



Assessment of proposed road design at
the intersection of Yan Yean Road and
Bridge Inn Road, Doreen

Root Investigation Report

Prepared For: WSP

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1. Introduction

Yan Yean Road is currently in the process of design for an upgrade. At the intersection with Bridge Inn Road there are 2 large River Red Gums *Eucalyptus camaldulensis* located close to the existing roundabout. There is a desire to retain these trees as part of the road upgrade.

Due to the levels of encroachment into Tree Protection Zones, a non-destructive root investigation (NDRI) was completed to identify the presence or absence of tree roots. This information will be used to inform the design process and determine whether the trees can be retained.

2. Documents Reviewed in Preparation of the Report

- Krishnaraj, S. J., 2018, *Assessment of 2 River Red Gums at the corner of Yan Yean Road and Bridge Inn Road, Construction Impact Assessment*, C&R Ryder Consulting Pty. Ltd.
- Ryder, C., 2019, *Design Review Memo-Yan Yean Road, Review of intersection proposal and assessment of tree impact*, C&R Ryder Consulting Pty. Ltd, 16/04/2019
- Arcadis, 2019, *Yan Yean Road, Bridge Inn Road Intersection, Plan*, Rev A, Date 19.03.19, file AA009647-00-RG00-SKT-0224
- Arcadis, 2019, *Yan Yean Road, Bridge Inn Road Intersection, Swept Paths*, Rev A, Date 19.03.19, file AA009647-00-RG00-SKT-0247.dgn
- AA009647-32-RG00-YY Rd_Bridge Inn Rd.dgn
- ELS Asset Survey - 3543-001 A8 BRIDGE INN RD REV 0.dwg

3. Methodology

A non-destructive root investigation was completed along the proposed alignment as provided within the documentation. Offsets to hard features were taken from drawings and then measured on-site. It is estimated that the accuracy of this is approximately 10-20cm, which is sufficient for the exercise.

Additionally, a 40m section was completed on the eastern side of the trees. The purpose was to identify potential constraints if a redesign to move the intersection to the east of the trees was considered.

The hydro excavation was completed on Monday 27 May, 2019. Trenches were excavated to 600-800mm depth unless buried features precluded this (Figure 1 & Figure 2). The hydro excavation allows roots and utilities to be retained whilst excavating the soil and gravel.

Roots identified within the trenches were then counted, classified and their location and depth recorded. The number and size of roots has been used to assess likely impacts to the trees.

Following completion of the below ground assessments, the site was reinstated with crushed rock and cold mix asphalt or topsoil where required (Figure 3).



Figure 1: Hydro excavation in action



Figure 2: Completed slot trench.



Figure 3: Reinstated trench within the paddock.

