



**Tree Consultants & Contractors**  
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31 May 2017

Mr. Bernard Stewart  
 Kew Development Corporation Pty Ltd  
 32 Pine Ct  
 Kew Vic. 3101

Dear Sir,

**Re: Stage 8, Kew Cottages**

**Introduction**

A 3 storey residential apartment building with basement parking is proposed to replace an existing single level building (within stage 8) at the former Kew Cottages. This is a reduction by two levels from what was formerly proposed. Galbraith and Associates has been requested by the Kew Development Corporation to update the status of the trees within 10m of the proposed building since these trees were last reported on in November 2015 as part of the Statement of Evidence for the Heritage Council Hearing. Details include a species description for each tree within 10m of the proposed building, data on trunk diameters at 1.4m above ground, heights by spreads, condition, a description of the overall treed nature of the vicinity, origin of the trees, approx. age and tree protection zones (according to the relevant Australian Standard 4970:2009 'Protection of trees on development sites' for the higher worth trees).

Each tree within the vicinity of the proposal is located and numbered on the accompanying extract of the existing Conditions TPZ Encroachment – Site Plan on page 3 and described in the accompanying table of data on pages 4 and 5. The plan has the canopy extent of each tree accurately surveyed.

The design drawings upon which I now base my assumptions are numbers AR08-1.04 Rev D, AR08-1.05 Rev D, AR08-1.06 Rev E, AR08-1.07 Rev G, AR08-1.08 Rev F, AR08-1.09 Rev E, AR08-24.01 Rev E, AR08-24.02 Rev G, AR08-24.03 Rev G, AR08-24.04 Rev H, AR08-24.05 Rev E, AR08-24.06 Rev D, AR08-24.07 Rev E, AR08-24.08 Rev D, AR08-24.09 Rev C and AR08-24.10 Rev E.

### **The Trees - General**

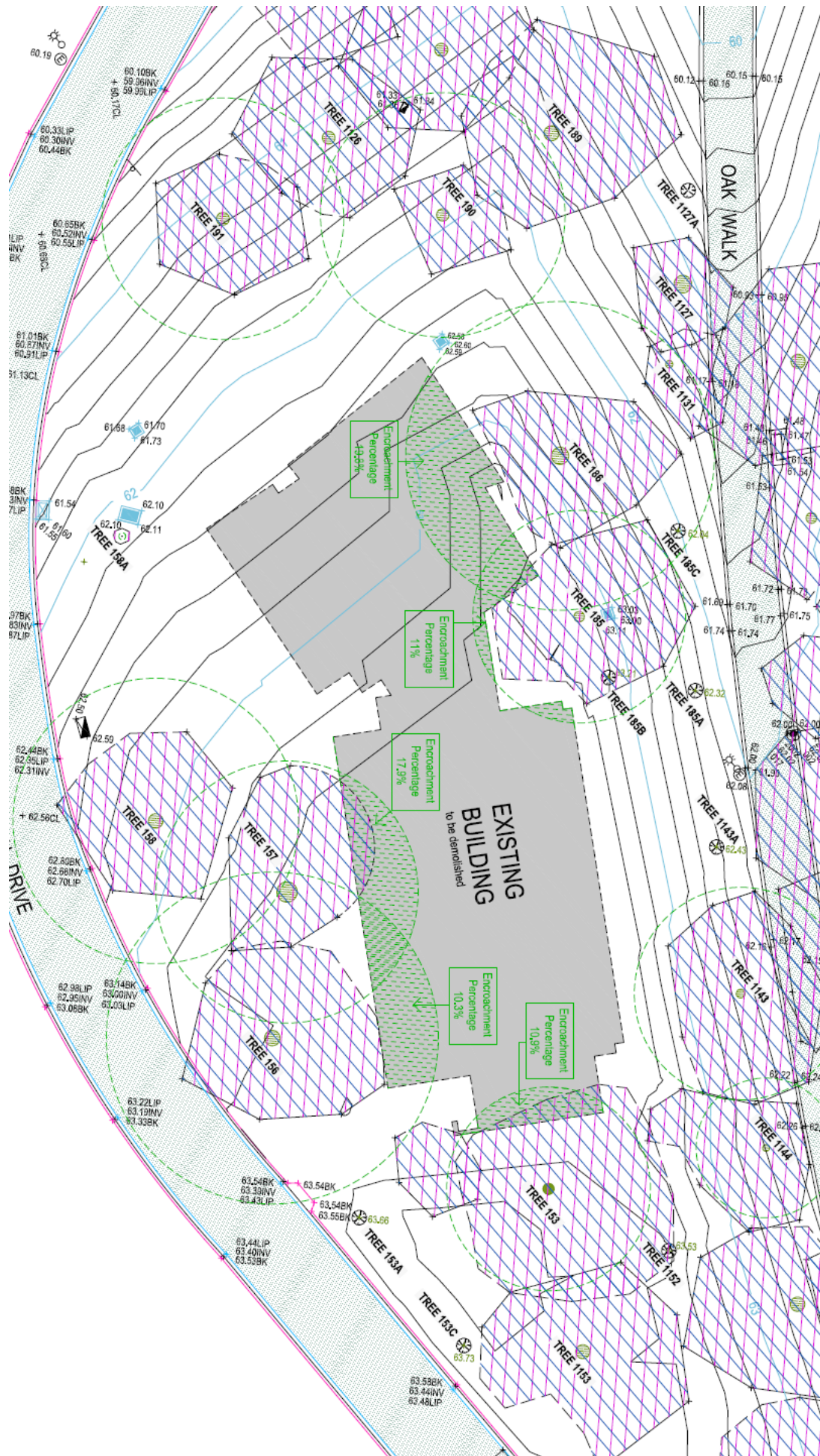
All the mature trees along Main Drive were planted in either 1900 or 1901. This is evident from our increment analysis of the oaks which have died and have had to have been removed in recent times. It is estimated most of the mature trees in the study area around the existing offices of the Kew Development Corporation are likely to be of a similar age.

