Hurstville Private Hospital

Pearl Street, Hurstville, NSW

Prepared for:

Healthe Care

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ARBORICULTURAL IMPACT ASSESSMENT

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1.0 Introduction

1.1 Synopsis

This report represents an Arboricultural Impact Assessment (AIA) of two (2) Council owned street trees located in the road reserve of Pearl Street and fronting Hurstville Private Hospital. Moir Landscape Architecture Pty Ltd have been commissioned by Healthe Care to prepare an AIA for the trees as identified in Figure 1. This report was prepared by Phillip Walbank, AQF Level 5 qualified Arborist. Appendix 1 - 'About the Author', contains details of the author's qualifications, affiliations and insurances.

The following assessment has been prepared in accordance with Hurstville Development Control Plan 1 (DCP1). Reference is made to the most current Australian Standards including AS4970 (2009) Protection of Trees on Development Sites and AS4973 (2007) Pruning of Amenity Trees.

The tree summary data sheets, contained in Section 5 of the report, lists the assessed trees and includes measurements of height, crown spread, trunk diameter and tree age. Tree A-Z (Barrell, 2010) was utilised to categorise the trees into those that should be considered a material constraint and those that should not.

Recommendations are provided to aid in the ongoing care and preservation of trees identified for retention and to mitigate any potential adverse impacts from the proposed development. This is to assist in prolonging the longevity of trees.

2.0 Background

2.1 Site Description

The site is located in the Local Government Area of Hurstville. Hurstville Private Hospital occupies a generally rectangular parcel of land. The hospital has frontages to Millett, Gloucester and Pearl Streets.

The immediate neighbourhood has an established feel. The trees collectively provide a positive contribution to the visual quality and landscape amenity of the site and surrounding area. Houses are a mix of styles and age. The immediate area is characterised by a mixture of single storey houses and units, multi storey unit blocks and commercial premises.

The two subject trees are located within Council owned land between a lower level car park and Pearl Street. The street trees form part of a linear formation dominated by Tallowwoods (*Eucalyptus microcorys*) which appear to be of a similar age, height and condition.

Figure 1 - Site Locality Plan (Source: Nearmap)

3.0 Methodology

3.1 Overview

Fieldwork for the tree assessment was undertaken in March of 2012. A survey plan for the site, prepared by Mitchell Land Surveyors, indicates the location of the existing tree in relation to existing buildings, infrastructure and services. Visual Tree Assessment (VTA) was utilised for the assessment of the trees.

3.2 Visual Tree Assessment (VTA)

The VTA is an internationally recognised visual assessment of a tree formulated by Mattheck and Breloer (2004). A visual inspection of a tree is taken from the ground to observe and interpret tree defects and uses the growth response and form of the tree to identify those defects. Such items include, but are not limited to, external signs of decay, growth related defects, physical damage and adverse site conditions.

The VTA is based of the Axiom of Uniform Stress. This is the principle that adaptive growth, as a result of mechanical stresses, results in a condition in which no part of the tree is either underloaded or overloaded. The principle is also related to factors such as availability of carbohydrates in the tree, essential for normal functions such as production of leaves and wood. According to Mattheck and Breloer (2004) 'a tree shows through its configuration what is wrong with it'.

Trees are placed into three main categories following the VTA:

- trees that currently appear to present no significant hazard;
- trees showing immediately diagnosable hazards which may require remedial action; and
- trees with suspected defects which require more detailed assessment.

Data Collection

- A clinometer was used to determine the approximate height of the trees.
- A 6.5m diameter tape was used to obtain the diameter at breast height (1.4m).
- A 30m tape was used to measure crown spread.
- A digital camera was used to record the current condition of existing trees.

3.3 Tree Evaluation

TreeAZ

TreeAZ Version 10.10-ANZ (Barrell 2010) was used to categorise the trees into those that should be considered a material constraint in the context of any proposed development ('A' trees) and those that should not ('Z' trees).

The TreeAZ method of tree assessment is an international method of assessing trees in the planning process that is fully compatible with the advice set out in AS 4970 (2009) Protection of Trees on Development Sites. In summary, trees assessed as potentially important are categorised as 'A' and those assessed as less important are categorised as 'Z'. Further explanation of TreeAZ can be found in Appendix 4 and at www.TreeAZ.com. In the context of new development, all the Z trees are discounted as a material constraint in layout design. All the A trees are potentially important and they dictate the design constraints.

3.0 Methodology

AS 4970-2009 Australian Standard – Protection of Trees on Development Sites.
Reference is made to AS4970 – Protection of Trees on Development Sites. The document describes the best practices for the planning and protection of trees on development sites. It is critical that as part of the future expansion of the site tree protection zones are defined and established.

