

2nd June 2021

Nicola Rooks
Strategic Planner
Banyule City Council

Dear Nicola

**RE: PEER REVIEW ARBORICULTURAL TREE HEALTH AND HAZARD ASSESSMENT
OF THE PROPOSED TREE TOP CLIMBING AND ADVENTURE FACILITY BY ECOLINE**

I refer to my recent engagement to undertake a Peer Review of an Arborist assessment in relation to amendment C107 received in relation to a Tree Top Climbing and Adventure Facility at Yarra Flats Park East Ivanhoe.

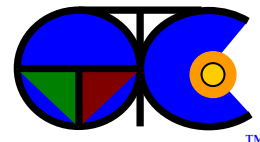
Enclosed for your perusal is my assessment and report associated with the Peer review conducted on the Arborist report prepared by Advanced Treescape Consulting entitled Arboricultural Tree Health and Hazard Assessment (2018 update), dated the 31st of August 2018. The Author was Russell Kingdom and the proponent is Ecoline Pty Ltd.

In addition to the Peer review of this document, background information was also taken from associated submissions mentioned in the C107 amendment document in relation to this proposal

Should there be any queries in relation to this report or its recommendations, please do not hesitate to contact me on **0407 915 561**.

for and on behalf of,
Arborist Reports Australia

Principal Consulting Arborist



**PEER REVIEW
ARBORICULTURAL TREE HEALTH AND HAZARD
ASSESSMENT
OF THE PROPOSED
TREE TOP CLIMBING AND ADVENTURE FACILITY
BY ECOLINE**

**Yarra Flats Park
East Ivanhoe**

REPORT & ASSESSMENT PREPARED BY

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REPORT PREPARED FOR

**Nicola Rooks
Strategic Planner
City of Banyule**

2nd June 2021

Tree Top Climbing and Adventure Facility Yarra Flats Park East Ivanhoe

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1. BACKGROUND

In my capacity as the Director and Principal Consultant Arborist for Arborist Reports Australia, I have been engaged by some of the most recent and popular High ropes and Tree Climbing adventure facilities in Victoria. They include the Enchanted Maze Tree Surfing facility at the Enchanted Maze Adventure Garden, 55 Purves Road Arthurs Seat and on the Mornington Peninsula and the Live Wire Park at 180 Erskine Falls Road Lorne. In researching the feasibility of these facilities and their potential impact on the host trees at Yarra Flats Park, I visited these three established facilities Livewire Park, the Otway Fly and Otway Zipline at Beech Forest. I have previously attended and inspected the trees at the Tree top Adventure and the High Ropes course at Glen Harrow Park Belgrave in the Dandenongs. The Enchanted Maze Tree Surfing has been established since 2013 and Live Wire Park has been established since about 2018. A visit of the aforementioned facilities in 2021 showed all of them up and running with no apparent issues with regard to the subject trees. The predominant species at the Enchanted Maze is the Messmate Stringy Bark Gum (*Eucalyptus obliqua*) with the occasional Narrow-Leafed Peppermint Gum (*Eucalyptus radiata*). The predominant species at the Live Wire Park is the Victorian Blue Gum (*Eucalyptus globulus* 'Bicostata') with the occasional Mountain Grey Gum (*Eucalyptus cypellacarpa*). These two locations are considered dry forests. Glen Harrow park has Manna Gums (*Eucalyptus viminalis*) and some exotic species and the Otway Fly and Otway Zip line is in a Mountain Ash (*Eucalyptus regnans*) wet forest. Therefore the range of Eucalyptus species that these types of constructions have been built is quite diverse. The two facilities Arborist Reports Australia was involved in preparing arboricultural reports and follow up tree protection and management plans were for the Enchanted Maze and the Live Wire Park. Ecoline was responsible for the construction of the Roller Coaster Zip-line at Live Wire but not of the rest of the installed infrastructure in the trees at this site.

I have an ongoing relationship with the Enchanted Maze, in terms of providing an annual health, structure and risk assessment of the trees utilised in the course and other trees throughout the gardens. In preparing this Peer review, I will draw on my experience with the two facilities that I had direct involvement with and other established facilities that were visited during May 2021 as part of my research to determine how the trees were coping from a health, structure and medium to long-term viability perspective.

2. EXECUTIVE SUMMARY

Otto Leenstra Principal Consultant Arborist for Arborist Reports Australia has been engaged by the City of Banyule provide a Peer Review on the latest amended Arboricultural Tree Health and Hazard Assessment report by Russell Kingdom for Ecoline Pty Ltd dated 31st August 2018 (Referred to from here as the 'Arborist Report'). Ecoline is the proponent who will be constructing and operating this facility in accordance with amendment C107 associated with the Tree Climbing and Adventure Facility proposal (Referred to from here as 'The Proposal'). In essence this amendment sets the criteria under consideration of an area of Parks Victoria land and the commercialization of public land through private investment to provide a feature that will attract visitors to the facility and to the area. The area is part of the Yarra Flats Park, which is part of the whole Yarra Bend Park stretching along the Yarra River in the northeastern suburbs of Melbourne. The selected area is located at the eastern end of the Yarra Flats Entry Road car-park accessed from The Boulevard to the west in East Ivanhoe. The current facilities include a sealed road adjacent car-parking, BBQ shelter and a degraded toilet block. The infrastructure here is basic and degraded and the toilet block is not operational. The major indigenous tree species in this area is the River Red Gum (*Eucalyptus camaldulensis*). This species is the major tree species of Floodplain Riparian Woodland EVC056 the Ecological Vegetation Class (EVC) of this location. EVCs are discussed in more detail in section 6.4 of this report. The age range of these trees ranges from late semi-mature to mature. Trees selected for the proposal, include trees that would be considered in late Semi-Maturity to Early Maturity to trees that are considered Mature. Trees in late Semi-Maturity to Early Maturity would still be undergoing significant secondary growth, where tree diameters incrementally increase each year. This is a consideration to deal with and manage, with the mounting of infrastructure associated with the proposal.

In the selected area, the River Red Gums are generally in good health, with foliage density in the normal range. Any evidence of previous limb shed of larger scaffold branches is generally seen around the perimeter or in areas where trees have been removed around retained trees increasing exposure and therefore wind shear. The selected area has mostly intact tree canopies with minimal scarring observed associated with limb shear of larger scaffold branches. The assessment of the proposed individual trees selected by Ecoline as part of The Proposal and the subject of the Arborist Report have the capacity to support the intended infrastructure in terms of the tree's structural integrity point of view. I support this finding. The Arborist Report identifies major defects that may impact The Proposal and where appropriate makes a recommendation to address the defect. This recommendation is often pruning. There needs to be more detail on pruning where it has a bearing beyond an arboricultural requirements such as the removal of moribund deadwood, or a structurally defective branch. My understanding is basal limbs or limbs under intended canopy locations often require removal to prevent unapproved access to the course.

The Arborist Report makes brief mention of Weed species in section 4.3 part B WEED SPECIES and identifies them as Noxious. Blackberry (*Rubus fruticosus*) is the only noxious weed and all other weeds are environmental weeds. Nonetheless they do pose a serious threat to the absent symbiotic relationships necessary for a healthy forest ecosystem. This was touched upon in the Practical Ecology report also.

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EXECUTIVE SUMMARY *continued....*

The control of environmental weeds and their recommended replacement with indigenous lower layer vegetation associated with Floodplain Riparian Woodland is something that must occur. This is also a recommendation in the Practical Ecology No Net Loss and Flora and Fauna assessment.

Whilst a Tree Protection and Management Plan and the establishment of one in section 6.1 page 17 of the Arborist report, was identified as 'TPZs are not required', they certainly are required. The reality is to install a course of this nature is achieved using climbing arborists to access the trees. This method in itself is low impact and each of the 58 selected trees will need to be easily accessed by this method. The Tree Protection and Management Plan needs to be specific and one that relates to the creation of exclusion zones around trees does and cannot apply.

This is probably what the Arborist Report referred to in their brief statement that 'No TPZs are required'. Recommendations with regard to tree protection and management plans will be presented later in this report. One of the most glaring failures of this report is the easy identification of the actual trees to which the recommendations apply. None of the trees have been physically numbered and the Site Plan included in the Arborist report is inadequate. A subsequent examination of other associated documentation was Site and Administration Plans and the Practical Ecology No Net Loss Analysis and Flora and Fauna assessment. This Site Plan derived from the Site and Administration Plans should be the Site Plan used in all associated documentation. In a practical sense anyone must be able to walk up to a tree and identify it with a number and related it back to a Feature Survey Plan and the intended installation of the tree top platforms, ropes and cables. This Feature Survey Plan and associated proposed conditions plan, can then be used to develop a comprehensive Tree Protection and Management Plan.

The development of a Tree Protection and Management Plan means that any issue associated with each individual tree can be determined, assessed and implemented. This is essential at the initial and ongoing review at pre construction, construction and post construction phases of The Proposal.

The report also lacks detail on methods of attachment. My assessment is that Ecoline does adopt Arboricultural best practice by not installing locating nails or bolts to mount the platforms. This is consistent with their Zipline Rollercoaster at Live Wire in Lorne. A review of the Ecoline website and the photographic evidence in the Arborist Report confirms Arboricultural Best Practice in terms of minimising impact by avoiding location nails or spikes. The Otway Zipline uses a product called Ecoclips that involves no penetration of the trees and the Glen Harrow Course in Belgrave, also has mounted platforms without the use of spikes that penetrate the tree. These features make any future loosening or adjustment of platforms relatively simple.

Despite this other developers use a minimal amount of spikes or nails to assist with the mounting of platforms. Injury to trees includes exudation of kino or tree sap at the sites where the trunks have been penetrated. There is also evidence of wound-wood accumulation particularly in semi mature to early mature trees where secondary growth and diameter increase was observed. These are natural coping mechanisms for trees and to date, I have not seen any associated tree decline. Despite these signs of the impact of spikes, trees remain in fair to good health, with no visible differences with trees where platforms are not installed. The condition of trees remains in Fair to Good Health and Structure in the facilities I inspect from a tree health and management perspective annually. This is testimony to the resilience of trees and in particular Eucalypts to withstand methods that are not considered arboricultural best practice but are nevertheless undertaken. There obviously needs to be a trade-off between public safety and tree health, with public safety of paramount importance. There is a preference for arboricultural best practice as these platforms need to be sustainable over the lifetime of a tree. If this is achievable and these methods are available then they should be used.

Whilst some of this detail may have certainly been outside the terms of reference set by Ecoline for the Arborist Report matters of Tree Protection and Management are essential in the development and future management of The Proposal.

Other supporting documents that need to be considered that are separate to the Arborist Report are -

- i. A scaled Site plan referred to as Figure 2 in the document
Banyule_C107bany_Treetop_Adventure__680_The_Boulevard_Ivanhoe_East_incorporated_document_Exhibition,
- ii. The Site and Administration Office Plan prepared by Ecoline

and

- iii. The No Net Loss Analysis and Flora and Fauna assessment prepared by Practical Ecology Dated December 2018.

