



ARBORICULTURAL IMPACT ASSESSMENT REPORT MILPERRA VILLAGE: VERSION 2



PREPARED BY

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#### 1.0 INTRODUCTION

Sturt Noble Arboricultural Consulting was engaged by Anglican Community Services to assess the trees on the site of a new Seniors and RACF development at Bullecourt Avenue, Milperra. We were also engaged to provide an Arboricultural Impact Assessment Report, including management of any trees proposed to be retained, to assist Anglican Community Services in preparing a Development Application to City of Canterbury Bankstown Council.

The Development Application seeks consent to construct a Seniors and RACF development containing basement carparking, on grade visitor parking, community centre, a residential care building and 3 blocks of seniors living. This development will require removal of 26 No. existing trees on site.

Arborist Guy Sturt inspected 98 trees located both on site (26 trees) and on adjacent land- on the Council verge along Bullecourt Avenue/ Lane (23 trees) and the adjacent Golf Course (49 Trees): Denoted trees 1-98; on 15<sup>th</sup> August 2017; and trees were assessed by the Visual Tree Assessment (VTA) method. (Mattheck & Breloer, 1994).

All of the trees were assessed by viewing from the ground. No aerial inspection or diagnostic testing was undertaken as part of this assessment.

Consulting Arborist Guy Sturt; in this report considers the likely impacts of works proposed and makes recommendations for tree removal, retention and protection.

The aims of this report are:

- To assess/ review the condition of existing trees located within the vicinity of a new Seniors and RACF development construction in order to assess each individual tree's suitability to be retained as a sustainable part of the landscape in the long term. This includes impacts on trees located on neighbouring sites.
- To provide information to the Anglican Community Services, Project Manager, Engineers and other consultants on recommended adjustments if required to their designs that will enable trees to be retained or have better long term health outcomes and minimize potentials for hazard.
- To satisfy the requirements of the consent authority by providing information about the trees their overall health and suitability for removal or retention based on plans supplied.
- To provide information to the Anglican Community Services, Project Manager and Site Manager on appropriate tree protection measures, appropriate setbacks, constraints and tree management procedures during site works.
- To provide information to Anglican Community Services, Project Manager and Site Manager about the importance of tree management and necessary protection measures required to prevent creating a later hazard due to site works.

#### 2.0 METHODOLOGY

### 2.1 Tree Assessment

Consulting Arborist Guy Sturt visited the site on 15<sup>th</sup> August 2017; to assess the trees and consider the likely impacts of works proposed on 98 trees located both on site and on adjacent land- on the Council verge along Bullecourt Avenue/ Lane and the adjacent Golf Course (Denoted trees 1-98). This assessment is summarised in Appendix 1.

The trees were assessed from the ground by the Visual Tree Assessment (VTA) method as described in Mattheck & Breloer (1994), using non-invasive tools such as binoculars and acoustic mallet. No digging or exposing of the root zones occurred in this inspection and no aerial inspection by climbing was performed.

The following data was collected for each tree:

- Botanical and common name.
- Tree dimensions.
- Canopy density.
- Overall health and vitality, including epicormic growth, deadwood and predation by pests and diseases.
- Structural condition was assessed including evident faults such as *Bark Inclusions* or poor branch attachments, decay, cavities and mechanical or biological damage.
- Stability of the tree including excessive trunk lean, stability of the soil, soil cracking, soil heaving, exposed roots and root damage.
- Health and condition was rated as *Good, Fair* or *Poor*, based on overall tree *vigour* and *structure* at the time of inspection.
- Tree retention values were assessed by assessing each tree according to the Sustainable Retention Index Value Matrix (SRIV)
- The Tree Protection Zones (TPZ) and Structural Root Zones (SRZ).

We note full assessment was not carried out on the trees on the adjacent Golf Course (49 Trees) as these are separated from the site by a drainage channel and encroachment should not occur on this boundary. These trees were broadly assessed as a group with the exception of some exotic specimens.

# 2.2 Tree Protection Zones (TPZ) and Structural Root Zones (SRZ)

The Tree Protection Zones (TPZ) and Structural Root Zones (SRZ) have been arrived at using methods as detailed in Australian Standard AS 4970– 2009. The intention of the TPZ is to ensure protection of the root system and canopy from the potential damage from construction works and ensure the long-term health and stability of each tree to be retained. The Structural Root Zone (SRZ) is located within the TPZ and provides the bulk of mechanical support and anchorage for a tree.

#### 2.3 Incursions to the Tree Protection Zone

Under AS 4970:2009 Protection of trees on development sites, an incursion of up to 10% of the area of the TPZ is considered acceptable, provided that there is no encroachment to the SRZ. Major (> 10%) incursions to the TPZ may require more detailed investigations, such as exploratory excavations and root investigation to enable an informed evaluation of the potential impact of the proposed works.

# 2.4 Incursions into the Structural Root Zone

Incursions into the SRZ are not likely to be supported unless the Project Arborist has undertaken exploratory investigation and can demonstrate that there will be minimal impact to the tree.

### 3.0 OBSERVATIONS

# 3.1 The Site

The site is a rectangular shaped lot of land (Lot 161 DP 752013) at Bullecourt Avenue, Milperra located on the site of the previous practice fairway at Bankstown Golf Course. It has a total area of approximately 2.765 Ha. and is a flat cleared site with 26 native trees located within mown turf.

Tree specimens are generally scattered in open lawn and receive full sun exposure. 49 specimens largely *Melaleuca decora* (Tree No. 36-84) are located just outside the site to the edge of the practice chipping green and maintenance shed on Bankstown Golf Course. In addition; a further 22 Spotted Gum (*Corymbia maculata*) are located in the council verge along Bullecourt Avenue.



