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PRELIMINARY ARBORICULTURAL REPORT

Sydney Harbour Bridge Cycleway Northern Access Milsons Point

Prepared for: TfNSW

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Revision B

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1.0 INTRODUCTION

1.1 Background

- 1.1.1 This Preliminary Arboricultural Report was prepared for Transport for NSW (TfNSW) in relation to the Sydney Harbour Bridge Cycleway Northern Access Project (the Project). As background, around 2000 bike trips are taken across the Sydney Harbour Bridge (SHB) cycleway on weekdays, making it the most heavily used cycleway in Sydney.¹ It is the only cross-harbour bike route in eastern Sydney and is a critical part of the wider bike network, linking the two sides of the city across the harbour.
- 1.1.2 The northern end of the SHB cycleway is currently accessed from Burton Street via a 55-step stairway. The stairway rises 11 metres and then requires cyclists to push their bikes through the safety barriers at the top of the steps. The steps are a safety hazard and slow the movement of people as they access or exit the cycleway, creating bottlenecks at peak times. The stairs also prevent a wider group of people from using the cycleway.
- 1.1.3 A range of ramp options (both linear and loop) were developed for TfNSW for the northern SHB cycleway access. In response to community feedback, TfNSW proceeded with plans to upgrade access to the SHB cycleway with the linear ramp as the preferred option.² On the August 18th 2021, TfNSW commenced a competitive design process via an open Registration of Interest (ROI) to select three leading architectural design teams with heritage and Connecting with Country expertise to help design a linear ramp. The winning design team led by ASPECT Studios was announced on the 1st April 2022.³
- 1.1.4 The purpose of this Report is to undertake a Visual Tree Assessment⁴ (VTA), provide an overview of the quality and value of the trees at the site, determine Tree Protection Zone (TPZ) and Structural Root Zone (SRZ) areas, and provide arboricultural advice to assist in design development. This Revision B Report includes the assessment and discussion of additional trees in the southern section of Bradfield Park North and selected street trees within the Alfred Street road reserve. This Report also provides recommendations for tree sensitive design and construction methods based on the early Concept Design by Aspect.
- 1.1.5 In preparing this Report, the authors have considered the objectives of the following:
- *State Environmental Planning Policy Vegetation in Non-Rural Areas (2017)*
 - *North Sydney Local Environmental Plan (2013)*
 - *Section 16 to Part B of North Sydney Development Control Plan (2013)*
 - *Transport for NSW Sydney Harbour Bridge Ramp Option - Consultation Report (2021)*
 - *Sydney Harbour Bridge Cycleway Access Project – North Supplementary Detailed Heritage Framework (2021)*
 - *Australian Standard 4970 Protection of Trees on Development Sites (2009)*
 - *Australian Standard 4373 Pruning of Amenity Trees (2007)*
 - *Australian Standard 2303 Tree Stock for Landscape Use (2015)*
 - *Safe Work Australia Guide for Managing Risks of Tree Trimming and Removal Work (2016)*

Refer to Methodology (**Appendix 1**)

¹ TfNSW (2021)

² TfNSW (2021)

³ TfNSW (2021)

⁴ Mattheck & Breloer (2003)

1.2 The Project

1.2.1 The scope of the Project includes:

- Construction of a ramp structure at the northern end of the SHB cycleway
- Integration works between the transition at the ramp landing point to the surrounding street network
- Relocation of utilities to facilitate the delivery of the cycleway works

2.0 RESULTS

2.1 The Site

2.1.1 The site includes the former Kirribilli Bowling Green (Northern Bowling Green), Bradfield Park Central, the southern section of Bradfield Park North and a section of Alfred Street.

2.1.2 Bradfield Park (including northern section) is listed in Schedule 5 of the *North Sydney Local Environmental Plan (2013)* (I0538).⁵ Bradfield Park Central is located outside the curtilage of the SHB, Milsons Point Station and the LEP listing for Bradfield Park.⁶ The former Kirribilli Bowling Club is not listed as a heritage item.

2.2 Historical Background

2.2.1 Bradfield Park occupies a portion of land originally part of a land grant to Robert Ryan in 1800. In the 1850s, the subdivision and lot sales led to the creation of Milson Point Wharf and Land Cove Road (Alfred Street) in 1861. Bradfield Park was originally formed in the aftermath of major earthworks undertaken during construction of SHB.⁷

2.2.2 North Sydney Council completed the northern rockery and Milsons Point Station entry section of Bradfield Park in 1934 however plans for further works were delayed by the Great Depression of the 1930s. Surviving plantings from the 1930s include the *Butia capitata* (Wine Palms) at the entrance to the station.⁸

2.2.3 A review of the 1943 aerial photograph of the site shows trees in the same locations as Trees 8, 14 and 20 which are likely the original plantings. Tree 4 is of a similar age to Trees 8, 14 and 20 and was likely planted at the same time however this tree appears to have been relocated to the northernmost raised lawn at some point.

2.2.4 Archival images of the site in the 1960s show a line of Poplars in front of the viaduct pilasters. These were replaced with Simons Poplars located either side of the bridge pilasters by Council in the 1990s.⁹

2.2.5 The Cabbage Palms were introduced in 1981 when Burton Street was closed to through traffic.¹⁰ The land was transferred to the North Sydney Council in 1988 to allow construction of the Sydney Harbour Tunnel.

2.2.6 None of the trees are listed in Schedule 5 of the *North Sydney Local Environmental Plan (2013)*.¹¹

⁶ North Sydney Council (2012)

⁷ Tonkin Zulaikha Greer Architects Pty Ltd (2021)

⁸ Tonkin Zulaikha Greer Architects Pty Ltd (2021)

⁹ Tonkin Zulaikha Greer Architects Pty Ltd (2021)

¹⁰ Tonkin Zulaikha Greer Architects Pty Ltd (2021)

¹¹ North Sydney Council (2013)

2.3 Tree Assessment

2.3.1 Thirty-four (34) trees were assessed using the Visual Tree Assessment¹² (VTA) criteria. The trees comprise a mix of Australian-native and exotic species including *Butia capitata* (Jelly Palm), *Corymbia maculata* (Spotted Gum), *Ficus macrophylla* (Moreton Bay Fig), *Lagerstroemia indica* (Crepe Myrtle), *Livistona australis* (Cabbage Tree Palm), *Lophostemon confertus* (Brush Box), *Phoenix canariensis* (Canary Island Date Palm), *Platanus x acerifolius* (London Plane Tree), *Populus simonii* (Simons Poplar), *Pyrus cvs* (Ornamental Pear Cultivars) and *Ulmus parvifolia* (Chinese Elm).

2.3.2 A search of the BioNet Atlas of NSW Wildlife Database was undertaken in October 2021. No individual threatened tree species listed within this database for the area were identified during the current field investigations of the site.¹³ The ecological significance and habitat value of the trees has not been assessed and is beyond the scope of this report.

