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Vegetation Management Consultants

LACHLAN'S LINE, PEDESTRIAN BRIDGE, DELHI ROAD, NORTH RYDE

ARBORICULTURAL IMPACT ASSESSMENT

PREPARED FOR:

LANDCOM

INSTITUTE OF AUSTRALIAN CONSULTING ARBORICULTURISTS
IACA
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date	*revision*	*prepared*	*checked*
11/10/17	Review of Environmental Factors	LD	AS
30/10/17	Review of Environmental Factors	LD	AM
28/05/18	Revised Construction Drawings	AM	AS

Executive Summary

This report was commissioned by Landcom to accompany their REF for their proposal for a pedestrian and cycleway bridge, located within the City of Ryde Council area at Delhi Road, North Ryde. The aim of this report is to provide an assessment of the impacts generated by the construction of the proposed development, specifically the forty three trees that are situated in proximity to the bridge structure, in accordance with AS4970 - 2009.

This report collates and presents information collected by Luke Davis and Andrew Morrison on the 20/09/17. The data collected is located at **7. Tree Survey Table** (page 19) also see **8. Tree Survey Table Notes** (page 23) for notes relating to tree survey table.

Generally the site's vegetation was observed to have a native tree canopy, with a native shrub midstorey and a turf groundcover layer. The existing surveyed trees are shown at **9. Tree Location Plan** (page 27).

The proposed development will involve the construction of a 170m long raised pedestrian bridge which traverses over the M2 Motorway and Delhi Road at North Ryde. Prep works at each set down point will involve the clearing and demolition of existing structures, regrading site levels through excavation, cutting and filling of soil on site, and the installation of temporary piling platforms. Permanent works will include the drilling and laying of piles and piers to support the walkway and crane lifting to fixing in place, the bridge spans themselves. The extent of site works is also illustrated at **9. Tree Location Plan** (page 27).

The matrix below gives a brief overview summary of tree significance and level of encroachment from the proposed development of numbered trees.

	ENCROACHMENT WITHIN TPZ Numbering of trees as shown on Tree Location Plan				
TREE LANDSCAPE SIGNIFICANCE		**No Impact**	**Major Encroachment**	**Within Construction Footprint**	**Trees previously approved for removal**
	High	43	34	-	-
	Medium	59A	-	149	27 & 29
	Low	10, 11, 35, 44(L-M) & 59(L-M)	36, 143 & 150	1, 2(L-M), 3, 4, 5, 6, 7, 8, 9, 12, 37, 39, 144, 145, 146, 147, 148, 152(L-M) & 156(L-M)	18, 19, 20, 21, 22, 23, 24, 26, 28, 30(L-M), 31 & D
	Total Number of trees	**7**	**4**	**20**	**14**

In consideration of the data collected recommendations are provided for the removal or retention of trees including specific tree protection measures required to reduce the anticipated impacts from the proposed construction on those trees proposed to be retained. This report specifically recommends:

- The removal of Tree No.'s 18, 19, 20, 21, 22, 23, 24, 26, 27, 28, 29, 30(L-M), 31 & D has previously been approved under SSD 5093.
- The removal of Tree No.'s 1, 2, 3, 4, 5, 6, 7, 8, 9 & 12 if the development is approved, as they are within the development footprint of the pedestrian bridge or within the earthworks associated with Pier 1 of the proposed bridge.
- The removal of Tree No.'s 18, 19, 20, 21, 22, 23, 24, 26, 27, 28, 29, 30, 31, D, 37 & 39 if the development is approved, as they are within the development footprint of the pedestrian bridge or within the earthworks associated with Pier 2 of the proposed bridge.
- The removal of Tree No.'s 144, 145, 146, 147, 148, 149, 152 & 156, if the development is approved, as they are within the development footprint of the pedestrian bridge or within the earthworks associated with Pier 3 of the proposed bridge.
- The removal of low significance trees, Tree No.'s 36 & 143, if the development is approved, as they have major unsustainable encroachment by the earthworks associated with the proposed bridge.
- The removal of Tree No.'s 25 & 38 as they are dead, having no habitat hollows.
- The retention of Tree No. 34. This tree belongs to the Sydney Turpentine and Ironbark Forest (STIF) endangered ecological community. This tree is of high significance and design modification has been specified to avoid and minimise impacts from the proposed rig platform providing major encroachment. See **9 Tree Location Plan** page 27, sheets T06, T06 & T07). Specific notes regarding tree retention modifications and management plan can be found at **6.3 Construction Design Management Plan** (page 16).
- The retention of Tree No. 150. This tree belongs to the STIF endangered ecological community and design modification has been specified to avoid and minimise impacts from the proposed temporary platform providing major encroachment. These are outlined above for Tree 34.
- The retention and protection of Tree No.'s 10, 11, 35, 43, 44, 59 & 59A as these will not be affected by the proposed works.

- No landscape plans or service plans have been supplied. Constructed elements such as retaining walls, paving and other features; and open trenches for services should be located outside the TPZ of all retained trees. This arboricultural assessment should be reviewed if additional encroachments are proposed within TPZ's of retained trees.
- Where possible removed trees shall be used for habitat or mulch as directed by the ecological consultant.
- Project Arborist supervision is required for all works located within the TPZ of all retained trees.
- A minimum AQF Level 5 Project Arborist shall be engaged to certify the tree protection works, works during construction and tree and soil condition at the conclusion of works for those trees to be retained, in accordance with **6 Tree Management** (page 16).
- For additional tree protection notes see **10. General Tree Protection Notes** (page 36).

Table of Contents

1. Introduction

This report was commissioned by Landcom to accompany their REF for their proposal for a pedestrian and cycleway bridge, located within the City of Ryde Council area at Delhi Road, North Ryde. The aim of this report is to provide an assessment of the impacts generated by the construction of the proposed development, specifically the forty three trees that are situated in proximity to the bridge structure, in accordance with AS4970 - 2009.

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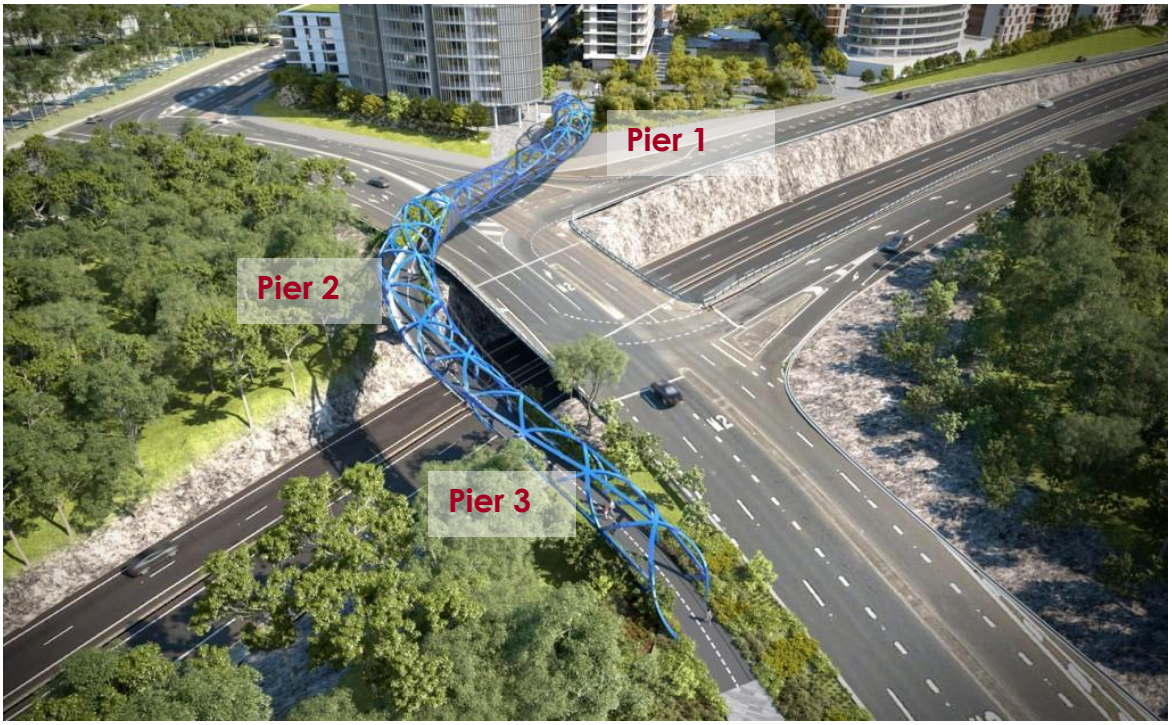

Figure 1: *Aerial view of the proposed bridge at intersection of the M2 and Delhi Road, North Ryde, taken from the southeast.* *From http://www.kistudio.com.au/project/lachlans-line-pedestrian-cycle-bridge/ viewed 20-06-18.*

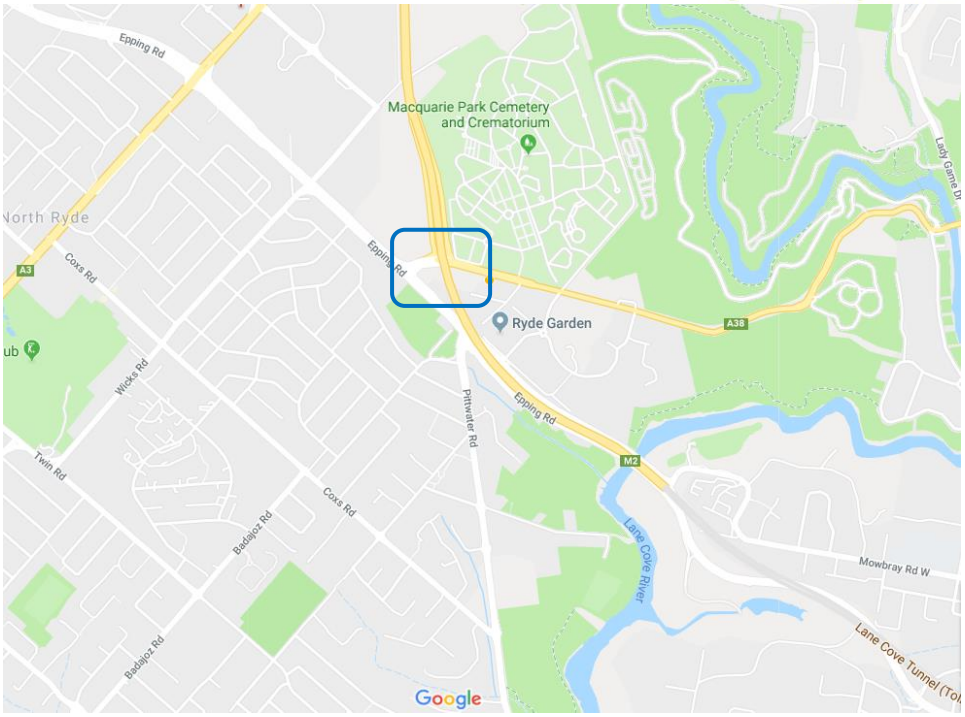

Figure 2: *Location of proposed site works indicated in rectangle.* *From https://www.google.com.au/maps/place/Display+Suite:+nbh+at+Lachlan's+Line/@-33.7960342,151.1272609,14.96z/data=!4m5!3m4!1s0x6b12a6086cbbfdb1:0x87c6a4895706fae1!8m2!3d-33.785264!4d151.127644 viewed 20-06-18.*

2. Methodology

2.1. Limitations

Care has been taken to obtain all information from reliable sources. All data has been verified as far as possible. However Andrew Morrison - Consulting Arborist can neither guarantee nor be responsible for the accuracy of information provided by others. Unless stated otherwise:

- Information contained in this report covers only the tree/s examined and reflects the health and structure of the tree at the time of inspection. The documented, observations, results, recommendations and conclusions given may vary after the site visit due to environmental conditions. Liability will not be accepted for damage to person or property as a result of natural processes, unforeseeable actions or occurrences.
- Observations recorded for trees located within adjacent properties have been made without entering that property. As a result measurements for these trees are estimated. Similarly these trees were not subject to a complete visual inspection and defects or abnormalities may be present but not recorded.
- The inspection was limited to visual examination from the base of the subject tree without dissection, excavation, probing or coring (unless specifically noted otherwise).
- There is no warranty or guarantee, expressed or implied, that problems or deficiencies of the subject tree may not arise in the future.

2.2. Site Inspection

A visual inspection of the tree/s was performed from ground level, data collected includes:

- Genus, Species, Common Name;
- Height, Width, DBH (Diameter at Breast Height), DRB (Diameter above Root Buttress);
- Age and Health;
- Amenity and Ecological Value;
- Crown Form and Condition;
- Visible Defects or Evidence of Wounding.

2.3. Measurement

- Tree locations are supplied on the client supplied survey plan or triangulated using a measuring tape.
- Diameter at breast height (DBH) and Diameter above Root Buttress (DRB) are measured using a diameter tape.
- Height is measured using a clinometer.
- Canopy width is estimated using a measured stride paced out on site.
- Structural Root Zone (SRZ) and Tree Protection Zone (TPZ) radii are measured (in accordance with AS 4970-2009) from the centre of the trunk.
- Development impact/setback is measured from the nearest face of the trunk to the face of the structure in Auto CAD using the perpendicular distance function. Generally this is measured without detailed foundation design.

2.4. Recording Data

Data collected is collated in the tree survey table located at **7. Tree Survey Table** (page 19). The tree survey table contains abbreviations for terms describing the trees characteristics; explanatory notes pertaining to these are located at **8. Tree Survey Table Notes** (page 23).

The physical data for tree locations, crown width and DRB is schematically described in **9. Tree Location Plan** (page 27).

