Biodiversity Assessment Report

Tamworth Mental Health Unit

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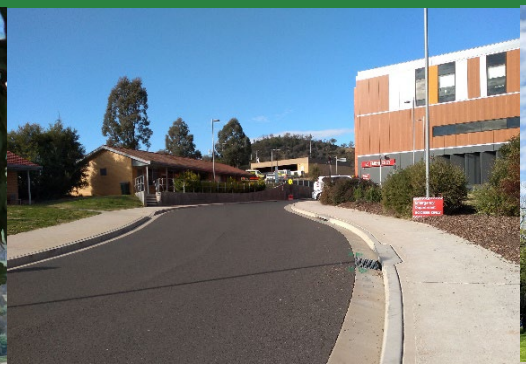


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Executive Summary

This Biodiversity Assessment Report (BAR) has been prepared for NSW Health Infrastructure to accompany a Review of Environmental Factors (REF) for a new Tamworth Mental Health Unit at the Tamworth Hospital, located at Lot 1 DP 1181268 (the site).

Key results of the field assessment are as follows:

- Vegetation on site is highly disturbed with a number of open space areas and a total of 66 trees (39 native, 25 exotic and one stag) of various ages and conditions.
- Vegetation on site is not representative of any plant community types (PCTs) outlined in the BioNet Vegetation Classification system.
- Eleven hollow-bearing trees occur on site.
- No NSW *Biodiversity Conservation Act 2016* (BC Act) or *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) listed threatened flora were recorded on site.
- No BC Act or EPBC Act listed threatened ecological communities (TECs) occur on site.
- Five threatened fauna species (Grey-headed Flying-fox (*Pteropus poliocephalus*), Dusky Woodswallow (*Artamus cyanopterus cyanopterus*), Little Lorikeet - *Glossopsitta pusilla*, Squirrel Glider (*Petaurus norfolcensis*) and Koala (*Phascolarctos cinereus*) are considered to potentially occur within the site and utilise tree species being impacted.

The Activity would incur the following biodiversity impacts:

- Removal of 31 planted trees (comprising 13 native trees and 17 exotic/ non-endemic trees) and one stag.
- Removal of three hollow-bearing trees.

The magnitude of these impacts is not sufficient enough to result in a significant impact to threatened species.

Review of statutory instruments relevant to the Activity was completed as follows:

- **BC Act**: the Activity is unlikely to significantly impact any threatened species or communities.
- **EPBC Act**: the Activity is unlikely to significantly affect threatened species or communities, or listed migratory species.

1. Introduction and Background

1.1 Introduction

NSW Health Infrastructure (HI) propose to construct a new Tamworth Mental Health Unit, which is part of the NSW Government's $700 million State-wide Mental Health Infrastructure Program (the proposal) at the Tamworth Hospital, located at Lot 1 DP 1181268 (the site) as part of their delivery of infrastructure solutions and services to support the healthcare needs of the NSW communities.

This Biodiversity Assessment Report (BAR) has been prepared to:

- Identify any biodiversity constraints to the Activity; including identification of habitat for threatened species or communities listed under the *Biodiversity Conservation Act 2016* (BC Act) or *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).
- Identify any significant trees or fauna habitat features of biodiversity importance.
- Identify High Environmental Values (HEV).
- Assess the Activity against relevant statutory requirements.

1.2 The Site

The site is the existing Tamworth Hospital located at 31-35 Dean Street, North Tamworth within Tamworth Regional Local Government Area (LGA), and currently accommodates Tamworth Hospital and associated buildings /infrastructure. The site associated with Lot 1 DP 1181268 is bounded by Dean Street to the west and Johnson Street to the south (**Illustration 1.1**). It is approximately 20.62 hectares in area. The site of the new Tamworth Mental Health Unit currently consists of three existing buildings (Staff Accommodation building (TA34), Rotary Hostel (TA08) and Rotary Lodge (TA09)), pathways, parking and other landscaped areas.

The development area of the new Tamworth Mental Health Unit generally slopes from north-east to south-west with a fall of around 7.8 m. The site has an elevation of approximately 420 m AHD (Australian Height Datum). There are mixed plantings of native and exotic species at the site associated with gardens and parklands.

1.3 The Activity

1.3.1 Activity Overview

The proposed development is for construction of a new Tamworth Mental Health Unit (TMHU) within the grounds of the Tamworth Hospital (the Activity) and would be completed in stages as follows:

- Early works stage:
  - Construction of Car Park A Zone 3.
  - Redevelopment and expansion of Car Park A Zone 4.
  - Construction of Car Park B Zone 2.
  - Redevelopment and expansion of Car Park D Zone 1.
- Main works stage:
  - The demolition of three existing buildings, including Staff Accommodation building (TA34), Rotary Hostel (TA08) and Rotary Lodge (TA09).
  - Removal of informal staff carpool carpark.

- Removal of trees.
- Construction of new TMHU building.
- Construction of stairs and pathways.
- Construction of ancillary infrastructure, including stormwater drainage, retaining walls, and services/ utility adjustments and connections.
- Installation of campus wayfinding.

1.3.2 Proposed Activity

1.3.2.1 New TMHU building

The new TMHU building would be up to three storeys high and would vary in height; however, the highest part of the building would not exceed a height of more than 15 m above existing ground level. The new building is substantially setback from the hospital's property boundaries and does not directly interface with adjoining properties or other sensitive uses such as dwellings.

1.3.2.2 Roadways and parking

The new 37-bed TMHU is expected to generate a demand for 36 parking bays, comprising 28 staff, seven visitors, and one accessible parking bay. To meet the demand and facilitate construction of the new building, the proposal will result in the following changes to existing parking provisions:

- Removal of 94 general visitor parking bays from Car Park B.
- Removal of eight existing accessible parking bays from Car Park B.
- Addition of eight accessible parking bays and three general parking bays at the new interface between Car Park B and TMHU.
- Reconfiguration and expansion of Car Park A ('Zone 4'), losing six bays and adding 46.
- Reconfiguration and expansion of Car Park D ('Zone 1'), losing one bay and adding 33.
- New car park west of Car Park B ('Zone 2'), losing two bays and adding 50.
- Reconfiguration of the entrance driveway to Car Park A ('Zone 3'), resulting in a gain of 17 parking bays.

The above items total a net supply of 46 parking bays. The parking provisions exceed the demand and all lost parking provisions are replaced.

Concept plans and designs are provided in **Appendix A.**

1.3.2.3 Tree Removal and Landscaping

A total of 18 trees have been identified at the proposed TMHU building site. 14 trees are proposed to be removed to facilitate the construction. None of the trees have been assessed as being of high or very high landscape significance (refer **Appendix C**).

A total of 48 trees have been identified within the proposed car parks. 17 trees are proposed to be removed to facilitate the construction (refer **Appendix D**). Two of the trees are part of the date palm grouping that has been identified as being of heritage significance, however, due to the strategy of tree retention, the removal of the two trees does not impact the heritage value of the tree grouping.

The landscape design will focus on providing a range of new landscape opportunities including unique living and break out spaces for the residents. The initial schematic design principles focused on distinctive landmarks and characteristics of the region, such as: the mountains and bush, the river, and the valley. The resulting proposed courtyards will offer a range of active and passive engagement opportunities for both residents and staff.

1.3.2.4 Utilities

As part of the proposed TMHU works, a new substation has been proposed as it is understood the existing substations are loaded to capacity. The communication services for the new TMHU building would be provided by connecting to the existing Tamworth Hospital campus ICT network.

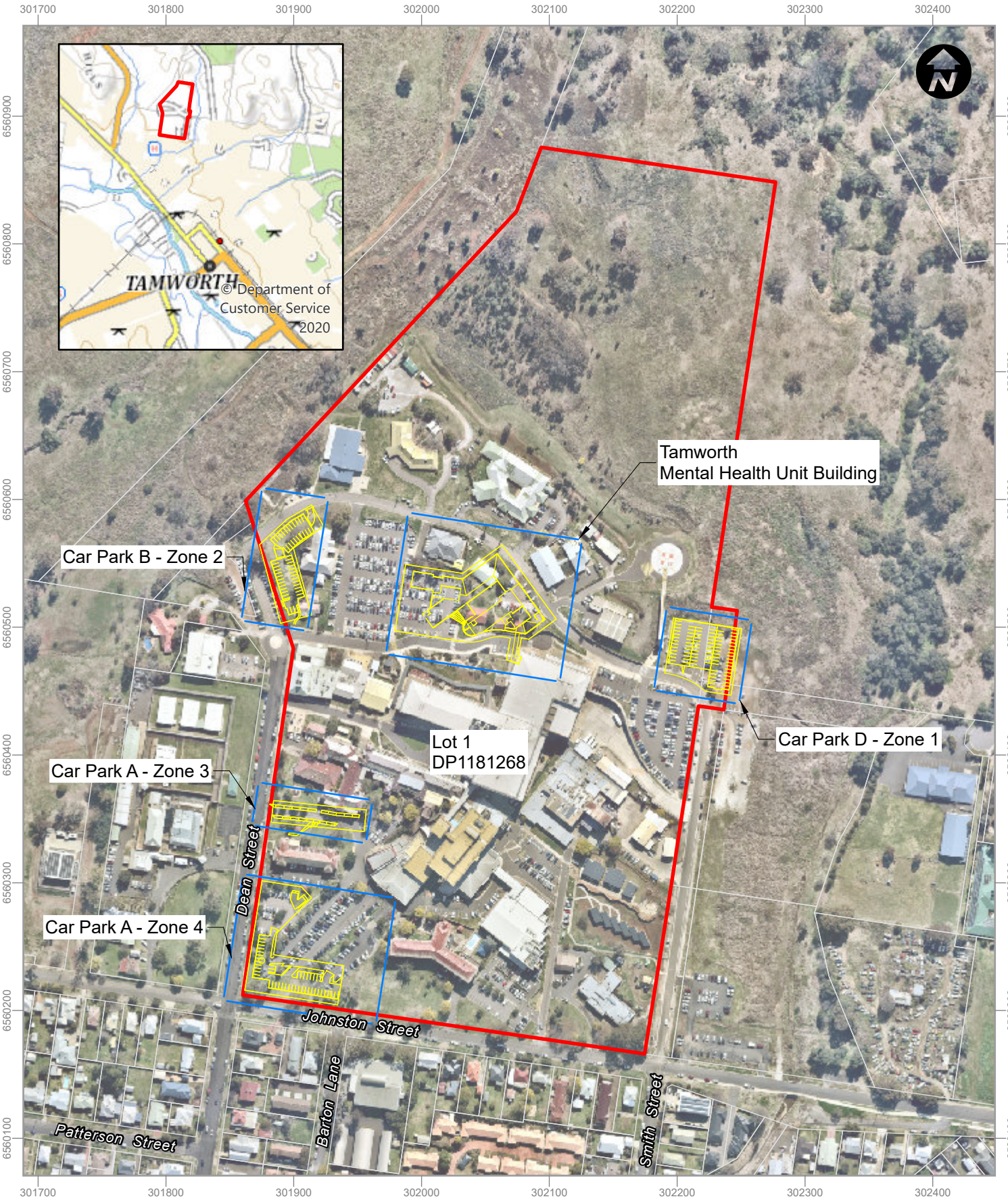
Water and sewage load calculations have been completed for the new TMHU building and have taken into account the existing load that will be demolished as part of preparing the site for the new building.

There are no gas connections required for the new TMHU building.

1.4 Definitions Used in this Report

The following definitions have been used throughout this BAR:

- **Activity** – as described in Section 1.3.
- **Site** – the land within which the Activity occurs (Lot 1 DP 1181268).
- **Study area** – the site plus a 100 m buffer around the site. This includes areas of vegetation and associated habitat that may be subject to direct or indirect impacts as a result of the Activity.
- **Impact area** – this includes all areas to be directly impacted by the Activity.
- **Locality** – a 10 km buffer around the site.



GDA 1994 MGA Zone 56

LEGEND

- Site boundary
- Cadastre
- Proposed design
- Extent of works

0 80 Metres

The Site - Illustration 1.1

Information shown is for illustrative purposes only
Drawn by: AB Checked by: TLJ Reviewed by: MCZ
Source of base data: Nearmap 17/08/2022
Date: 13/02/2023

2. Methodology

2.1 Desktop Review

The desktop assessment included analysis of the following information sources:

- Aerial photographic imagery.
- NSW Mitchell Landscapes – Version 3.1 (as per NSW Sharing and Enabling Environmental Data (SEED mapping)) (Planning Industry and Environment, 2016).
- Interim Biogeographic Regionalisation of Australia (IBRA version 7.0) (Thackway & Cresswell, 1995).
- Biodiversity Values mapping (as per the Biodiversity Values Map and Threshold Tool) (NSW Government, 2023).
- Directory of Important Wetlands of Australia (Department of Climate Change Energy the Environment and Water, 2023a).
- Priority weed listings for the North West Coast region (Department of Primary Industries, 2023b).
- Trees Near Me NSW (NSW Department of Planning and Environment, 2023c).

2.1.1 Database Searches

Table 2.1 outlines the desktop database searches completed prior to field assessment.

Table 2.1 Threatened Species Database Searches

Database	Search Date	Area Search	Reference
BioNet Atlas species sighting search	03/02/23	10 km x 10 km centred on the study area	(NSW Department of Planning and Environment, 2023a)
EPBC Protected Matters Search Tool	03/02/23	10 km buffer on the study area	(Department of Climate Change Energy the Environment and Water, 2023b)
NSW Department of Primary Industries (Fishing and Aquaculture) spatial data	03/02/23	Centred on site and immediate surroundings	(Department of Primary Industries, 2023a)

2.2 Field Assessment

Two Arboriculture Assessments (ArborSafe, 2023a and 2023b) were undertaken to identify trees at the site (refer to **Appendix C** and **Appendix D**).

Two ecological field assessments were undertaken for the site. The first site assessment was undertaken by Environmental Scientist Theresa Choi on 16 July 2021 which informed the Preliminary Biodiversity Assessment Report (GeoLINK, 2022). A second site assessment was undertaken by Ecologist Ben Millan on 22 December 2022. Both field assessments sought primarily to identify key biodiversity constraints and potential impacts by assessing the type, extent and condition of vegetation and fauna habitat, especially as it pertained to threatened species and ecological communities using the following methodology:

- Vegetation assessment and mapping including identifying vegetation communities to plant community type (PCT), where present and applicable.

- Identification of native tree and associated groundcover requiring removal for the Activity.
- Targeted surveys for threatened flora (as identified in BioNET searches) in areas of suitable habitat.
- Identification of threatened ecological communities (TECs) where applicable.
- Identification and survey (by GPS) of any hollow-bearing trees or habitat features and potential habitat for threatened fauna.
- Opportunistic fauna survey.

While the survey only provides a 'snapshot' of fauna usage, the techniques utilised provide suitable sampling for a range of fauna with an emphasis on targeting threatened species most likely to occur within the site. Based on local fauna records and vegetation/ habitat present at the site, predictions of fauna usage can be made with a high level of confidence. Given the minor nature of the Activity, within a substantially modified site, the scope of assessment is considered adequate.

3. Vegetation

3.1 Desktop Analysis

3.1.1 Database Search Results

BioNet search results identified records of three threatened flora species and habitat for ten threatened ecological communities within the search area (refer to **Appendix B**). PMST results identified habitat for 11 threatened flora species and four threatened ecological communities within the search area.

3.2 Background Information

Arboricultural assessments (ArborSafe, 2023a and 2023b) of the site have been prepared (**Appendix C** and **Appendix D**) and found the following:

- All trees and shrubs on site are considered amenity plantings and include a number of exotic, ornamental species.
- 66 trees (39 native, 25 exotic and one stag) were identified across the site.
- No trees were identified as being of either national, state or local heritage significance.

3.3 Site Features

3.3.1 Vegetation

Vegetation at the site is highly modified and consists of both planted native and exotic trees and a highly disturbed ground cover. A total of 66 trees (39 native, 26 exotic and one stag) were identified within the site, the composition of trees within the site is provided below.

Native trees species include:

- 10 x Red Ironbark (*Eucalyptus sideroxylon*).
- 7 x Yellow Box (*Eucalyptus melliodora*).
- 7 x Silky Oak (*Grevillea robusta*).
- 3 x Crimson Bottlebrush *(Callistemon citrinus*).
- 2 x *Eucalyptus* sp..
- 1 x Willow Bottlebrush (*Callistemon salignus*).
- 1 x White Cedar (*Melia azedarach*).
- 1 x Weeping Myall (*Acacia pendula*).
- 1 x Apple Box (*Eucalyptus bridgesiana*).
- 1 x Willow Wattle (*Acacia salicinia*).
- 1 x Kurrajong (*Brachychiton populneus*).
- 1 x Manna Gum *(Eucalyptus viminalis spp. viminalis).*
- 1 x Black Tea Tree *(Melaleuca bracteata*).
- 1 x Norfolk Island Hibiscus *(Lagunaria patersonii*).
- 1 x Bracelet Honey Myrtle *(Melaleuca armillaris*).

Exotic/ ornamental species include:

- 8 x Canary Island Date Palm (*Phoenix canariensis*).
- 3 x Chinese Elm (*Ulmus parvifolia*).

- 2 x Peppercorn (*Schinus areira*).
- 2 x Jacaranda (*Jacaranda mimosifolia).*
- 2 x European Olive *(Olea europaea).*
- 2 x Himalayan Cedar (*Cedrus deodara*).
- 2 x Chinese Pistachio (*Pistacia chinensis*).
- 1 x Cypress (*Cupressus* sp.).
- 1 x Callery Pear (*Pyrus calleryana*).
- 1 x Chinese Hackberry (*Celtis sinensis*).
- 1 x Carob Bean (Ceratonia siliqua).
- 1 x Salt Cedar *(Tamarix sp.).*

In addition to those listed above one stag (dead tree) is also present.

Vegetation on site is not representative of any plant community types (PCTs) outlined in the BioNet Vegetation Classification system (NSW Department of Planning and Environment, 2023b).

Tree data and tree locations within the site are detailed in Arborist Assessments (refer to **Appendix C** and **Appendix D**).

3.3.2 Threatened Flora

No BC Act or EPBC Act listed threatened flora were recorded at the site.

3.3.3 Threatened Ecological Communities

No BC Act or EPBC Act listed TECs occur at the site.

3.3.4 Priority Weeds

No *Biosecurity Act 2015* listed priority weeds for the North West Local Land Services region (Department of Primary Industries, 2023b) were observed at the site.

4. Fauna Habitat

4.1 Desktop Analysis

4.1.1 Database Search Results

BioNet search results identified records of 25 threatened fauna species within the search area (refer to **Appendix B**). PMST results identified habitat for 23 threatened fauna species and ten migratory fauna species within the search area.

4.1.2 Connectivity

The site is not within any mapped wildlife corridors (Scotts, 2003). Due to the site's highly modified state and lack of substantial areas of remnant vegetation within or around the site, it is likely the site only provides habitat for highly mobile species (i.e. birds and bats) or species which are adapted to urban environments. It is unlikely the site provides any significant fauna connectivity within the landscape.

4.1.3 Waterways and Aquatic Habitat

The Peel River is located approximately 1 km south of the site. Based on local topography and surrounding land features, the river is the major potential receptor of any surface water flow via the existing stormwater system. Spring Creek is a small ephemeral creek located 100m to the east of the edge of the site boundary. No other natural drainage lines or watercourses are located within the lot or site boundary. Proposed works would not significantly impact any waterbodies or significantly change hydrology conditions.

4.2 Site Features

4.2.1 Habitat Values

The site provides minimal habitat for fauna species due to the high level of disturbance, human activity, lighting and noise. Established trees on site provide marginal habitat/ foraging resources for locally occurring avifauna, arboreal mammals, microbats and flying-foxes. Due to limited connectivity, these trees are likely only utilised by highly mobile species (i.e. birds or bats) or species which are well adapted to disturbed environments.

4.2.1.1 Hollow-bearing Trees

Eleven hollow-bearing trees were identified as follows:

- Three Yellow Box (*Eucalyptus melliodora*):
  - Tree **#26**: 2 x small limb hollows and 1 x medium limb hollow.
  - Tree **#27**: 2 x medium limb hollows.
  - Tree **#40**: 1 x small trunk hollow and 1 x large trunk hollow.
- Four Peppercorn (*Schinus areira*).

- Tree **#29**: 6 x small limb hollows, 1 x medium limb hollow, 1 x large limb hollow and 1 x trunk hollow.
- Tree **#52**: 2 x small trunk hollows, 1 x medium trunk hollow and 3 x large trunk hollows.
- No ID: 2 x medium trunk hollows.
- No ID: 2 x medium trunk hollows.

- Three Silky Oak (*Grevillea robusta*)

  - Tree **#34**: 1 x small limb hollow and 1 x medium trunk hollow.
  - Tree **#35**: 2 x small limb hollows.
  - Tree **#36**: 1 x small trunk hollow.

4.2.2 Threatened Fauna

No BC Act or the EPBC Act listed threatened fauna species were observed within the survey area.

No primary Koala feed trees were identified within the site or proposed to be impacted.

Secondary Koala feed trees including Yellow Box (*Eucalyptus melliodora*) and Apple Box (*Eucalyptus bridgesiana*) were identified within the site and are proposed to be impacted. No Koala faecal pellets were identified under secondary Koala use trees.

4.2.3 Potential Threatened Fauna Occurrence

Five threatened fauna species are considered to potentially occur within the site and locality (refer to **Appendix E**) as follows:

- Little Lorikeet (*Glossopsitta pusilla*) and Dusky Woodswallow (*Artamus cyanopterus cyanopterus*) – Marginal foraging habitat on site associated with Eucalyptus trees.
- Squirrel Glider (*Petaurus norfolcensis*) – *Eucalyptus* species are present on site and contribute nectar and pollen to the diet of Squirrel Gliders.
- Koala (*Phascolarctos cinereus*) – The Secondary Koala feed trees including Yellow Box (*Eucalyptus melliodora*) and Apple Box (*Eucalyptus bridgesiana*) were identified within the site and provide potential foraging habitat for the species.
- Grey-headed Flying-fox (*Pteropus poliocephalus*) – *Eucalyptus* species are present on site and contribute nectar and pollen to the diet of Grey-headed flying foxes.

Due to the limited extend of habitat on site and the site's existing modified state, the site provides only a small portion of the resources associated with any potentially occurring threatened species populations. It is unlikely that any threatened fauna species populations would be dependent on the site to fulfill lifecycle needs.

5. Matters of National Environmental Significance

Matters of National Environmental Significance (MNES), listed under the EPBC Act, are addressed in this section. The following biodiversity MNES protected under the EPBC Act were considered for their relevance to the Action:

- Wetlands of international importance (Ramsar) (EPBC Act sections 16 and 17B) .
- Listed threatened species and communities (EPBC Act sections 18 and 18A).
- Listed migratory species (EPBC Act sections 20 and 20A).

5.1 Wetlands of International Importance

No wetlands of international importance occur within the study area or broader locality. As such, the Action will not impact any wetlands of international importance.

5.2 Listed EPBC Act Threatened Ecological Communities

No threatened ecological communities listed under the EPBC Act occur within the site or study area, or would be impacted by the Action.

5.3 Listed EPBC Act Threatened Flora Species

No threatened flora species listed under the EPBC Act occur within the site or study area, or would be impacted by the Action.

5.4 Listed EPBC Act Threatened Fauna Species

An assessment in accordance with the DoE (2013) *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance* (Department of the Environment, 2013) has been undertaken for two EPBC Act listed threatened species with potential to occur on site and whose habitat would be directly impacted by the proposed action: Koala and Grey-headed Flying-fox (refer to **Appendix G**). The assessment concluded that the proposed action was not likely to result in a significant impact on these species.

No other EPBC Act listed threatened fauna species are likely to occur on site or be significantly impacted by the Action.

4.5 Listed Migratory Species

A total of ten migratory species listed under the EPBC Act were identified within the search area by the PMST. The site does not comprise important habitat for any of these species as defined in the DoE (2013) *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance* (Department of the Environment, 2013). The Action is therefore unlikely to have a significant impact on any EPBC Act listed migratory species.

6. Impacts and Mitigation

6.1 Impacts of the Activity

The Activity footprint and associated biodiversity Impacts are displayed in **Illustration 6.1**.

6.1.1 Direct Impacts

6.1.1.1 Vegetation Removal

The Activity will require removal of 31 planted native and non-endemic/ exotic trees and one stag (dead tree). Tree removal is associated with development of carparks and the new TMHU Building.

A total of 13 native trees require removal these include:

- 5 x Red Ironbark (*Eucalyptus sideroxylon*).
- 1 x Kurrajong (*Brachychiton populneus*).
- 1 x Apple Box (*Eucalyptus bridgesiana*).
- 1 x Yellow Box (*Eucalyptus melliodora*).
- 1 x *Eucalyptus* sp.
- 1 x Silky Oak (*Grevillea robusta*).
- 1 x White Cedar (*Melia azedarach*).
- 1 x Weeping Myall (*Acacia pendula*).
- 1 x Bracelet Honey Myrtle *(Melaleuca armillaris).*

A total of 17 exotic/ ornamental / non endemic trees require removal these include:

- 2 x Canary Island Date Palm (*Phoenix canariensis*).
- 2 x Peppercorn (*Schinus areira*).
- 2 x Chinese Elm (*Ulmus parvifolia*).
- 2 x Himalayan Cedar (*Cedrus deodara*).
- 2 x Jacaranda (*Jacaranda mimosifolia).*
- 2 x European Olive *(Olea europaea).*
- 2 x Chinese Pistachio (*Pistacia chinensis*).
- 1 x Chinese Hackberry (*Celtis sinensis*).
- 1 x Salt Cedar *(Tamarix sp.).*
- 1 x Norfolk Island Hibiscus *(Lagunaria patersonii)* - Endemic to Lord Howe and Norfolk Islands.

An additional one stag (dead tree) requires removal.

No PCTs would be directly impacted. Given the existing modified state of the study area, biodiversity impacts associated with this vegetation removal are not significant.

6.1.1.2 Threatened Fauna

Thirteen native trees would be directly impacted by the Activity. The majority of native trees being removed provide foraging habitat in the form of blossom and herbivorous resources for threatened fauna. Background searches identified five threatened fauna species with a moderate to higher likelihood of occurring within the site.

These included:

- Grey-headed Flying-fox (*Pteropus poliocephalus*) listed as Vulnerable under both the BC and EPBC Act..
- Dusky Woodswallow (*Artamus cyanopterus cyanopterus*) listed as Vulnerable under the BC Act
- Little Lorikeet (*Glossopsitta pusilla*) listed as Vulnerable under the BC Act.
- Squirrel Glider (*Petaurus norfolcensis*) listed as Vulnerable under the BC Act.
- Koala (*Phascolarctos cinereus*) listed as Endangered under both the BC and EPBC Act.

While negative, this incremental habitat loss is not significant given the existing modified state of the study area. The majority of species that have potential to be impacted by the Activity would still have the capability to access resources within the greater locality. It is unlikely any species predicted to occur would solely be reliant of resources within the site.

6.1.1.3 Hollow-bearing Trees

Three hollow-bearing trees will require removal for the Activity as follows:

- Yellow Box (*Eucalyptus melliodora):* **Tree #26** (DBH 100 cm)- 2 x small limb hollows and 1 x medium limb hollow.
- Peppercorn (*Schinus areira*): **Tree #29** (DBH 64 cm) - 6 x small limb hollows, 1 x medium limb hollow, 1 x large limb hollow and 1 x trunk hollow.
- Peppercorn (*Schinus areira*): **Tree #52** (DBH 110 cm) - 2 x small trunk hollows, 1 x medium trunk hollow and 3 x large trunk hollows.

In total, the following hollows are expected to be impacted as a result of the Activity:

- 10 x small hollows.
- 3 x medium hollows.
- 5 x large hollows.

While negative, this incremental and cumulative habitat loss is not significant given the existing modified state of the study area.

