment D).

5.3.16 **Crown Pruning:** There is to be no crown pruning on any tree without approval from the Project Arborist or the relevant Consent authority. All approved crown pruning is to comply with *AS4373–2007 Pruning of amenity trees.* All pruning works are to be undertaken by qualified contracting Arborist with minimum arboricultural qualification of AQF Level 3 (Certificate) with monitoring from the Project Arborist.

Hoarding erection may require minor crown pruning on Trees 13-25. Limbs are to be retained and wrapped (as per Fig. 04 of the Tree Protection Plan – Option 2) wherever possible.

As the height of machinery to be used is not yet known, an accurate assessment cannot be made of the amount (if any) crown pruning that is required over the ex-situ works. Further assessment of actual pruning will be required at part of construction documentation.

The crown pruning required above the existing gutter to provide a 4.3 metres vehicular clearance for temporary diversion is indicated in the Tree Schedule (Attachment B). The diameter indicated is at nearest branch collar.

5.3.17 **Replacement Hills Figs:** Replacement Hill's Figs, *Ficus microcarpa var. Hillii* are to be provided for removed Hills Figs (Trees 13-24, 46, 47 and 49) located on Hickson Road. The trees should be a minimum of 300 litre container and comply with Natspec document *Specifying Trees – a guide to assessment of tree quality.* The trees in Hickson Road are the same species (cultivar) as is in the Main Avenue of Hyde Park, Sydney. The replacement trees should be the same quality as those to be used by City of Sydney for replanting within Hyde Park. The existing rootplates of removed trees should be excavated to allow for the formation of new tree pits. The new tree pit design should be approved by the relevant authority.

Attachment A: Tree Schedule – OPTION 1 (In-Situ)

Tree Schedule - Hickson Road Remediation DA, Barangaroo SSD 6617 (Option 1: In-Situ Remediation)

TREE No.	COMMON NAME/ GENUS SPECIES	DBH (m)	HEIGHT (m)	CANOPY RADIUS (m)	AGE CLASS	VIGOUR	CONDITION	SRZ RADIUS (m)	TPZ RADIUS (m)	SULE	©SIG RATING	©RETENTION INDEX	RECOMMENDATION	DIAM. OF & HEIGHT TO 1ST BRANCH ABOVE GUTTER (m)	PRUNING TO ACHIEVE 4.3m CLEARANCE AT GUTTER - DIAMETER AT BRANCH COLLAR	COMMENTS
1	Hills Fig, *Ficus microcarpa var. Hillii*	0.6	12	N8, S7, E7, W8	M	G	F	2.7	7.2	M	2	A	R+	0.2 @ 3.7	***100, 200, 150***	*Retain. 1st Order bark inclusion, S side at 2m. Basal wound SE side. Minor pavement uplift.*
2	Hills Fig, *Ficus microcarpa var. Hillii*	0.4	10	5	M	F	F	2.3	4.8	M	2	A	R+	0.1 @ 3.5	***80, 100, 50, 100***	*Retain. Partial 1st Order bark inclusion, on both N and W sides at 2m. Minor pavement uplift. Foliage yellowing 21.8.14.*
3	Hills Fig, *Ficus microcarpa var. Hillii*	0.5	10	6	M	G	F	2.5	6.0	M	2	A	R+	0.2 @ 3.0	***200, 200, 100, 250, 180***	*Retain. Recent mechanical damage to W side. 1st Order bark inclusion on both N and W sides at 2m. Minor pavement uplift. Crown spread 7m E side.*
4	Hills Fig, *Ficus microcarpa var. Hillii*	0.4	10	5	M	P	F	2.3	4.8	S	2	B	R+	0.1 @ 3.2	***50, 100, 100, 100, 150***	*Retain. Partial 1st Order bark inclusion, on both W and SE sides at 2m. Minor pavement uplift.*
5	Hills Fig, *Ficus microcarpa var. Hillii*	0.5	11	6	M	F	F	2.5	6.0	M	2	A	R+	0.25 @ 2.5	***250, 50, 100***	*Retain. Gas inspection pit 1m to SW. Stormwater inlet pit 2m to S. Moderate pavement uplift.*
6	Hills Fig, *Ficus microcarpa var. Hillii*	0.4	10	5	M	P	F	2.3	4.8	M	2	A	R+	0.15 @ 3.3	***150, 50, 150***	*Retain. 1st Order bark inclusion, N side at 2m. Minor pavement uplift.*
7	Hills Fig, *Ficus microcarpa var. Hillii*	0.5	10	6	M	G	F	2.5	6.0	M	2	A	R+	0.25 @ 3.5	***250, 200, 180***	*Retain. Minor pavement uplift. Record pruning in lower crown.*
8	Hills Fig, *Ficus microcarpa var. Hillii*	0.5	10	N5, S6, E6, W5	M	F	F	2.5	6.0	M	2	A	R+	0.15 @ 3.1	***150, 180, 50***	*Retain. Root run at back of curb from Tree 9 to S. Moderate pavement uplift. Recent vehicular entrance Gate H4.1 to N. & Gate 4 to S.*
12	Hills Fig, *Ficus microcarpa var. Hillii*	0.6	12	10	M	G	F	2.7	7.2	M	2	A	R+	0.3 @ 3.1	***300, 180, 180, 150***	*Retain. 1st Order bark inclusion on both NE and SW sides. Stormwater inlet pit, 4m to NE. Bark wounding lower limbs. Major pavement uplift. Minor pruning N. side recent.*
13	Hills Fig, *Ficus microcarpa var. Hillii*	0.6	12	10	M	G	F	2.7	7.2	M	2	A	R+	0.4 @ 3.3	***450***	*Retain. 1st Order bark inclusion on both NE and SW sides. Major pavement uplift.*
14	Hills Fig, *Ficus microcarpa var. Hillii*	0.5	11	7	M	G	F	2.5	6.0	M	2	A	R+	0.25 @ 4.0	***100, 120, 300***	*Retain. 1st Order bark inclusion on both SE and SW sides. Optus Pit 5m to S. Stormwater inlet pit 4m to SE. Root run at back of kerb, 5m to N. Major pavement uplift.*
15	Hills Fig, *Ficus microcarpa var. Hillii*	0.5	12	6	M	G	F	2.5	6.0	M	2	A	R+	0.18 @ 3.9	***40, 50, 180***	*Retain. Branch failure E side at 2m. Bark wounding SE side. Lamp pole 4m to S. Moderate pavement uplift.*
16	Hills Fig, *Ficus microcarpa var. Hillii*	0.5	13	7	M	G	F	2.5	6.0	M	2	A	R+	0.3 @ 4.0	***300, 100, 50, 50, 50*** - *descending*	*Retain. 1st Order bark inclusion on SE side. Bike parking adjacent to W side. Moderate pavement uplift.*

TREE No.	COMMON NAME/ GENUS SPECIES	DBH (m)	HEIGHT (m)	CANOPY RADIUS (m)	AGE CLASS	VIGOUR	CONDITION	SRZ RADIUS (m)	TPZ RADIUS (m)	SULE	©SIG RATING	©RETENTION INDEX	RECOMMENDATION	DIAM. OF & HEIGHT TO 1ST BRANCH ABOVE GUTTER (m)	PRUNING TO ACHIEVE 4.3m CLEARANCE AT GUTTER - DIAMETER AT BRANCH COLLAR	COMMENTS
17	Hills Fig, *Ficus microcarpa var. Hillii*	0.5	16	N12, S5, E6, W10	M	G	F	2.5	6.0	M	2	A	R+	0.4 @ 3.8	***400, 300***	*Retain. Root run at back of kerb, 6m to N. Broken limbs N and S. Major pavement uplift. Pumpstation to W.*
18	Hills Fig, *Ficus microcarpa var. Hillii*	0.7	18	N5, S5, E10, W10	M	G	F	2.8	8.4	M	2	A	R+	0.25 @ 3.8	***250, 50, 350***	*Retain. Root run at back of curb, 7m to N. Building adjacent to W. Major pavement uplift. See original.*
19	Hills Fig, *Ficus microcarpa var. Hillii*	0.7	16	N6, S6, E12, W12	M	G	F	2.8	8.4	M	2	A	R+	0.4 @ 3.5	***400***	*Retain. Trunk wound, SE side at 2m. Building adjacent to west. Major pavement uplift. Trunk protection in place.*
20	Hills Fig, *Ficus microcarpa var. Hillii*	0.6	15	N5, S7, E7, W6	M	G	F	2.7	7.2	M	2	A	R+	0.3 @ 3.6	***300, 180***	*Retain. Branch failure, NE side at 1-3m. Sewage inspection pit 1m to NW. Minor pavement uplift. Trunk protection in place.*
21	Hills Fig, *Ficus microcarpa var. Hillii*	0.4, 0.5	14	N5, S6, E7, W8	M	G	F	2.8	7.2	M	2	A	R+	0.4 @ 2.9	***400***	*Retain. Gas inspection pit in gutter, 1m to SE. Limb failure, NE at 4m. Building adjacent to W. Stormwater inlet 2m to SE. Minor pavement uplift. Trunk protection in place.*
22	Hills Fig, *Ficus microcarpa var. Hillii*	0.4	9	N2. S6, E2, W6	M	P	P	2.3	4.8	S	3	C	R+	0.05 @ 4.1	***100, 50***	*Retain. Major branch failure, N at 2m. Minor pavement uplift. Trunk protection in place.*
23	Hills Fig, *Ficus microcarpa var. Hillii*	0.5	10	N6, S4, E5, W6	M	P	F	2.5	6.0	S	2	B	R+	0.2 @ 3.7	***200***	*Retain. Minor pavement uplift. Trunk protection in place.*
24	Hills Fig, *Ficus microcarpa var. Hillii*	0.5	12	N5, S5, E8, W8	M	P	F	2.5	6.0	S	2	B	R+	0.05 @ 3.7	***50, 180, 150***	*Retain. Recent pruning N side. Moderate pavement uplift. Trunk protection in place.*
25	Hills Fig, *Ficus microcarpa var. Hillii*	0.6	15	9	M	P	F	2.7	7.2	M	2	A	R+	0.15 @ 4.5		*Retain. Recent pruning in lower crown. Water main inspection pit 1m to E. Major pavement uplift.*
26	Hills Fig, *Ficus microcarpa var. Hillii*	0.0	8	3	SM	G	F	1.5	2.0	M	3	B	R+	0.15 @ 3.0	***180, 150***	*Retain. Minor pavement uplift. (Approximate DBH given trunk battening) Trunk protection in place.*
27	Hills Fig, *Ficus microcarpa var. Hillii*	0.2	9	4	SM	F	F	1.7	2.4	M	3	B	R+	0.05 @ 5.9		*Retain. Hoarding adjacent. Sewer pit 1m to NE. Minor pavement uplift. (Approximate DBH given trunk battening)*