#### Figure 1: Location Plan

#### 3.2 Soils

Green Web-Sydney states that along the Georges River, Hawkesbury Sandstone dominates and has small fringes of Quaternary alluvium along river and creek margins. Low lying alluvium supports River-flat Forest, Freshwater Wetland, and/or Estuarine Complex.

However, it is noted that as trees are located within a levelled golf course fairway the soils would be significantly disturbed.

#### 3.3 Vegetation Community

The site is highly disturbed and modified. The entire site has been largely cleared for the golf course development. Scattered specimens of *Melaleuca decora* which are possibly remnant of the former vegetation community occur on site.

## 3.4 Tree Health and Condition

A complete tree assessment schedule for the trees both on site (26 trees) and on adjacent land- on the Council verge along Bullecourt Avenue/ Lane (23 trees denoted trees 1-23, 24-35,85-98) was prepared and is included in Appendix 1. This includes the following: a tree number, botanical name, common name, height, canopy spread, canopy density, defects, pests & diseases and a SRIV rating (IACA 2010).

We note full assessment was not carried out on the trees on the adjacent Golf Course (49 Trees) Denoted trees 36-84; as these are separated from the site by a drainage channel and encroachment should not occur on this boundary. These trees were broadly assessed as a group with the exception of some exotic specimens.

All trees identified on the site are Australian native trees. Figure 2 indicates the tree locations.

None of the native trees identified on the development site are listed as significant trees under the Bankstown Council's Register of Significant trees, Threatened or Vulnerable species. The *Melaleuca decora* possibly form part of the former vegetation community on site. We would recommend replanting the existing drainage channel on the site with specimens of *Melaleuca decora*; as well as using them at points along the new overland flow paths through the site.

#### 3.5 Construction Methodology

The plans provided by Bickerton Masters Architects with details of the proposed new residential apartment are minimal with regard to Construction Detailing. The Drawings prepared by Bickerton Masters Architects (Figure 3) indicates underground basement parking will be excavated over a moderate part of the site-generally under the building footprints.

In addition; the site levels are been altered over a large extent of the site to manage flood constraints which will result in the remaining trees on site being removed.

# 3.6 Construction Impacts

There are very minor incursions (less than 10%) to the *Corymbia maculata* on the Council verge along Bullecourt Avenue.

Trees No. 1 -11 have a retaining wall built on the edge of their TPZs and a level change of 600mm as part of flood mitigation works. Trees 12-21 have a pathway built and a level change on the edge of their TPZs.

All these incursions are considered acceptable subject to the implementation of the tree protection measures specified in this report.

It is noted that Tree Number 22 on the corner of Bullecourt Avenue and Bullecourt Lane will impacted by the construction of the new footpath on Bullecourt Avenue to access the bus stop and pedestrian refuge requested by Council. The tree will require removal to implement these works and Anglicare will need to seek consent for removal from Council.

It is also noted that Tree Number 23 on the Council land on the currently unformed Bullecourt Lane will be impacted by the reconstruction of the new entry road required to service the development. The TPZ will be encroached by 28% which is generally not acceptable under *AS 4970:2009 Protection of trees on development sites*. Root pruning for any roadworks will create a significant encroachment and removal is recommended.

The tree will require removal to implement these works and Anglicare will need to seek consent for removal from Council.

Forseeable impacts on other trees on the adjacent sites from the proposed construction type and anticipated methodology include:

- Excavations for landscape paved areas and retaining walls
- Excavations and trenching for underground services.
- Ripping or cultivation of soil for landscaped areas.
- Excavations and footings for boundary fences.
- Excavations for drainage swales and overland flow.
- Soil level changes including the placement of fill material for the footings and to make up grades to landscape areas.
- Laying impermeable paving to paths and slabs.
- · Movement and storage of plant, equipment & vehicles;
- Storage of building materials, waste and waste receptacles.

Figure 2: Existing Trees



# LEGEND

SITE BOUNDARY



EXISTING TREES REFER TO TREE ASSESSMENT SHEET

SURVEY INFORMATION FROM: RYGATE AND COMPANY PTY LIMITED P.W. RYGATE AND WEST REF: 74578 REV: E



SCALE 1:800 @ A3

Figure 3: Development Plan – Ground Floor



# 4.0 DISCUSSION

#### 4.1 Tree Retention

The Retention Values for all trees on site have been established and are included in Appendix 1. These have been determined on the basis of the estimated longevity of the trees and their landscape significance rating. One tree surveyed is dead and will require removal and does not enter into the discussion.

Proposed site design and construction of the development and associated infrastructure/ facilities should consider the Tree Protection Zones as discussed in the following sections to minimise any adverse impact to trees on adjacent land.

In addition to Tree Protection Zones, the extent of the canopy (canopy dripline) should also be considered, particularly in relation to construction activities and along access points. Significant pruning of trees to accommodate digging machinery is generally not acceptable.

#### 4.3 Tree Protection

#### 4.3.1 General

Bankstown's Tree Preservation Order (BCC, 2005) "prohibits the ring–barking, cutting down, topping, lopping, removing, injuring, or the wilful destruction of any tree except with the consent of Council, or if exempt under Part E2 of this DCP.

Part E2 of this DCP does not apply where it can be proven to Council that a tree is dead, dying, has become dangerous, or if its removal is necessary to protect human life or property from the imminent danger of a bushfire burning in the vicinity.

Council must consider (but not be limited to) the following matters when determining an application under Part E2 of this DCP:

- (a) the existing and likely future amenity of the area by considering if the tree is:
  - (i) significant as a single specimen than as part of a group of trees;
  - (ii) of historic or cultural significance;
  - (iii) registered on Council's register of significant trees;
  - (iv) prominent due to its height, size, position, or age;
  - (v) endemic, rare, or endangered;
  - (vi) provides a significant visual screen."

This tree removal/ management application will be made as part of the Development Application for the Development and as such will not require a separate Tree Permit Application. This report will support the Application. Moreover all works on site in the vicinity of adjacent trees; will be specified and certified in accordance with the provisions of Australian Standard *AS4970 – 2009 Protection of trees on development sites* (Standards Australia 2009).