2.3.3 As required by Clause 2.3.2 of *Australian Standard 4970 Protection of Trees on Development Sites (2009)*, each of the trees assessed has been allocated a Retention Value. TreeiQ allocates one of four Retention Value categories based on a combination of Landscape Significance and Useful Life Expectancy (ULE). The assessment of Landscape Significance and ULE involves a degree of subjectivity and there will be a range of tree quality and value within each of the Retention Value categories. The Retention Values do not consider any proposed development works and are not a schedule for tree retention or removal. The trees have been allocated one of the following Retention Values:

- Priority for Retention
- Consider for Retention
- Consider for Removal
- Priority for Removal

Refer to Tree Assessment Schedule (**Appendix 1**)

2.3.4 Trees 1, 23 & 26

Trees 1, 23 and 26 were identified as *Ulmus parvifolia* (Chinese Elm) and are mature specimens located in the southern section of Bradfield Park North. The trees are of moderate Landscape Significance and have been allocated a Retention Value of *Consider for Retention*.

2.3.5 Trees 1 and 23 are in good health and structural condition with no significant defects identified at the time of inspection. A major inclusion has developed at the junction of co-dominant stems on Tree 26. This defect is not considered a significant hazard at the current time however it may become more serious as the tree's crown grows in size, weight and sail area.

2.3.6 Trees 2, 3 & 28-30

Trees 2, 3 and 28-30 were identified as *Populus simonii* (Simons Poplar) and are mature specimens located in the southern section of Bradfield Park North, adjacent to the SHB viaduct wall. The form of the trees has been significantly impacted by Reduction Pruning to provide clearance for the SHB viaduct wall. Trees 2, 3 and 29-30 are of moderate Landscape Significance and have been allocated a Retention Value of *Consider for Retention*. Tree 28 is of low Landscape Significance and has been allocated a Retention Value of *Priority for Removal*.

¹² Mattheck & Breloer (2003)

¹³ NSW Office of Environment and Heritage (2011)

- 2.3.7 Trees 2, 3 and 28-30 are in good health. Trees 2, 3 and 30 are in fair structural condition as a result of the pruning works undertaken for viaduct clearance. The branching structure of a tree is mechanically optimized to dissipate wind loading forces, providing a dampening effect in windy conditions which helps to protect against failure. Where excessive lateral branches are removed, the dampening effect is reduced increasing the likelihood of branch failure.
- 2.3.8 Trees 28 and 29 are in poor structural condition and have also been impacted by the pruning works. In addition, a major basal wound and rib of adaptive growth is present on the trunk of Tree 28 and a seam of depressed tissue which runs from the base of the trunk to 1.5m was noted on Tree 29.
- 2.3.9 **Trees 4, 8, 14 & 20**
Trees 4, 8 and 20 were identified as *Butia capitata* (Jelly Palm) and are late-mature specimens located within the raised lawn areas fronting the station entrance. The trees are of very high Landscape Significance and have been allocated a Retention Value of *Priority for Retention*.
- 2.3.10 Trees 8 and 20 are in good health and structural condition with no significant defects identified at the time of inspection. Tree 4 is in fair health as indicated by foliar damage (widespread yellow/orange necrotic spotting of older fronds) consistent with either a leaf blight and/or nutritional deficiency. Potassium is the most likely nutritional deficiency to be affecting the palm which may eventually result in palm death. Pathology testing of damaged foliage and nutritional analysis of soils in the vicinity of the tree is recommended. Recommendations for ameliorative action should be determined on the testing results.
- 2.3.11 Tree 14 is dead and appears to have died relatively recently as indicated by the uniform appearance of the desiccated crown which has not yet begun to shed dead fronds. The cause of death is not known however the potential biotic and/or abiotic factors affecting Tree 4 are likely to have also contributed to or caused the death of Tree 14. To minimise the potential for spreading pathogens between trees, tools used for the removal of Tree 14 should be thoroughly sterilized using an 80% methylated spirits/20% water spray on completion of the works. This also applies to the removal of dead/dying fronds on all other palms at the site.
- 2.3.12 **Trees 5-7, 10-13 & 16-18**
Trees 5-7, 10-13 and 16-18 were identified as *Livistona australis* (Cabbage Tree Palm) and are mature specimens located in pavements intersecting the raised lawn areas to the front of the station. The trees are of high Landscape Significance and have been allocated a Retention Value of *Priority for Retention*.
- 2.3.13 Trees 5-7, 10-13 and 16-18 are in good health and structural condition with no significant defects identified at the time of inspection. Tree 18 has a cable tie affixed to the trunk which is starting to become occluded as the trunk expands. The cable tie should be removed to prevent restriction of the tree's vascular function.
- 2.3.14 **Trees 9, 15 & 19**
Trees 9, 15 and 19 were identified as *Lagerstroemia indica* (Crepe Myrtle) and are semi-mature mature specimens located in the raised lawn areas to the front of the station. Trees 9, 15 and 19 are of low Landscape Significance and have been allocated a Retention Value of *Consider for Removal*.
- 2.3.15 Trees 9, 15 and 19 are in good health and structural condition with no significant defects identified at the time of inspection.

2.3.16 Tree 21

Tree 21 was identified as *Ficus macrophylla* (Moreton Bay Fig) and is a mature specimen located in the south-western corner of the site. The tree is of high Landscape Significance and has been allocated a Retention Value of *Priority for Retention*.

2.3.17 Tree 21 is in good health and structural condition with no significant defects identified at the time of inspection. Fungal fruiting bodies consistent in appearance with the genus *Auricularia* are present at the wound face of a pruned dead branch. This fungus is predominantly a saprobe which is feeding on the dead tissue at the wound face and should not impact the health of the tree.

2.3.18 Tree 22

Tree 22 was identified as *Corymbia maculata* (Spotted Gum) and is located in the southern section of Bradfield Park North. The tree is of moderate Landscape Significance and has been allocated a Retention Value of *Consider for Retention*.

2.3.19 Tree 22 is in good health and structural condition with no significant defects identified at the time of inspection.

2.3.20 Trees 24 & 25

Trees 24 and 25 were identified as *Lophostemon confertus* (Brush Box) and are located in the southern section of Bradfield Park North. The trees are of moderate Landscape Significance and have been allocated a Retention Value of *Consider for Retention*.

2.3.21 Trees 24 and 25 are in good health and structural condition with no significant defects identified at the time of inspection.

2.3.22 Tree 27

Tree 27 was identified as *Pyrus cvs* (Ornamental Pear Cultivars) and is a young specimen located in the southern section of Bradfield Park North. The tree is of low Landscape Significance and has been allocated a Retention Value of *Consider for Removal*.

2.3.23 Tree 27 is in good health and structural condition with no significant defects identified at the time of inspection. The tree is starting to develop a phototropic lean due to suppression from the adjacent Tree 26. It is expected the form of the tree will continue to be impacted as it grows.