TREE No.	COMMON NAME/ GENUS SPECIES	DBH (m)	HEIGHT (m)	CANOPY RADIUS (m)	AGE CLASS	VIGOUR	CONDITION	SRZ RADIUS (m)	TPZ RADIUS (m)	SULE	©SIG RATING	©RETENTION INDEX	RECOMMENDATION	DIAM. OF & HEIGHT TO 1ST BRANCH ABOVE GUTTER (m)	PRUNING TO ACHIEVE 4.3m CLEARANCE AT GUTTER - DIAMETER AT BRANCH COLLAR	COMMENTS
28	Hills Fig, *Ficus microcarpa var. Hillii*	0.6	15	8	M	P	F	2.7	7.2	M	2	B	R+	0.4 @ 3.3		*Retain. Hoarding adjacent. Twin trunked from 1.5m. Moderate pavement uplift. Recent pruning W side.*
29	Hills Fig, *Ficus microcarpa var. Hillii*	0.5	11	6	M	F	F	2.5	6.0	M	2	B	R+	0.2 @ 5.4		*Retain. Wounding to NW side at 2m. Minor pavement uplift. See original. (Approximate DBH given trunk battening) Recent pruning W side.*
31	Hills Fig, *Ficus microcarpa var. Hillii*	0.3	9	3	SM	G	F	2.0	3.6	M	3	B	R+	0.10 @ 4.2	***150***	*Retain. Building adjacent to E.*
32	Hills Fig, *Ficus microcarpa var. Hillii*	0.2	8	2	SM	F	F	1.7	2.4	M	3	B	R+	0.05 @ 4.3		*Retain. Bark wound NE side at 1m. Building adjacent to E.*
33	Hills Fig, *Ficus microcarpa var. Hillii*	0.3	9	3	SM	F	F	2.0	3.6	M	3	B	R+	0.1 @ 4.5		*Retain. Building adjacent to E.*
34	Hills Fig, *Ficus microcarpa var. Hillii*	0.2	9	3	SM	P	F	1.7	2.4	M	3	B	R+	0.02 @ 5.0		*Retain. Gas inspection pit 2m to NE. Building adjacent to E.*
37	Hills Fig, *Ficus microcarpa var. Hillii*	0.2	6	2	SM	F	F	1.7	2.4	M	3	B	R+			*Retain. Building adjacent to E. Power lines above crown.*
38	Hills Fig, *Ficus microcarpa var. Hillii*	0.3	8	N0, S6, E2, W4	SM	F	F	2.0	3.6	M	3	B	R+	0.15 @ 4.0	***200***	*Retain. Building adjacent to east. Power lines above crown.*
39	Hills Fig, *Ficus microcarpa var. Hillii*	0.3	12	N4, S5, E2, W5	SM	F	F	2.0	3.6	M	2	A	R+	0.1 @ 4.6		*Retain. Wall adjacent to E.*
40	Hills Fig, *Ficus microcarpa var. Hillii*	0.4	12	N4, S5, E2, W6	SM	G	F	2.3	4.8	M	2	A	R+	0.15 @ 4.4		*Retain. Wall adjacent to E.*
41	Hills Fig, *Ficus microcarpa var. Hillii*	0.3	9	N5, S5, E1, W6	SM	G	F	2.0	3.6	M	3	B	R+	0.2 @ 3.8	***200, 150***	*Retain. Wall adjacent to E.*
42	Hills Fig, *Ficus microcarpa var. Hillii*	0.3	9	N4, S4, E1, W5	SM	G	F	2.0	3.6	M	3	B	R+	0.05 @ 4.8		*Retain. Tree at irregular setback, 2m. Telstra pit 1m to W. See original.*
43	Hills Fig, *Ficus microcarpa var. Hillii*	0.3	7	2	IM	G	F	2.0	3.6	M	3	B	R+	0.05 @ 3.7	***50***	*Retain. Tree pit details differs. Granite setts used rather than deco gravel.*

TREE No.	COMMON NAME/ GENUS SPECIES	DBH (m)	HEIGHT (m)	CANOPY RADIUS (m)	AGE CLASS	VIGOUR	CONDITION	SRZ RADIUS (m)	TPZ RADIUS (m)	SULE	©SIG RATING	©RETENTION INDEX	RECOMMENDATION	DIAM. OF & HEIGHT TO 1ST BRANCH ABOVE GUTTER (m)	PRUNING TO ACHIEVE 4.3m CLEARANCE AT GUTTER - DIAMETER AT BRANCH COLLAR	COMMENTS
44	Hills Fig, *Ficus microcarpa var. Hillii*	0.3	7	3	IM	F	F	2.0	3.6	M	3	B	R+	0.05 @ 3.9	***100***	*Retain. Building adjacent to E.*
45	Moreton Bay Fig, *Ficus macrophylla*	0.4	8	7	SM	G	F	2.3	4.8	M	3	B	R+			*Retain. Raised planter bed in the Bond forecourt. Not in road reserve.*
46	Hills Fig, *Ficus microcarpa var. Hillii*	0.3	7	N5, S5, E2, W6	IM	G	F	2.0	3.6	M	3	B	R+	0.05 @ 4.5		*Retain. Recent pruning SW side.*
47	Hills Fig, *Ficus microcarpa var. Hillii*	0.3	5	3	IM	G	F	2.0	3.6	M	3	B	R+	0.05 @ 4.0	***50, 20***	*Retain. Recent branch failure W side (truck damage). Recent pruning N side. Bark wounds W side at 2m.*
49	Hills Fig, *Ficus microcarpa var. Hillii*	0.3, 0.3	7	N5, S5, E3, W5	IM	G	F	2.3	4.8	M	3	B	R+	0.05 @ 4.0	***50, 50***	*Retain. Recent pruning in lower crown.*
50	Hills Fig, *Ficus microcarpa var. Hillii*	0.3 @ 1.0	6	3	IM	G	F	2.0	3.6	M	3	B	R+	0.05 @ 3.1		*Retain. Pruning recently undertaken. Truck damage to lower limbs. Damaged limb E side (storm damage)*
51	Fan Palm, *Washingtonia filifera*	0.4	8	3	M	G	G	2.3	4.8	M	3	B	R+	NA		*Retain. Located in planter bed, within road reserve.*
52	Fan Palm, *Washingtonia filifera*	0.4	8	3	M	G	G	2.3	4.8	M	3	B	R+	NA		*Retain. Located in planter bed, within road reserve.*
53	Fan Palm, *Washingtonia filifera*	0.5	8	3	M	G	G	2.5	6.0	M	3	B	R+	NA		*Retain. Located in planter bed, within road reserve.*
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TREE No.	COMMON NAME/ GENUS SPECIES	DBH (m)	HEIGHT (m)	CANOPY RADIUS (m)	AGE CLASS	VIGOUR	CONDITION	SRZ RADIUS (m)	TPZ RADIUS (m)	SULE	©SIG RATING	©RETENTION INDEX	RECOMMENDATION	DIAM. OF & HEIGHT TO 1ST BRANCH ABOVE GUTTER (m)	PRUNING TO ACHIEVE 4.3m CLEARANCE AT GUTTER - DIAMETER AT BRANCH COLLAR	COMMENTS

©RETENTION INDEX	NO. OF TREES
A	20
B	25
C	1
D	0

RECOMMENDATION	NO. OF TREES
R	0
R+	46
T	0
Rm	0

COMMON NAME/GENUS SPECIES CULTIVAR – Common names can vary with selected texts. Where species is unknown, "*sp*." indicated after genus. Where cultivar is unknown "*cv*" indicated after species. The number in brackets e.g. (x9) after the species indicates the number of trees in this tree group.

DBH – Diameter at Breast Height. Tree trunk diameter measured at breast height (1.4 metres above ground level). Fabric diameter tape is used which assumes a circular cross section. Multiple measurements indicate multiple trunks. More than three trunks are indicated as "multi". Where DBH measurement cannot be taken at 1.4m the height at which it has been taken is indicated in the Comments column.

CANOPY SPREAD RADIUS – Average canopy radius (widest + narrowest ÷ 2). Circular canopy depictions on Tree Plan/Survey are indicative only. Where canopy spread was significantly skewed, all four cardinal point measurements were recorded.

AGE CLASS – Immature (IM), Semi-mature (SM), Mature (M), Over-mature (OM). Assessment of the tree's current Age. A **Mature (M)** tree has reached a near stable size (biomass) above and below ground. Trees can have a Mature age class for >90% of life span. **Over-mature (OM)** trees show symptoms of irreversible decline and decreasing biomass.