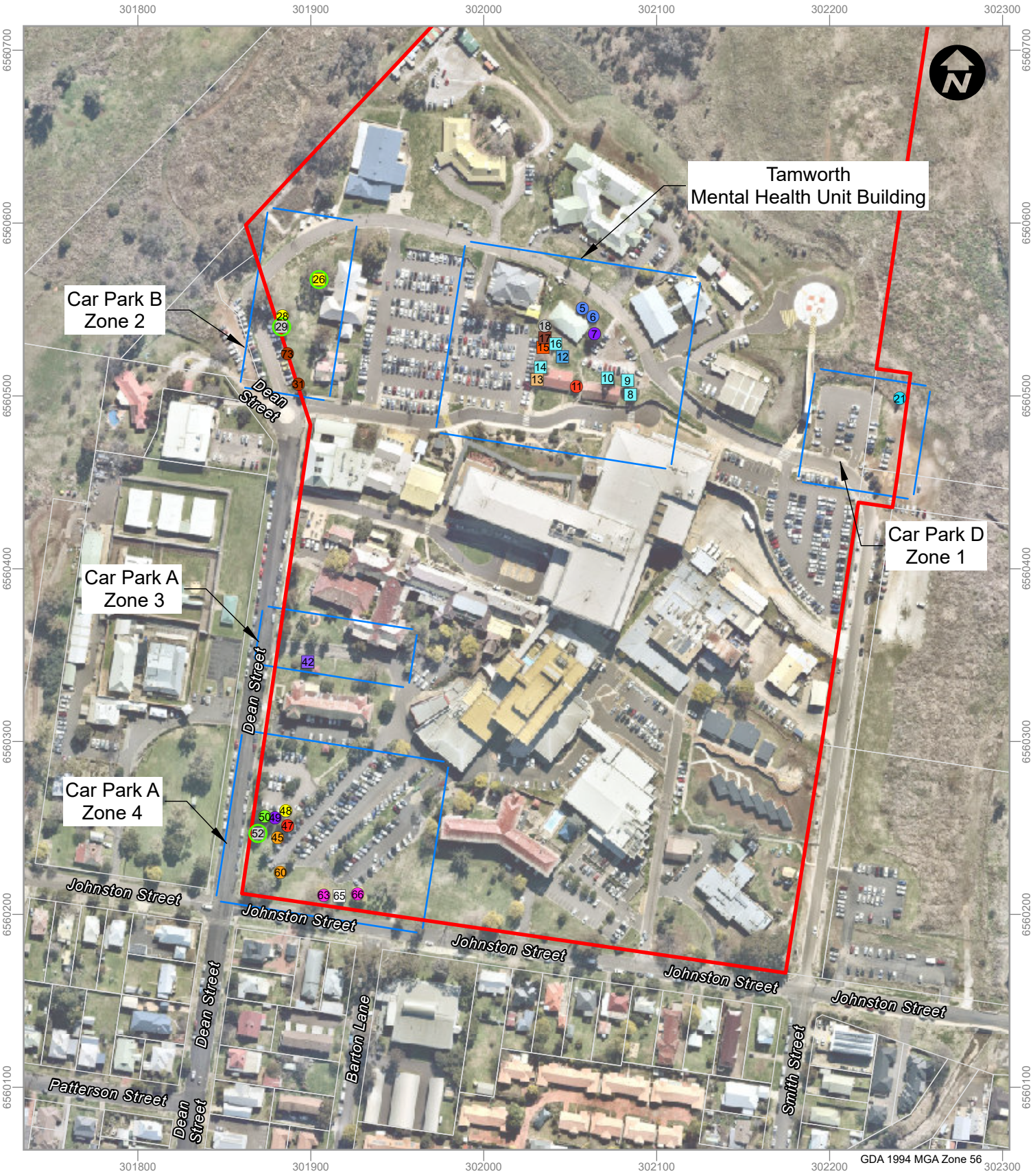
6.1.2 Indirect Impacts

Based on the construction requirements and nature of the Activity, anticipated indirect development impacts may include temporary disturbance from noise, human activity and machine operations to locally occurring fauna species during construction. Operational noise and lighting is not expected to be significantly different to that which is currently occurring.

6.1.3 Impacts to Threatened Species and TECs

No threatened flora or TECs occur on site or would be impacted by the Activity.

Statutory assessments under the BC Act have been completed for threatened fauna species with the potential to utilise areas of the site and adjacent habitat (refer to **Appendix F**). This assessment has concluded that impacts of the Activity are unlikely to significantly impact the subject threatened fauna species.



LEGEND

- Site boundary
- Cadastre
- Extent of works

Tree to be removed

- Apple Box
- Bracelet Honey Myrtle
- Canary Date Palm
- Chinese Elm
- Chinese Hackberry
- Chinese Pistachio
- Eucalyptus
- European Olive
- Himalayan Cedar
- Jacaranda
- Kurrajong
- Norfolk Hibiscus
- Peppercorn
- Red Ironbark
- Salt Cedar
- Silky Oak
- Stag
- Weeping Myall
- White Cedar
- Yellow Box
- Hollow-bearing tree

0 60 Metres

Biodiversity Impacts - Illustration 6.1

Information shown is for illustrative purposes only
Drawn by: AB Checked by: TLJ Reviewed by: MCZ
Source of base data: Nearmap 17/08/2022
Date: 13/02/2023

6.2 Mitigation

The mitigation measures outlined in **Table 6.1** are recommended to minimise biodiversity impacts associated with the Activity. General environmental mitigation measures are outlined in the corresponding REF and not duplicated here.

Table 6.1 Mitigation measures

Mitigation	Reason
Measures must be implemented during construction works so that machinery and plant do not introduce weed propagules or plant pathogens to the site (e.g. by adoption and implementation of the 'Arrive Clean, Leave Clean' guidelines (DoE 2015).	Minimise introduction or spread of weeds and pathogens.
Any tree pruning or protection works must be completed by a certificate 5 arborist and in accordance with *Australian Standard 4970-2009 Protection of trees on development sites*.	To ensure tree health is maintained by professional accepted practices.
Pre-clearing surveys must be undertaken each morning prior to vegetation clearing by an ecologist/ spotter-catcher to ensure nesting or roosting fauna are not present within vegetation to be removed; or undertake fauna capture, relocation or rescue as appropriate. Additional Koala and hollow-bearing tree specific requirements are provided below.	To minimise risks to fauna.
Retained trees would be protected in accordance with *Australian Standard 4970-2009 Protection of trees on development sites*. This includes installing no-go fencing and signage around tree protection zones.	To minimise risks to retained trees.
Hollow-bearing Tree Specific Measures	
Felling of hollow-bearing trees would be supervised by an ecologist or spotter-catcher.	To minimise risks to fauna.
Where trunk hollows or limb hollows require removal, an arboreal inspection of the hollow would be undertaken by the arborist or ecologist/ spotter-catcher.	To minimise risks to fauna.
If unexpected threatened fauna is discovered, then work would stop immediately, and a plan would be formulated by the ecologist/ wildlife carer to determine the most appropriate course of action.	To minimise risks to fauna.
If the hollow is found to be occupied by a non-threatened arboreal mammal or reptile, where appropriate the hollow entrance would be covered (e.g. stuffed with a pillow case) and the tree limb cut at a suitable distance from the hollow to avoid any fauna impact.	To minimise risks to fauna.
All hollow limbs and trunks containing fauna or are not able to be thoroughly inspected would be lowered to the ground using roping techniques.	To minimise risks to fauna.
All hollows and habitat trees would be inspected by an ecologist/ spotter-catcher after being lowered to the ground to or undertake fauna capture, relocation or rescue as appropriate.	To minimise risks to fauna.

Mitigation	Reason
Koala Specific Measures	
On the day of clearing and prior to any clearing taking place, all trees within 50 m of those trees to be cleared are to be inspected for the presence of Koalas by an experienced Koala ecologist/ spotter-catcher.	To minimise risks to Koala.
Should Koalas be present, clearing works must: ■ Be temporarily suspended within a range of 50 m from any tree which is occupied by a Koala. ■ Be avoided in any area between the koala and the nearest areas of habitat to allow the animal to move to adjacent refuge. ■ Must not resume until the koala has moved from the tree of its own volition. Should clearing continue in areas away from the Koala, the ecologist/ spotter-catcher would remain as a designated Koala spotter to monitor the animal until the clearing is finished that day in case the animal moves into proximity of the clearing (which would trigger the works to stop).	To minimise risks to Koala.

6.3 Summary of Local Compensation for Vegetation Loss

For replacement tree plantings and nest boxes Health Infrastructure NSW have advised that a 1:1 ratio (13 native species plantings endemic to the area) is required to compensate for 13 native species removed.

Suggested hollow replacement ratios have been determined using the Transport for NSW Biodiversity Policy and are presented in **Table 6.2**.

Table 6.2 Hollow Replacement Ratios

Category	Number impacted	Replacement required	Number of nest boxes required
Hollow (assuming a 20% occupancy rate)	18 (3.6 when assuming a 20% occupancy rate)	Provide three artificial hollows for every occupied hollow removed = (3.6 impacts hollows x 3)	11 (rounded to nearest whole number)

Offset planting would occur at a location discerned by HI NSW. A Vegetation Management Plan (VMP) would be developed to guide the plantings and nest box installations.

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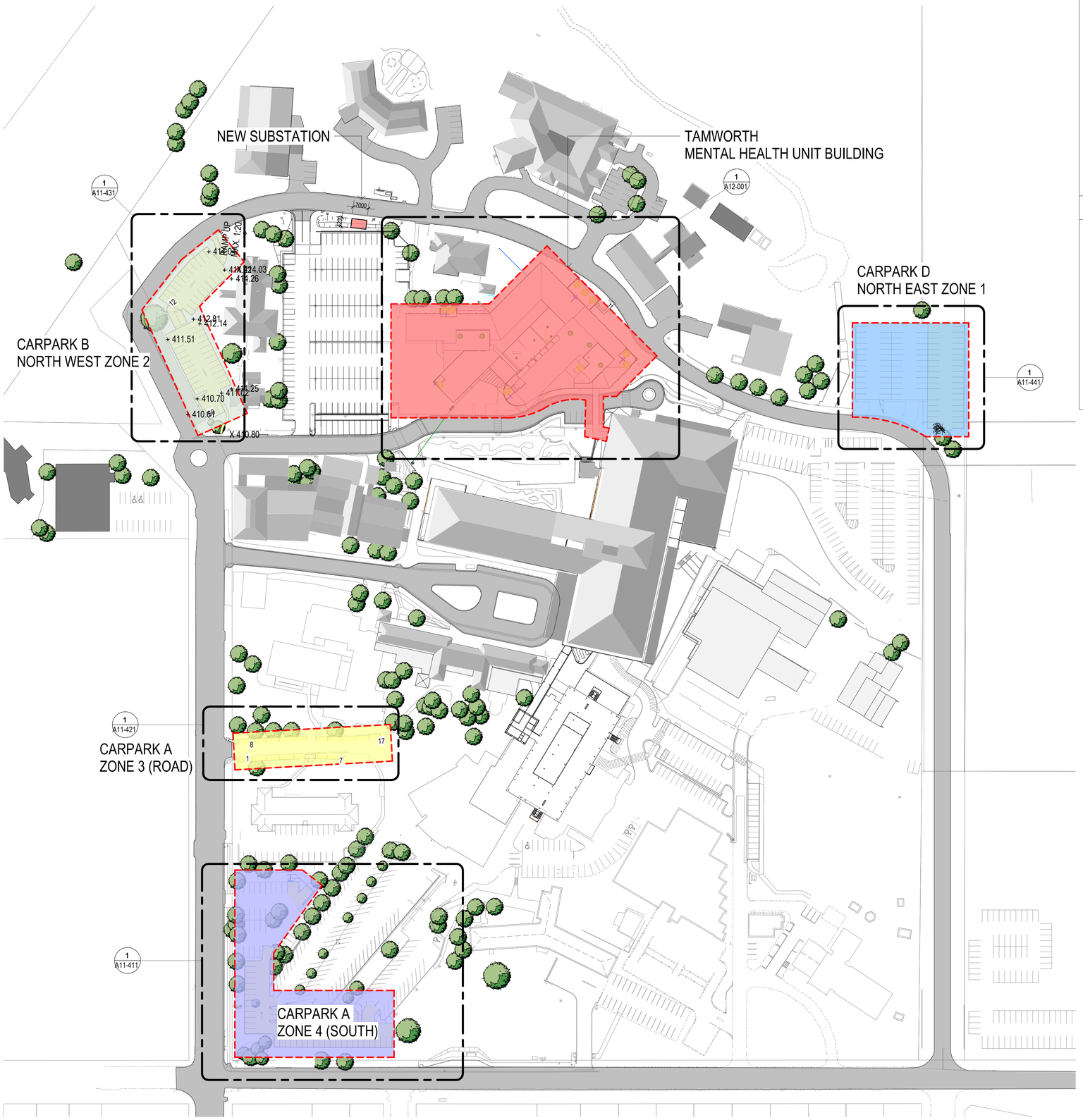
Copyright and Usage

Appendix A

Concept Plan



LEGEND

- PROPOSED TAMWORTH MENTAL HEALTH UNIT BUILDING
- PROPOSED CARPARK A - ZONE 4 (SOUTH)
- PROPOSED CARPARK A - ZONE 3 (ROAD)
- PROPOSED CARPARK B - NORTH WEST ZONE 2
- PROPOSED CARPARK D - NORTH EAST ZONE 1

NOTES

THIS DRAWING IS FOR SITE CONTEXT/INFORMATION & IS NOT AN AUDIT OF EXISTING/AS BUILT CONDITIONS OTHER THAN THOSE ALLOCATED IN THIS SCOPE OF WORKS PER LEGEND SHOWN ABOVE

ALL REDUCED LEVELS INDICATED ARE NOMINAL LEVELS & ARE TO BE CONFIRMED/ COORDINATED WITH CIVIL ENGINEER'S DOCUMENTATION AND AGAINST SURVEY INFORMATION. GRADIENTS WITHIN CARPARK TO COMPLY WITH AS2890.1 & AS2890.6

NOTE: SURVEY INFORMATION INDICATED HAS BEEN PROVIDED BY OTHERS. SURVEYS HAVE BEEN PRODUCED USING BOTH GDA94 & GDA2020. ALL SETOUTS TO BE VERIFIED ON SITE PRIOR TO ANY CONSTRUCTION

REFER TO CIVIL ENGINEER'S DOCUMENTS FOR FALLS TO EXISTING & NEW DRAINAGE PITS/OUTLETS & OSD/TREATMENT CHAMBERS

ARCHITECTURAL DRAWINGS TO BE READ IN CONJUNCTION WITH CIVIL & SERVICES ENGINEER'S DOCUMENTATION

KEY PLAN

REV	DESCRIPTION	DRN	DATE
A	REF - DRAFT ISSUE 2	DP	11/11/2022
B	REF ISSUE	DP	02/12/2022
C	REF ISSUE	DP	10/02/2023
D	REF ISSUE	DP	13/02/2023
E	REF ISSUE	DP	15/02/2023

DIMENSIONS

USE FIGURED DIMENSIONS, DO NOT SCALE. CONTRACTORS MUST VERIFY ALL DIMENSIONS ON THE SITE BEFORE COMMENCING ANY WORK OR MAKING ANY SHOP DRAWING WHICH MUST BE SUBMITTED AND REVIEWED BEFORE MANUFACTURE.

FIXTURES, FITTINGS & EQUIPMENT SPECIFICATIONS

SUBSTITUTE FF&E EQUIPMENT SPECIFICATIONS
THE FIT-OUT DESIGN AND DOCUMENTATION HAS BEEN COMPLETED ON THE BASIS OF FF&E AND EQUIPMENT ADVISED TO THIS OFFICE AT THE TIME OF BRIEFING THE DESIGN. THE DESIGN PROVISIONS FOR FF&E AND EQUIPMENT INCORPORATES SPATIAL ALLOCATIONS, SERVICING, LOADING AND ACCESS CLEARANCES AND WHERE APPROPRIATE SERVICES REQUIREMENTS, HAVING DUE REGARD FOR SURROUNDING FIXTURES AND FITTINGS. IT SHOULD BE NOTED THAT SUBSTITUTE FF&E OR EQUIPMENT WITH ALTERNATE SPECIFICATIONS SHOULD NOT BE PROCURED PRIOR TO VALIDATING THOSE SPECIFICATIONS AGAINST THE ITEM CONTROL SCHEDULE AND DESIGN PROVISIONS IN THE MODEL. THIS OFFICE ACCEPTS NO RESPONSIBILITY FOR THE PROCUREMENT OF SUBSTITUTE FF&E AND EQUIPMENT WHICH HAS NOT BEEN REVIEWED AND VALIDATED AGAINST THE ORIGINAL DESIGN PROVISIONS.

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THE SERVICE POINTS IDENTIFIED ON THESE DRAWINGS HAVE BEEN OVERLAYED FROM THE BUILDING SERVICES ENGINEERING MODEL, AND ARE PROVIDED FOR INFORMATION AND SET-OUT PURPOSES ONLY. WE HAVE BEEN ADVISED BY THE SERVICES ENGINEERS THAT THE POINTS REPRESENTED ON THESE DRAWINGS ARE CORRECT AT THE TIME OF PUBLICATION. THIS OFFICE DOES NOT WARRANT THE ACCURACY OF THIS DATA. REFER TO THE BUILDING SERVICES ENGINEERING DOCUMENTATION FOR THE INSTALLATION OF THE SERVICES POINTS, AND THE INTERFACE BETWEEN THE SERVICES POINTS AND THE RESPECTIVE ENGINEERING SYSTEMS.

ISSUED FOR INFORMATION

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CLIENT

Hunter New England Local Health District

PROJECT

TAMWORTH MENTAL HEALTH UNIT

Dean Street Tamworth NSW

DRAWING TITLE

SITE PLAN - PROPOSED OVERALL - REF

SCALE	DATE	DRAWN BY	CHECKED
As indicated@A1	11/09/22	Author	Checker

PROJECT No	DRAWING No	REVISION
10500.1	A01-002	E

Appendix B

Database Search Results

Data from the BioNet Atlas website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1°C; ^^ rounded to 0.01°C. Copyright the State of NSW through the Department of Planning, Industry and Environment. Search criteria : Licensed Report of all Valid Records of Threatened (listed on BC Act 2016) ,Commonwealth listed ,CAMBA listed ,JAMBA listed or ROKAMBA listed Entities in selected area [North: -31.02 West: 150.88 East: 150.98 South: -31.12] returned a total of 153 records of 28 species.
Report generated on 3/02/2023 12:09 PM

Kingdom	Class	Family	Species Code	Scientific Name	Exotic	Common Name	NSW status	Comm. status	Records	Info
Animalia	Reptilia	Carphodactylidae	2139	Uvidicolus sphyrurus		Border Thick-tailed Gecko	V,P	V	6	
Animalia	Aves	Megapodiidae	0008	Alectura lathami		Australian Brush-turkey population in the Nandewar and Brigalow Belt South Bioregions	E2,P		2	
Animalia	Aves	Apodidae	0335	Apus pacificus		Fork-tailed Swift	P	C,J,K	1	
Animalia	Aves	Apodidae	0334	Hirundapus caudacutus		White-throated Needletail	P	V,C,J,K	1	
Animalia	Aves	Accipitridae	0218	Circus assimilis		Spotted Harrier	V,P		2	
Animalia	Aves	Accipitridae	0225	Hieraaetus morphnoides		Little Eagle	V,P		17	
Animalia	Aves	Falconidae	0238	Falco subniger		Black Falcon	V,P		7	
Animalia	Aves	Scolopacidae	0168	Gallinago hardwickii		Latham's Snipe	P	J,K	3	
Animalia	Aves	Psittacidae	0260	Glossopsitta pusilla		Little Lorikeet	V,P		9	
Animalia	Aves	Psittacidae	0309	Lathamus discolor		Swift Parrot	E1,P	CE	2	
Animalia	Aves	Psittacidae	0302	Neophema pulchella		Turquoise Parrot	V,P,3		6	
Animalia	Aves	Strigidae	0248	Ninox strenua		Powerful Owl	V,P,3		1	
Animalia	Aves	Climacteridae	8127	Climacteris picumnus victoriae		Brown Treecreeper (eastern subspecies)	V,P		11	
Animalia	Aves	Acanthizidae	0504	Chthonicola sagittata		Speckled Warbler	V,P		10	
Animalia	Aves	Meliphagidae	8303	Melithreptus gularis gularis		Black-chinned Honeyeater (eastern subspecies)	V,P		2	
Animalia	Aves	Artamidae	8519	Artamus cyanopterus cyanopterus		Dusky Woodswallow	V,P		7	
Animalia	Aves	Petroicidae	0380	Petroica boodang		Scarlet Robin	V,P		2	
Animalia	Aves	Estrildidae	0652	Stagonopleura guttata		Diamond Firetail	V,P		8	
Animalia	Mammalia	Dasyuridae	1008	Dasyurus maculatus		Spotted-tailed Quoll	V,P	E	5	
Animalia	Mammalia	Phascolarctidae	1162	Phascolarctos cinereus		Koala	E1,P	E	12	
Animalia	Mammalia	Petauridae	1137	Petaurus norfolcensis		Squirrel Glider	V,P		6	
Animalia	Mammalia	Pteropodidae	1280	Pteropus poliocephalus		Grey-headed Flying-fox	V,P	V	24	
Animalia	Mammalia	Molossidae	1329	Micronomus norfolkensis		Eastern Coastal Free-tailed Bat	V,P		1	
Animalia	Mammalia	Vespertilionidae	1353	Chalinolobus dwyeri		Large-eared Pied Bat	V,P	V	1	
Animalia	Mammalia	Miniopteridae	3330	Miniopterus orianae oceanensis		Large Bent-winged Bat	V,P		1	
Plantae	Flora	Myrtaceae	4134	Eucalyptus nicholii		Narrow-leaved Black Peppermint	V	V	1	
Plantae	Flora	Myrtaceae	4293	Syzygium paniculatum		Magenta Lilly Pilly	E1	V	1	
Plantae	Flora	Poaceae	4895	Dichanthium setosum		Bluegrass	V	V	4	

Australian Government

Department of Climate Change, Energy, the Environment and Water

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 03-Feb-2023

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	3
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	34
Listed Migratory Species:	10

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	44
Commonwealth Heritage Places:	1
Listed Marine Species:	17
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	None
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	14
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar Wetlands)		[Resource Information]
Ramsar Site Name	Proximity	Buffer Status
Banrock station wetland complex	1000 - 1100km upstream from Ramsar site	In feature area
Riverland	900 - 1000km upstream from Ramsar site	In feature area
The coorong, and lakes alexandrina and albert wetland	1100 - 1200km upstream from Ramsar site	In feature area

Listed Threatened Ecological Communities			[Resource Information]
For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps. Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.			
Community Name	Threatened Category	Presence Text	Buffer Status
Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland	Critically Endangered	Community likely to occur within area	In feature area
New England Peppermint (Eucalyptus nova-anglica) Grassy Woodlands	Critically Endangered	Community may occur within area	In feature area
Weeping Myall Woodlands	Endangered	Community may occur within area	In feature area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area	In feature area

Listed Threatened Species			[Resource Information]
Status of Conservation Dependent and Extinct are not MNES under the EPBC Act. Number is the current name ID.			
Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Anthochaera phrygia			
Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Calyptorhynchus lathami lathami South-eastern Glossy Black-Cockatoo [67036]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Polytelis swainsonii Superb Parrot [738]	Vulnerable	Species or species habitat may occur within area	In feature area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area
FISH			
Maccullochella peelii Murray Cod [66633]	Vulnerable	Species or species habitat known to occur within area	In feature area
FROG			
Litoria booroolongensis Booroolong Frog [1844]	Endangered	Species or species habitat known to occur within area	In feature area
MAMMAL			

Scientific Name	Threatened Category	Presence Text	Buffer Status
Chalinolobus dwyeri			
Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat known to occur within area	In feature area
Dasyurus maculatus maculatus (SE mainland population)			
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area	In feature area
Nyctophilus corbeni			
Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Petaurus australis australis			
Yellow-bellied Glider (south-eastern) [87600]	Vulnerable	Species or species habitat may occur within area	In feature area
Petrogale penicillata			
Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)			
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat known to occur within area	In feature area
Pteropus poliocephalus			
Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area	In feature area
PLANT			
Cadellia pentastylis			
Ooline [9828]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Callistemon pungens			
[55581]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Dichanthium setosum			
bluegrass [14159]	Vulnerable	Species or species habitat known to occur within area	In feature area
Eucalyptus nicholii			
Narrow-leaved Peppermint, Narrow-leaved Black Peppermint [20992]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Euphrasia arguta [4325]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Homoranthus prolixus [55198]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Lepidium aschersonii Spiny Pepper-cress [10976]	Vulnerable	Species or species habitat may occur within area	In feature area
Lepidium monoplocoides Winged Pepper-cress [9190]	Endangered	Species or species habitat may occur within area	In feature area
Prasophyllum sp. Wybong (C.Phelps ORG 5269) a leek-orchid [81964]	Critically Endangered	Species or species habitat may occur within area	In feature area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Vincetoxicum forsteri listed as Tylophora linearis [92384]	Endangered	Species or species habitat may occur within area	In feature area
REPTILE			
Aprasia parapulchella Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat may occur within area	In feature area
Hemiaspis damelii Grey Snake [1179]	Endangered	Species or species habitat may occur within area	In feature area
Uvidicolus sphyrurus Border Thick-tailed Gecko, Granite Belt Thick-tailed Gecko [84578]	Vulnerable	Species or species habitat known to occur within area	In feature area
Wollumbinia belli Bell's Turtle, Western Sawshell Turtle, Namoi River Turtle, Bell's Saw-shelled Turtle [86071]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Listed Migratory Species			[Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Migratory Terrestrial Species			
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area	In feature area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area	In feature area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area	In feature area
Migratory Wetlands Species			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area	In feature area

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land Name	State	Buffer Status
Commonwealth Bank of Australia		
Commonwealth Land - Commonwealth Bank of Australia [12980]	NSW	In buffer area only
Commonwealth Trading Bank of Australia		
Commonwealth Land - Commonwealth Trading Bank of Australia [16080]	NSW	In buffer area only
Commonwealth Land - Commonwealth Trading Bank of Australia [12972]	NSW	In buffer area only
Commonwealth Land - Commonwealth Trading Bank of Australia [12958]	NSW	In buffer area only
Communications, Information Technology and the Arts - Australian Postal Corporation		
Commonwealth Land - Australian Postal Commission [12964]	NSW	In buffer area only
Commonwealth Land - Australian Postal Commission [12993]	NSW	In buffer area only
Communications, Information Technology and the Arts - Telstra Corporation Limited		
Commonwealth Land - Australian & Overseas Telecommunications Corporation [12962]	NSW	In buffer area only
Commonwealth Land - Australian Telecommunications Commission [12965]	NSW	In buffer area only
Commonwealth Land - Australian Telecommunications Commission [12963]	NSW	In buffer area only
Commonwealth Land - Australian Telecommunications Commission [12973]	NSW	In buffer area only
Commonwealth Land - Australian Telecommunications Commission [12956]	NSW	In buffer area only
Commonwealth Land - Australian Telecommunications Commission [12955]	NSW	In buffer area only
Commonwealth Land - Australian Telecommunications Commission [12954]	NSW	In buffer area only
Commonwealth Land - Australian Telecommunications Commission [12953]	NSW	In buffer area only
Commonwealth Land - Telstra Corporation Limited [15957]	NSW	In buffer area only
Commonwealth Land - Telstra Corporation Limited [12957]	NSW	In buffer area only
Defence		

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - Defence Service Homes Corporation [12969]	NSW	In buffer area only
Commonwealth Land - Defence Service Homes Corporation [12968]	NSW	In buffer area only
Commonwealth Land - Defence Service Homes Corporation [12966]	NSW	In buffer area only
Commonwealth Land - Defence Service Homes Corporation [12967]	NSW	In buffer area only
Commonwealth Land - Defence Service Homes Corporation [12970]	NSW	In buffer area only
Commonwealth Land - Defence Service Homes Corporation [12971]	NSW	In buffer area only
Commonwealth Land - Defence Service Homes Corporation [12975]	NSW	In buffer area only
Commonwealth Land - Defence Service Homes Corporation [12979]	NSW	In buffer area only
Commonwealth Land - Defence Service Homes Corporation [12951]	NSW	In buffer area only
Commonwealth Land - Director of Defence Service Homes [12978]	NSW	In buffer area only
Defence - TAMWORTH GRES DEPOT ; BEERSHEBA BARRACKS-TAMWORTH [11202]	NSW	In buffer area only
Defence - Defence Housing Authority		
Commonwealth Land - Defence Housing Authority [15429]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [15428]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [15427]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [12960]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16158]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16070]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [12977]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [12976]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16101]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16100]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16103]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16102]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16069]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [12981]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [12959]	NSW	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - Director of War Service Homes [12961]	NSW	In buffer area only
Commonwealth Land - Director of War Service Homes [12974]	NSW	In buffer area only

Commonwealth Heritage Places [Resource Information]

Name	State	Status	Buffer Status
Historic			
Tamworth Post Office	NSW	Listed place	In buffer area only

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Bubulcus ibis as Ardea ibis			
Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata			
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area
Calidris ferruginea			
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area
Calidris melanotos			
Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
Chalcites osculans as Chrysococcyx osculans			
Black-eared Cuckoo [83425]		Species or species habitat known to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area overfly marine area	In feature area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area	In feature area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area overfly marine area	In feature area
Neophema chrysostoma Blue-winged Parrot [726]		Species or species habitat may occur within area overfly marine area	In feature area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Rostratula australis as Rostratula benghalensis (sensu lato)			
Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area

Extra Information

EPBC Act Referrals				[Resource Information]
Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Chaffey Dam Pipeline Project	2022/09314		Assessment	In feature area
Controlled action				
Hills Plain subdivision	2005/2432	Controlled Action	Completed	In buffer area only
One Tree Hill Estate - Stage 13	2003/1142	Controlled Action	Post-Approval	In feature area
Operation of Peel River Drought Protection Works	2019/8590	Controlled Action	Post-Approval	In buffer area only
Rosewood Estate (Stage 3) Rural Residential Subdivision	2013/7060	Controlled Action	Post-Approval	In buffer area only
Rural residential subdivision, Rosewood Estate, Moore Creek, NSW	2013/6905	Controlled Action	Completed	In buffer area only
Vegetation clearing for a residential subdivision	2013/6812	Controlled Action	Post-Approval	In buffer area only
Not controlled action				
Dubbo - Tamworth Natural Gas Pipeline	2000/32	Not Controlled Action	Completed	In buffer area only
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
Replacement Pipeline between Dungowan Village and Calala	2021/9091	Not Controlled Action	Completed	In buffer area only
Residential Development & Assoc Infrastructure 31 & 41 Panorama Road	2005/2115	Not Controlled Action	Completed	In feature area

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
Residential Subdivision, Warramunga Avenue	2005/2201	Not Controlled Action	Completed	In feature area
Not controlled action (particular manner)				
Aerial baiting for wild dog control	2006/2713	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Rural residential subdivision, Lots 172 and 180 DP753851 Barakula Drive, Moore Creek, NSW	2016/7736	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact us page.