2.5. Reference Documents

The report was written in coordination with:

- 50% Detail Design prepared by Arup Pty Ltd Revision 1, dated 29/09/17.
- Survey Plan prepared by Crux Pty Ltd Revision A, dated 03/08/16.
- Property Ownership shown on plan prepared by Arup Revision E, dated 16/06/17.
- Construction Footprint- Worksite 3 Option 1 Co-ordination Sketch prepared by Arenco /Daracon Group, Rev D, dated 07/05/18.
- Lachlan's Line Model - Trees Retained (Option 1 Earth Ramp), Sketch prepared by Arenco /Daracon Group, supplied 03/05/18.
- Surendran Karasu; Email Correspondence from Alliance Geotechnical, 15 May 2018 5:08pm, 2018.

- The Australian Standard for the Protection of Trees on Development Sites (AS 4970 – 2009).

2.6. Council Tree Preservation Order

Ryde City Council defines a tree as:

a) Any tree, whether on private or public land (land owned or under the care, control and management of the City of Ryde), with a height greater than 5 metres and a trunk circumference of 450mm at 1.4 metres above ground level.
b) Native vegetation within defined 'Urban Bushland' (refer to map).
c) Trees which are prominent or have landmark qualities due to their height, size, position and age.
d) Trees which are part of an important wildlife habitat, refuge or corridor.
e) Native bushland subject to controls under State Environmental Planning Policy 19.
f) Trees on the City of Ryde Significant Tree Register.

The following trees are exempt from the City of Ryde TPO:

i. Trees that are within 3m of an approved detached building and any associated building, as measured from the outside of the tree, at 1.4m from the ground.
ii. The removal of dead or dying tree/s, as long as the trees are not a threatened species habitat.
iii. Tree(s) posing an immediate danger, e.g. after a storm.
iv. Tree(s) that have been declared noxious weeds in the local government area of the City of Ryde under the Noxious Weeds Act 1993 or an undesirable species in accordance with the TPO list.

2.7. Determining a tree's significance

The landscape significance of a tree is an essential criterion to establish the importance that a particular tree may have on a site. When determining a tree's significance within the landscape context, the following questions are asked of each tree. Significance may be expressed in increments of High, Medium or Low. For a High rating the majority (≥4) of the answers will be yes; for a Medium rating half (=3) of the answers will be yes; and for the Low rating the minority of answers will be yes (≤2).

1. Is the tree a locally native remnant; an endangered species; a part of an endangered ecological community; or does the tree provide critical habitat for an endangered species?

2. Is the tree of botanical interest; listed as a heritage item under the Federal State or Local Regulations?

3. Is the tree visually prominent in the locality?

4. Is the tree well structured?

5. Is the tree in good health and does it display signs of good vigour?

6. Is the tree typically formed for the species?

7. Is the tree located in a position that will accommodate future growth?

3. Observations

3.1. Site Description

The site is three separate road reserve areas (specifically, the location of each of the 3 bridge piers), located at the intersection of Delhi Road and the M2 Motorway. They each currently contain established native trees paths, turf areas and gardens. The site has a general southerly aspect.

3.2. Soil Landscape Map

The soils in this area are from the Lucas Heights soil landscape group [3]. They are characterised by moderately deep 50-150 cm hard setting yellow podzolic soils and yellow soloths, with yellow earths on the outer edges.

Generally the landscape is characterised by gently undulating crests and ridges on plateau surfaces of the Mittagong formation with alternating bands of shale and fine-grained sandstones. There is local relief to 30 m with slope gradients of <10%, and rock outcrops are absent [3].

These soils are limited by low soil fertility, low available water capacity and stony soil. The critical soil characteristics of this soil type for trees growing on this site include low fertility, and low water capacity [3].

3.3. Native Vegetation Map

The Turpentine Ironbark margin forest endangered ecological community[13, 14] is dominated by Eucalyptus *punctata* and *Syncarpia glomulifera* with a sparse stratum of small trees including *Acacia parramattensis* and *Pittosporum undulatum*. A variety of tree species occur more sporadically, including *Corymbia gummifera* and *E. globoidea*.

The shrub stratum is usually relatively sparse and features mesic species such as *Polyscias* sambucifolia, *Breynia oblongifolia* and *Notelaea longifolia* as well as some sclerophyllous species such as *Leucopogon juniperinus* [13, 14].

The ground stratum is frequently dense and dominated by a range of grass species including *Entolasia marginata, E. stricta, Panicum simile, Themeda australis, Microlaena stipoides var. stipoides, Echinopogon caespitosus var. caespitosus* and *Oplismenus aemulus*. A variety of herb species are also represented. Frequently recorded species include *Pratia purpurascens, Gonocarpus tetragynus, Dianella caerulea, Dichondra repens* and *Pseuderanthemum variabile*[13, 14].

Turpentine Ironbark Margin Forest, is listed as endangered under the Threatened Species Conservation Act 1995. There appears to be species representative of this vegetation community located on this site.

3.4. Summary of site inspection data

Generally the site's vegetation was observed to have a native tree canopy, with a native shrub midstorey and a turf groundcover layer. The existing surveyed trees are shown at **9. Tree Location Plan** (page 27).

3.5. Summary of Proposed Development

The proposed development will involve the construction of a 170m long raised pedestrian bridge which traverses over the M2 Motorway and Delhi Road at North Ryde. Prep works at each set down point will involve the clearing and demolition of existing structures, regrading site levels through excavation, cutting and filling of soil on site, and the installation of temporary piling platforms. Permanent works will include the drilling and laying of piles and piers to support the walkway and crane lifting to fixing in place, the bridge spans themselves. The extent of site works is also illustrated at **9. Tree Location Plan** (page 27).

3.6. Tree significance and encroachment matrix

The matrix below gives a brief overview summary of tree significance and level of encroachment from the proposed development of numbered trees.

	ENCROACHMENT WITHIN TPZ Numbering of trees as shown on Tree Location Plan				
TREE LANDSCAPE SIGNIFICANCE		**No Impact**	**Major Encroachment**	**Within Construction Footprint**	**Trees previously approved for removal**
	High	43	34	-	-
	Medium	59A	-	149	27 & 29
	Low	10, 11, 35, 44(L-M) & 59(L-M)	36, 143 & 150	1, 2(L-M), 3, 4, 5, 6, 7, 8, 9, 12, 37, 39, 144, 145, 146, 147, 148, 152(L-M) & 156(L-M)	18, 19, 20, 21, 22, 23, 24, 26, 28, 30(L-M), 31 & D
	Total Number of trees	**7**	**4**	**20**	**14**

4. Discussion

4.1. Trees with Major Encroachment

The proposed construction encroaches within the TPZ by more than 10% or is within the SRZ.

- Tree 34 is located 1.96m from the temporary retaining block wall associated with the proposed temporary platform to support the drill rig which is required during constriction to drill the holes for Pier 2 and to support the crane required to install the suspended bridge.

  This tree is a mature Grey Ironbark (*Eucalyptus paniculata*). This tree belongs to the Sydney Turpentine and Ironbark Forest (STIF) endangered ecological community. It is considered to be of high significance and will be retained and protected.

  The proposed temporary platform provides a 34.9% fill encroachment within the TPZ and an encroachment within the SRZ. The fill associated with the temporary platform will be of varying depth from 0 – 1.7m and is intended to be removed as soon as possible, 12 months from installation.

See **4.4 Temporary Work Platform** (page 13) for discussion of the impacts of the temporary work platform and the specifications to mitigate against those impacts on site.

- Trees 36, 143 are located 0.58m from the earthworks for rig platform (near pier 2) and 0.82m from pier 3 platform providing 25.8% and 23.6% encroachment respectively within the TPZ and encroachment within the SRZ. These trees are considered to be of low significance and should not be considered a constraint on the development.

- Tree 150 is located 1.96m from proposed earthworks providing a 23.7% (major) encroachment within the TPZ and marginal encroachment within the SRZ. This tree is a representative species of the Sydney Turpentine and Ironbark Forest (STIF) endangered ecological community and we understand design modification has been completed to avoid and minimise impacts from the proposed temporary platform providing major encroachment by using a mass block retaining wall constructed as per the details for the platform at pier 2 within the TPZ of Tree 34. We have not seen those plans, however, construction should be consistent with that shown for Tree 34. See **4.4 Temporary Work Platform** (page 13) for discussion of the impact of the temporary work platform and the specifications to mitigate against those impacts on site.

4.2. Trees within the development footprint

The client has requested that an offset of 5m from the footprint of the pedestrian walkway bridge be cleared of all vegetation. This is due to the radiant heat effect on the structure in the event of trees within this offset catching fire. This offset is also required for bridge construction access and maintenance purposes. Particularly, the client has stated that the paint and sealants used on the pedestrian walkway bridge will be damaged from constant exposure to eucalyptus oils and leaf litter.

- Trees 1, 2, 3, 4, 5, 6, 7, 8, 9 & 12 are located within the development footprint of the pedestrian bridge or within the earthworks associated with Pier 1 of the proposed bridge. These trees are considered to be of low significance (Tree 2 is of low-medium significance) and should not be considered a constraint on development.
- Trees 18, 19, 20, 21, 22, 23, 24, 26, 28, 29, 30 (low-medium), 31, D, 37 & 39 are located within the development footprint of the pedestrian bridge or within the earthworks associated with Pier 2 of the proposed bridge. These trees are considered to be of low significance (Tree 2 is of low-medium significance) and should not be considered a constraint on development.

- Trees 144, 145, 146, 147, 148, 152 & 156 are located within the development footprint of the pedestrian bridge or within the earthworks associated with Pier 3 of the proposed bridge. These trees are considered to be of low significance (Tree 2 is of low-medium significance) and should not be considered a constraint on development.

- Tree 149 is located within the development footprint of the pedestrian bridge or within the earthworks associated with Pier 3 of the proposed bridge. It is considered to be of medium significance, has major deadwood to 100mm in diameter. Extensive redesign of the proposed bridge would be required to retain this tree. It cannot be retained if the development is approved in its current form.

4.3. Other Tree Comments

- Tree No.'s 10, 11, 35, 43, 44, 59 & 59A are located in positions that will allow their retention without impact from the proposed development.

- Tree No.'s 25 & 38 are dead and have no habitat hollows. They should be removed.

- Other dead trees were found on site during the inspection and not assigned numbers. These trees should be considered for immediate removal irrespective of the proposed development application.

4.4. Temporary Work Platform

The temporary work platform will be retained by mass block walls. We anticipate the following impacts on trees:

a) Compaction to the soil profile. Compaction can be caused by using machinery and installation of compacted fill. Compaction is generally regarded as irreversible. Compaction forces can directly injure roots through shear fracture and/or crushing. Healthy tree growth and development requires soil which that is loose and friable allowing root growth, and the availability of adequate water and oxygen. Compaction reduces access to oxygen and water within the root zone and leads to a decrease in the vigour of the tree, and in extreme cases, death.

b) The placement of fill material over existing soil profiles will create a barrier preventing water infiltration and oxygen exchange.

c) Excavation is required to achieve a level base for mass block retaining walls. If this is carried out for the blocks nearest the SRZ and inner TPZ, major structural roots could be cut. Cutting major structural roots will provide an opportunity for the ingress of decay-causing organisms and render the tree unstable.

d) Mechanical damage to trunk and branches may occur if machinery contacts the bark or outer cambium. It is understood that machinery with long booms, masts or jibs will be required to operate on this site.

e) Contamination of existing soil may be caused by imported ballast or waste. This material may have toxins, unsuitable pH and/or nutrient levels. Contamination may also be caused by construction liquids, chemicals, lubricants or fuels

The use of a 'dose model' is useful when evaluating the effects of stressors to three categories; duration, intensity and frequency. To reduce stress to the tree requires the reduction of one or more of these categories.

a) Duration - Given that the duration (length of build) is likely to be 12 months, all endeavours should be made to reduce the likelihood of delays in the project. We understand the platform will be needed to support the drilling rig at the commencement of works and a crane at the conclusion of works to assemble the bridge deck. All efforts should be made to restrict the length of build to 12 months or shorter.

b) Intensity – The intensity (magnitude) of compaction is supplied by the force of machinery installing fill, the weight of fill and mass blocks installed over the area of the platform and the weight of the rig when on site. This needs to be evaluated

and mitigated. The exclusion of water and air can be mitigated by providing irrigation and gap graded ballast.

c) Frequency - Frequency would refer to any future 'repeat' event of platform building after the proposed construction. At this stage no future installations of temporary platforms are planned.

In collaboration with the project engineers and geotechnical consultant, a methodology has been developed for the design of the temporary platform. The design provides strategies for the dose reduction of intensity and duration stressors.

Drawings for the temporary platform are found See **9 Tree Location Plan** (page 27), sheets T06, T06 & T07. Specific notes regarding tree retention modifications and management plan can be found at **6.3 Construction Design Management Plan** (page 16). Considerations for the development of the temp platform design included the following:

- The platform must provide stability for the machinery rig used in construction. We understand from the geotechnical consultant, the load bearing capacity of the existing soil is 250kPa, which 'is sufficient to cater for the pressure imposed by the piling rig'18.

- The platform must reduce compaction of the existing soil profile. We understand the platform will provide a load of 10kPa.

- The platform must eliminate the need for excavation. Block installation may be supported above ground on gap-graded aggregate and secured using star pickets or similar to prevent them moving downslope.

- The platform must allow gaseous exchange and water permeability at the original soil surface. We understand that this can be achieved by the use of large diameter railway ballast and perforated steel pipes containing drip irrigation.

- Trees are dynamic living organisms which respond to changes in their growing environments it is not reasonable to foresee all intricacies of site works and thereby the respective impacts. All reasonable requests by the project arborist should be implemented by the contractor.

The geotechnical consultant has advised that compaction of the existing soil is not required as it is strong enough, and that the mass blocks can be installed without cutting the soil within the TPZ. The project engineer has advised that compaction of the upper 500mm layer of road base is required but that this will not affect compaction of the original soil profile within the TPZ of this tree.

4.5. Tree Management Plan

Construction of the temporary platform will involve site preparation, installation, commissioning, decommissioning and site rehabilitation.