2.3.24 Tree 31

Tree 31 was identified as *Phoenix canariensis* (Canary Island Date Palm) and is located in a roundabout at the junction of Alfred Street and Fitzroy Street. The tree is of moderate Landscape Significance and has been allocated a Retention Value of *Consider for Retention*. *Phoenix canariensis* (Canary Island Date Palm) is an exotic palm species which was introduced to Australia in the late 1800's. It is historically associated with commemorative plantations and civic landscapes established during the late nineteenth and early twentieth centuries (including the Inter-war Period). Tree 31 is not visible in aerial imagery from 1943 and unlikely to be a culturally significant specimen.

2.3.25 Tree 31 is in good health and structural condition with no significant defects identified at the time of inspection.

2.3.26 Trees 32 & 34

Trees 32 and 34 were identified as *Planantus x acerifolius* (London Plane Tree) and are semi-mature specimens located within the western Alfred Street road reserve. The trees are of low Landscape Significance and have been allocated a Retention Value of *Consider for Removal*.

2.3.27 Trees 32 and 34 are in good health and structural condition with no significant defects identified at the time of inspection.

2.3.28 Tree 33

Tree 33 was identified as *Planantus x acerifolius* (London Plane Tree) and is located within the western Alfred Street road reserve. The tree is of moderate Landscape Significance and has been allocated a Retention Value of *Consider for Retention*.

2.3.29 Tree 33 is in good health. It is in poor structural condition with significant canker-like wounds located on the lower trunk. This wounding is consistent with infection by *Phytophthora* sp. *Phytophthora* sp. is relatively common, fungus-like (oomycete) plant pathogen responsible for *Phytophthora* Dieback or *Phytophthora* Root Rot and can also cause trunk and stem lesions.

3.0 TREES & DEVELOPMENT

3.1 Australian Standard 4970 (2009) Protection of Trees on Development Sites

3.1.1 *Australian Standard 4970 Protection of Trees on Development Sites 2009* (AS-4970) sets out a framework for the assessment, integration and management of trees within the development context. AS-4970 outlines that a Tree Protection Zone (TPZ) is the principal means of protecting trees on development sites. It is an area isolated from construction disturbance so that the tree remains viable.¹⁴

3.1.2 The TPZ is calculated as a radial measurement based on twelve (12) times the tree's Diameter at Breast Height (DBH).¹⁵ For palms, other monocots, cycads and tree ferns, the TPZ should not be less than 1m outside the crown projection. These formulas are based on extensive research and are generally accepted within the arboricultural industry as being suitable for calculating areas designed to maintain the long-term viability of trees on development sites.

3.1.3 AS-4970 also provides calculations to determine a tree's Structural Root Zone (SRZ). The SRZ is described in AS-4970 as the area around the base of a tree required for the tree's stability in the ground. This zone considers a tree's structural stability only, not the root zone required for its vigor and long-term viability, which will usually be a much larger area. Severance of structural roots (>25mmØ) within the SRZ is generally not recommended as it may lead to the destabilisation and/or decline of the tree.

3.1.4 Palm species do not produce a woody root system, rather a dense fibrous root mass of relatively short-lived roots originating from the Root Initiation Zone (RIZ) in the root crown area at the base of the trunk, and as such, the SRZ does not apply. This characteristic of this root architecture generally allows for palm species to be highly tolerant of transplanting where the RIZ is retained.

¹⁴ Standards Australia (2009)

¹⁵ ¹⁵ Standards Australia (2009)

- 3.1.5 Ideally, works should be avoided within the TPZ. A *Minor Encroachment* is less than 10% of the TPZ and is outside the SRZ. A *Minor Encroachment* is considered acceptable by AS-4970 when it is compensated for elsewhere and contiguous within the TPZ. A *Major Encroachment* is greater than 10% of the TPZ or inside the SRZ. *Major Encroachments* generally require root investigations undertaken by non-destructive methods or the use of tree sensitive construction methods.
- 3.1.6 AS-4970 outlines that the TPZ may need to be modified (extended) to provide additional protection to the above ground parts of the tree. Where conflict between branches, new structures and construction machinery could occur, 3D laser surveying of the tree's crown may be required to accurately determine potential impacts. Branches may be temporarily protected with padding and timber battens or tied back, or in some cases pruning may be possible to provide additional clearances where these works would not impact the tree's ULE or form. Pruning requirements should be outlined within a Pruning Specification prepared in accordance with *Australian Standard 4373 Pruning of Amenity Trees (2007)*.

Refer to Tree Protection Zone Plan (**Appendix 3**)

3.2 Ramp Design

3.2.1 Trees 1, 23 & 27

Trees 1, 23 and 27 *Ulmus parvifolia* (Chinese Elm) are proposed for retention in the Concept Design. TPZ fencing should be established at the perimeter of the lawn area where the trees are located.

- 3.2.2 Reduction Pruning/Crown Lifting may be required to provide vertical clearance to the cycle ramp. These works are relatively minor and should not impact the ULE of the trees.

Refer to Figures (**Appendix 4**)

3.2.3 Trees 2, 3 & 28-30

Trees 2, 3 and 28-30 *Populus simonii* (Simons Poplar) are proposed for removal in the Concept Design to allow for the ramp footprint and new footpath below. Archival images of the site show these trees were planted in the 1990s to replace the original 1960s Poplars. The trees have short (5-15 years) and transient (<5 years) ULEs and should not be considered a design constraint.

2.3.4 Trees 4-8, 10-13, 16-18 & 20

Trees 4, 8 and 20 *Butia capitata* (Jelly Palm) and Trees 5-7, 10-13 and 16-18 *Livistona australis* (Cabbage Tree Palm) are proposed for retention in the Concept Design. TPZ fencing should be established at the perimeter of each garden bed where the trees are located.

- 2.3.5 In the event that design/construction conflicts occur between the ramp and the trees (particularly Trees 7 and 18), they could be transplanted, stored and reinstated following ramp installation. If possible, Trees 4, 8 and 20 *Butia capitata* (Jelly Palm) should be left in-situ as they are late-mature specimens with very high Landscape Significance and the physiological stress associated with transplanting may reduce their ULE.

- 3.2.6 Although palms are generally highly tolerant of transplanting, several factors must be considered as part of a transplanting proposal, including:

- Time Frame – Particularly for mature/large trees an extended period of pre-transplant preparation is generally required and involves staged root pruning, rootball preparation and irrigation.
- Reduction in ULE – Even with the implementation of best practice preparation, transplanting and re-establishment, transplanting procedures may place the trees under high levels of physiological stress which may impact their ULE.
- Financial Costs - The physical size and weight of large trees which are to be transplanted requires the use of heavy machinery which may require significant financial expenditure.
- Logistical Constraints – The practicality of transplanting large trees may be limited by a range of factors including access, infrastructure (both at the existing site and the new site), and the transportation route between the sites. The provision of adequate guying/additional support, irrigation and post transplanting care during the re-establishment phase must also be considered.
- Heritage Impacts – The removal of significant trees from their contextual setting and the resultant impact on heritage significance needs to be considered and assessed in accordance with heritage guidelines.