The Algerian Oaks are unusual in that they are grafted. Vegetative material such as shoots of Algerian Oaks have been grafted onto English Oak rootstocks.

Unfortunately this has resulted in some instances of delayed graft incompatibility whereby the grafts have become swollen to more or less degrees, preventing adequate sap flow between the scions and root stocks. This is not so much of a problem to the trees in the immediate vicinity – the past drought and extreme heat waves over summer presenting more of a problem.

The Canary Island Pines are generally very healthy and are a favoured destination for flocks of Yellow Tailed Black Cockatoos who feed on the cones. The cedars, Monterey Pines, Bunya and Hoop Pines also enjoy the conditions at the site, although drought stress is evident to varying degrees. The mature Monterey Pines have limited safe useful life expectancies.

There are several younger trees, including tree 157 on the south side of the offices. This is a rapidly growing Narrow Leaved Peppermint (*Eucalyptus radiata*) which is highly likely to have been planted less than 36 years ago. The species occurs naturally in parts of Melbourne and as far north as Queensland. The relatively coarse bark of the lower trunk is not typical of the local provenance trees. No trees of this species have been found to be naturally occurring in the Studley Park, Yarra Bend area according to the publication 'Flora of Melbourne'. The morphology of the tree is more typical of what one sees in the New England Tablelands of NSW.