AS4973-2007 Australian Standard - Pruning of Amenity Trees
AS4373 Pruning of Amenity Trees is the minimum standard for pruning techniques. The intention of the Standard is to encourage pruning practices and procedures that reduce the risk of hazard development, branch failure, pathogen infection and premature tree death. Lopping, topping, flush cuts and stub cuts are unacceptable practices. A summary of AS4373 is provided in Appendix 5.

4.0 The Proposal

4.1 Overview

The development proposal comprises redevelopment within the existing Hurstville Private Hospital building and new building works.

The redevelopment is predominantly internal and located at ground level of building with partial redevelopment within the basement car parks and on level 1. The existing south-east corner of the site is currently a large excavated space used for parking and access.It will be developed to become an extension to the existing building footprint. This extension will include: A new lift, extension of the lower and upper basement levels, and 3 new storeys over the existing two storey medical centre to create a 5 storey building which will be extended into the south-east corner of the site over the new extended basement levels. Refer to Architectural drawings, prepared as part of this submission, for additional information.

5.0 Observations

5.1 Overview

The tree data summary sheets provided in sections 5.3 and 5.4 of the report provides a list of the tree species assessed and measurements including height, DBH and crown spread. The data sheets contain a summary of defects and general observations of the trees form, trunk, branches and canopy, roots and callous formation.

5.2 Common Issues

Common tree defects observed on assessed trees include a variety of issues including:

Topping

Both street trees (TR01 and TR02), identified as a mature Tallowoods (*Eucalyptus microcorys*) had been topped during some stage early in their life. Topping results in the formation of multiple branch attachments at the topping point. Weak branch unions and a history of regular pruning within the canopies of the trees is visible in the pruning wounds and different stages of wound occlusion present. Weak branch unions including epicormic shoots and included bark were observed.

Poor Pruning

Evidence of poor pruning techniques were observed and included stub cuts and flush cuts. Additionally, an observation of the occlusion of wounds provided an indication of tree vigour and the type of pruning technique undertaken.

Crown asymmetry

The VTA also included measurements of the trees crown spread. The measurements were taken to the north, south, east and west, and give an indication of the crown shape in plan and general crown symmetry. Both trees generally exhibit slight crown asymmetry which is normal and in this situation not a major issue.

5.0 Observations

TR01	Botanical Name:	*Eucalyptus microcorys*
	Common Name:	**Tallowwood**

Photograph 1

View from Pearl Street looking south west

Photograph 2

View from Millett Street looking east

Height	DBH	Canopy Spread				Condition		
metres (approx)	metres @ 1.4m	N	E	S	W	Age J / E / M / O	Vigor P / A / G	Structure P / A / G
13	**0.58**	**6.0**	**7.0**	**5.0**	**5.5**	**M**	**A**	**P**

5.3 Tree Summary Data Sheet - Tree 01

Form
Deliquescent, crown slightly asymmetrical with bias to the east.

Trunk
Multi stem from approximately 2.5m above ground level. The tree was observed to have been topped at some stage early in its life. This has resulted in multiple attachments at the point of topping. Trunk taper was considered average.

Branches and Canopy
Flush cuts and stub cuts (not per Australian Standards) were observed. Crown lifting, mainly for pedestrian and vehicle clearance, is evidenced by pruning wounds. Multiple leaders with some weak branch unions, rubbing branches and included bark observed. Live crown ratio was approximately 70% with low volume dead wood observed. Low - medium volume epicormic shoots present.

Roots
The base of the tree is predominantly bare earth with a thin layer of leaf litter. The surrounding soil was compacted.

Callous Formation
Occlusion of new wounds was considered average, an indication the tree exhibits average vigour.

5.0 Observations

TR02	Botanical Name:	*Eucalyptus microcorys*
	Common Name:	**Tallowwood**

Photograph 3

View from Pearl Street looking north east

Photograph 4

View from Millett Street looking east

Height	DBH	Canopy Spread				Condition		
metres (approx)	metres @ 1.4m	N	E	S	W	Age J / E / M / O	Vigor P / A / G	Structure P / A / G
13	**0.60**	**6.0**	**8.0**	**6.0**	**6.5**	**M**	**A**	**P**

5.4 Tree Summary Data Sheet - Tree 02

Form
Deliquescent, crown slightly asymmetrical with bias to the east.

Trunk
Multi stem from approximately 2.5m above ground level. The tree was observed to have been topped at some stage early in its life. This has resulted in multiple attachments at the point of topping. Trunk taper was considered average.

Branches and Canopy
Flush cuts and stub cuts (not per Australian Standards) were observed. Crown lifting, mainly for pedestrian and vehicle clearance, is evidenced by pruning wounds. Multiple leaders with some weak branch unions, rubbing branches and included bark observed. Live crown ratio was approximately 80% with low volume dead wood observed. Low volume epicormic shoots present.

Roots
Basal damage to primary scaffold root. The base of the tree is predominantly bare earth with a thin layer of leaf litter. The surrounding soil was compacted.