VIGOUR – Good (G), Fair (F) or Poor (P). The general appearance of the canopy/foliage of the tree at the time of inspection. Vigour can vary with the season and rainfall frequency. A tree can have Good vigour but be hazardous due to Poor condition. A tree in Good vigour has the ability to sustain its life processes. Vigour is synonymous with health.

CONDITION – Good (G), Fair (F) or Poor (P). The general form and structure of the trunk/s and branching. Trunk lean, trunk/branch structural defects, canopy skewness or other hazard features are considered.

SRZ RADIUS – Structural Root Zone. The area around a tree required for tree stability. Earthworks should be prohibited within the SRZ. The area is calculated from the formula and graph at Figure 1 of AS4970-2009. The SRZ graph has been adapted from the work of Claus Mattheck (1994). DBH has been used instead of stem diameter above root buttress in the calculation of SRZ. 0.1m has been added to SRZ to allow for minor increases in stem diameter.

TPZ RADIUS – Tree Protection Zone. Radial offset (m) of twelve times (12X) trunk DBH measured from centre of trunk (for trees less than 0.3 metre DBH minimum TPZ is 2.0 metres). To satisfactorily retain the tree construction activity (both soil cut and fill) must be restricted within this offset. TPZ offsets are rounded to the nearest 0.1 metre. Existing constraints to root spread can vary TPZ. Generally an area equivalent to the TPZ should be available to the tree post development. Encroachment occupying up to 10% of the TPZ area is acceptable without detailed rootzone assessment. Encroachments greater than 10% require specific arboricultural assessment.

SULE – Safe Useful Life Expectancy. A systematic pre-development tree assessment procedure developed by Jeremy Barrell, Hampshire, England. The SULE method used in this assessment has been adapted for simplified use within the field. It gives a length of time that the Arborist feels a particular tree can be retained with an acceptable level of risk based on the information available at the time of the inspection. SULE ratings are **Long** (retainable for 40 years or more with an acceptable level of risk), **Medium** (retainable for 16-39 years), **Short** (retainable for 5-15 years) and **Removal** (tree requiring immediate removal due to imminent hazard or absolute unsuitability).

©SIG. RATING – ©Significance Rating Scale (see notes over)

©RETENTION INDEX (see notes over)

RECOMMENDATIONS – Retain ***(R)*** – Trees with no TPZ encroachments proposed; ***Retain Plus (R+)*** – Trees with variable but acceptable TPZ encroachments; ***Transplant*** **(T)** – Trees proposed to be transplanted or ***Remove (Rm)*** – Trees proposed to be removal to allow for the proposed works.

COMMENTS – Comments relating to notable tree features, the location, surrounding site features at the time of inspection and where applicable the reason for removal.

©SIG. RATING – ©Significance Rating Scale. A site specific qualitative evaluation of a tree relative to the existing landuse developed by Tree Wise Men® Australia Pty Ltd. Takes into consideration the impact of the tree on the surrounding landscape, streetscape and bushland. Rarity, habitat value, historical/cultural value and structural form of the tree are considered in this rating system. It is possible for a tree to have a Short SULE and a ©Significance Rating of 1. Likewise it is possible for a tree to be given a Long SULE and a ©Significance Rating of 4 (e.g. weed species). The ©Significance Ratings used in this Report are as outlined in Table 1.

Table 1: ©Significance Rating Characteristics

Rating	Significance	Characteristics (some or all)
©Sig. Rating 1	**Exceptional**	▪ Major contribution to site amenity ▪ Remnant specimen ▪ Heritage Listed ▪ Listed on Significant Tree Register ▪ Threatened Species ▪ Good vigour and condition ▪ Cultural significance ▪ Possible habitat for threatened fauna ▪ Excellent, well formed specimen ▪ Rare or unusual species ▪ Large above ground biomass ▪ Unique within the site and surrounds
©Sig. Rating 2	**High**	▪ Considerable contribution to site amenity ▪ Remnant specimen ▪ Good vigour and condition ▪ Threatened Species ▪ Cultural significance ▪ Possible habitat tree for threatened fauna ▪ Well formed specimen ▪ Rare or unusual species ▪ Large or moderate above ground biomass ▪ Other specimens with similar characteristics within the site and surrounds
©Sig. Rating 3	**Moderate**	▪ Minor contribution to site amenity ▪ Remnant or planted ▪ Fair or Poor vigour and condition ▪ Potential for growth ▪ Well formed or asymmetrical form ▪ Other specimens with similar characteristics within the site and surrounds
©Sig. Rating 4	**Low**	▪ Small/poor specimen ▪ Poor vigour and condition ▪ Inappropriate for the location ▪ Minor contribution to landscape amenity ▪ Easily replaced ▪ Weed species or TPO Exempt ▪ Hazardous ▪ Previously ©Sig. Rating 5 tree

©RETENTION INDEX. A site specific assessment of an individual tree's retention value developed by Tree Wise Men® Australia Pty Ltd. Incorporating SULE and ©Significance Rating each tree is allocated a retention value of A, B, C or D. The ©Retention Index values can be described as follows:

©Retention Value A	**Should be retained**	▪ Major redesign may be required (e.g. movement of building footprint, re-alignment of roadway).
©Retention Value B	**Could be retained**	▪ Minor redesign may be required (e.g. level changes, pavement detail).
©Retention Value C	**Could be removed**	▪ Should not constrain proposed development.
©Retention Value D	**Should be removed or permanently fenced off (irrespective of development layout.)**	▪ Imminently dangerous. ▪ In an irreversible state of decline.

©Retention Index		**©Significance Rating**			
		1	**2**	**3**	**4**
SULE Rating	**Long (40+ years)**	**A**		**B**	**C**
	Medium (15-40 years)				
	Short (5-15 years)	**B**			
	Remove (< 5 years)	**D**			

Note: This ©Retention Index was developed for general residential, commercial and industrial developments. The applicability of the system to SSD 6617-2014 is limited and should be used as a guide to tree quality only.

Attachment B: Tree Schedule – OPTION 2 (Ex-Situ)

Tree Schedule - Barangaroo Remediation and Landforming, SSD 6617 -2014 (Option 2 - Ex-Situ Remediation)

TREE No.	COMMON NAME/ GENUS SPECIES	DBH (m)	HEIGHT (m)	CANOPY RADIUS (m)	AGE CLASS	VIGOUR	CONDITION	SRZ RADIUS (m)	TPZ RADIUS (m)	SULE	©SIG RATING	©RETENTION INDEX	RECOMMENDATION	DIAM. OF & HEIGHT TO 1ST BRANCH ABOVE GUTTER (m)	PRUNING TO ACHIEVE 4.3m CLEARANCE AT GUTTER - DIAMETER AT BRANCH COLLAR	COMMENTS
1	Hills Fig, *Ficus microcarpa var. Hillii*	0.5	12	N7, S6, E7, W7	M	G	F	2.5	6.0	M	2	A	R+	0.2 @ 3.8	***100, 200, 150***	*Retain. 1st Order bark inclusion, S side at 3m. Basal wound SE side. Minor pavement uplift.*
2	Hills Fig, *Ficus microcarpa var. Hillii*	0.4	10	5	M	G	F	2.3	4.8	M	2	A	R+	0.1 @ 3.5	***80, 100, 50, 100***	*Retain. Partial 1st Order bark inclusion, on both N and W sides at 2m. Minor pavement uplift.*
3	Hills Fig, *Ficus microcarpa var. Hillii*	0.5	10	6	M	G	F	2.5	6.0	M	2	A	R+	0.2 @ 3.2	***200, 200, 100, 250, 180***	*Retain. Recent mechanical damage to W side. 1st Order bark inclusion on both N and W sides at 2m. Minor pavement uplift.*
4	Hills Fig, *Ficus microcarpa var. Hillii*	0.4	10	5	M	P	F	2.3	4.8	S	2	B	R+	0.1 @ 3.2	***50, 100, 100, 100, 150***	*Retain. Partial 1st Order bark inclusion, on both W and SE sides at 2m. Minor pavement uplift.*
5	Hills Fig, *Ficus microcarpa var. Hillii*	0.5	11	6	M	G	F	2.5	6.0	M	2	A	R+	0.3 @ 2.5	***250, 50, 100***	*Retain. Gas inspection pit 1m to SW. Stormwater inlet pit 2m to S. Moderate pavement uplift.*
6	Hills Fig, *Ficus microcarpa var. Hillii*	0.4	10	5	M	F	F	2.3	4.8	M	2	A	R+	0.15 @ 3.3	***150, 50, 150***	*Retain. 1st Order bark inclusion, N side at 2m. Minor pavement uplift.*
7	Hills Fig, *Ficus microcarpa var. Hillii*	0.5	10	5	M	G	F	2.5	6.0	M	2	A	R+	0.25 @ 3.5	***250, 200, 180***	*Retain. Minor pavement uplift.*
8	Hills Fig, *Ficus microcarpa var. Hillii*	0.5	10	N5, S6, E6, W5	M	F	F	2.5	6.0	M	2	A	R+	0.15 @ 3.1	***150, 180, 50***	*Retain. Root run at back of curb from Tree 9 to S. Moderate pavement uplift.*
12	Hills Fig, *Ficus microcarpa var. Hillii*	0.6	12	7	M	G	F	2.7	7.2	M	2	A	R+	0.3 @ 3.1	***300, 180, 180, 150***	*Retain. 1st Order bark inclusion on both NE and SW sides. Stormwater inlet pit, 4m to NE. Bark wounding lower limbs. Major pavement uplift.*
13	Hills Fig, *Ficus microcarpa var. Hillii*	0.6	12	7	M	G	F	2.7	7.2	M	2	A	Rm			*Remove to facilitate remediation works. 1st Order bark inclusion on both NE and SW sides. Major bark wounds on NE side at 1m. Major pavement uplift.*
14	Hills Fig, *Ficus microcarpa var. Hillii*	0.5	11	6	M	G	F	2.5	6.0	M	2	A	Rm			*Remove to facilitate remediation works. 1st Order bark inclusion on both SE and SW sides. Optus Pit 5m to S. Stormwater inlet pit 4m to SE. Root run at back of kerb, 5m to N. Major pavement uplift. See original.*
15	Hills Fig, *Ficus microcarpa var. Hillii*	0.5	12	6	M	G	F	2.5	6.0	M	2	A	Rm			*Remove to facilitate remediation works. Branch failure E side at 2m. Bark wounding SE side. Lamp pole 4m to S. Moderate pavement uplift.*
16	Hills Fig, *Ficus microcarpa var. Hillii*	0.5	13	7	M	G	F	2.5	6.0	M	2	A	Rm			*Remove to facilitate remediation works. 1st Order bark inclusion on SE side. Bike parking adjacent to W side. Moderate pavement uplift.*