In order to determine how much space trees require for their long term viability, Tree Protection Zones (TPZs) and Structural Root Zones (SRZs) are calculated in accordance with AS 4970:2009 Protection of trees on development sites.

# 4.3.2 Tree Protection Zones (TPZ)

The intention of the TPZ is to ensure protection of the root system from the potential damage from construction works and ensure the long-term health and stability of each tree to be retained. Suitable protective devices, such as temporary fencing, trunk protection boards or ground protection (where appropriate) must be installed to ensure adequate protection of a tree from construction activity and avoid disturbance within the TPZ.

The indicative TPZ areas have been calculated as specified in Section 3.2 of AS 4970:2009 Protection of trees on development sites.

Additionally the report considers and addresses specific site factors that may influence the location of the TPZ and/or structural tree roots. Examples of factors to be considered are (but not limited to) the location of rocks, footings, watercourses, structures, other vegetation and soil types. The indicative TPZ may require adjustment accordingly.

AS 4970:2009 Protection of trees on development sites prohibits the following activities within specified Tree Protection Zones:

- a. excavations and trenching (with exception of the approved foundations and underground services);
- b. ripping or cultivation of soil;
- c. mechanical removal of vegetation (using an excavator or similar);
- d. soil disturbance or movement of natural rock;
- e. soil level changes including the placement of fill material (excluding any suspended floor or slab);
- f. movement and storage of plant, equipment & vehicles;
- g. erection of site sheds;
- h. affixing of signage or hoardings to trees;
- i. storage of building materials, waste and waste receptacles;
- j. storage of bulk materials such as sand, gravel, soil, spoil or similar materials;
- *k.* disposal of waste materials and chemicals including paint, solvents, cement slurry, fuel, oil and other toxic liquids; and
- *I.* any other physical damage to the trunk or root system or any other activity likely to cause damage to the tree.

#### 4.4 Impact Assessment

The impacts of construction of the basement, buildings, access ramps, earthworks and drainage swales are such that all twenty six (26) trees on site which will require removal. We note the majority of these have been classified as overmature or senescent and at the end of their safe useful life expectancy.

The plan in Figure 4 indicates there no evident impacts of the proposed building construction on the existing trees adjacent to the site proposed to be retained and protected.

With implementation of the tree protection measures it should be possible to maintain the majority of trees on the adjacent sites with no adverse impacts.

Tree Number 22 on the corner of Bullecourt Avenue and Bullecourt Lane will impacted by the construction of the new footpath on Bullecourt Avenue to access the bus stop and pedestrian refuge requested by Council. The tree will require removal to implement these works and Anglicare will need to seek consent for removal from Council.

It is also noted that Tree Number 23 on the Council land on the currently unformed Bullecourt Lane will be impacted by the reconstruction of the new entry road required to service the development. The TPZ will be encroached by 28% which is generally not acceptable under *AS 4970:2009 Protection of trees on development sites*. Root pruning for any roadworks will create a significant encroachment and removal is recommended.

This tree will require removal to implement these works and Anglicare will need to seek consent for removal from Council. This is a *Melaleuca decora* of low vigour and fair condition with a short term retention value (Refer Appendix 1: Tree Assessment Schedule)

Figure 4: Impact assessment



# **ENCROACHMENT SCHEDULE**

Encro

achment (%)	
0.2%	
9.7%	
3.5%	
0.0%	
3.8%	
9.3%	
6.7%	
7.8%	
4.7%	
3.8%	
8.9%	

#### 5.0 CONCLUSIONS

A complete tree assessment schedule for the trees both on site (26 trees) and on adjacent land- on the Council verge along Bullecourt Road/ Lane (23 trees) denoted trees 1-23, 24-35,85-98) was prepared.

Trees on the site are mostly mature specimens adapted to the existing conditions. In general any proposed new developments shall optimally provide for the long term health of those existing trees which are recommended for retention. However due to the excavated basement carpark & building, drainage swales, earthworks, access paths, roads and on grade carpark footprint covering a large part of the site; no existing trees on the site will be able to retained.

All Twenty six (26) trees on site have been identified as requiring removal to enable the construction of the development. (Figure 5)

None of the native trees identified on the development site are listed as significant trees under the Bankstown Council's Register of Significant trees, Threatened or Vulnerable species. We note the majority of these to be removed have been classified as overmature or senescent and at the end of their safe useful life expectancy.

We note full assessment was not carried out on the trees on the adjacent Golf Course (49 Trees) Denoted trees 36-84; as these are separated from the site by a drainage channel and encroachment should not occur on this boundary.

Any proposed works to this existing drainage channel will need to be reviewed to ensure that the many roots are currently exposed in this channel are not impacted; and any proposed works shall mitigate the current situation if possible (ie. Cover the exposed roots and stabilize the channel). We would recommend replanting the existing drainage channel on the site with specimens of *Melaleuca decora;* as well as using them at points along the new overland flow paths through the site.

There are very minor incursions (less than 10%) to the *Corymbia maculata* on the Council verge along Bullecourt Avenue/ Lane. Trees No. 1 -11 have a retaining wall built on the edge of their TPZs and a level change of 600mm as part of flood mitigation works. Trees 12-21 have a pathway built and a level change on the edge of their TPZs.

All these incursions are considered acceptable subject to the implementation of the tree protection measures specified in this report.

Tree Number 22 on the corner of Bullecourt Avenue and Bullecourt Lane will impacted by the construction of the new entry road on Bullecourt Lane and bus stop access requested by Council. The tree will require removal to implement these works and Anglicare will need to seek consent for removal from Council.