3.2.7 Preliminary pothole investigations should be undertaken to determine the location of services and soil depths if transplanting of is being considered. A Transplanting Feasibility Report should be prepared by an experienced Tree Transplanting Contractor.

3.2.8 Trees 9, 15 & 19

Trees 9, 15 and 19 *Lagerstroemia indica* (Crepe Myrtle) are proposed for removal in the Concept Design to allow for the ramp footprint. Trees 9, 15 and 19 are of low Landscape Significance and should not be considered a design constraint. New tree planting using healthy, advanced-sized specimens could replace the loss of amenity from tree removal within a short timeframe.

3.2.9 Tree 21

Tree 21 *Ficus macrophylla* (Moreton Bay Fig) is proposed for retention in the Concept Design. TPZ fencing should be established at the perimeter of the garden bed in which the tree is located. The asphaltic surface at the base of the tree should be retained in-situ as root/ground protection.

3.2.10 There is limited space on site for the establishment of site sheds and for a crane to lower sections of the ramp into place. The Burton Street carpark which is adjacent to Tree 21 may provide a suitable location for these structures. However, access in and out of the carpark and general crane movements will be limited due to the crown of the tree. Only minor pruning which will not significantly reduce the size of the crown of the tree will be possible.

Refer to Figures (**Appendix 4**)

3.2.11 Tree 22, 24 & 25

Tree 22 *Corymbia maculata* (Spotted Gum) and Trees 24 and 25 *Lophostemon confertus* (Brush Box) are proposed for retention in the Concept Design. TPZ fencing should be established at the perimeter of the lawn area in which the trees are located.

3.2.12 A new footpath may need to be constructed to replace the existing footpath running parallel and adjacent to the viaduct. The new footpath should be installed above grade (including sub-base layers/slabs) if it represents more than 15-20% of the TPZ and/or is located within SRZ areas.

3.2.13 Tree 27

Tree 27 *Pyrus cvs* (Ornamental Pear Cultivars) is proposed for retention in the Concept Design. TPZ fencing should be established at the perimeter of its TPZ.

3.2.14 Tree 31

Tree 31 *Phoenix canariensis* (Canary Island Date Palm) is proposed for removal in the Concept Design. It may be possible to transplant this tree to a new location. However, new planting of this species is now uncommon due to its propensity to self-seed and become weedy and its susceptibility to the fungal disease *Fusarium oxysporum* f. sp. *Canariensis*.

3.2.15 Trees 32 & 34

Trees 32 and 34 *Planantus x acerifolius* (London Plane Tree) are proposed for retention in the Concept Design. Trunk protection should be installed to protect the trees against impact damage.

3.2.16 Tree 33

Tree 33 *Planantus x acerifolius* (London Plane Tree) is proposed for retention in the Concept Design. Trunk protection should be installed to protect the trees against impact damage. In addition, the basal flare of the tree has overgrown the adjacent section of kerb. This section of kerb should be retained in-situ as part of the works. The front face of the kerb may be cut back if required however demolition saw cuts should avoid damaging any part of the tree.

3.2.17 It should be noted that Tree 33 is in poor structural condition with significant canker-like wounds located on the lower trunk. If Tree 33 is to be retained, pathology testing and internal diagnostic testing should be undertaken to more accurately determine the significance of this defect.

4.0 CONCLUSION

4.1.1 Thirty-four (34) trees were assessed in preparation of this Report and comprise a mix of Australian-native and exotic species. Of these:

- Fourteen (14) were trees allocated a Retention Value of *Priority for Retention*
- Twelve (12) trees were allocated a Retention Value of *Consider for Retention*
- Six (6) trees were allocated a Retention Value of *Consider for Removal*
- One (1) tree was allocated a Retention Value of *Priority for Removal*
- One (1) tree is dead

4.1.2 Trees with a Retention Value of *Priority for Retention* should be prioritised for retention and trees with a Retention Value of *Consider for Retention* should be incorporated into the design whenever possible. Trees with a Retention Value of *Consider for Removal* should not be considered a design constraint and trees with a Retention Value of *Priority for Removal* should be removed regardless of any future development works.

4.1.3 An Arboricultural Impact Assessment should be prepared by an Arborist (AQF Level 5) at the 30% and 100% stages to examine the potential impact of any proposed works on the trees and provide recommendations for tree sensitive methods and tree protection measures.

5.0 LIMITATIONS & DISCLAIMER

TreeiQ takes care to obtain information from reliable sources. However, TreeiQ can neither guarantee nor be responsible for the accuracy of information provided by others. Plans, diagrams, graphs and photographs in this Arboricultural Report are visual aids only and are not necessarily to scale. This Report provides recommendations relating to tree management only. Advice should be sought from appropriately qualified consultants regarding design/construction/ecological/heritage etc issues.

This Report has been prepared for exclusive use by the client. This Report shall not be used by others or for any other reason outside its intended target or without the prior written consent of TreeiQ. Unauthorised alteration or separate use of any section of the Report invalidates the Report.

Many factors may contribute to tree failure and cannot always be predicted. TreeiQ takes care to accurately assess tree health and structural condition. However, a tree's internal structural condition may not always correlate to visible external indicators. There is no warranty or guarantee, expressed or implied that problems or deficiencies regarding the trees or site may not arise in the future. Information contained in this report covers only the trees assessed and reflects the condition of the trees at the time of inspection. Additional information regarding the methodology used in the preparation of this Report is attached as Appendix 1. A comprehensive tree risk assessment and management plan for the trees is beyond the scope of this Report.

Reference should be made to any relevant legislation including Tree Management Controls. All recommendations contained within this Report are subject to approval from the relevant Consent Authority.

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Tonkin Zulaikha Greer Architects Pty Ltd (2021), *Sydney Harbour Bridge Cycleway Access Project – North Supplementary Detailed Heritage Framework*, pg 5

Appendix 1: Methodology

- 1.1 Site Inspection:** This report was determined as a result of a comprehensive site inspections during October 2021 and April/May 2022.
- 1.2 Visual Tree Assessment (VTA):** The subject tree(s) was assessed using the Visual Tree Assessment criteria and notes as described in *The Body Language of Trees – A Handbook for Failure Analysis*.¹⁶ The inspection was limited to a visual examination of the subject tree(s) from ground level only. No internal diagnostic or tissue testing was undertaken as part of this assessment. Trees outside the subject site were assessed from the property boundaries only.
- 1.3 Tree Dimensions:** The dimensions of the subject tree(s) are approximate only.
- 1.4 Tree Locations:** The location of the subject tree(s) was determined from the supplied plans. Trees not shown on the supplied plans have been plotted in their **approximate location only**.
- 1.5 Trees & Development:** Tree Protection Zones, Tree Protection Measures and Sensitive Construction Methods for the subject tree were based on methods outlined in *Australian Standard 4970-2009 Protection of Trees on Development Sites*.

The *Tree Protection Zone* (TPZ) is described in AS-4970 as 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 *Structural Root Zone* (SRZ) is described in AS-4970 as the area around the base of a tree required for the tree's stability in the ground. Severance of structural roots within the SRZ is not recommended as it may lead to the destabilisation and/or demise of the tree.