## TREE SURVEY

Tree No.	Species Indigenous (I) Victorian (V) Australian (A) Exotic (E) Weed (W)	DBH (cm)	HxS (m)	Comments, WOR, TPZ(m)
1153	<i>Cedrus atlantica</i> 'Glauca' Blue Atlantic Cedar	67	11x16	Mature tree in quite good condition with long safe useful life expectancy (SULE). Age is approx. 116 years WOR 8 TPZ 8.1
153	<i>Pinus canariensis</i> E Canary Island Pine	58	19x16	Mature tree in good health, of good structure and with a long safe useful life expectancy (SULE). Age is approx. 116 years . WOR 9 TPZ 7
153A	<i>Ficus macrophylla</i> A Moreton Bay Fig	6	3x2	Recently established healthy tree.
153B	<i>Ulmus procera</i> E English Elm	2	2.5x0.5	Recently established healthy tree.
153C	<i>Ulmus procera</i> E	2	2.5x0.5	Recently established healthy tree.
1152	<i>Cupressus sempervirens</i> 'Stricta' Pencil Cypress	27	10x2	Small fastigate tree in fair-good condition but has some old basal wounding. Age is approx. 70. WOR 6 TPZ 3.2
1144	<i>Quercus robur</i> x <i>canariensis</i> E English/Algerian Oak hybrid	40	8x12	Medium sized lopsided mature tree in good condition, although stunted. Age is approx. 116 years. WOR 7 TPZ 4.8
1143	<i>Quercus canariensis</i> E Algerian Oak	61	9x14	The tree has minor to moderate die-back as a result of past drought stress. Its SULE is dependent on future care and incidence of drought. Age is approx. 116 years. WOR 6 TPZ 7.3
1143A	<i>Quercus cerris</i> E Turkey Oak	2	2x1	Recently planted sapling – healthy.
185	<i>Pinus canariensis</i> E	61	18x12	The canopy appears healthy however fruiting bodies of the root and butt rot pathogen <i>Phaeolus schweinitzii</i> were present on the trunk base in May 2013 and 2014 suggesting the SULE of this tree is not long. The tree needs to be monitored. Age is approx. 116 years. WOR 5 TPZ 7.3
185A	<i>Quercus canariensis</i> E	8	5x3	Recently planted sapling – healthy.
185B	<i>Tristaniaopsis laurina</i> V Water Gum	6	3x2	Recently planted sapling – healthy.
185C	<i>Quercus canariensis</i> E	3	2x3	Recently planted healthy sapling.
186	<i>Pinus radiata</i> EW Monterey Pine	77, 44	19x12	Over mature tree in fair-good condition. SULE < 20 Age is approx. 115 years. WOR 6 TPZ 10.6
1131	<i>Quercus canariensis</i> E	36	8x8	Stunted healthy tree lopsided to the north. Age is approx. 115 years. WOR 7 TPZ 4.3

<b>Tree No.</b>	<b>Species Indigenous (I) Victorian (V) Australian (A) Exotic (E) Weed (W)</b>	<b>DBH (cm)</b>	<b>HxS (m)</b>	<b>Comments, WOR, TPZ(m)</b>
1127	Arbutus unedo E Strawberry Tree	16, 18, 19, 14, 14	6x8	Mature healthy somewhat stunted tree. Age is approx. 116 years. WOR 7 TPZ 4.4
189	Pinus canariensis E	86	22x15	Mature tree in good condition. Age is approx. 116 years. WOR 9 TPZ 10.3
190	Araucaria bidwillii E Bunya Bunya	70	15x10	Mature tree in moderate health which will require a cable to stabilise the potentially weak fork in the trunk at 1.5m. Age is approx. 116 years. TPZ 8.4
191	Pinus canariensis E	67	20x15	Mature tree in good condition. Age is approx. 116 years. Somewhat thin, in need of irrigation. WOR 9 TPZ 8.3
1126	Cedrus deodara E	70	19x16	Good condition. WOR 8 TPZ 8.4
158	Araucaria heterophylla A Hoop Pine	92	19x14	Mature tree in good condition. Age is approx. 116 years. WOR 9 TPZ 9.8
158A	Brachychiton populneus V Kurrajong	4	2.5x1	Healthy recently established tree.
157	Eucalyptus radiata V Narrow leaved Peppermint.	70, 27	15x15	Healthy vigorous tree, probably of the order of 40 years of age, lopsided to the north-west. WOR 7 TPZ 9.0
156	Pinus radiata E Monterey Pine	95	20x15	Over mature tree in fair-good condition. SULE < 20 Age is approx. 116 years. WOR 5 TPZ 11.4

## Impact of the Proposal

***Trees Proposed to be Removed*** Tree No. 185B, a recently planted sapling, is proposed to be removed. I am informed this tree was planted by the applicant for aesthetic purposes to improve the entry to the Walker Corporation site office and would not be considered a heritage listed tree. The tree does not appear on plans forming part of Heritage Permit No.P16912 comprising Annexure B which provide for the precincts landscaping.