Ultimately what is lacking and required in terms of these supporting documents, is a Tree Protection and Management Plan that links all the requirements of these documents. The format that Arborist Reports Australia uses and would like to see in terms of a Tree Protection and Management Plan, is a series of Hold points that address each and every aspect of tree management. By ensuring conformance and addressing any non conformances ensures accountability in terms of the rollout of the Tree Protection and Management plan.

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EXECUTIVE SUMMARY *continued....*

In terms of submissions for and against this proposal. There have been a number against. In terms of tree health, structure and ability of the genus *Eucalyptus* and the species *Eucalyptus camaldulensis* the River Red Gum, there is no reason why the installation of platforms, cables and a ropes course, in the selected trees should not occur.

An eleventh hour report provided for comment prepared by Global Urban Forest is centered on the conditions that the trees are currently facing, in terms of soil compaction, potential for windthrow and a critique on the Visual Tree Assessment process and Hazard Assessment. There is no doubt that the identified growing conditions of compaction prevail in the subject 58 trees and the wider Yarra Flats Park. The oldest trees in this area are up to an estimated 300 years old and their ability to withstand these conditions is simply testimony to the resilience of the trees. It is my view that the success of The Proposal is that the two key Australian Standards are adopted and adhered to. They are AS4970-2009 *The Protection of Trees on Development Sites* and AS4373-2007 *The Pruning of Amenity and Ornamental Trees*. These standards are particularly designed to manage tree health and viability. The Practical Ecology report presents environmental weed control and revegetation and landscape recommendations based on the Zones including Conservation Zones that they identify. All these documents add relevance to the potential success of The Proposal.

3. TERMS OF REFERENCE

To satisfy the requirement of this report the terms of reference are as follows:

- a) Review all relevant documentation with regard to The Proposal and review the Arborist report.
- b) Inspect the subject trees and determine the accuracy of the Arborist report and associated Visual Tree Assessment of the site where the 58 trees in the eight proposed courses are located.
- c) Conduct a Peer review of the Arborist report in relation to the Proposal and amendment C107 and the Incorporated Document that details Permit requirements for the Proposal.
- d) To make management recommendations in terms of where there are shortcomings or failures with regard to the Arborist Report and allied documents considering concerns raised by parties against the Proposal

4. PROCEDURE

- a) The required documentation was accessed, read and reviewed to gain a background and insight into the Proposal.
- b) The Arborist report to be Peer Reviewed was thoroughly read.
- c) A site visit was conducted on the 12/05/2021. A walk through of the entire area was conducted. Six trees to the north of the circular access road were assessed. Our assessment was compared to the assessment of the subject trees in the Arborist Report.
- d) The subject trees and vegetation was visually assessed from the ground and observations of the surrounding environment were made.
- e) The subject trees were plotted using Location application build into an Apple Ipad. A Map layer provided by Nearmap was used.
- f) With regard to the six features on the subject site, Arboricultural features were collected. Height ranges were estimated, Average canopy widths were taken in east west and north south planes and diameters measured at 1.4 metres above the ground and above the root buttress of the tree in accordance with *Australian Standard For The Protection Of Trees On Development Sites As4970-2009*.
- g) From the Arboricultural assessment relevant features and observations were collected and recorded of six sample trees for the purpose of the reviewing the accuracy of the Arborist report, and are presented in the aerial photographs in section 5 of this report and the Assessment table in table in Appendix 3 of this report
- h) The Observations and Recommendations Appendix 3 includes the results of all the inspection criteria associated with the site assessment.
- i) Other sites were visited to gain a comparison to how these trees where these sorts of developments have been established in terms of tree health and structure. These included Glen Harrow Park Belgrave, Live Wire Park Lorne, the Otway Fly and Otway Zip Line Beech Forest. These sites were visited on the 20th and 21st of May to gain an insight in how these types of facilities are impacting tree health and structure
- j) Previous annual ongoing assessments associated with the Enchanted Maze were also considered.

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5. TREE LOCATION

4A Tree Location Aerial Overview Map Showing Trees in Study Area Inset Map showing approximate property boundary(Aerial photography Courtesy of Nearmap).



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4B Tree Location Aerial Map showing northern and western area of the proposed extensions (Aerial photography Courtesy of Nearmap).



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6. DISCUSSION

6.1 Significance Ratings and Definitions

Each tree in the sample assessment is assigned a 'Significance' or 'Retention Rating' based on the assessment.

The Significance or Retention Ratings are as follows;

Table 6.1.1 Significance Ratings and Definitions

Rating	Definition
High	<i>A worthy tree deserving of protection and retention.</i>
Moderate	<i>A tree that has reached a level of maturity where it provides a significant contribution to the landscape</i>
Low	<i>Has not yet attained a degree of significance</i>
None	<i>Of little or no significance</i>
Habitat	<i>Natural home of an animal or plant.</i>

The Arboricultural significance needs to be considered with the 'Reason For Significance' criteria also recorded in table 4.1. These descriptors confirm the trees ethnicity (Whether the tree is Indigenous, native, or exotic (non-native) and a comment on its significance status. The status may refer to whether the tree may be considered to be a Landscape Feature or an Environmental weed.

The Recommendation selection criteria are as follows;

Table 6.1.2 Recommendation Outcomes and Definitions

Recommended Outcome	Definition
Remove Or removal	Defective tree that presents an unacceptable risk
Reasonable to Remove	Defective tree that does not present a risk
Retained but reasonable to remove	Intention to retain a tree however the arboricultural inspection reveals a defective tree.
Not Retained	Intention to remove
Retainable	A tree (defective or other) that may be Retainable subject to a tree management plan that may include some remedial maintenance action or tree protection.
Retained	A tree where provision has been made to retain subject to a tree management plan

6.2 Existing Conditions

In terms of the tree population on this site the following considerations apply

- The ethnicity of the tree, shrub or area of vegetation - Its origin is important in determining what planning controls might apply to it. The ethnicity of the tree is also coupled with other statements of the status of the tree other than its overall arboricultural significance. This might include its status as of high habitat value or as landscape feature an environmental or a noxious weed or its status as not significant or a transient species.
- Its arboricultural significance as described in table 6.1.1. Its arboricultural significance determines the potential retention value of the tree.

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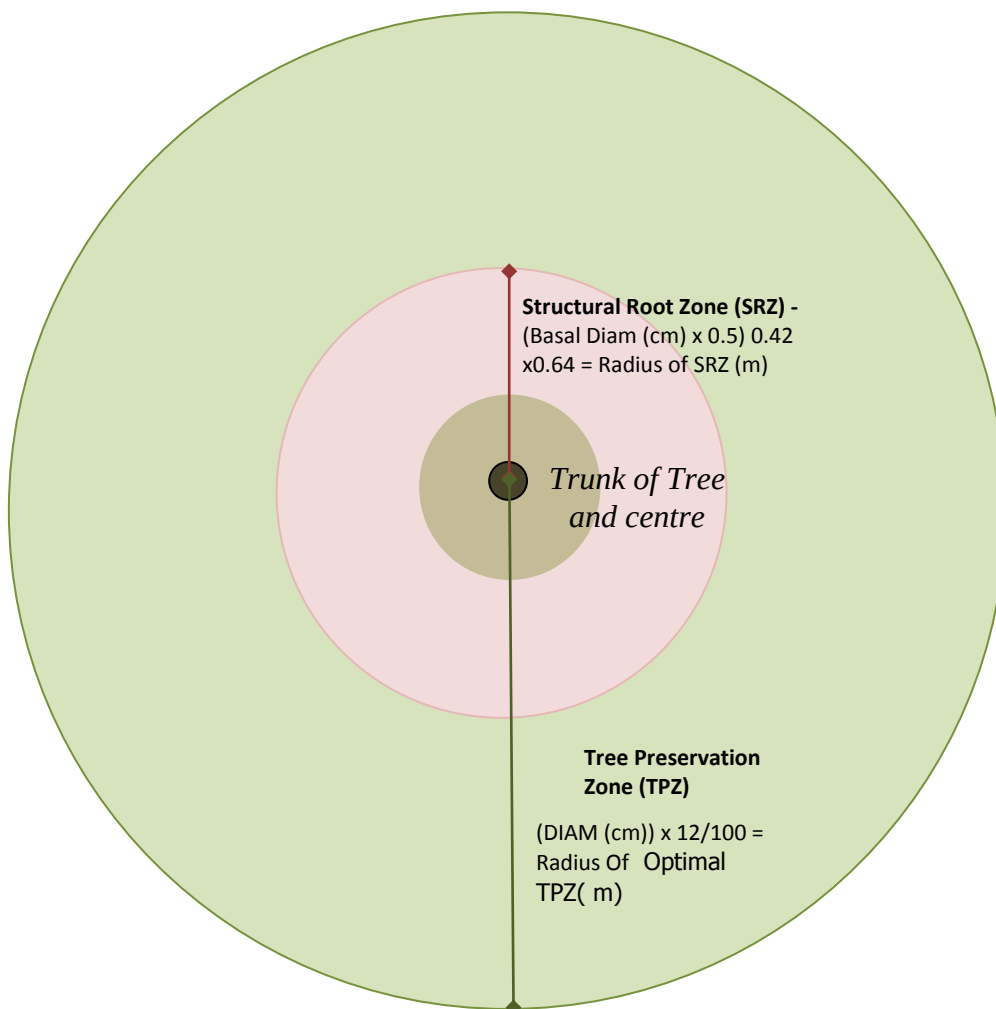
DISCUSSION *continued...*

6.3 Retention trees Tree Preservation Zones (TPZ) General

Attention to the protection of the root zone is an important consideration where TPZs are recommended. Any tree located outside the extent of construction or excavation where a separation distances equate to the optimal Tree Preservation Zone (TPZ) can be *retained* or is *retainable* without the need to consider the location of any tree roots. Where these distances are compromised or reduced there is a requirement to consider the impact of the construction or excavation to the location of retention trees. The closer one moves toward the trunk of the tree the larger the diameter of the roots. The point where the roots taper quickly is called the zone of rapid taper and between this radius and the centre of the trunk of the tree is the Structural Root Zone (SRZ).

The Australian Standard for the Protection of Trees on Development Sites AS 4970-2009 uses a mathematical formula to determine the extent of tree root zones as a measure of the radius from the centre of the trunk of the tree based on the trunk diameter above the buttress. The diagram in figure 6.3 sets out these regions and the mathematical formulas that have been applied to calculate the optimum TPZ and SRZ in Appendix 3 of this report. The actual extent of the TPZ may vary considerably and is dependent on environmental conditions and site constraints.

Figure 6.3 SRZ and Optimum TPZ diagram



In terms of the Tree Protection Zones associated with trees #1 to #58, each zone is based on the calculation in accordance with *AS4970-2009 The Protection of Trees on Development Sites*. A Tree Protection and Management Plan prepared for these trees must be specific to them. It will not be the creation of exclusion zones but rather the establishment of ground protection and other measures. This includes matters such as the establishment of access paths and specific recommendations associated with for example, the construction of administration buildings, toilet blocks and effluent fields and other excavation or changes in soil level.