In some cases it may be possible to encroach into or make variations to the theoretical TPZ. A *Minor Encroachment* is less than 10% of the area of the TPZ and is outside the SRZ. The area lost to this encroachment should be compensated for elsewhere and contiguous with the TPZ. A *Major Encroachment* is greater than 10% of the TPZ or inside the SRZ. In this situation the Project Arborist must demonstrate that the tree would remain viable. This may require root investigation by non-destructive methods or the use of sensitive construction methods.

- 1.6 Tree Health:** The health of the subject tree(s) was rated as *Good, Fair or Poor* based on an assessment of the following factors:
- I. Foliage size and colour
 - II. Pest and disease infestation
 - III. Extension growth
 - IV. Crown density
 - V. Deadwood size and volume
 - VI. Presence of epicormic growth
- 1.7 Tree Structural Condition:** The structural condition of the subject tree(s) was rated as *Good, Fair or Poor* based on an assessment of the following factors:
- I. Assessment of branching structure
(i.e. co-dominant/bark inclusions, crossing branches, branch taper, terminal loading, previous branch failures)
 - II. Visible evidence of structural defects or instability
(i.e. root plate movement, wounds, decay, cavities, fungal brackets, adaptive growth)
 - III. Evidence of previous pruning or physical damage
(root severance/damage, lopping, flush-cutting, lions tailing, mechanical damage)
- 1.8 Useful Life Expectancy (ULE):** The ULE is an estimate of the longevity of the subject tree(s) in its growing environment. The ULE is modified where necessary to take in consideration tree(s) health, structural condition and site suitability. The tree(s) has been allocated one of the following ULE categories (Modified from Barrell, 2001):
- I. 40 years +
 - II. 15-40 years
 - III. 5-15 years
 - IV. Less than 5 years

¹⁶ Mattheck & Breloer (2003)

- 1.9 Landscape Significance:** Landscape Significance was determined by assessing the combination of the cultural, environmental and aesthetic values of the subject tree(s). Whilst these values are subjective, a rating of high, moderate, low or insignificant has been allocated to the tree(s). This provides a relative value of the tree's Landscape Significance which may aid in determining its Retention Value. If the tree(s) can be categorized into more than one value, the higher value has been allocated.

| Landscape Significance | Description |
|------------------------|--|
| Very High | The subject tree is listed as a Heritage Item under the <i>Local Environmental Plan</i> with a local or state level of significance. |
| | The subject tree is listed on Council's Significant Tree Register or meets the criteria for significance assessment of trees and/or landscapes by a suitably qualified professional. The criteria are based on general principles outlined in the Burra Charter and on criteria from the Register of the National Estate. |
| High | The subject tree creates a 'sense of place' or is considered 'landmark' tree. |
| | The subject tree is of cultural or historical importance or is widely known. |
| | The subject tree is a prominent specimen which forms part of the curtilage of a heritage item with a known or documented association with that item. |
| | The subject tree has been identified by a suitably qualified professional as a species scheduled as a Threatened or Vulnerable Species for the site defined under the provisions of the NSW <i>Biodiversity Conservation Act (2016)</i> or the Commonwealth <i>Environmental Protection and Biodiversity Conservation Act (1999)</i> . |
| | The subject tree is known to contain nesting hollows to a species scheduled as a Threatened or Vulnerable Species for the site as defined under the provisions of the NSW <i>Biodiversity Conservation Act (2016)</i> or the Commonwealth <i>Environmental Protection and Biodiversity Conservation Act (1999)</i> . |
| | The subject tree is an excellent representative of the species in terms of aesthetic value. |
| Moderate | The subject tree is of significant size, scale or makes a significant contribution to the canopy cover of the locality. |
| | The subject tree makes a positive contribution to the visual character or amenity of the area. |
| | The subject tree provides a specific function such as screening or minimising the scale of a building. |
| Low | The subject tree is a good representative of the species in terms of aesthetic value. |
| | The subject tree is a known environmental weed species or is not protected by Council's Tree Management Controls. |
| | The subject tree makes little or no contribution to the amenity of the locality. |
| | The subject tree is a poor representative of the species in terms of aesthetic value. |

- 1.10 Retention Value:** Retention Value was based on the subject tree's Useful Life Expectancy and Landscape Significance. The Retention Value was modified where necessary to take in consideration the subject tree's health, structural condition and site suitability. The subject tree(s) has been allocated one of the following Retention Values:

- I. Priority for Retention
- II. Consider for Retention
- III. Consider for Removal
- IV. Priority for Removal

| ULE | | Landscape Significance | | |
|-------------------|------------------------|------------------------|------------------------|----------------------|
| | Very High | High | Moderate | Low |
| 40 years + | Priority for Retention | Priority for Retention | | Consider for Removal |
| 15-40 years | | Priority for Retention | Consider for Retention | |
| 5-15 years | | Consider for Retention | | |
| Less than 5 years | Consider for Removal | Priority for Removal | | |

The above table has been modified from the Footprint Green Tree Significance and Retention Value Matrix.