Callous Formation
Occlusion of new wounds was considered average, an indication the tree exhibits average vigour.

6.0 Arboricultural Impact Appraisal

6.1 Summary of the impact on trees

An assessment of the impact of the proposal on the retained trees has been made. The two trees that may be affected by the development proposal are listed in Table 1.

Impact	Reason	Important trees		Unimportant trees	
		AA	A	Z	ZZ
Retained trees that may be affected through disturbance to TPZs	Construction works	-	TR01, TR02	-	-
Retained trees to be pruned to fit in the development proposal	Space for development	-	TR01, TR02	-	-

Table 1 - Summary of trees that may be affected by the development.

6.2 Detailed Impact Appraisal

6.2.1 TPZ Disturbance

Two category A trees could potentially be affected through TPZ disturbance. Provided the necessary tree protection measures are implemented and adhered to it is unlikelky the trees would be adversley affected by the works.

6.2.2 Pruning

Both trees would require reduction pruning for building clearances. All pruning works are to be carried out in accordance with Australian Standard 4973 (2007) - Pruning of Amenity Trees and undertaken by an Arborist with minimum AQF Level 2 qualifications in Arboriculture. It is strongly recommended that the pruning works are to be as minimal as possible to allow for proposed building clearances only. An approximate extent of pruning is illustrated in Photograph 5 (below) and the limit of pruning is shown on the Tree Protection Plan (Appendix 6).

6.2.3 Statutory Controls

Both trees are legally protected under Hurstville Council's Tree Preservation Order. It will be necessary to consult Council prior to any pruning is carried out. The proposed pruning works are to be as minimal as possible. All work is to be sanctioned by Hurstville Council prior to being carried out.

6.3 Proposals to mitigate any impact

6.3.1 Protection of retained trees

The successful retention of trees depends on the quality of the protection and administrative procedures to ensure these protective measures remain in place whilst there is an unacceptable risk of damage. An effective means of doing this is through an arboricultural method statement that can be specifically referred to in a planning consent. An arboricultural method statement for this site is setout in detail in section 7.0 of this report.

7.0 Arboricultural Method Statement

7.1 Introduction

7.1.1 Terms of Reference

This section of the report is an arboricultural method statement setting out management and protection details that must be implemented to secure successful tree retention. It has evolved from the best practices outlined in AS4970 (2009) - Protection of Trees on Development Sites.

7.1.2 Plan TPP01

The Tree Protection Plan (TPP01) in Appendix 6 is illustrative and based entirely on the information provided. This plan can only be used for dealing with tree issues and all scaled measurements must be checked against the original submission documents. The precise location of all protective measures must be confirmed at the pre-commencement meeting before any demolition or construction activity starts. Its base is the survey with the proposed layout superimposed so that the two can be easily compared. It shows existing numbered trees and the location of proposed tree protection measures. The tree protection plan has been prepared in accordance with guidelines outlined in AS4970 – Protection of Trees on Development Sites. A tree protection specification is included in Appendices 7 of this report.

7.2 Tree management

7.2.1 Project Arborist

A Project Arborist with AQF Level 5 qualifications is to be engaged to ensure compliance with the tree protection measures and monitor the trees throughout the development process.

7.2.2 Hold Points

A list of hold points are specified in the schedule of works. The hold points include a general description of the task to be undertaken and in what stage of the construction process it is to occur. The purpose of this is to ensure each stage of the works is inspected and certified by the Project Arborist and reported back to the Client and Council.

7.2.3 Schedule of Works and Responsibilities

Hold Point	Task	Responsibility	Certification	Timing of Inspection
1	A pre-commencement site meeting	Principle Contractor	Project Arborist, Council representative	Prior to any demolition or construction works begin
2	Establishment of tree protection zones including installation of tree protection fencing, ground protection and trunk/bark protection.	Principle Contractor	Project Arborist	Prior to demolition and site establishment
3	Inspection of trees by Project Arborist	Principle Contractor	Project Arborist	Bi monthly during construction phase

4	Inspection of trees by Project Arborist	Principle Contractor	Project Arborist	following removal of tree protection measures and prior to issue of Practical Completion.

7.3 Tree protection

7.3.1 Tree Protection

A tree protection plan has been prepared for the two trees identified for retention. The Tree Protection plan identifies Tree Protection Zones (TPZs). It has been prepared in accordance with the guidelines outlined in AS4970 - Protection of Trees on Development Sites. A tree protection specification is included in Appendix 7 of this report.

7.3.2 Tree Protection Measures

Tree protection measures are to be carried out in accordance with the Tree Protection Plan (TPP-01) and associated details contained in Appendix 2 of this report. This is to include tree protection fencing or trunk protection and ground protection.