***Trees Proposed to be Retained*** All the trees to be retained, which is every tree except No. 185B, can be readily and successfully retained under this proposal. In most cases, the basement and building encroaches either the same or less into the TPZs of the trees near the building, than does the existing. Where there is greater encroachment, such as into trees 153, 156 and 157, this is for the rock batter wall around the outer perimeter of the new building which is to be placed on grade, thereby having no impact on the root zone beneath.

Other encroachments into TPZs are from the pedestrian ramp and visitor car spaces into the TPZ of tree 156 and a pedestrian ramp into the TPZ of tree 185. In the case of the former, it is only the visitor car spaces which will require excavation for a total of 5% of the TPZ which is readily acceptable. With respect to the pedestrian ramps, they are to be porous and built above grade where within the TPZs, hence the roots beneath can continue to thrive.

The only other tree to have its TPZ encroached upon by more than the current building footprint is tree 1143. Only 0.8% of its TPZ is encroached upon, and this is only by the battered rock wall at grade, hence one can be very confident this tree will not be adversely impacted.

## TREE MANAGEMENT PLAN

**There must be no parking at any times by any vehicles within the TPZs of any trees except on designated paved areas.**

### *Specific Protection Measures*

A new pedestrian footpath is proposed adjacent to Main Drive, opposite trees **156** and **158**. It will be important that the path is constructed on grade without any excavation of the existing lawn by more than 100mm depth. This path leads to visitor car parks, a bicycle parking area and a pedestrian entry ramp leading upwards into the building to the west of tree 158. Again it must be ensured that there is no lowering of levels by more than 100mm (apart from the digging of pads) in order to construct these surfaces. I recommend that the paths be porous to allow air and moisture percolation. Typical surfaces are granitic sand held in by edging or cobble stones over crushed rock.

It will be important that there is no excavation for strip footings for the pedestrian ramp. The only excavation acceptable will be for point loads such as pads or pier holes. There must be flexibility in the choice of location of such holes and they must be dug by hand under arboricultural supervision. Where significant root development is encountered when digging the holes, i.e. roots of approximately 50mm thickness or more, the roots must be left unharmed, the soil backfilled and a new site for a pad/pier hole found without significant roots. This must be under the supervision of the project arborist.

A pedestrian ramp from Main Drive to the building is proposed to be constructed between trees 156 and 158 above the existing grade. It will be important that there is no excavation for strip footings for this ramp. The only excavation acceptable will be for point loads such as piers. The sites for support holes must only be chosen as per the methodology already specified in the previous paragraph.

The covered porch to the south of tree 185 is to be on grade and is already largely covered by concrete. Again, this covered porch and the pedestrian path leading to it, must be constructed in a non root destructive manner as per the pedestrian ramp near tree 158. The pedestrian path leading from Oak walk to these steps must be on grade and porous.

There is very little or no encroachment into the TPZs of the remaining trees.



## **TREE MANAGEMENT PLAN - General**

### **Demolition Protection**

The occupier of the site must ensure that, prior to their commencement of work on the site, all contractors and tradespersons undertaking work on the site that has the potential to damage any tree are advised in writing of the status of trees to be retained as detailed in the endorsed arborist report and of any obligations in relation to the protection of those trees.

Have each tree to be retained clearly marked and numbered as per the plans on pages 4 and 5 with strict instructions to the demolition contractor to avoid any physical impact with them.

Fence off the trees to be retained to at least the tree protection zones (TPZs) from the trunk centres wherever possible. If this is impossible, due to site constraints such as lack of pedestrian access and the necessity for pathways within the TPZs for the ferrying of materials, at least protect the trunks with fencing but extend the fences as far as possible to the TPZs whilst still ensuring that construction can take place in a safe and efficient manner. Where not already paved, mulch to a depth of 150mm outside the fences (where structures or paving is not present) to a radius of at least the TPZs from the trunk centres.

Leave the existing concrete paving in place until last.

Each fence must be at least 1.8m high sturdy high visibility fencing. Builder's chain and mesh temporary fencing is good for this.

There must be no excavation or soil compaction within the TPZs where the TPZs are outside the existing building footprint, unless this is deemed by the consulting arborist as not being prejudicial to the safe useful life expectancy (SULE) of the tree during that time.