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Appendix C

Arboricultural Impact Assessment - TMHU Building

Root Partnerships
Tamworth Hospital - Banksia Unit
Tamworth NSW
Arboricultural Impact Assessment

20 February 2023

Assessment and Report prepared by:

Andy Clark
Dip. Hort. (Arb.), AQF Level 5

JNC02173v3

C02173v3

20 February 2023

Sri Viswanathan
Root Partnerships
Level 19
9 Hunter Street
Sydney NSW 2000

Arboricultural Impact Assessment Report regarding eighteen (18) trees located within the vicinity of the proposed Tamworth Hospital - Banksia Unit development

Dear Sri,

We are pleased to provide you with the following Arboricultural Impact Assessment Report for eighteen (18) trees located within the grounds of Tamworth Hospital, the site of the proposed Banksia Development.

Complete use of this report is authorised under the conditions limiting its use as stated in Appendix A Item 7 of "*Arboricultural Reporting Assumptions and Limiting Conditions*".

Should you have any queries relating to this report, its recommendations, or the options considered please do not hesitate to contact us on 1300 272 671.

Regards,

Andy Clark
Consulting Arborist
Dip. Hort. (Arb.), AQF Level 5

CIVICA

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CIVICA

1 Executive Summary

1.1.1 The following Arboricultural Impact Assessment (Report) regarding eighteen (18) trees located within the grounds of Tamworth Hospital. The subject site was identified by Root Partnerships, on behalf of NSW Health Infrastructure (the Client), as possessing trees that may be impacted upon by a proposed construction of a new hospital wing – designated as the Banksia Development.

1.1.2 In part, the project scope was to nominate subject trees that can be retained, or require removal to facilitate the proposed development, as well as identify and reduce potential conflicts between subject trees and site development. Accurate information on the area required for tree retention and methods/techniques suitable for tree protection during construction have been provided.

1.1.3 Tree retention values have been determined based upon a modified version of the British Standard and which have been prescribed into one of the following four (4) categories, A, B, C and U. Refer to Appendix C for further detail. Generally, relevant consent authorities will consider:

- **A** retention value trees as a site constraint and may require alterations to the proposed development design and/or specific protection measures to allow retention, unless the proposed development outweighs the retention value of the tree
- **B** retention value trees as a site constraint consideration, lesser changes should be considered to retain such trees
- **C** retention value trees are not considered a site constraint
- **U** retention value trees are considered a site opportunity, as such trees are recommended for removal regardless of the proposed development.

1.1.4 Fourteen (14) of the eighteen (18) trees are situated within the proposed development footprint and therefore would require removal under the current design. Three (3) trees out of the fourteen (14) are in such a poor state as they should be removed irrespective of development. To retain any of these trees, a redesign or relocation of the development would be required. For a number of reasons including tree age, ease of replacement, ULE and low visual impact, this is not considered a reasonable option.

1.1.5 The four (4) trees which are recommended for retention are situated in an area which can easily be excluded from any construction activities with no long-term negative impacts envisaged.

Category	Description	Total	Removal		Retain	
			located within development footprint	irrespective of future development	with specific protection	with generic protection
A	High retention value trees	0				
B	Moderate retention value trees	8	7, 13, 14, 18			1, 2, 3, 4
C	Low retention value trees	7	5, 6, 8, 9, 10, 11, 12			
U	Trees to be removed irrespective of proposed development	3		15, 16, 17		

CIVICA

2 Introduction

2.1.1 ArborSafe Australia Pty Ltd was engaged by Sri Viswanathan on behalf of the Client to complete an Arboricultural Impact Assessment Report on eighteen (18) trees located within the Tamworth Hospital grounds at Dean Street, Tamworth.

2.1.2 The proposed development site was located within the hospital grounds and includes a number of existing single storey buildings, carparking, pedestrian pathways and surrounding areas of open space and trees.

2.1.3 The proposed development has been reviewed and in summary consists of the demolition of the existing buildings, outdoor infrastructure and trees and the construction of a new hospital wing across the entire footprint.

2.1.4 The report was intended to provide information on site trees and how they may be impacted upon by the proposed development. Report findings and recommendations provided are based upon guidance provided within Australian Standard AS 4970–2009: *Protection of Trees on Development Sites*.

2.1.5 Observations and recommendations provided within this report are based upon information provided by the Client and an arborist site visit.

3 Scope

3.1.1 Carry out a visual examination of the nominated trees located within the vicinity of the proposed development.

3.1.2 Provide an objective appraisal of the subject trees in relation to their species, estimated age, health, structural condition, useful life expectancy (ULE) and viability within the landscape.

3.1.3 Based on the findings of this investigation, provide independent recommendations on the retention value of the trees.

3.1.4 Nominate subject trees that can be retained or require removal to facilitate the development.

3.1.5 Identify and reduce potential conflicts between subject trees and site development by providing accurate information on the area required for tree retention and methods/techniques suitable for tree protection during construction.

3.1.6 Provide information on restricted activities within the area nominated for tree protection, as well as suitable construction methods to be adopted during demolition and/or construction.

4 Methodology

4.1 Data Collection

4.1.1 Andrew Clark of ArborSafe Australia Pty Ltd carried out a site inspection of the subject trees on 27 May 2021.

4.1.2 Trees that are the subject of this report (Figure 1) were identified during discussions with the Client, reviewing relevant supplied development documentation and the onsite assessment. All site trees above 3m in height and/or with a crown spread of greater than 3m have been included within this report.

4.1.3 The subject trees were inspected from the ground using the initial component of Visual Tree Assessment (VTA) (Matthek, 1994). No foliage or soil samples were taken and no aerial, underground or internal investigations were undertaken.

4.1.4 Tree height and canopy width were estimated and have been provided to the nearest whole metre. Trunk diameter at breast height (DBH) and trunk diameter at the root crown (DRB) were measured with a diameter tape and provided to the nearest centimetre.

4.1.5 Environmental and Heritage information has been sourced from the NSW Govt *Sharing & Enabling Environmental Data (SEED)* website. The source of all information has been referenced accordingly.

4.1.6 Data collected on site was analysed by Andrew Clark. Relevant recommendations were formulated and collated into report format.

4.1.7 Tree protection zones (TPZ) and structural root zones (SRZ) were calculated in accordance with the Australian Standard AS 4970–2009: *Protection of Trees on Development Sites* (refer to Section 7.6).

4.1.8 Retention values have been determined based upon a modified version of the British Standard BS 5837–2012: *Trees in Relation to Design, Demolition and Construction* (refer to Appendix C).

4.1.9 All photographs were taken at the time of the site inspections by the author and have not been altered for brightness or contrast, nor have they been cropped.

4.1.10 Plans of the existing site and of the proposed development were provided to ArborSafe on 2 June 2021.

4.1.11 No proposed underground service locations have been reviewed in the preparation of this report.

5 Observations

5.1 Location

5.1.1 The site was located within the grounds of the Tamworth Hospital, Dean Street, Tamworth (Figure 1). Specifically, the area designated in this report, was located to the north of the site, immediately to the north of the emergency department.

5.1.2 As the proposed development site was within the hospital grounds usage surrounding the area was all hospital related. The Emergency Department was located to the south, carparking to the west and auxiliary hospital buildings to the north and east.

5.1.3 The site possessed a level, sloping aspect characterised by a high point located at the north, with the low point to the south.

5.1.4 Site soils were expected to differ from natural soil horizon profiles due to extensive and longstanding site development and usage.

5.1.5 The site was located within the Tamworth Regional Council Local Government Area (LGA).

Figure 1. Whole site image (location). The red square identifies the area within the larger Tamworth Hospital complex containing the subject trees that may be impacted by the proposed development. (SEED, n.d.).

5.2 Site Trees

5.2.1 Trees can be identified on site using white tree tags which are typically located at approximately 2.0m from ground level on the southern side of the trunk.

5.2.2 Twelve (12) of the subject trees were species endemic to the local area, with another two (2) native to Australia and the remaining four (4) exotic species. 61% (11 of 18) of the trees were classed in the semi-mature age bracket, with another 22% (4 of 18) of the trees were classed as juvenile, with the remaining 17% (3 of 18) being mature.

5.2.3 The dominant species within the site was *Eucalyptus sideroxylon* (Red Ironbark) with a line of juvenile trees having been planted at the eastern end of the area to complement the existing declining mature specimen. The structure within the young trees was not good with multiple included unions observed which would limit future ULE.

5.2.4 Some of the other larger or more numerous specimens within the site were made up of *Eucalyptus melliodora* (Yellow Box) and *Eucalyptus bridgesiana* (Apple Box). The remainder of the trees were smaller trees of minimal visual impact which would be easily replaced if required.

5.2.5 Two (2) of the smaller exotic trees, numbered 5 & 6, were *Olea europaea* (European Olive) which were multi-stemmed trees growing from cut stumps, but which had Rotary Club commemorative plaques at the base.

5.2.6 The subject trees were considered to have all been planted, as opposed to remnant, specimens.

Tree List

Tree #	Species	Risk
1	Yellow Box	Low
2	Yellow Box	Medium
3	Yellow Box	Medium
4	Eucalypt	Medium
5	European Olive	Negligible
6	European Olive	Negligible
7	Himalayan Cedar	Negligible
8	Red Ironbark	Medium
9	Red Ironbark	Negligible
10	Red Ironbark	Medium
11	Bracelet Honey Myrtle	Negligible
12	White Cedar	Low
13	Salt Cedar	Medium
14	Red Ironbark	High
15	Dead tree	High
16	Red Ironbark	Medium
17	Weeping Myall	High
18	Apple Box	Low

Figure 2. Site map showing subject trees. Note that icon colour indicates trees current risk rating (not Retention Value). Tree attributes are to be obtained from Appendix E – Tree Assessment Data. (ArborSite, May 2021).

Figure 3. View to south of Trees 1 & 2 *Eucalyptus melliodora* (Yellow Box) in their growing environment. (ArborSafe, May 2021).

Figure 4. View to south of Tree 7 *Cedrus deodara* (Himalayan Cedar) in its growing environment. (ArborSafe, May 2021).

Figure 5. View to west of Trees 8 & 9 *Eucalyptus sideroxylon* (Red Ironbark) in their growing environment. (ArborSafe, May 2021).

Figure 6. View to south of Trees 13 – 18 in their growing environment. (ArborSafe, May 2021).

5.3 Tree Retention Values

5.3.1 Retention values were determined based upon a modified version of the British Standard BS 5837–2012: *Trees in Relation to Design, Demolition and Construction*. This standard categorises tree retention value based upon assessment of the tree's quality (health and structure), and life expectancy. Other criteria such as its physical dimensions, age class, location and its Amenity, Heritage and Environmental significance are also considered. A breakdown of attributes required for each category can be obtained from Appendix C – Tree Retention Values.

Category	Tree numbers
A	
B	1, 2, 3, 4, 7, 13, 14, 18
C	5, 6, 8, 9, 10, 11, 12
U	15, 16, 17

5.4 Heritage Status

5.4.1 The proposed development site had no trees identified as being of national, state or local heritage significance. (SEED, n.d.).

5.5 Botanical and Environmental Status

5.5.1 The site trees were considered common species in the local area and as such hold limited botanical significance.

5.5.2 The subject site was not within a specific *Area of Regional Koala Significance* (ARCS), with no BioNet Koala sightings listed (SEED, n.d.).

5.5.3 No subject trees were observed to have habitat hollows within dead branch stubs and/or the trunks themselves so were considered of minimal habitat significance.

6 Discussion

6.1 Proposed Construction

6.1.1 The proposed development has been reviewed and in summary consists of the demolition of the existing buildings, outdoor infrastructure and trees and the construction of a new multi-storey hospital wing across the entire footprint.

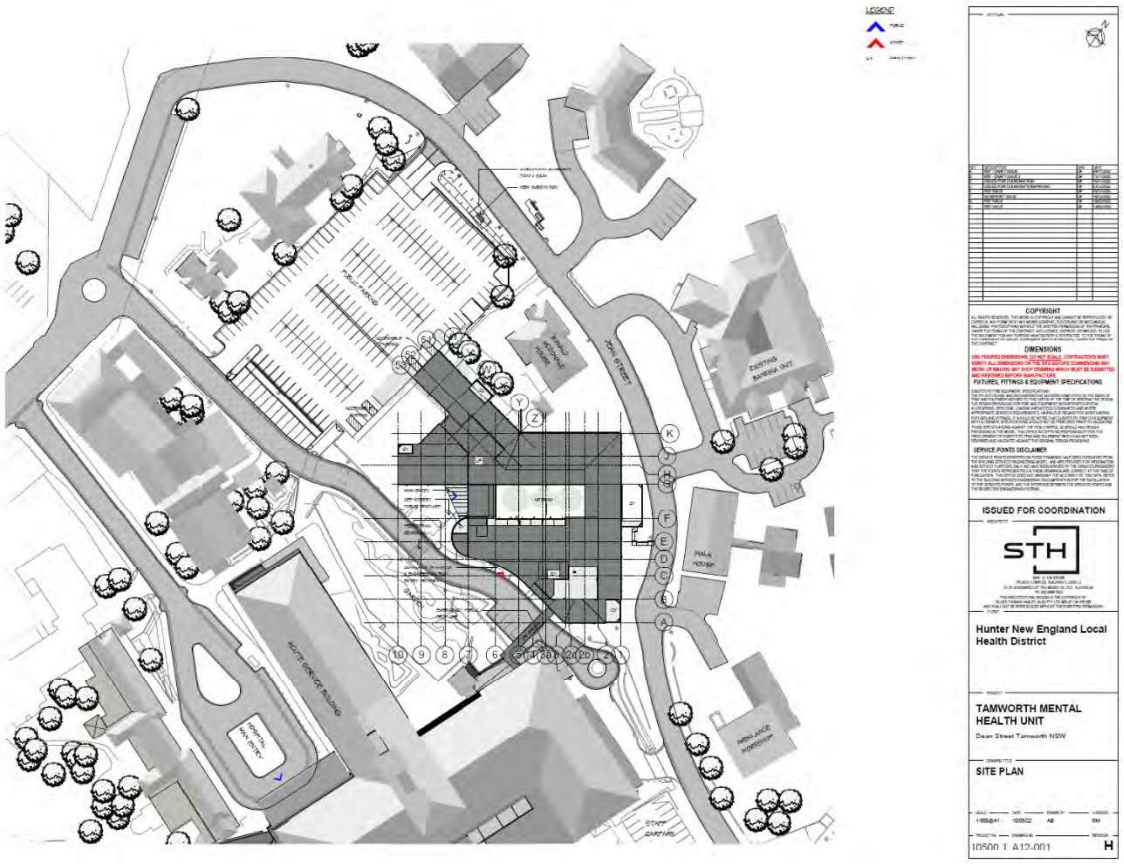


Figure 7. Excerpt from Tamworth Mental Health Unit Site Plan (A12-001, Rev H). (STH, 13 February 2023).

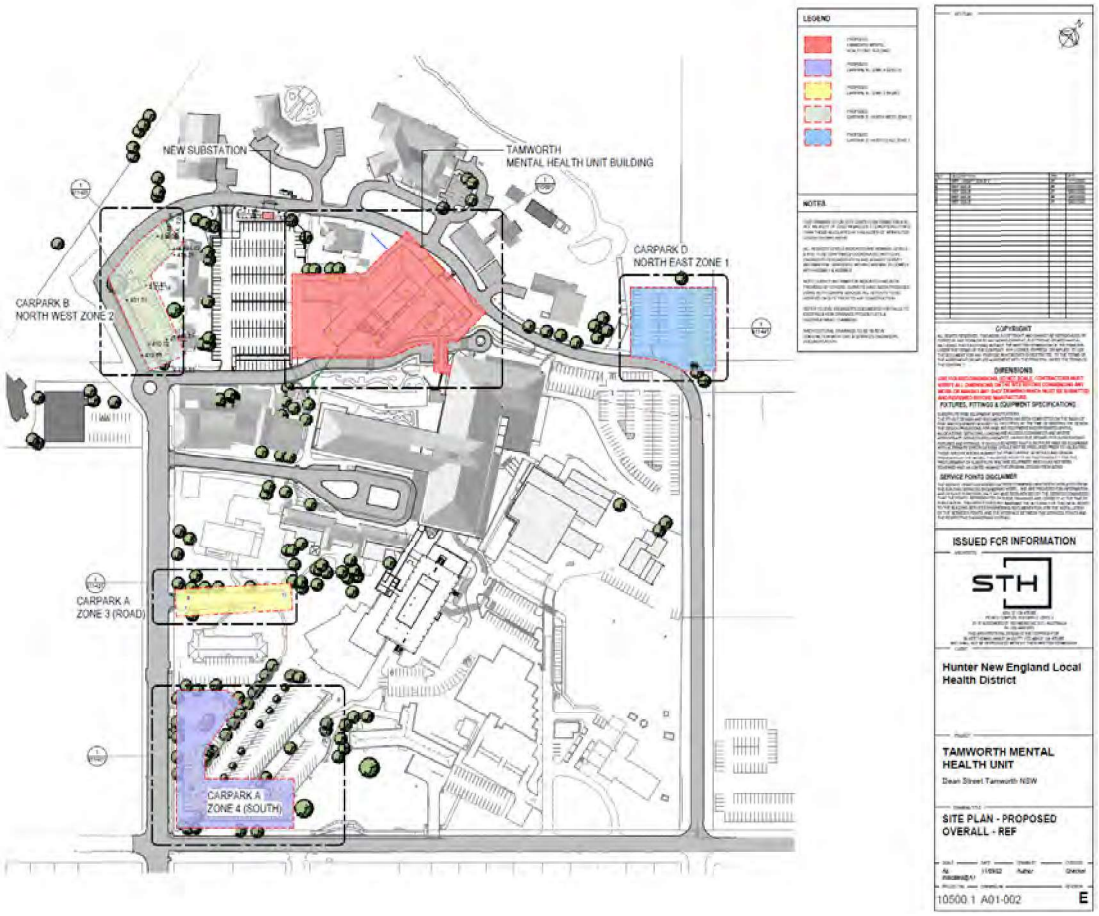


Figure 8. Excerpt from Tamworth Mental Health Unit Site Plan – Proposed Overall - Ref (A01-002, Rev E). (STH, 15 February 2023).

6.2 Determining TPZ Encroachment

6.2.1 **Major encroachment**. As per the Australian Standard AS 4970–2009: *Protection of Trees on Development Sites*, a major encroachment into the TPZ of any tree is considered to occur when it is beyond 10% of the total TPZ area. Trees with major encroachment may require removal or, in certain instances, be retained with specific protection requirements throughout the construction stage.

6.2.2 **Minor encroachment**. Under the aforementioned standard, a minor encroachment is determined as being less than 10% of the total TPZ area. Trees with minor encroachment may be retained with specific, generic or no protection requirements throughout the construction stage.

6.2.3 **No encroachment**. Trees with no encroachment may be retained with generic or no protection requirements throughout the construction stage.

6.2.4 For the purposes of this report, trees to be removed or retained have been identified as those:

- Requiring removal due to a level of encroachment into their TPZ that would likely result in a detrimental impact upon their future health and/or stability
- Retainable and requiring specific protection requirements throughout construction (i.e. generic requirements plus arborist supervision and careful construction methods within their TPZ)
- Retainable and requiring generic tree protection measures only (i.e. protective fencing and restriction of activities within the TPZ).

6.3 Impact of Proposed Development

6.3.1 Review of the proposed design has been undertaken in the context of tree retention and removal across the site.

6.3.2 The eleven (11) trees affected by direct conflict with the proposed construction footprint would require removal under the current design. To retain any of these trees, a redesign or relocation of the development would be required.

6.3.3 Three (3) additional trees are recommended to be removed irrespective of development due to either being dead or having health or stability which precludes them from being within the hospital complex due to unpredictable stability. Refer to section 7.1 or Appendix E for further detail.

6.3.4 The main development impact which affects trees, but not necessarily to the point of requiring immediate removal, is through significant root damage due to major TPZ encroachment. These can largely be placed into three (3) categories – soil compaction, level changes or direct root severance.

6.3.5 Negative tree impacts can manifest as either a reduction in health and/or vigour due to root loss resulting in a reduction in water and nutrient absorption capability or on tree stability if larger structural roots are impacted. Ultimately, the outcome for the trees depends on a number of variable factors including species, age, current health, TPZ encroachment percentage, soil type, topography, previous site use and the proposed design and construction methodology.

6.3.6 Compacted soils, especially artificially compacted soils, such as those found under building platforms or pedestrian pathways, have a higher bulk density down to a deeper level of subsoil. Bulk density is the term used for describing the weight of soil per unit volume. The broad engineering thinking is that the higher the density the more stable the building surface due to less soil movement in expansion, contraction, or compression. A higher bulk density is produced by compacting the soil to reduce available pore space between the soil particles.

6.3.7 The effect of compacted soils on plants is somewhat influenced by the soil type but generally a reduction in available pore space reduces the available area for oxygen and water within the soil. A reduction in available soil water and oxygen inhibits root activity within the soil, as they are essential for root elongation and growth, and the lack of these properties is considered a major limiting factor (Urban, 2008).

6.3.8 A similar reduction in root activity, due to a reduction in pore space, can occur following significant soil level changes across the TPZ. The impacts of soil level changes do depend on the added soil composition (sand vs clay-based vs silt material), installation methodology (compacted vs uncompacted) and depth deposited. The impacts of level change also generally occur over a longer time frame, as roots are still present and attached to the tree but may now be in a situation unfavourable to future root activity. Negative impacts can be mitigated by limiting the depth of the raised soil level and/or by ensuring the added soil is uncompacted and of a coarse sandy grade material to allow ease of water and oxygen penetration down to the original soil level. Over time additional soil can be beneficial as it increases usable soil volume for roots to utilise (especially in areas of high-water table) or by adding better quality soil to the existing soil.

6.3.9 Root severance has a definite negative impact on trees as it immediately causes a reduction in root function and capability where there is no time for the tree to easily adjust. The impact on trees due to the severance of larger roots is compounded as they not only function as highways for nutrients and water but in anchoring the tree in the ground.

6.3.10 The assumption of allowable encroachment and minimal long-term health or structural impacts to the trees rely on a combination of the following being used – root sensitive construction methods being adhered to within the TPZ, minimal excavation within the TPZ to limit root severance (i.e. construction placed outside the TPZ where possible), course sandy fill rather than excavation utilised to affect level changes where possible (i.e. to minimise root severance and allow the trees root system time to adjust), no construction occurring within the SRZ, compensatory area being available around the unimpacted aspects of the trees and the enhancement of the existing TPZ area (i.e. mulched, soil conditioning and irrigation when required).

6.3.11 The remaining four (4) trees would be situated outside any proposed development zone and as such could be protected by exclusion from the construction site.

7 Tree Protection and Management Recommendations

7.1 Tree Removal

7.1.1 Eleven (11) trees would require removal, based on the supplied design proposal, to facilitate the development.

7.1.2 A further three (3) trees should be removed irrespective of development (Cat U) due to poor health and/or structure.

Recommendation	Category A High retention value		Category B Moderate retention value		Category C Low Retention value		Category U No retention value	
	Qty	Tree numbers	Qty	Tree numbers	Qty	Tree numbers	Qty	Tree numbers
Remove for development	0		4	7, 13, 14, 18	7	5, 6, 8, 9, 10, 11, 12	3	15, 16, 17

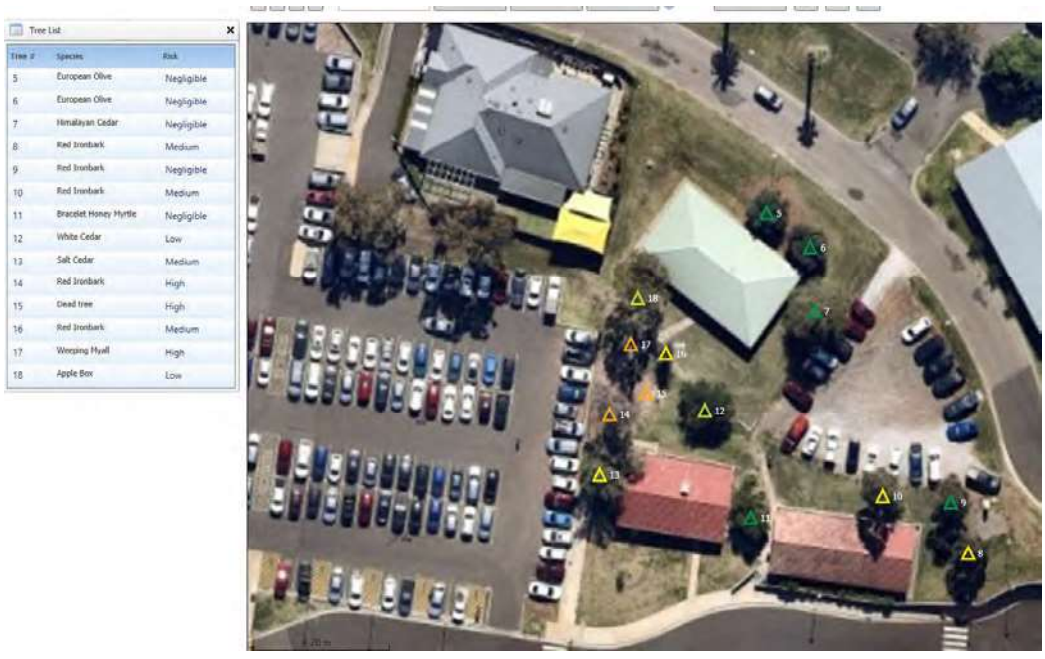


Figure 9. Site map showing trees recommended for/requiring removal to facilitate development. (ArborSafe, May 2021).

7.2 Tree Retention

7.2.1 Four (4) trees were recommended for retention and require generic protection measures during construction to ensure they remain viable following the completion of works.

Recommendation (Refer Section 7.5–7.9)	Category A High retention value		Category B Moderate retention value		Category C Low Retention value	
	Qty	Tree numbers	Qty	Tree numbers	Qty	Tree numbers
Retain with specific protection requirements	0		0		0	
Retain with generic protection requirements	0		4	1, 2, 3, 4	0	

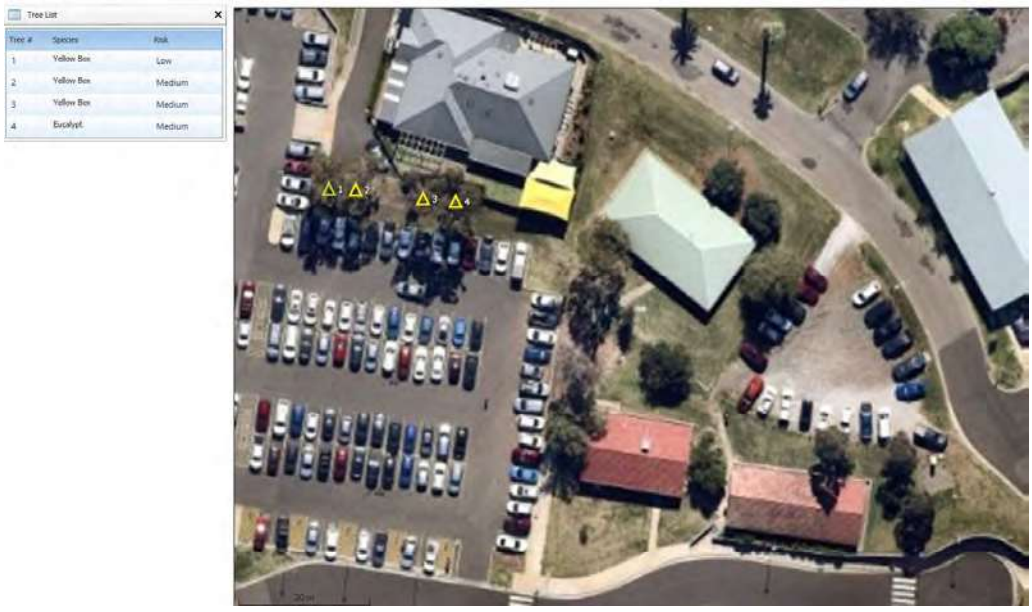


Figure 10. Site map showing tree requiring generic protection measures. (ArborSafe, May 2021).

7.3 Generic Protection and Reporting Measures

7.3.1 All trees to be retained require protection during the construction stage. Tree protection measures generally include a range of:

- Activities restricted within the TPZ
- Protective fencing
- Trunk and ground protection
- Tree protection signage
- Involvement from the project arborist
- Project milestones
- Compliance reporting

7.3.2 Where generic tree protection measures can be undertaken as per the controls outlined in this report, no further arboricultural supervision should be required until post project (Final) sign-off (see Section 7.9).

7.3.3 Where there are variations to project scope impacting generic controls, input from the project arborist should be sought in advance of works.