7.3.3 Tree Protection Fencing

The fencing is to be in accordance with the AS4970- Protection of Trees on Development Sites. Tree protection fencing is to be established prior to site establishment including demolition, earthworks, or construction works. The TPZ fencing is to be maintained at the required distance from the trees and kept secure to prevent access until completion of the works.

The fencing aligns to the edge of the existing footpath. If retained, the concrete footpath is considered sufficient for root protection provided fencing is installed between the back of kerb and footpath alignment. Tree protection signage is to be attached to the fencing so that it is clearly visible. Refer to Appendix 3 for details.

7.3.4 Trunk Protection and Ground Protection

Where fencing cannot be installed, install timber battening to the trunk of the trees, aligned vertically and spaced at 150mm and secured by steel strapping or wire at 300mm wide spacing over protective padding. The timber battens are to be 50 x 100mm hardwood and extend a minimum of 2 metres up the trunk.

If timber battens are to be used ground protection between the kerb and the footpath is required. Ground protection is to include a layer of geotextile membrane laid over the existing ground level overlaid with 100mm mulch or aggregate topped with steel plates or rumble boards. Refer to Appendix 3 for details.

7.3.5 Maintenance of the TPZ

If not otherwise specified the area within the TPZ is to be mulched and to a depth of 100mm. Soil moisture levels are to be monitored by the Project Arborist and supplementary watering or irrigation provided as necessary.

9.0 Bibliography

Publications

Draper, D.B. and Richards, P.A. (2009) *Dictionary for Managing Trees in Urban Environments*. CSIRO Publishing, Collingwood, Victoria, Australia.

Lonsdale, D. (1999) *Principles of Tree Hazard Assessment and Management, Seventh Impression 2009*. TSO (The Stationery Office), Great Britain.

Matheny, N. and Clarke, J.R. (1994) *A Photographic Guide to The Evaluation of Hazard Trees in Urban Areas 2nd Edn*. International Society of Arboriculture, Champaign, Illinois.

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Mattheck, C. and Breloer, H. (1994) *The Body Language of Trees - A Handbook of Failure Analysis, Seventh Impression 2003*. TSO (The Stationery Office) Great Britain.

Roberts, J., Jackson, N. and Smith, M. (2006) *Tree Roots in The Built Environment*. TSO (The Stationery Office) Great Britain.

Standards Australia (2007) *AS 4373-2007 Australian Standard - Pruning of Amenity Trees*. Standards Association of Australia.

Standards Australia (2009) *AS 4970-2009 Australian Standard – Protection of trees on development sites*. Standards Association of Australia.

Appendix 1 - About the Author

Phillip Walbank is a Registered Landscape Architect, Horticulturist and AQF Level 5 Arborist. Phillip is currently employed as a Senior Associate of Moir Landscape Architecture.

Qualifications:
Diploma in Horticulture (Arboriculture) - North Coast Institute of TAFE (2011).
Graduate Diploma in Landscape Architecture – Queensland University of Technology (1998).
Bachelor of Horticultural Science – University of Western Sydney, Hawkesbury (1996).

Institute memberships:
Associate Member of the Australian Institute of Landscape Architects (AILA)
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Insurances:

Type		Insurer Policy No.	Amount	Expiry
Workers compensation	CGU	WNE030832316122	Unlimited	30/06/2013
Public Liability	NRMA	EB 2094970	$20,000,000	15/10/2012
Professional Indemnity	JLT	009032427	$5,000,000	31/10/2012

Appendix 2 - Assumptions & Limiting Factors

1. The report remains the property of the author and the client. It may not be copied or used for any purpose without permission. The author accepts no responsibility its use by other persons.

2. The report is to be in its entirety.

3. The report is based on a Visual Tree Assessment (VTA) undertaken from the ground. No aerial inspection, internal analysis, below ground root inspection has been undertaken.

4. The report only covers identifiable defects present at the time of the inspection. The author accepts no responsibility or liability for any structural defects or unforeseen event / weather conditions that may occur after the time of the inspection and assessment.

5. Trees are living organisms and their condition will change overtime. There is no guarantee for problems or deficiencies of the subject that may arise in the future.

6. Care has been taken to obtain all information from reliable sources however the author cannot guarantee or be held responsible for the accuracy of information provided by others.

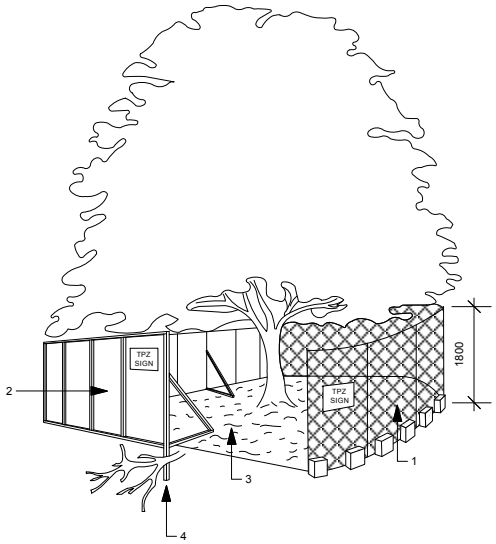
7. Accuracy of survey drawings, including the location of above and below grounds services.