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DISCUSSION *continued...*

6.4 Ecological Vegetation Class

The subject site is an area of altered Ecological Vegetation Class 0056 Flood Plain Riparian Woodland (Bioregion Gippsland Plain. The Ecological Vegetation class system was originally developed by the Department of Sustainability and Environment (DSE 2006).

The following definitions summarise the classification of native vegetation with regard to this system.

‘Bioregions have been adopted in the Federal Environment Protection and Biodiversity Conservation Act 1999; under the Interim Biogeographic Regionalisation for Australia and in Victoria’s Biodiversity Strategy.

‘Bioregions are promoted for regional-scale biodiversity planning because they are based on the patterns of ecological characteristics and the underlying environmental features. They therefore reflect natural boundaries and relationships between biodiversity assets and natural resource based activities. Victoria has 28 bioregions across the state.’ (*Definition courtesy of DEPI, Department of Primary Industries and Environment*).

In the state of Victoria there are 28 Bioregions that are in-turn broken down into Ecological Vegetation Classes (EVCs). as described in the following definition.

‘A system of native vegetation classification that is described through a combination of its floristics, life form and ecological characteristics, in relation to particular environmental attributes.

Each EVC included a collection of floristic communities (eg large trees, tall to small shrubs, climbers and crawlers, grasses and graminoids) that occur across a bio-geographic range, and although differing in species, have similar habitat and ecological processes operating’ (*@ State of Victoria DSE 2006*).

The Bench Mark for Vegetation Quality Assessment document prepared by DELWP for this EVC describes 0056 Flood Plain Riparian Woodland is as follows;

An open eucalypt woodland to 20 m tall over a medium to tall shrub layer with a ground layer consisting of amphibious and aquatic herbs and sedges. Occurs along the banks and floodplains of the larger meandering rivers and major creeks, often in conjunction with one or more floodplain wetland communities. Elevation and rainfall are relatively low and soils are fertile alluviums subject to periodic flooding and inundation.

The dominant native tree species is the River Red Gum (*Eucalyptus camaldulensis*). Ground flora and understorey shrub layers are highly altered. The revegetation guide presented in the Practical Ecology No Net Loss and Flora and Fauna Assessment dated the 18 December 2018 is supported.

7. CONCLUSIONS

Summary 7.0.0

It is my conclusion that The Arborist Report is a comprehensive Visual Tree Assessment (VTA) of all the 58 trees associated with the Proposal. Where photographs could verify the identity of a tree the Visual Tree Assessments are accurate. With regard to the six trees which could be identified and verified, descriptions were accurate and recommendations whether the trees were fit for purpose and identified tree maintenance could be verified. Visual Tree Assessment is often considered subjective and lacking a more scientific approach. One of the most important aspects of tree assessment is the translation of information on future maintenance and tree care. It is my view that some further detail on the requirements for each tree is required and a better process from the identification of hazards and the management of risk.

7.0.1 Hazard Assessment and Risk Management

An eleventh hour report prepared by Global Urban Forest attempts to cast doubt on the validity of the VTA and in particular the Hazard Rating system allotted to each tree. Their expertise was dependent on presenting a scientific assessment of the soil structure associated with the trees and the impact of soil structure as a precursor to tree failure and health. There evidence of a canker in tree #1 is a simplistic attempt to discredit the whole Hazard Assessment process adopted in the Arborist Report without any supporting structural assessment. Cankers are often superficial and are more likely to impact smaller narrower diameter limbs where the percentage impact to structure is higher leading to failure. The photograph shows a degree of compartmentalisation of this defect. The Arborist Report has used the Matheny and Clark method of determining a hazard rating. That is Failure potential plus size of part (branch) plus target rating. This method is an effective determinate and thought process to deliver a relative risk rating. Part 8 has some commentary of a risk management process and points to a flow chart in Appendix 9 that is unfortunately blank.

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CONCLUSIONS *continued...*

7.0.1 Hazard Assessment and Risk Management

As the World renowned Arborist Claus Mattheck so eloquently put it

There will never be an absolutely stable tree! -A natural failure rate among completely healthy trees is the price paid for the energy saving lightweight structures of Nature. The demand for the absolutely safe tree is therefore contrary to the logic of the laws of nature.....(Claus Mattheck/ Helge Breloer 1998. The Body Language of Trees).

Indeed the *Body Language of Trees* presents a detailed analysis of tree failure which is based on a number of factors. Windthrow tree failure is more likely to occur in cleared or partially cleared areas where the effects of wind are more pronounced and unpredictable. Visual Tree Assessment and the ability to recognise potential failure, is included in the Visual Tree Assessment methodology used by every qualified Consultant Arborist (Certificate 5 or above). The VTA conducted in the Arborist report does consider all the relevant issues, such as basal and root structure, current lean, root zone restriction and other health and structure indicators.

The examples of windthrow presented in the Global Urban Forest report are not from the area where the Proposal is planned, where the overall woodland canopy is intact.

My assessment of the proposed site as detailed in the Executive Summary is of an intact River Red Gum woodland in terms of the canopy trees. With no evidence of major catastrophic limb failure or indeed tree failure. Any evidence of these sort of events are limited to trees around the perimeter where the impact of wind damage is more likely. The notion that the River Red Gum is a limb dropper is largely false. The instance of failure in all Eucalyptus species and trees in general is based on the health and inherent structure of the tree. Trees do not have an immune system, but instead create chemical barriers and physical barriers through growth to contain the spread of disease, a process called Compartmentalization. The River Red Gum is considered to be a good compartmentalizer of disease. The predictors of failure are identified in the Arborist Report. The potential for failure and the seriousness of such an event is the number based on the Matheny and Clark Method previously discussed.

The Arborist report Visual Tree Assessment has considered structural defects (eg **IMFU** Inclusive main fork union, **IMBU** Inclusive Main Branch Union) and extent of lean. The Arborist report has also considered pathological and fauna activity and the impact on health and structure (eg **bor**-Borer activity, **PD**-Parrot damage **BF** Bracket Fungus).

In the absence of the Flow chart in Appendix 9 it is unclear what the Arborist Report was recommending in terms of Risk Management. It is my view that the Australian and New Zealand Standard for Risk Management (**AS/NZS 4360-2004 Risk Management**) be incorporated, in a Risk Management Process. A flow chart that represents the process I would recommend to adopt is presented in figure 7.0.2.

The following headings identify how this flow chart might be incorporated in a Risk Management Strategy for trees defined by this process.

7.0.2 The Risk Management Process

Where trees are concerned, risk management is about having a plan in place that can be logically rolled out and implemented. It is about recognising the likelihood and consequences associated with tree failure and rolling out controls to eliminate or reduce these possibilities. It's about exercising your Duty of Care and protect the public from

i. Establish The Context

The context of this project is and was to engage a professional Arborist to inspect a population of trees to determine the level of risk.

Criteria were structured around a Risk Matrix measuring:

- The likelihood and consequence as detailed in section 4 of this report.

The likelihood and consequence provide the assessment criteria for determining the potential risk of inspected trees.

In consultation with management, timeframes were established in the rollout and implementation of the Risk Management Program by removing and pruning of selected trees. Trees that were found not to be defective were referred for future reinspection.

ii. Identify Risks

What can happen.

- Tree failure in the worst case scenario may injure or kill people,
- Tree failure may damage property,

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CONCLUSIONS *continued...*

ii. Identify Risks

- Failure to provide a safe environment may open Public Open Space managers to litigation if it is found that a reasonable 'Duty of Care' was lacking.

iii. Risk Analysis/Risk Evaluation/Risk Rectification

Inspect the tree population and measure the potential risk, assign priorities and carry out rectification works to remove or reduce risk exposure by implementing the recommendations of the Inspection/Project Arborist.

iv. Identify Options

There are realistic restrictions associated with the implementation of a risk management plan. These are centred on;

- Resourcing,
- Relevant Council Planning Overlays that protect trees,
- Budgetary Considerations,
- Facility Usage and Bookings,

iv. Identify Options

Weather conditions may also be a factor.

If any of these restrictions apply to the management of the tree population in the inspection areas and the recommended time frames for rectification cannot be achieved then other options that may be implemented. These options are centred on the following;

- Limit or prevent access near trees by installing appropriate barriers or signs.

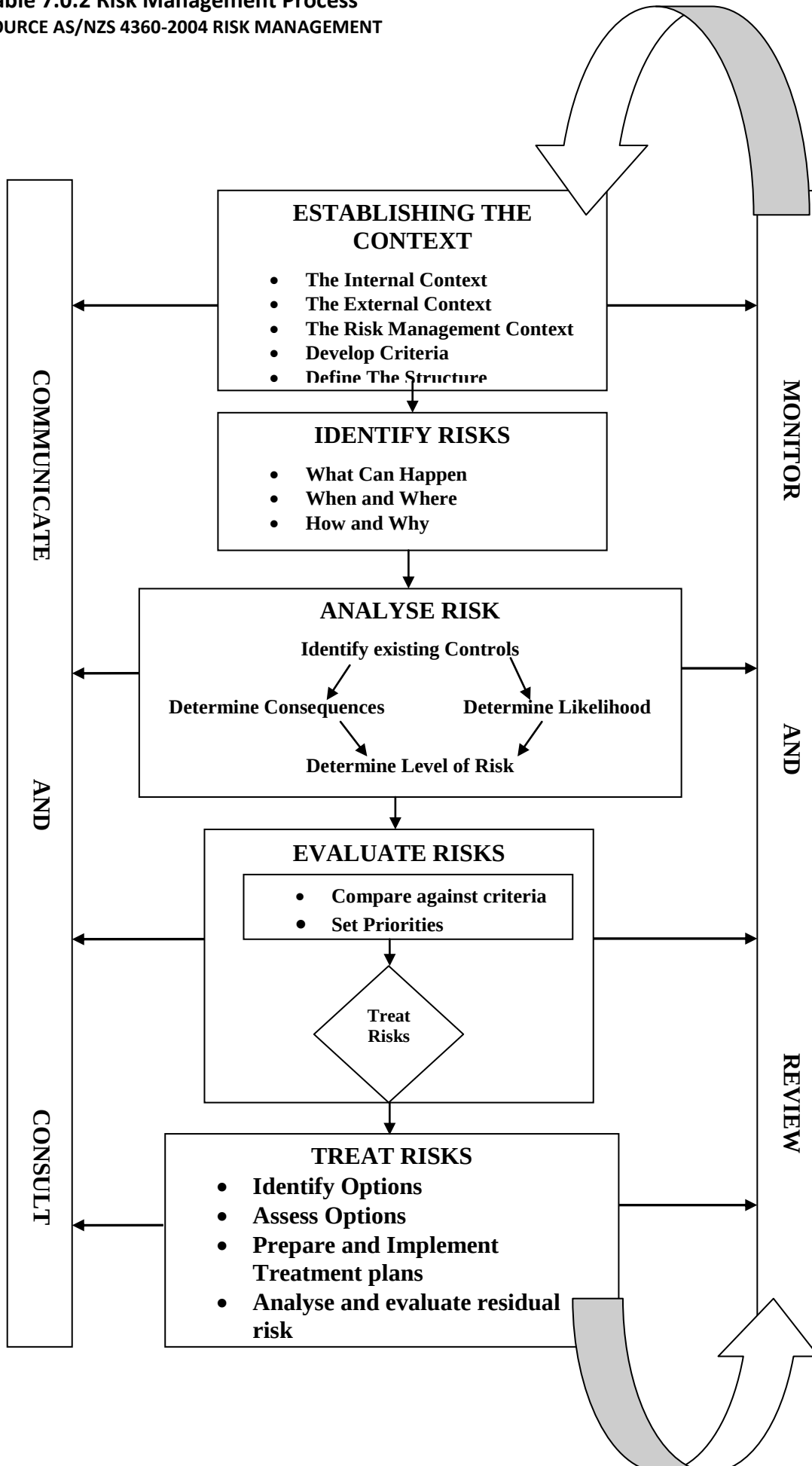
An easily implemented strategy suggested with many of the trees in the revegetation areas is isolating trees with the extension of mulched garden beds to the edge of the canopy of the trees. Lawns tend to invite people near trees whilst mulched planted garden beds discourage this interaction. Discouraging public access in the vicinity of potentially hazardous trees by developing landscapes that discourage public interaction whilst encouraging public access away from trees is a sound strategy that is readily adopted.