Appendix 2: Tree Assessment Schedule

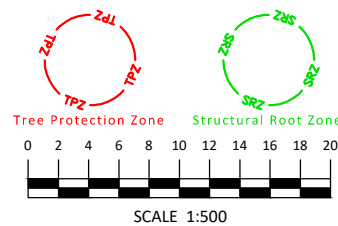
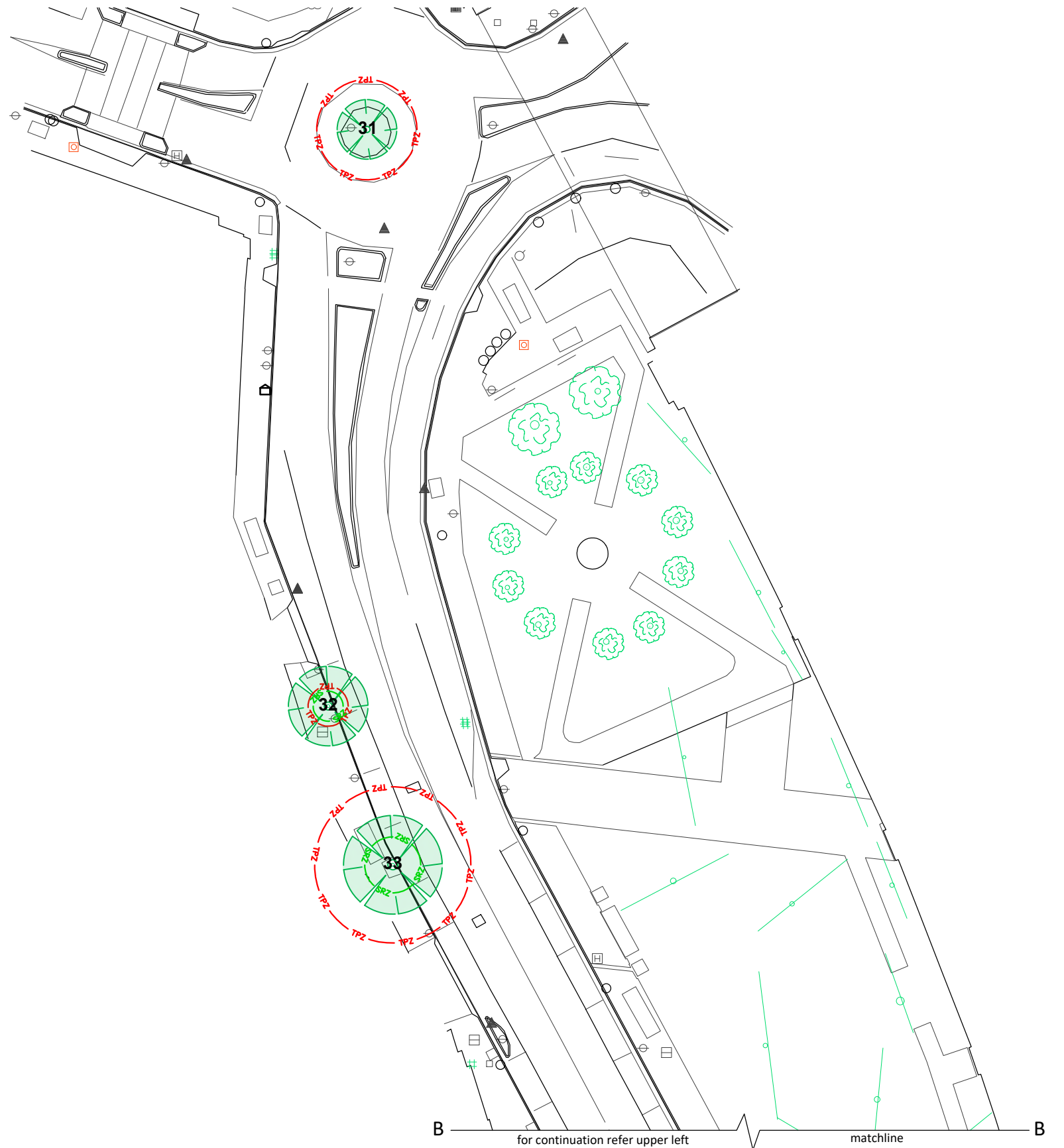
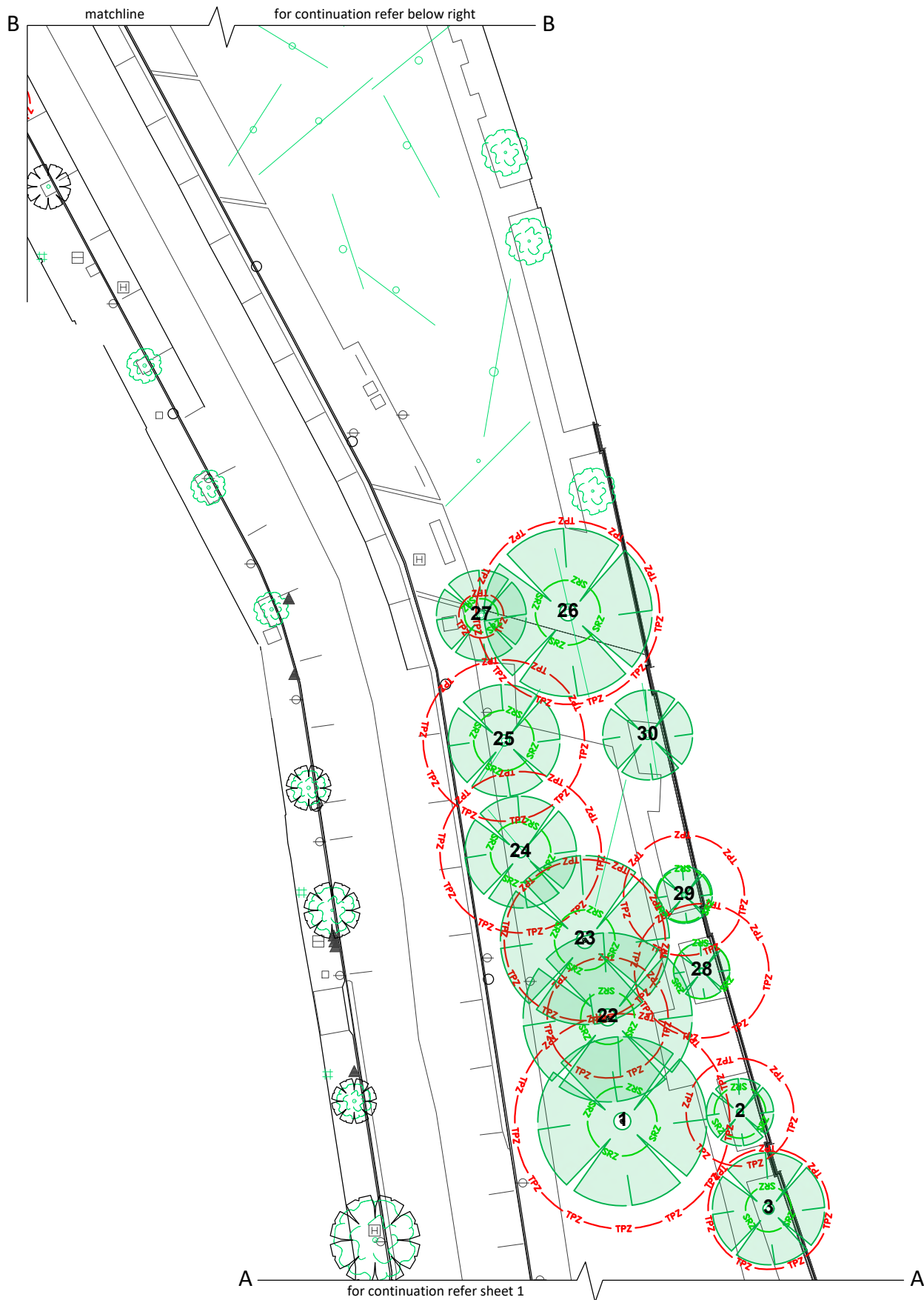
| Tree No. | Species | DBH comb. (mm) | Height (m) | Radial Crown Spread (m) | Health Rating | Structural Rating | Comments | Age Class | ULE (years) | L/Sign | Retention Value | Radial TPZ (m) | Radial SRZ (m) |
|----------|--|----------------|------------|-------------------------|---------------|-------------------|--|-------------|-------------|-----------|------------------------|----------------|----------------|
| 1 | <i>Ulmus parvifolia</i> (Chinese Elm) | 800 | 11 | 9 | Good | Good | Small (<25mmØ) & medium (25-75mmØ) deadwood in low volumes. Small (<25mmØ) & medium (25-75mmØ) epicormic growth in low volumes. Branch inclusion(s), minor. Mechanical damage to exposed surface root(s). Cavity(s), minor. | Mature | 15-40 | Moderate | Consider for Retention | 9.6 | 3.1 |
| 2 | <i>Populus simonii</i> (Simons Poplar) | 400 | 9 | 5 | Good | Fair | Small (<25mmØ) & medium (25-75mmØ) deadwood in low volumes. Small (<25mmØ) & medium (25-75mmØ) epicormic growth in low volumes. Pruning wound(s), various stages of decay. Asymmetrical crown form due to Reduction Pruning for bridge pilasters. Crown lifted for pedestrian clearance. Hanger in crown. | Mature | 5-15 | Moderate | Consider for Retention | 4.8 | 2.3 |
| 3 | <i>Populus simonii</i> (Simons Poplar) | 450 | 9 | 5 | Good | Fair | Small (<25mmØ) & medium (25-75mmØ) deadwood in low volumes. Small (<25mmØ) & medium (25-75mmØ) epicormic growth in low volumes. Partially suppressed. Pruning wound(s), various stages of decay. Asymmetrical crown form due to Reduction Pruning for bridge pilasters. Crown lifted for pedestrian clearance. | Mature | 5-15 | Moderate | Consider for Retention | 5.4 | 2.4 |
| 4 | <i>Butia capitata</i> (Jelly Palm) | 450 | 8 | 3 | Fair | Good | Fig in crown. Leaf spot/disco colouration - blight/nutrient deficiency? | Late Mature | 5-15 | Very High | Priority for Retention | 4.0 | n/a |
| 5 | <i>Livistona australis</i> (Cabbage Tree Palm) | 450 | 10 | 2 | Good | Good | Licen on trunk. | Mature | 15-40 | High | Priority for Retention | 3.0 | n/a |
| 6 | <i>Livistona australis</i> (Cabbage Tree Palm) | 450 | 10 | 2 | Good | Good | Licen on trunk. Wound at base. | Mature | 15-40 | High | Priority for Retention | 3.0 | n/a |