It is also noted that Tree Number 23 on the Council land on the currently unformed Bullecourt Lane will be impacted by the reconstruction of the new entry road required to service the development. The TPZ will be encroached by 28% which is generally not acceptable under *AS 4970:2009 Protection of trees on development sites*. Root pruning for any roadworks will create a significant encroachment and removal is recommended.

The final fencing and landscape designs will need to be reviewed to ensure no TPZ's are encroached. Trees on the adjacent sites must be protected from potential damage caused by construction activities. Tree Protection can include fencing, trunk/branch protection and ground protection. Refer to Section 6.0 for detailed requirements and for activities prohibited within any Tree Protection Zone.

Where recommended work processes and tree protection measures cannot be adhered to further advice should be sought from the Project Arborist.



nt (%)
2%
%
5%
)%
3%
3%
%
3%
%
3%
9%

### 6.0 TREE PROTECTION RECOMMENDATIONS

#### 6.1 Design of the Development

A complete tree assessment schedule for the trees both on site (26 trees) and on adjacent land- on the Council verge along Bullecourt Road (23 trees) denoted trees 1-22, 23-35,85-98) was prepared.

We note full assessment was not carried out on the trees on the adjacent Golf Course (49 Trees) Denoted trees 36-84; as these are separated from the site by a drainage channel and encroachment should not occur on this boundary.

The Spotted Gum (*Corymbia maculata*) located on the council Verge on Bullecourt Road (Tree Nos. 1-21) are largely clear of development in their TPZ's and encroachment should not occur across this boundary. The final fencing and landscape/ civil designs will need to be reviewed to ensure that TPZ's are not encroached.

It is noted that Tree Number 22 on the corner of Bullecourt Avenue and Bullecourt Lane will impacted by the construction of the new footpath on Bullecourt Avenue to access the bus stop and pedestrian refuge requested by Council. The tree will require removal to implement these works and Anglicare will need to seek consent for removal from Council.

Tree Number 23 on Bullecourt Lane is likely to be impacted by the construction of the new entry road. The TPZ will be encroached by 24.5% which is not acceptable under AS 4970:2009 Protection of trees on development sites. The options will be either to seek consent for removal or root pruning from the landowner. Root pruning will create a significant encroachment and removal is recommended.

#### 6.2 Tree Removal

Application for removal of all Twenty Six (26) trees on site (No. 24-35,85-98) is sought as part of the Development Application. These have been identified as requiring removal due to excavation of foundations/ basement or site filling for the development.

Tree No 89 is dead and does not require consent.

Anglicare shall seek consent for removal of Tree No. 22 Spotted Gum (*Corymbia maculata*) and Tree No. 23 White Feather Honey Myrtle (*Melaleuca decora*) from Council on their road reserves.

#### 6.3 Canopy and root pruning

#### 6.3.1 Canopy pruning

Care shall be taken when operating backhoes, excavators and similar equipment near trees to avoid damage to tree canopies (foliage and branches). Under no circumstances shall branches be torn-off by construction equipment. Where there is potential conflict between tree canopy and construction activities, the advice of the Project Arborist must be sought.

All pruning works shall be directed by the Project Arborist and shall be carried out by an AQF Level 3 Arborist. All pruning works shall be in accordance with the Australian Standard (*AS*) 4373:2007 Pruning of amenity trees. This standard outlines appropriate pruning practices and procedures that reduce the risk of damage and injury to trees. Correct pruning practices respect the natural form and branching habit of a tree and work with the trees natural defence mechanisms against disease to avoid damage and injury to trees.

Pruning should always be limited to the minimum amount necessary to achieve the desired aim. Significant loss of foliage created by excessive pruning may weaken the tree, leading to premature decline or predisposition to branch failure or disease, creating potential hazards.

Council consent will be required prior to commencement of the work. Pruning must be performed in accordance with *Australian Standard (AS)* 4373:2007 Pruning of amenity trees (Standards Australia 2007).

# 6.3.2 Root pruning

Exploratory excavation may be required where the proposed excavation created by the development works exceeds 10% of the Tree Protection Zone of any Prescribed Tree; or service trenches are required within the TPZ; to determine the impact of the development on the tree. The purpose of the investigation is to verify the quantity, size, type, depth and orientation of tree roots along the perimeter of the proposed encroachment in order to make an informed judgement in relation to the potential impact on the tree.

Exploratory excavation shall only be carried out using non-destructive or non-injurious techniques, such as careful digging using hand held implements, using compressed air (Airspade®), water pressure, or suction (vacuum device) or a combination of these techniques, to carefully remove soil without damaging roots. The work shall be undertaken by an arborist with a minimum qualification of AQF Level 3. Once roots are exposed, a visual examination can be carried with the Project Arborist to evaluate the potential impact of the proposed root loss on the health and stability of the tree.

The results of the root investigation together with the Development Impact Assessment must be documented in the report and submitted together with the DA. The report shall contain information that demonstrates that the trees will remain viable in conjunction with the works.

Where root pruning is required, roots shall be severed with sterile, clean, sharp pruning implements resulting in a clean cut. Any excavated root zones shall be retained in a moist condition during the construction phase using Hessian material or mulch where practical. Trees that have roots removed shall have drip irrigation installed around the root zone to ensure they receive an adequate supply of water.

#### 6.4 Tree Protection Measures

It is recommended a site specific Tree Protection Plan (TPP) is prepared to guide the construction process to ensure all trees designated for retention remain as a sustainable part of the landscape in the long term.

The plan shall be prepared by a consulting arborist (AQF Level 5) and should at a minimum include a detailed plan of the locations of, and specifications for, tree protection measures.

The TPP shall include a monitoring schedule relating to critical points during the works (hold points) where the Project Arborist is required to visit the site and confirm that works are being undertaken as conditioned by Council/as required.

The following tree protection measures shall be implemented prior to the commencement of any site works, and shall remain in place for the duration of the development.