This will require supervision for the following activities:

a. Inspection of the installed tree protection fencing.

b. Scraping the soil of existing mulch in preparation for construction of mass block wall and fill.

c. Installation of the perforated pipe and irrigation system.

d. Installation of the mass blocks, ballast and fill using machinery.

e. Transporting of the drilling rig and large machinery onto site.

f. Monthly site inspections to inspect tree health, structure, and irrigation regime.

5. Recommendations

In consideration of the data collected recommendations are provided for the removal or retention of trees including specific tree protection measures required to reduce the anticipated impacts from the proposed construction on those trees proposed to be retained. This report specifically recommends:

- The removal of Tree No.'s 18, 19, 20, 21, 22, 23, 24, 26, 27, 28, 29, 30(L-M), 31 & D has previously been approved under SSD 5093.
- The removal of Tree No.'s 1, 2, 3, 4, 5, 6, 7, 8, 9 & 12 if the development is approved, as they are within the development footprint of the pedestrian bridge or within the earthworks associated with Pier 1 of the proposed bridge.
- The removal of Tree No.'s 18, 19, 20, 21, 22, 23, 24, 26, 27, 28, 29, 30, 31, D, 37 & 39 if the development is approved, as they are within the development footprint of the pedestrian bridge or within the earthworks associated with Pier 2 of the proposed bridge.
- The removal of Tree No.'s 144, 145, 146, 147, 148, 149, 152 & 156, if the development is approved, as they are within the development footprint of the pedestrian bridge or within the earthworks associated with Pier 3 of the proposed bridge.
- The removal of low significance trees, Tree No.'s 36 & 143, if the development is approved, as they have major unsustainable encroachment by the earthworks associated with the proposed bridge.
- The removal of Tree No.'s 25 & 38 as they are dead, having no habitat hollows.
- The retention of Tree No. 34. This tree belongs to the Sydney Turpentine and Ironbark Forest (STIF) endangered ecological community. This tree is of high significance and design modification has been specified to avoid and minimise impacts from the proposed rig platform providing major encroachment. See **9 Tree Location Plan** page 27, sheets T06, T06 & T07). Specific notes regarding tree retention modifications and management plan can be found at **6.3 Construction Design Management Plan** (page 16).
- The retention of Tree No. 150. This tree belongs to the STIF endangered ecological community and design modification has been specified to avoid and minimise impacts from the proposed temporary platform providing major encroachment as follows. These are outlined above for Tree 34.
- The retention and protection of Tree No.'s 10, 11, 35, 43, 44, 59 & 59A as these will not be affected by the proposed works.
- No landscape plans or service plans have been supplied. Constructed elements such as retaining walls, paving and other features; and open trenches for services should be located outside the TPZ of all retained trees. This arboricultural assessment should be reviewed if additional encroachments are proposed within TPZ's of retained trees.
- Where possible removed trees shall be used for habitat or mulch as directed by the ecological consultant.
- Project Arborist supervision is required for all works located within the TPZ of all retained trees.

- A minimum AQF Level 5 Project Arborist shall be engaged to certify the tree protection works, works during construction and tree and soil condition at the conclusion of works for those trees to be retained, in accordance with **6 Tree Management** (page 16).
- For additional tree protection notes see **10. General Tree Protection Notes** (page 36).

6. Tree Management

6.1. Tree Management Objectives

The general tree management objectives include:

- Appointment of a Project Arborist who has a minimum Level 5 AQF Arboriculture qualification and experience in managing trees on construction sites.
- Installation of additional root, trunk and branch protection as required to protect retained trees where minor encroachments within the TPZ are anticipated.
- The installation of a Tree Protection Fence to enclose and protect the TPZ.
- Monitoring, inspection and certification of tree protection as per the below hold points.

6.2. Management Objective Priorities

The prioritisation of the above objectives is integral for the successful management of site trees:

1. Protection of the TPZ of retained trees;
2. Protection of the trunk and branches of retained trees;
3. Reduction of stress related to construction impacts;
4. The ongoing viability of retained trees after practical completion.

6.3. Construction Design Management Plan

All efforts should be made to restrict the time period in which platform is installed to 12 months or shorter.

Platform construction works requiring heavy machinery should be avoided during heavy rain events or when soil is at field capacity or saturated, in order to avoid destruction of soil structure. This is specifically for all works prior to and including geotextile and ballast.

6.4. Site Management - Platform Construction Design - 1

1.1. Engage project arborist for construction management.

1.2. Installation of Tree Protection Fencing or Site Boundary fencing to isolate area from public.

1.3. Measurement of base line soil compaction prior to construction using penetrometer to depth of 600mm or similar at 4 locations distributed under mass blocks and 4 locations distributed under fill, as indicated in Plan T08.

1.4. Manual raking of organic mulch layer to be under arborist supervision to a maximum of 50mm depth. This should be stockpiled and kept isolated from weed and disease propagules.

1.5. Geofabric laid on exposed soil should:

1.5.1 Achieve horizontal pressure distribution of anticipated platform plus rig (250kPa) throughout the full platform footprint within the TPZ.

1.5.2 Allow gaseous exchange and water permeability.

1.5.3 Provide barrier between fill materials and existing soil.

1.6 14 x 100mm perforated black steel pipes laid at 500-600mm centres over geofabric to allow maximum possible air movement and water infiltration near existing ground level within TPZ. Pipes to be secured with 300mm S12 pegs at 2.5m centres Refer to T08 for pipe lengths.

1.7 Drip Irrigation installed with automatic timer, within black steel piping within TPZ of Tree 34. Application rate to be equivalent to, or less than 8.0mm per hour to avoid run off from clay site soil. Project arborist to inspect irrigation controller schedule.

1.8 Mass Block wall blocks to be installed using machinery no greater than equivalent of 15t mass over 3m2/ track area. Machinery shall only travel over areas with geotextile and a minimum of 300mm of ballast installed to avoid compaction. Turning within the TPZ shall be avoided. Steel pipes to be accommodated within block profile and to extend to open air to permit direct air diffusion and drainage.

1.9 Mass Block wall structure to be levelled using 20mm diameter gap gradient aggregate or similar over existing ground level. No cutting of soil to level blocs. Star pickets or similar to engineers detail to be placed adjacent the downhill face of block to stop downhill movement of blocks in accordance with engineers details.

1.10 150mm washed railway ballast or similar to provide air and water movement as above. To be set in Geocell or similar cellular confinement system.

1.11 Geofabric shall be laid over washed railway ballast, before road base is installed. Geofabric, see, 1.5, above.

1.12 Road base to 500mm depth, compacted, over geofabric.

6.5. Site Management - Bridge Construction - 2

2.1 Monthly site inspections by arborist to monitor tree health, inspect tree damage and determine irrigation scheduling.

2.2 Use of a rigger/dogman to guide the rig operator to avoid tree stems and crowns.

2.3 Contact project arborist if any spills or accidental injury to retained trees on site.

2.4 Contact project arborist if any pruning of branches or roots is required.

2.5 Contractor to put in place Hydrocarbon, Chemical and other liquids Spill Response plan and a Bulk Materials Spill Response Plan which are compliant with the relevant authority.

6.6. Site Management - Restoration - 3

3.1 Removal of mass block wall, railway ballast and final geofabric to be carried out under project arborist supervision. Minimization of heavy machinery to be used - see point 1.8, above.

3.2 Removal of Tree Protection Fencing and inspection by project arborist.

3.3 Measurement of degree of compaction at the conclusion of construction using penetrometer to depth of 300mm or similar at the same 8 locations as above in point 1.3.

3.4 Replace stockpiled original mulch/soil as to achieve as close to original coverage as possible.

6.7. Hold Points, Inspection and Certification

To ensure this plan is implemented hold points (**HP**) have been specified in the schedule of works (below). Once each stage is reached the work will be inspected and certified by the Project Arborist and the next stage may commence.

Alterations to this schedule may be required due to necessity however this shall be through consultation with the Project Arborist only.

6.8. Schedule of Works and Responsibilities

Hold Point	Task	Responsibility	Certification	Timing of Inspection
1	Indicate clearly (with spray paint on trunks) trees approved for removal only	Principal Contractor	Project Arborist	Prior to demolition and site establishment.
2	Install Tree Protection Fence & certification of Spill plan	Principal Contractor	Project Arborist	Prior to vehicles or machinery entering site.
3	Existing soil compaction measurements taken	Principal Contractor	Project Arborist	Prior to the commencement of Hold point 4
4	Supervise manual raking of mulch	Principal Contractor	Project Arborist	Prior to the commencement of Hold point 5
5	Supervise the laying of geofabric, perforated pipes & irrigation	Principal Contractor	Project Arborist	Prior to the commencement of Hold point 6
6	Supervise installation of ballast, mass blocks & laying of geofabric over ballast	Principal Contractor	Project Arborist	Prior to the installation of roadbase to temporary platform
7	Inspection of trees by Project Arborist	Principal Contractor	Project Arborist	Monthly during construction period
8	Supervise dismantling of temporary platform	Principal Contractor	Project Arborist	Within 12 months of Hold Point 6 certification
9	Soil compaction measurements taken	Principal Contractor	Project Engineer	Prior to the reapplication of mulch collected at Hold Point 4
10	Inspection of trees by Project Arborist	Principal Contractor	Project Arborist	Following the removal of tree protection measures from HP 1
11	Final Inspection of trees by Project Arborist	Principal Contractor	Project Arborist	Prior to issue of occupation certificate.

7. Tree Survey Table

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LACHLAN'S LINE TREE SURVEY DATA

DATE OF SURVEY: 20/09/17

No impact | Major encroachment | Within development - pedestrian bridge | Within development footprint - earthworks

NO#	Genus	Species	Common Name	Height	Spread	Trunk Dia	Trunk Dia 2	Trunk Dia 3	Trunk Dia 4	DBH	DRB	SRZ	TPZ	Age	Health	Crown	Signifi-cance	Am	Eco	Form	Development Setback and Encroachment	Comments
1	*Callistemon*	*salignus*	White Bottlebrush	4	3	300				300	300	1996	3600	M	F	F	L	L	M	M	Within proposed earthworks - pedestrian bridge	DBH taken at grade. Basal trunk sweep
2	*Syncarpia*	*glomulifera*	Turpentine Tree	9	7	220	280	280		453	600	2670	5436	SM-M	Av	Av	L-M	M	H	M	Within proposed earthworks - pedestrian bridge	Multi trunked from 1m
3	*Allocasuarina*	*littoralis*	Black Sheoak	6	3	70	100	120		172	290	1968	2064	SM-M	F	F	L	L	M	M, CD	Within proposed earthworks - pedestrian bridge	-
4	*Allocasuarina*	*littoralis*	Black Sheoak	6	1	100				100	140	1500	2000	J	F	F	L	L	M	CD	Within proposed earthworks - pedestrian bridge	Co-dominant with Tree 3
5	*Callistemon*	*viminalis*	Weeping Bottlebrush	3	3	90				90	100	1500	2000	J	Av	Av	L	L	M	CD	Within proposed earthworks - pedestrian bridge	-
6	*Callistemon*	*viminalis*	Weeping Bottlebrush	4	4	300				300	300	1996	3600	J	Av	Av	L	L	M	M	Within proposed earthworks - pedestrian bridge	DBH taken at grade
7	*Allocasuarina*	*littoralis*	Black Sheoak	5	4	300				300	300	1996	3600	SM	Av	F	L	L	L	M	Within footprint of pedestrian bridge	DRB taken at grade
8	*Callistemon*	*viminalis*	Weeping Bottlebrush	3	3	90				90	100	1500	2000	J	Av	Av	L	L	M	CD	Within proposed earthworks - pedestrian bridge	-
9	*Allocasuarina*	*littoralis*	Black Sheoak	5	2	90	120			150	200	1683	2000	J	F	F	L	L	M	M	Within footprint of pedestrian bridge	-
10	*Syncarpia*	*glomulifera*	Turpentine Tree	9	6	210	220	220	190	421	620	2707	5052	SM	Av	F	L	L	H	CD, M	No impact	Multi trunked from base
11	*Syncarpia*	*glomulifera*	Turpentine Tree	5	3	240				240	240	1817	2880	SM	Av	F	L	L	H	CD, Sup	No impact	DBH taken at 1m. Crown skew to North-East
12	*Callistemon*	*viminalis*	Weeping Bottlebrush	3	2	60				60	90	1500	2000	J	Av	Av	L	L	M	CD, M	Within footprint of pedestrian bridge	-
18	*Acacia*	*parramattensis*	Parramatta Wattle	4	2	100				100	130	1500	2000	SM	Av	P	L	L	H		Within footprint of pedestrian bridge	-
19	*Melaleuca*	*decora*	White Feather Honey Myrtle	4	1	80				80	90	1500	2000	J	Av	Av	L	L	M		Within footprint of pedestrian bridge	-
20	*Acacia*	*parramattensis*	Parramatta Wattle	6	3	100				100	130	1500	2000	SM	Av	Av	L	L	H		Within footprint of pedestrian bridge	-
21	*Syncarpia*	*glomulifera*	Turpentine Tree	6	2	80				80	90	1500	2000	J	Av	Av	L	L	H		Within footprint of pedestrian bridge	-
22	*Acacia*	*parramattensis*	Parramatta Wattle	6	2	60				60	70	1500	2000	J	P	Av	L	L	H		Within footprint of pedestrian bridge	Tree is in advanced decline
23	*Acacia*	*parramattensis*	Parramatta Wattle	6	1	60				60	70	1500	2000	J	P	Av	L	L	H		Within footprint of pedestrian bridge	Tree is in advanced decline
24	*Acacia*	*parramattensis*	Parramatta Wattle	3	2	50				50	60	1500	2000	J	P	Av	L	L	H		Within footprint of pedestrian bridge	-
25	-	-	-	-	-	-				-	-	-	-		DEAD						Within footprint of pedestrian bridge	-
26	*Eucalyptus*	*microcorys*	Tallowwood	8	5	130				130	150	1500	2000	J	Av	P-F	L	L	M		Within footprint of pedestrian bridge	Inclusion
27	*Eucalyptus*	*resinifera*	Red Mahogany	16	10	510				510	570	2613	6120	M	G	Av	M	M	H	CS	Within proposed earthworks - pedestrian bridge - within RMS land	-
28	*Eucalyptus*	*punctata*	Grey Gum	10	8	240				240	550	2575	2880	SM	F	P	L	L	H	L, CS	Within proposed earthworks - pedestrian bridge - within RMS land	Heavy lean to North. Previous failed co dominant trunk at base
29	*Eucalyptus*	*pilularis*	Blackbutt	24	15	700				700	740	2916	8400	M	Av	F-Av	M	M	H	D	Within proposed earthworks - pedestrian bridge - within RMS land	Major deadwood to 100mm diameter. Dieback. Crown is sparse. Previous branch failure at 3m
30	*Eucalyptus*	*paniculata*	Grey Ironbark	15	7	290				290	300	1996	3480	SM	Av	F-Av	L-M	M	H	L, CS	Within proposed earthworks - pedestrian bridge - within RMS land	Lean to South-East