Whilst the Arborist Report identified a Level of Risk as determined by a number, there is no analysis or prioritising of this risk in terms of Likelihood and Consequence. It is important to establish priorities to determine when to intervene to address any identified risk concerns. I have included my Likelihood and Consequence Risk Matrix in Appendix 1, which determines when an identified hazard might be actioned. The important aspect of any Risk Management program is to have a defined process and an auditable trail.

In the absence of a Flow Chart in Appendix 9 of the Arborist Report, the following figure summarises the Risk Management Process and its implementation. In terms of Risk Management associated with any tree it is important to compare the process undertaken with a recognised Australian and New Zealand Standard.

Tree Top Climbing and Adventure Facility Yarra Flats Park East Ivanhoe

Table 7.0.2 Risk Management Process
SOURCE AS/NZS 4360-2004 RISK MANAGEMENT



Tree Top Climbing and Adventure Facility Yarra Flats Park East Ivanhoe

CONCLUSIONS *continued...*

7.0.3 Yarra River Flats Flood Potential

The River Red Gum is a tree that can withstand periodic flood events. The River Red Gum is common along Australia's many rivers systems including the Murray and Darling River systems and the Yarra River. The description of the proposed site as the Yarra Flats Park, suggests that this area is in a Floodplain. As a potential flood plain there is always a potential for inundation. The potential for inundation and any potential impact to the subject trees or the wider tree population, is dependent on the velocity of the water and its ability to wash soil from around the trees. My research on the matter of potential flooding of this part of the Yarra is out of my field of expertise. A Hydrologist or Melbourne Water would need to conduct a Flood Risk assessment to determine the Likelihood and Consequence of such an event. (Reference 2010 *Melbourne Water Flood Risk Assessment: How flood impacts are assessed in the Port Phillip and Westernport region*). From an Arboricultural perspective, the River Red Gum has the ability to withstand these events and a Tree Top Adventure Facility in the canopy of the trees is unlikely to be impacted. Construction at ground level must consider the floor levels and the advice of Melbourne Water in terms of building construction to mitigating these natural occurrences. Arboriculturally and from an ecological perspective, the control of environmental weeds and the introduction of the missing shrub and other understorey layers will assist in the reduction of water velocity in a Flood event. The implementation of the Land Management Report which is part of the Practical Ecology No Net Loss and Flora and Fauna assessment goes a long way in addressing the absence of these necessary vegetation layers. The examples of tree failure of trees in the Global Urban Forest assessment links examples of what appear to be from revegetation or revegetation/regeneration sites with the subject trees to the north. The condition of these trees and the failure of the root plate is multi-factorial and to draw a conclusion that the trees in the subject area will meet a similar fate is unlikely based on current evidence. There is an absence of windthrow and limb shed trees in the proposed site, where the canopy trees are in fair to good condition. The potential for windthrow is heightened near the perimeter of areas and on single trees with the absence of protection of surrounding trees. If soil health is a concern, then there is nothing to prevent this issue to be addressed through the betterment of the health of the trees as the Land Management Plan in Practical Ecology's No Net Loss and Flora and Fauna reports recommends. The insertion of cables and tree top courses in my experience actually contributes to the stability of trees. Cabling and the insertion of branch support hardware has been adopted by Arborists for decades to assist in maintaining and stabilising suspicious branch attachment. The Royal Botanic Gardens in Melbourne has a number of examples of these techniques.

7.0.4 Environmental Impacts

The commentary in the Global Urban Forest report is based on existing conditions, which the aim should be to improve in any case. A Tree Protection and Management plan can address these shortcomings. One of the biggest threats to tree health are environmental changes. Factors that affect symbiotic relationships include the absence of understorey.

Many Eucalypts are impacted by a phenomenon called *Eucalyptus dieback*. This complex disease is based on systematic changes in environment, including compaction, the absence or alteration to understorey. One impact that often occurs is with the absence of the shrub and ground cover layer, there is an absence of woodland birds. This commonly leads to a proliferation of defoliators such as Lerps and Psyllids and defoliation of trees. A Tree Protection and Management Plan has the ability to address this at this site, where environmental weed infestation is high. The Land Management report pages 63-65 of the Practical Ecology No Net Loss and Flora and Fauna assessment addresses restoring understory and needs to be incorporated into a Tree Protection and Management Plan

7.0.5 Tree Identification

As presented in the Executive Summary in section 2, the main shortcoming of the Arborist Report is an inability easily correlate the recommendations made, with the trees onsite. To address this each tree must be numbered with a numbered tag. On trees such as River Red Gums a 14 mm staple would not be a significant injury to the tree. As an example the six trees that information was collected on were tagged as shown in the following photograph.



Tree Top Climbing and Adventure Facility Yarra Flats Park East Ivanhoe

CONCLUSIONS *continued...*

7.0.5 Tree Identification

The plan in the report is inadequate and is different to the Site Plan used in the Site and Administration Office Plans that was also used as a base plan in the Practical Ecology report. It is important that the same plan must be adopted across all reports. This will ensure that the administration to ensure compliance with the permit conditions can be carried out.

7.0.6 Tree Protection and Management Plan

The Arborist Report does not recommend a Tree Protection and Management Plan. Indeed the report identifies that Tree Protection is not required. The Arborist report represents a Preliminary Tree Report, based on a Preliminary Tree Assessment (AS4970-2009 *The Protection of Trees on Development Sites* Tree Management Process 2.3.2 and 2.3. 3) . This is a requirement under AS4970-2009 *The Protection of Trees on Development Sites*. In terms of a Preliminary Tree Report the Arborist report delivers, no question. The Development Design, presented by Ecoline on Face value, meets the requirements of a sustainable tree top development. The success of previous developments conducted by Ecoline and other companies in areas that have similar developments are testimony to this.

The final step in accordance with the recommendations of AS4970-2009 *The Protection of Trees on Development Sites*, is the Arboricultural Impact Assessment of which the required Tree Protection and Management Plan is an integral part.

The Practical Ecology report presents a weed control and revegetation plan. Whilst this document satisfactorily identifies milestones there is no mechanism to ensure compliance. A properly developed and administered Arboricultural Impact Statement and Tree Protection and Management Plan has the protection and management of the 58 subject trees as the ultimate outcome. This document must consider and make recommendations on the location and construction of pathways, the control and removal of environmental weeds and tree growing site improvements such as mulching and understorey planting for all the reasons identified in this section.

The location and construction of pathways would specify the use of permeable pavements, such as granitic angular rock with no fine particles, with the use of mulch or elevated board walks where there may be flood potential. The Plan in this document would show the Structural and optimal Tree Protection Zones in accordance with AS4970-2009. (*Refer to example on the Aerial photograph in section 5*).

The following represents my recommendations based on the Peer review of the Arborist report and associated documentation of the proposal.

Tree Top Climbing and Adventure Facility Yarra Flats Park East Ivanhoe

8. RECOMMENDATIONS

8.0.1 Peer Review Recommendations

- Contrary to the Arborist report Tree Protection is a key requirement of this project as identified in the Incorporated document and subsequent recommendations of this document.
- The Site Survey plan presented in the Site and Administration Office Plans and the No Net Loss and Flora and Fauna Survey and Report by Practical Ecology be the document used in the Arborist Report and future Arboricultural Impact Statement and Tree Protection and Management Plan. There are different versions in associated reports. The Site Plan should be presented in a legible scale 1:200. It is unclear whether the site plan is a derivative of a Feature Survey Plan carried out by a licensed surveyor. If this is not the case then a Feature Survey Plan should be developed and become the base document.
- A system is required to identify trees that are part of the proposal and identified in the submitted plans in the first instance. These trees must be accurately identified out in the field with some sort of tree tagging and numbering system. Refer to example in section 7 of this report.
- Their needs to be more specific details on the recommendations with respect to individual trees. For example Remove dead wood greater than 50 millimetres in the middle canopy. Remove basal epicormic growth so that the platform cannot be accessed from the ground etc.
- All other major trees that abut proposed public areas such as car-parks, future pathways and future facilities should also be identified tagged and recorded. This assessment will also measure and identify any health concerns with regard to these additional trees and the mitigation of risk by removing defective branches and moribund deadwood over pathway and car-parks
- A Tree Protection and Management Plan is identified as being required in the City of Banyule's Incorporated document. A Tree Protection and Management Plan cannot create exclusion zones around trees, but rather must identify each aspect of protection and maintenance that is required to the satisfaction of the City of Banyule. This includes the recommendations for the control and removal of environmental weeds revegetation and the installation of the hardware in the trees.
- A system of measurement of compliance is required. Each aspect of the Tree Management Plan should be itemised and have the ability for the Project Arborist to tick off on Compliance to each part of the plan. Areas of Non Compliance can also be identified and a process entered into to ensure that every aspect of the Tree Management Plan can and is applied. This is important for the City of Banyule in administering the requirements of the Planning amendment C107 and any issued Planning Permit as detailed in the Incorporated document. Refer to example document Appendix 1 for Global Considerations.
- The Arboricultural Impact Statement and Tree Protection and Management Plan referred to the Incorporated Document, must be prepared by the Arborist and must draw together the intent of protecting and managing the subject trees. The primary documents to consider are the **Site and Administration Office Plans** and the **No Net Loss Flora and Vegetation Assessment Report by Practical Ecology (December 2018)** and in particular the Land Management Plan pages 63-65 of this report. It should be noted that despite the importance of the Land Management plan there is no current indication that it will be implemented. Again their needs to be a Comply or Does Not Comply checklist so that it occurs in accordance with the recommendations of this document.
- Tree protection zones identified in the Preliminary Arborist Report are to be shown on the Tree Protection Plan and any referred to on any other associated documentation.
- The requirements of the potential for flooding and construction to mitigate this is an issue that needs to be addressed by Melbourne Water if required. Arboriculturally the River Red Gum is a tree that is naturally equipped to withstand the impacts of infrequent flood events. It is important that the natural understorey in the Yarra Flats area be restored to reduce water velocity as well as restoring the absent symbiotic relationships that are currently disrupted by the prevalence of environmental weeds.
- The Arborist report has used a recognised methodology in terms of hazard assessment. What is missing is a mechanism to manage any of these identified defects. Each management recommendation made must be accompanied with a Likelihood and Consequence measurement using an approved Risk Matrix. The Risk Management Flow Chart was not shown in the Arborist report provided for review. A Risk Management Process should be based on a recognised standard. My recommendation is to incorporate the Australian and New Zealand Standard for Risk Management (*AS/NZS 4360-2004 Risk Management*) to manage risk and the Duty of Care of stakeholders.