7.3.4 Tree protection measures will largely be focused on excluding trees (to be retained) from the associated construction activities and mulching to help increase tree health and vigour. The measures which are to be applied are detailed in Section 7.4, 7.5.2, 7.12, 7.13 and 7.16 of this Report.

7.4 Activities Prohibited within the TPZ

- Machine excavation including trenching
- Storage
- Preparation of chemicals, including cement products
- Parking of vehicles and plant
- Refuelling
- Dumping of waste
- Wash down and cleaning of equipment
- Placement of fill
- Lighting of fires
- Soil level changes
- Temporary or permanent installation of utilities and signs
- Physical damage to the tree

7.5 Protective Fencing Specification

7.5.1 Protective fencing (Figure 11) is to be installed as far as practicable from the trunk of any retained trees. Fencing should be erected as per the image below before any machinery or materials are brought to site and before commencement of works (including demolition).

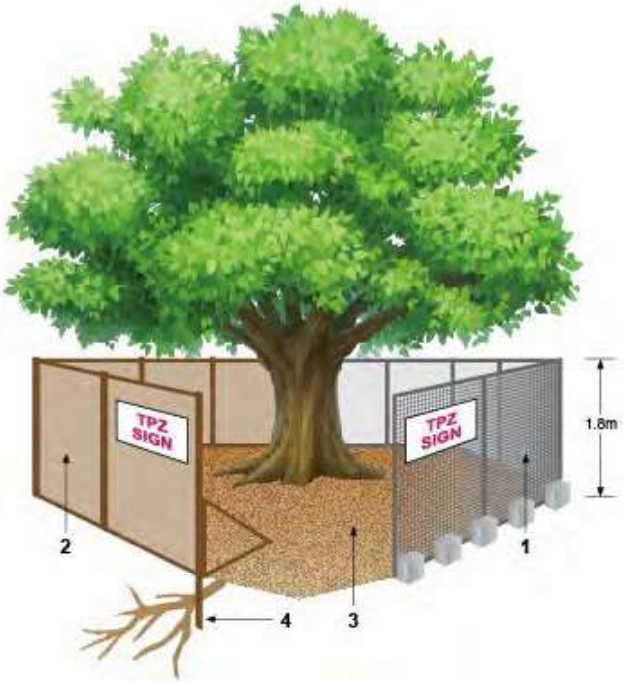
7.5.2 In some areas of the site (i.e. protection of trees on neighbouring properties) existing boundary fencing or perimeter site fencing may be used as an alternative to protective fencing.

7.5.3 Once erected, protective fencing must not be removed or altered without approval from the project arborist. The TPZ fencing should be secured to restrict access.

7.5.4 TPZ fencing is to be a minimum of 1.8m high and mesh or wire between posts must be highly visible. Fence posts and supports should have a diameter greater than 20mm and should ideally be freestanding, otherwise be located clear of the roots. See image below.

7.5.5 Tree protection fencing must remain intact throughout all proposed construction works and must only be dismantled after their conclusion. The temporary dismantling of tree protection fencing must only be done with the authorisation of a consulting arborist and/or the responsible authority.

7.5.6 The subject trees themselves must also not to be used as a billboard to support advertising material. Affixing nails or screws into the trunks of trees to display signs of any type is not a recommended practice in the successful retention of trees.



Legend:

1. Chain wire mesh panels with shade cloth attached (if required), 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 (at discretion of the project arborist). No excavation, construction activity, grade changes, surface treatment or storage materials of any kind are permitted within the TPZ
4. Bracing is permissible within the TPZ. Installation of supports should avoid damaging roots.

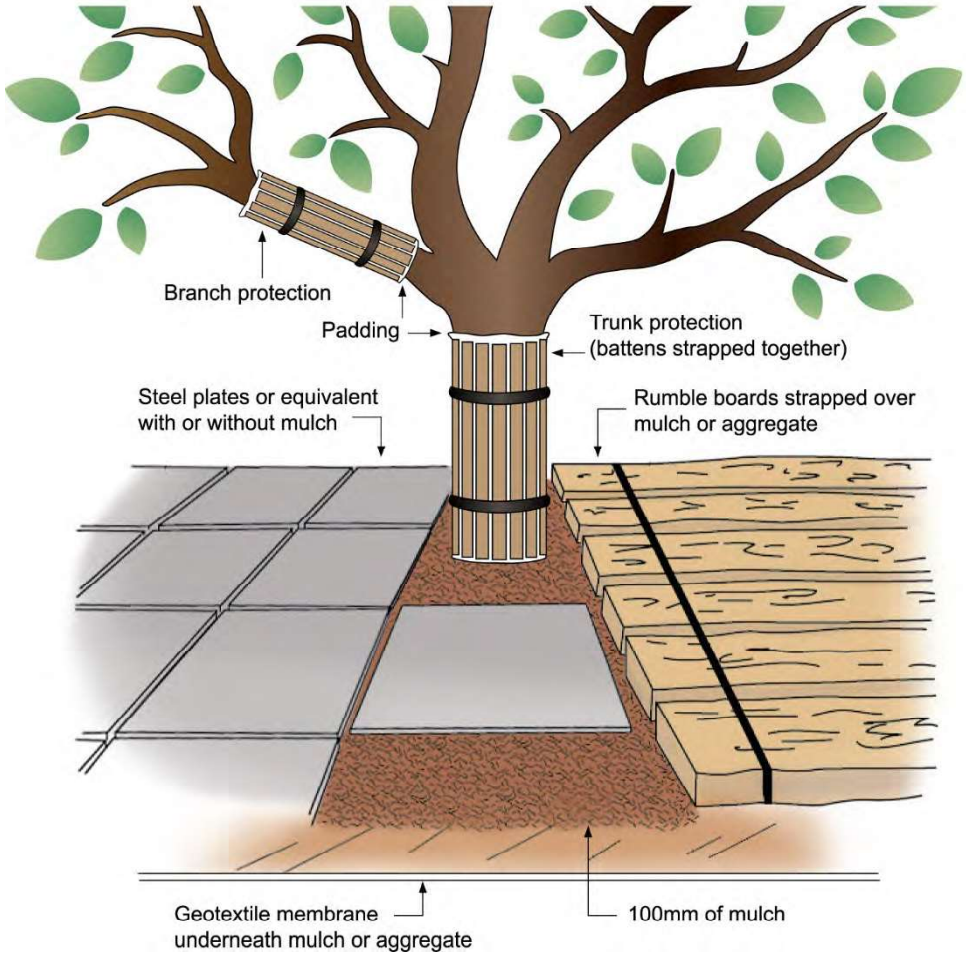
Figure 11. Depicts standard fencing techniques. (AS 4970–2009).

7.6 Trunk and Ground Protection

7.6.1 Given that proposed works are often within the TPZs of retained trees, standard protective fencing may not always be a viable method of protection. In these areas trunk protection and ground protection should be installed prior to the commencement of works and remain in place until after construction works have been completed.

7.6.2 Where construction access into the TPZ of retained trees cannot be avoided, the root zone of each tree must be protected using either steel plates or rumble board strapped over mulch/aggregate until such a time as permanent above ground surfacing (cellular confinement system or similar) is to be installed.

7.6.3 Trunk and ground protection (Figure 12) should be undertaken in line with the Australian Standard AS 4790–2009: *Protection of Trees on Development Sites* as per the image below:



Notes:

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.

Figure 12. Depicts trunk and ground protection techniques. (AS 4970–2009).

7.7 Tree Protection Signs

7.7.1 Signs identifying the TPZ (Figure 13) should be placed at 10m intervals around the edge of the TPZ and should be visible from within the development site.

Figure 13. Depicts standard fencing techniques. (AS 4970–2009).

7.8 Project Arborist

7.8.1 An official "Project Arborist" must be commissioned to oversee the tree protection, any works within the TPZ's and complete regular monitoring compliance certification.

7.8.2 The project arborist must have minimum five (5) years industry experience in the field of arboriculture, horticulture with relevant demonstrated experience in tree management on construction sites, and Diploma level qualifications in arboriculture – AQF Level 5.

7.8.3 Inspections are to be conducted by the project arborist at several key points during the construction in order to ensure that protection measures are being adhered to during construction stages and decline in tree health or additional remediation measures can be identified.

7.9 Project Milestones

7.9.1 The following visits and milestones were recommended as to when on-site tree inspection by the project arborist is required:

Item	Purpose of Visit	Timing of Visit(s)	Prerequisites
1	Pre-start induction	Following sign off from Item 1. Contractor to provide a minimum of five days advance notice for this visit.	Prior to commencement of works. All parties involved in the project to attend.
2	Supervision of works in TPZ's including all regrading and excavations	Whenever there is work planned to be performed within the TPZ's. Contractor to provide a minimum of five days advance notice for such visits.	
3	Regular site inspections	Minimum frequency monthly for the duration of the project.	The checklist must be completed by the Project Arborist at each site inspection and signed by both parties.
4	Final sign off	Following completion of works.	Practical completion of works and prior to tree protection removal.

7.10 Compliance Reporting

7.10.1 Following each inspection, the project arborist shall prepare a report detailing the condition of the trees. These reports should certify whether or not the works have been completed in compliance with the consent relating to tree protection.

7.10.2 These reports should contain photographic evidence where required to demonstrate that the work has been carried out as specified.

7.10.3 Matters to be monitored and included in these reports should include tree condition, tree protection measures and impact of site works which may arise from changes to the approved plans.

7.10.4 The reports and Compliance Statements shall be submitted to the Project Manager (as well as the Clients' nominated representative) following each inspection.

7.10.5 The reports and any Non-Compliance Statements shall be submitted to the Project Manager (as well as the Clients' nominated representative) if tree protection conditions have been breached. Reports should contain clear remedial action specifications to minimise any adverse impact on any subject tree.

7.11 Proposed Pruning

7.11.1 It is anticipated that zero to minor pruning may be required, of no greater than 10% of any single trees total canopy size, to facilitate the development. Any pruning required would likely be crown lifting or minor reduction pruning, to facilitate access.

7.11.2 All pruning is recommended to be completed in accordance with the Australian Standard AS 4373–2007: *Pruning of Amenity Trees* (Standards Australia, 2007) and undertaken by a suitably qualified arborist (minimum AQF 3 arborist).

7.11.3 Reduction pruning should focus on the removal of smaller diameter branches where feasible and remove no greater than 10% of the total crown. Branches no greater than 50mm diameter are to be removed unless specifically approved by the project arborist.

7.12 Offset Tree Planting

7.12.1 Offset planting should reflect the number of trees removed and the initial loss of amenity and biomass. New trees should be of long-term potential and sourced from a reputable supplier.

7.12.2 Replacement tree species must suit their location on the site in terms of their potential physical size and their tolerance(s) to the surrounding environmental conditions. To avoid unethical or unprofessional tree selection and/or their placement within the landscape, replacement tree species must be selected in consultation with a consulting arborist, who can also assist in implementing successful tree establishment techniques.

7.12.3 Replacement tree species must have the genetic potential to reach a mature size potential of those trees removed to facilitate the development. As a guide, potential height will be a minimum of 10m (or more) and produce a spreading canopy so as they may provide amenity value to the property and contribute to the tree canopy of the surrounding area in the future.

7.13 Additional Excavation/Trenching within TPZs

7.13.1 In the event additional excavation is required within the TPZs of retained trees identified within this report, or any other site trees, arborist involvement will be required to ensure works are undertaken in accordance with the Australian Standard AS 4970–2009: *Protection of Trees on Development Sites.*

7.13.2 Where excavation or trenching is required to facilitate installation of underground services within the TPZs of any site trees arborist supervision is required. Works should be undertaken using techniques that are sensitive to tree roots to avoid unnecessary damage. Such techniques include:

1. Excavation by hand
2. Excavation using a high-pressure water jet and vacuum truck
3. Excavation using an Air Spade with vacuum truck.

7.13.3 Machine excavation should be prohibited within the TPZs of retained trees unless undertaken at the direct consent from the project arborist and/or the responsible authority.

7.14 Plant Health Care

7.14.1 When managing a tree affected by development incursions within its TPZ, plant tonic and growth stimulant drenching should be undertaken. Plant tonic and growth stimulant drenching is the process of adding diluted products directly to the root area of a tree to promote and assist trees to cope with loss of roots during the development process. They also assist trees to provide better resistance to sap sucking insects and fungal attack/disease and improve the establishment of beneficial microbial populations and nutrient uptake. See Appendix D – Plant Health Care and Mulching

7.15 Irrigation

7.15.1 Regular checks are required to ensure retained trees are receiving the correct amount of water. The majority of a tree's fine water absorbing roots are located in the top 10–30cm of soil. To undertake a basic soil moisture test, dig a small hole to a depth of 40cm at the dripline of the tree. If the soil is moist at this depth, water is not needed. Slow irrigation that provides an even coverage and targets the absorbing roots is the key to successful irrigation and encourages a deeper tree root system. Irrigation near the trunk is unnecessary as for most trees there are generally fewer water absorbing roots in this area. Irrigating the soil from half-way between the trunk and the dripline as well as beyond the dripline will provide water where it will most effectively be used. Preferably, water your trees during the cooler evening and early morning period when temperatures are lower, humidity is higher, and the air is calmer thereby reducing water evaporation from the soil surface. Irrigation in the middle of the day is not harmful to most trees however it is less efficient.

7.16 Mulching

7.16.1 Mulching regulates soil moisture and temperature levels, suppresses weeds, minimises soil compaction and reduces run off during periods of heavy rain. Acquiring wood chip mulch from programmed tree works (and by purchasing it from local tree contractors) would be a proactive way to improve the growing conditions around trees that ultimately will result in improved tree health and vitality.

7.16.2 Mulch should aim to cover an area at least as large as a tree's crown projection (and preferably larger) for it to be effective. It should also be laid at a uniform thickness of 75–100mm. Mulch should also be placed over damp to wet soil and never over dry soil. Application during the cooler months of the year is ideal. In areas where grass exists where you wish to mulch, spray the grass first with a non-selective herbicide and allow it to wilt and die before placement. This practice will negate grass growing up through the mulch over time.

7.16.3 Mulching within the canopy areas of trees not only improves long term tree health but also acts to reduce tree risk by reducing targets that pass and/or congregate under their canopies. This in turn will minimise the likelihood of injury in the event of a branch failure.

8 References

- Matthek, C. a. B. H., 1994. *The Body Language of Trees: A Handbook for Failure Analysis.* H. M. Stationery Office: University of Michigan.
- SEED, N. G. -., n.d. *SEED - Sharing and Enabling Environmental Data.* [Online] Available at: https://geo.seed.nsw.gov.au/Public_Viewer/index.html?viewer=Public_Viewer&locale=en-AU
- Standards Australia, 2007. *AS 4373–2007 Pruning of Amenity Trees,* GPO Box 476 Sydney NSW 2001: Standards Australia.
- Standards Australia, 2009. *AS4970–2009: Protection of Trees on Development Sites,* Sydney: Standards Australia.
- The British Standards Institution, 2012. *BS5837–2012: Trees in relation to design, demolition and construction,* London: BSI Standards Limited.
- Urban, J., 2008. *Up By Roots - Healthy Soils and Trees in the Built Environment.* Champaign (Illinois): International Society of Arboriculture.

Plans of the existing site and of the proposed development were provided to ArborSafe on 12 August 2021 and include:

- Banksia Proposed Site Plan (A10-001, Rev SD2), Silver Thomas Hanley, 11 August 2021
- Level 02 General Arrangement Plan (A20-201, Revision SD2), Silver Thomas Hanley, 11 August 2021
- Tamworth Mental Health Unit Site Plan (A12-001, Rev H), Silver Thomas Hanley, 13 February 2023
- Tamworth Mental Health Unit Site Plan – Proposed Overall – Ref (A01-002, Rev E), Silver Thomas Hanley, 15 February 2023

Appendix A. Arboricultural Reporting Assumptions and Limiting Conditions

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

Appendix B. Explanation of Tree Assessment Terms

Tree number: Refers to the individual identification number assigned within the ArborSafe software to each assessed tree on the site and the number which appears of the tree's tag.

Tree location: Refers to the easting and northing coordinates assigned to the location of the tree as obtained from the geo-referenced aerial image within the ArborSafe software.

Tree species: Provides the botanic name (genus, species, sub-species, variety and cultivar where applicable) in accordance with the International Code of Botanical Nomenclature (ICBN), and the accepted common name.

Trees in group: The number of trees encompassing a collective assessment of more than one tree. Typically grouped trees have similar attributes that can be encompassed within one data record.

Height: The estimated range in metres attributed to the tree from its base to the highest point of the canopy. Where required height will be estimated to the nearest metre.

Diameter at Breast Height (DBH): Refers to the tree's estimated trunk diameter measured 1.4m from ground level for a single trunked tree. These estimates increase in 50mm increments. Where required DBH will be measured to give an accurate measurement for single trunked trees, trees with multiple trunks, significant root buttressing, bifurcating close to ground level or trunk defects and will be measured as per the Australian Standard AS 4970–2009: *Protection of Trees on Development Sites*.

Tree Protection Zone (TPZ): A specified area above and below ground and at a given distance measured radially away from the centre of the tree's trunk and which is set aside for the protection of its roots and crown. It is the area required to provide for the viability and stability of a tree to be retained where it is potentially subject to damage by development. The radius of the TPZ is calculated by multiplying its DBH by 12. TPZ radius = DBH × 12. (Note "Breast Height" is nominally measured as 1.4m from ground level).TPZ is a theoretical calculation and can be influenced by existing physical constraints such as buildings, drainage channels, retaining walls, etc. (Standards Australia, 2009).

Structural Root Zone (SRZ): The area close to the base of a tree required for the tree's anchorage and stability in the ground. The woody root growth and soil cohesion in this area are necessary to hold the tree upright. The SRZ is nominally circular with the trunk at its centre and is expressed by its radius in metres. SRZ radius = $(D \times 50)^{0.42 \times 0.64}$ (Standards Australia, 2009).

Canopy spread: The estimated range in metres attributed to the spread of the tree's canopy on its widest axis. Where required crown spread will be estimated to the nearest metre.

Origin: Refers to the origin of the species and its type.

Category	Description
Locally Endemic	Occurs naturally in the local area and is native to a given region or ecosystem.
Australian Native	Occurs naturally within Australia and its territories but is not endemic to the local area.
Exotic Evergreen	Occurs naturally outside of Australia and its territories and typically retains its leaves throughout the year.
Exotic Deciduous	Occurs naturally outside of Australia and its territories and typically loses its leaves at least once a year.

Health: Refers to the health and vigour of the tree.

Category	Description
Excellent	Canopy full with even foliage density throughout, leaves are entire and are of an excellent size and colour for the species with no visible pathogen damage. Excellent growth indicators, e.g. seasonal extension growth. Exceptional specimen.
Good	Canopy full with minor variations in foliage density throughout, leaves are entire and are of good size and colour for the species with minimal or no visible pathogen damage. Good growth indicators, none or minimal deadwood.
Fair	Canopy with moderate variations in foliage density throughout, leaves not entire with reduced size and/or atypical in colour, moderate pathogen damage. Reduced growth indicators, visible amounts of deadwood, may contain epicormic growth.
Poor	Canopy density significantly reduced throughout, leaves are not entire, are significantly reduced in size and/or are discoloured, significant pathogen damage. Significant amounts of deadwood and/or epicormic growth, noticeable dieback of branch tips, possibly extensive.
Dead	No live plant material observed throughout the canopy, bark may be visibly delaminating from the trunk and/or branches.

Age: Refers to the life cycle of the tree.

Category	Description
Young	Newly planted small tree not fully established may be capable of being transplanted or easily replaced.
Juvenile	Tree is small in terms of its potential physical size and has not reached its full reproductive ability.
Semi-mature	Tree in active growth phase of life cycle and has not yet attained an expected maximum physical size for its species and/or its location.
Mature	Tree has reached an expected maximum physical size for the species and/or location and is showing a reduction in the rate of seasonal extension growth.
Senescent	Tree is approaching the end of its life cycle and is exhibiting a reduction in vigour often evidenced by natural deterioration in health and structure.

Structure: Refers to the structure of the tree from roots to crown.

Category	Description
Good	Sound branch attachments with no visible structural defects, e.g. included bark or acute angled unions. No visible wounds to the trunk and/or root plate. No fungal pathogens present.
Fair	Minor structural defects present, e.g. apical leaders sharing common union(s). Minor damage to structural roots. Small wounds present where decay could begin. No fungal pathogens present.
Poor	Moderate structural defects present, including bifurcations with included bark with union failure likely within 0–5 years. Wounding evident with cavities and/or decay present. Damage to structural roots.
Hazardous	Significant structural defects with failure imminent (3–6 months). Defects may include active splits and/or partial branch or root plate failures. Tree requires immediate arboricultural works to alleviate the associated risk.

Useful Life Expectancy (ULE): Useful life expectancy refers to an expected period of time the tree can be retained within the landscape before its amenity value declines to a point where it may detract from the appearance of the landscape and/or presents a greater risk and/or more hazards to people and/or property. ULE values consider tree species, current age, health, structure and location. ULE values are based on the tree at the time of assessment and do not consider future changes within the tree's location and environment which may influence the ULE value.

Category
0 Years
<5 Years
5–10 Years
10–15 Years
15–25 Years
25–50 Years
>50 Years

Defects: Visual observations made of the presenting defects of the tree and its growing environment that are, or have the capacity to impact upon, the health, structural condition and/or the useful life expectancy of the tree. Defects may include adverse physical traits or conditions, signs of structural weaknesses, plant disease and/or pest damage, tree impacts to assets or soil related issues.

Tree Significance: Includes environmental, social or historical reasons why the tree is significant to the site. The tree may also be rare under cultivation or have a rare or localised natural distribution.

Arborist Actions: A list of arboricultural and/or plant health care works that are aimed at maintaining or improving the tree's health, structural condition or form. Actions may also directly or indirectly reduce the risk potential of the tree such as via the removal of a particular branch or the moving of infrastructure from under its canopy.

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Appendix C. Tree Retention Values

Based upon a modified version of the British Standard BS 5837–2012: *Trees in relation to design, demolition and construction* – recommendations.

Category and definition	Criteria (including sub-categories where appropriate)		
Category U			
Trees in such a condition that they cannot realistically be retained as viable trees in the context of the current land use for longer than 5 years.	• Trees that have a severe structural defect that are not remediable such that their failure is expected within 12 months. • Trees that will become unviable after removal of other Category U trees (e.g. where for whatever reason the loss of companion shelter cannot be mitigated by pruning). • Trees that are dead or are showing signs of significant, immediate and irreversible overall decline. • Trees infected with pathogens of significance to the health and or safety of other trees nearby • Low quality trees suppressing adjacent trees of better quality. • Noxious weeds or species categorised as weeds within the local area. **Note:** Category U trees can have existing or potential conservation value* which might make it desirable to preserve.		
	1. Arboricultural Qualities	**2. Landscape qualities**	**3. Cultural and environmental values**
Category A			
Trees of High Quality with an estimated remaining life expectancy of at least 25 years and of dimensions and prominence that it cannot be readily replaced in <20 years.	Trees that are particularly good examples of their species, especially if rare or unusual (in the wild or under cultivation); or those that are important components of groups or avenues.	Trees or groups of significant visual importance as arboricultural and/or landscape features. (e.g. feature and landmark trees).	Trees, groups or plant communities of significant conservation, historical, commemorative or other value (e.g. remnant trees, aboriginal scar trees, critically endangered plant communities, trees listed specifically within a Heritage statement of significance).
Category B			
Trees of Moderate Quality with an estimated remaining life expectancy of 15–25 years and of dimensions and prominence that cannot be readily replaced within 10 years.	Trees that might be included within Category A but are downgraded because of diminished condition such that they are unlikely to be suitable for retention beyond 25 years.	Trees that are visible from surrounding properties and/or the street but make little visual contribution to the wider locality.	Trees with conservation or other cultural value (trees within conservation areas or landscapes described within a statement of significance, locally indigenous species).
Category C			
Trees of Low Quality with an estimated remaining life expectancy of 5–15 years, or young trees that are easily replaceable.	Trees of very limited value or such impaired condition that they do not qualify in higher categories.	Trees offering low or only temporary/transient landscape benefits.	Trees with no material conservation or other cultural value.

*Where trees would otherwise be categorised as U, B or C but have significant identifiable conservation, heritage or landscape value even though only for the short term, they may be upgraded, although they might be suitable for retention only.

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Tree Quality

		Health**			
		Excellent/ Good	Fair	Poor	Dead
Structure	Good	A	B	C	U
	Fair	B	B	C	U
	Poor	C	C	U	U
	Hazard*	U	U	U	U

* Structural hazard that cannot be remediated through mitigation works to enable safe retention.

** Trees of short term reduced health that can be remediated via basic, low cost plant health care works (e.g. mulching, irrigation etc.) may be designated in a higher health rating to ensure correct retention value nomination.

Category A	Typically trees in this category are of high quality with an estimated remaining life expectancy of at least 25 years and of dimensions and prominence that it cannot be readily replaced in <20 years. The tree may make significant amenity contributions to the landscape and may make high environmental contributions. In some cases, trees within this category may not meet the above criteria, however possess significant heritage or ecological value. Trees of this retention value warrant design consideration and amendment to ensure their viable retention.
Category B	Typically trees in this category are of moderate quality with an estimated remaining life expectancy of 15–25 years and prominence of size dimensions that cannot be readily replaced within 10 years. They may make moderate amenity contributions to the landscape and make low/moderate environmental contributions. Trees with this retention value warrant lesser design consideration in an attempt to allow for their retention.
Category C	Trees in this category are of low quality with an estimated remaining life expectancy of 5–15 years, or young trees that are easily replaceable, may have poor health and/or structure, are easily replaceable, or are of undesirable species and do not warrant design consideration.
Category U	Trees in this category are found to be in such a condition that they cannot realistically be retained as viable trees in the context of the current land use for longer than five years. These trees may be dead and/or of a species recognised as a weed that resulted in them being unretainable.

Appendix D. Plant Health Care and Mulching

Guide to plant health tonics and root growth stimulants

Considering the varying sizes of trees in common urban landscapes, it is suggested that an application volume of combined water and product solution of 80–150L for small to medium sized trees (5-10m height), 150–250L for medium to large sized trees (10-20m height) and 250–400L for large to very large sized trees (+20m height). Note: a lesser volume of total mixed product could be used if a more concentrated mix is drenched and water irrigation used to further drench the area and therefore dilute the stronger mix application.

The following product recommendations have been based on previous successful works undertaken by ArborSafe. The information provided is to be used as a general guide only, depending on your tree species, health or location. We recommend you always refer to the manufacturers label before applying any product. You may need to further consult with ArborSafe or your Project Arborist to develop a more specific program for your tree needs.

- **Soil Conditioner** concentrate such as Kelpro, Seasol or similar 600–800mL/100L of water. A concentration of beneficial nutrients stimulating plant growth and root establishment, ideal for trees under stress.
- **Nitrogen Boost** concentrate such as Nitrosol liquid plant food or similar 300mL/100L of water. A general-purpose fertilizer that contains a nitrogen boost (the most abundantly used element for tree growth). NB: Care must be taken when applying general fertilizer, particularly where plants can be affected Phosphorus toxicity.
- **Root Biostimulant** concentrate such as Auxinone or similar 400mL/100L of water. A scientific blend of hormone root growth stimulants and vitamins assisting in the regeneration of roots.
- **Microbial Formulation** concentrate such as Noculate Liquid or similar 500mL/100L of water. Generally containing strains of beneficial soil microorganisms, humic acid, kelp, essential amino acids, vitamins, biotin, folic acid and natural sugars designed to enhance the establishment of beneficial microbial populations.
- **Carbohydrate Energy Source** such as Molasses 500-800mL/100L of water. Molasses is the by-product of sugar refining. It contains all the nutrients from the raw sugarcane plant and is a carbohydrate energy source that feeds soil microorganisms and increases microbial activity.
- **Surfactant/Wetting Agent** (optional) such as Dispatch (Liquid) 200–300ml/100L of water. Improves the infiltration and penetration of applied water and irrigation.

We recommend you always refer to the manufacturers label before applying any product using the above as a guide only.

Guide to mulching and maintenance for established trees

Whether a tree is a newly planted young tree, or a well-established mature tree, the area around its base is a key factor in its long-term retention and viability. Maintaining a soil environment that is conducive to tree root development is vital for trees of all ages. This guide provides information on appropriate maintenance practices around the base of trees including mulching and the restriction of activities that may cause harm to tree roots or trunks.

1. Why mulch?

Mulching is a plant health care action which can be undertaken to improve plant and soil health (Figure 14), as well as overall landscape aesthetics. Placing an organic (or sometimes inorganic) material on the soil surface reduces the level of direct sunlight contact. Mulching should not be confused with composting which involves incorporating organic matter such as composts or manures into the soil profile. All plants in their natural ecologies (except for some arid and coastal ecologies) are naturally mulched by the falling of leaves, bark, flowers and other organic material.

This action is of great importance in successful cultivation of plants as it:

- assists in the regulation of soil moisture and temperature levels
- helps to suppress weeds
- minimises soil compaction
- reduces run-off during periods of heavy rain
- adds organic matter to the soil, and
- improves overall structure, nutrition and water holding composition.

Mulch is best comprised of organic materials such as wood chips, leaf litter, straw or hay as these will degrade over time. Long-term mulching improves soil health and structure as it encourages the activities of earthworms, microflora and beneficial fungi. Inorganic materials such as stones and gravel can be moderately effective as mulch but will not provide the ongoing improvements to soil health.