TREE No.	COMMON NAME/ GENUS SPECIES	DBH (m)	HEIGHT (m)	CANOPY RADIUS (m)	AGE CLASS	VIGOUR	CONDITION	SRZ RADIUS (m)	TPZ RADIUS (m)	SULE	©SIG RATING	©RETENTION INDEX	RECOMMENDATION	DIAM. OF & HEIGHT TO 1ST BRANCH ABOVE GUTTER (m)	PRUNING TO ACHIEVE 4.3m CLEARANCE AT GUTTER - DIAMETER AT BRANCH COLLAR	COMMENTS
17	Hills Fig, *Ficus microcarpa var. Hillii*	0.5	16	N12, S5, E6, W10	M	G	F	2.5	6.0	M	2	A	Rm			*Remove to facilitate remediation works. Root run at back of kerb, 6m to N. Broken limbs N and S. Building adjacent to W. Major pavement uplift.*
18	Hills Fig, *Ficus microcarpa var. Hillii*	0.7	16	N5, S5, E10, W10	M	G	F	2.8	8.4	M	2	A	Rm			*Remove to facilitate remediation works. Root run at back of curb, 7m to N. Building adjacent to W. Major pavement uplift.*
19	Hills Fig, *Ficus microcarpa var. Hillii*	0.7	16	N6, S6, E12, W12	M	G	F	2.8	8.4	M	2	A	Rm			*Remove to facilitate remediation works. Trunk wound, SE side at 2m. Building adjacent to west. Major pavement uplift.*
20	Hills Fig, *Ficus microcarpa var. Hillii*	0.6	15	N5, S7, E7, W6	M	G	F	2.7	7.2	M	2	A	Rm			*Remove to facilitate remediation works. Branch failure, NE side at 1-3m. Building adjacent to W. Sewage inspection pit 1m to NW. Minor pavement uplift.*
21	Hills Fig, *Ficus microcarpa var. Hillii*	0.6	14	N5, S6, E6, W6	M	G	F	2.7	7.2	M	2	A	Rm			*Remove to facilitate remediation works. Gas inspection pit in gutter, 1m to SE. Limb failure, NE at 4m. Building adjacent to W. Stormwater inlet 2m to SE. Minor pavement uplift.*
22	Hills Fig, *Ficus microcarpa var. Hillii*	0.4	9	N2. S6, E2, W6	M	P	P	2.3	4.8	S	3	C	Rm			*Remove to facilitate remediation works. Branch failure, N at 2m. Minor pavement uplift.*
23	Hills Fig, *Ficus microcarpa var. Hillii*	0.5	10	N6, S4, E5, W6	M	P	F	2.5	6.0	S	2	B	Rm			*Remove to facilitate remediation works. Minor pavement uplift.*
24	Hills Fig, *Ficus microcarpa var. Hillii*	0.5	12	N5, S5, E6, W6	M	P	F	2.5	6.0	S	2	B	Rm			*Remove to facilitate remediation works. Moderate pavement uplift.*
25	Hills Fig, *Ficus microcarpa var. Hillii*	0.6	15	9	M	F	F	2.7	7.2	M	2	A	R+	0.15 @ 5.5		*Retain. Hoarding adjacent. Water main inspection pit 1m to E. Major pavement uplift. (Approximate DBH given trunk battering)*
26	Hills Fig, *Ficus microcarpa var. Hillii*	0.2	8	3	SM	G	F	1.7	2.4	M	3	B	R+	0.1 @ 3.0	***180, 150***	*Retain. Hoarding adjacent. Minor pavement uplift. (Approximate DBH given trunk battening)*
27	Hills Fig, *Ficus microcarpa var. Hillii*	0.2	9	4	SM	F	F	1.7	2.4	M	3	B	R+	0.05 @ 5.9		*Retain. Hoarding adjacent. Sewer pit 1m to NE. Minor pavement uplift. (Approximate DBH given trunk battening)*

TREE No.	COMMON NAME/ GENUS SPECIES	DBH (m)	HEIGHT (m)	CANOPY RADIUS (m)	AGE CLASS	VIGOUR	CONDITION	SRZ RADIUS (m)	TPZ RADIUS (m)	SULE	©SIG RATING	©RETENTION INDEX	RECOMMENDATION	DIAM. OF & HEIGHT TO 1ST BRANCH ABOVE GUTTER (m)	PRUNING TO ACHIEVE 4.3m CLEARANCE AT GUTTER - DIAMETER AT BRANCH COLLAR	COMMENTS
28	Hills Fig, *Ficus microcarpa var. Hillii*	0.6	15	8	M	F	F	2.7	7.2	M	2	B	R+	0.4 @ 3.3		*Retain. Hoarding adjacent. Twin trunked from 1.5m. Moderate pavement uplift. (Approximate DBH given trunk battening)*
29	Hills Fig, *Ficus microcarpa var. Hillii*	0.5	11	6	M	F	F	2.5	6.0	M	2	B	R+	0.2 @ 5.4		*Retain. Wounding to NW side at 2m. Minor pavement uplift. See original. (Approximate DBH given trunk battening)*
31	Hills Fig, *Ficus microcarpa var. Hillii*	0.3	9	3	SM	G	F	2.0	3.6	M	3	B	R+	0.05 @4.2	***150***	*Retain. Building adjacent to E.*
32	Hills Fig, *Ficus microcarpa var. Hillii*	0.2	8	1	SM	G	F	1.7	2.4	M	3	B	R+	0.5 @ 4.6		*Retain. Bark wound NE side at 1m. Building adjacent to E.*
33	Hills Fig, *Ficus microcarpa var. Hillii*	0.3	9	3	SM	F	F	2.0	3.6	M	3	B	R+	0.1 @ 4.7		*Retain. Building adjacent to E.*
34	Hills Fig, *Ficus microcarpa var. Hillii*	0.2	9	3	SM	F	F	1.7	2.4	M	3	B	R+	0.02 @ 5.0		*Retain. Gas inspection pit 2m to NE. Building adjacent to E.*
37	Hills Fig, *Ficus microcarpa var. Hillii*	0.2	6	2	SM	F	F	1.7	2.4	M	3	B	R+	0.03 @ 4.5		*Retain. Building adjacent to E. Power lines above crown.*
38	Hills Fig, *Ficus microcarpa var. Hillii*	0.3	8	N0, S6, E2, W4	SM	F	F	2.0	3.6	M	3	B	R+	0.15 @ 4.5	***200***	*Retain. Building adjacent to east. Power lines above crown.*
39	Hills Fig, *Ficus microcarpa var. Hillii*	0.3	12	N4, S5, E2, W5	SM	G	F	2.0	3.6	M	2	A	R+	0.1 @ 4.6		*Retain. Wall adjacent to E.*
40	Hills Fig, *Ficus microcarpa var. Hillii*	0.4	12	N4, S5, E2, W5	SM	G	F	2.3	4.8	M	2	A	R+	0.15 @ 4.4		*Retain. Wall adjacent to E.*