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LACHLAN'S LINE TREE SURVEY DATA

DATE OF SURVEY: 20/09/17

No impact	Major encroachment	Within development - pedestrian bridge	Within development footprint - earthworks

NO#	Genus	Species	Common Name	Height	Spread	Trunk Dia	Trunk Dia 2	Trunk Dia 3	Trunk Dia 4	DBH	DRB	SRZ	TPZ	Age	Health	Crown	Signifi-cance	Am	Eco	Form	Development Setback and Encroachment	Comments
31	*Eucalyptus*	*microcorys*	Tallowwood	9	4	130				130	150	1500	2000	J	Av	Av	L	L	M		Within footprint of pedestrian bridge	-
D	*Eucalyptus*	*resinifera*	Red Mahogany	9	4	190				190	200	1683	2280	J	G	Av	L	M	H	L	Within proposed earthworks - pedestrian bridge - within RMS land	Not on survey. Lean to North with associated crown skew
34	*Eucalyptus*	*paniculata*	Grey Ironbark	28	15	630	580			857	1150	3509	10284	M	Av	Av	H	H	H	D, M	Located 2.15m from Mass Block retaining wall providing a 34.9% (major) encroachment	Northern trunk DBH: 630. Rib on Northern trunk at 1m. Previous failed co dominant stem on Western trunk at 4m. Deadwood less than 5% of crown, up to 100mm in diameter. Multi trunked from base. Co dominant trunk at 9m with associated rib - very pronounced
35	*Eucalyptus*	*microcorys*	Tallowwood	6	4	130	180			223	250	1849	2676	SM	P	P	L	L	M	M, Sup	No impact	Multi trunked at 1m
36	*Eucalyptus*	*botryoides*	Bangalay	10	4	185				185	270	1910	2220	J-SM	Av	F	L	L	M	CD, L	Located 0.58m from earthworks for rig platform providing a 25.8% (major) encroachment within the TPZ and encroachment within the SRZ	Slight lean to North
37	*Casuarina*	*cunninghamiana*	River Sheoak	4	6	150				150	220	1752	2000	J	P	P	L	L	M	CD, L	Within proposed earthworks - pedestrian bridge	Extreme trunk skew to North. Clematis spp. Climber to top of tree
38	-	-	-	-	-	-				-	-	-	-		DEAD						Within proposed earthworks - pedestrian bridge	Extreme trunk skew to North. Clematis spp. Climber to top of tree
39	*Callistemon*	*salignus*	White Bottlebrush	3	2	100				100	150	1500	2000	J	P	P	L	L	M		Within proposed earthworks - pedestrian bridge	-
43	*Eucalyptus*	*pilularis*	Blackbutt	28	12	470				470	520	2515	5640	M	Av	Av	H	H	H	D	No impact	Canopy spread is 6m North from trunk
44	*Corymbia*	*maculata*	Spotted Gum	16	5	240				240	290	1968	2880	SM	Av	Av	L-M	M	M		No impact	Forest form. Crown skew to North
59	*Syncarpia*	*glomulifera*	Turpentine Tree	14	9	240	410			476	650	2762	5712	M	Av	Av	L-M	M	H	M	No impact	Multi trunked from base. Crown skew to North. Deadwood less than 5% of crown. Canopy spread is 6m North-East from trunk
59A	*Syncarpia*	*glomulifera*	Turpentine Tree	18	8	210	290	450		576	900	3166	6912	M	AV	Av	M	M	H	CD, M	No impact	Small diameter deadwood in lower crown. Swelling at N stem bifurcation/150mm dia scaffold attachment at 10m.
143	*Callistemon*	*viminalis*	Weeping Bottlebrush	3	2	70				70	80	1500	2000	J	Av	Av	L	L	M	M	Located 0.82m from proposed earthworks providing a 23.6% (major) encroachment - anticipated pathway within SRZ	DBH taken at grade
144	*Callistemon*	*viminalis*	Weeping Bottlebrush	4	2	160				160	160	1533	2000	J	Av	Av	L	L	M	M	Within proposed earthworks - pedestrian bridge	DBH taken at grade
145	*Callistemon*	*viminalis*	Weeping Bottlebrush	3	2	70				70	80	1500	2000	J	Av	Av	L	L	M	L	Within proposed earthworks - pedestrian bridge	-
146	*Callistemon*	*viminalis*	Weeping Bottlebrush	3	3	160				160	160	1533	2000	J	Av	Av	L	L	H	M	Within proposed earthworks - pedestrian bridge	DBH taken at grade
147	*Elaeocarpus*	*reticulatus*	Blueberry Ash	4	2	70				70	90	1500	2000	J	G	Av	L	L	H		Within footprint of pedestrian bridge	-
148	*Elaeocarpus*	*reticulatus*	Blueberry Ash	4	2	80				80	100	1500	2000	J	Av	Av	L	L	H		Within footprint of pedestrian bridge	-

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LACHLAN'S LINE TREE SURVEY DATA

DATE OF SURVEY: 20/09/17

No impact	Major encroachment	Within development - pedestrian bridge	Within development footprint - earthworks

NO#	Genus	Species	Common Name	Height	Spread	Trunk Dia	Trunk Dia 2	Trunk Dia 3	Trunk Dia 4	DBH	DRB	SRZ	TPZ	Age	Health	Crown	Signifi-cance	Am	Eco	Form	Development Setback and Encroachment	Comments
149	*Syncarpia*	*glomulifera*	Turpentine Tree	17	9	710				710	830	3060	8520	M	Av	F-Av	M	M	H	M	Within proposed earthworks - pedestrian bridge	Multi trunked from 7-8m. Major deadwood to 100mm in diameter
150	*Syncarpia*	*glomulifera*	Turpentine Tree	10	4	430				430	475	2421	5160	SM	P	P	L	L	H	Sup	Located 1.96m from proposed earthworks providing a 23.7% (major) encroachment within the TPZ and marginal encroachment within the SRZ	Top 2m of tree is dead. Live canopy on West side of crown
152	*Eucalyptus*	*acmenoides*	White Mahogany	16	6	310				310	370	2180	3720	SM	G	Av	L-M	M	H	CD, M	Within proposed earthworks - pedestrian bridge	Multi trunked from 7m. Co dominant with Tree 156
156	*Eucalyptus*	*acmenoides*	White Mahogany	14	7	325	210			387	430	2322	4644	SM	G	Av	L-M	M	H	CD, M	Within proposed earthworks - pedestrian bridge	Closest tree to M2. Multi trunked from 1.5m

8. Tree Survey Table Notes

8.1. Genus, Species and Common Name

The botanical and common name of each tree is identified and recorded. Occasionally the exact species name is unknown; *sp.* is recorded to indicate this.

8.2. Height, Spread, Trunk Dia, DBH and DRB

- The tree's height and spread is recorded in metres.
- The tree **DBH** is recorded in millimetres. DBH is an abbreviation of Diameter (of the trunk) measured at Breast Height (or 1.2m from the base of the trunk). If more than one trunk is present the DBH is calculated in accordance with AS4970-2009 Protection of Trees on Development Sites.
- If the tree has multiple trunks multiple trunks each trunk DBH (**Trunk Dia**) will be recorded individually.
- The tree **DRB** is recorded in millimetres. DRB is an abbreviation of Diameter (of the trunk) measured above the Root Buttress. It is required to calculate the SRZ in accordance with AS4970-2009 Protection of Trees on Development Sites when there is major encroachment within the TPZ, ie. greater than 10% is encroached upon or if there is an encroachment within the SRZ.

8.3. Age

The age class of each tree is estimated as either:

- **J** – Juvenile, a young sapling, easily replaced from nursery stock.
- **SM** - Semi Mature, a tree that has not grown to mature size.
- **M** - Mature, a tree that has reached mature size and will slowly increase in size over time.
- **OM** - Over Mature, a tree that has been mature for a long period and is beginning to display signs of decline, e.g. large dead branches.
- **S** - Senescent, an over mature tree that is now in decline.

8.4. Health and Vigour

The trees health and vigour is recorded as a measurement of:

- **G** - Good the tree does not appear stressed with no excessive dieback, insect infestation, decay, dead wood or epicormic shoots.
- **Avg** - Average Health the tree appears stressed and have some crown dieback, and/or a few epicormic shoots, and/or some dead wood in the crown and some new growth at branch tips. These trees may benefit from remediation of the growing environment to reduce stress and return it to good health.
- **F** - Fair the tree may have areas of crown dieback, and/or epicormic shoots, and/or areas of decay, and/or reduced new growth at branch tips. These trees have been stressed for a short period of time, remediation of the growing environment may improve the trees health.
- **P** - Poor the tree may have large areas of crown dieback, and/or many epicormic shoots, and/or reduced new growth at branch tips. These trees have been stressed for a long time, remediation of the growing environment would not return the tree to good health.

- **D** – Dead the tree is dead

8.5. Crown Condition

The crown condition of each tree is assessed and recorded as either:

- **G** - Good Condition: the tree appears to have no visible indication of inherent structural defects.
- **Avg** - Average Condition: the tree has minor structural defects which may be corrected with remedial works or pruning, allowing the tree to return to Good Condition.
- **F** - Fair Condition: the tree has visible structural defects such as (but not limited to) dead branches, and/or an unbalanced crown, and/or leaning trunk and/or areas of decay. These trees do not demonstrate the typical form of their species, or have been damaged or have begun to deteriorate. Remedial works or pruning may return the tree to Average Condition.
- **P** - Poor Condition: the tree has significant structural defects such as (but not limited to) very large dead branches, and/or extremely unbalanced crown, and/or subsiding trunk and/or large areas of decay. These trees do not demonstrate the typical form of their species, or have been severely damaged or have deteriorated significantly. Remedial pruning would not return the tree to Fair Condition.

8.6. Significance

Measured as High, Medium or Low, see **2.7. Determining a tree's significance** (page 9).

8.7. Amenity Value

Amenity value is a subjective measurement based on the tree's contribution to the landscape, it may be based on the tree's visual form, however it also includes non visual attributes such as provision of shade for a seat, screening of poor views or for privacy, or if it has historical significance. The amenity value is recorded as:

- **H** - High, the trees form is an excellent example of its species and it makes a great specimen and/or it has other attributes such screening, or is historical significance. These trees are visually prominent and valuable to the community or public domain.
- **M** - Medium, the tree may have an altered form and/or it has attributes that provides amenity to local residents only.
- **L** – Low, the tree is not a good specimen and it does not provide substantial benefit to local residents or the community.

8.8. Ecological Value

Ecological value is a measurement of the trees contribution to the environment. It is determined by the trees area of origin, its potential to provide habitat to native fauna and its potential to become an environmental pest. The ecological value is recorded as:

- **H** - High, the tree is locally native or remnant and/or it has habitat value for native fauna.
- **M** - Medium the tree is native but not locally native.

- **L** - Low, the tree is not native and/or it may be a listed nuisance or weed species.
- **Ha** – Habitat, is the tree valued by fauna for food (ie. foliage fruit or sap) or shelter (ie. nesting, roosting, dray or hollow).

8.9. Form

The form, structure or shape of each tree is assessed and recorded as either one or a combination of several of the below terms; (**U**) Upright, (**B**) Broad, (**C**) Conical, (**Sh**) Shrub, (**CS**) Crown Shy (also referenced is the adjacent dominant tree canopy ie. **T4**), (**V**) Vase, (**D**) Dome, (**P**) Palm, (**S**) Spreading, (**L**) Leaning or (**BM**) Basal Multi Trunked.

Crown form may also be assessed in accordance with the relationship with the neighbouring tree and recorded as either: **S** - Suppressed, the crown is located beneath another larger crown and is leaning away (Crown Shy); **CD** - Codominant, the crown is adjacent to another crown of similar size, their crown areas may appear joined; **D** - Dominant, the crown is above other lower crowns; **E** - Emergent, the crown emerges from a lower canopy formed by other dominant or codominant crowns.

8.10. Defects

The presence of one or a combination of several defects is recorded (**W**) Wound, (**D**) Decay, (**F**) Fungus, (**B**) Bulge, (**FB**) Fibre Buckling, (**C**) Cracks, (**S**) Split, (**H**) Hollow, (**DB**) Die Back, (**E**) Epicormic shoots, (**DW**) Dead Wood, (**I**) Inclusion, (**CA**) Cavities, (**PF**) Previous Failure, (**R**) Root Damage, (**P**) Pruning wound, (**PD**) Pests and diseases, (**ST**) Storm Damage.