8. Any required updates, reassessment or re-examination of the original report by another party will incur a fee.

9. The author shall not be required to give testimony or to attend court by reason of this report unless subsequent contractual arrangements have been made including payment of additional fees.

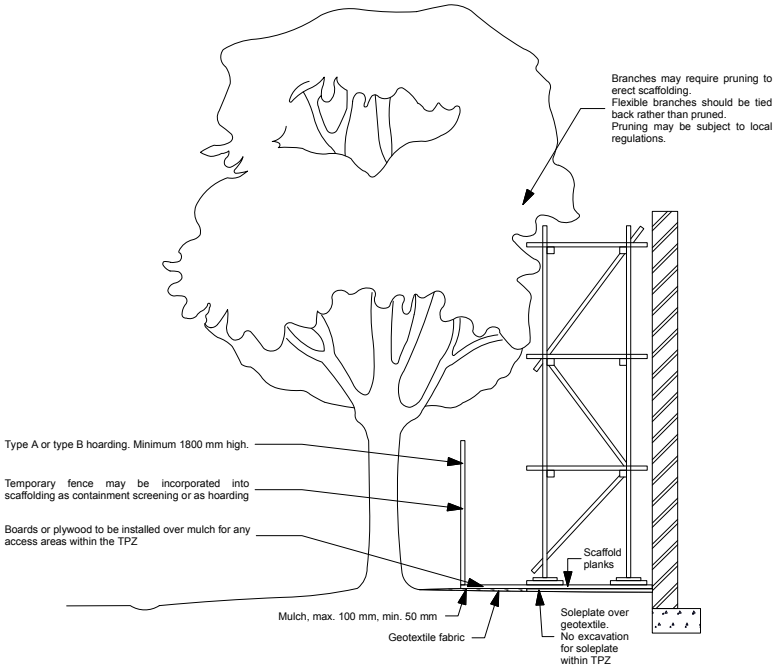
Appendix 3 - Tree Protection Measures

PROTECTIVE FENCING (Standard Australia)



LEGEND:
1: Chain wire mesh panels with shade cloth (if required) attached, held in place with concrete feet
2: Alternative plywood or wooden paling fence panels. This fencing material also prevents building materials or soil entering the TPZ
3: Mulch installation across surface of TPZ
4: Bracing is permissible within the TPZ. Installation of supports should avoid damaging roots

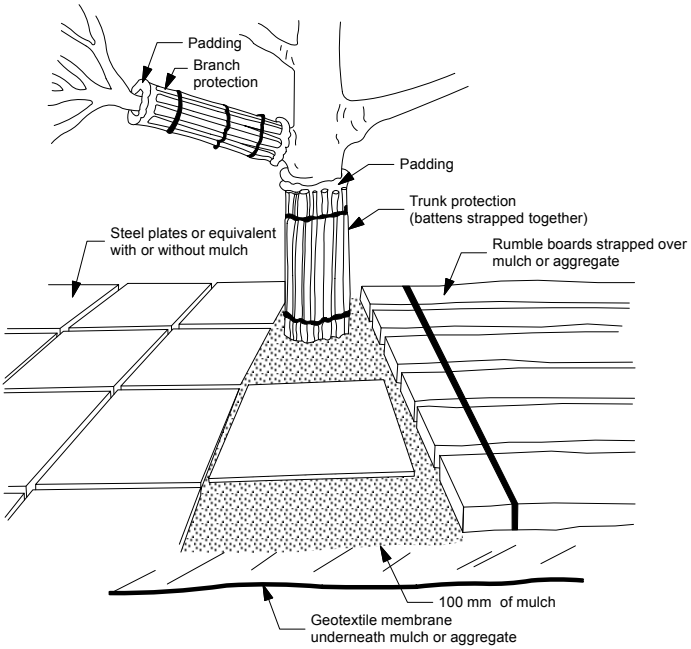
INDICATIVE SCAFFOLDING WITHIN A TPZ (Standard Australia)



NOTE: Excavation required for the insertion of support posts for tree protection fencing should not involve the severance of any roots greater than 20 mmm in diameter, without the prior approval of the project arborist.

Appendix 3 - Tree Protection Measures

EXAMPLES OF TRUNK, BRANCH AND GROUND PROTECTION
(Standard Australia)



Appendix 4 - Summary of TREE AZ

1. TreeAZ and further information: TreeAZ is a method of assessing the quality and importance of trees in the planning process that is fully compatible with the advice set out in DR AS 4970. In summary, trees assessed as most important are categorised as A and those assessed as less important are categorised as Z. All the Z trees are discounted as a material constraint to development. All the A trees are potentially important, and the site constraints are dictated by these trees. This information is then used by the architect to optimise the retention of the best trees in the context of other material considerations. Further information on TreeAZ can be found at www.TreeAZ.com.