TREE No.	COMMON NAME/ GENUS SPECIES	DBH (m)	HEIGHT (m)	CANOPY RADIUS (m)	AGE CLASS	VIGOUR	CONDITION	SRZ RADIUS (m)	TPZ RADIUS (m)	SULE	©SIG RATING	©RETENTION INDEX	RECOMMENDATION	DIAM. OF & HEIGHT TO 1ST BRANCH ABOVE GUTTER (m)	PRUNING TO ACHIEVE 4.3m CLEARANCE AT GUTTER - DIAMETER AT BRANCH COLLAR	COMMENTS
41	Hills Fig, *Ficus microcarpa var. Hillii*	0.3	9	N5, S5, E1, W5	SM	G	F	2.0	3.6	M	3	B	R+	0.2 @ 3.8	***200, 150***	*Remove to facilitate remediation works (Stage 4). Wall adjacent to E.*
42	Hills Fig, *Ficus microcarpa var. Hillii*	0.3	9	N4, S4, E1, W5	SM	G	F	2.0	3.6	M	3	B	R+	0.05 @ 4.8		*Retain. Tree at irregular setback, 2m. Telstra pit 1m to W. See original.*
43	Hills Fig, *Ficus microcarpa var. Hillii*	0.2	7	2	IM	G	F	1.7	2.4	M	3	B	R+		***50***	*Retain. Pit details differs. Granite setts.*
44	Hills Fig, *Ficus microcarpa var. Hillii*	0.2	7	3	IM	G	F	1.7	2.4	M	3	B	R+	0.05 @ 3.7	***100***	*Retain. Building adjacent to E.*
45	Moreton Bay Fig, *Ficus macrophylla*	0.4	8	5	SM	G	F	2.3	4.8	M	3	B	R+	0.05 @ 3.8		*Retain. Raised planter bed. Not in road reserve.*
46	Hills Fig, *Ficus microcarpa var. Hillii*	0.2	7	N5, S5, E2, W6	IM	G	F	1.7	2.4	M	3	B	Rm			*Remove to facilitate remediation works. Pit details differ. Granite setts.*
47	Hills Fig, *Ficus microcarpa var. Hillii*	0.2	5	3	IM	G	F	1.7	2.4	M	3	B	Rm			*Remove to facilitate remediation works. Bark wounds W side at 2m.*
49	Hills Fig, *Ficus microcarpa var. Hillii*	0.2	6	N5, S5, E3, W5	IM	G	F	1.7	2.4	M	3	B	Rm			*Remove to facilitate remediation works.*
50	Hills Fig, *Ficus microcarpa var. Hillii*	0.2	6	3	IM	G	F	1.7	2.4	M	3	B	R+	0.05 @ 3.1		*Retain. Damaged limb E side (storm damage)*
51	Fan Palm, *Washingtonia filifera*	0.4	7	3	M	G	G	2.3	4.8	M	3	B	R+	NA		*Retain. Located in raised planter bed, within road reserve.*
52	Fan Palm, *Washingtonia filifera*	0.4	7	3	M	G	G	2.3	4.8	M	3	B	R+	NA		*Retain. Located in raised planter bed, within road reserve.*
53	Fan Palm, *Washingtonia filifera*	0.5	7	3	M	G	G	2.5	6.0	M	3	B	R+	NA		*Retain. Located in raised planter bed, within road reserve.*
46																

TREE No.	COMMON NAME/ GENUS SPECIES	DBH (m)	HEIGHT (m)	CANOPY RADIUS (m)	AGE CLASS	VIGOUR	CONDITION	SRZ RADIUS (m)	TPZ RADIUS (m)	SULE	©SIG RATING	©RETENTION INDEX	RECOMMENDATION	DIAM. OF & HEIGHT TO 1ST BRANCH ABOVE GUTTER (m)	PRUNING TO ACHIEVE 4.3m CLEARANCE AT GUTTER - DIAMETER AT BRANCH COLLAR	COMMENTS

©RETENTION INDEX	NO. OF TREES
A	20
B	25
C	1
D	0

RECOMMENDATION	NO. OF TREES
R	0
R+	31
T	0
Rm	15

COMMON NAME/GENUS SPECIES CULTIVAR – Common names can vary with selected texts. Where species is unknown, "*sp*." indicated after genus. Where cultivar is unknown "*cv*" indicated after species. The number in brackets e.g. (x9) after the species indicates the number of trees in this tree group.

DBH – Diameter at Breast Height. Tree trunk diameter measured at breast height (1.4 metres above ground level). Fabric diameter tape is used which assumes a circular cross section. Multiple measurements indicate multiple trunks. More than three trunks are indicated as "multi". Where DBH measurement cannot be taken at 1.4m the height at which it has been taken is indicated in the Comments column.

CANOPY SPREAD RADIUS – Average canopy radius (widest + narrowest ÷ 2). Circular canopy depictions on Tree Plan/Survey are indicative only. Where canopy spread was significantly skewed, all four cardinal point measurements were recorded.

AGE CLASS – Immature (IM), Semi-mature (SM), Mature (M), Over-mature (OM). Assessment of the tree's current Age. A **Mature (M)** tree has reached a near stable size (biomass) above and below ground. Trees can have a Mature age class for >90% of life span. **Over-mature (OM)** trees show symptoms of irreversible decline and decreasing biomass.

VIGOUR – Good (G), Fair (F) or Poor (P). The general appearance of the canopy/foliage of the tree at the time of inspection. Vigour can vary with the season and rainfall frequency. A tree can have Good vigour but be hazardous due to Poor condition. A tree in Good vigour has the ability to sustain its life processes. Vigour is synonymous with health.

CONDITION – Good (G), Fair (F) or Poor (P). The general form and structure of the trunk/s and branching. Trunk lean, trunk/branch structural defects, canopy skewness or other hazard features are considered.

SRZ RADIUS – Structural Root Zone. The area around a tree required for tree stability. Earthworks should be prohibited within the SRZ. The area is calculated from the formula and graph at Figure 1 of AS4970-2009. The SRZ graph has been adapted from the work of Claus Mattheck (1994). DBH has been used instead of stem diameter above root buttress in the calculation of SRZ. 0.1m has been added to SRZ to allow for minor increases in stem diameter.

TPZ RADIUS – Tree Protection Zone. Radial offset (m) of twelve times (12X) trunk DBH measured from centre of trunk (for trees less than 0.3 metre DBH minimum TPZ is 2.0 metres). To satisfactorily retain the tree construction activity (both soil cut and fill) must be restricted within this offset. TPZ offsets are rounded to the nearest 0.1 metre. Existing constraints to root spread can vary TPZ. Generally an area equivalent to the TPZ should be available to the tree post development. Encroachment occupying up to 10% of the TPZ area is acceptable without detailed rootzone assessment. Encroachments greater than 10% require specific arboricultural assessment.

SULE – Safe Useful Life Expectancy. A systematic pre-development tree assessment procedure developed by Jeremy Barrell, Hampshire, England. The SULE method used in this assessment has been adapted for simplified use within the field. It gives a length of time that the Arborist feels a particular tree can be retained with an acceptable level of risk based on the information available at the time of the inspection. SULE ratings are **Long** (retainable for 40 years or more with an acceptable level of risk), **Medium** (retainable for 16-39 years), **Short** (retainable for 5-15 years) and **Removal** (tree requiring immediate removal due to imminent hazard or absolute unsuitability).

©SIG. RATING – ©Significance Rating Scale (see notes over)

©RETENTION INDEX (see notes over)

RECOMMENDATIONS – Retain ***(R)*** – Trees with no TPZ encroachments proposed; ***Retain Plus (R+)*** – Trees with variable but acceptable TPZ encroachments; ***Transplant* (*T*)** – Trees proposed to be transplanted or ***Remove (Rm)*** – Trees proposed to be removal to allow for the proposed works.

COMMENTS – Comments relating to notable tree features, the location and surroundings at the time of inspection and where applicable the reason for removal.

©SIG. RATING – ©Significance Rating Scale. A site specific qualitative evaluation of a tree relative to the existing landuse developed by Tree Wise Men® Australia Pty Ltd. Takes into consideration the impact of the tree on the surrounding landscape, streetscape and bushland. Rarity, habitat value, historical/cultural value and structural form of the tree are considered in this rating system. It is possible for a tree to have a Short SULE and a ©Significance Rating of 1. Likewise it is possible for a tree to be given a Long SULE and a ©Significance Rating of 4 (e.g. weed species). The ©Significance Ratings used in this Report are as outlined in Table 1.

Table 2: ©Significance Rating Characteristics

Rating	Significance	Characteristics (some or all)
©Sig. Rating 1	**Exceptional**	▪ Major contribution to site amenity ▪ Remnant specimen ▪ Heritage Listed ▪ Listed on Significant Tree Register ▪ Threatened Species ▪ Good vigour and condition ▪ Cultural significance ▪ Possible habitat for threatened fauna ▪ Excellent, well formed specimen ▪ Rare or unusual species ▪ Large above ground biomass ▪ Unique within the site and surrounds
©Sig. Rating 2	**High**	▪ Considerable contribution to site amenity ▪ Remnant specimen ▪ Good vigour and condition ▪ Threatened Species ▪ Cultural significance ▪ Possible habitat tree for threatened fauna ▪ Well formed specimen ▪ Rare or unusual species ▪ Large or moderate above ground biomass ▪ Other specimens with similar characteristics within the site and surrounds
©Sig. Rating 3	**Moderate**	▪ Minor contribution to site amenity ▪ Remnant or planted ▪ Fair or Poor vigour and condition ▪ Potential for growth ▪ Well formed or asymmetrical form ▪ Other specimens with similar characteristics within the site and surrounds
©Sig. Rating 4	**Low**	▪ Small/poor specimen ▪ Poor vigour and condition ▪ Inappropriate for the location ▪ Minor contribution to landscape amenity ▪ Easily replaced ▪ Weed species or TPO Exempt ▪ Hazardous ▪ Previously ©Sig. Rating 5 tree