Figure 14. An excellent example of how to mulch a young tree. (Lachlan Andrews, September 2015).

2. How to mulch

- Apply mulch to damp soil, as placing over dry soil makes it difficult to rehydrate. Applying during the cooler months of the year is an ideal time.
- If mulching on top of a pre-existing grass area, grass or weeds must first be hand weeded and/or sprayed with a non-selective herbicide and left to wilt and die before applying mulch.
- Mulch should be applied at a uniform thickness of 75–100mm and re-applied approximately every 12 months. Do not place mulch up against the trunk of a tree as the damp mulch can cause bark to decay.
- Apply over a wide area, at least as large as a tree's crown projection (preferably larger), within and outside the current root mass to encourage lateral root development and expansion.
- Wood chip mulch (such as that generated from wood chippers) is considered an ideal mulch for landscape use as it contains a wide variety of materials that are of different sizes (such as bark, foliage and timber), is relatively cheap to purchase, and can be obtained in large quantities. Stockpiling of mulch after tree contractors have conducted works at a site is a way of generating 'free' mulch and ensuring that plant material from tree pruning and/or removals is recycled on site, not imported from external suppliers, saving costs and making the site more self-sustaining.
- The use of mulch made from pine bark or red gum chips are discouraged as they seldom degrade and therefore do not add nutrition to the soil profile. The uniform particle size and resin content can provide an impervious layer to water as well as retarding gaseous exchange.
- Mulching within the canopy areas of larger trees (Figure 15) can not only improve long-term tree health but can also act to reduce tree risk by decreasing the number of targets that pass and/or congregate under their canopies. This in turn will minimise the likelihood of injury in the event of a branch failure.
- When using wood chip mulch, ensure that if it has been made from live plant material that is stored and allowed to compost for between 3 and 6 months prior to use. Never apply fresh, 'green' mulch around trees as this can induce what is called the nitrogen drawdown, which can result in the removal of nitrogen from the soil resulting in plants with nutrient deficiencies.

For further information refer to the Australian Standard AS 4454–2012: *Composts, Soil Conditioners and Mulches*.

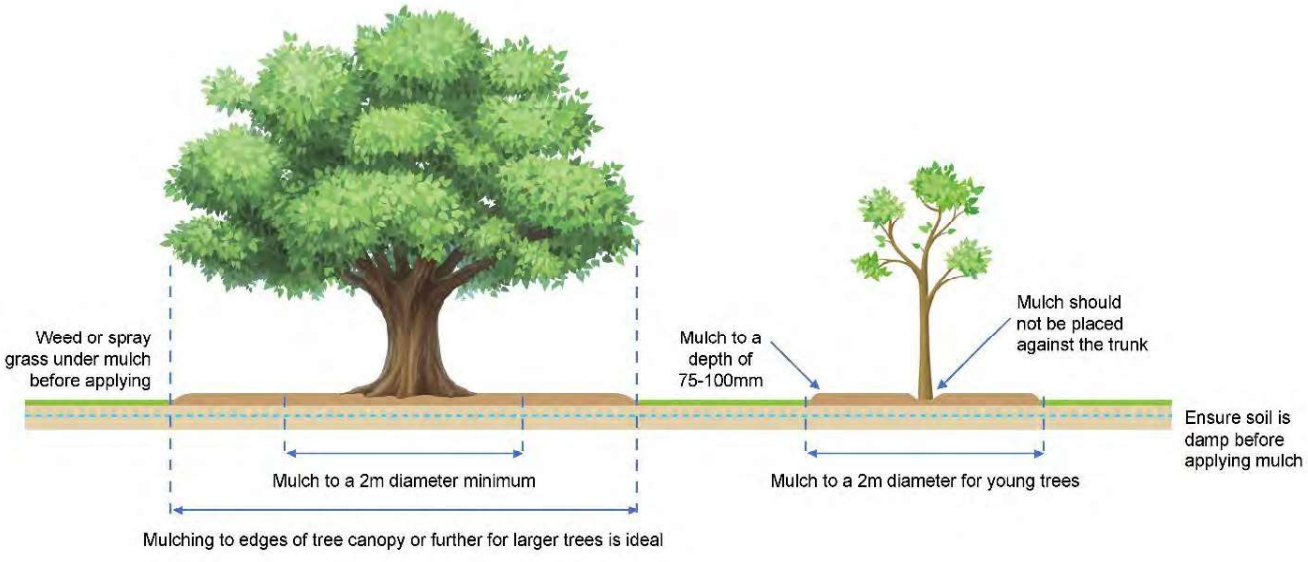

Figure 15. Mulching established and young trees (ArborSafe Australia, 2020).

3. Root and trunk damage

The function of tree roots is primarily to provide water and nutrient uptake for the tree, provide stability through structural roots that anchor it to the ground and as a means of food and nutrient storage. Damage to tree roots can lead to a reduction to any or all of these functions.

Damage to tree roots (Figure 16 and Figure 17) and the lower portion of a tree's trunk is a common and often unnecessary occurrence that can lead to the entry of decay fungi into a tree's structural framework. Once present, decay may develop in larger structural roots and/or the base of the trunk, which can result in a reduction in tree health and in severe cases even compromise stability.

Works such as trenching and excavation are often the cause of root damage to trees. Refer to ArborSafe's Guide – Tree protection during construction or the Australian Standard AS 4970–2009: *Protection of Trees on Development Sites* for things to consider when performing construction activities near trees.

Everyday activities such as grass cutting via mowing or brush cutters can result in serious root damage or wounding to the lower trunk. Young trees with their trunks damaged by machinery often need replacing, while damage to the trunks and/or surface roots of established trees is not only detrimental to tree health but can also result in costly repairs to machinery.

Another advantage to mulching around the trunk and root crown is that it limits damage to both parts from mowing equipment. This in turn reduces mechanical damage and compaction.

Figure 16. An example of damage to tree roots caused via mowing. (Luke Dawson, June 2017).

Figure 17. Image showing wound caused to upper portion of surface root by mower. (Luke Dawson, June 2017).

4. How to avoid root and trunk damage

The following points serve to highlight ways to avoid damage to tree roots and trunks caused via grass cutting activities:

- Mulching around young and established trees negates the need for brush cutter and/or lawn mower use around the base of a tree. Mulching therefore not only creates a barrier between tree roots and trunk that are susceptible to damage, it improves soil condition, minimises soil compaction and decreases the total area required for mowing.
- Where mulching is not feasible, raising the cutting height of mowers and maintaining grass at a greater height can avoid unnecessary 'scalping' of roots and damage to mowers/blades.
- Where surface roots are located away from the trunk and in a location where neither the application of mulch nor the raising of mower height is inappropriate, it may be possible to raise the soil grade directly around the root/s to minimise damage. It is important that the application of new material does not result in significant changes to the soil profile that may inadvertently damage roots. Material applied should be permeable and allow the development of turf which will protect the roots. Coarse sand or a planting mix with a high sand to organic matter ratio (e.g. 80/20 mix) spread at a depth of 75–100mm could suitably protect the surface root from damage, while allowing turf to redevelop within the area.
- ArborSafe is able to answer any questions regarding the material, depth and method of application to be used to ensure the tree/s remain viable for the long-term.

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Appendix E. Tree Assessment Data

Tree no.	Botanical Name	Common Name	Origin	Trees in group	DBH Total (cm)	DRB (cm)	Radial TPZ (m)	TPZ area (m2)	Radial SRZ (m)	Tree Height (m)	Canopy (m)	Health	Structure	Age	TLE (Yrs.)	Defects	Significance	Arborist comments	Tree Quality Score	Tree Retention value subcategory	Recommendation
1	*Eucalyptus melliodora*	Yellow Box	Endemic	1	57		6.9	148.75		5-10	5-10	Good	Fair	Semi-Mature	25-50	Co-dominant stems;Deadwood/stubs < 30mm;Dieback;Soil problems;	Amenity value/shade;Attractive landscape feature;	- 27-05-2021 : Andy Clark : Canopy bias to the north, growing in close proximity to asphalt carpark. 4m to lowest branch.	B	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
2	*Eucalyptus melliodora*	Yellow Box	Endemic	1	50		6.0	111.24		5-10	5-10	Good	Fair	Semi-Mature	15-25	Co-dominant stems;Damaging infrastructure;Deadwood/stubs < 30mm;Included bark;Soil problems;	Amenity value/shade;Attractive landscape feature;	- 27-05-2021 : Andy Clark : Growing in close proximity to asphalt carpark. 4m to lowest branch. At minimum remove deadwood and mulch to 2m around trunk to improve growing conditions. Remove southern stem, encroaching on carpark light, back to the basal union.	B	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
3	*Eucalyptus melliodora*	Yellow Box	Endemic	1	59		7.1	157.66		10-15	5-10	Fair	Fair	Semi-Mature	15-25	Co-dominant stems;Deadwood/stubs < 30mm;Dieback;Wound(s);	Amenity value/shade;	- 27-05-2021 : Andy Clark : The tree is in a reduced state of health with moderate canopy density, small terminal branch dieback & the remaining foliage consisting of 60% epicormic growth. Estimated height to base of canopy is 6m.	B	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
4	*Eucalyptus sp.*	Eucalypt	Endemic	1	92		11.0	382.63		10-15	10-15	Good	Fair	Mature	15-25	Co-dominant stems;Deadwood/stubs < 30mm;Epicormic growth;Included bark;Wound(s);	Amenity value/shade;	- 27-05-2021 : Andy Clark : The included union at 1 & 4m, between co-dominant stems, appeared inactive at this inspection (no sap exudation, cracking or crown separation). Variou canker like wounds observed within crown structure. No recent branch failure points observed. Estimated height to base of canopy is 5m.	B	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
5	*Olea europaea*	European Olive	Exotic	1	42		5.1	81.43		<5	<5	Good	Fair	Semi-Mature	15-25	Co-dominant stems;Crossing/rubbing branches;Included bark;	Screen value;Commemorative tree;	- 27-05-2021 : Andy Clark : Comemoritive Rotary tree. Multi stemmed specimen growing from old cut stump.	C	2	Remove - tree located within proposed development footprint or has major encroachment into its TPZ.
6	*Olea europaea*	European Olive	Exotic	1	42		5.1	81.43		<5	<5	Good	Fair	Semi-Mature	15-25	Co-dominant stems;Crossing/rubbing branches;Included bark;	Screen value;Commemorative tree;	- 27-05-2021 : Andy Clark : Comemoritive Rotary tree. Multi stemmed specimen growing from old cut stump.	C	2	Remove - tree located within proposed development footprint or has major encroachment into its TPZ.
7	*Cedrus deodara*	Himalayan Cedar	Exotic	1	62		7.4	172.32		5-10	5-10	Good	Good	Semi-Mature	25-50		Amenity value/shade;Attractive landscape feature;	- 27-05-2021 : Andy Clark : Ranked down from A grade due to age and size. Estimated height to base of canopy is 2m.	B	2	Remove - tree located within proposed development footprint or has major encroachment into its TPZ.
8	*Eucalyptus sideroxylon*	Red Ironbark	Endemic	1	40		4.8	71.30		5-10	<5	Good	Poor	Juvenile	5-10	Included bark;Weak union(s);	Amenity value/shade;	- 27-05-2021 : Andy Clark : To improve future structure and ULE remove the minor terminal leader back to the included trunk union at 7m. Estimated height to base of canopy is 1m.	C	1	Remove - tree located within proposed development footprint or has major encroachment into its TPZ.
9	*Eucalyptus sideroxylon*	Red Ironbark	Endemic	1	42		5.0	79.85		5-10	<5	Good	Good	Juvenile	25-50		Amenity value/shade;	- 27-05-2021 : Andy Clark : Estimated height to base of canopy is 1m.	C	2	Remove - tree located within proposed development footprint or has major encroachment into its TPZ.
10	*Eucalyptus sideroxylon*	Red Ironbark	Endemic	1	54		6.5	134.13		10-15	<5	Good	Fair	Semi-Mature	10-15	Co-dominant stems;Included bark;Weak union(s);	Amenity value/shade;	- 27-05-2021 : Andy Clark : Multiple included unions throughout crown structure of both stems results in limited ULE. Estimated height to base of canopy is 2m.	C	1	Remove - tree located within proposed development footprint or has major encroachment into its TPZ.
11	*Melaleuca armillaris*	Bracelet Honey Myrtle	Native	3	16		2.0	12.57		<5	<5	Good	Fair	Juvenile	10-15	Co-dominant stems;	Screen value;Within group;	- 27-05-2021 : Andy Clark : 3 x juvenile trees growing in group situation. Estimated height to base of canopy is 0m.	C	2	Remove - tree located within proposed development footprint or has major encroachment into its TPZ.
12	*Melia azedarach*	White Cedar	Endemic	1	57		6.9	148.84		<5	5-10	Good	Poor	Semi-Mature	10-15	Co-dominant stems;Crossing/rubbing branches;Epicormic growth;Included bark;Poor pruning;Previous failure(s);Wound(s);	Amenity value/shade;Screen value;	- 27-05-2021 : Andy Clark : Multi-stemmed specimen with upper canopy largely consisting of epicormic growth. Estimated height to base of canopy is 1m.	C	2	Remove - tree located within proposed development footprint or has major encroachment into its TPZ.
13	*Tamarix sp.*	Salt Cedar	Exotic	1	69		8.3	218.23		5-10	5-10	Good	Fair	Semi-Mature	15-25	Co-dominant stems;Dieback;Epicormic growth;Poor pruning;Wound(s);Undesirable species	Amenity value/shade;	- 27-05-2021 : Andy Clark : Estimated height to base of canopy is 2m.	B	2	Remove - tree located within proposed development footprint or has major encroachment into its TPZ.
14	*Eucalyptus sideroxylon*	Red Ironbark	Endemic	1	85		10.2	326.53		15-20	5-10	Fair	Fair	Mature	15-25	Deadwood/stubs > 60mm;Dieback;Epicormic growth;Suckers;	Amenity value/shade;Significant due to age/size;	- 27-05-2021 : Andy Clark : The tree is in a reduced state of health with moderate canopy density, small terminal branch dieback & the remaining foliage consisting of 70% epicormic growth. Recent health improvement observed, possibly following good seasonal rains. Remove dead and declining branches back to live wood to encourage epicormic growth. Estimated height to base of canopy is 6m.	B	2	Remove - tree located within proposed development footprint or has major encroachment into its TPZ.
15	*Dead Tree*	Dead tree	Native	1	36		4.3	59.04		5-10	<5	Dead	Hazardous	Semi-Mature	0	Deadwood/stubs > 100mm;Decay;Previous failure(s);Weak union(s);		- 27-05-2021 : Andy Clark : Dead tree requires removal.	U		Remove tree irrespective of future development.
16	*Eucalyptus sideroxylon*	Red Ironbark	Endemic	1	32		3.8	46.01		5-10	<5	Poor	Poor	Juvenile	0	Deadwood/stubs > 30mm;Epicormic growth;Excessive thinning;		- 27-05-2021 : Andy Clark : The tree is in a reduced state of health with minimal canopy density, all branches dead & the remaining foliage consisting of 100% epicormic growth growing from the trunk.	U		Remove tree irrespective of future development.
17	*Acacia pendula*	Weeping Myall	Endemic	1	45		5.4	93.06		10-15	10-15	Good	Hazardous	Mature	<5	Co-dominant stems;Crack(s)/split(s);Included bark;Weak union(s);		- 27-05-2021 : Andy Clark : Tree presents with multiple included unions throughout crown structure. Removal recommended due to separation observed between main included stem union at 5m.	U		Remove tree irrespective of future development.
18	*Eucalyptus bridgesiana*	Apple Box	Endemic	1	56		6.7	141.73		10-15	10-15	Good	Fair	Semi-Mature	25-50	Co-dominant stems;Wound(s);	Amenity value/shade;Attractive landscape feature;	- 27-05-2021 : Andy Clark : Good response growth around lower trunk wound, western aspect, with no sap exudation, fungal fruiting bodies, cambial dieback or significant decay observed. Slight canopy bias to the north. Estimated height to base of canopy is 7m. Target prune to provide 2m clearance from building edge.	B	1	Remove - tree located within proposed development footprint or has major encroachment into its TPZ.

Appendix F. Tree Protection Plan

Figure 18. Site map showing retained trees with suggested Tree Protection/Site perimeter Fence locations. (ArborSafe, May 2021).

For further information
Telephone 1300 272 671
www.arborsafe.com.au

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Appendix D

Arboricultural Impact Assessment – Car Parks

RP Infrastructure
Tamworth Hospital
Dean Street, North Tamworth
Arboricultural Impact Assessment

20 February 2023

Assessment and Report prepared by:

Andy Clark
Dip. Hort. (Arb.), AQF Level 5

JNC03675v2

JNC03675v2

20 February 2023

Yonis Ahmad
Project Manager
RP Infrastructure
Level 19, 9 Hunter Street
Sydney NSW 2000

Arboricultural Impact Assessment Report regarding forty-eight (48) trees located within the vicinity of the proposed carparking zones at Tamworth Hospital

Dear Yonis,

We are pleased to provide you with the following Arboricultural Impact Assessment Report for forty-eight (48) trees within the grounds of Tamworth Hospital.

Complete use of this report is authorised under the conditions limiting its use as stated in Appendix A Item 7 of "*Arboricultural Reporting Assumptions and Limiting Conditions*".

Should you have any queries relating to this report, its recommendations, or the options considered please do not hesitate to contact us on 1300 272 671.

Regards,

Andy Clark
Consulting Arborist
Dip. Hort. (Arb.), AQF Level 5

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Table of Contents

1 Executive Summary

1.1.1 The following Arboricultural Impact Assessment (Report) regarding forty-eight (48) trees located within the grounds of Tamworth Hospital. The subject site was identified by RP Infrastructure (the Client) as possessing trees that may be impacted upon by five (5) proposed carparking zones.

1.1.2 In part, the project scope was to nominate subject trees that can be retained, or require removal to facilitate the proposed development, as well as identify and reduce potential conflicts between subject trees and site development. Accurate information on the area required for tree retention and methods/techniques suitable for tree protection during construction have been provided. The assumptions and recommendations may alter in the future following a review of further detailed planning and construction plans.

1.1.3 A site survey should be completed using a registered surveyor. Tree numbers contained within this report and located on the individual tree tags onsite should be used in the survey. The TPZ, SRZ and Retention Value of all trees (Category A, B, C and U) should be displayed accurately on the site survey and subsequent development plans, using appropriate colour coding where possible

1.1.4 Fifteen (15) trees would require removal, based on the supplied design, to facilitate development. Ten (10) of these have direct conflict with the proposed carparking spaces, while the remaining five (5) have major TPZ encroachment of greater than 40%.

1.1.5 A further two (2) trees should be removed, in the context of development (Category U), due to poor health and/or structure, although both trees would also require removal due to either direct conflict or major TPZ encroachment.

1.1.6 The remaining thirty-one (31) trees are recommended for retention. Within this number, Trees 46, 51, 62, 64 and 67 have proposed development within their TPZ (Figure 17) of a TPZ encroachment percentage that should enable retention with some specific protection measures, such as further assessment following detailed design and/or site arborist supervision during initial excavation.

1.1.7 Tree retention values have been determined based upon a modified version of the British Standard and which have been prescribed into one of the following four (4) categories, A, B, C and U. Refer to Appendix C for further detail. Generally, relevant consent authorities will consider:

- **A** retention value trees as a site constraint and may require alterations to the proposed development design and/or specific protection measures to allow retention, unless the proposed development outweighs the retention value of the tree
- **B** retention value trees as a site constraint consideration, lesser changes should be considered to retain such trees
- **C** retention value trees are not considered a site constraint
- **U** retention value trees are considered a site opportunity, as such trees are recommended for removal regardless of the proposed development.

1.1.8 Trees impacted by the proposed development:

Category	Description	Total	Removal		Retain	
			located within development footprint	irrespective of future development	with specific protection	with generic protection
A	High retention value trees	1			62	
B	Moderate retention value trees	32	26, 28, 42, 45, 47, 48, 49, 60, 63		46, 51, 64, 67	27, 30, 33, 34, 35, 36, 37, 38, 39, 40, 41, 43, 44, 55, 56, 59, 61, 68, 69
C	Low retention value trees	13	21, 31, 52, 65, 66, 73			19, 20, 32, 53, 54, 57, 58
U	Trees to be removed irrespective of proposed development	2		29, 50		

2 Introduction

2.1.1 Civica ArborSafe was engaged by Yonis Ahmad on behalf of the Client to complete an (early) Arboricultural Impact Assessment Report on forty-eight (48) trees located at various locations within the grounds of the Tamworth Hospital, Dean Street, Tamworth.

2.1.2 The proposed development has been reviewed and in summary consists of the expansion of existing, and/or construction of new carparking spaces within the Hospital grounds across four (4) zones.

2.1.3 The report was intended to provide information on site trees and how they may be impacted upon by the proposed development. Report findings and recommendations provided are based upon guidance provided within Australian Standard AS 4970–2009: *Protection of Trees on Development Sites*.

2.1.4 Observations and recommendations provided within this report are based upon information provided by the Client and an arborist site visit. These assumptions may alter in the future following a review of further detailed planning and construction plans.

3 Scope

3.1.1 Carry out a visual examination of the nominated trees located within the vicinity of the proposed development.

3.1.2 Provide an objective appraisal of the subject trees in relation to their species, estimated age, health, structural condition, useful life expectancy (ULE) and viability within the landscape.

3.1.3 Based on the findings of this investigation, provide independent recommendations on the retention value of the trees.

3.1.4 Nominate subject trees that can be retained or require removal to facilitate the development.

3.1.5 Identify and reduce potential conflicts between subject trees and site development by providing accurate information on the area required for tree retention and methods/techniques suitable for tree protection during construction.

3.1.6 Provide information on restricted activities within the area nominated for tree protection, as well as suitable construction methods to be adopted during demolition and/or construction.

4 Methodology

4.1 Data Collection

4.1.1 Andy Clark of Civica ArborSafe carried out a site inspection of the subject trees on 28 October 2022.

4.1.2 Trees that are the subject of this report were identified by reviewing the proposed carparking zones within the supplied development documentation, with all site trees above 3m in height included within this report. Data was included for an additional four (4) trees, situated within an existing informal carparking space immediately south of the proposed Zone 1 carpark. Several small juvenile self-sown trees/shrubs situated along the existing southern Zone 2 carpark perimeter fence have been omitted from the report based on their species, current size and/or potential future size and contribution to local amenity.

4.1.3 The subject trees were inspected from the ground using the initial component of Visual Tree Assessment (VTA) (Mattheck, 1994). No foliage or soil samples were taken and no aerial, underground or internal investigations were undertaken.

4.1.4 Tree height and canopy width were estimated and have been provided in a variety of ranges with 5m increments. Trunk diameter at breast height (DBH) and trunk diameter at the root crown (DRB) were measured with a diameter tape and provided to the nearest centimetre.

4.1.5 Tree impacts and TPZ encroachment assumptions are based upon measurements obtained during the onsite arborist visit and reviewing the overview plans against existing infrastructure and tree data and locations.

4.1.6 Environmental and Heritage information has been sourced from the NSW Central resource for Sharing and Enabling Environmental Data (SEED) mapping tool. The source of all information has been referenced accordingly.

4.1.7 Data collected on site was analysed against the supplied development documentation by Andy Clark, following which relevant findings and recommendations were formulated and collated into report format.

4.1.8 Tree protection zones (TPZ) and structural root zones (SRZ) were calculated in accordance with the Australian Standard AS 4970–2009: *Protection of Trees on Development Sites* (refer to Section 7.6).

4.1.9 Retention values have been determined based upon a modified version of the British Standard BS 5837–2012: *Trees in Relation to Design, Demolition and Construction* (refer to Appendix C).

4.1.10 All photographs were taken at the time of the site inspections by the author and have not been altered for brightness or contrast, nor have they been cropped.

4.1.11 Basic overlay plans of the proposed development were provided to ArborSafe in late October 2022.

4.1.12 No proposed underground service locations, detailed cut/fill or section drawings/plans have been reviewed in the preparation of this report.

5 Observations

5.1 Location

5.1.1 The four (4) proposed carparking zones were located within the grounds of Tamworth Hospital (Figure 1).

5.1.2 Site soils were expected to differ from natural soil horizon profiles due to extensive and longstanding site development and usage.

5.1.3 The site was located within the Tamworth Regional Council Local Government Area (LGA).

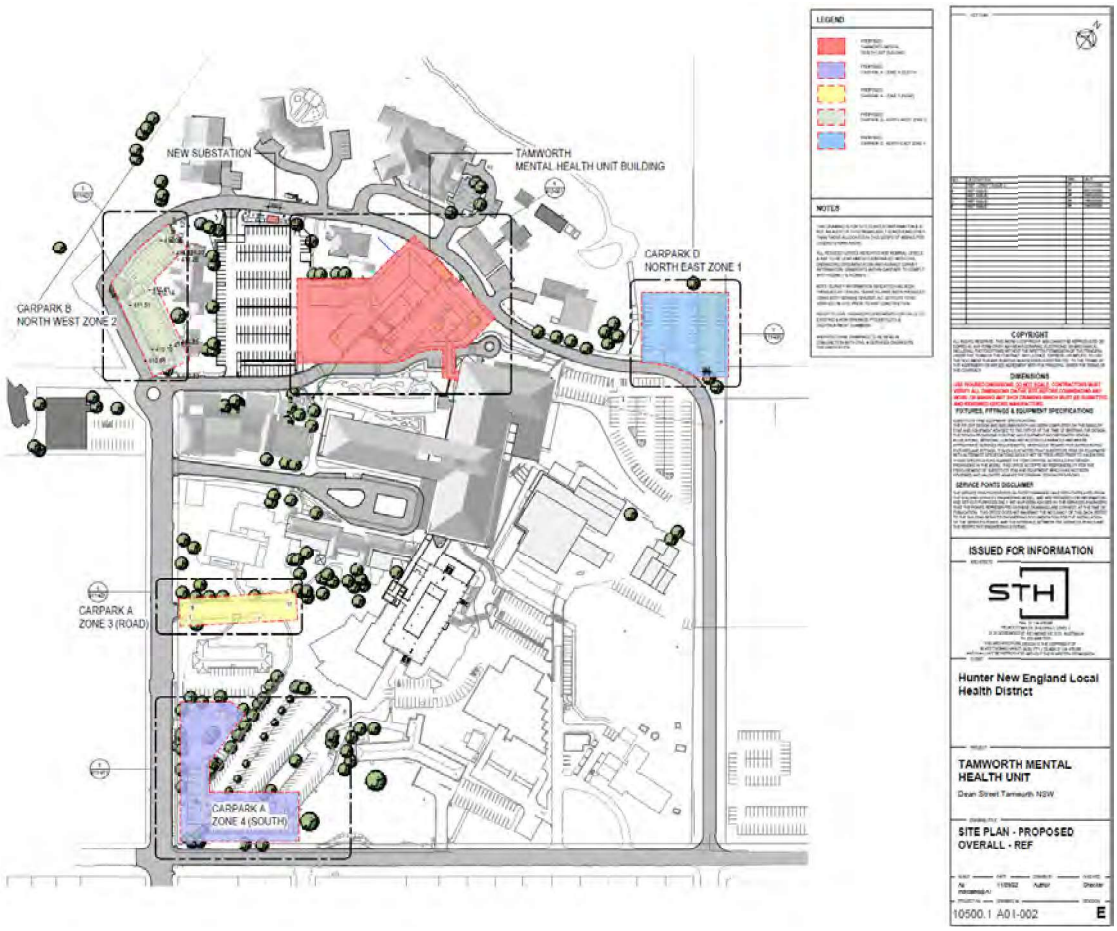


Figure 1. Excerpt from –Site Plan – Proposed Overall – Ref (Dwg. No. A01-002, Rev. E). (STH, 15 February 2023).

5.2 Site Trees

5.2.1 Trees can be identified on site using white tree tags which are typically located at approximately 2m from ground level on the southern side of the trunk. The tree numbering starts at Tag 19, as earlier tags form a subset of a previous survey undertaken within the site.

5.2.2 The majority of trees are considered to be planted stock, or possibly self-sown from local provenance seed. The treescape is well established with thirty (30) of the existing surveyed trees (62.5%) rated as mature and a further four (4) trees (8.5%) being in the senescent category. Ten (10) trees (21%) were rated as semi-mature and a further four (4) trees (8%) rated as juvenile specimens.

5.2.3 Twenty-one (21) species were identified across the site with the most prevalent being *Eucalyptus sideroxylon* (Red Iron Bark), *Eucalyptus melliodora* (Yellow Box), *Grevillea robusta* (Silky Oak) and *Phoenix dactylifera* (Date Palm).

5.2.4 There were a couple of self-sown juvenile trees of weedy tendencies situated around Tree 21 which were not included due to their small size and species.