2 Underlying principles of TreeAZ: The TreeAZ assessment system is based on the potential for a tree to contribute to amenity; if it is in good condition and can be retained a long time, it has a high potential; if it is in poor condition and cannot be retained for long, it has a low potential. This must not be confused with its present amenity value, which often does not reliably reflect its potential. For example, a tree with a severe defect may have a high present amenity value, but will have little or no potential to contribute to future amenity because it will have to be removed for safety reasons. The only exceptions to this are small or young trees and trees of ecological importance. All trees assessed as having a high potential for contributing to amenity are categorised as A and all trees with a low potential are categorised as Z. Trees that are very good examples of the A category are recorded as AA and trees that are very poor examples of the Z category are recorded as ZZ. These categories are divided into further numbered subcategories that clarify the reason for allocation to the main category. The separation between high and low category trees is based on whether they have a safe useful life expectancy (SULE) of more or less than 10 years. Ten years is the cut off point because it is widely accepted that a tree should have a SULE in excess of 10 years if it is suitable for statutory protection (see www.TreeAZ.com). This test can be logically applied to development sites because if a tree is unsuitable for statutory protection, then it should not realistically be a material constraint in any planning decision because it cannot be reliably protected.

3. How categories dictate the tree constraints: Category A and AA trees can be retained for more than 10 years and so their retention is most desirable. They are the best individuals and should be carefully considered as a material constraint because their loss may have a significant impact on amenity. Category Z and ZZ trees are not worthy of being a material planning constraint because they do not have the potential to contribute to amenity for more than 10 years. They do not have to be retained, their loss will not have a material impact and they are discounted as constraints. However, this does not rule out keeping them if there are sufficient maintenance resources and space.

Appendix 4 - Summary of TREE AZ

CAUTION: TreeAZ assessments must be carried out by a competent person qualified and experienced in arboriculture. The following category descriptions are designed to be a brief field reference and are not intended to be self-explanatory. They must be read in conjunction with the most current explanations published at www.TreeAZ.com.

Category Z: Unimportant trees not worthy of being a material constraint

Local policy exemptions: Trees that are unsuitable for legal protection for local policy reasons including size, proximity and species

Z1	Young or insignificant small trees, below the local size threshold for legal protection, etc
Z2	Too close to a building, i.e. exempt from legal protection because of proximity, etc
Z3	Species that cannot be protected for other reasons, i.e. scheduled noxious weeds, out of character in a setting of acknowledged importance, etc.

High risk of death or failure: Trees that are likely to be removed within 10 years because of acute health issues or severe structural failure.

Z4	Dead, dying, diseased or declining.
Z5	Severe damage and/or structural defects where a high risk of failure cannot be satisfactorily reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, overgrown and vulnerable to adverse weather conditions, etc.
Z6	Instability, i.e. poor anchorage, increased exposure, etc.

Excessive nuisance: Trees that are likely to be removed within 10 years because of unacceptable impact on people.

Z7	Excessive, severe and intolerable inconvenience to the extent that a locally recognised court or tribunal would be likely to authorise removal, i.e. dominance, debris, interference, etc
Z8	Excessive, severe and intolerable damage to property to the extent that a locally recognized court or tribunal would be likely to authorise removal, i.e. severe structural damage to surfacing and buildings, etc.

Good management: Trees that are likely to be removed within 10 years through responsible management of the tree population.

Z9	Severe damage and/or structural defects where a high risk of failure can be temporarily reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, vulnerable to adverse weather conditions, etc.
Z10	Poor condition or location with a low potential for recovery or improvement, i.e. dominated by adjacent trees or buildings, poor architectural framework, etc.
Z11	Removal would benefit better adjacent trees, i.e. relieve physical interference, suppression, etc
Z12	Unacceptably expensive to retain, i.e. severe defects requiring excessive levels of maintenance, etc.

Appendix 4 - Summary of TREE AZ

NOTE: Z trees with a high risk of death/failure (Z4, Z5 & Z6) or causing severe inconvenience (Z7 & Z8) at the time of assessment and need an urgent risk assessment can be designated as ZZ. ZZ trees are likely to be unsuitable for retention and at the bottom of the categorisation hierarchy. In contrast, although Z trees are not worthy of influencing new designs, urgent removal is not essential and they could be retained in the short term, if appropriate.

Category A: Important trees suitable for retention for more than 10 years and worthy of being a material constraint.

