The Burnside Village Tree – A Case Study of Construction and Tree Protection

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Introduction

Burnside Village is a relatively major suburban shopping centre servicing the eastern suburbs of Adelaide. The owners of the shopping centre have tried to maintain the 'village' feel of the shopping centre through various developments over the past 20-30 years. A major part of this has been the retention of a number of mature eucalypts within and around the car parking area; to the point that when looking at the next stage of the development there was an overriding requirement to retain as many trees as possible. One of the trees, a River Red Gum, was located in an existing driveway/parking area between two separate sections of the shopping centre; this tree was particularly important to the owners and as such they started the design process with the premise that this tree be retained and incorporated within the new shopping area.

In order to retain the tree the owners employed us to assess the tree and determine how much protection was required to minimise the impact of any potential development around the tree. Assessments were undertaken in 2007 and a Tree Protection Zone (TPZ) of 11 metres in radius was calculated to be appropriate for this tree in this situation. The owners then used this information to assist in designing a new complex around the tree.

In late 2008 to early 2009 the preliminary design was put together with the tree to be centred in a new mall area with shops on three sides and the main entrance on the fourth side. The tree was to be retained in an open alfresco type area with its crown extending through and above the roof. Due to the need for increased car parking the area around the tree's TPZ was to be excavated to allow for under croft parking; effectively this was akin to putting the tree in a large pot. Whilst there were some obvious challenges these preliminary designs looked very exciting and promised a good result for both the shopping centre and the tree.

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Over the next twelve months plans and method statements were put in place to remove the existing infrastructure, including buildings, services and pavement, and manage the canopy to ensure minimum contact with construction equipment and in the longer term the proposed building. A tree protection plan was also put in place to ensure both the root zone and canopy were protected during the construction phase.

In early 2010 the final plan was completed and there were a number of changes to the preliminary plans that both impacted directly on the tree and on a number of the tree protection measures that had been put into the tree protection plan. Some of the changes were:

- Suspending a deck over the majority of the TPZ which involved four piers being sunk into the root zone; and
- Installation of an air vent from the under croft parking within the root zone and below the proposed deck; and
- Installation of other services to supply water and electricity to water features and lights around the tree; and most importantly
- The introduction of a roof above the tree to allow the deck to be used all year as an alfresco type area.

Obviously these changes meant a rethink in a number of areas and some investigation/research into the potential impacts of putting a glass roof above the tree.

In hind sight this was an opportunity to reconsider the whole scenario more thoroughly as the level of impact had reached a point where the tree was potentially going to respond poorly. Having said that the reality was that glass is available that allows for plants to grow well beneath it and as such this wasn't seen as a factor that would prevent the successful completion of the project. The issues could be dealt with through the tree protection zone method statements and management protocols.

With construction due to start almost immediately the first phases of the tree protection and management plan and then implemented on an as appropriate basis. There were a number of issues associated with the construction process:-

- Torrential rain at important times delaying activities on the site and within the TPZ.
- Torrential rain washing building waste into the TPZ causing contamination of the area.
- Greater than anticipated requirements for support piers within the TPZ.
- Enclosed scaffolding around the tree for the installation of the roof and glass above and adjacent to the tree.
- Additional service installation below the deck.
- No allowance for water to be supplied to the irrigation system below the deck.
- Various other relatively minor construction activities.

The tree has shown signs of stress throughout the period since the roof was installed. A number of potential causes were considered including the below:

- The roof; shouldn't be, the glass was requested to allow the full spectrum of light through to the tree to ensure photosynthesis was not inhibited.
- Lack of water; moisture tests show the irrigation is providing adequate water and the soil moisture is stable.
- Lack of rain; without rain falling on the crown the leaves may be getting dirty and potentially being affected to the point where they are not photosynthesising to their capacity.
- Nutrient levels; tests again show the nutrient levels are about right and with the amelioration this should improve further.
- Lack of wind; possibly an issue with little to no wind contacting the lower crown where the majority of dead leaves were being retained.
- Air quality; possibly - air conditioning has been installed and dry air was being directed toward the crown.

Testing

With the assistance of the University of Western Australia and Murdoch University we were able to undertake a number of tests within the crown.

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These included testing light levels at different times of the day and monitoring humidity, temperature and leaf turgidity (water content) over a six week period.

The test results gave us the following information:

1. The light levels were at the lowest point for photosynthesis to occur and given River Red Gum is a relatively high light user it appears leaves that were unable to be productive were/are being shed.
2. The humidity is so low, dry air, in the crown that for the majority of the day the leaf stomata were effectively closed; this further limits both the tree's ability to take up water and therefore to photosynthesise.
3. There is increased insect and fungal activity on the leaves which is likely to be related to the low humidity.
4. Water whilst available is not being taken up due to the lack of photosynthetic activity and the low humidity causing the stomata to close.

Obvious thinning and dead leave retention particularly in the lower canopy.

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Where to from here?

The Burnside Village management have committed to implementing a number of strategies to enhance the tree's environment and to minimise the identified issues.

- Modification of the air conditioning system to prevent dry, heated or cooled, air being directed onto the tree.
- Installation of a misting system to increase the humidity in the crown to the point where stomata activity is normalised.
- Installation of a full spectrum lighting system to increase the usable light available for photosynthesis.
- Crown management to remove sections that are not going to recover and maximise the potential for the remaining branches to improve their foliage cover.
- Ongoing monitoring and treatment of soil moisture and nutrient levels to maintain the tree's requirements.

Conclusion

The tree has undergone radical changes over the last 24-36 months and is still adapting to its new environment. Management processes are in place to improve the tree's environment and there is a strong commitment from Burnside Village to do the best by the tree.

The long term success or failure of this tree will depend on how well we monitor it and assist it to adapt to its new environment.

The tree potentially has a good future however this is an ongoing project and only time will tell as to its long term success.

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