5.2.5 Refer to images in the *5.4 – Proposed Construction* section of this Report for tree pictures.

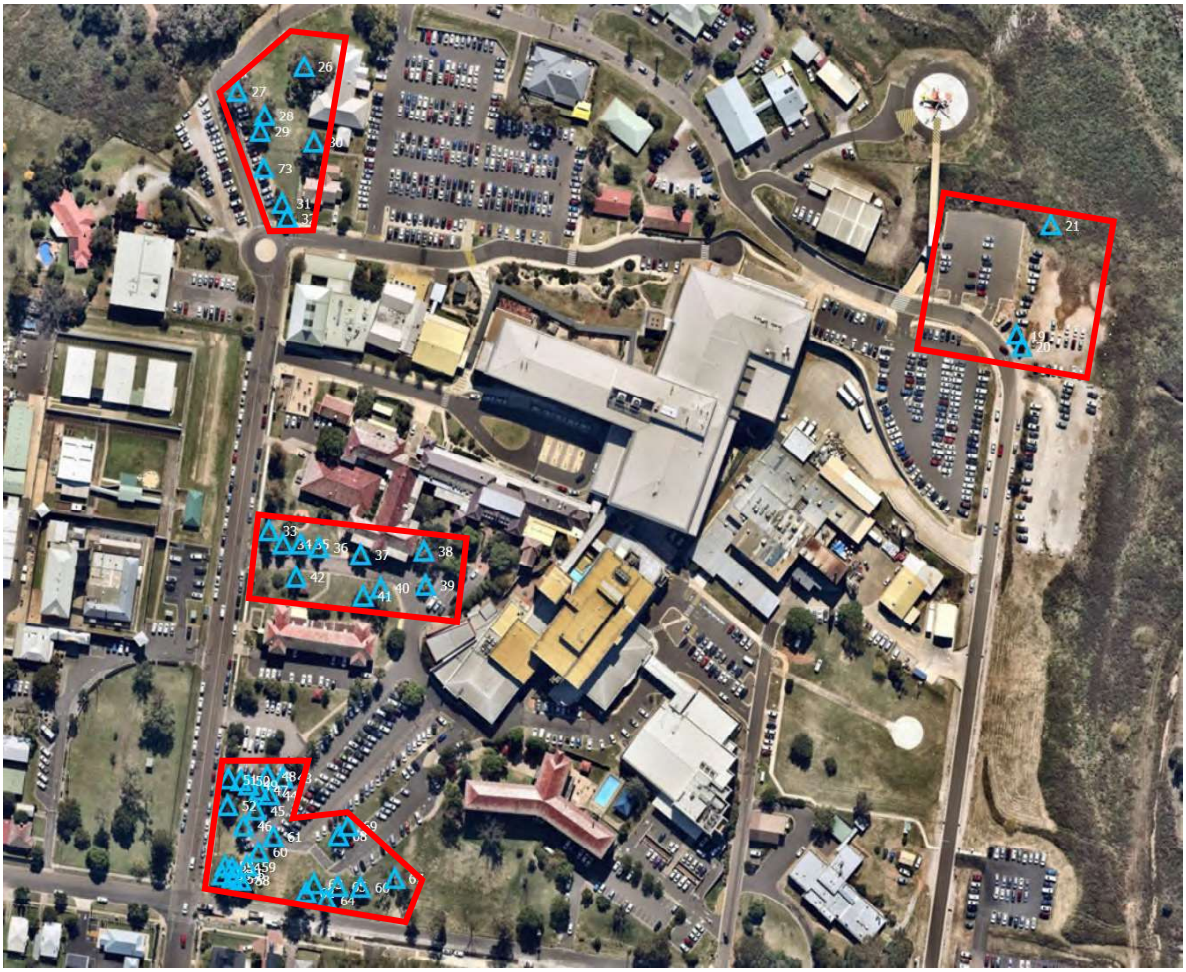


Figure 2. Site map showing subject trees. The red lines delineate the four(4) zones containing the subject trees that may be impacted by the proposed development. Tree attributes are to be obtained from Appendix E – Tree Assessment Data. (ArborSafe, October 2022).

5.3 Tree Retention Values

5.3.1 Retention values were determined based upon a modified version of the British Standard BS 5837–2012: *Trees in Relation to Design, Demolition and Construction*. This standard categorises tree retention value based upon assessment of the tree's quality (health and structure), and life expectancy. Other criteria such as its physical dimensions, age class, location and its Amenity, Heritage and Environmental significance are also considered. A breakdown of attributes required for each category can be obtained from Appendix C – Tree Retention Values.

Category	Tree numbers
A	62
B	26, 27, 28, 30, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 51, 55, 56, 59, 60, 61, 63, 64, 67, 68, 69
C	19, 20, 21, 31, 32, 52, 53, 54, 57, 58, 65, 66, 73
U	29, 50

5.4 Proposed Construction

5.4.1 The basic overlay plans of the proposed development have been reviewed and in summary consist of the expansion of existing, and/or construction of new carparking spaces within the Hospital grounds across four (4) zones (refer to Figure 1–6).

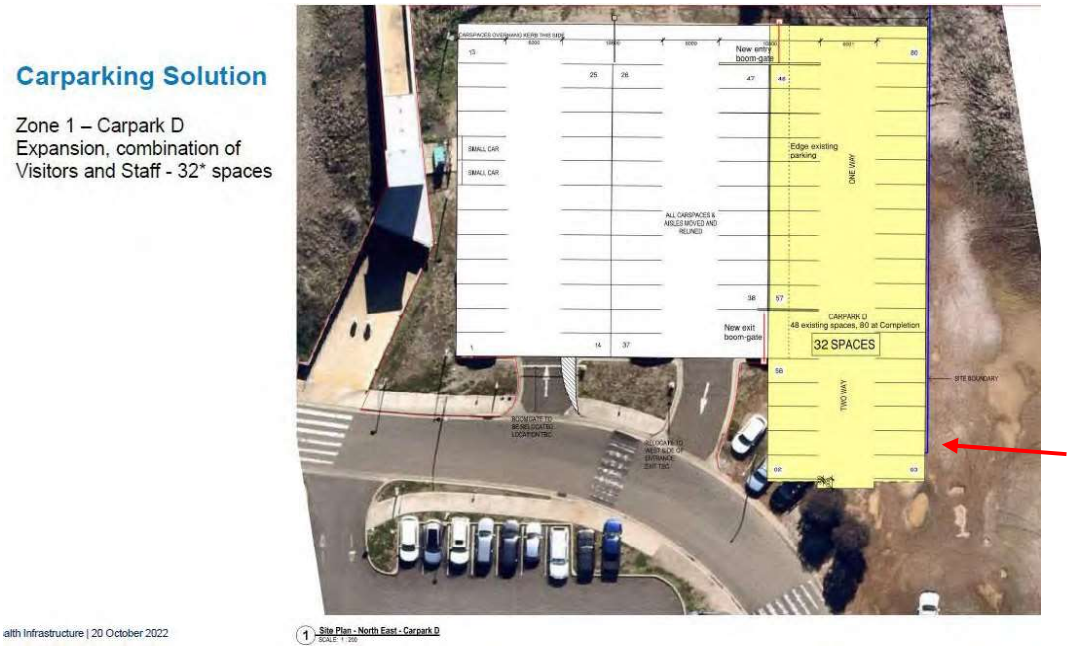


Figure 3. Excerpt from Arborist Scope - carparking Zone 1. Red arrow shows direction of Figure 4 image. (Client, 20 October 2022).

Figure 4. Overview image of carparking Zone 1 with Trees 19 and 20 to the left. (ArborSafe, 28 October 2022).

Figure 5. Overview image of the Zone 1 – extension area (refer to Figure 2), showing Trees 22–25. (ArborSafe, 28 October 2022).

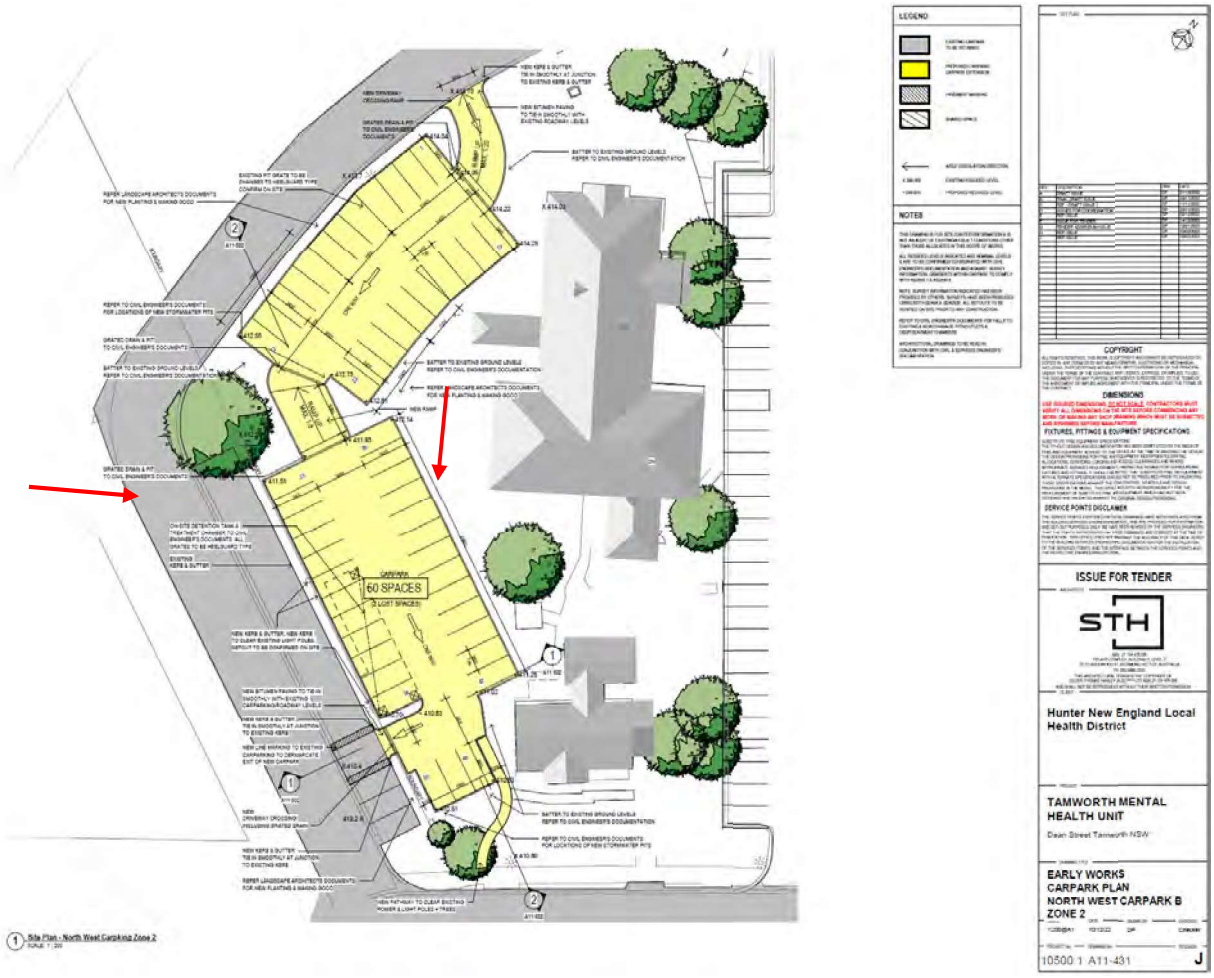


Figure 6. Excerpt from Early Works Carpark Plan North West Carpark B Zone 2 (Dwg. No. A11-431, Rev. J). Red arrows shows direction of Figure 7 and 8 images. (STH, 15 February 2023).

Figure 7. Overview image of carparking Zone 2, with Tree 27 in the foreground. (ArborSafe, 28 October 2022).

Figure 8. Overview image of carparking Zone 2, with Tree 30 in the foreground. (ArborSafe, 28 October 2022).

Figure 9. Excerpt from Early Works Carpark Plan South West Carpark A Zone 3 (Dwg. No. A11-421, Rev. G). (STH, 15 February 2023).

Figure 10. Overview image of carparking Zone 3, with Tree 40 in the left foreground. (ArborSafe, 28 October 2022).

Figure 11. Excerpt from Early Works Carpark Plan South West Carpark A Zone 4 (Dwg. No. A11-411, Rev. J) Red arrows shows direction of Figure 12–15 images. (STH, 15 February 2023).

Figure 12. Overview image of carparking Zone 4, with Tree 52 and 46 in the foreground. (ArborSafe, 28 October 2022).

Figure 13. Overview image of carparking Zone 4, with Palm 60 in the left foreground and Trees 53–59 in the group. (ArborSafe, 28 October 2022).

Figure 14. Overview image of carparking Zone 4, with Tree 62 in the right foreground. (ArborSafe, 28 October 2022).

Figure 15. Overview image of carparking Zone 4. (ArborSafe, 28 October 2022).

5.5 Heritage Status

5.5.1 The proposed development site has no trees identified as being of national or state heritage significance. (SEED, n.d.).

5.5.2 Tree 40, a *Eucalyptus melliodora* (Yellow Box), and a double row of *Phoenix dactylifera* (Date Palms) identified as 39, 43, 44, 45, 46, 59, 60 and 61 are mentioned as having Local significance in the Tamworth Council LEP (Urbis, June 2012)

5.6 Botanical and Environmental Status

5.6.1 The site trees were considered common species in the local area and as such hold limited botanical significance.

5.6.2 A number of the trees were observed to have cavities or hollows which may have been of use to local fauna. These trees were identified as 26, 27, 29, 40 and 52.

6 Discussion

6.1 Determining TPZ Encroachment

6.1.1 **Major encroachment**. As per the Australian Standard AS 4970–2009: *Protection of Trees on Development Sites*, a major encroachment into the TPZ of any tree is considered to occur when it is beyond 10% of the total TPZ area. Trees with major encroachment may require removal or, in certain instances, be retained with specific protection requirements throughout the construction stage.

6.1.2 **Minor encroachment**. Under the aforementioned standard, a minor encroachment is determined as being less than 10% of the total TPZ area. Trees with minor encroachment may be retained with specific, generic or no protection requirements throughout the construction stage.

6.1.3 **No encroachment**. Trees with no encroachment may be retained with generic or no protection requirements throughout the construction stage.

6.1.4 For the purposes of this report, trees to be removed or retained have been identified as those:

- Requiring removal due to a level of encroachment into their TPZ that would likely result in a detrimental impact upon their future health and/or stability
- Retainable and requiring specific protection requirements throughout construction (i.e. generic requirements plus arborist supervision and careful construction methods within their TPZ)
- Retainable and requiring generic tree protection measures only (i.e. protective fencing and restriction of activities within the TPZ).

6.2 Impact of Proposed Development

6.2.1 Review of the proposed design, and of the basic overlay plan provided, has been undertaken in the context of tree retention and removal across the site.

6.2.2 The trees affected by direct conflict with the proposed construction footprint would require removal under the current design. To retain any of these trees a redesign or relocation of the development would be required. Refer to Appendix E for full detail.

6.2.3 The other main development impact which affects trees, but not necessarily to the point of requiring immediate removal, is through significant root damage due to major TPZ encroachment. Root damage largely occurs due to two (2) main impacts – soil compaction (compacting existing site soil to build on or installing additional fill to raise soil levels) and/or direct root severance (excavation for service installation or lowering surface levels).

6.2.4 Negative tree impacts can manifest as either a reduction in health and/or vigour due to root loss (absorption and/or transport roots) resulting in a reduction in water and nutrient absorption capability or on tree stability if larger roots are impacted. Ultimately, the outcome for the trees depends on a number of variable factors including species, age, current health, TPZ encroachment percentage, soil type, topography, previous site use and the proposed design and construction methodology.

6.2.5 Compacted soils, especially artificially compacted soils such as those found under driveways or building platforms, have a higher bulk density down to a deeper level of subsoil. Bulk density is the term used for describing the weight of soil per unit volume. The broad engineering thinking is that the higher the density the more stable the road surface due to less soil movement in expansion, contraction, or compression. A higher bulk density is produced by compacting the soil to reduce available pore space between the soil particles.

6.2.6 The effect of compacted soils on plants is somewhat influenced by the soil type but generally a reduction in available pore space reduces the available area for oxygen and water within the soil. A reduction in available soil water and oxygen inhibits root activity within the soil, as they are essential for root elongation and growth, and the lack of these properties is considered a major limiting factor. The impact of significant soil level rises across the TPZ generally occurs over a longer time frame, as the stored energy can still be utilised and shifted within the tree even if the long-term use of the affected root is limited, than if the roots were directly severed. This generally allows the tree more time to react to the changed growing environment. Root severance has the same effect, reduction in root function and capability, but on an instantaneous time scale where there is no time for the tree to adjust.

6.2.7 The assumption of allowable encroachment and minimal long-term health or structural impacts to the trees rely on a combination of the following being used - root sensitive construction methods being adhered to within the TPZ, minimal excavation within the TPZ to limit root severance (i.e. construction placed outside the TPZ where possible), fill rather than excavation utilised to affect level changes where possible (i.e. to minimise root severance and allow the trees root system time to adjust), no construction occurring within the SRZ, compensatory area being available around the unimpacted aspects of the trees and the enhancement of the existing TPZ area (i.e. mulched, soil conditioning and irrigation when required).

7 Tree Protection and Management Recommendations

7.1 Tree Removal

7.1.1 Fifteen (15) trees would require removal, based on the supplied design, to facilitate development. Ten (10) of these have direct conflict with the proposed carparking spaces, numbered 21, 26, 28, 42, 45, 49, 60, 65, 66 and 73, while the remaining five (5), numbered 31, 47, 48, 52, and 63, have major TPZ encroachment of greater than 40%.

7.1.2 A further two (2) trees should be removed, in the context of development (Category U), due to poor health and/or structure, although both trees would also require removal due to either direct conflict or major TPZ encroachment

Recommendation	Category A High retention value		Category B Moderate retention value		Category C Low Retention value		Category U No retention value	
	Qty	Tree numbers	Qty	Tree numbers	Qty	Tree numbers	Qty	Tree numbers
Remove for development	0		9	26, 28, 42, 45, 47, 48, 49, 60, 63	6	21, 31, 52, 65, 66, 73	0	
Remove in the context of development	0		0		0		2	29, 50

Figure 16. Site map showing trees requiring removal. (ArborSafe, October 2022).

7.2 Tree Retention

7.2.1 Thirty-one (31) trees were recommended for retention and require generic, and sometimes specific, protection measures during construction to ensure they remain viable following the completion of works.

Recommendation	Category A High retention value		Category B Moderate retention value		Category C Low Retention value	
	Qty	Tree numbers	Qty	Tree numbers	Qty	Tree numbers
Retain with specific protection requirements	1	62	4	46, 51, 64, 67	0	
Retain with generic protection requirements	0		19	27, 30, 33, 34, 35, 36, 37, 38, 39, 40, 41, 43, 44, 55, 56, 59, 61, 68, 69	7	19, 20, 32, 53, 54, 57, 58

7.3 Site survey

7.3.1 A site survey should be completed using a registered surveyor. Tree numbers contained within this report and located on the individual tree tags onsite should be used in the survey.

7.3.2 The TPZ, SRZ and Retention Value of all trees (Category A, B, C and U) should be displayed accurately on the site survey and subsequent development plans, using appropriate colour coding where possible, using the information contained in the attached Appendix E - Tree Assessment Data Sheet.

7.4 Specific Protection Measures

7.4.1 Trees 46, 51, 62, 64 and 67 have proposed development within their TPZ (Figure 17) of a percentage, slightly above the generally acceptable 10% (refer to Appendix E – Tree Assessment Data Sheet), that should enable retention with minimal long term impact. Further assessment following detailed design should be undertaken to assess their retention suitability.

7.4.2 If no further design reviews are undertaken, site preparation excavation is to be carried out only under arborist supervision and works should be undertaken using techniques that are sensitive to tree roots to avoid unnecessary damage. Such techniques include:

- Arborist supervision
- The use of machinery should be undertaken from areas of hardstand to avoid potential root compaction
- The proposed excavation should commence at the outer extent of the TPZ and move inwards to minimise root damage to the tree
- No excavation should occur within the SRZ of these trees
- Roots discovered are to be treated with care and minor roots (<40mm diameter) pruned with a sharp, sterile handsaw or secateurs. All significant roots (>40mm diameter) are to be recorded, photographed and reported to the project arborist.

Figure 17. Site map showing trees requiring specific protection measures. (ArborSafe, October 2022).

7.5 Generic Protection and Reporting Measures

7.5.1 All retained trees require generic protection measure (Figure 18). Refer to Section 7.6–7.12 for further detail.

Figure 18. Site map showing tree requiring generic protection measures. (ArborSafe, October 2022).

7.5.2 All trees to be retained require protection during the construction stage. Tree protection measures include a range of:

- Activities restricted within the TPZ
- Protective fencing
- Trunk and ground protection
- Tree protection signage
- Involvement from the project arborist
- Project milestones
- Compliance reporting

7.6 Activities Prohibited within the TPZ

- Machine excavation including trenching
- Storage
- Preparation of chemicals, including cement products
- Parking of vehicles and plant
- Refuelling
- Dumping of waste
- Wash down and cleaning of equipment
- Placement of fill
- Lighting of fires
- Soil level changes
- Temporary or permanent installation of utilities and signs
- Physical damage to the tree

7.7 Protective Fencing Specification

7.7.1 Protective fencing (Figure 19) is to be installed as far as practicable from the trunk of any retained trees. Fencing should be erected as per the image below before any machinery or materials are brought to site and before commencement of works (including demolition).

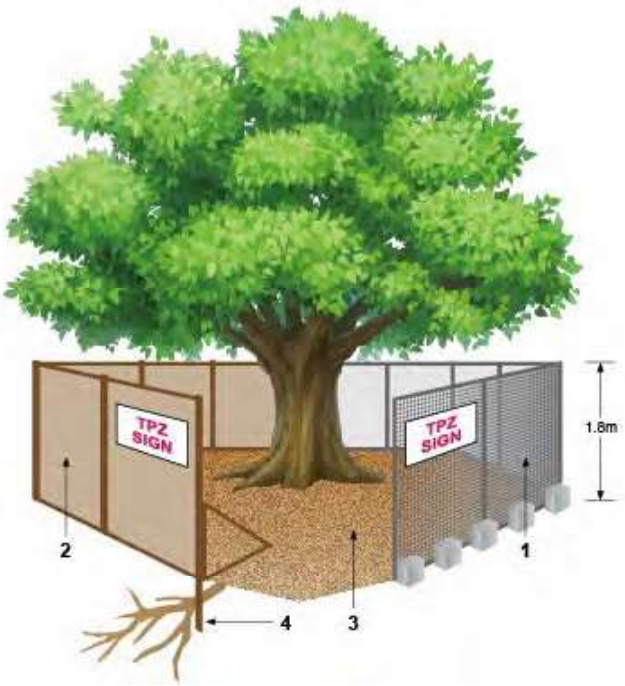
7.7.2 In some areas of the site (i.e. protection of trees on neighbouring properties) existing boundary fencing may be used as an alternative to protective fencing.

7.7.3 Once erected, protective fencing must not be removed or altered without approval from the project arborist. The TPZ fencing should be secured to restrict access.

7.7.4 TPZ fencing is to be a minimum of 1.8m high and mesh or wire between posts must be highly visible. Fence posts and supports should have a diameter greater than 20mm and should ideally be freestanding, otherwise be located clear of the roots. See image below.

7.7.5 Tree protection fencing must remain intact throughout all proposed construction works and must only be dismantled after their conclusion. The temporary dismantling of tree protection fencing must only be done with the authorisation of a consulting arborist and/or the responsible authority.

7.7.6 The subject trees themselves must also not to be used as a billboard to support advertising material. Affixing nails or screws into the trunks of trees to display signs of any type is not a recommended practice in the successful retention of trees.



Legend:

1. Chain wire mesh panels with shade cloth attached (if required), 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 (at discretion of the project arborist). No excavation, construction activity, grade changes, surface treatment or storage materials of any kind are permitted within the TPZ
4. Bracing is permissible within the TPZ. Installation of supports should avoid damaging roots.

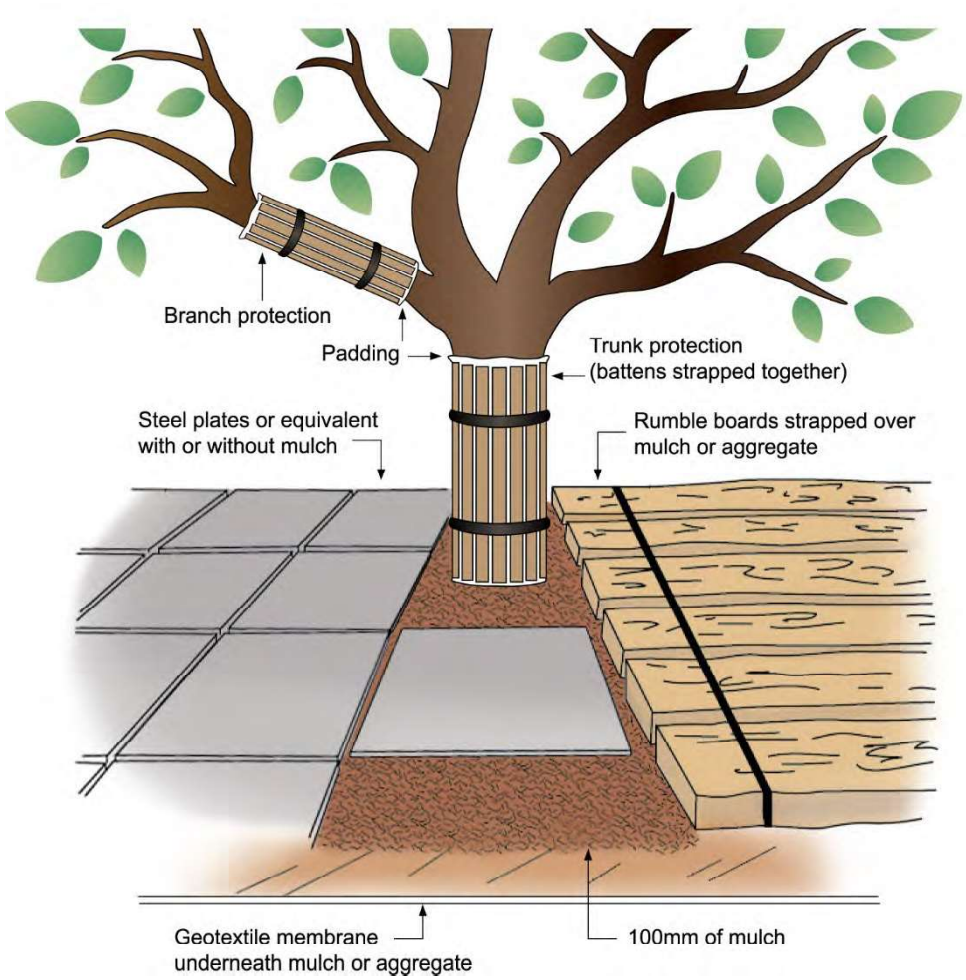
Figure 19. Depicts standard fencing techniques. (AS 4970–2009).

7.8 Trunk and Ground Protection

7.8.1 Given that proposed works are often within the TPZs of retained trees, standard protective fencing may not always be a viable method of protection. In these areas trunk protection and ground protection should be installed prior to the commencement of works and remain in place until after construction works have been completed.

7.8.2 Where construction access into the TPZ of retained trees cannot be avoided, the root zone of each tree must be protected using either steel plates or rumble board strapped over mulch/aggregate until such a time as permanent above ground surfacing (cellular confinement system or similar) is to be installed.

7.8.3 Trunk and ground protection (Figure 20) should be undertaken in line with the Australian Standard AS 4790–2009: *Protection of Trees on Development Sites* as per the image below:



Notes:

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.

Figure 20. Depicts trunk and ground protection techniques. (AS 4970–2009).

7.9 Tree Protection Signs

7.9.1 Signs identifying the TPZ (Figure 21) should be placed at 10m intervals around the edge of the TPZ and should be visible from within the development site.

Figure 21. Depicts standard fencing techniques. (AS 4970–2009).

7.10 Project Arborist

7.10.1 An official "Project Arborist" must be commissioned to oversee the tree protection, any works within the TPZ's and complete regular monitoring compliance certification.

7.10.2 The project arborist must have minimum five (5) years industry experience in the field of arboriculture, horticulture with relevant demonstrated experience in tree management on construction sites, and Diploma level qualifications in arboriculture – AQF Level 5.

7.10.3 Inspections are to be conducted by the project arborist at several key points during the construction in order to ensure that protection measures are being adhered to during construction stages and decline in tree health or additional remediation measures can be identified.

7.11 Project Milestones

7.11.1 The following visits and milestones were recommended as to when on-site tree inspection by the project arborist is required:

Item	Purpose of Visit	Timing of Visit(s)	Prerequisites
1	Pre-start induction	Following sign off from Item 1. Contractor to provide a minimum of five days advance notice for this visit.	Prior to commencement of works. All parties involved in the project to attend.
2	Supervision of works in TPZ's including all regrading and excavations	Whenever there is work planned to be performed within the TPZ's. Contractor to provide a minimum of five days advance notice for such visits.	
3	Regular site inspections	Minimum frequency monthly for the duration of the project.	The checklist must be completed by the Project Arborist at each site inspection and signed by both parties.
4	Final sign off	Following completion of works.	Practical completion of works and prior to tree protection removal.

7.12 Compliance Reporting

7.12.1 Following each inspection, the project arborist shall prepare a report detailing the condition of the trees. These reports should certify whether or not the works have been completed in compliance with the consent relating to tree protection.