8.11. SRZ (Structural Root Zone)

The SRZ is a radial area extending outwards from the centre of the trunk. This area contains the majority of the structural woody roots. This area is responsible primarily for stability. Root damage or root loss within this zone greatly increases the opportunity for decay fungi to ingress into the heartwood, causing internal decay in addition to destabilising the tree's structural integrity. The SRZ is calculated as follows (This calculation is derived from the Australian Standard 4970 – 2009 Protection of Trees on Development Sites):

$$\textbf{SRZ (Radius)} = (D \times 50)^{0.42} \times 0.64$$

8.12. TPZ (Tree Protection Zone)

The TPZ is a circular area with a radius measured by multiplying the DBH by twelve (12), or a circular area the size of the tree's drip line whichever is greater. This area contains the majority of the essential structural and feeder roots responsible for stability, gaseous exchange and water and nutrient uptake. Excavation, back filling, compaction or other disturbance should not occur in this area.

The TPZ is used to identify the minimum area required for the safe retention of a given tree. This calculation is derived from the Australian Standard 4970 – 2009 Protection of Trees on Development Sites. An incursion to 10% within the TPZ is potentially acceptable if no other option is available. A major encroachment (in excess of 10%) is required to be clearly justified by the project Arborist and compensated for elsewhere. Justification methodology may vary depending on site or the individual tree's health, vigour and ability to withstand disturbance and may require root investigation.

8.13. Development Setback / Impact

The successful retention of trees on construction sites is dependent on the adequate allocation and management of the space above, below and around trees to be retained.

The trunk and canopy of trees to be retained must be protected to ensure the trunk and branches are not damaged during construction. The removal of bark and / or branches allows the potential ingress of micro organisms which may cause decay. Similarly the removal of bark restricts the tree's ability to distribute water, mineral ions and glucose.

It is essential to prevent the disturbance of the soil beneath the drip line of each tree, because this is the area where oxygen, water and mineral ions are absorbed by tree roots. Oxygen, water and mineral ions are essential for healthy plant growth. If soil becomes compacted, the ability of roots to function correctly is greatly reduced. Similarly the removal or damage of roots will reduce the ability of roots to function correctly. Woody roots provide stability for the tree and they also transport nutrients to the leaves.

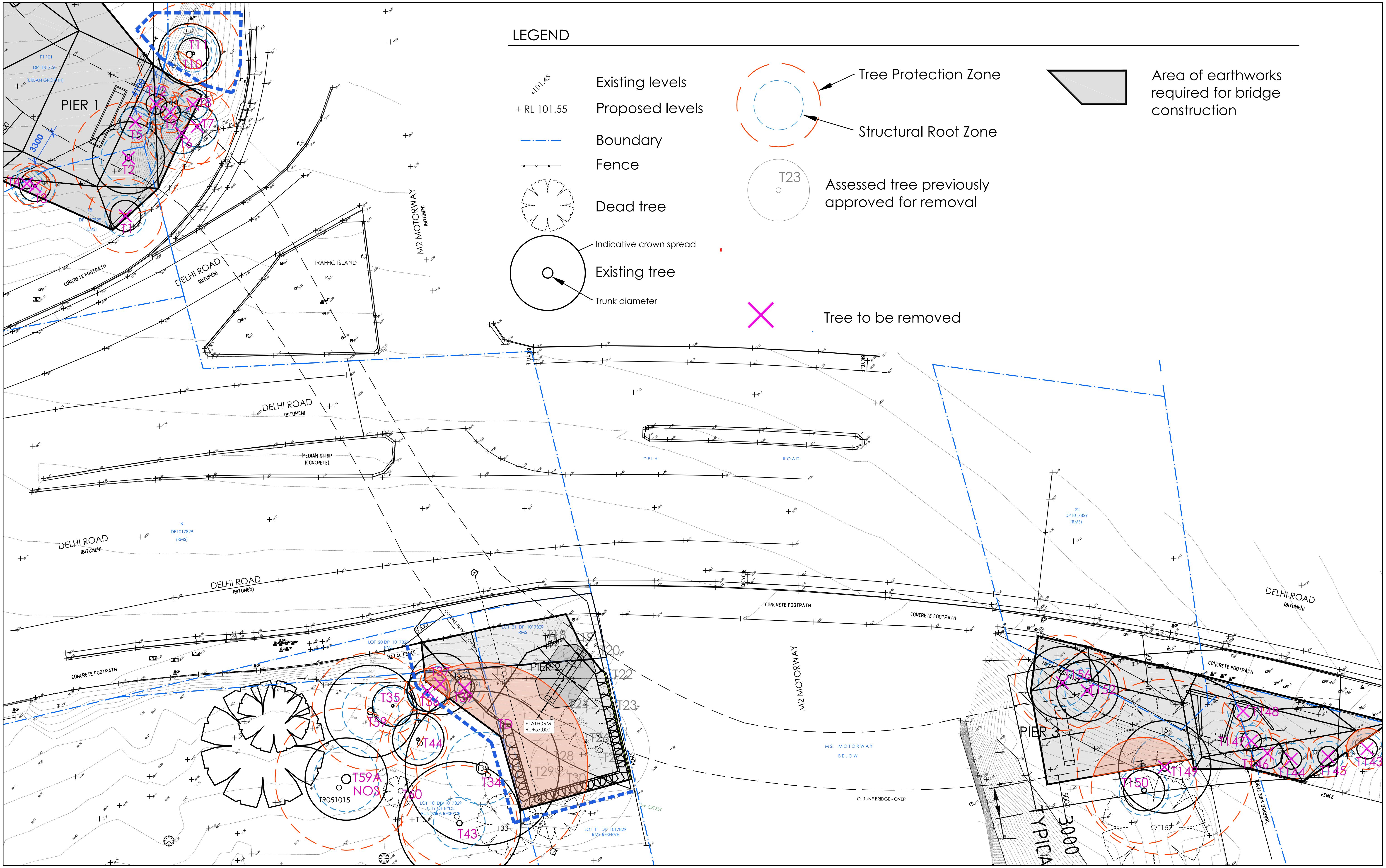
The potential implications of removing or damaging roots are threefold:

1. The risk of whole tree failure is increased, as tree roots anchor and stabilise the tree. Woody roots are developed to assist in the support of the tree in prevailing wind, with these roots removed wind throw may occur, which would result in the mass failure of the tree.
2. The ability of the tree to absorb and transfer the essential nutrients, oxygen and water from the soil to the leaves is greatly affected. This will place the tree under stress and reduce the tree's ability to photosynthesise, and in turn cause the tree to use up stored energy reserves. These energy reserves are used to fight infection and insect attack, for new growth, maintenance of existing tissues and also for healing wounds. Once energy reserves become depleted a tree is much more susceptible to drought, disease and pest attack.
3. Open wounds are sites by which decay-causing pathogens can enter the tree. The severance or damage of woody roots creates sites where pathogens may gain ingress. Whilst the effect of decay may not be immediately apparent, the long term health and structure of the tree will be compromised.

8.14. Comments

Comments generally relate to the suitability for retention. The comments allow for a brief notation of other factors relevant to the assessment of the tree.

9. Tree Location Plan



REVISION	DESCRIPTION	DRAWN	CHECK	DATE
E	SUBMITTED TO CLIENT FOR COMMENT	LD+AM	AS	09-10-17
F	SUBMITTED TO CLIENT FOR COMMENT	LD+AM	AM	27-10-17
G	SUBMITTED TO CLIENT - BOUNDRY LINES FORMAT	AM	AM	22-03-18
H	SUBMITTED TO CLIENT - ADDITIONAL TREES - T59A + T60	AM	MD	11-04-18
I	SUBMITTED CLIENT - PROPOSED RIG PLATFORM+RECOMMENDED 20% ENCR	AM	MD	17-05-18
J	SUBMITTED TO CLIENT - AMENDED REPORT	AM	MD	22-05-18

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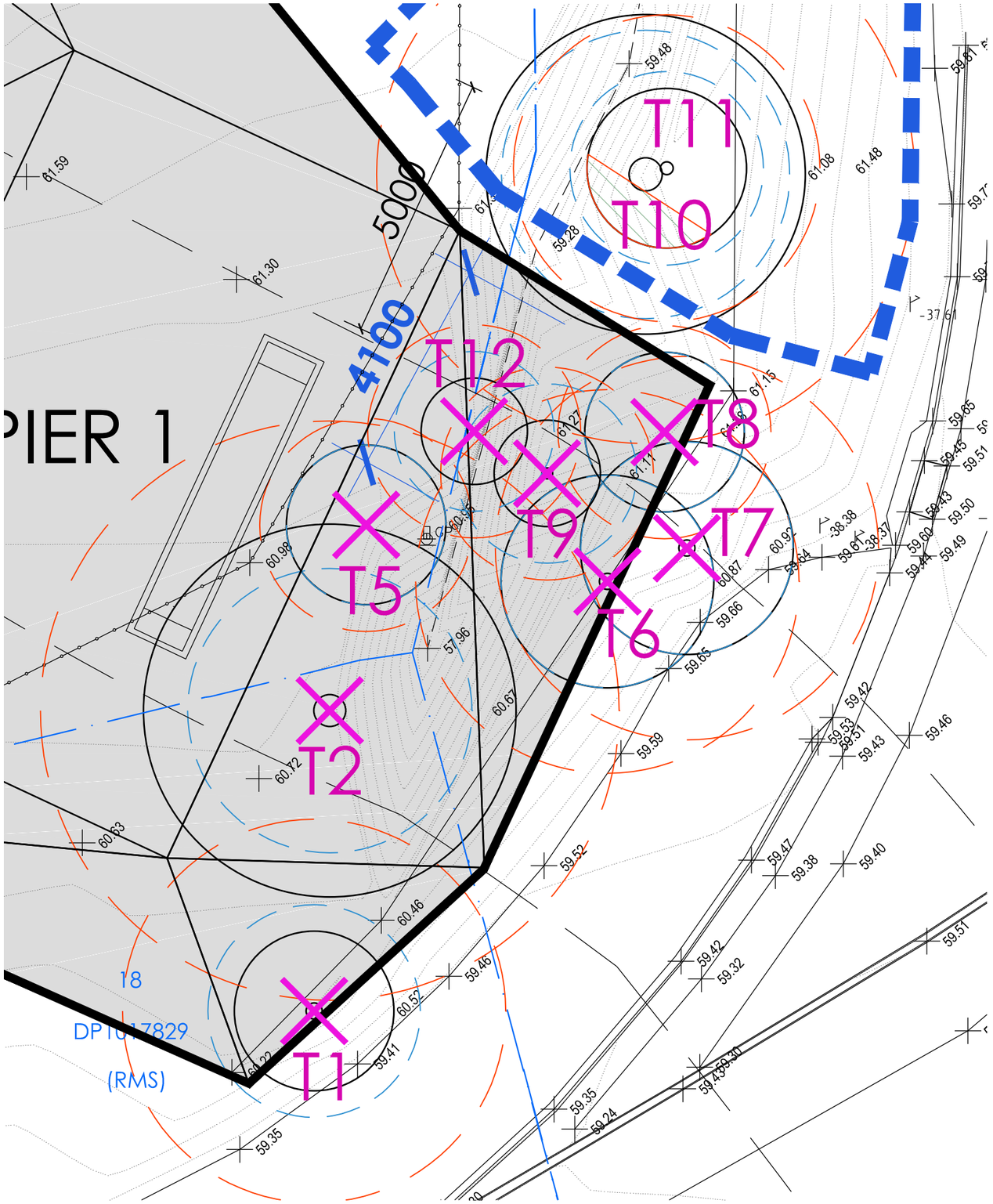
ADDRESS
LACHLANS LINE PEDESTRIAN BRIDGE

CLIENT
LANDCOM

PROJECT: NEW DEVELOPMENT
DRAWING: SITE LOCATION PLAN
SCALE: N.T.S. @ A3 | ISSUE: REF | SHEET: T - 01
DRAWN: LD+AM | CHECK: AM | DATE: 11-04-18 | REVISION: H



LEGEND

- Existing levels (+101.45)
- Proposed levels (+ RL 101.55)
- Boundary
- Fence
- Existing tree (Indicative crown spread; Trunk diameter)
- Tree Protection Zone
- Structural Root Zone
- Dead tree
- Assessed tree previously approved for removal (T23)
- Tree to be removed
- Area of earthworks required for bridge construction
- Indicative tree protection - fencing + trunk battens

TREES REQUIRING REMOVAL DUE TO PROPOSED BRIDGE AND ASSOCIATED EARTHWORKS - PIER 1

NO#	Genus	Species	Common Name
1	*Callistemon*	*salignus*	White Bottlebrush
2	*Syncarpia*	*glomulifera*	Turpentine Tree
3	*Allocasuarina*	*littoralis*	Black Sheoak
4	*Allocasuarina*	*littoralis*	Black Sheoak
5	*Callistemon*	*viminalis*	Weeping Bottlebrush
6	*Callistemon*	*viminalis*	Weeping Bottlebrush
7	*Allocasuarina*	*littoralis*	Black Sheoak
8	*Callistemon*	*viminalis*	Weeping Bottlebrush
9	*Allocasuarina*	*littoralis*	Black Sheoak
12	*Callistemon*	*viminalis*	Weeping Bottlebrush

REVISION	DESCRIPTION	DRAWN	CHECK	DATE
E	SUBMITTED TO CLIENT FOR COMMENT	LD+AM	AS	09-10-17
F	SUBMITTED TO CLIENT FOR COMMENT	LD+AM	AM	27-10-17
G	SUBMITTED TO CLIENT - BOUNDRY LINES FORMAT	AM	AM	22-03-18
H	SUBMITTED TO CLIENT - ADDITIONAL TREES - T59A + T60	AM	MD	11-04-18
I	SUBMITTED CLIENT - PROPOSED RIG PLATFORM+RECOMMENDED 20% ENCR	AM	MD	17-05-18
J	SUBMITTED TO CLIENT - AMENDED REPORT	AM	MD	22-05-18