A1	No significant defects and could be retained with minimal remedial care
A2	Minor defects that could be addressed by remedial care and/or work to adjacent trees
A3	Special significance for historical, cultural, commemorative or rarity reasons that would warrant extraordinary efforts to retain for more than 10 years
A4	Trees that may be worthy of legal protection for ecological reasons (Advisory requiring specialist assessment)

NOTE: Category A1 trees that are already large and exceptional, or have the potential to become so with minimal maintenance, can be designated as AA at the discretion of the assessor. Although all A and AA trees are sufficiently important to be material constraints, AA trees are at the top of the categorisation hierarchy and should be given the most weight in any selection process.

Appendix 5 - Summary of AS 4373

All pruning work is to be undertaken with due regard for the age, shape, size, character, conditions and position for each tree. Pruning is to be carried out in accordance with Australian Standard 4373 'Pruning of Amenity Trees'. Pruning is to be carried out by an Arborist with minimum AQF Level 3.

Crown maintenance

Dead wooding
Removal of dead, dying, diseased or broken branches from a trees crown. Branch and diameter are to be specified. Trees with hollows or other habitat value – consider input from an Ecologist.

Crown thinning
The selective removal of branches to reduce density and does not generally alter the size of the canopy. To retain the main structural framework of the branches and removal of minor secondary branches. The purpose is to increases light penetration, air flow and decrease branch end weight. Specific to the health, vigor, age and species of the tree. Maximum diameter and location of branches to be removed are to be specified.

Selective pruning
Selective removal of nominated branches that may be causing a specific problem. Specified as part of the assessment.

Formative pruning
Pruning of young trees to assist in the development of the crown, form and shape of the tree and to develop string structure. Often used as a precursor to more specialised pruning (eg pollarding, pleaching etc) and to accommodate site constraints (eg building, utilities, etc).

Crown modification

Pruning that changes the structural appearance and habit of a tree.

Reduction pruning
The removal of branches back to lower laterals for the purpose of reducing encroachment into buildings, powerlines etc. The extent of crown or limb reduction are to be specified.

Crown lifting
The gradual removal of flower branches to allow access and visibility. Height to which the crown is to be lifted are to be specified with resect for the overall height and species of the tree.

Pollarding
A specialised pruning technique usually undertaken on certain deciduous trees that have been formatively pruned at an early age. This system of pruning maintains the tree at a certain size to provide a very formal appearance. It involves internodal cuts made at a chosen height resulting in the development of callous knobs and requires annual removal of epicormic shoots arising from the cut.

Remedial (restorative) pruning
Pruning carried out on trees which have lost their natural form and structure through storm damage, mechanical

damage, vandalism, lopping, dieback or disease. Carried to prolong useful life expectancy of such trees and reduce their hazard potential. A stage approach where the trees are cut back hard to skeleton form and the new growth is reworked form epicormic growth. Regrowth is managed by reduction pruning or crown thinning.

Line clearance
A form of reduction pruning to maintain clearances around overhead services.

Palms
Palms are pruned to remove old and potentially hazardous fronds and fruit. Removal of healthy fronds should be avoided. The terminal growth is never removed as single trunked palms have only one growing point and climbing devices that wound the stem (spikes) should not be used.

Unacceptable practices

Lopping and topping
Lopping is the removal of branches to a distance and not to a collar or bark ridge. Topping is the removal of the upper part of the tree to reduce its height by lopping.
Results of Lopping & Topping:

- Increased rate of shoot production and elongation.
- Resulting regrowth is weakly attached and prone to failure.
- Remaining stubs may decay.
- Natural habit of the tree is destroyed.
- Often reduces the lifespan of the tree.
- Predisposes the trees to fungal infection and insect attack.

Wound painting
Wound dressings and sealants essentially aim to prevent decay, stimulate closure and improve tree appearance. They are applied to assist the occlusion of a wound face. Occlusion is the growth process whereby woundwood develops to enclose the wound face. Most decay problems can be prevented if wounds close rapidly.

They have been found to have little to no effect on the rate of wound closure and in certain cases contain chemicals that may be detrimental to tree health. Tree vigor is considered the best treatment for wounds and decay and greatly reduces the risk of insect infestation or decay. Tree vigor is maintained and enhanced by a programmed regime of fertilising, irrigation and pest management (Harris et al, 2004).

Flush cutting
Flush cutting is cutting the branch as close as possible to the trunk resulting in removal of the branch collar and create large wounds into the trunk.
Results of Flush Cutting:

- Removes or damages the branch collar and stem tissue. These features define and enclose a range of chemical defences.
- Larger wounds are created.
- The tree is required to use more energy and rely on stored starch to occlude the wound.
- Exposed wound is prone to decay.
- Long term defects such as cavities may eventuate.