4. Site Map

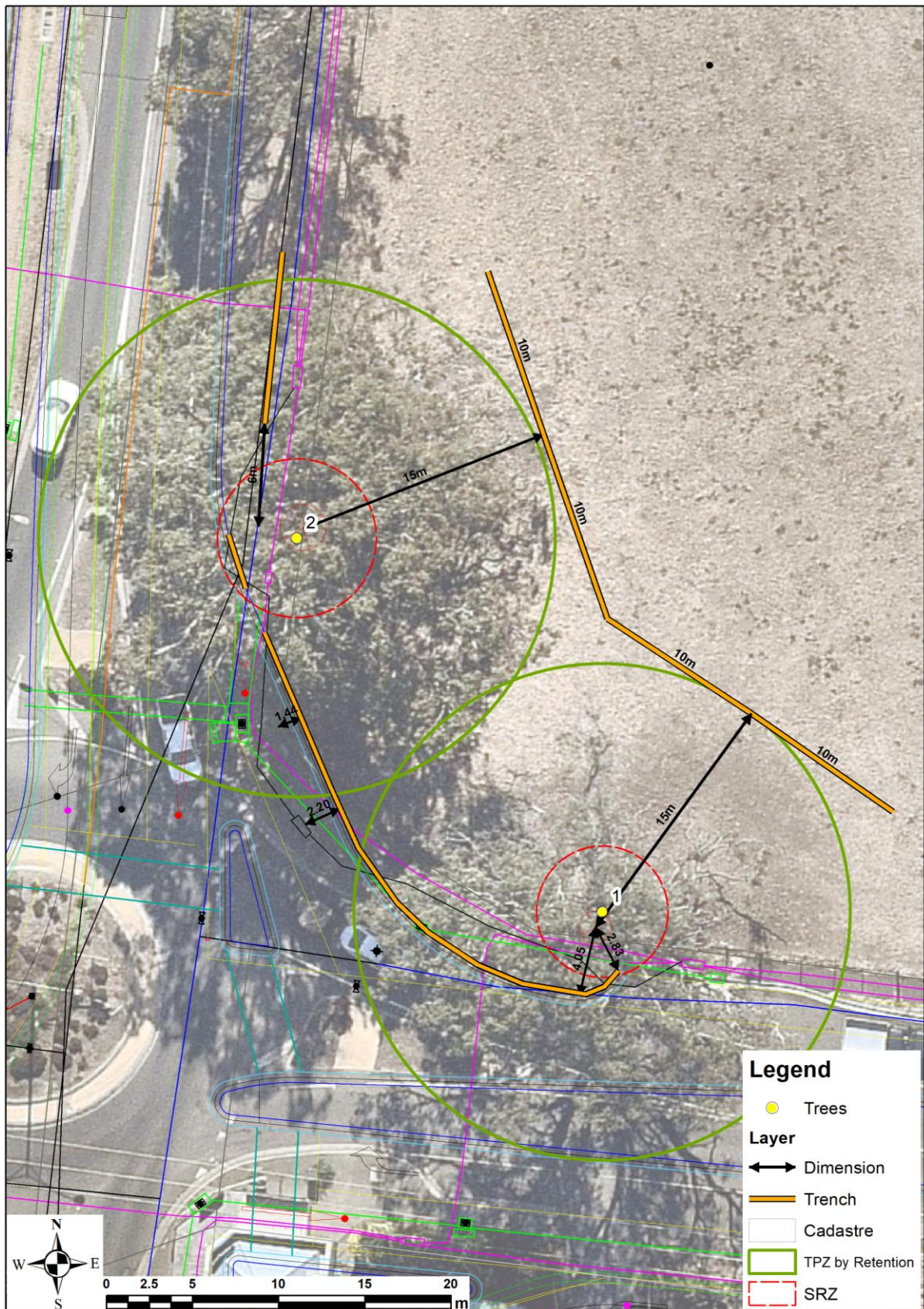


Figure 4: Map of trees and areas that were trenched using NDRI

5. Findings

5.1 Tree Details

Both trees are River Red Gum *Eucalyptus camaldulensis*, indigenous to the area and remnant.

Tree 1 is generally in a state of decline. As described by Krishnaraj (2018), 'it is evident that the tree is declining but over a long term (Figure 5). The tree has an asymmetric canopy with an irregular branching pattern. The canopy is sparse with horizontally extending branches within the paddock and it has a lean in general towards the road'. There is also significant psyllid damage throughout the canopy.

Tree 2 is generally in good condition for its size and age. There is a good canopy of foliage, minimal deadwood and no signs of pest or disease likely to be causing decline.



Figure 5: Trees 1 and 2

5.2 Root Investigation

The root investigation was completed in 2 sections:

1. along the proposed alignment of the intersection primarily on the southern and western side of the trees
2. along a 40m line offset approximately 15m from either tree trunk.

5.2.1 Trench 1

Trench 1 comprised a line from Tree 1 (Figure 6), along the back of existing kerb (where the proposed alignment proceeds into the running lane), through private property (Figure 7) and past Tree 2, heading north (Figure 8).

Whilst the initial alignment was proposed just off the running lane, attempts to get through the asphalt were unsuccessful due to a depth in excess of 250-300mm. Instead, the trench was excavated on the eastern side of the asphalt spoon drain. Beyond a depth of approximately 400mm, the ground was a heavy clay and very hard to excavate. This has implications when limiting tree root growth.

A section of approximately 6m could not be excavated due to depth of asphalt.

No roots were identified in Trench 1 along its length. Some of the factors that have lead to this include:

1. A large stormwater installed along the southern section near Tree 1 has cut all roots. It was approximately 400-500mm diameter and buried approximately 700mm deep (Figure 9).
2. Telstra and NBN, both installed near the tree are likely to have damaged roots over the years near both trees.
3. The deep culvert and box drain have acted as a substantial barrier to tree roots.
4. The depth of the road layer is substantial. Hydro excavation of the road edge suggested an impermeable layer of 300-400mm. When combined with a compacted sub-base of another ~300mm, it is likely to have prevented root growth.

Whilst it is acknowledged that a small section could not be excavated, existing hard infrastructure makes the presence of tree roots in this area unlikely.



Figure 6: Trench 1 near Tree 1.



Figure 7: Trench 1 where it crosses into private property



Figure 8: Trench 1 on the western side of the asphalt drain. Failed asphalt cut to the right.



Figure 9: Approximate alignment of drainage pipe has cut all roots.

5.2.2 Trench 2

Trench 2 was a 40m section at a 15m offset to both trees in the paddock on the north-east side (Figure 4 and Figure 10). This location was chosen following discussion with Will Parker as the initial drawing supplied was found to be not to scale.

Along the 40m length of the trench, no roots greater than ~5mm diameter were identified. Within this size category, several were found; however, they may have been attached to the many, small saplings growing in the area. These had been grazed or slashed many times resulting in very little above ground biomass; however, relatively large root systems.



Figure 10: Trench 2.