| Tree No. | Species | DBH comb. (mm) | Height (m) | Radial Crown Spread (m) | Health Rating | Structural Rating | Comments | Age Class | ULE (years) | L/Sign | Retention Value | Radial TPZ (m) | Radial SRZ (m) |
|----------|--|----------------|------------|-------------------------|---------------|-------------------|---|-------------|-------------|-----------|------------------------|----------------|----------------|
| 7 | <i>Livistona australis</i> (Cabbage Tree Palm) | 350 | 10 | 2 | Good | Good | Licen on trunk. | Mature | 15-40 | High | Priority for Retention | 3.0 | n/a |
| 8 | <i>Butia capitata</i> (Jelly Palm) | 400 | 7 | 3 | Good | Good | | Late Mature | 15-40 | Very High | Priority for Retention | 4.0 | n/a |
| 9 | <i>Lagerstroemia indica</i> (Crepe Myrtle) | 130 | 4 | 2 | Good | Good | No access to base. | Semi-mature | 15-40 | Low | Consider for Removal | 2.0 | 1.5 |
| 10 | <i>Livistona australis</i> (Cabbage Tree Palm) | 300 | 10 | 2 | Good | Good | Licen on trunk. Minor abrasion damage on trunk. | Mature | 15-40 | High | Priority for Retention | 3.0 | n/a |
| 11 | <i>Livistona australis</i> (Cabbage Tree Palm) | 300 | 10 | 2 | Good | Good | Licen on trunk. Minor abrasion damage on trunk. | Mature | 15-40 | High | Priority for Retention | 3.0 | n/a |
| 12 | <i>Livistona australis</i> (Cabbage Tree Palm) | 400 | 10 | 2 | Good | Good | Licen on trunk. | Mature | 15-40 | High | Priority for Retention | 3.0 | n/a |
| 13 | <i>Livistona australis</i> (Cabbage Tree Palm) | 400 | 10 | 2 | Good | Good | Licen on trunk. Wound at base. | Mature | 15-40 | High | Priority for Retention | 3.0 | n/a |
| 14 | <i>Butia capitata</i> (Jelly Palm) | | | | | | DEAD | | | | | | |
| 15 | <i>Lagerstroemia indica</i> (Crepe Myrtle) | 130 | 4 | 2 | Good | Good | No access to base. | Semi-mature | 15-40 | Low | Consider for Removal | 2.0 | 1.5 |

| Tree No. | Species | DBH comb. (mm) | Height (m) | Radial Crown Spread (m) | Health Rating | Structural Rating | Comments | Age Class | ULE (years) | L/Sign | Retention Value | Radial TPZ (m) | Radial SRZ (m) |
|----------|--|----------------|------------|-------------------------|---------------|-------------------|---|-------------|-------------|-----------|------------------------|----------------|----------------|
| 16 | <i>Livistona australis</i> (Cabbage Tree Palm) | 350 | 10 | 2 | Good | Good | Licen on trunk. | Mature | 15-40 | High | Priority for Retention | 3.0 | n/a |
| 17 | <i>Livistona australis</i> (Cabbage Tree Palm) | 350 | 10 | 2 | Good | Good | Licen on trunk. | Mature | 15-40 | High | Priority for Retention | 3.0 | n/a |
| 18 | <i>Livistona australis</i> (Cabbage Tree Palm) | 350 | 10 | 2 | Good | Good | Licen on trunk. Cable tie on trunk. | Mature | 15-40 | High | Priority for Retention | 3.0 | n/a |
| 19 | <i>Lagerstroemia indica</i> (Crepe Myrtle) | 130 | 4 | 2 | Good | Good | No access to base. | Semi-mature | 15-40 | Low | Consider for Removal | 2.0 | 1.5 |
| 20 | <i>Butia capitata</i> (Jelly Palm) | 400 | 7 | 3 | Good | Good | Fig in crown. | Late Mature | 15-40 | Very High | Priority for Retention | 4.0 | n/a |
| 21 | <i>Ficus macrophylla</i> (Moreton Bay Fig) | 800 | 10 | 15 | Good | Good | Crown density 75-95%. Recently pruned with Auricularia fruiting body at wound. Wound(s), various stages of decay. Lopped for powerline clearance. Exposed surface roots. | Mature | 15-40 | High | Priority for Retention | 9.6 | 3.1 |
| 22 | <i>Corymbia maculata</i> (Spotted Gum) | 450 | 13 | 8 | Good | Good | Partially suppressed. Small (<25mmØ) & medium (25-75mmØ) deadwood in low volumes. Small (<25mmØ) & medium (25-75mmØ) epicormic growth in low volumes. | Mature | 15-40 | Moderate | Consider for Retention | 5.4 | 2.4 |
| 23 | <i>Ulmus parvifolia</i> (Chinese Elm) | 600 | 15 | 12 | Good | Good | Partially suppressed. Small (<25mmØ) & medium (25-75mmØ) deadwood in low volumes. Small (<25mmØ) & medium (25-75mmØ) epicormic growth in low volumes. Wound(s), various stages of decay. Adaptive growth on branch. | Mature | 15-40 | Moderate | Consider for Retention | 7.2 | 2.7 |