#### 6.4.1 Tree Protection Zones

The Tree Protection Zones recommended for all trees external to the site to be retained shall be equivalent to the Tree Protection Zone as specified in Figure 4 & Appendix 1 This is a radial distance measured from the centre of the trunk of the subject trees.

The following activities are prohibited within the specified Tree Protection Zones:-

- Excavations and trenching (with exception of the approved foundations and underground services);
- Ripping or cultivation of soil;
- Mechanical removal of vegetation;
- Soil disturbance
- Soil level changes including the placement of fill material (excluding any suspended floor or slab);
- Movement and storage of plant, equipment & vehicles;
- Erection of site sheds;
- Affixing of signage or hoardings to trees;
- Storage of building materials, waste and waste receptacles;
- Disposal of waste materials and chemicals including paint, solvents, cement slurry, fuel, oil and other toxic liquids;
- Other physical damage to the trunk or root system; and

• Any other activity likely to cause damage to the tree.

Place a 50-75mm layer of coarse organic mulch over the entire surface of the TPZ. Where the TPZ is adjacent to construction activities first lay down geotextile fabric beneath the mulch to facilitate easy removal of the mulch at completion and any accidental spillage of construction materials.

Install drip irrigation installed around the root zone if required by the Project Arborist.

### 6.4.2 Tree Protection Fencing

All trees external to the site to be retained shall be protected prior to and during construction from all activities that may result in detrimental impact by erecting a suitable protective fence beneath the canopy to the full extent of the Tree Protection Zone (excluding the footprint of the proposed works and areas within adjoining properties).

As a minimum the fence should consist temporary chain wire panels 1.8 metres in height, supported by steel stakes as required and fastened together and supported to prevent sideways movement. The fence shall be erected prior to the commencement of any work on-site and shall be maintained in good condition for the duration of construction. Where tree protection zones merge together a single fence encompassing the area is deemed to be adequate.

Appropriate signage shall be installed on the fencing to prevent unauthorised movement of plant and equipment or entry to the Tree Protection Zone.

Refer to appendix 2 for examples of protective fencing and signage.

# 6.4.3 Trunk, Branch & Ground Protection

Pavements should be avoided within the Tree Protection Zone of trees to be retained where possible. Proposed paved areas within the Tree Protection Zone of trees to be retained should be placed above grade to minimise excavations within the root zone and avoid root severance and damage.

Placement of fill material within the Tree Protection Zone of trees to be retained should be avoided where possible. Where placement of fill cannot be avoided, the material should be a coarse, gap-graded material such as 20 – 50mm crushed basalt (Blue Metal) or equivalent to provide some aeration to the root zone. Note that Roadbase or crushed sandstone or other material containing a high percentage of fines is unacceptable for this purpose. The fill material should be consolidated with a non-vibrating roller to minimise compaction of the underlying soil. A permeable geotextile may be used beneath the subbase to prevent migration of the stone into the sub-grade. No fill material should be placed in direct contact with the trunk.

Refer to Appendix 2 for examples of trunk, branch and ground protection.

#### 6.4.4 Excavations within Tree Protection Zones

The excavator shall work within the footprint of existing pavements where possible to avoid compaction of the adjacent soil and Tree Protection Zones.

#### 6.4.5 Underground Services

All proposed underground services should be located as far away as practicable to avoid excavation within the Tree Protection Zone of trees to be retained.

For underground services, where the incursion to the Root Zone is less than 10% of the total TPZ (i.e. beyond the Minimum Setback Distance), a chain trenching device may be used. A backhoe or skid steer loader (bobcat) is unacceptable due to the potential for excessive compaction and root damage. Where large woody roots (greater than 50mm in diameter) are encountered during excavation or trenching, these shall be retained intact wherever possible (eg by sub-surface boring beneath roots or re-routing the service etc).

Excavations required for underground services within the Structural Root Zone of any tree to be retained should only be undertaken by sub-surface boring. The Invert Level of the pipe, plus the pipe diameter,

must be lower than the estimated root zone depth as specified at a minimum depth of 600mm. This will depend on the soil conditions at the site. Where this is not practical and root pruning is the only alternative, proposed root pruning should be assessed by the Project Arborist to determine continued health and stability of the subject tree.

# 6.4.6 Tree Damage/ Decline

If trees show signs of stress or deterioration, remedial action shall be taken to improve the health and vigour of the subject tree (s) in accordance with best practice arboricultural principles. Advice must be sought from the Project Arborist.

In the event of any tree becoming damaged for any reason during the construction period the Project Arborist must be engaged to inspect and provide advice on any remedial action to minimise any adverse impact. Such remedial action shall be implemented as soon as practicable and certified by the arborist.

#### 7.0 DISCLAIMER

The author and Sturt Noble Arboricultural Consulting take no responsibility for actions taken and their consequences, contrary to those expert and professional instructions given as recommendations.

This is not a hazard assessment report and it should be noted that trees are always inherently dangerous. This assessment was carried out from the ground, and covers what was reasonably able to be assessed and available to the assessor at the time of inspection. No aerial or subterranean inspections were carried out and structural weakness may exist within roots, trunk or branches.

Any protection or preservation methods recommended are not a guarantee of tree survival or safety but are designed to improve vigour and reduce risk. Timely inspections and reports are necessary to monitor the trees' condition. No responsibility is accepted for damage or injury caused by the trees and no responsibility is accepted if the recommendations in this report are not followed.

#### Limitations on the use of this report:

Trees are dynamic living structures, growing and adapting to conditions around them. Tree condition will change and vary over time depending on weather, environmental factors and mechanical or human interaction.

This report is to be utilised in its entirety only. Any written or verbal submission, report or presentation that includes statements taken from the findings, discussions, conclusions or recommendations made in this report, may only be used where the whole of the original report (or a copy) is referenced in, and directly attached to that submission, report or presentation.

#### Assumptions

Care has been taken to obtain information from reliable resources. All data have been verified insofar as possible; however, Sturt Noble Arboricultural Consulting can neither guarantee nor be responsible for the accuracy of information provided by others.