The following worded sign must be attached to the tree protection fences "Tree Protection Fence" The signs must be weatherproof with large clear professional lettering.

Undertake any building clearance pruning according to the Australian Standard AS 4373:2007.

Avoid removing underground drains and services from within the TPZs but outside the existing building footprint. If this has to occur, then ensure it is done under consultation and supervision of the project arborist.

When removing concrete and paving from within the TPZs, ensure it is slid out away from the trees without gouging or excavating within the TPZs.

When removing unwanted woody vegetation near the trees to be retained, do not gouge out the stumps with excavator buckets or excavate within the TPZs. If the stumps remain in the ground when pulling the trees/shrubs out, then have them



carefully ground out at a later date. When removing non woody vegetation within the TPZs, again, do not scrape back the top soil more than approximately 100mm depth.

### **Pre-Construction Protection**

Spray and kill existing grass and weeds within the TPZs.

Add mulch to as close as possible to the extent of the TPZs to a depth of approximately 100mm. The mulch should be organic such as wood chips, preferably rich in foliar content. Woodchips from removed trees or branch prunings are fine.

Fence off the trees to be retained, using similar type fencing as mentioned for the demolition, to at least the TPZs from the trunk centres wherever possible. If this is impossible, due to site constraints such as lack of pedestrian access and the necessity for pathways within the TPZs for the ferrying of materials, or due to the existing or future presence of structures such as buildings, roads, drives, car parks and footpaths within the TPZs, at least protect the trunks with fencing, and mulch to a depth of 150mm outside the fences (where structures or paving is not present) to a radius of at least the TPZs from the trunk centres.

The fences must remain intact without any fill or rubbish entering them for the life of the project. If they have to be removed or shifted within that time, the period during which this occurs must be minimized, and there must be no excavation or soil compaction within the TPZ, unless this is deemed by the consulting arborist as not being prejudicial to the safe useful life expectancy (SULE) of the tree during that time.

The following worded sign must be attached to the tree protection fences “Tree Protection Fence” The signs must be weatherproof with large clear professional lettering.

Any pruning which is necessary for building works clearances or hazard reduction must be undertaken according to the Australian Pruning Standard AS 4373:2007. Only the minimum amount necessary should be removed.

If site sheds are to be located within the mulched zones, they are to be positioned on raised wooden blocks and taps for washing out cannot be located / attached to these sheds within the TPZs.

## **During Construction Protection**

Maintain as above.

There must not be any trenching, excavation, addition of fill or level reductions by more than 100mm for any purpose, or significant soil compaction within the TPZs from the centre of the retained tree, where the TPZs are outside the existing building footprint, unless it has been shown by non root destructive exploratory trenching under arboricultural supervision beforehand that the tree's SULE is unlikely to be compromised.

Drains or services, if they have to go within the TPZs where the TPZs are outside the existing building footprint, must only be undertaken by non root destructive means such as horizontal boring at greater than 800mm depth or by pneumatic or hydraulic means under arboricultural supervision, unless it has been shown by non root destructive exploratory trenching under arboricultural supervision beforehand that the tree's SULE is unlikely to be compromised.

Do not excavate nor reduce levels by more than 100mm for any reason including paving, within the TPZs, unless it has been demonstrated by non root destructive exploratory excavation under arboricultural supervision beforehand it is unlikely to adversely impact on the SULEs of the trees to do so.

The tree protection fences and signs must be maintained in good order for the life of the project. They can only be moved with the permission of the consulting arborist.

Do not wash or dump chemicals into the soil anywhere near the TPZs.

## **Irrigation**

All the trees within the Stage 8 area must be regularly irrigated during the late spring, summer and early autumn periods of construction, the amount and frequency being determined by the consulting arborist. The means of administering the water can be from a drip system or water truck and done in a manner which allows the administered water to soak into the root zone as opposed to running off its surface. A rule of thumb is 5 litre per cm DBH on approximately ten occasions over this period.

## **Post Construction**

For up to two years after construction the heritage trees should be regularly inspected by the consulting arborist. The inspections must be undertaken at least twice during the April to October periods and fortnightly during the November to March periods. Reports must be made of these inspections. Where works such as irrigation, hazard reduction pruning, disease, pest and weed control are thought warranted by the consulting arborist, the measures recommended by him must be implemented.