7.12.2 These reports should contain photographic evidence where required to demonstrate that the work has been carried out as specified.

7.12.3 Matters to be monitored and included in these reports should include tree condition, tree protection measures and impact of site works which may arise from changes to the approved plans.

7.12.4 The reports and Compliance Statements shall be submitted to the Project Manager (as well as the Clients' nominated representative) following each inspection.

7.12.5 The reports and any Non-Compliance Statements shall be submitted to the Project Manager (as well as the Clients' nominated representative) if tree protection conditions have been breached. Reports should contain clear remedial action specifications to minimise any adverse impact on any subject tree.

7.13 Proposed Pruning

7.13.1 It is anticipated that minor pruning only will be required, largely centred on reduction or crown lifting to facilitate site access during construction, of no greater than 10% of any one trees total crown area. Such pruning is considered to have minimal long term health impact to the tree.

7.13.2 All pruning is recommended to be completed in accordance with the Australian Standard AS 4373–2007: *Pruning of Amenity Trees* (Standards Australia, 2007) and undertaken by a suitably qualified arborist (minimum AQF 3 arborist).

7.13.3 Reduction pruning should focus on the removal of smaller diameter branches where feasible and remove no greater than 10% of the total crown. Branches no greater than 50mm diameter are to be removed unless specifically approved by the project arborist.

7.14 Offset Tree Planting

7.14.1 Offset planting should reflect the number of trees removed and the initial loss of amenity and biomass. New trees should be of long-term potential and sourced from a reputable supplier.

7.14.2 Replacement tree species must suit their location on the site in terms of their potential physical size and their tolerance(s) to the surrounding environmental conditions. To avoid unethical or unprofessional tree selection and/or their placement within the landscape, replacement tree species must be selected in consultation with a consulting arborist, who can also assist in implementing successful tree establishment techniques.

7.14.3 Replacement tree species must have the genetic potential to reach a mature size potential of those trees removed to facilitate the development. As a guide, potential height will be a minimum of 10m (or more) and produce a spreading canopy so as they may provide amenity value to the property and contribute to the tree canopy of the surrounding area in the future.

7.15 Additional Excavation/Trenching within TPZs

7.15.1 In the event additional excavation is required within the TPZs of retained trees identified within this report, or any other site trees, arborist involvement will be required to ensure works are undertaken in accordance with the Australian Standard AS 4970–2009: *Protection of Trees on Development Sites.*

7.15.2 Where excavation or trenching is required to facilitate installation of underground services within the TPZs of any site trees arborist supervision is required. Works should be undertaken using techniques that are sensitive to tree roots to avoid unnecessary damage. Such techniques include:

1. Excavation by hand
2. Excavation using a high-pressure water jet and vacuum truck
3. Excavation using an Air Spade with vacuum truck.

7.15.3 Machine excavation should be prohibited within the TPZs of retained trees unless undertaken at the direct consent from the project arborist and/or the responsible authority.

7.16 Plant Health Care

7.16.1 When managing a tree affected by development incursions within its TPZ, plant tonic and growth stimulant drenching should be undertaken. Plant tonic and growth stimulant drenching is the process of adding diluted products directly to the root area of a tree to promote and assist trees to cope with loss of roots during the development process. They also assist trees to provide better resistance to sap sucking insects and fungal attack/disease and improve the establishment of beneficial microbial populations and nutrient uptake. See Appendix D – Plant Health Care and Mulching

7.17 Irrigation

7.17.1 Regular checks are required to ensure retained trees are receiving the correct amount of water. The majority of a tree's fine water absorbing roots are located in the top 10–30cm of soil. To undertake a basic soil moisture test, dig a small hole to a depth of 40cm at the dripline of the tree. If the soil is moist at this depth, water is not needed. Slow irrigation that provides an even coverage and targets the absorbing roots is the key to successful irrigation and encourages a deeper tree root system. Irrigation near the trunk is unnecessary as for most trees there are generally fewer water absorbing roots in this area. Irrigating the soil from half-way between the trunk and the dripline as well as beyond the dripline will provide water where it will most effectively be used. Preferably, water your trees during the cooler evening and early morning period when temperatures are lower, humidity is higher, and the air is calmer thereby reducing water evaporation from the soil surface. Irrigation in the middle of the day is not harmful to most trees however it is less efficient.

7.18 Mulching

7.18.1 Mulching regulates soil moisture and temperature levels, suppresses weeds, minimises soil compaction and reduces run off during periods of heavy rain. Acquiring wood chip mulch from programmed tree works (and by purchasing it from local tree contractors) would be a proactive way to improve the growing conditions around trees that ultimately will result in improved tree health and vitality.

7.18.2 Mulch should aim to cover an area at least as large as a tree's crown projection (and preferably larger) for it to be effective. It should also be laid at a uniform thickness of 75–100mm. Mulch should also be placed over damp to wet soil and never over dry soil. Application during the cooler months of the year is ideal. In areas where grass exists where you wish to mulch, spray the grass first with a non-selective herbicide and allow it to wilt and die before placement. This practice will negate grass growing up through the mulch over time.

7.18.3 Mulching within the canopy areas of trees not only improves long term tree health but also acts to reduce tree risk by reducing targets that pass and/or congregate under their canopies. This in turn will minimise the likelihood of injury in the event of a branch failure.

8 References

- Mattheck, C. a. B. H., 1994. *The Body Language of Trees: A Handbook for Failure Analysis.* H. M. Stationery Office: University of Michigan.
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- The British Standards Institution, 2012. *BS5837–2012: Trees in relation to design, demolition and construction,* London: BSI Standards Limited.
- Urban, J., 2008. *Up By Roots - Healthy Soils and Trees in the Built Environment.* Champaign (Illinois): International Society of Arboriculture.
- Urbis, June 2012. *Heritage Impact Statement,* Sydney: Urbis.

Plans of the existing site and of the proposed development were provided to ArborSafe in late October 2022 and include:

- Arborist Scope – Carparking, October 2022.
- Site Plans, Demolition Plans and Carpark Plans, Drawings A01-002, A10-000, A10-001, A11-202 to 205, A11-411, A11-421m A11-431, A12-001, STH, 13-15 February 2023.

Appendix A. Arboricultural Reporting Assumptions and Limiting Conditions

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

Appendix B. Explanation of Tree Assessment Terms

Tree number: Refers to the individual identification number assigned within the ArborSafe software to each assessed tree on the site and the number which appears of the tree's tag.

Tree location: Refers to the easting and northing coordinates assigned to the location of the tree as obtained from the geo-referenced aerial image within the ArborSafe software.

Tree species: Provides the botanic name (genus, species, sub-species, variety and cultivar where applicable) in accordance with the International Code of Botanical Nomenclature (ICBN), and the accepted common name.

Trees in group: The number of trees encompassing a collective assessment of more than one tree. Typically grouped trees have similar attributes that can be encompassed within one data record.

Height: The estimated range in metres attributed to the tree from its base to the highest point of the canopy. Where required height will be estimated to the nearest metre.

Diameter at Breast Height (DBH): Refers to the tree's estimated trunk diameter measured 1.4m from ground level for a single trunked tree. These estimates increase in 50mm increments. Where required DBH will be measured to give an accurate measurement for single trunked trees, trees with multiple trunks, significant root buttressing, bifurcating close to ground level or trunk defects and will be measured as per the Australian Standard AS 4970–2009: *Protection of Trees on Development Sites*.

Tree Protection Zone (TPZ): A specified area above and below ground and at a given distance measured radially away from the centre of the tree's trunk and which is set aside for the protection of its roots and crown. It is the area required to provide for the viability and stability of a tree to be retained where it is potentially subject to damage by development. The radius of the TPZ is calculated by multiplying its DBH by 12. TPZ radius = DBH × 12. (Note "Breast Height" is nominally measured as 1.4m from ground level).TPZ is a theoretical calculation and can be influenced by existing physical constraints such as buildings, drainage channels, retaining walls, etc. (Standards Australia, 2009).

Structural Root Zone (SRZ): The area close to the base of a tree required for the tree's anchorage and stability in the ground. The woody root growth and soil cohesion in this area are necessary to hold the tree upright. The SRZ is nominally circular with the trunk at its centre and is expressed by its radius in metres. SRZ radius = $(D \times 50)^{0.42 \times 0.64}$ (Standards Australia, 2009).

Canopy spread: The estimated range in metres attributed to the spread of the tree's canopy on its widest axis. Where required crown spread will be estimated to the nearest metre.

Origin: Refers to the origin of the species and its type.

Category	Description
Indigenous	Occurs naturally in the local area and is native to a given region or ecosystem.
State Native	Occurs naturally within State but is not indigenous.
Australian Native	Occurs naturally within Australia and its territories but is not a State native or indigenous.
Exotic Evergreen	Occurs naturally outside of Australia and its territories and typically retains its leaves throughout the year.
Exotic Deciduous	Occurs naturally outside of Australia and its territories and typically loses its leaves at least once a year.

Health: Refers to the health and vigour of the tree.

Category	Description
Excellent	Canopy full with even foliage density throughout, leaves are entire and are of an excellent size and colour for the species with no visible pathogen damage. Excellent growth indicators, e.g. seasonal extension growth. Exceptional specimen.
Good	Canopy full with minor variations in foliage density throughout, leaves are entire and are of good size and colour for the species with minimal or no visible pathogen damage. Good growth indicators, none or minimal deadwood.
Fair	Canopy with moderate variations in foliage density throughout, leaves not entire with reduced size and/or atypical in colour, moderate pathogen damage. Reduced growth indicators, visible amounts of deadwood, may contain epicormic growth.
Poor	Canopy density significantly reduced throughout, leaves are not entire, are significantly reduced in size and/or are discoloured, significant pathogen damage. Significant amounts of deadwood and/or epicormic growth, noticeable dieback of branch tips, possibly extensive.
Dead	No live plant material observed throughout the canopy, bark may be visibly delaminating from the trunk and/or branches.

Age: Refers to the life cycle of the tree.

Category	Description
Young	Newly planted small tree not fully established may be capable of being transplanted or easily replaced.
Juvenile	Tree is small in terms of its potential physical size and has not reached its full reproductive ability.
Semi-mature	Tree in active growth phase of life cycle and has not yet attained an expected maximum physical size for its species and/or its location.
Mature	Tree has reached an expected maximum physical size for the species and/or location and is showing a reduction in the rate of seasonal extension growth.
Senescent	Tree is approaching the end of its life cycle and is exhibiting a reduction in vigour often evidenced by natural deterioration in health and structure.

Structure: Refers to the structure of the tree from roots to crown.

Category	Description
Good	Sound branch attachments with no visible structural defects, e.g. included bark or acute angled unions. No visible wounds to the trunk and/or root plate. No fungal pathogens present.
Fair	Minor structural defects present, e.g. apical leaders sharing common union(s). Minor damage to structural roots. Small wounds present where decay could begin. No fungal pathogens present.
Poor	Moderate structural defects present, including bifurcations with included bark with union failure likely within 0–5 years. Wounding evident with cavities and/or decay present. Damage to structural roots.
Hazardous	Significant structural defects with failure imminent (3–6 months). Defects may include active splits and/or partial branch or root plate failures. Tree requires immediate arboricultural works to alleviate the associated risk.

Useful Life Expectancy (ULE): Useful life expectancy refers to an expected period of time the tree can be retained within the landscape before its amenity value declines to a point where it may detract from the appearance of the landscape and/or presents a greater risk and/or more hazards to people and/or property. ULE values consider tree species, current age, health, structure and location. ULE values are based on the tree at the time of assessment and do not consider future changes within the tree's location and environment which may influence the ULE value.

Category
0 Years
<5 Years
5–10 Years
10–15 Years
15–25 Years
25–50 Years
>50 Years

Defects: Visual observations made of the presenting defects of the tree and its growing environment that are, or have the capacity to impact upon, the health, structural condition and/or the useful life expectancy of the tree. Defects may include adverse physical traits or conditions, signs of structural weaknesses, plant disease and/or pest damage, tree impacts to assets or soil related issues.

Tree Significance: Includes environmental, social or historical reasons why the tree is significant to the site. The tree may also be rare under cultivation or have a rare or localised natural distribution.

Arborist Actions: A list of arboricultural and/or plant health care works that are aimed at maintaining or improving the tree's health, structural condition or form. Actions may also directly or indirectly reduce the risk potential of the tree such as via the removal of a particular branch or the moving of infrastructure from under its canopy.

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Appendix C. Tree Retention Values

Based upon a modified version of the British Standard BS 5837–2012: *Trees in relation to design, demolition and construction* – recommendations.

Category and definition	Criteria (including sub-categories where appropriate)		
Category U			
Trees in such a condition that they cannot realistically be retained as viable trees in the context of the current land use for longer than 5 years.	• Trees that have a severe structural defect that are not remediable such that their failure is expected within 12 months. • Trees that will become unviable after removal of other Category U trees (e.g. where for whatever reason the loss of companion shelter cannot be mitigated by pruning). • Trees that are dead or are showing signs of significant, immediate and irreversible overall decline. • Trees infected with pathogens of significance to the health and or safety of other trees nearby • Low quality trees suppressing adjacent trees of better quality. • Noxious weeds or species categorised as weeds within the local area. **Note:** Category U trees can have existing or potential conservation value* which might make it desirable to preserve.		
	1. Arboricultural Qualities	**2. Landscape qualities**	**3. Cultural and environmental values**
Category A			
Trees of High Quality with an estimated remaining life expectancy of at least 25 years and of dimensions and prominence that it cannot be readily replaced in <20 years.	Trees that are particularly good examples of their species, especially if rare or unusual (in the wild or under cultivation); or those that are important components of groups or avenues.	Trees or groups of significant visual importance as arboricultural and/or landscape features. (e.g. feature and landmark trees).	Trees, groups or plant communities of significant conservation, historical, commemorative or other value (e.g. remnant trees, aboriginal scar trees, critically endangered plant communities, trees listed specifically within a Heritage statement of significance).
Category B			
Trees of Moderate Quality with an estimated remaining life expectancy of 15–25 years and of dimensions and prominence that cannot be readily replaced within 10 years.	Trees that might be included within Category A but are downgraded because of diminished condition such that they are unlikely to be suitable for retention beyond 25 years.	Trees that are visible from surrounding properties and/or the street but make little visual contribution to the wider locality.	Trees with conservation or other cultural value (trees within conservation areas or landscapes described within a statement of significance, locally indigenous species).
Category C			
Trees of Low Quality with an estimated remaining life expectancy of 5–15 years, or young trees that are easily replaceable.	Trees of very limited value or such impaired condition that they do not qualify in higher categories.	Trees offering low or only temporary/transient landscape benefits.	Trees with no material conservation or other cultural value.

* Where trees would otherwise be categorised as U, B or C but have significant identifiable conservation, heritage or landscape value even though only for the short term, they may be upgraded, although they might be suitable for retention only.

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Tree Quality

		Health**			
		Excellent/ Good	Fair	Poor	Dead
Structure	Good	A	B	C	U
	Fair	B	B	C	U
	Poor	C	C	U	U
	Hazard *	U	U	U	U

* Structural hazard that cannot be remediated through mitigation works to enable safe retention.

** Trees of short term reduced health that can be remediated via basic, low cost plant health care works (e.g. mulching, irrigation etc.) may be designated in a higher health rating to ensure correct retention value nomination.

Category A	Typically trees in this category are of high quality with an estimated remaining life expectancy of at least 25 years and of dimensions and prominence that it cannot be readily replaced in <20 years. The tree may make significant amenity contributions to the landscape and may make high environmental contributions. In some cases, trees within this category may not meet the above criteria, however possess significant heritage or ecological value. Trees of this retention value warrant design consideration and amendment to ensure their viable retention.
Category B	Typically trees in this category are of moderate quality with an estimated remaining life expectancy of 15–25 years and prominence of size dimensions that cannot be readily replaced within 10 years. They may make moderate amenity contributions to the landscape and make low/moderate environmental contributions. Trees with this retention value warrant lesser design consideration in an attempt to allow for their retention.
Category C	Trees in this category are of low quality with an estimated remaining life expectancy of 5–15 years, or young trees that are easily replaceable, may have poor health and/or structure, are easily replaceable, or are of undesirable species and do not warrant design consideration.
Category U	Trees in this category are found to be in such a condition that they cannot realistically be retained as viable trees in the context of the current land use for longer than five years. These trees may be dead and/or of a species recognised as a weed that resulted in them being unretainable.

Appendix D. Plant Health Care and Mulching

Guide to plant health tonics and root growth stimulants

Considering the varying sizes of trees in common urban landscapes, it is suggested that an application volume of combined water and product solution of 80–150L for small to medium sized trees (5-10m height), 150–250L for medium to large sized trees (10-20m height) and 250–400L for large to very large sized trees (+20m height). Note: a lesser volume of total mixed product could be used if a more concentrated mix is drenched and water irrigation used to further drench the area and therefore dilute the stronger mix application.

The following product recommendations have been based on previous successful works undertaken by ArborSafe. The information provided is to be used as a general guide only, depending on your tree species, health or location. We recommend you always refer to the manufacturers label before applying any product. You may need to further consult with ArborSafe or your Project Arborist to develop a more specific program for your tree needs.

- **Soil Conditioner** concentrate such as Kelpro, Seasol or similar 600–800mL/100L of water. A concentration of beneficial nutrients stimulating plant growth and root establishment, ideal for trees under stress.
- **Nitrogen Boost** concentrate such as Nitrosol liquid plant food or similar 300mL/100L of water. A general-purpose fertilizer that contains a nitrogen boost (the most abundantly used element for tree growth). NB: Care must be taken when applying general fertilizer, particularly where plants can be affected Phosphorus toxicity.
- **Root Biostimulant** concentrate such as Auxinone or similar 400mL/100L of water. A scientific blend of hormone root growth stimulants and vitamins assisting in the regeneration of roots.
- **Microbial Formulation** concentrate such as Noculate Liquid or similar 500mL/100L of water. Generally containing strains of beneficial soil microorganisms, humic acid, kelp, essential amino acids, vitamins, biotin, folic acid and natural sugars designed to enhance the establishment of beneficial microbial populations.
- **Carbohydrate Energy Source** such as Molasses 500-800mL/100L of water. Molasses is the by-product of sugar refining. It contains all the nutrients from the raw sugarcane plant and is a carbohydrate energy source that feeds soil microorganisms and increases microbial activity.
- **Surfactant/Wetting Agent** (optional) such as Dispatch (Liquid) 200–300ml/100L of water. Improves the infiltration and penetration of applied water and irrigation.

We recommend you always refer to the manufacturers label before applying any product using the above as a guide only.

Guide to mulching and maintenance for established trees

Whether a tree is a newly planted young tree, or a well-established mature tree, the area around its base is a key factor in its long-term retention and viability. Maintaining a soil environment that is conducive to tree root development is vital for trees of all ages. This guide provides information on appropriate maintenance practices around the base of trees including mulching and the restriction of activities that may cause harm to tree roots or trunks.

1. Why mulch?

Mulching is a plant health care action which can be undertaken to improve plant and soil health (Figure 22), as well as overall landscape aesthetics. Placing an organic (or sometimes inorganic) material on the soil surface reduces the level of direct sunlight contact. Mulching should not be confused with composting which involves incorporating organic matter such as composts or manures into the soil profile. All plants in their natural ecologies (except for some arid and coastal ecologies) are naturally mulched by the falling of leaves, bark, flowers and other organic material.

This action is of great importance in successful cultivation of plants as it:

- assists in the regulation of soil moisture and temperature levels
- helps to suppress weeds
- minimises soil compaction
- reduces run-off during periods of heavy rain
- adds organic matter to the soil, and
- improves overall structure, nutrition and water holding composition.

Mulch is best comprised of organic materials such as wood chips, leaf litter, straw or hay as these will degrade over time. Long-term mulching improves soil health and structure as it encourages the activities of earthworms, microflora and beneficial fungi. Inorganic materials such as stones and gravel can be moderately effective as mulch but will not provide the ongoing improvements to soil health.

Figure 22. An excellent example of how to mulch a young tree. (Lachlan Andrews, September 2015).

2. How to mulch

- Apply mulch to damp soil, as placing over dry soil makes it difficult to rehydrate. Applying during the cooler months of the year is an ideal time.
- If mulching on top of a pre-existing grass area, grass or weeds must first be hand weeded and/or sprayed with a non-selective herbicide and left to wilt and die before applying mulch.
- Mulch should be applied at a uniform thickness of 75–100mm and re-applied approximately every 12 months. Do not place mulch up against the trunk of a tree as the damp mulch can cause bark to decay.
- Apply over a wide area, at least as large as a tree's crown projection (preferably larger), within and outside the current root mass to encourage lateral root development and expansion.
- Wood chip mulch (such as that generated from wood chippers) is considered an ideal mulch for landscape use as it contains a wide variety of materials that are of different sizes (such as bark, foliage and timber), is relatively cheap to purchase, and can be obtained in large quantities. Stockpiling of mulch after tree contractors have conducted works at a site is a way of generating 'free' mulch and ensuring that plant material from tree pruning and/or removals is recycled on site, not imported from external suppliers, saving costs and making the site more self-sustaining.
- The use of mulch made from pine bark or red gum chips are discouraged as they seldom degrade and therefore do not add nutrition to the soil profile. The uniform particle size and resin content can provide an impervious layer to water as well as retarding gaseous exchange.
- Mulching within the canopy areas of larger trees (Figure 23) can not only improve long-term tree health but can also act to reduce tree risk by decreasing the number of targets that pass and/or congregate under their canopies. This in turn will minimise the likelihood of injury in the event of a branch failure.
- When using wood chip mulch, ensure that if it has been made from live plant material that is stored and allowed to compost for between 3 and 6 months prior to use. Never apply fresh, 'green' mulch around trees as this can induce what is called the nitrogen drawdown, which can result in the removal of nitrogen from the soil resulting in plants with nutrient deficiencies.

For further information refer to the Australian Standard AS 4454–2012: *Composts, Soil Conditioners and Mulches*.

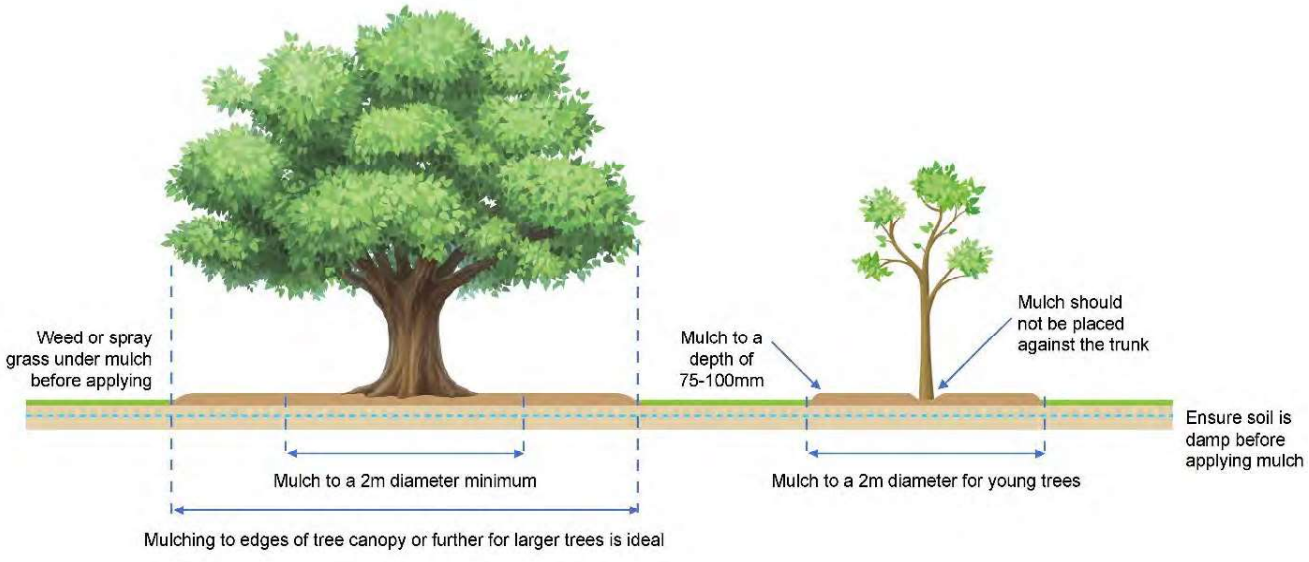

Figure 23. Mulching established and young trees (ArborSafe Australia, 2020).

3. Root and trunk damage

The function of tree roots is primarily to provide water and nutrient uptake for the tree, provide stability through structural roots that anchor it to the ground and as a means of food and nutrient storage. Damage to tree roots can lead to a reduction to any or all of these functions.

Damage to tree roots (Figure 24 and Figure 25) and the lower portion of a tree's trunk is a common and often unnecessary occurrence that can lead to the entry of decay fungi into a tree's structural framework. Once present, decay may develop in larger structural roots and/or the base of the trunk, which can result in a reduction in tree health and in severe cases even compromise stability.

Works such as trenching and excavation are often the cause of root damage to trees. Refer to ArborSafe's Guide – Tree protection during construction or the Australian Standard AS 4970–2009: *Protection of Trees on Development Sites* for things to consider when performing construction activities near trees.

Everyday activities such as grass cutting via mowing or brush cutters can result in serious root damage or wounding to the lower trunk. Young trees with their trunks damaged by machinery often need replacing, while damage to the trunks and/or surface roots of established trees is not only detrimental to tree health but can also result in costly repairs to machinery.

Another advantage to mulching around the trunk and root crown is that it limits damage to both parts from mowing equipment. This in turn reduces mechanical damage and compaction.

Figure 24. An example of damage to tree roots caused via mowing. (Luke Dawson, June 2017).

Figure 25. Image showing wound caused to upper portion of surface root by mower. (Luke Dawson, June 2017).

4. How to avoid root and trunk damage

The following points serve to highlight ways to avoid damage to tree roots and trunks caused via grass cutting activities:

- Mulching around young and established trees negates the need for brush cutter and/or lawn mower use around the base of a tree. Mulching therefore not only creates a barrier between tree roots and trunk that are susceptible to damage, it improves soil condition, minimises soil compaction and decreases the total area required for mowing.
- Where mulching is not feasible, raising the cutting height of mowers and maintaining grass at a greater height can avoid unnecessary 'scalping' of roots and damage to mowers/blades.
- Where surface roots are located away from the trunk and in a location where neither the application of mulch nor the raising of mower height is inappropriate, it may be possible to raise the soil grade directly around the root/s to minimise damage. It is important that the application of new material does not result in significant changes to the soil profile that may inadvertently damage roots. Material applied should be permeable and allow the development of turf which will protect the roots. Coarse sand or a planting mix with a high sand to organic matter ratio (e.g. 80/20 mix) spread at a depth of 75–100mm could suitably protect the surface root from damage, while allowing turf to redevelop within the area.
- ArborSafe is able to answer any questions regarding the material, depth and method of application to be used to ensure the tree/s remain viable for the long-term.