Tree Top Climbing and Adventure Facility Yarra Flats Park East Ivanhoe

RECOMMENDATIONS *continued...*

8.0.2 Report Appendices

The following appendices are associated with this report

Appendix 1

Sample of a Risk Matrix, to measure the Likelihood and Consequence of the numbered values in the Hazard Ratings for each of the trees. This Matrix has been used in the assessment of the six trees in Appendix 3 of this report.

Appendix 2

Sample of Global Tree Management Plan Identifying a global assessment of what the Tree Protection Plan prepared by the Arborist should entail. The Preliminary Arborist report would identify the specific requirements for the subject trees in the report. These need to be expanded upon in a Tree Protection and Management Plan for this document. This is a requirement of *AS4970-2009 The Protection of Trees on Development Sites* and must apply specifically to the Proposal with the ultimate outcomes of it in mind. An approved Arboricultural Impact Assessment and a Tree Protection and Management Plan must meet the criteria of this document.

Appendix 3

Onsite Assessment details of the six sample trees selected to determine the validity and accuracy of the Arborist Report

Appendix 4

Site Photographs

Appendix 5

Glossary of Arboricultural Terms

Appendix 6

Important Information - Disclaimer And Statement Of Indemnity And Limiting Conditions

Appendix 7

Qualifications and experience of the Consultant

Tree Top Climbing and Adventure Facility Yarra Flats Park East Ivanhoe

9. REFERENCES

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- Australian Standard for the Pruning of Ornamental and Amenity Trees AS4373-2007
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- Standards Australia (2004) (*Australian and New Zealand Standard for Risk Management AS2460-2004*)
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- European Standards for Ropes Courses: *NF EN 15567 - 2. Operation Requirements*
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- Otto Leenstra and Associates 2017 *Tree Management Plan 180 Erskine Falls Road 310717.pdf*
- Otto Leenstra and Associates 2012 *Enchanted Maze P10_1257 Tree Management Plan 311212.doc*
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for and on behalf of,

Arborist Reports Australia

Tree Management & Arboricultural Consulting



Otto Leenstra

Principal Consultant Arborist

RISK MATRIX

General Risk Matrix Guidelines

To categorise the relative health and structural integrity of trees the results of the Visual Tree Assessment (VTA) are considered with the repercussions associated with potential limb failure.

With the VTA associated with the Risk Assessment, the Arboricultural considerations and assumptions are determined based on the following table and the definitions associated with the *Likelihood* of failure, described in and the succeeding definitions that follow. Therefore A has the highest Likelihood of failure and D has the lowest.

To determine the repercussions or *Consequence* associated with limb failure, the trees are assessed based on the location of the tree and the size of any potential limb or tree that might fail. Therefore a rating 5 would be considered the highest or Catastrophic and a rating 1 the lowest or Low.

Using the Risk Matrix a determination was reached on the potential of a tree to fail.

Risk Matrix Table

Likelihood	Consequence				
	1 Low	2 Minor	3 Moderate	4 Major	5 Catastrophic
A (Certain)	M	M	H	I	I
B (Likely)	L	M	H	H	I
C (Possible)	L	L	M	M	H
D (Unlikely)	L	L	L	L	M

Likelihood

A Visual Tree Assessment by a qualified and experienced Arborist has determined that;

A Extensive structural degradation by pathological (fungal or bacterial), biological (insects-borers, termites or other fauna), or environmental agents (sun, wind, rain or the actions of people and machines) on the buttress roots, trunk or scaffold branches of a tree, that will lead to major collapse of weighted material.

B That in the foreseeable future, localised structural degradation by pathological (fungal or bacterial), biological (insects-borers, termites or other fauna), or environmental agents (sun, wind, rain or the actions of people and machines) on the buttress roots, trunk or scaffold branches of a tree, will in all likelihood lead to major collapse of weighted material.

C The tree shows signs of repairing structural degradation through secondary growth and the compartmentalisation (or walling off) of areas of, localised structural degradation by pathological (fungal or bacterial), biological (insects-borers, termites or other fauna), or environmental agents (sun, wind, rain or the actions of people and machines) on the buttress roots, trunk or scaffold branches of a tree, to a degree that through management options other than removal the potential for major collapse may be avoided.

D The tree shows no or few signs of structural degradation and through secondary growth and the compartmentalisation (or walling off) of areas of, localised structural degradation by pathological (fungal or bacterial), biological (insects-borers, termites or other fauna), or environmental agents (sun, wind, rain or the actions of people and machines) on the buttress roots, trunk or scaffold branches of a tree, to a degree that no maintenance management has been identified for the foreseeable future.

Consequence

While Likelihood is directly linked to the Arboricultural status of a tree based on the Visual Tree Assessment undertaken, Consequence is a measure of the 'What if' the tree should fail. The consequence for a risk assessment associated with trees is a measure based on the location of the tree in relation to any potential target. In the context of the [Insert Organisation] the target might be the location of a tree in relation to a lawn area public entrance, car park or a public frequented area such as a [Insert Example] or other people attractor. The failure of a tree or the branch from a tree in a bushland area will have a far less potential consequence than the failure of a tree in high public usage area.

Therefore in determining the potential consequence the location of the tree was considered in relation to the observed activities during the assessment period and what could be determined from the location of built infrastructure in the vicinity of inspection trees. Also the usage of the land in the holiday season had a major bearing on the Consequence rating. Based on this analysis the following definitions define 'Consequence'.

Catastrophic(5)

The tree is located in a high public usage area or where there is a people attractor such as [Insert Relevant People Attractor Dependent on Client Needs], or there is a potential for frequent interaction with trees for extended periods of time. Limbs of trees may be heavy and large and the trees may be located in high wind exposure areas. There is no protection from the potential of limb or tree failure such as the presence of built structures.

Major (4)

Trees located and overhanging a lawn area or amenity building or pathway with frequent short to medium-term interaction potential with trees such as walking past or standing sitting under a tree for a short period of time. There may be some protection offered by lightweight built structures such as other trees or amenity buildings or structure such as fences or other vegetation that reduces interaction. Limbs may still be large and heavy.

Moderate (3)

Trees located in a garden bed or revegetation area bordering a public area or carpark with less frequent interaction with people. Limbs are developing in association with the inherent growth of the tree.

Minor (2)

Trees located in a bushland precinct, revegetation area or wide garden bed with a degree of established understorey vegetation present that would further reduce any of interaction with the tree. Heavy limbs if present are likely to fall within these areas

Low (1)

Tree located in a bushland precinct, revegetation area that are very unlikely to attract people. Bushland and understorey around these trees makes access to within the spread of their canopy difficult. Heavy limbs if present are likely to fall within these areas.

Risk Rating	Proposed Time Frames
I Immediate	Maintenance action item as soon as possible from 24 hrs to less than 1 month from notification date. (This flexibility is dependent on the time of year when Consequence may be lower due to a lower exposure to the public)
H High	Maintenance action item from 1-12 months from notification date based on arboricultural asseesment
M Moderate	Maintenance action item within 1-3 years of notification date. Maintenance may be referred for annual Reinspection. Where no maintenance action identified Re-inspection within 1-3 years of initial inspection depending on Risk outcome (unless earlier inspection is advised.)
L Low	No action or where maintenance action identified Reinspection within 3 years of notification date to determine if level of risk has changed
NOTE THE INTENDED PROCESS IS TO ACTION ALL IMMEDIATE AND HIGH PRIORITY WORKS IN ACCORDANCE WITH THE RISK MANAGEMENT PLAN AND ARBORIST TIMELINE RECOMMENDATIONS	

Tree Top Climbing and Adventure Facility Yarra Flats Park East Ivanhoe

TREE MANAGEMENT PLAN *continued...*

Appendix 1 Tree Management Plan Risk Management.(Sample)

Conforms **Does** **Not**
conform

Item No	When	Activity	Required Standard
A	Year 1	Access to Trees and Ropes Course	Limit or prevent access near trees by installing appropriate barriers or signs Extend revegetation and understorey planting to the edge of the canopy of the trees by constructing mulched garden beds under subject trees. Fence off areas that the public (observers not participant are not permitted to access
B	Year 1	Design public meeting places to reduce interaction	Remove environmental weeds in accordance with Land Management Plan (By Practical Ecology. Establish meeting places outside Tree Protection Zones Establish infrastructure such as seating from under the canopies of trees. Utilise the shadows that trees cast. Where feasible arrange seats near the trunks of established trees as limb shed is more likely to occur towards branch extremities.
C	Year 1-3	Succession and Revegetation Planting.	Plant healthy shrub and ground cover layer. The planting of replacement and environmental enhancement vegetation must be undertaken in conjunction with the recommendations of the Practical Ecology report
	Ongoing	Observation	Encourage future patrons and workers to be aware of their surroundings and report any incident of limb shed or defect to the operator Any trees that develop defects post inspection should be reported to a qualified Arborist to make an off program assessment. Where a defect presents a risk the tree should be isolated until an assessment has been conducted Information on the tree management and inspection process should be provided to patrons. As part of Duty of Care patrons must be made aware of potential risks.
	Annually	Professional Assessment and Maintenance Requirements	Annual Inspection by qualified Arborist prior to identify immediate and high priority works may be actioned. Any identified risks to be managed in accordance with an agreed Risk Matrix and agreed time frames. Pruning, removal and other maintenance to be undertaken in accordance with an agreed Risk matrix and carried out by qualified climbing Arborists (Certificate IV or above)

- i. Risk management is a primary consideration for this Proposal. It is important that all stake holders be aware of their Duty of Care obligations. Management must not only consider the installation of the course but future interaction with the public.