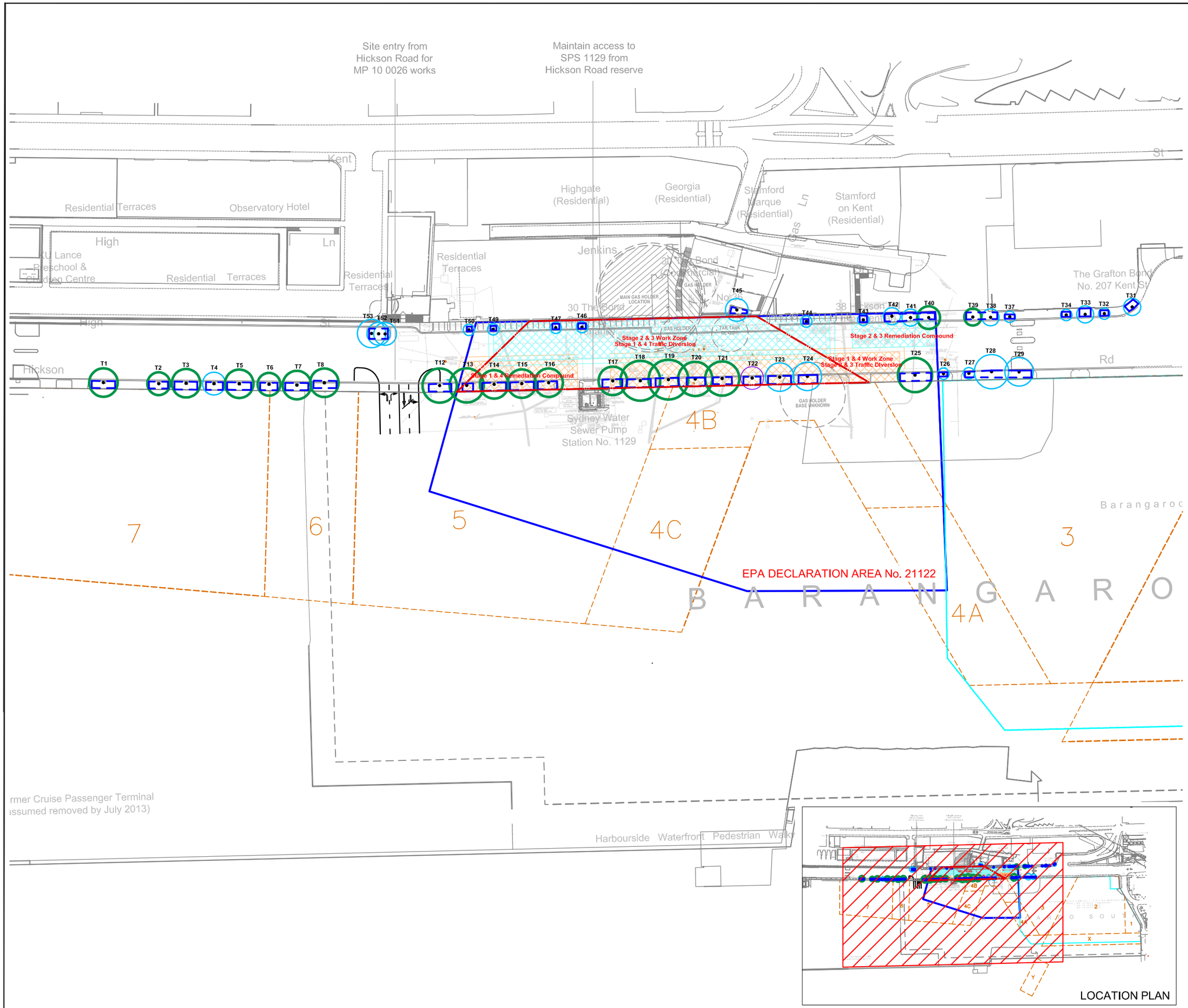
©RETENTION INDEX. A site specific assessment of an individual tree's retention value developed by Tree Wise Men® Australia Pty Ltd. Incorporating SULE and ©Significance Rating each tree is allocated a retention value of A, B, C or D. The ©Retention Index values can be described as follows:

©Retention Value A	**Should be retained**	▪ Major redesign may be required (e.g. movement of building footprint, re-alignment of roadway).
©Retention Value B	**Could be retained**	▪ Minor redesign may be required (e.g. level changes, pavement detail).
©Retention Value C	**Could be removed**	▪ Should not constrain proposed development.
©Retention Value D	**Should be removed or permanently fenced off (irrespective of development layout.)**	▪ Imminently dangerous. ▪ In an irreversible state of decline.

©Retention Index		**©Significance Rating**			
		1	**2**	**3**	**4**
SULE Rating	**Long (40+ years)**	**A**		**B**	**C**
	Medium (15-40 years)				
	Short (5-15 years)	**B**			
	Remove (< 5 years)	**D**			

Note: This ©Retention Index was developed for general residential, commercial and industrial developments. The applicability of the system to SSD 6617-2014 is limited and should be used as a guide to tree quality only.

Attachment C: Tree Protection Plan – Option 1 (In-Situ)
3 Sheets



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LEGEND

Tree number with trunk as plotted on Site Survey:	T33 ●
©Retention Value A TPZ:	○
©Retention Value B TPZ:	○
©Retention Value C TPZ:	○
Protective fencing:	- - - -
Outline of Hickson Road Remediation Area:	
Outline of EPA Declaration Area 21122:	
Stage 1 & 4 Work Zone & Stage 2 & 3 traffic diversion:	
Stage 2 & 3 Work Zone & Stage 1 & 4 traffic diversion:	

Note: This plan is to be read in conjunction with Arboricultural Impact Assessment Ref:2095AIASSD 6617-2015 - February, 2015

TITLE:	**©TREE PROTECTION PLAN - OPTION 1 - IN SITU**
CLIENT:	LEND LEASE (MILLERS POINT) PTY LTD
PROJECT:	REMEDIATION AND LANDFORMING WORKS SSD 6617-2015
DRAWING NO:	2095TPP01SSD 6617-2015 Sheet 1 of 3
DRAWN BY:	JB, MH, SB, RF
BASED ON:	226463-CCT-SKT-2014, 2015, 2018-2022/B, ARUP Dated 21/8/14
REV:	F REV DATE: 20/02/2015
SCALE:	1:1500@A3

0 10 20 50 Metres

N

Site entry from Hickson Road for MP 10 0026 works

Maintain access to SPS 1129 from Hickson Road reserve

HOARDING TO COMPLY WITH CoS HOARDING POLICY. LIMB PRUNING FOR TEMPORARY STRUCTURES TO BE MINIMISED.

CROWN PRUNING IN ACCORDANCE WITH AIA REPORT *2095AIASSD 6617-2015* FOR TRAFFIC DIVERSION WORKS. CO-ORDINATION WITH DRILLING CONTRACTOR FOR ISCO WORKS. ALL CROWN PRUNING TO BE APPROVED BY PROJECT ARBORIST AND CoS.

Kent

Ln

Residential Terraces

Residential Terraces

Jenkins St

30 The Bond (Commercial)

Georgia (Residential)

Stamford Marque (Residential)

Gas Ln

Stamford on Kent (Residential)

38 Hickson Rd (Residential)

GAS HOLDER

MAIN GAS HOLDER LOCATION

TAR TANK RL 2.0m

GAS HOLDER BASE UNKNOWN

T6 T7 T8 T12 T13 T14 T15 T16 T17 T18 T19 T20 T21 T22 T23 T24 T25 T26 T27 T28 T29 T37 T38 T39 T40 T41 T42 T43 T44 T45 T46 T47 T49 T50 T51 T52 T53

Stage 2 & 3 Work Zone
Stage 1 & 4 Traffic Diversion

Stage 2 & 3 Remediation Compound

Stage 1 & 4 Work Zone
Stage 2 & 3 Traffic Diversion

Stage 1 & 4 Remediation Compound

Sydney Water Sewer Pump Station No. 1129

4B

4C

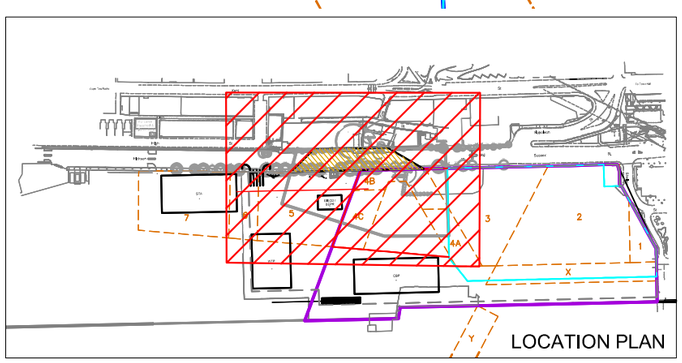
5

6

B

A

DRILLING OF WELLS WITHIN FOOTPATH WILL NEED TO AVOID CONCENTRATED SURFACE ROOTS (SEE FIG. F3 OF *INDICATIVE PRELIMINARY WORK PLAN FOR ISCO* - AECOM, 11.9.14).



LOCATION PLAN

TREE WISE MEN®
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LEGEND

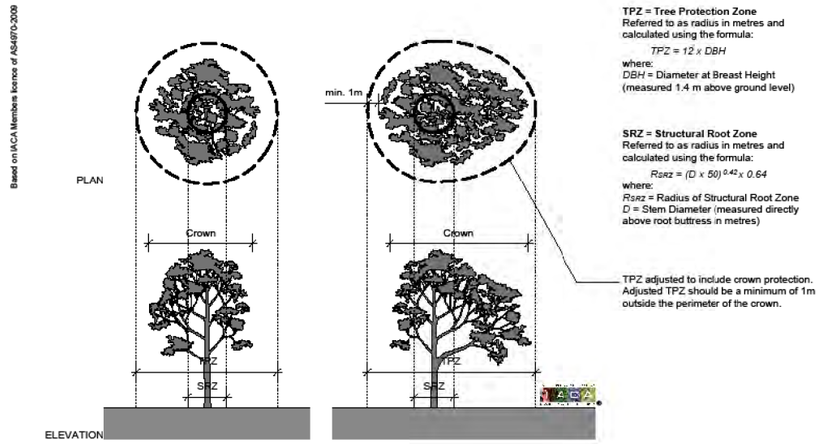
Tree number with trunk as plotted on Site Survey:	T33
©Retention Value A TPZ:	
©Retention Value B TPZ:	
©Retention Value C TPZ:	
Protective fencing:	
Outline of Hickson Road Remediation Area:	
Outline of EPA Declaration Area 21122:	
Stage 1 & 4 Work Zone & Stage 2 & 3 traffic diversion:	
Stage 2 & 3 Work Zone & Stage 1 & 4 traffic diversion:	

Note: This plan is to be read in conjunction with Arboricultural Impact Assessment Ref:2095AIASSD 6617-2015 - February, 2015.