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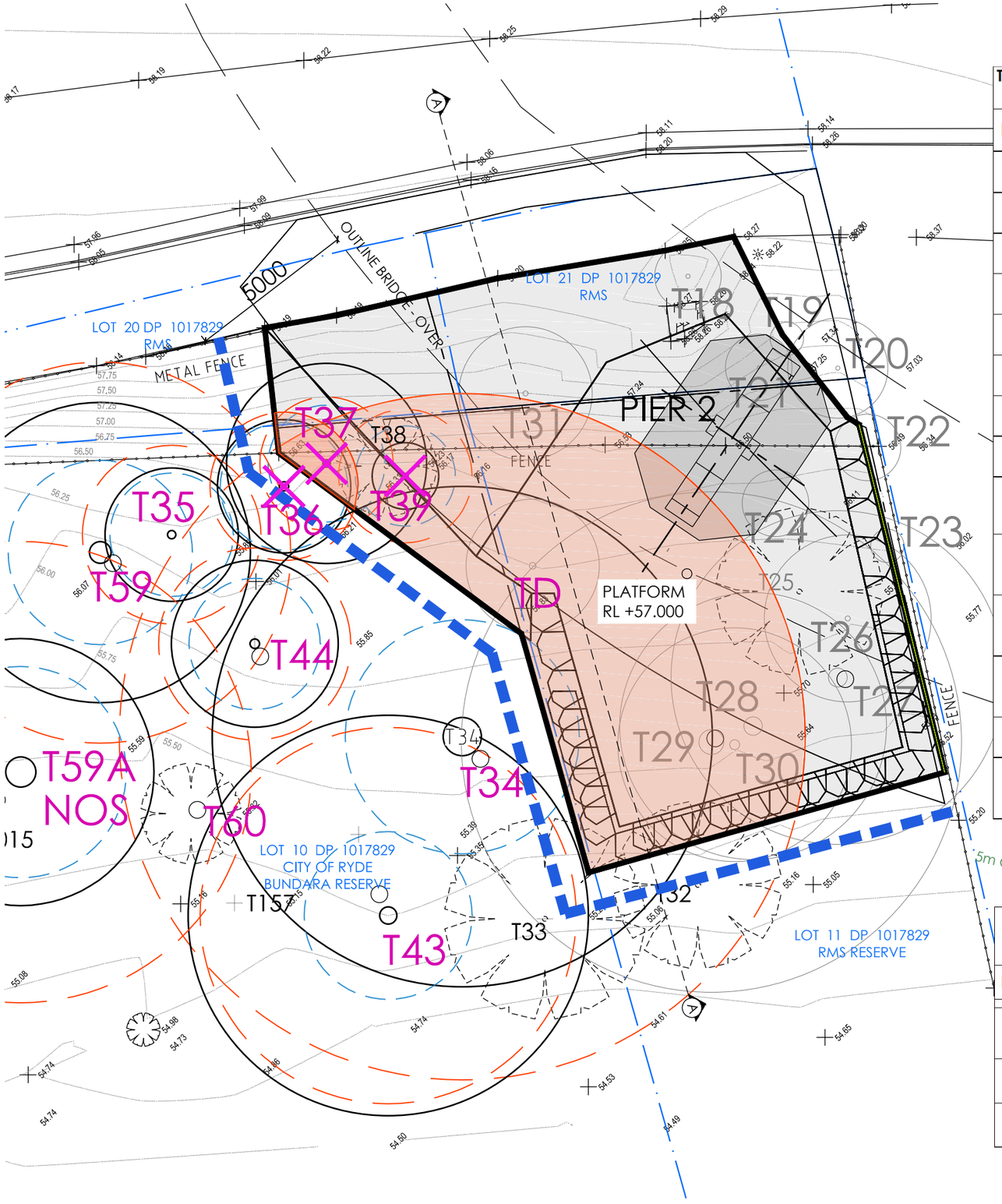
ADDRESS: **LACHLANS LINE PEDESTRIAN BRIDGE**

CLIENT: **LANDCOM**

PROJECT: NEW DEVELOPMENT
DRAWING: TREE LOCATION PLAN - PIER 1
SCALE: N.T.S. @ A3 | ISSUE: REF | SHEET: T - 02
DRAWN: LD+AM | CHECK: AM | DATE: 22-05-18 | REVISION: J



TREES PREVIOUSLY APPROVED FOR REMOVAL UNDER SSD 5093, 200m^3 OF STIF

NO#	Genus	Species	Common Name
18	*Acacia*	*parramattensis*	Parramatta Wattle
19	*Melaleuca*	*decora*	White Feather Honey Myrtle
20	*Acacia*	*parramattensis*	Parramatta Wattle
21	*Syncarpia*	*glomulifera*	Turpentine Tree
22	*Acacia*	*parramattensis*	Parramatta Wattle
23	*Acacia*	*parramattensis*	Parramatta Wattle
24	*Acacia*	*parramattensis*	Parramatta Wattle
26	*Eucalyptus*	*microcorys*	Tallowwood
27	*Eucalyptus*	*resinifera*	Red Mahogany
28	*Eucalyptus*	*punctata*	Grey Gum
29	*Eucalyptus*	*pilularis*	Blackbutt
30	*Eucalyptus*	*paniculata*	Grey Ironbark
31	*Eucalyptus*	*microcorys*	Tallowwood
D	*Eucalyptus*	*resinifera*	Red Mahogany

TREES REQUIRING REMOVAL DUE TO PROPOSED BRIDGE AND ASSOCIATED EARTHWORKS - PIER 2

NO#	Genus	Species	Common Name
36	*Eucalyptus*	*botryoides*	Bangalay
37	*Casuarina*	*cunninghamiana*	River Sheoak
39	*Callistemon*	*salignus*	White Bottlebrush

LEGEND

+101.45 — Existing levels

+ RL 101.55 — Proposed levels

Boundary

Fence

Indicative crown spread

Existing tree

Trunk diameter

Tree Protection Zone

Structural Root Zone

Dead tree

T23 — Assessed tree previously approved for removal

Encroachment into Tree Protection Zone

Tree to be removed

Area of earthworks required for bridge construction

Indicative tree protection - fencing + trunk battens

NOS — Tree not located on survey

FOR FURTHER DETAIL REFER TO SHEETS T06, T07 & T08

REVISION	DESCRIPTION	DRAWN	CHECK	DATE
E	SUBMITTED TO CLIENT FOR COMMENT	LD+AM	AS	09-10-17
F	SUBMITTED TO CLIENT FOR COMMENT	LD+AM	AM	27-10-17
G	SUBMITTED TO CLIENT - BOUNDRY LINES FORMAT	AM	AM	22-03-18
H	SUBMITTED TO CLIENT - ADDITIONAL TREES - T59A + T60	AM	MD	11-04-18
I	SUBMITTED CLIENT - PROPOSED RIG PLATFORM+RECOMMENDED 20% ENCR	AM	MD	17-05-18
J	SUBMITTED TO CLIENT - AMENDED REPORT	AM	MD	22-05-18

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ADDRESS: **LACHLANS LINE PEDESTRIAN BRIDGE**

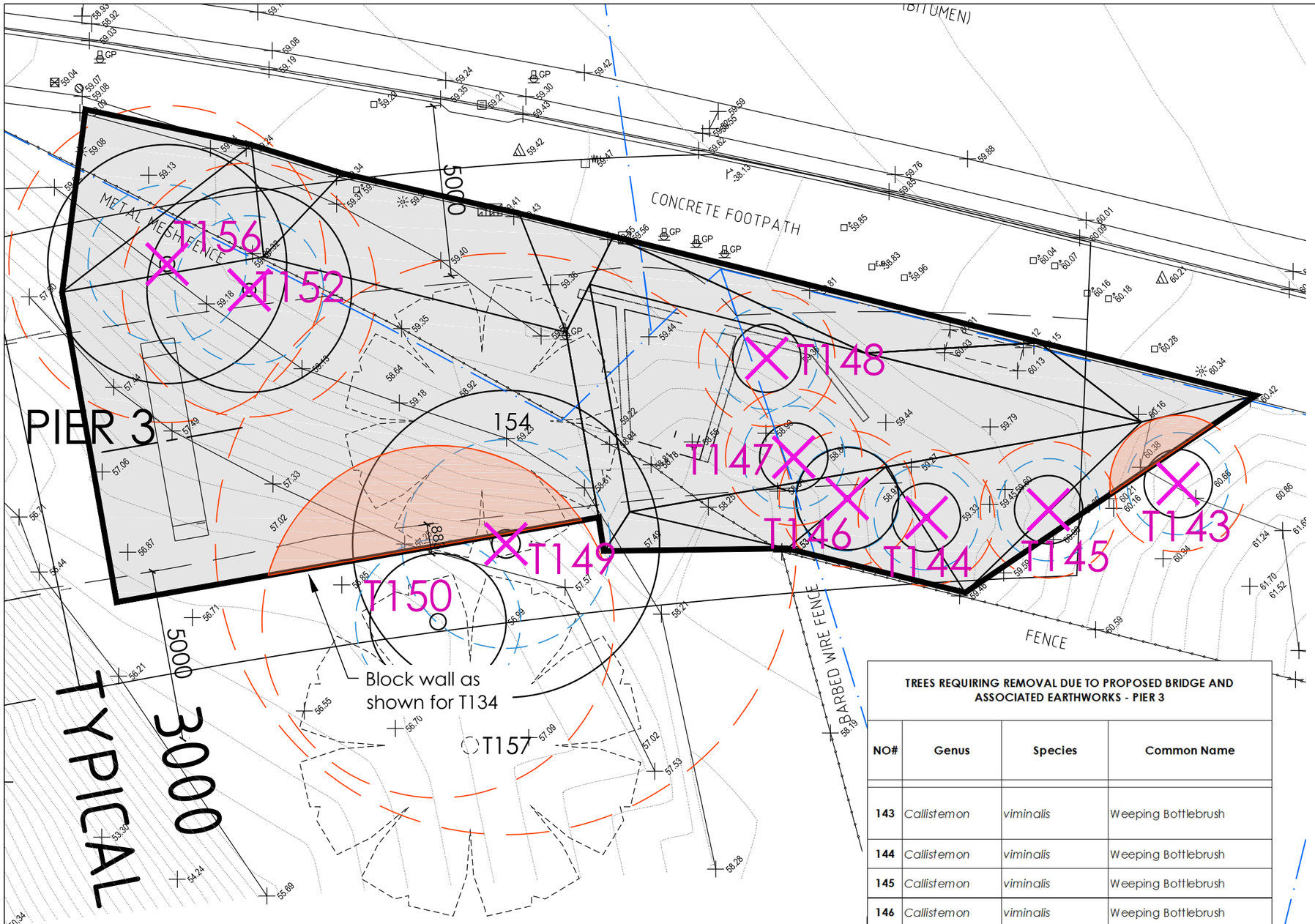
CLIENT: **LANDCOM**

PROJECT: NEW DEVELOPMENT

DRAWING: TREE LOCATION PLAN - PIER 2

SCALE	ISSUE	SHEET
N.T.S. @ A3	REF	T - 03

DRAWN	CHECK	DATE	REVISION
LD+AM	AM	11-04-18	H



LEGEND

- Existing levels (+101.45)
- Proposed levels (+ RL 101.55)
- Boundary
- Fence
- Existing tree (Indicative crown spread; Trunk diameter)
- Tree Protection Zone
- Structural Root Zone
- T157 Dead tree
- Encroachment into Tree Protection Zone
- Tree to be removed
- Area of earthworks required for bridge construction
- Indicative tree protection -fencing + trunk battens

TREES REQUIRING REMOVAL DUE TO PROPOSED BRIDGE AND ASSOCIATED EARTHWORKS - PIER 3

NO#	Genus	Species	Common Name
143	*Callistemon*	*viminalis*	Weeping Bottlebrush
144	*Callistemon*	*viminalis*	Weeping Bottlebrush
145	*Callistemon*	*viminalis*	Weeping Bottlebrush
146	*Callistemon*	*viminalis*	Weeping Bottlebrush
147	*Elaeocarpus*	*reticulatus*	Blueberry Ash
148	*Elaeocarpus*	*reticulatus*	Blueberry Ash
149	*Syncarpia*	*glomulifera*	Turpentine Tree
152	*Eucalyptus*	*acmenoides*	White Mahogany
156	*Eucalyptus*	*acmenoides*	White Mahogany

REVISION	DESCRIPTION	DRAWN	CHECK	DATE
E	SUBMITTED TO CLIENT FOR COMMENT	LD+AM	AS	09-10-17
F	SUBMITTED TO CLIENT FOR COMMENT	LD+AM	AM	27-10-17
G	SUBMITTED TO CLIENT - BOUNDRY LINES FORMAT	AM	AM	22-03-18
H	SUBMITTED TO CLIENT - ADDITIONAL TREES - T59A + T60	AM	MD	11-04-18
I	SUBMITTED CLIENT - PROPOSED RIG PLATFORM+RECOMMENDED 20% ENCR	AM	MD	17-05-18
J	SUBMITTED TO CLIENT - AMENDED REPORT	AM	MD	22-05-18