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Appendix 1 Tree Management Plan Tree Pruning and Canopy Management .(Sample)

Conforms **Does** **Not**
conform

Item No	When	Activity	Required Standard
A	Ongoing	Pruning	Designed to reduce the risk potential of retention trees and improve the visual amenity of retention trees whilst maintaining habitat potential, roosting opportunities and nesting hollows
B	Ongoing	Pruning	Must be undertaken by a qualified Arborist in accordance with Australian Standard for the Pruning of Amenity and Ornamental trees AS 4373-2007.
C	Ongoing	Pruning	Shall consist of end-weight reduction pruning, removal of dead and diseased branches, defective attachment points, internal pruning and removal of sucker and epicormic growth based on the adopted inspection regime.
D	Every 3 years	Pruning (Epicormic growth)	Epicormic growth is survival mechanism that many Eucalyptus species have. In times of environmental stress adventitious buds under the bark of these trees are activated. These buds quickly establish and assist the tree in maintaining nutrient reserves through photosynthesis. Epicormic growth may require pruning where there is a High probability that the growth may be shed impacting future patrons. This requirement is determined as part of the annual inspection program.

- i. The focus of Tree Pruning and Canopy Management is to ensure that any moribund and structurally defective branches over the tree canopy courses are removed.
- ii. Decisions on pruning requirements are decided as part of the recommended annual inspection of the tree canopy course and the broader inspection of all the trees.
- iii. In accordance with any program Immediate and High Priority works are actioned in accordance with agreed time frames. Moderate and Lower priority works may be deferred reinspected or actioned.

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Appendix 1 Tree Management Plan Cable and Platform Adjustment (Sample)				Conforms	Does conform	Not
Item No	When	Activity	Required Standard			
A	Daily	Course Inspection	The course is inspected by staff employed by the Proponent. The staff walk all the canopy courses checking for any defects or obstructions. The courses are designated as good to go if the inspection shows no issues that require attention			
B	Annually	Cable Tension	The cables allow for the some dynamic movement of the tree and adjustment of cable tension is not required. The method of attachment allows for a degree of secondary growth. From an arboricultural perspective each attachment point must be inspected annually.			
C	Annually	Platform Adjustment	The platforms also allow for the some dynamic movement of the tree and adjustment of cable tension is not required. The method of attachment allows for a degree of secondary growth. From an arboricultural perspective each attachment point must be inspected annually and adjusted for secondary growth in diameter.			
D	Annually	Clamping Adjustment	The platform clamps are the most rigid aspect of the construction allow for the some dynamic movement of the tree and adjustment of cable tension may not required. The method of attachment must allow for a degree of secondary growth. An annual inspection of these attachments is required.			
E	Annually	Impacts to Tree Health	Measures of tree health are determined by examining relative foliage density across the population. Foliage density is measured against neighbouring trees with and without hardware installed. Other measures of health include epicormic growth responses, degrees of branch dieback and failure rates of trees. If any of these symptoms are discovered and fall outside the normal range then a tree health regime must be implemented. This includes soil decompaction and cultivation, loosening of hardware in consultation with engineers, understorey planting, introduction of soil conditioners such as soil mycorrhizae and adjusting nutrient and trace element levels. Introduction of missing vegetation layers leads to better outcomes for trees restoring absent symbiotic relationships			

Tree Top Climbing and Adventure Facility Yarra Flats Park East Ivanhoe**Cable Hardware and Platform Adjustment**

- i. Periodic cable and platform adjustment need to be undertaken in accordance with the European standard (NF EN 15567) and building and engineering standards that apply to the ropes course and any relevant Australian Standard.
- ii. The expected reaction of trees to the clamping of the cables and platforms to them will consist of stress responses such as the exudation of kino a process that would disinfect any wounding. The next response would potentially be the production of wound wood above and below the platforms/cables. The platforms themselves have been cut larger to accommodate secondary growth of the trees. The amount of clearance provided is enough clearance for two to three years based on expected growth rates. The introduction of the cables means that under no circumstances are these cables to be removed. This is because the cable introduction potentially will alter the normal dynamic nature of the movement of the tree and if a cable were removed this may result in the tree failing because it has not been allowed to develop strength to offset the potential action of the cables. Cables and platforms and the movement of patrons and users through the course may result in areas of wear on the bark which over-time may impact on the cambium layer under the bark of the tree.

Appendix 3 Assessment Details and Recommendations

Tree Number	Botanical Common Name	Height Canopy Spread	Structure Significance	Age	Useful Life Expectancy	Diam (cm) Circ (mm)	Structural Root Zone (m)	Tree Protection Zone (m)	Maintenance Likelihood Consequence	Maintenance Comments
No of Trees	General Comments	Health	Reasons for Significance	Location Details						Priority
039	Eucalyptus camaldulensis/River Red Gum	15 to 19 m 8 to 10 m Fair	Fair Moderate Native to Victoria; Indigenous	Early Maturity	greater than 20 years	45 1413.9	2.37	5.4	Growing Environment improvements D (Failure Unlikely) 3 (Moderate)	<i>Environment - Improve growing environment, remove weeds and Burgen ; Environment - Improve growing environment and mulch to canopy edge; Follow up - Understorey plant; Pruning - Deadwood & Stub Removal minor only</i>
1	<i>Foliage - Live crown ratio within normal limits ; Form - Upright; Health - Minor deadwood <25mm; Observations - Environmental weed competition Wandering Jew and Burgen; Basal diameter 60 cm</i>					<i>Refer to aerial plan Section 5; Abutting circular roadway</i>			Low	
040	Eucalyptus camaldulensis/River Red Gum	15 to 19 m 8 to 10 m Fair	Fair Moderate Native to Victoria; Indigenous	Early Maturity	greater than 20 years	50 1571	2.47	6	Growing Environment improvements D (Failure Unlikely) 3 (Moderate)	<i>Environment - Improve growing environment, remove weeds and Burgen ; Environment - Improve growing environment and mulch to canopy edge; Follow up - Understorey plant</i>
1	<i>Foliage - Live crown ratio within normal limits ; Form - Upright; Health - Minor deadwood <50mm; Form - Codominant at 6m</i>					<i>Refer to aerial plan Section 5; Abutting circular roadway one tree in</i>			Low	
044	Eucalyptus camaldulensis/River Red Gum	15 to 19 m 11 to 14 m Fair	Fair Moderate Native to Victoria; Indigenous	Mature	greater than 20 years	75 2356.5	2.93	9	Pruning D (Failure Unlikely) 3 (Moderate)	<i>Pruning - Deadwood & Stub Removal; Environment - Improve growing environment, remove weeds and Burgen ; Environment - Improve growing environment and mulch to canopy edge; Follow up - Understorey plant</i>
1	<i>Foliage - Live crown ratio within normal limits ; Form - Asymmetric to SW; Structure trunk hollow at 3.5 m on east side; Observations - Environmental weed competition Wandering Jew and Burgen; Basal diameter 60 cm; Pathogens - Kino exudation; Pathogens</i>					<i>Refer to aerial plan Section 5; Abutting circular roadway</i>			Low	
050	Eucalyptus camaldulensis/River Red Gum	15 to 19 m 11 to 14 m Fair	Fair Moderate Native to Victoria; Indigenous	Mature	greater than 20 years	75 2356.5	2.93	9	Pruning D (Failure Unlikely) 4 (Major)	<i>Pruning - Deadwood & Stub Removal and crown clean; Pruning - Remove subordinate stem; Environment - Improve growing environment and mulch to canopy edge, remove Blackberries and Hawthorn suckers, kikuyu</i>
1	<i>Foliage - Live crown ratio within normal limits; Basal diameter 85 cm; Form - Larger trunk plus subordinate epicormic stem 25 cm dbh; Form - Asymmetric canopy bias to South East</i>					<i>Refer to aerial plan Section 5; East of shelter and north of roadway edge of mowed area</i>			Moderate	

Appendix 3 Assessment Details and Recommendations

Tree Number	Botanical Common Name	Height Canopy Spread	Structure Significance	Age	Useful Life Expectancy	Diam (cm) Circ (mm)	Structural Root Zone (m)	Tree Protection Zone (m)	Maintenance Likelihood Consequence	Maintenance Comments
No of Trees	General Comments	Health	Reasons for Significance	Location Details			Priority			
051	Eucalyptus camaldulensis/River Red Gum	20 to 24 m 11 to 14 m Fair	Fair Moderate Native to Victoria; Indigenous	Mature	greater than 20 years	100 3142	3.31	12	Pruning D (Failure Unlikely) 4 (Major) Moderate	<i>Pruning - Deadwood & Stub Removal of branches greater than 25mm, and crown clean throughout above proposed course; Environment - Soil structure improvements and de-compaction; remove environmental weeds and pasture grasses and understory plant</i>
1	<i>Foliage - Live crown ratio within normal limits; Pathogens - Cankers Scaffold branches and trunk; Health - Minor deadwood <50mm; Form - Upright; Growing environment - High compaction, mowing zone; Form - Codominant at 7 m ; Structure - Open branch attachm</i>					<i>Refer to aerial plan Section 5; East of shelter and north of roadway</i>				
052	Eucalyptus camaldulensis/River Red Gum	15 to 19 m 11 to 14 m Fair	Fair Moderate Native to Victoria; Indigenous	Mature	greater than 20 years	90 2827.8	3.17	10.8	Pruning D (Failure Unlikely) 3 (Moderate) Low	<i>Pruning - Deadwood & Stub Removal and crown clean over tree top course; Environment - Improve growing environment and mulch to canopy edge; Bush-land management, remove competitive grasses and environmental weeds; Follow up - Understorey plant</i>
1	<i>Foliage - Live crown ratio within normal limits; Observations - Sucker growth; Health - Minor deadwood <50mm; Structure - Open branch attachment points; Observations Basal diameter 120 cm; Form - Larger trunk plus subordinate stem 75 Anna 50 cm</i>					<i>Refer to aerial plan Section 5; East of shelter and north of roadway</i>				

Tree Top Climbing and Adventure Facility Yarra Flats Park East Ivanhoe

Photographs

1



2



Plate 1 Above - This is the existing called the Shock Wave Zip Coaster constructed by Ecoline. Tree Protection and attachment methods are shown in **Plate 2**. The canopy density and health indicators of these trees remain within normal limits.

Tree Top Climbing and Adventure Facility Yarra Flats Park East Ivanhoe

Photographs

3



Plate 3 This photograph shows the Tree top adventure course also associated with the Livewire park in Lorne. The course is amongst predominantly Victorian Blue Gums. There health indicators are within normal limits with normal foliage density.