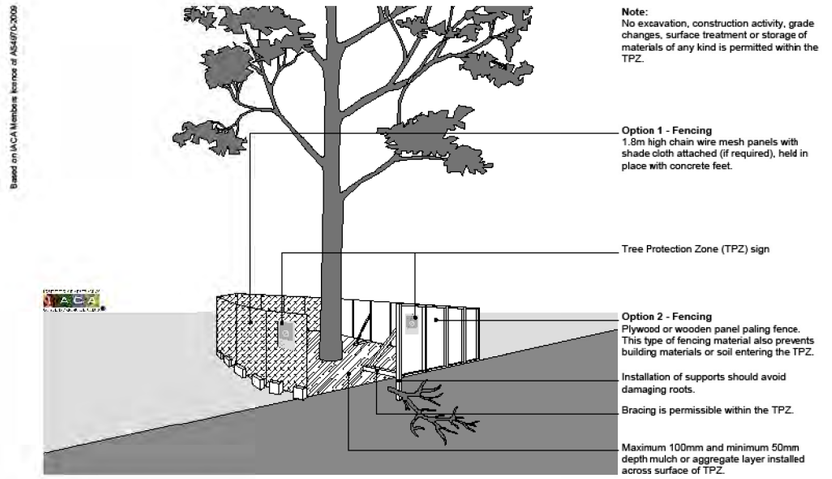
TITLE:	**©TREE PROTECTION PLAN - OPTION 1 - IN SITU**
CLIENT:	LEND LEASE (MILLERS POINT) PTY LTD
PROJECT:	REMEDIATION AND LANDFORMING WORKS SSD 6617-2015
DRAWING NO:	2095TPP01SSD 6617-2015 Sheet 2 of 3
DRAWN BY:	JB, MH, SB, RF
BASED ON:	226463-CCT-SKT-2014, 2015, 2018-2022/B, ARUP Dated 21/8/14
REV:	F REV DATE: 20/02/2015
SCALE:	1:1000@A3

0 10 20 50 meters

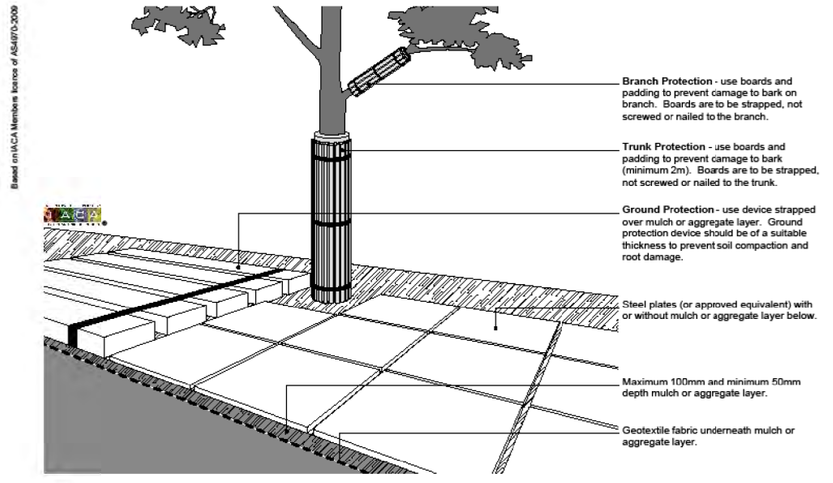
N



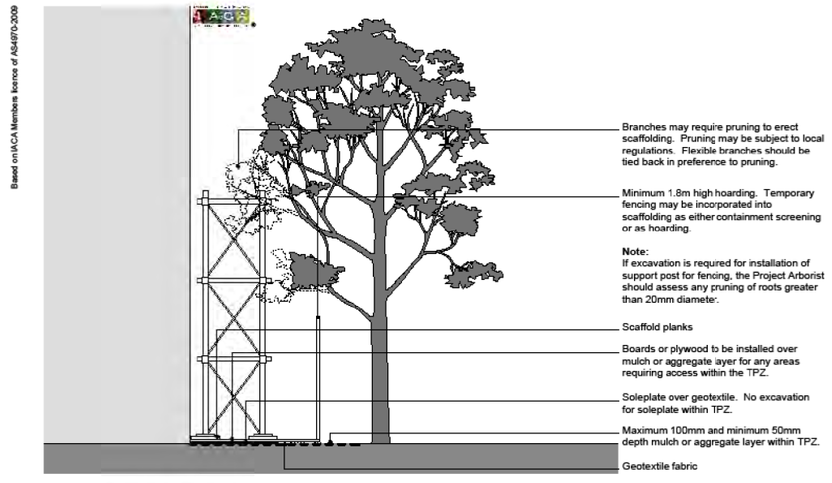
02 Indicative Tree Protection Zone (TPZ) Scale 1:500 @ A4



03 Tree Protection Fencing Not to Scale



04 Examples of Branch, Trunk and Ground Protection Not to Scale



05 Indicative Scaffolding within a Tree Protection Zone (TPZ) Not to Scale

IMPORTANT TREE MANAGEMENT NOTES
FOR ALL RETAINED TREES

1. Tree impact assessment has been considered in relation to ***AS4970-2009 Protection of trees on development sites***.

2. This ***Tree Protection Plan*** is equivalent to the Development Submission plan identified in Table 1, ***AS4970-2009***.

3. This ***Tree Protection Plan*** should be incorporated into the site Construction Management Plan and stage all construction documentation.

4. Tree impact assessment includes likely impacts from development including: building platforms, driveways/accessways, services/infrastructure installation and cut/fill batters.

5. The extent of TPZ shown on this plan does not reflect any confinement of roots by existing structures, buildings, walls, topography, etc.

6. A ***Project Arborist*** with minimum AQF Level 5 qualifications is to be engaged to monitor and report regularly on works adjacent to trees.

7. ***Tree Protection Fencing*** as indicated, should be installed prior to demolition of existing structures or other site preparation works. Tree Protection Fencing should comprise of chainlink wire or wire mesh panels as per Figure 05 of the TPP. The following activities are to be prohibited within tree protection fencing: topsoil stripping, excavation, placement of soil fill, stockpiling of any materials, placement of site sheds/offices, parking of heavy machinery, placement of machinery haul roads.

8. If ***scaffolding*** is required within TPZ, install as shown in Figure 05 of the TPP.

9. Services installation should be supervised by the ***Project Arborist***. No roots greater than 50mm diameter are to be cut or damaged. Services should be routed beyond TPZ wherever possible.

10. ***Trunk battening*** and ***ground protection*** to be installed to trees where works are required within Tree Protection Fencing. Battening to comply with Figure 04 of the TPP.

11. ***Exposed surface roots*** to be covered/protected as per Fig. 04 (SHT 3 of 3).

12. All ***tree pruning*** is to comply with

AS4373-2007, Pruning of Amenity Trees. All approved tree removal is to comply with WorkCover Code of Practice for the Amenity Tree Industry.

13. ***Mulch*** is to be spread to a depth of 100mm within the TPZs. Where TPZs are greater than 5 metres of where native seedling regeneration would be prohibited, seek advice from the Project Arborist and Ecologist.

14. ***Over-excavation*** or battering towards trees is to be avoided unless indicated on approved earthworks or services drawings.

15. Contiguous ***strip footings*** are to be avoided wherever possible. Use discontinuous pier and beam type footings or other lightweight construction for walling and fencing within TPZs.

16. ***Temporary irrigation***, hand watering or water cart may be required during drought periods. The Project Arborist is to monitor soil moisture levels and advise on delivery volumes and frequency.

17. Temporary ***haul roads*** may be required to be installed where heavy machinery movements are proposed within TPZs of trees to minimize compaction. Woodchip mulch should be used as a minimum. Recycled concrete or other aggregate placed over a geofabric may be required for heavy use areas.

TREE WISE MEN®
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131 Fuller Street Narrabeen NSW 2101
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treewise@treewisemen.com.au
www.treewisemen.com.au

Note: This plan is to be read in conjunction with Arboricultural Impact Assessment Ref:2095AIASSD 6617-2015 February, 2015.

TITLE:	**©TREE PROTECTION PLAN - OPTION 1 - IN SITU**
CLIENT:	LEND LEASE (MILLERS POINT) PTY LTD
PROJECT:	REMEDIATION AND LANDFORMING WORKS SSD 6617-2015
DRAWING NO:	2095TPP01SSD 6617-2015 Sheet 3 OF 3
DRAWN BY:	JB, MH, SB, RF
BASED ON:	IACA Licence of *AS4970-2009 Protection of trees on development sites*
REV:	F REV DATE: 20/02/2015

Attachment D: Tree Protection Plan - Option 2 (Ex-Situ)
3 Sheets

Maintain access to SPS 1129 from Hickson Road reserve

Remove site trees to facilitate remediation works

Site entry from Hickson Road for MP 10 0026 works

Kent

St

dential Terraces

Observatory Hotel

High

Residential Terraces

Residential Terraces

Residential Terraces

Highgate (Residential)

Georgia (Residential)

Stamford Marque (Residential)

Stamford on Kent (Residential)

Gas Ln

Jenkins

St

30 The Bond (Commercial)

30 The Bond Ground Floor Tenancy

MAIN GAS HOLDER LOCATION

GAS HOLDER

TAR TANK

No 36

38 Hickson Rd (Residential)

The Grafton Bond No. 207 Kent St

Rd

Stage 1, 2 & 3 Work Zone
Stage 4, 5 & 6 Traffic Diversion

Stage 4, 5 & 6 Work Zone
Stage 1, 2 & 3 Traffic Diversion

T1 T2 T3 T4 T5 T6 T7 T8 T12 T13 T14 T15 T16 T17 T18 T19 T20 T21 T22 T23 T24 T25 T26 T27 T28 T29 T31 T32 T33 T34 T37 T38 T39 T40 T41 T42 T43 T44 T45 T46 T47 T49 T50 T51 T52 T53

Sydney Water Sewer Pump Station No. 1129

GAS HOLDER BASE UNKNOWN

4B

EPA DECLARATION AREA No.21122.