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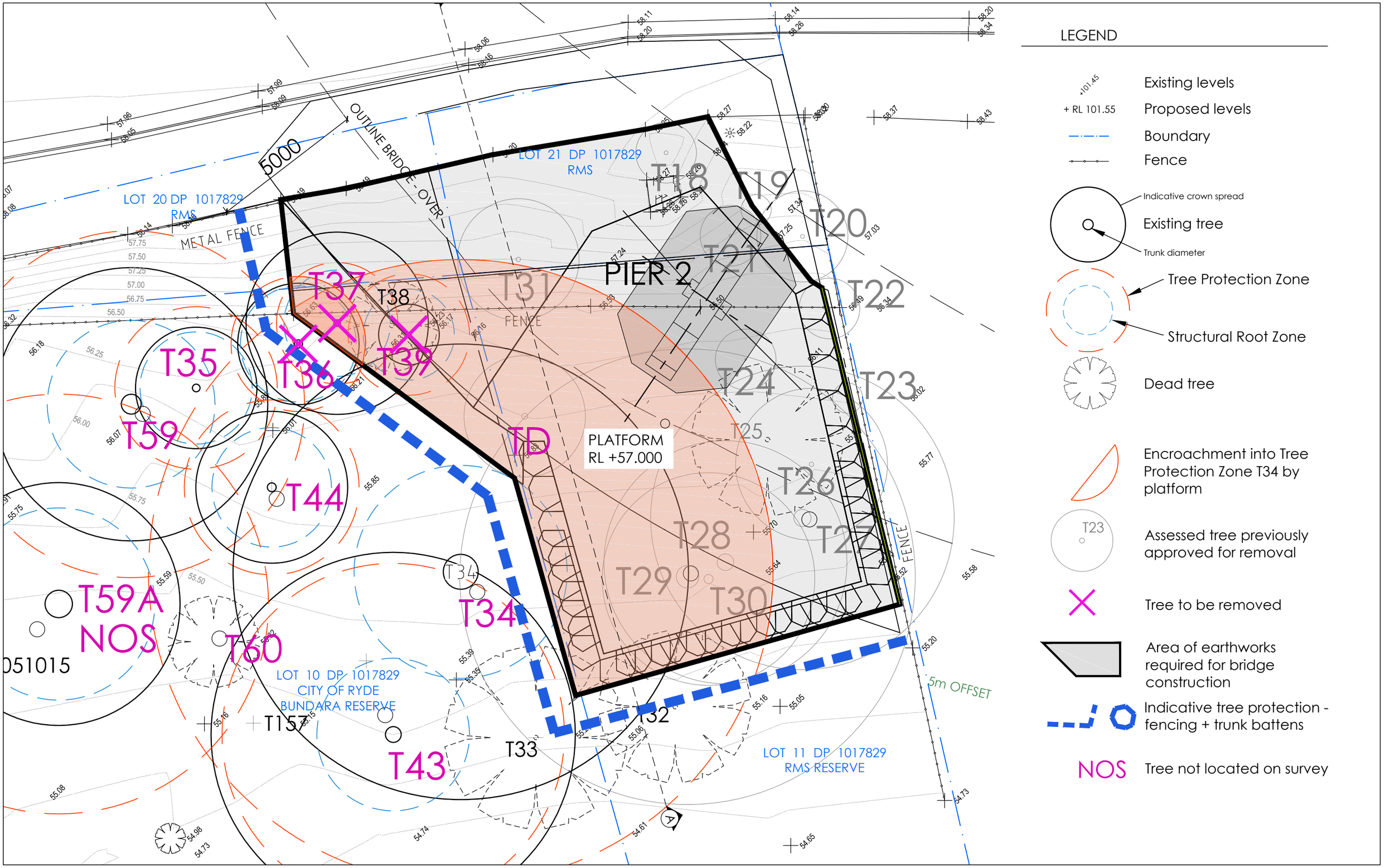
ADDRESS: **LACHLANS LINE PEDESTRIAN BRIDGE**

CLIENT: **LANDCOM**

PROJECT: NEW DEVELOPMENT
DRAWING: TREE LOCATION PLAN
SCALE: N.T.S. @ A3 | ISSUE: REF | SHEET: T - 04
DRAWN: LD+AM | CHECK: AM | DATE: 22-05-18 | REVISION: J



LEGEND

- +101.45 — Existing levels
- + RL 101.55 — Proposed levels
- Boundary
- Fence
- Indicative crown spread
- Existing tree
- Trunk diameter
- Tree Protection Zone
- Structural Root Zone
- Dead tree
- Encroachment into Tree Protection Zone T34 by platform
- T23 — Assessed tree previously approved for removal
- Tree to be removed
- Area of earthworks required for bridge construction
- Indicative tree protection - fencing + trunk battens
- NOS — Tree not located on survey

REVISION	DESCRIPTION	DRAWN	CHECK	DATE
E	SUBMITTED TO CLIENT FOR COMMENT	LD+AM	AS	09-10-17
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ADDRESS
LACHLANS LINE PEDESTRIAN BRIDGE

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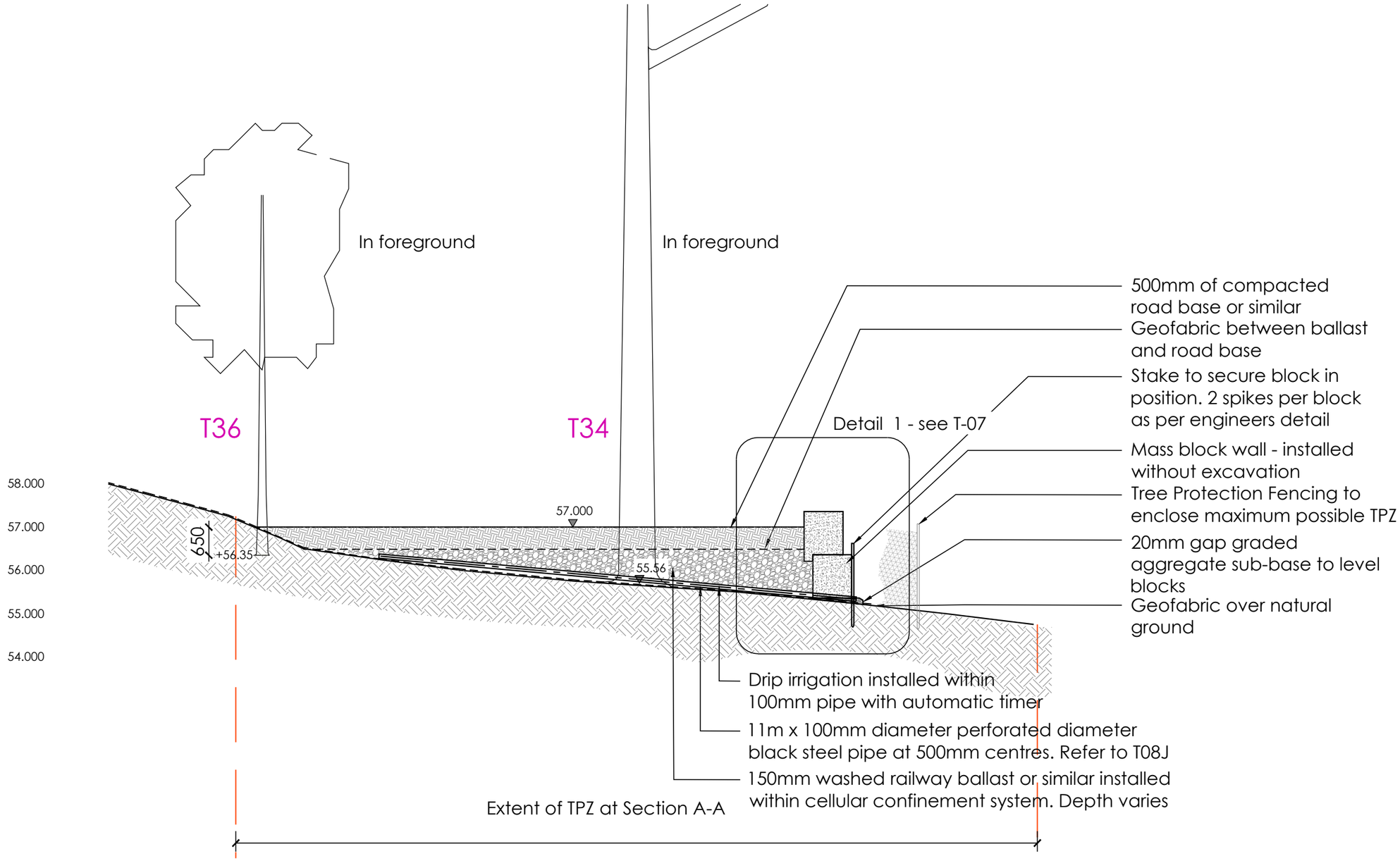
PROJECT: NEW DEVELOPMENT
DRAWING: TREE LOCATION PLAN - PIER 2
SCALE: N.T.S. @ A3 | ISSUE: REF | SHEET: T - 05
DRAWN: LD+AM | CHECK: AM | DATE: 22-05-18 | REVISION: J



A 1:100 TYPICAL SECTION

TEMPORARY WORK PLATFORM

All structures and grades to engineers details

REVISION	DESCRIPTION	DRAWN	CHECK	DATE
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F	SUBMITTED TO CLIENT FOR COMMENT	LD+AM	AM	27-10-17
G	SUBMITTED TO CLIENT - BOUNDRY LINES FORMAT	AM	AM	22-03-18
H	SUBMITTED TO CLIENT - ADDITIONAL TREES - T59A + T60	AM	MD	11-04-18
I	SUBMITTED CLIENT - PROPOSED RIG PLATFORM+RECOMMENDED 20% ENCR	AM	MD	17-05-18
J	SUBMITTED TO CLIENT - AMENDED REPORT	AM	MD	25-05-18

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CLIENT

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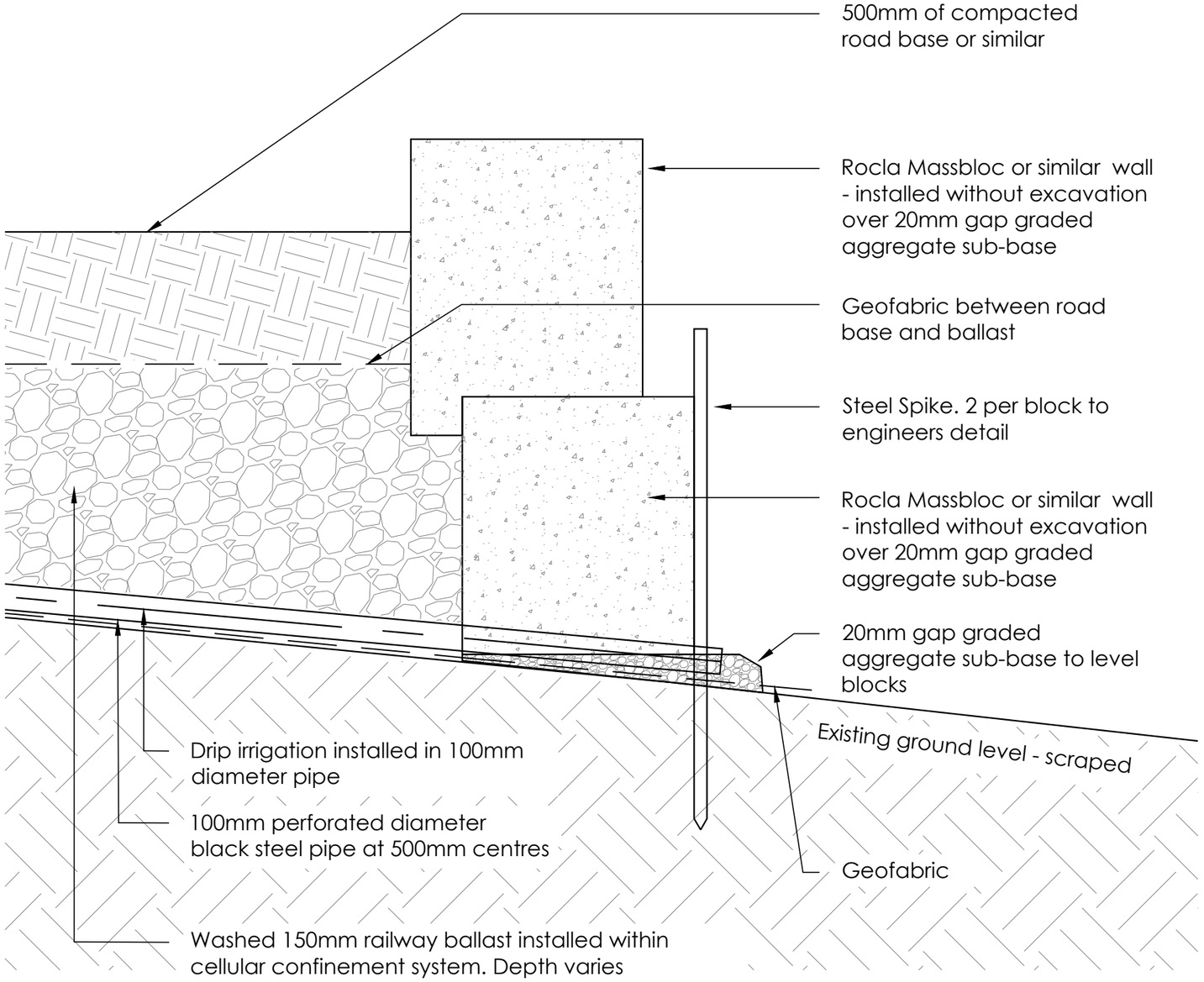
PROJECT: NEW DEVELOPMENT

DRAWING: TYPICAL SECTION - PIER 2

SCALE	ISSUE	SHEET
1:100 @ A3	REF	T - 06

DRAWN	CHECK	DATE	REVISION
AM	MD	28-05-18	J



1 / 1:20 TYPICAL DETAIL

TEMPORARY WORK PLATFORM SURROUNDING T34 & T150

All structures and grades to engineers details

1. PLATFORM CONSTRUCTION DESIGN + MANAGEMENT - Refer to Arboreport Impact Assessment, 28-05-18

- All efforts should be made to restrict the time period in which platform is installed to 12 months or shorter.
- 1. PLATFORM CONSTRUCTION DESIGN + MANAGEMENT

1.1. Engage project arborist for construction management.

1.2. Installation of Tree Protection Fencing or Site Boundary fencing to isolate area from public.

1.3. Measurement of base line soil compaction prior to construction using penetrometer to depth of 600mm or similar at 4 locations distributed under mass blocks and 4 locations distributed under fill, see Plan T08.

1.4. Manual raking of organic mulch layer to be under arborist supervision to a maximum of 50mm depth. This should be stockpiled and kept isolated from weed and disease propagules.

1.5. Geofabric laid on exposed soil should:

1.5.1 Achieve horizontal pressure distribution of anticipated platform plus rig (250kPa) throughout the full platform footprint within the TPZ.