4



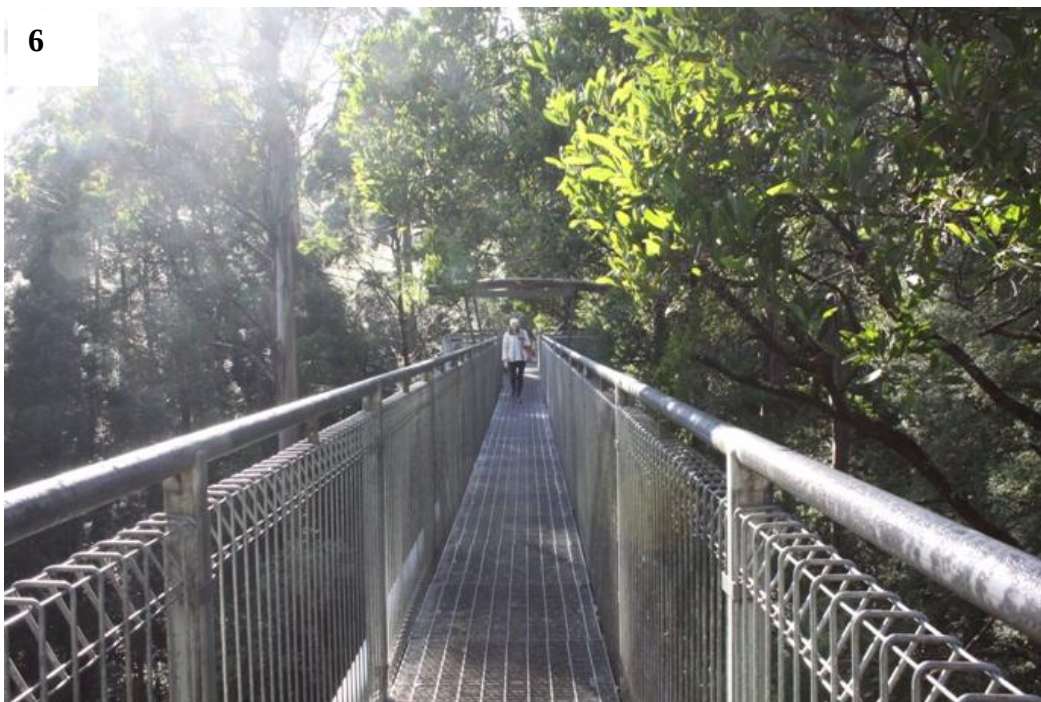
Plate 4 The Iconic Otway Fly. 8 metre sections of this structure were transported along the paths and erected onsite. There is no sign of any impacts to the Mountain Ash Forest

Tree Top Climbing and Adventure Facility Yarra Flats Park East Ivanhoe

Photographs



Plate 5 (above) and **plate 6** below. This substantial structure was assembled in this wet forest. It represents the more extreme development and yet it is now an integral part of the forest



Appendix 4 Tree Top Climbing and Adventure Facility Yarra Flats Park East Ivanhoe

Photographs

7



Plate 7 This is the closeup of attachment methods at the Glen Harrow Park in Belgrave. There are no locating spikes with all platforms mounded with adjustable ratchet straps and **Plate 8** cables

8



Tree Top Climbing and Adventure Facility Yarra Flats Park East Ivanhoe

Photographs

9



Plate 9 This photograph is a of a platform setup at the Enchanted Maze. The course is located in a Messmate Stringybark Woodland area

10



Plate 10 This photograph shows a more substantial construction at the start of one of the courses. The canopy density of the trees is a good indicator of stress and remains normal.

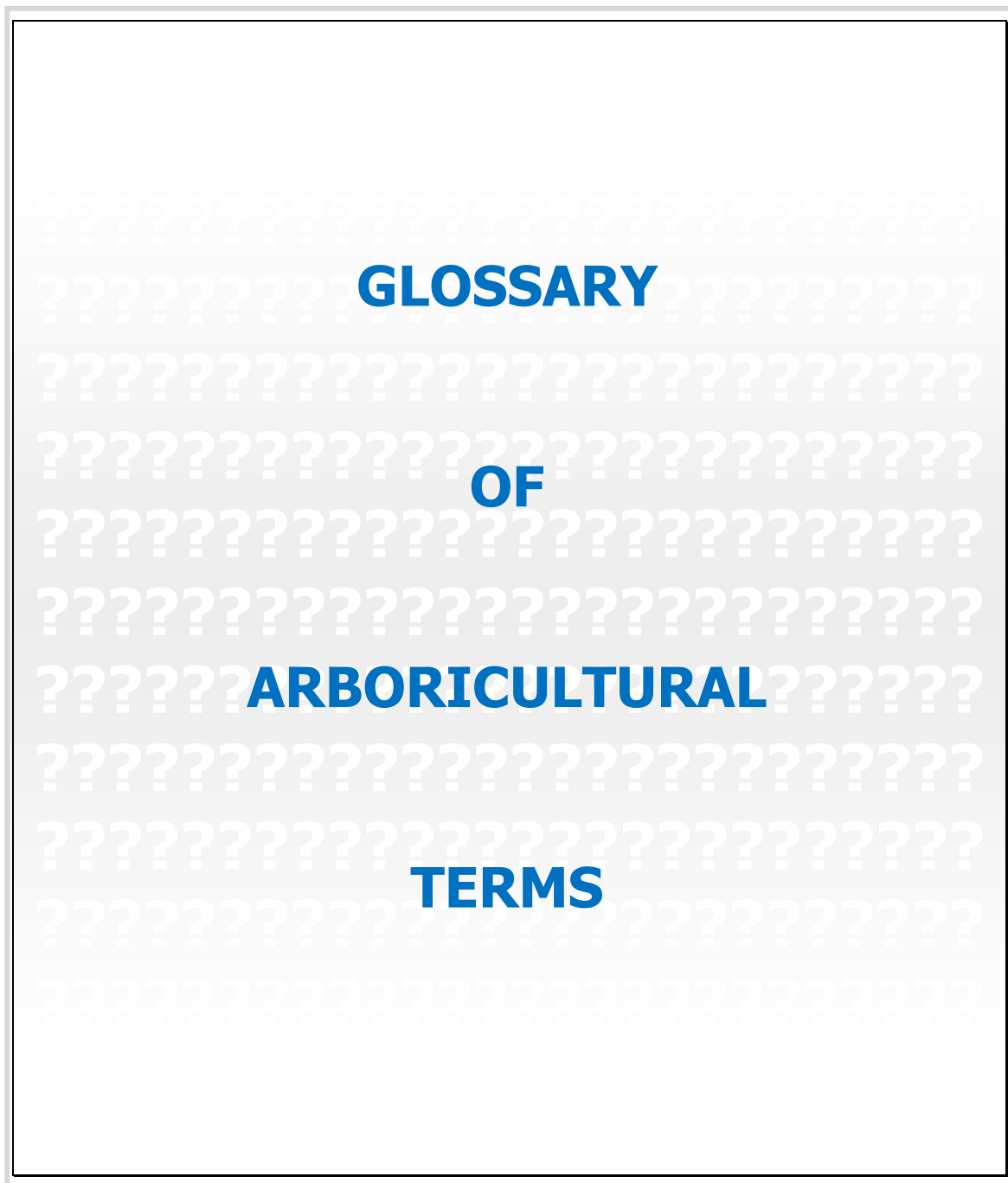
Tree Top Climbing and Adventure Facility Yarra Flats Park East Ivanhoe

11



Plate 11 (Above). The Enchanted Maze is one of the most longest running tree top courses in Australia. The trees have been inspected by Arborist Reports Australia since 2013 and the trees to this day remain in good health, with no tree failure attributed to the course

Glossary of Arboricultural Terms



Glossary of Arboricultural Terms

Category	Feature	Definition
Arboricultural Features	Botanical Name (Common Name)	<i>Latin and Common Name to which tree is referred.</i>
Age Categories	Young	<i>A newly planted tree of less than 1.5 metres in height and less than 3 years in age.</i>
	Juvenile	<i>A young establishing tree greater than 1.5 metres in height and between 3-12 years in age.</i>
	Semi-Mature	<i>An established tree of greater than 50-60% mass of its mature equivalent.</i>
	Mature	<i>A tree, which has reached the adult mass of other trees growing in similar environments. A mature tree is characterised by an advanced branching system consisting of lower and upper scaffold branches. Small branch hollows may begin to form.</i>
	Senescent	<i>A tree, which has past maturity and is beginning to decline towards eventual death. These trees consist of a greater degree of deadwood, mature branch hollows areas of decay and canopy dieback.</i>
Biodiversity	Biodiversity	<i>the variety of plant and animal life in the world or in a particular habitat, a high level of which is usually considered to be important and desirable.</i>
	EVC	<i>Ecological Vegetation Class based on vegetation assessment criteria developed by Victorian Government department, Department of Environment Water Land and Planning (DEWLP)</i>
	Life Form	<i>Refers to the type of vegetation whether that is a Canopy Tree or Tall or medium shrub, grass or rambler. (Refer to definitions under Tree Category)</i>
Condition	Good	<i>Full tree crown balanced foliage with good colour and excellent to good growth indicators</i>
	Fair	<i>Less than 30% deadwood, mostly good foliage colour with some discolouration, canopy may be unbalanced and the tree may have a minor pathogen infestation.</i>
	Fair-Poor	<i>Less than 30% deadwood, discoloured or distorted leaves pathogens present leading to tree decline and death.</i>
	Poor	<i>Greater than 30% deadwood, discoloured or distorted leaves pathogens present leading to tree decline and death.</i>
	Very Poor	<i>Approaching death</i>
		<i>The Arborist uses overall condition of the branch attachment and root system to determine the trees condition.</i>
Dimensions	DBH	<i>Diameter at Breast Height. Usually 1.2-1.3m from base of the trunk or above buttress.</i>
	Height (m)	<i>Height of tree from the ground to apex.</i>
	Canopy Spread (m)	<i>Canopy diameter at widest point from edge of dripline to edge of dripline.</i>
	Trunk Diameter (cm)	<i>The diameter of a tree measured at the most appropriate area based on the inherent structure of the tree as determined by a qualified Arborist.</i>
	SRZ (m)	<i>The region of larger diameter structural roots between the centre of the trunk and the Zone of rapid taper. Refer AS 4970-2009</i>
	TPZ (m)	<i>Tree Preservation Zone erected at zone of rapid taper, or at dripline or ten-twelve the times diameter of tree trunk. Refer AS4970-2009</i>
Form	Good	<i>Balanced and typical of species</i>
	Fair	<i>Generally balanced or slightly asymmetric</i>
	Poor	<i>Unbalanced, excessive trunk lean not typical of the species</i>