5.2.3 Implications

Completion of the root investigation has revealed that these 2 trees do not have any roots within the areas assessed. Given the size of the trees and their likely age of 200+ years, it is inferred from this that the trees' roots are deeper than the 600-800mm excavated. Whilst it is contemporary theory that tree roots are shallow (Akinnifesi, Kang & Ladipo 1999, Havis 1938, Hitchmough 1994, Peter & Lehmann 2000, Sydnor et al. 2000, Watson 1995), exceptions are not uncommon. Given the ecology of the species is to grow along floodplains, watercourses and areas with subterranean moisture, it is entirely likely that these trees have deep root systems.

On the western and southern sides of the tree, where the design is proposed, provided excavation doesn't exceed approximately 800mm or get closer to the tree than investigated, there is unlikely to be any impact. In terms of the tree roots at depth, there will be little net change to the conditions above. This should maintain the trees as viable.

On the north-eastern side of the tree, works at an offset of 15m are unlikely to impact tree roots. Longer term issues may arise with a change to hydrology patterns as the trenched alignment is uphill of a small catchment. This will need to be taken into account if a design proceeds in this area, ensuring access to water long-term.

As part of the design for an intersection near these trees additional consideration will need to be given to management throughout construction and mitigation of negative impacts. There is to be no trenching for conduits or utilities and any that must be installed are to be bored with a minimum of 1m cover to the surface.

This can be managed through the implementation of a Tree Protection Management Plan.

5.3 Revegetation & Mulch

Part of the consideration for the area around the trees should be to revegetate where possible. By underplanting the trees with indigenous species, including acacias, nutrient cycling will improve soil conditions and quality over time for the trees.

The available area within the TPZ should also be mulched to a depth of 75-100mm. The mulch should be composted to minimise nitrogen drawdown. Some of the best forms of mulch are the tree trimmings that have been 'chipped' by tree contractors. Provided it is stockpiled for several weeks to compost and is weed seed free, it provides a good mix of woody and leafy material. This type of mulch usually breaks down to improve the soil quality, microflora and fauna.

Mulch has many benefits to plants including:

- Soil moisture conservation
- Soil compaction reduction
- Grass and weed suppression
- Reduction in soil erosion
- Soil structure improvements
- An increase in soil fertility
- An improvement in the quality and diversity of soil biology
- Moderation of soil temperature on a diurnal and seasonal basis (Harris, Clark & Matheny 1999, Bastian 2009, Day & Harris 2017).

5.4 Tree Protection Management Plan

Following completion of a design that will allow tree retention, a Tree Protection Management Plan (TPMP) is to be developed. It is to contain:

- The engagement of a project arborist with a minimum qualification of Diploma in Arboriculture (AQF level 5 or equivalent)
- Detail regarding how the trees will be retained:
 - During excavation
 - Prior to and during construction
 - Post construction
- A tree protection plan to scale that is to show:
 - all tree protection zones and structural root zones,
 - all tree protection fenced off areas and areas where ground protection systems will be used
 - All services to be located within the tree protection zone and a notation to state that all services will either be located outside of the tree protection zone or bored under the tree protection zone
 - A notation to refer to the tree management plan for specific detail on what actions are required within the tree protection zone.
- Location of tree protection measures and ground protection
- Certification, milestones, inspection times and hold points.

The TPMP is to be developed in accordance with AS4970-2009 *Protection of Trees on Development Sites*.

6. Conclusion

C&R Ryder Consulting was engaged to complete a non-destructive root investigation near 2 large River Red Gums *Eucalyptus camaldulensis* at the intersection of Yan Yean Road and Bridge Inn Road, Doreen. A new intersection is proposed and there is significant public pressure to ensure these trees are retained.

The first trench was excavated along the proposed back of kerb based on design plans provided. This was primarily to the south of Tree 1 and the west of Tree 2. At a depth of 600-800mm, no roots were found along any section of the trench. This is likely to be due to historic disturbance, installation of utilities, compaction for the road and deep rooting.

The second trench was excavated along a 40m line, offset 15m to the north-east from both trees. No roots were uncovered along the length of the trench that could positively be identified as belonging to either tree. The reason for this remains unknown.

Given the findings, it is fair to conclude that if the design can keep to these alignments and depths, very little root damage will occur.

It is recommended that:

1. The design is refined to show required excavation and finished levels. The excavation for the road base should not exceed 600-800mm without additional investigation. There is to be no additional fill placed within the undisturbed areas of the TPZs.
2. If the design is shifted to the north-east, consideration is given to how the hydrology can be maintained within the small catchment to ensure the trees continue to receive water long-term.
3. The area within the TPZ that is available is converted to mulched garden bed with indigenous plantings, including acacias.
4. Any changes to the design are reviewed by the project arborist for potential impacts to trees.
5. There is to be no trenching behind the proposed alignment for utilities. Any conduits or pipes required within the TPZ are to be bored maintaining a minimum of 1m cover to natural ground.
6. Prior to any works, a detailed Tree Protection Management Plan is prepared outlining tree protection measures, arborist involvement, excavation, utility installation, lighting and other works to ensure the trees will remain viable at the end of the project.

7. References

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