1.5.2 Allow gaseous exchange and water permeability.

1.5.3 Provide barrier between fill materials and existing soil.

1.6 14 x 100mm perforated black steel pipes laid at 500-600mm centres over geofabric to allow maximum possible air movement and water infiltration near existing ground level within TPZ. Pipes to be secured with 300mm S12 pegs at 2.5m centres Refer to T08 for pipe lengths.

1.7 Drip Irrigation installed with automatic timer, within black steel piping within TPZ of Tree 34. Application rate to be equivalent to, or less than 8.0mm per hour to avoid run off from clay site soil. Project arborist to inspect irrigation controller schedule.

1.8 Mass Block wall blocks to be installed using machinery no greater than equivalent of 15t mass over 3m2/ track area. Machinery shall only travel over areas with geotextile and a minimum of 300mm of ballast installed to avoid compaction. Turning within the TPZ shall be avoided. Steel pipes to be accommodated within block profile and to extend to open air to permit direct air diffusion and drainage.

1.9 Mass Block wall structure to be levelled using 20mm diameter gap gradient aggregate or similar over existing ground level. No cutting of soil to level blocs. Star pickets or similar to engineers detail to be placed adjacent the downhill face of block to stop downhill movement of blocks in accordance with engineers details.

1.10 150mm washed railway ballast or similar to provide air and water movement as above. To be set in Geocell or similar cellular confinement system.

1.11 Geofabric shall be laid over washed railway ballast, before road base is installed. Geofabric, see, 1.5, above.

1.12 Road base to 500mm depth, compacted, over geofabric.

- 2. SITE MANAGEMENT - BRIDGE CONSTRUCTION

2.1 Monthly site inspections by arborist to monitor tree health, inspect tree damage and determine irrigation scheduling.

2.2 Use of a rigger/dogman to guide the rig operator to avoid tree stems and crowns.

2.3 Contact project arborist if any spills or accidental injury to retained trees on site.

2.4 Contact project arborist if any pruning of branches or roots is required.

2.5 Contractor to put in place Hydrocarbon, Chemical and other liquids Spill Response plan and a Bulk Materials Spill Response Plan which are compliant with the relevant authority.

- 3. SITE RESTORATION MANAGEMENT

3.1 Removal of mass block wall, railway ballast and final geofabric to be carried out under project arborist supervision. Minimization of heavy machinery to be used - see point 1.8, above.

3.2 Removal of Tree Protection Fencing and inspection by project arborist.

3.3 Measurement of degree of compaction at the conclusion of construction using penetrometer to depth of 300mm or similar at the same 8 locations as above in point 1.3.

3.4 Replace stockpiled original mulch/soil as to achieve as close to original coverage as possible.

REVISION	DESCRIPTION	DRAWN	CHECK	DATE
E	SUBMITTED TO CLIENT FOR COMMENT	LD+AM	AS	09-10-17
F	SUBMITTED TO CLIENT FOR COMMENT	LD+AM	AM	27-10-17
G	SUBMITTED TO CLIENT - BOUNDRY LINES FORMAT	AM	AM	22-03-18
H	SUBMITTED TO CLIENT - ADDITIONAL TREES - T59A + T60	AM	MD	11-04-18
I	SUBMITTED CLIENT - PROPOSED RIG PLATFORM+RECOMMENDED 20% ENCR	AM	MD	17-05-18
J	SUBMITTED TO CLIENT - AMENDED REPORT	AM	AS	28-05-18

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ADDRESS: **LACHLANS LINE PEDESTRIAN BRIDGE**

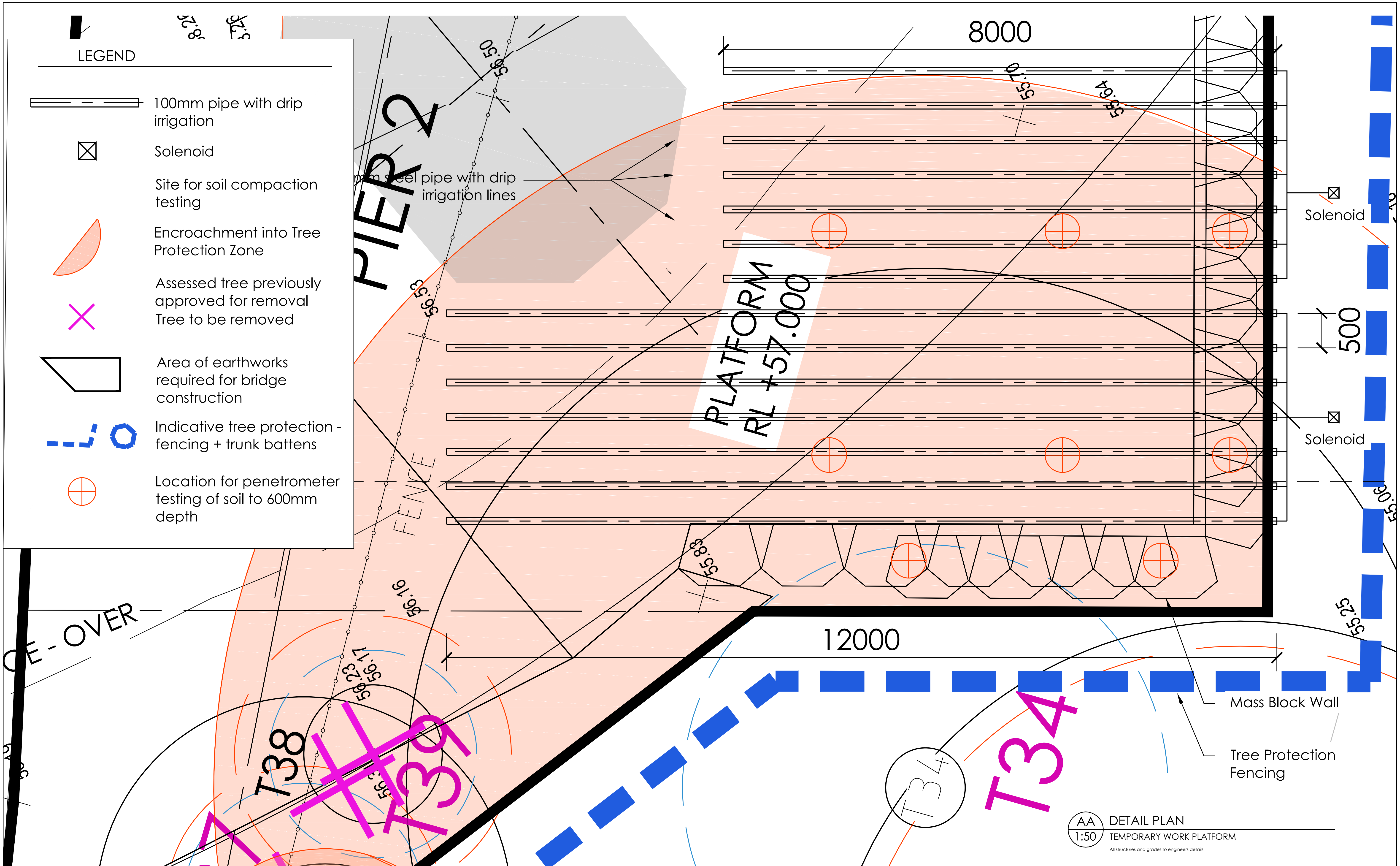
CLIENT: **LANDCOM**

PROJECT: NEW DEVELOPMENT

DRAWING: TEMPORARY WORK PLATFORM DETAIL - PIER 2

SCALE	ISSUE	SHEET
1:20 @ A3	REF	T - 07

DRAWN	CHECK	DATE	REVISION
AM	AS	28-05-18	J



REVISION	DESCRIPTION	DRAWN	CHECK	DATE
E	SUBMITTED TO CLIENT FOR COMMENT	LD+AM	AS	09-10-17
F	SUBMITTED TO CLIENT FOR COMMENT	LD+AM	AM	27-10-17
G	SUBMITTED TO CLIENT - BOUNDRY LINES FORMAT	AM	AM	22-03-18
H	SUBMITTED TO CLIENT - ADDITIONAL TREES - T59A + T60	AM	MD	11-04-18
I	SUBMITTED CLIENT - PROPOSED RIG PLATFORM+RECOMMENDED 20% ENCR	AM	MD	17-05-18
J	SUBMITTED TO CLIENT - AMENDED REPORT	AM	MD	25-05-18

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ADDRESS
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CLIENT
LANDCOM

PROJECT: NEW DEVELOPMENT
DRAWING: TEMP PLATFORM PLAN AT T34
SCALE: 1:50 @ A3
ISSUE: REF
SHEET: T - 08
DRAWN: AM
CHECK: MD
DATE: 28-05-18
REVISION: J

10. General Tree Protection Notes

10.1. Structural Root Zone (SRZ)

The SRZ is a radial area extending outwards from the centre of the trunk calculated as follows:

$$\textbf{SRZ (Radius)} = (D \times 50)^{0.42} \times 0.64$$

10.2. Tree Protection Zone (TPZ)

The TPZ is a radial area extending outwards from the centre of the trunk equal to the DBH x 12. This area shall be protected by a TPF (*see below*). For all trees to be retained a TPZ is to be created and maintained.

The TPZ function is primarily to protect the root zone by restricting access however the canopy of the tree shall also be protected from damage or injury. The Project Arborist shall approve the extent of the TPZ.

The TPZ shall be mulched to a depth of 75mm with an approved organic mulch. Supplementary watering shall be provided in dry periods to reduce water or construction stress, particularly to those trees which may have incurred root disturbance.

In the TPZ the following activities shall be excluded:

- Excavation, compaction or disturbance of the existing soil.
- The movement or storage of materials, waste or fill.
- Movement or storage of plant, machinery, equipment or vehicles.
- Any activity likely to damage the trunk, crown or root system.
- Scaffolding.

10.3. Tree Protection Fencing (TPF)

Prior to site establishment, tree protection fencing shall be installed to establish the TPZ for trees to be retained. Tree protection fencing shall be maintained entire for the duration of the construction program.

Tree protection fencing shall be:

- To enclose as much of the TPZ as can reasonably be enclosed, allowing for pedestrian access and 1m offset around construction footprint and scaffolding.
- Cyclone chain link wire fence or similar, with lockable access gates.
- Certified and Inspected by the Project Arborist
- Installed prior to the commencement of the works.
- Prominently signposted with 300mm x 450mm boards stating "**NO ACCESS TO THIS AREA - TREE PROTECTION ZONE CONTACT PROJECT ARBORIST 0407 006 852**".

10.4. Trunk and Root Zone Protection

Other measures may be required in addition to tree protection fencing. These specific protection measures will be installed as directed by the Project Arborist to protect the canopy, trunk or branches from the risk of damage.

The Project Arborist shall be consulted if there is risk of damage to a retained tree. The Project Arborist may require:

- A 75mm layer of approved mulch to be installed to the TPZ.
- A temporary drip irrigation system to be installed to the TPZ.
- Additional root protection to be installed.
- Additional trunk and branch protection to be installed.

10.5. Tree Damage

In the event of damage to a tree or the TPZ of a tree to be retained the Project Arborist shall be engaged to inspect and provide advice on remedial action. This should be implemented as soon as practicable and certified by the Project Arborist.

10.6. Excavation within the TPZ

Excavation within the TPZ shall be avoided. All care shall be undertaken to preserve tree root systems. Excavation within the canopy drip line or TPZ shall subject to the approval and supervision of the Project Arborist. Excavation shall be executed by hand to avoid damage to roots.

If excavation within the TPZ is required other than that anticipated in this report the Project Arborist shall be notified. A root mapping exercise may be required and should be certified by the Project Arborist. Root mapping shall be undertaken by either ground penetrating radar (GPR), air spade, water laser or by hand excavation. The purpose shall be to locate woody structural roots greater than 50mm in diameter.

Where roots 50mm dia. or greater are encountered, alternative construction method shall be considered to ensure roots are not severed. Adequate allowance must also be made for future radial root growth. In paved areas, consideration should be given to raising the proposed pavement level and using a porous fill material in preference to excavation.

If there is no avoiding placing services through the TPZ excavate outside the TPZ and underbore below the root ball of the tree as directed by the Arborist.

10.7. Fill

All fill material to be placed within the TPZ should be approved by Arborist and equal to 5-7mm Round River Pea Gravel to provide aeration and percolation to the root zone. Otherwise no fill should be placed within the TPZ of trees to be retained.

10.8. Pavements

Proposed paved areas within the TPZ should be placed on or above grade to minimise excavation, and avoid root severance and/or damage. Pavements should be permeable or avoided otherwise.

10.9. Pruning

All pruning work required (including root pruning) should be in accordance with Australian Standard No *4373 -2007 - Pruning of Amenity Trees*.

If required, roots should be severed with clean sharp implement flush with the face of the excavation and maintained in a moist condition. Root pruning shall be performed under the supervision of the Project Arborist.

10.10. Tree Removal

Tree removal work shall be carried out by an experienced Level 3 Arborist in accordance with the NSW Work Cover Code of Practice for the Amenity Tree Industry (1998).

Care shall be taken to avoid damage to trees during the felling operation. Stumps shall be grubbed-out using a mechanical stump grinder to a minimum depth of 300mm without damage to other retained root systems.

10.11. Post Construction Maintenance

In the event of any tree deteriorating in health after the construction period, the Project Arborist shall be engaged to provide advice on any remedial action. Remedial action shall be implemented as soon as practicable and certified by the Project Arborist.

Tree protection fencing with additional trunk and root protection shall be removed following completion of construction. The mulch layer in the TPZ shall be retained and replenished where required to maintain a 75mm thickness.

11. References

1. **AS 4970 - 2009 Protection of Trees on Development Sites**; Standards Australia.

2. **AS 4373 - 2007 Pruning of Amenity Trees**; Standards Australia.

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