Glossary of Arboricultural Terms

Category	Feature	Definition
		<i>multi-stemmed specimen co-dominant leaders over-extended branches.</i>
	Asymmetric Canopy	<i>Canopy growth unbalanced with more vigorous growth on one side</i>
Form	Trunk Lean	<i>Tree Trunk is not perpendicular to the ground by a visible degree.</i>
	Multi-trunked	<i>More than one trunk associated with the tree originating from ground level</i>
	Co-dominant Leaders	<i>Two leaders originating from a single trunk of near equal or comparable in size and age</i>
	Overextended Branches	<i>Branches that extend out further than the canopy line of the tree, making them prone to wind sheet</i>
	End-weight	<i>Overweighted branches where there is little or no reaction wood growth to support weight</i>
	Pathogens	<i>General term describes the presence of animal, fungal or bacterial agents that are detrimental to tree health.</i>
Other Terms	Amenity	<i>A term that describes a tree's contribution to the environment from a perspective of visual appeal, or its contribution to the landscape for other reasons such as the provision of shade or shelter.</i>
	Active split	<i>A defect where movement between two or more stems is detected.</i>
	Bifurcation	<i>Is a term used to describe a potential structural fault in a tree, where two or more branches grow in an acute angle to each other, which can result in a weak branch union. These points form either an active or non-active split depending on the presence of movement or included bark.</i>
	Dieback	<i>General decline of a tree, which leads to dead wood in the canopy as a result of many different factors impacting on tree health.</i>
	Epicormic	<i>Epicormic growth is associated with the activation of dormant buds within the bark or stems of many tree species. The activation of epicormic growth by a tree is usually in response to a non-beneficial environmental factor or action to a tree. Trees will produce epicormic growth after a fire, root loss or excessive or inappropriate pruning. The resulting growth is poorly attached.</i>
	Branch	<i>Supporting structure of a tree. Also called a limb. A scaffold branch is the major supporting branch or branches. A leader is a directional branch that supports the canopy in part of the tree eg southern leader.</i>
	Tree Friendly Construction	<i>A method of construction that dramatically reduces impacts on tree health if carried out correctly. Such a method encompasses the retention of soil oxygen and the root majority when constructing near trees. This results in a much higher percentage of successfully retained trees.</i>
	Useful Life Expectancy' (ULE)	<i>Refers to the time one could maintain a tree in an urban situation. By far the most important long-term consideration is the length of time a tree can be maintained as a useful amenity and not a liability. ULE is contingent on a number of obvious management assumptions and the fundamental principles of public safety and usefulness in the landscape. The actual life</i>

Glossary of Arboricultural Terms

Category	Feature	Definition
		<i>expectancy up until the total death of a tree may be considerably longer.</i>
	Vigour	<i>A measure of the health of a tree indicated by its extension growth and foliage colour and size.</i>
Pathogens	Decay	<i>Breakdown of wood due to fungal and bacterial decay pathogens weakening lignin.</i>
	Fungal bodies	<i>Fruiting bodies of various fungal pathogens indicating activity and potential associated decay</i>
	Scales, Lerps & Psyllids	<i>Leaf insects that in plague proportions can have a significant effect on tree health causing defoliation</i>
	Elm Leaf Beetle	<i>A serious insect pest associated with the genus <i>Ulmus</i> that affects visual amenity and causes defoliation.</i>
Pathogens	Oak leaf Miner	<i>An insect pest of the genus <i>Quercus</i> that causes blistering and defoliation.</i>
	Termites	<i>An insect that causes structural degradation of heart wood.</i>
	Fusarium Wilt	<i>Bacterial pathogen that causes foliar wilt and tree death. Quarantine necessary</i>
	Phytophthora spp	<i>Bacterial pathogen in the soil that causes tree death. Quarantine necessary</i>
	Armillari spp	<i>Fungal pathogen in the soil that causes tree death. Quarantine necessary</i>
Significance (Arboricultural)	High	<i>A worthy tree deserving of protection and retention.</i>
	Low	<i>Has not yet attained a degree of significance</i>
	None	<i>Of little or no significance</i>
Significance (Reason)	Habitat	<i>Natural home of an animal or plant.</i>
	Developing Landscape Specimen	<i>A tree that has the potential to become a viable landscape specimen</i>
	Environmental Weed	<i>An environmental weed is a plant species that has the capacity to invade natural ecosystems and bushland and disrupt the natural balance. Environmental weeds successfully compete for nutrients space and light reducing or preventing the normal growth of native species. They are often garden escapees and seeds may be carried to natural bushland as waterborne in streams and waterways, air borne and distributed by wind patterns. Animals including humans also spread weeds. Human activity including planting and cultivating weed species in the garden creates a seed source. Commonly birds that feed on flowers or seeds will carry these seeds to bushland areas.</i>
	Native Victoria to	<i>Indigenous tree to Victoria</i>
	Native	<i>Native to another state of Australia</i>
	Non-native	<i>Native to another country</i>
	Exotic	<i>Cultivated in and native to another country</i>
	Transient	<i>A species that may have been planted as a timber crop</i>
Structure	Good	<i>No visible structural defects identified in the tree</i>
	Fair	<i>Mature branch structure with distinct branch collar formation and production of major deadwood in older or shade lower scaffold branches.</i>
	Typical	<i>Structure, which is normal for a particular species.</i>
	Fair-Poor	<i>Senescing branch structure with distinct branch collar formation and major deadwood in older or shaded lower scaffold</i>

Glossary of Arboricultural Terms

Category	Feature	Definition
		<i>branches. Defects such as bifurcated or suspect branch attachment may be present but not yet showing signs of instability.</i>
	Poor	<i>Senescing branch structure with distinct branch collar formation, kino exudation and major deadwood throughout the tree. Defects such as bifurcated or suspect branch attachment are apparent and action to mitigate any potential risk should be initiated,.</i>
	Very Poor	<i>Senescing branch structure with distinct branch collar, kino exudation and developed cankers and evidence of decay and major deadwood throughout the tree. Defects such as bifurcated or suspect branch attachment are obvious. Branch attachment and action to mitigate any potential risk must be initiated immediately.</i>
Form	Form	<i>The shape which a tree has adopted in response to its growing environment and situation.</i>
Tree	Canopy Tree	<i>Tallest tree in an EVC</i>
	Sub-canopy tree	<i>Understorey tree underneath canopy tree</i>
	Shrub	<i>Tall or medium depending on height</i>
	Graminoid/Grass	<i>Grass or grass-like plant, including grasses (Poaceae), sedges (Cyperaceae), rushes (Juncaceae), arrow-grasses (Juncaginaceae), and quillworts (Isoetes). Applies to vascular plants only.</i>
	Rambler	<i>Climbing plant</i>
Vigour	Low	<i>Low Vigour affecting growth</i>
	Normal	<i>Normal growth</i>

Important Information

Disclaimer And Statement Of Indemnity And Limiting Conditions

Visual Tree Assessment

The Arboricultural Visual Tree Assessment and any further resultant report arising, is to advise on the status of a tree, or trees, in accordance with the terms of reference advised.

Trees are living systems and therefore there always remains a degree of risk and hazard potential.

At the time of inspection;

1. The consultant shall exercise all professional efforts as a Duty of Care including safety and hazard potential.
2. The consultant shall advise of reasonable steps to maintain the tree in good condition and limit or prevent injury from falling branches, or hazardous situations.
3. The recipient of this report is expected to authorise and implement the recommendations described herein, to the satisfaction of the consultant.
4. The consultant cannot be liable for any changes to the status of the tree, or its health, as a result of damage caused to the tree by environmental factors or other damage after the inspection.
5. The consultant shall not be held responsible for any structural failure of the tree or trees that may lead to property damage, injury or death arising from the failure of, or interaction with, any part of the tree.

Arboricultural Reports

1. Any legal description provided to the consultant is assumed to be correct. Any titles and ownership of any property are assumed to be accurate. No responsibility is assumed for matters legal in character.
2. It is assumed that any property/project is not in violation of any applicable codes, ordinances, statutes or other government regulations.
3. Care has been taken to obtain all information from reliable sources. All data has been verified in so far as possible, however, the consultant can neither guarantee nor be responsible for the accuracy of the information provided by others.
4. This report remains the property of Otto Leenstra and Associates and is not authorised for distribution to any third party, or to be used by the intended recipient, or agent acting on the behalf of the recipient or person to which the report is addressed until the agreed fee is paid in full.
5. The consultant shall not be required to give testimony or to attend court by reason of this report unless subsequent contractual arrangements are made, including payment of an additional fee for such services.
6. Alteration of any part of this report not undertaken by the consultant invalidates the entire report.
7. Possession of this report or a copy thereof does not imply right of publication or use for any purpose by anyone but the person to whom it is addressed or intended, without the prior written consent of the of the consultant.
8. Neither all nor any part of the contents of this report, nor any copy thereof, shall be used for any purpose by anyone but the person to whom it is addressed, without the written consent of the consultant, nor shall it be conveyed by anyone, including the client, to the public through advertising, public relations, news, sales or other media, without the written consent of the consultant.
9. This report and any values expressed herein represent the opinion of the consultant and the consultant's fee is in no way contingent upon the reporting of a specified value, a stipulated result, the occurrence of a subsequent event, nor upon any finding to be reported.
10. Sketches, diagrams, graphs and photographs in this report, being intended as visual aids, are not necessarily to scale and should not be construed as engineering or architectural reports or surveys unless expressed otherwise.
11. Information contained in this report covers only those items that were examined and reflect the condition of those items at the time of inspection.
12. Inspection is limited to visual examination of accessible components without dissection, excavation or probing. There is no warranty or guarantee expressed or implied that the problems or deficiencies of the plants or property in question may not arise in the future.

Qualifications and Experience

1. Name and address of the expert

Otto Leenstra
 Otto Leenstra and Associates TAS Arborist Reports Australia
 Tree Management and Arboricultural Consultancy
 371 Browns Road ST ANDREWS BEACH 3941

2. Qualifications and experience

Qualifications

2012 Certificate 5 Diploma of Arboriculture (Arbortrim Training)
 2008-Diploma of Management (Ballarat University)
 1993-Advanced Certificate of Arboriculture (Burnley)
 1988 Certificate of Recreational Turf Management (Burnley)
 1986 Certificate of Parks and Recreation Supervision (TAFE)
 1984 Trade Certificate in Gardening (TAFE)
 1982-Advanced Certificate of Horticulture (Burnley)

Work Experience

- 2015 -Current Principal Consultant Arborist Otto Leenstra and Associates
- 2014-2015- Regional Senior Arborist Victoria & Tasmania Defence Maintenance Contracts
- 2004-2015 Senior Arborist and Arboricultural Supervisor of Tree Management Transfield Services Mornington Peninsula Shire Parks and Roadsides Contract and practicing Consultant Arborist
- 1999-2004 Senior Consultant Arborist ArborCo Pty Ltd
- 1997-1999: Consultant Arborist for Earthly Concepts Pty Ltd
- 1995-1997: Environment & Landscape Co-ordinator for Mornington Peninsula Shire Council
- 1989-1995: Arboricultural Officer (Tree Specialist), Shire of Flinders
- 1989-1995: Consultant Arborist/Horticulturist, Self Employed
- 1987-1989: Greenkeeper, Morning Golf Club & Mornington Racing Club
- 1986-1988: Landscape Gardener, Self Employed
- 1981-1986: Parks Foreperson, City of Frankston

3. Area of expertise

Otto Leenstra has over 30 years experience in all aspects horticulture and arboriculture. These roles incorporate experience in both private and public corporations as outlined above. He has worked on tree assessments for private clients and tree assessments for development projects. He has also represented a number of clients at the Victorian Civil and Administrative Tribunal (VCAT). Specific projects undertaken include the retention and protection of trees on development sites and the development of comprehensive tree management programs.

Otto Leenstra is a passionate supporter of the arboricultural industry in which he has taken an active role for the past 25 years and has professional affiliations with the Australian Arboricultural Association (AAA). He regularly addresses residents, business and community groups on arboricultural issues, and have extensive expertise in local government and private practice.