PROPOSED DEVELOPMENT

LIMIT OF PRUNING

LIMIT OF PRUNING

F1

TR02

F1

F1

F1

TR01

F1

EXISITNG CONCRETE FOOTPATH TO REMAIN

ROOT PROTECTION BOUNDARY

PEARL STREET

LEGEND

TR02 'A' TREES

F1 TREE PROTECTION FENCING

EXTENT OF ROOT PROTECTION

PROPOSED DEVELOPMENT - 2 STOREY AT PEARL STREET

North

0 1 2 3 4 5 10m

TREE PROTECTION PLAN

PROJ: 0806
DWG: TPP01 REVB
DATE: 06-09-12

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Appendix 7 - Tree Protection Specification

EXTRACT – AS 4970-2009 Australian Standard – Protection of trees on development sites. Standards Association of Australia.

3.1 Tree Protection Zone (TPZ)

The tree protection (TPZ) zone is the principal means of protecting trees on development sites. It is a combination of root area and crown area requiring protection. It is an area isolated from construction disturbance so that the tree remains viable.

The TPZ incorporates the structural root zone (SRZ) (refer to Clause 3.3.5)

3.2 Determining the TPZ

The radius of the TPZ is calculated for each tree by multiplying its DBH x 12.

TPZ = DBH x 12 (where DBH is the trunk diameter measured at 1.4m above ground).

Radius is measured from the centre of the stem at ground level.

A TPZ should not be less than 2m nor greater than 15m (except where crown protection is required).Clause 3.3 covers variations to the TPZ.

The TPZ of palms, other monocots, cycads and tree ferns should not be less than 1m outside the crown projection.

3.3 Variations to the TPZ

3.3.1 General

It may be possible to encroach into or make variations to the standard TPZ. Encroachment includes excavation, compacted fill and machine trenching

3.3.2 Minor Encroachment

If the proposed encroachment is less than 10% of the area of the TPZ and is outside the SRZ (see Clause 3.3.5), detailed root investigations should not be required. The area lost to this encroachment should be compensated for elsewhere and contiguous with the TPZ. Variations must be made by the project arborist considering relevant factors listed in Clause 3.3.4.

3.3.3 Major Encroachment

If the proposed encroachment is greater than 10% of the TPZ or inside the SRZ (see Clause 3.3.5), the project arborist must demonstrate that the tree(s) would remain viable. The area lost to this encroachment should be compensated for elsewhere and contiguous with the TPZ. This may require root investigation by non-destructive methods and consideration of relevant factors listed in Clause 3.3.4.

3.3.4 (omitted)

3.3.5 Structural Root Zone

The SRZ is the area required for tree stability. A larger area is required to maintain a viable tree. The SRZ only needs to be calculated when major encroachment into a TPZ is proposed. There are many factors that affect the size of the SRZ (eg. tree height, crown area, soil type, soil moisture). The SRZ may also be influenced by natural or built structures, such as rocks and footings. An indicative SRZ radius can be determined using an equation which takes into account the trunk diameter measured immediately above the root buttress.

Appendix 7 - Tree Protection Specification

SECTION 4 TREE PROTECTION MEASURES

4.1 General

Tree protection measures include a range of activities and structures. Structures are used to identify and isolate the TPZ (refer to Section 3). These measures are identified in the arboricultural impact assessment and tree protection plan. The TPZ is a restricted area usually delineated by protective fencing (or use of an existing structure such as an existing fence or wall). It is installed prior to site establishment and retained intact until completion of the works.

Some works and activities within the TPZ may be authorized by the determining authority. These must be supervised by the project arborist. Any additional encroachment that becomes necessary as the site works progress must be reviewed by the project arborist and be acceptable to the determining authority before being carried out. Approved tree removal and pruning should be carried out before the installation of tree protection measures.

4.2 Activities restricted in the TPZ

Activities generally excluded from the TPZ include but are not limited to-

(a) machine excavation including trenching;
(b) excavation for silt fencing;
(c) cultivation;
(d) storage;
(e) preparation of chemicals, including preparation of cement products;
(f) parking of vehicles and plant;
(g) refuelling;
(h) dumping of waste;
(i) wash down and cleaning of equipment;
(j) placement of fill;
(k) lighting of fires;
(l) soil level changes;
(m) temporary or permanent installation of utilities and signs, and
(n) physical damage to the tree.

4.3 Protective fencing

Fencing should be erected before any machinery or materials are brought onto the site and before the commencement of works including demolition. Once erected, protective fencing must not be removed or altered without approval by the project arborist. The TPZ should be secured to restrict access. AS 4687 specifies applicable fencing requirements. Shade cloth or similar should be attached to reduce the transport of dust, other particulate matter and liquids into the protected area. Fence posts and supports should have a diameter greater than 20 mm and be located clear of roots. Existing perimeter fencing and other structures may be suitable as part of the protective fencing.

4.4 Signs

Signs identifying the TPZ should be placed around the edge of the TPZ and be visible from within the development site (refer Figure 3). The lettering on the sign should comply with AS 1319.