## Arborist Supervision

The project arborist should be requested to inspect the site

- Before Demolition begins to ensure the tree protection fencing is adequately set up and that the demolition contractor is aware of the necessary tree protection measures
- Before Construction begins to ensure the tree protection fencing is adequately set up and that the builder is aware of the necessary tree protection measures
- Supervise any pruning
- Be prepared to supervise any excavation within the TPZs, but outside the existing building footprint
- Check the soil moisture around the trees on at least one occasion over the summer period of construction.

### Notes on Terminology

In order to understand the column headings of the tables of data, I have provided the following explanations:

**DBH** diameter of trunk over bark at breast height In a number of cases where the tree has forked into multiple trunks below breast height (1.3-1.5m) the diameter is measured below the fork and an estimate is made for the single trunk equivalent at breast height, or else figures for each of the individual stems can be given.

**HxS** This is the estimated height (H) of the tree and its average crown spread (S).

**SULE** Safe useful life expectancy in years. Taken in the context that the area is to be developed for residential use, and that sensible distances are maintained between the buildings and the trees, this is the estimate of time that the tree will continue to provide useful amenity without imposing an onerous financial burden in order to maintain relative safety, and avoid excessive nuisance.

### Worthiness of Retention (WOR):

The worth for retention of a tree is based on the assumption that the site is to be re-developed, and that there is the opportunity for new tree planting. It is based on a number of factors. These factors are:

1. structure, health, form and safe useful life expectancy,
2. size, prominence in the landscape,
3. species rarity,
4. whether indigenous,
5. whether an environmental weed.
6. importance for habitat of native wildlife
7. whether of historical or cultural interest

Any tree with a WOR rating of 3 or less should be seriously considered for removal before development begins because it is dead, nearly dead or dangerous, a weed, is causing or is likely to cause a severe nuisance in the near future, or just of very little significance and readily replaceable with new plantings. Trees rated 4-6 are of some significance. Some of these trees may respond to treatments such as formative pruning, removal of dead wood, weight reduction pruning etc. Trees rated

7 or higher are of high significance (the higher the ranking the more so), primarily because of their good health, structure, form, prominence in the landscape and SULE, although all they still may need substantial works done on them as already detailed, if they are to be retained.

**Tree Protection Zone (TPZ)** According to the Australian Standard AS 4970-2009 'Protection of Trees on Building Sites', the TPZ is the principal means of protecting trees on development sites. It is a combination of the root area and crown area requiring protection. It is an area isolated from construction disturbance, so that the tree remains viable.' The radius of the TPZ is calculated by multiplying the DBH by 12. The radius is measured from the centre of the stem at ground level. An area of 10% of the TPZ is deemed acceptable to violate if 10% of the area of the TPZ is made up in other directions. *Thus if encroachment is from one side only, encroachment to as close as approximately 8 times the DBH (2/3 the listed TPZ radius) is permissible according to the Standard.*

The TPZs as calculated according to the AS 4970-2009 should only be construed as a rough guide. They are only used in this statement because various local authorities now demand it in their assessments of development applications. Many factors such as the type of encroachment on the TPZ, species tolerance, age, presence of spiral grain, soil type, soil depth, tree lean, the existence of onsite structures or root directional impediments, level of wind exposure, irrigation and ongoing tree care and maintenance are each highly influential on the size and success of the TPZ estimation, therefore the figures derived from the Standard and provided in this report must be treated as rough guides only.

### **Tree Origin Categories**

Each tree has been classified as to whether it is indigenous (**I**), native to Victoria (**V**), native to Australia (**A**), exotic (**E**) or an environmental weed (**W**).

An indigenous species (**I**) is one that is known to grow naturally in the local area, even if the individual tree has been planted and is from a seed source or provenance foreign to the area.

A species classified **V** is one which has a part or all, even if very small, of its natural range within Victoria, although it may occur outside the state as well. It does not however occur naturally in the local area.

A species classified **A** is native elsewhere in Australia than Victoria. It does not occur naturally in the local area.

A species classified **E** has its natural range occurring outside Australia.

A species classified **W** is a seriously invasive environmental weed.

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