Unless stated otherwise:

Information contained in this report covers only the trees that were examined and reflects the condition of the trees at the time of inspection.

Assessment is limited to the conditions at the time of the inspection and only trees discussed in the report have been assessed.

Where access to the base of the tree is limited, such as difficult site access due to site conditions, only general comments can be made. Assessment of tree health and structure is limited to that visible from the site of proposed works and may not reflect the true condition of the tree. Assessment of tree health and structure is limited to that visible from the site of proposed works and may not reflect the true condition of the tree.

Plans used to assess likely impact are those appended/ referenced.

Ongoing monitoring of all trees is advised and where significant changes are observed, further advice should be requested.

Unusual developments or sudden changes in a tree's condition should be addressed immediately.

#### 8.0 **REFERENCES**

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Googlemaps ©. Viewed 16<sup>th</sup> August 2017

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Standards Australia (2007) Australian Standard AS4373-2007 *Pruning of Amenity Trees,* Pub. Standards Australia, Sydney.

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9.1 Appendix 1 Tree Assessment Schedule

Tree Assessment Snee	Tree	'ee	Asse	ssme	nt	She	et
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Location:		1633	3 Mil	perra	a Villa	age.	Bulle	ecou	rt Roa	ad, N	1ilpeı	rra.																
Client:		Angl	licare	5																								
Date:		24.0	)8.20	17																								
				Dim	nenti	ons				Hea	alth			Vigo	our			St	ructu	ire			Ag	ge Cla	ass	1	~ ~	
Tree No.	Botanical Name / Common Name	<b>TPZ</b> radius (m)	SRZ radius (m)	DBH (m)	DAB (m)	Height (m)	Spread EW (m)	Spread NS (m)	Deadwood	Dieback	Pests	Diseases	Canopy density %	Foliage size	Foliage colour	Extension growth	Inclusions	Fractures	Wounds	Cavities	Decay	Senescent	Mature	Semi Mature	Young	New planting	tetention Value SRIV	Comments
	COUNCIL VERGE																											
1	Corymbia maculata Spotted Gum	4.32	2.43	0.36	0.48	12	8	8			yes	0	80	small	Good	No							•				MGVF9	Large Wound. Mistletoe infestation.
2	Corymbia maculata Spotted Gum	6	2.85	0.5	0.7	12	8	8			yes	0	80	small	Good	No							•				MGVF9	Mistletoe infestation.Co-Dominant
3	Corymbia maculata Spotted Gum	4.56	2.45	0.38	0.49	11	6	5			yes	0	80	small	Good	No							•				MGVF9	Large Wound. Mistletoe infestation.Small wound.
4	Corymbia maculata Spotted Gum	3.6	2.25	0.3	0.4	10	6	6			yes	00	80	small	Good	No							•				MGVF9	Mistletoe infestation.
5	Corymbia maculata Spotted Gum	4.32	2.41	0.36	0.47	12	6	9			yes	00	80	small	Good	No							•				MGVF9	Mistletoe infestation.
6	Corymbia maculata Spotted Gum	5.16	2.61	0.43	0.57	12	7	8			yes	00	80	small	Good	No							•				MGVF9	Mistletoe infestation.
7	Corymbia maculata Spotted Gum	3.84	2.3	0.32	0.42	10	7	8			yes	0	80	small	Good	No							•				MGVF9	Mistletoe infestation.
8	Corymbia maculata <b>Spotted Gum</b>	3.84	2.32	0.32	0.43	12	7	9			yes	G	80	small	Good	No							•				MGVF9	Mistletoe infestation.
9	Corymbia maculata Spotted Gum	3.6	2.25	0.3	0.4	12	7	8			yes		70	small	Good	No							•				MGVP6	Mistletoe infestation.
10	Corymbia maculata Spotted Gum	4.32	2.41	0.36	0.47	12	7	8			yes		70	small	Good	No							•				MGVP6	Mistletoe infestation.
11	Corymbia maculata Spotted Gum	5.16	2.57	0.43	0.55	12	8	10			yes	ċ	70	small	Good	No							•				MGVP6	Mistletoe infestation.
12	Corymbia maculata Spotted Gum	4.44	2.55	0.37	0.54	10	7	8			yes	ŝ	80	small	Good	No							•				MGVF9	Mistletoe infestation.
13	Corymbia maculata <b>Spotted Gum</b>	2.16	2.25	0.18	0.4	8	ω	4				ŝ	80	small	Good	No											MLVP2	Mistletoe infestation.Stunted growth.
14	Corymbia maculata Spotted Gum	3.84	2.2	0.32	0.38	10	6	6			yes	č	70	small	Good	No							•				MGVP6	Mistletoe infestation.
15	Corymbia maculata Spotted Gum	4.32	2.34	0.36	0.44	12	8	12			yes	0	80	small	Good	No							•				MGVF9	Mistletoe infestation.
16	Corymbia maculata Spotted Gum	4.32	2.41	0.36	0.47	12	8	9				00	60	small	Good	No							•				MGVP6	
17	Corymbia maculata Spotted Gum	3.84	2.34	0.32	0.44	12	8	8			yes	ŝ	60	small	Good	No							•				MGVP6	Mistletoe infestation.
18	Corymbia maculata Spotted Gum	3.12	2.15	0.26	0.36	10	7	6			yes	č	70	small	Good	No							•				MGVF9	Mistletoe infestation.