| Tree No. | Species | DBH comb. (mm) | Height (m) | Radial Crown Spread (m) | Health Rating | Structural Rating | Comments | Age Class | ULE (years) | L/Sign | Retention Value | Radial TPZ (m) | Radial SRZ (m) |
|----------|--|-------------------|------------|-------------------------|---------------|-------------------|--|-----------|-------------|----------|------------------------|----------------|----------------|
| 24 | <i>Lophostemon confertus</i> (Brush Box) | 600 | 15 | 8 | Good | Good | Small (<25mmø) & medium (25-75mmø) deadwood in low volumes. Spheroplast growth. | Mature | 15-40 | Moderate | Consider for Retention | 7.2 | 2.7 |
| 25 | <i>Lophostemon confertus</i> (Brush Box) | 600 | 15 | 8 | Good | Good | Small (<25mmø) & medium (25-75mmø) deadwood in low volumes. | Mature | 15-41 | Moderate | Consider for Retention | 7.2 | 2.7 |
| 26 | <i>Ulmus parvifolia</i> (Chinese Elm) | 400 300 450 | 10 | 12 | Good | Fair | Small (<25mmø) & medium (25-75mmø) deadwood in low volumes. Small (<25mmø) & medium (25-75mmø) epicormic growth in low volumes. Co-dominant inclusion, major. | Mature | 15-40 | Moderate | Consider for Retention | 8.2 | 2.9 |
| 27 | <i>Pyrus cvs</i> (Ornamental Pear Cultivars) | 50 | 4 | 1 | Good | Good | Suckers from base. Developing slight phototropic lean due to suppression from Tree 26. | Young | 5-15 | Low | Consider for Removal | 2 | 1.5 |
| 28 | <i>Populus simonii</i> (Simons Poplar) | 500 | 14 | 5 | Good | Poor | Crown density 25-50% - not in full at time of assessment (Autumn). Small (<25mmø) & medium (25-75mmø) deadwood in low volumes. Small (<25mmø) & medium (25-75mmø) epicormic growth in low volumes. Partially suppressed. Pruning wound(s), various stages of decay. Major wound with early stages of decay 0-1.4m. Rib of adaptive tissue. Possible injection sites. Asymmetrical crown form due to Reduction Pruning for bridge pilasters. Crown lifted for pedestrian clearance. | Mature | <5 | Moderate | Priority for Removal | 6 | 2.5 |
| 29 | <i>Populus simonii</i> (Simons Poplar) | 400 | 13 | 3 | Good | Poor | Crown density 25-50% - not in full at time of assessment (Autumn). Small (<25mmø) & medium (25-75mmø) deadwood in low volumes. Small (<25mmø) & medium (25-75mmø) epicormic growth in low volumes. Pruning wound(s), various stages of decay. Depressed seam of tissue 0-1.5m. Asymmetrical crown form due to Reduction Pruning for bridge pilasters. Crown lifted for pedestrian clearance. | Mature | 5-15 | Moderate | Consider for Retention | 6 | 2.5 |

| Tree No. | Species | DBH comb. (mm) | Height (m) | Radial Crown Spread (m) | Health Rating | Structural Rating | Comments | Age Class | ULE (years) | L/Sign | Retention Value | Radial TPZ (m) | Radial SRZ (m) |
|----------|---|----------------|------------|-------------------------|---------------|-------------------|---|-------------|-------------|----------|------------------------|----------------|----------------|
| 30 | <i>Populus simonii</i> (Simons Poplar) | 450 | 12 | 6 | Good | Fair | Crown density 25-50% - not in full at time of assessment (Autumn). Small (<25mmø) & medium (25-75mmø) deadwood in low volumes. Small (<25mmø) & medium (25-75mmø) epicormic growth in low volumes. Pruning wound(s), various stages of decay. Asymmetrical crown form due to Reduction Pruning for bridge pilasters. Crown lifted for pedestrian clearance. | Mature | 5-15 | Moderate | Consider for Retention | 5.4 | 2.4 |
| 31 | <i>Phoenix canariensis</i> (Canary Island Date Palm) | 600 | 7 | 4 | Good | Good | No access to base. | Mature | 15-40 | Moderate | Consider for Retention | 5 | n/a |
| 32 | <i>Planantus x acerifolius</i> (London Plane Tree) | 100 | 6 | 2 | Good | Good | | Semi-mature | 15-40 | Low | Consider for Removal | 2 | 1.5 |
| 33 | <i>Planantus x acerifolius</i> (London Plane Tree) | 650 | 17 | 10 | Good | Poor | Major basal wound possibly Phytophthora infection. Girdled root. Lopped branch. Displaced kerb. | Mature | 5-15 | Moderate | Consider for Retention | 7.8 | 2.8 |
| 34 | <i>Planantus x acerifolius</i> (London Plane Tree) | 200 | 13 | 7 | Good | Good | | Semi-mature | 15-40 | Low | Consider for Removal | 2.4 | 1.7 |



Sydney Harbour Bridge Cycleway
Northern Access
TPZ SRZ Plan Sheet 2
Client: Transport for NSW
date: 20th May 2022
scale: 1:500 (A3)

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Appendix 4: Plates



Plate 1: Showing Tree 1 – potential Reduction Pruning



Plate 2: Showing Trees 2 & 3



Plate 3: Showing Trees 4-7



Plate 4: Showing Tree 14



Plate 5: Showing Trees 16-20



Plate 6: Showing Tree 21 – potential Reduction Pruning



Plate 7: Showing Tree 21 – potential Reduction Pruning



Plate 8: Showing Tree 22



Plate 9: Showing Tree 23 – potential Reduction Pruning & Trees 24 & 25



Plate 10: Showing Trees 26 & 27



Plate 11: Showing Tree 28



Plate 12: Showing Tree 28 - rib

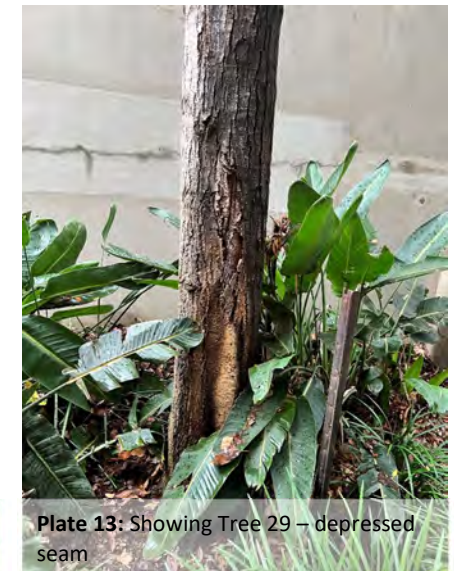


Plate 13: Showing Tree 29 – depressed seam



Plate 14: Showing Tree 31



Plate 15: Showing Tree 32-34



Plate 16: Showing Tree 33 – canker-like lesions



Plate 17: Showing Tree 34