Barangaroo South - B
Refer: MI
MI
MI

7

6

5

4C

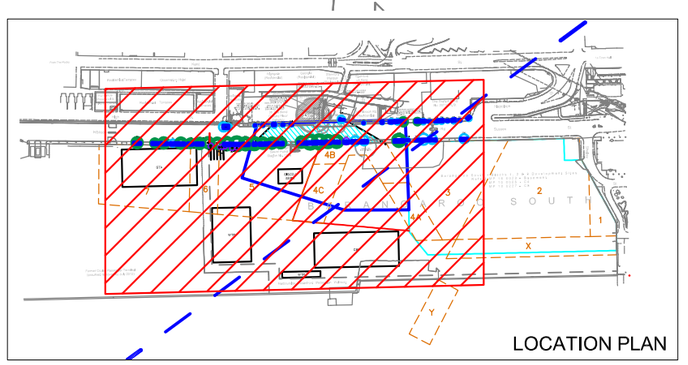
3

4A

B A R A N G A R O O S O U T H

ger Terminal
y July 2013)

Harbourside Waterfront Pedestrian Walkway



LOCATION PLAN

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treewise@treewisemen.com.au
www.treewisemen.com.au

LEGEND

Tree number with trunk as plotted on Site Survey:	T33 ●
©Retention Value A TPZ:	
©Retention Value B TPZ:	
©Retention Value C TPZ:	
Trees requiring removal to facilitate Option 2 works:	
Protective fencing:	
Outline of Hickson Road Remediation Area:	
Outline of EPA Declaration Area 21122:	
Stage 1, 2 & 3 Work Zone & Stage 4, 5, & 6 traffic diversion:	
Stage 4, 5 & 6 Work Zone & Stage 1, 2 & 3 traffic diversion:	

Note: This plan is to be read in conjunction with Arboricultural Impact Assessment Ref:2095AIASSD 6617-2015 - February, 2015

TITLE:	**©TREE PROTECTION PLAN - OPTION 2 - EX SITU**
CLIENT:	LEND LEASE (MILLERS POINT) PTY LTD
PROJECT:	REMEDIATION AND LANDFORMING WORKS SSD 6617-2015
DRAWING NO:	2095TPP01SSD 6617-2015 Sheet 1 of 3
DRAWN BY:	JB, MH, SB, RF
BASED ON:	226463-CCT-SKT-2015, 2016, 2023-2028/B, ARUP Dated 21/8/14
REV:	F REV DATE: 20/02/2015
SCALE:	1:1500@A3

0 10 20 50 metres

N

Maintain access to SPS 1129 from Hickson Road reserve

Remove site trees to facilitate remediation works

Site entry from Hickson Road for MP 10 0026 works

HOARDING TO COMPLY WITH CoS HOARDING POLICY. LIMB PRUNING TO BE MINIMISED.

AVOID OVEREXCAVATION WITHIN TPZ OF RETAINED TREES. VERTICAL SHORING TO BE USED WHERE POSSIBLE.

Kent

Highgate (Residential)

Georgia (Residential)

Stamford Marque (Residential)

Stamford on Kent (Residential)

Gas Ln

Jenkins

Residential Terraces

Residential Terraces

30 The Bond (Commercial)

30 The Bond Ground Floor Tenancy

MAIN GAS HOLDER LOCATION

GAS HOLDER

No 36

38 Hickson Rd (Residential)

St

The No

T53 T52 T51 T50 T49 T47 T46 T45 T44 T43 T42 T41 T40 T39 T38 T37

Stage 1, 2 & 3 Work Zone
Stage 4, 5 & 6 Traffic Diversion

T6 T7 T8 T12 T13 T14 T15 T16 T17 T18 T19 T20 T21 T22 T23 T24 T25 T26 T27 T28 T29

Stage 4, 5 & 6 Work Zone
Stage 1, 2 & 3 Traffic Diversion

GAS HOLDER
TAR TANK
RL 2.0m

GAS HOLDER
BASE UNKNOWN

Sydney Water Sewer Pump Station No. 1129

4B

EPA DECLARATION AREA No.21122.

6

5

4C

B A R A N G A R O

LOCATION PLAN

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DRAWING NO:	2095TPP01SSD 6617-2015 Sheet 2 of 3
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REV:	F REV DATE: 20/02/2015
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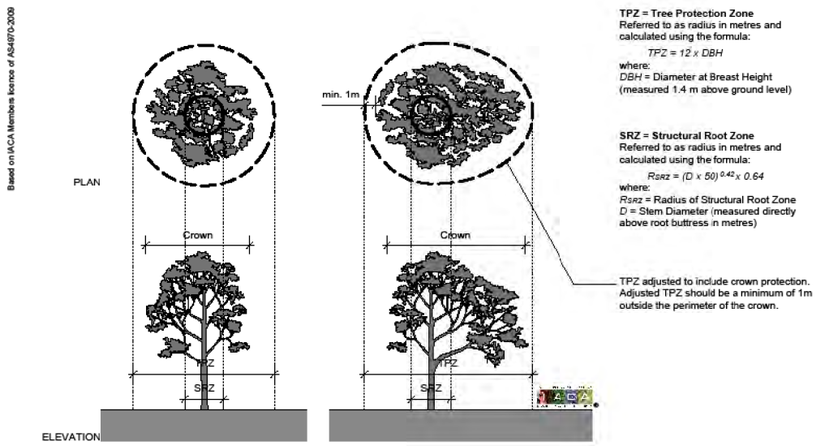
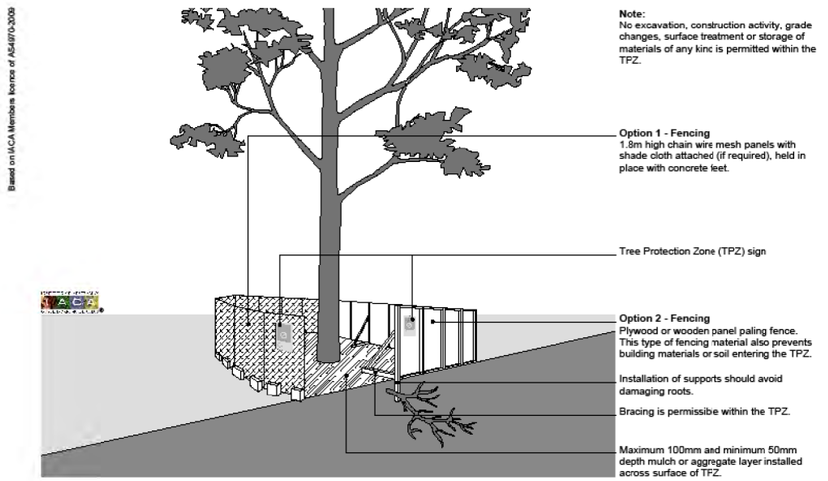
0 10 20 50 meters

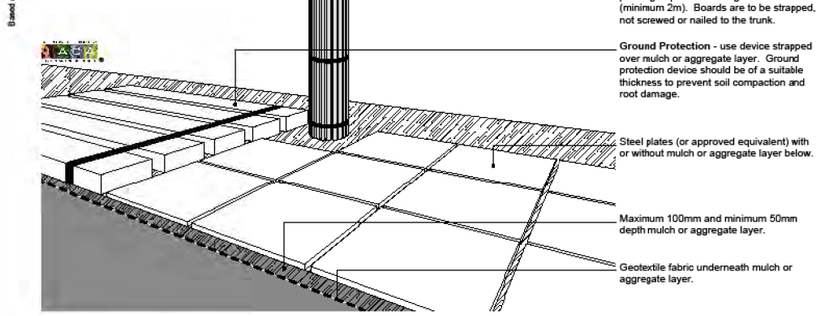
N



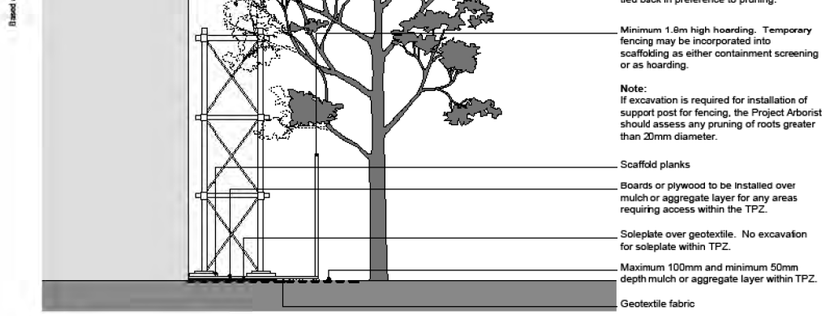
02 Indicative Tree Protection Zone (TPZ) Scale 1:500 @ A4



03 Tree Protection Fencing Not to Scale



04 Examples of Branch, Trunk and Ground Protection Not to Scale



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DRAWING NO:	2095TPP01SSD 6617-2015 Sheet 3 of 3		
DRAWN BY:	JB, MH, SB, RF		
BASED ON:	IACA Licence of *AS4970-2009 Protection of trees on development sites*		
DATE:	03/10/2012		
REV:	F	REV DATE:	20/02/2015