Tree	Assessment	Sheet
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Location:		163	3 Mi	lperra	a Villa	age.	Bulle	ecou	rt Roa	ad, N	1ilpe	rra.																
Client:		Ang	licar	e																								
Date:		24.0	)8.20	)17																								
				Dim	nenti	ons				Hea	alth			Vigo	our			St	ructi	ure			Ag	ge Cl	ass		_	
Tree No.	Botanical Name / Common Name	TPZ radius (m)	SRZ radius (m)	DBH (m)	DAB (m)	Height (m)	Spread EW (m)	Spread NS (m)	Deadwood	Dieback	Pests	Diseases	Canopy density %	Foliage size	Foliage colour	Extension growth	Inclusions	Fractures	Wounds	Cavities	Decay	Senescent	Mature	Semi Mature	Young	New planting	Retention Value SRIV	Comments
19	Corymbia maculata Spotted Gum	5.04	2.71	0.42	0.62	12	8	9			yes	:	60	small	Good	No							•				MGVF9	Mistletoe infestation.
20	Corymbia maculata Spotted Gum	4.8	2.51	0.4	0.52	10	6	7			yes	:	50	small	Good	No							•				MLVP2	Mistletoe infestation.
21	Corymbia maculata Spotted Gum	3.24	2.25	0.27	0.4	∞	6	7			yes	;	70	small	Good	No							•				MGVP6	Mistletoe infestation.
22	Corymbia maculata Spotted Gum	5.28	2.78	0.44	0.66	12	10	12			yes	:	85	small	Good	No							•				MGVF9	Mistletoe infestation.
23	Melaleuca decora White Feather Honey Myrtle		3.27	0.71	0.97	10	б	6		•		:	80	Good	Good	No						•					MLVF4	Co-dominant. Pruned around overhead wires.
	ON SITE																											
24	Melaleuca decora White Feather Honey Myrtle		2.25		0.4	6	ъ	6		•		:	06	Good	Good	No						•					OLVG3	Multitrunk with Dieback and deadwood in canopy.
25	Melaleuca decora White Feather Honey Myrtle		2.67		0.6	8	6	6				:	06	Good	Good	No						•					OLVG3	Multitrunk with Dieback and deadwood in canopy.
26	Melaleuca armillaris bracelet honey myrtle		2.25		0.4	6	6	6				:	30	Poor	Poor	No						•					OLVP0	Multitrunk with Dieback and deadwood in canopy.
27	Melaleuca decora White Feather Honey Myrtle		2.3		0.42	6	6	6				:	80	Good	Good	No						•					OLVG3	Multitrunk with Dieback and deadwood in canopy.
28	Melaleuca decora White Feather Honey Myrtle		2.67		0.6	7	6	6				1	80	Good	Good	No						•					OLVG3	Multitrunk with Dieback and deadwood in canopy.
29	Melaleuca decora White Feather Honey Myrtle		2.47		0.5	8	6	6				i	70	Good	Good	No						•					OLVG3	Multitrunk with Dieback and deadwood in canopy.
30	Melaleuca armillaris bracelet honey myrtle		2.47		0.5	7	5	5				:	30	Good	Good	No						•					OLVP0	Multitrunk with Dieback and deadwood in canopy.
31	Melaleuca decora White Feather Honey Myrtle		2.57		0.55	6	6	6				:	50	Good	Good	No						•					OLVG3	Multitrunk with Dieback and deadwood in canopy. Supressed.
32	Melaleuca decora White Feather Honey Myrtle		2		0.3	6	3	з				:	80	Good	Good	No						•					OLVP0	Multitrunk with Dieback and deadwood in canopy.
33	Melaleuca decora White Feather Honey Myrtle		2.25		0.4	6	5	5				:	80	Good	Good	No						•					OLVG3	Multitrunk with Dieback and deadwood in canopy.
34	Melaleuca decora White Feather Honey Myrtle	5.4	2.25	0.45	0.4	7	7	7				:	80	Good	Good	No						•					OLVF5	
35	Melaleuca decora White Feather Honey Myrtle	8.64	2.97	0.72	0.77	∞	11	12					70	Good	Good	No						•					OGVG6	Multitrunk with good form. Retain if possible.
	GOLF COURSE LAND																											

Tree	Assessment	Sheet
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Location:		163	3 Mil	perra	a Vill	age.	Bulle	ecou	t Roa	ad, N	Лilpe	rra.																
Client:		Ang	licare	5																								
Date:		24.0	)8.20	17																								
				Dim	nenti	ons				Hea	alth			Vig	our			St	ructu	ure			Ag	ge Cla	ass			
Tree No.	Botanical Name / Common Name	TPZ radius (m)	SRZ radius (m)	DBH (m)	DAB (m)	Height (m)	Spread EW (m)	Spread NS (m)	Deadwood	Dieback	Pests	Diseases	Canopy density %	Foliage size	Foliage colour	Extension growth	Inclusions	Fractures	Wounds	Cavities	Decay	Senescent	Mature	Semi Mature	Young	New planting	Retention Value SRIV	Comments
36-79	Melaleuca decora White Feather Honey Myrtle	3.6-6	2.25-2.67	0.3-0.5	0.4-0.6	8-12m							70-90	Good	Good	No						•					OLVF5/ OGVG5	Multitrunk with Dieback and deadwood in canopies.Roots exposed in drainage channel.
80	Pittosporum undulatum Sweet Pittosporum	2.4	2	0.2	0.3	6	4	თ					100	Good	Good	yes							•				MGVF4	
81	Cinnamomum camphora Camphor Laurel	7.8	2.85	0.65	0.7	9	8	8	•	•			40		pale	No						•					OLVF2	Weed Species.Dieback and deadwood in canopy.
81A	Araucaria heterophylla Norfolk Island Pine	3.24	2.1	0.27	0.34	8	7	7	•	•			90	Good	Good	No											MLVF4	Dieback and deadwood in canopy.
82-84	Melaleuca decora White Feather Honey Myrtle	3.6-6	2.25-2.6	0.3-0.5	0.4-0.6	8-12m							70-90	Good	Good	No						•					OLVF5/ OGVG5	Multitrunk with Dieback and deadwood in canopies.Roots exposed in drainage channel.
	ON SITE																											
85	Acacia decurrens Early Black Wattle	3	2	0.25	0.3	6	6	6	•	•			60	Good	Good	No		•	•			•					OLVP0	Self seeded in stockpile.Dieback and deadwood in canopy.Large split in trunk with frass evident.
86	Acacia floribunda White Sally Wattle	з	2	0.25	0.3	8	8	8	•	•			60	Good	Good	No						•					OLVP0	Self seeded in stockpile.Dieback and deadwood in canopy.
87	Acacia floribunda White Sally Wattle	4.8	2.37	0.4	0.45	8	8	8	•	•			60	Good	Good	No		•				•					OLVPO	Self seeded in stockpile.Dieback and deadwood in canopy.Multi trunk with fallen trunks on ground.
88	DEAD TREE																											
89	Melaleuca decora White Feather Honey Myrtle	5.76	2.67	0.48	0.6	8	9	9					70	Good	Good	No						•					OGVF5	Good Form. Retain if possible.
90	Melaleuca decora White Feather Honey Myrtle	6.12	2.67	0.51	0.6	9	9	9					60	Good	Good	No						•					OGVF5	Good Form. Retain if possible.
91	Melaleuca decora White Feather Honey Myrtle	5.4	2.53	0.45	0.53	8	7	6					60	Good	Good	No						•					OGVF5	Good Form. Retain if possible.
92	Melaleuca decora White Feather Honey Myrtle	5.52	2.67	0.46	0.6	8	6	6					80	Good	Good	No						•					OGVG6	Good Form. Retain if possible.
93	Melaleuca decora White Feather Honey Myrtle	9.36	3.12	0.78	0.87	8	8	9					70	Good	Good	No						•					OGVG6	Multitrunk with good form. Retain if possible.
94	Eucalyptus punctata Grey Gum	9.48	3.06	0.79	0.83	10	13	16	•	•			40	Good	Good	No			•			•					OLVG3	Multitrunk with poor form. Many wounds at base of trunk.
95	Eucalyptus punctata Grey Gum	6.6	2.98	0.55	0.78	10	14	10	•	•	•		40	Good	Good	No			•			•					OGVG6	Multitrunk with poor form. Many wounds at base of trunk.Mistletoe infestation.

#### Tree Assessment Sheet

Location:		163	3 Mi	lperr	a Vill	age.	Bulle	ecou	rt Ro	ad, N	Vilpe	erra.																
Client:		Ang	glicar	e																								
Date:		24.0	08.20	)17																								
				Din	nenti	ions				He	alth			Vig	our			St	ructu	ure			A	ge Cl	ass		_	
Tree No.	Botanical Name / Common Name	TPZ radius (m)	SRZ radius (m)	DBH (m)	DAB (m)	Height (m)	Spread EW (m)	Spread NS (m)	Deadwood	Dieback	Pests	Diseases	Canopy density %	Foliage size	Foliage colour	Extension growth	Inclusions	Fractures	Wounds	Cavities	Decay	Senescent	Mature	Semi Mature	Young	New planting	Retention Value SRIV	Comments
96	Melaleuca decora White Feather Honey Myrtle	6.84	2.95	0.57	0.76	8	6	7					95	Good	Good	yes							•				MGVG10	Good Form. Retain if possible.
97	Melaleuca decora White Feather Honey Myrtle	6.84	3.17	0.57	0.9	7	7	7					90	Good	Good	yes							•				MGVF9	Good Form. Retain if possible.Co-dominant Trunks.
98	Melaleuca decora White Feather Honey Myrtle	6.84	3.01	0.57	0.8	8	5	10					80	Good	Good	No							•				MGVF9	Irregular form. Cut by neighbour to boundary. Retain if possible.Co-dominant Trunks.

#### 9.2 Appendix 2 Tree protection measures



 $\label{eq:transformation} \begin{array}{l} \mathsf{TPZ} = \mathsf{TREE} \ \mathsf{PROTECTION} \ \mathsf{ZONE} \\ \mathsf{Referred} \ \mathsf{to} \ \mathsf{as} \ \mathsf{radius} \ \mathsf{in} \ \mathsf{metres} \ \mathsf{and} \ \mathsf{calculated} \ \mathsf{using} \ \mathsf{the} \ \mathsf{fomula:} \ \mathsf{TPZ} \ = \ \mathsf{12} \ \mathsf{x} \ \mathsf{DBH} \\ \mathsf{Where:} \ \mathsf{DBH} = \ \mathsf{Diameter} \ \mathsf{at} \ \mathsf{Breast} \ \mathsf{Height} \ (\mathsf{measured} \ \mathsf{1.4m} \ \mathsf{above} \ \mathsf{ground} \ \mathsf{level}) \end{array}$ 

RSRZ = STRUCTURAL ROOT ZONE

Referred to as radius in metres and calculated using the fomula: SRZ =  $(D \times 50)^{0.42} \times 0.64$ Where: RSRZ = Radius of Structural Root Zone D = Stem Diameter (measured directly above root buttress in metres)

#### INDICATIVE TREE PROTECTION ZONE (TPZ)

Based on AS4970-2009





NOTE: Less than 10% TPZ area and outside SRZ. Any loss of TPZ compensated for elsewhere.

# EXAMPLES OF MINOR ENCROACHMENT INTO TPZ Based on AS4970-2009



TREE PROTECTION ZONE SIGN Based on AS4970-2009



NOTE: 1. For trunk and branch protection use boards and padding that will prevent damage to bark. Boards are to be strapped to trees, not nailed or screwed. 2. Rumble boards should be of a suitable thickness to prevent soil compaction and root damage.

EXAMPLES OF TRUNK, BRANCH AND GROUND PROTECTION Based on AS4970-2009



PROTECTIVE FENCING Based on AS4970-2009



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

INDICATIVE SCAFFOLDING WITHIN A TPZ Based on AS4970-2009