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Appendix E. Tree Assessment Data

Tree no.	Zones	*Botanical Name*	Common Name	Origin	Trees in group	DBH Total (cm)	DRB (cm)	Radial TPZ (m)	TPZ area (m2)	Radial SRZ (m)	Tree Height (m)	Canopy (m)	Health	Structure	Age	TLE (Yrs.)	Defects	Significance	Arborist comments	Tree Quality Score	Tree Retention value subcategory	Recommendation
19	1	*Eucalyptus sideroxylon*	Red Ironbark	Endemic	1	20	28	2.4	18.10	1.9	6	<5	Good	Fair	Juvenile	15-25	Co-dominant stems; Soil compaction;	Amenity value/shade;		C	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
20	1	*Eucalyptus sideroxylon*	Red Ironbark	Endemic	1	20	28	2.4	18.10	1.9	6	<5	Good	Good	Juvenile	15-25	Soil compaction;	Amenity value/shade;		C	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
21	1	*Eucalyptus sp.*	Eucalypt	Native	1	20	28	2.4	18.10	1.9	5-10	<5	Good	Fair	Juvenile	15-25	Co-dominant stems;	Amenity value/shade;	28-10-2022 : Andy Clark : Species identification uncertain due to lack of access to reproductive tree parts. Possibly Apple Box (F. bridgesiana) surrounded by small, juvenile weed species Celtis, White Cedar (exempt species). Within proposed carpark footprint	C	3	Remove - tree located within proposed development footprint or has major encroachment into its TPZ.
26	2	*Eucalyptus melliodora*	Yellow Box	Endemic	1	100	120	12.0	452.39	3.6	15-20	15-20	Good	Fair	Mature	15-25	Cavity(s); Co-dominant stems; Deadwood/stubs > 30mm; Epicormic growth; Previous failure(s); Weak union(s); Wound(s);	Amenity value/shade; Attractive landscape feature; Significant due to age/size; Significant habitat - nests/hollows;	28-10-2022 : Andy Clark : Minor pocket cavity synonomous with a decayed branch stubs, and considered non-structural, observed within the main branching structure. 7m from adjacent building. Within proposed carpark footprint.	B	2	Remove - tree located within proposed development footprint or has major encroachment into its TPZ.
27	2	*Eucalyptus melliodora*	Yellow Box	Endemic	1	90	110	10.8	366.44	3.4	16	15-20	Good	Fair	Mature	15-25	Cavity(s); Co-dominant stems; Deadwood/stubs > 60mm; Epicormic growth; Previous failure(s); Wound(s);	Amenity value/shade; Significant habitat - nests/hollows;	28-10-2022 : Andy Clark : 4m from exiting road & carpark curb. Upper canopy consists of multiple stabilised stems from previous crown failure at 4m. Situated at the bottom of a slight level change in grassed area. Minimal TPZ encroachment on eastern aspect due to ramp construction.	B	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
28	2	*Ulmus parvifolia*	Chinese Elm	Exotic	1	58	73	6.9	151.14	2.9	5-10	10-15	Fair	Fair	Mature	15-25	Co-dominant stems; Deadwood/stubs > 30mm; Dieback; Included bark;	Amenity value/shade;	28-10-2022 : Andy Clark : The included co-dominant basal union appears inactive at this assessment (no cracking, canopy separation, sap exudation). Good epicormic response growth observed from previous drought related dieback. Tree situated at base of minor level change in grassed area. 7.5m from roadside carpark curb. Within proposed carpark footprint.	B	2	Remove - tree located within proposed development footprint or has major encroachment into its TPZ.
29	2	*Schinus areira*	Peppercorn	Exotic	1	64	78	7.7	185.48	3.0	5-10	10-15	Good	Poor	Senescent	<5	Cavity(s); Co-dominant stems; Decay; Epicormic growth; Previous failure(s); Weak union(s); Wound(s);	Significant habitat - nests/hollows;	28-10-2022 : Andy Clark : Significant trunk decay reduces ULE, Direct impact with proposed carpark.	U		Remove tree irrespective of future development.
30	2	*Eucalyptus sideroxylon*	Red Ironbark	Endemic	1	67	97	8.1	204.30	3.3	15-20	10-15	Good	Fair	Mature	15-25	Co-dominant stems; Epicormic growth; Poor pruning; Previous failure(s); Wound(s);	Amenity value/shade;	28-10-2022 : Andy Clark : Tree previously lopped at 6m with upper canopy consisting of (semi) stabilised regrowth. Previous stem failures have occurred. 10m from nth building. 12m from nth wst cnr of sth building. Minimal TPZ encroachment (Calculated at 6% - 6.5m from edge of carpark)	B	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
31	2	*Pistacia chinensis*	Chinese Pistachio	Exotic	1	44	49	5.3	87.58	2.5	6	5-10	Good	Good	Semi-Mature	15-25	Co-dominant stems; Undesirable species;	Screen value; Weed species;	28-10-2022 : Andy Clark : 2m from roadside carpark curb. Major TPZ.	C	2	Remove - tree located within proposed development footprint or has major encroachment into its TPZ.
32	2	*Callistemon salignus*	Willow Bottlebrush	Native	1	37	65	4.4	60.67	2.8	6	6	Good	Poor	Mature	5-10	Co-dominant stems; Included bark; Previous failure(s); Weak union(s);	Amenity value/shade;	28-10-2022 : Andy Clark : Tree presents with multiple included unions limiting ULE. Multiple Young Crepe myrtle and Celtis sp. growing around base of trees 31 & 32. Care required when constructing above ground concrete pedestrian footpath within TPZ.	C	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
33	3	*Eucalyptus viminalis ssp. viminalis*	Manna Gum	Endemic	1	77	110	9.2	268.22	3.4	10-15	5-10	Fair	Fair	Mature	15-25	Co-dominant stems; Deadwood/stubs > 60mm; Dieback; Epicormic growth; Poor pruning; Weak union(s); Wound(s);	Amenity value/shade;	28-10-2022 : Andy Clark : The tree is in a reduced state of health with canopy density at 70%, consisting largely of epicormic growth. Decline attributed to previous drought stress. Repeatedly pruned off powerline clearance on Western aspect. 8m from laneway curb.	B	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
34	3	*Grevillea robusta*	Silky Oak	Native	1	54	67	6.5	131.92	2.8	5-10	5-10	Good	Fair	Mature	10-15	Cavity(s); Co-dominant stems; Deadwood/stubs > 60mm; Decay; Epicormic growth; Poor pruning; Previous failure(s); Weak union(s); Wound(s);	Amenity value/shade;	28-10-2022 : Andy Clark : Tree previously lopped at 3m with upper canopy consisting of (sem) stabilised regrowth. Multiple previous branch failure points observed. 3m from laneway curb.	B	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
35	3	*Grevillea robusta*	Silky Oak	Native	1	45	63	5.4	91.61	2.7	5-10	5-10	Good	Fair	Mature	10-15	Cavity(s); Co-dominant stems; Deadwood/stubs > 60mm; Decay; Epicormic growth; Poor pruning; Previous failure(s); Weak union(s); Wound(s);	Amenity value/shade;	28-10-2022 : Andy Clark : Tree previously lopped at 3m with upper canopy consisting of (sem) stabilised regrowth. Multiple previous branch failure points observed. 3m from laneway curb.	B	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
36	3	*Grevillea robusta*	Silky Oak	Native	1	46	62	5.5	95.73	2.7	5-10	5-10	Good	Fair	Mature	10-15	Cavity(s); Co-dominant stems; Deadwood/stubs > 30mm; Decay; Epicormic growth; Poor pruning; Previous failure(s); Weak union(s); Wound(s);	Amenity value/shade;	28-10-2022 : Andy Clark : Tree previously lopped at 3m with upper canopy consisting of (sem) stabilised regrowth. Multiple previous branch failure points observed. 3m from laneway curb.	B	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
37	3	*Cupressus sp.*	Cypress	Exotic	1	53	57	6.4	127.08	2.6	5-10	5-10	Good	Fair	Mature	15-25	Co-dominant stems; Mechanical damage; Previous failure(s); Wound(s);		28-10-2022 : Andy Clark : 2.5m from laneway curb.	B	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
38	3	*Melaleuca bracteata*	Black Tea Tree	Native	1	43	48	5.2	83.65	2.4	5-10	5-10	Good	Fair	Mature	15-25	Co-dominant stems; Wound(s);	Amenity value/shade;	28-10-2022 : Andy Clark : 6m from laneway curb.	B	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
39	3	*Phoenix dactylifera*	Date Palm	Exotic	1	53	60	6.4	127.08	2.7	<5	<5	Good	Good	Semi-Mature	>50		Amenity value/shade; Unique location;	28-10-2022 : Andy Clark : Palm planted in 4 x 5m garden bed in the centre of the laneway. Transplantable if required.	B	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
40	3	*Eucalyptus melliodora*	Yellow Box	Endemic	1	120	135	14.4	651.44	3.8	15-20	10-15	Fair	Fair	Mature	15-25	Cavity(s); Co-dominant stems; Deadwood/stubs > 30mm; Decay; Epicormic growth; Poor pruning; Previous failure(s); Wound(s);	Amenity value/shade; Significant habitat - nests/hollows;	28-10-2022 : Andy Clark : Tree previously lopped at 9m with upper canopy consisting of (semi) stabilised regrowth. Minor pocket cavity synonomous with a decayed branch stub, and considered non-structural, observed within the main stem at 7m, 1m from laneway curb. Minor TPZ encroachment due to single carpark extaension on western aspect.	B	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
41	3	*Pyrus calleryana*	Callery Pear	Exotic	1	38	43	4.6	65.33	2.3	5	5-10	Good	Fair	Mature	15-25	Co-dominant stems;	Amenity value/shade;	28-10-2022 : Andy Clark : 6.5m from laneway curb.	B	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
42	3	*Grevillea robusta*	Silky Oak	Native	1	43	57	5.2	83.65	2.6	5-10	5-10	Good	Fair	Mature	10-15	Cavity(s); Co-dominant stems; Deadwood/stubs > 60mm; Decay; Epicormic growth; Poor pruning; Previous failure(s); Weak union(s); Wound(s);	Amenity value/shade;	28-10-2022 : Andy Clark : Tree previously lopped at 3m with upper canopy consisting of (sem) stabilised regrowth. Multiple previous branch failure points observed. 2m from laneway curb. Within proposed carpark footprint.	B	2	Remove - tree located within proposed development footprint or has major encroachment into its TPZ.
43	4	*Phoenix dactylifera*	Date Palm	Exotic	1	52	0	6.2	122.33		6	<5	Good	Good	Mature	>50		Amenity value/shade; Avenue tree;	28-10-2022 : Andy Clark : Transplantable if required.	B	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
44	4	*Phoenix dactylifera*	Date Palm	Exotic	1	52	0	6.2	122.33		6	<5	Good	Good	Mature	>50		Amenity value/shade; Avenue tree;	28-10-2022 : Andy Clark : Transplantable if required.	B	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
45	4	*Phoenix dactylifera*	Date Palm	Exotic	1	52	0	6.2	122.33		6	<5	Good	Good	Mature	>50		Amenity value/shade; Avenue tree;	28-10-2022 : Andy Clark : Transplantable if required. Within proposed carpark footprint.	B	2	Remove - tree located within proposed development footprint or has major encroachment into its TPZ.
46	4	*Phoenix dactylifera*	Date Palm	Exotic	1	52	0	6.2	122.33		5-10	<5	Good	Good	Mature	>50		Amenity value/shade; Avenue tree;	28-10-2022 : Andy Clark : Transplantable if required. Within proposed new carpark garden bed. Arborist supervision.	B	2	Retain tree with specific protection requirements (i.e. Generic measures plus supervision of works within the TPZ and/or use of root sensitive construction techniques).
47	4	*Brachychiton populneus*	Kurrajong	Native	1	43	53	5.2	83.65	2.5	5-10	5-10	Good	Fair	Mature	15-25	Co-dominant stems;	Amenity value/shade;	28-10-2022 : Andy Clark : 3m from existing carpark curb. Major TPZ encroachment from proposed driveway.	B	2	Remove - tree located within proposed development footprint or has major encroachment into its TPZ.

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Tree no.	Zones	*Botanical Name*	Common Name	Origin	Trees in group	DBH Total (cm)	DRB (cm)	Radial TPZ (m)	TPZ area (m2)	Radial SRZ (m)	Tree Height (m)	Canopy (m)	Health	Structure	Age	TLE (Yrs.)	Defects	Significance	Arborist comments	Tree Quality Score	Tree Retention value subcategory	Recommendation
48	4	*Ulmus parvifolia*	Chinese Elm	Exotic	1	48	76	5.8	103.91	2.9	5-10	10-15	Good	Fair	Semi-Mature	15-25	Co-dominant stems; Wound(s);	Amenity value/shade;	28-10-2022 : Andy Clark : 1/2m from existing nth carpark curb & 5m from eastern carpark.	B	2	Remove - tree located within proposed development footprint or has major encroachment into its TPZ.
49	4	*Cedrus deodara*	Himalayan Cedar	Exotic	1	24	32	2.9	26.06	2.1	5-10	<5	Good	Good	Semi-Mature	25-50		Amenity value/shade;	28-10-2022 : Andy Clark : 3m from existing nth carpark curb & 9m from eastern carpark curb.	B	2	Remove - tree located within proposed development footprint or has major encroachment into its TPZ.
50	4	*Celtis sinensis*	Chinese Hackberry	Exotic	1	20	25	2.4	18.10	1.8	5-10	<5	Good	Poor	Juvenile	5-10	Co-dominant stems; Included bark; Suppressed; Undesirable species;	Weed species;	28-10-2022 : Andy Clark : Self sown weed species growing within a clump of Oleander.	U		Remove tree irrespective of future development.
51	4	*Ceratonia siliqua*	Carob Bean	Exotic	1	49	62	5.9	108.26	2.7	5-10	5-10	Good	Fair	Mature	15-25	Co-dominant stems; Epicormic growth; Included bark; Poor pruning; Wound(s);	Amenity value/shade;	28-10-2022 : Andy Clark : The included union at ground & 2m appear inactive at this assessment (no cracking, canopy separation, sap exudation). Previously pruned for powerline clearance. 1m from existing nth carpark curb. TPZ encroachment of 12%. Arborist supervion when working within TPZ.	B	2	Retain tree with specific protection requirements (i.e. Generic measures plus supervision of works within the TPZ and/or use of root sensitive construction techniques).
52	4	*Schinus areira*	Peppercorn	Exotic	1	110	130	13.2	547.39	3.7	5-10	5-10	Fair	Poor	Senescent	<5	Cavity(s); Decay; Epicormic growth; Previous failure(s); Weak union(s); Wound(s);	Amenity value/shade; Significant habitat - nests/hollows;	28-10-2022 : Andy Clark : Significant trunk decay limits ULE. Previously lopped at 4m for powerline clearance. Major TPZ encroachment as well as unstable structure unsuited to occupancy changes.	C	2	Remove - tree located within proposed development footprint or has major encroachment into its TPZ.
53	4	*Callistemon citrinus*	Crimson Bottlebrush	Native	1	30	35	3.6	40.72	2.1	5-10	<5	Good	Fair	Mature	15-25	Co-dominant stems; Included bark; Suppressed;	Amenity value/shade; Within group;	28-10-2022 : Andy Clark : Compressed canopy shape due to close proximity to adjacent trees.	C	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
54	4	*Callistemon citrinus*	Crimson Bottlebrush	Native	1	25	28	3.0	28.27	1.9	5-10	<5	Good	Fair	Mature	15-25	Co-dominant stems; Included bark; Suppressed;	Amenity value/shade; Within group;	28-10-2022 : Andy Clark : Compressed canopy shape due to close proximity to adjacent trees. 7m from cnr of existing carpark curb.	C	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
55	4	*Ulmus parvifolia*	Chinese Elm	Exotic	1	37	47	4.4	61.93	2.4	10-15	5-10	Good	Good	Semi-Mature	25-50	Co-dominant stems; Wound(s);	Amenity value/shade; Within group;	28-10-2022 : Andy Clark : 9m from existing cnr carpark curb. Further detailed design required.	B	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
56	4	*Grevillea robusta*	Silky Oak	Native	1	48	60	5.8	104.23	2.7	10-15	5-10	Good	Fair	Mature	15-25	Epicormic growth; Poor pruning; Wound(s);	Amenity value/shade;	28-10-2022 : Andy Clark : Previously pruned for powerline clearance.	B	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
57	4	*Acacia salicina*	Willow Wattle	Endemic	1	26	32	3.1	30.58	2.1	5-10	5-10	Fair	Poor	Senescent	<5	Dieback; Suppressed;	Within group;	28-10-2022 : Andy Clark : Asymmetrical crown shape due to suppression from neighbouring tree.	C	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
58	4	*Callistemon citrinus*	Crimson Bottlebrush	Native	2	25	30	3.0	28.27	2.0	6	<5	Good	Fair	Mature	10-15	Co-dominant stems; Included bark; Suppressed;	Amenity value/shade; Within group;	28-10-2022 : Andy Clark : Asymmetrical crown shape due to suppression from neighbouring tree.	C	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
59	4	*Phoenix dactylifera*	Date Palm	Exotic	1	52	0	6.2	122.33		6	<5	Good	Good	Mature	>50		Amenity value/shade; Avenue tree;	28-10-2022 : Andy Clark : Transplantable if required.	B	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
60	4	*Phoenix dactylifera*	Date Palm	Exotic	1	52	0	6.2	122.33		5-10	<5	Good	Good	Mature	>50		Amenity value/shade; Avenue tree;	28-10-2022 : Andy Clark : Transplantable if required. Within proposed carpark footprint.	B	2	Remove - tree located within proposed development footprint or has major encroachment into its TPZ.
61	4	*Phoenix dactylifera*	Date Palm	Exotic	1	52	0	6.2	122.33		6	<5	Good	Good	Mature	>50		Unique location; Amenity value/shade; Avenue tree;	28-10-2022 : Andy Clark : Transplantable if required. Situated within carpark.	B	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
62	4	*Eucalyptus melliodora*	Yellow Box	Endemic	1	87	98	10.4	342.41	3.3	16	15-20	Good	Fair	Mature	25-50	Co-dominant stems; Epicormic growth; Wound(s);	Amenity value/shade;	28-10-2022 : Andy Clark : 4m from roadside curb. Further detailed design required. 13% TPZ encroachment. Arborist supervision. Machinery stand off.	A	2	Retain tree with specific protection requirements (i.e. Generic measures plus supervision of works within the TPZ and/or use of root sensitive construction techniques).
63	4	*Jacaranda mimosifolia*	Jacaranda	Exotic	1	33	38	4.0	50.17	2.2	6	5-10	Good	Fair	Semi-Mature	25-50	Co-dominant stems;	Amenity value/shade;		B	2	Remove - tree located within proposed development footprint or has major encroachment into its TPZ.
64	4	*Eucalyptus sideroxylon*	Red Ironbark	Endemic	1	51	62	6.1	117.67	2.7	10-15	5-10	Fair	Fair	Mature	15-25	Deadwood/stubs > 30mm; Dieback; Epicormic growth; Previous failure(s); Wound(s);	Amenity value/shade;	28-10-2022 : Andy Clark : Good epicormic response growth observed following drought dieback. Further detailed design required. Arborist supervision. Machinery stand off.	B	2	Retain tree with specific protection requirements (i.e. Generic measures plus supervision of works within the TPZ and/or use of root sensitive construction techniques).
65	4	*Lagunaria patersonii*	Norfolk Island Hibiscus	Native	1	35	44	4.2	55.42	2.3	5-10	<5	Good	Fair	Mature	10-15	Co-dominant stems;	Amenity value/shade;		C	2	Remove - tree located within proposed development footprint or has major encroachment into its TPZ.
66	5	*Jacaranda mimosifolia*	Jacaranda	Exotic	1	35	40	4.2	54.65	2.3	6	5-10	Good	Fair	Semi-Mature	25-50	Co-dominant stems;	Amenity value/shade;		C	2	Remove - tree located within proposed development footprint or has major encroachment into its TPZ.
67	4	*Eucalyptus sideroxylon*	Red Ironbark	Endemic	1	100	120	12.0	452.39	3.6	5-10	15-20	Fair	Fair	Senescent	10-15	Epicormic growth; Parasitic plant/mistletoe; Poor pruning; Previous failure(s); Weak union(s); Wound(s);	Amenity value/shade; Significant due to age/size;	28-10-2022 : Andy Clark : Elevated RV due to age, size & species. Upper canopy has previously been reduced. 15% TPZ encroachment. Arborist supervision. Machinery stand off.	B	2	Retain tree with specific protection requirements (i.e. Generic measures plus supervision of works within the TPZ and/or use of root sensitive construction techniques).
68	4	*Grevillea robusta*	Silky Oak	Native	1	42	48	5.0	79.80	2.4	5-10	5-10	Good	Fair	Semi-Mature	15-25	Co-dominant stems; Decay; Epicormic growth; Poor pruning; Wound(s);	Amenity value/shade;		B	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
69	4	*Grevillea robusta*	Silky Oak	Native	1	38	45	4.6	65.33	2.4	5-10	5-10	Good	Fair	Semi-Mature	15-25	Co-dominant stems; Epicormic growth; Poor pruning; Wound(s);	Amenity value/shade;		B	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).

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Appendix E

Threatened Fauna Potential Occurrence Assessment

Potential of Occurrence Assessment

A potential of occurrence assessment was completed to assess the likelihood of occurrence of each threatened fauna species within the subject site. All threatened biodiversity identified in background research were considered. The assessment is based on the habitat profile for the species and other habitat information in the Threatened Species Profile Database (Environment Energy and Science Group). The assessment also takes into consideration the dates and locations of nearby records and information about species populations in the locality.

Threatened Fauna Potential Occurrence Assessment

For this proposed Activity, the likelihood of occurrence of threatened and migratory fauna species and populations was determined based on the criteria shown in **Table D1**. Threatened fauna potential occurrence assessment is detailed in **Table D2.**

Table D1 Potential of occurrence criteria for threatened species and populations of fauna

Potential of occurrence	Criteria
Known	The species was observed in the subject site either during the current survey or during another survey less than one year prior.
High	A species has a high likelihood of occurrence if: ■ the subject site contains or forms part of a large area of high-quality suitable habitat ■ important habitat elements (i.e. for breeding or important life cycle periods such as winter foraging periods) are abundant within the subject site ■ the species has been recorded recently in similar habitat in the locality ■ the subject site is likely to support resident populations or to contain habitat that is visited by the species during regular seasonal movements or migration.
Moderate	A species has a moderate likelihood of occurrence if: ■ the subject site contains or forms part of a small area of high-quality suitable habitat ■ the subject site contains or forms part of a large area of marginal habitat ■ important habitat elements (i.e. for breeding or important life cycle periods such as winter foraging periods) are sparse or absent within the subject site ■ the subject site is unlikely to support resident populations or to contain habitat that is visited by the species during regular seasonal movements or migration but is likely to be used occasionally during seasonal movements and/or dispersal.
Low	A species has a low likelihood of occurrence if: ■ potentially suitable habitat exists but the species has not been recorded recently (previous 10 years) in the locality despite intensive survey (i.e. the species is considered to be locally extinct) ■ the species is considered to be a rare vagrant, likely only to visit the subject site very rarely, e.g. during juvenile dispersal or exceptional climatic conditions (e.g. extreme drought conditions in typical habitat of inland birds).
None	Suitable habitat is absent from the subject site.

Table D2 Threatened Fauna Potential Occurrence Assessment

Scientific Name	Common Name	Status		Habitat Requirement (EPBC Act SPRAT and/ or DPE Threatened Species Profiles)	Potential of occurrence	Outcome – Assessment of Significance (AoS)?
		BC Act	EPBC Act			
AMPHIBIANS						
Litoria booroolongensis	Booroolong Frog	E	E	restricted to NSW and north-eastern Victoria, predominantly along the western-flowing streams of the Great Dividing Range. It has disappeared from much of the Northern Tablelands, however several populations have recently been recorded in the Namoi catchment. The species is rare throughout most of the remainder of its range.	None	Lack of preferred habitat within site. AoS not undertaken.
BIRDS						
Actitis hypoleucos	Common Sandpiper	-	M	Utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats.	None	Lack of preferred habitat within site. AoS not undertaken.
Anthochaera phrygia	Regent Honeyeater	CE	CE	Dry open forest and woodland with an abundance of nectar-producing eucalypts, particularly box-ironbark woodland, swamp mahogany forests, and riverine sheoak woodlands.	Low	Lack of preferred habitat in Activity area. May occur as fly over whilst foraging in greater locality. The site does not occur within mapped important areas as defined by DPE. These areas are considered essential to support critical life stages of the species, e.g. breeding areas or locations important for foraging/ over-wintering for migratory species. AoS not undertaken.
Apus pacificus	Fork-tailed Swift	-	M	The Fork-tailed Swift is almost exclusively aerial, flying from less then 1 m to at least 300 m above ground and probably much higher. they mostly occur over inland plains but sometimes above foothills or in coastal areas.	Low	Marginal foraging habitat on site. May occur as fly over whilst foraging in greater locality. Unlikely to be reliant on habitat within site. AoS not undertaken.

Scientific Name	Common Name	Status		Habitat Requirement (EPBC Act SPRAT and/ or DPE Threatened Species Profiles)	Potential of occurrence	Outcome – Assessment of Significance (AoS)?
		BC Act	EPBC Act			
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V	-	Woodlands and dry open sclerophyll forests, usually dominated by eucalypts; also recorded in shrublands, heathlands and various modified habitats.	**Moderate**	Marginal foraging habitat on site associated with Eucalyptus sp. May occur whilst foraging in greater locality. **AoS undertaken.**
Botaurus poiciloptilus	Australasian Bittern	E	E	Permanent freshwater wetlands with tall dense vegetation, particularly bullrushes and spikerushes.	None	Lack of preferred habitat within site. AoS not undertaken.
Calidris acuminata	Sharp-tailed Sandpiper	-	M	Prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation.	None	Lack of preferred habitat within site. AoS not undertaken.
Calidris ferruginea	Curlew Sandpiper	E	CE; M	Tidal mudflats, sandy ocean shores and occasionally inland freshwater or salt-lakes.	None	Lack of preferred habitat within site. AoS not undertaken.
Calidris melanotos	Pectoral Sandpiper	-	M	Prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands.	None	Lack of preferred habitat within site. AoS not undertaken.
Chthonicola sagittata	Speckled Warbler	V	-	The Speckled Warbler lives in a wide range of Eucalyptus dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy. Large, relatively undisturbed remnants are required for the species to persist in an area.	Low	Marginal habitat within site. Lack of substantial areas of preferred habitat within the site or in close proximity. Unlikely to support resident populations. AoS not undertaken.
Circus assimilis	Spotted Harrier	V	-	Grassy open woodland, inland riparian woodland, grassland and shrub steppe.	Low	Marginal habitat within site. Lack of substantial areas of preferred habitat within the site or in close proximity. Unlikely to support resident populations. AoS not undertaken.

Scientific Name	Common Name	Status		Habitat Requirement (EPBC Act SPRAT and/ or DPE Threatened Species Profiles)	Potential of occurrence	Outcome – Assessment of Significance (AoS)?
		BC Act	EPBC Act			
Climacteris picumnus victoriae	Brown Treecreeper	V	-	Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species; also found in mallee and River Red Gum (*Eucalyptus camaldulensis*) forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses; usually not found in woodlands with a dense shrub layer; fallen timber is an important habitat component for foraging; also recorded, though less commonly, in similar woodland habitats on the coastal ranges and plains.	Low	Marginal habitat within site. Lack of substantial areas of preferred habitat within the site or in close proximity. May occur within greater locality associated with remnant woodland. AoS not undertaken.
Falco hypoleucos	Grey Falcon	E	V	The Grey Falcon is sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast.	Low	Lack of suitable habitat on site. May occur as vagrant whilst foraging in greater locality. AoS not undertaken.
Falco subniger	Black Falcon	V	-	Widely, but sparsely, distributed in New South Wales, mostly occurring in inland regions. In NSW there is assumed to be a single population that is continuous with a broader continental population	Low	Lack of suitable habitat on site. May occur as vagrant whilst foraging in greater locality. AoS not undertaken
Gallinago hardwickii	Latham's Snipe	-	M	Latham's Snipe are seen in small groups or singly in freshwater wetlands on or near the coast, generally among dense cover. They are found in any vegetation around wetlands, in sedges, grasses, lignum, reeds and rushes and	None	Lack of preferred habitat within site. AoS not undertaken.

Scientific Name	Common Name	Status		Habitat Requirement (EPBC Act SPRAT and/ or DPE Threatened Species Profiles)	Potential of occurrence	Outcome – Assessment of Significance (AoS)?
		BC Act	EPBC Act			
				also in saltmarsh and creek edges on migration. They also use crops and pasture.		
Glossopsitta pusilla	Little Lorikeet	V	-	Forages in open Eucalyptus forest and woodland; also feeds on Angophora, Melaleuca and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban trees also help sustain viable populations of the species.	**Moderate**	Marginal foraging habitat on site associated with Eucalyptus stands. Unlikely to support resident populations. AoS undertaken.
Grantiella picta	Painted Honeyeater	V	V	Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. Specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus *Amyema*.	Low	Lack of suitable habitat on site. The development footprint is highly degraded, small in size and does not support suitable microhabitat for the subject species. AoS not undertaken.
Hieraaetus morphnoides	Little Eagle	V	-	Open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter.	Low	Marginal nesting habitat on site associated with isolated Eucalyptus stands, however not considered large enough to form a remnant patch. No stick nests observed in site assessment. Unlikely to support resident populations and the site does not provide forging habitat. AoS not undertaken.
Hirundapus caudacutus	White-throated Needletail	-	V; M	Most often recorded aerial foraging above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy. Breeding does not occur in Australia.	Low	Marginal habitat – species known as an aerial species. May irregularly occur flying over the survey area during seasonal movements. AoS not undertaken.
Lathamus discolor	Swift Parrot	E	CE	Migrates to the Australian south-east mainland between February and October. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from	Low	Marginal habitat on site. May occur as a rare vagrant during seasonal movements. The site does not occur within mapped important areas as defined by DPIE. These

Scientific Name	Common Name	Status		Habitat Requirement (EPBC Act SPRAT and/ or DPE Threatened Species Profiles)	Potential of occurrence	Outcome – Assessment of Significance (AoS)?
		BC Act	EPBC Act			
				sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany *Eucalyptus robusta*, Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera*, Forest Red Gum *E. tereticornis*, Mugga Ironbark *E. sideroxylon*, and White Box *E. albens*. Commonly used lerp infested trees include Inland Grey Box *E. microcarpa*, Grey Box *E. moluccana*, Blackbutt *E. pilularis*, and Yellow Box *E. melliodora*.		areas are considered essential to support critical life stages of the species, e.g. breeding areas or locations important for foraging/ over-wintering for migratory species. AoS not undertaken.
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	V	-	Drier open forests or woodlands dominated by box and ironbark eucalypts, and open forests of smooth-barked gums, stringybarks, ironbarks and tea-trees.	Low	Lack of suitable habitat on site. The development footprint is highly degraded, small in size and does not support suitable microhabitat for the subject species. AoS not undertaken
Motacilla flava	Yellow Wagtail	-	M	Yellow Wagtails are migrants from the Northern Hemisphere to Australia. Occupies a range of damp or wet habitats with low vegetation, from damp meadows, marshes, waterside pastures, sewage farms and bogs to damp steppe and grassy tundra.	None	Lack of preferred habitat within site. AoS not undertaken.
Myiagra cyanoleuca	Satin Flycatcher	-	M	Satin Flycatchers inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests	None	Lack of preferred habitat within site. AoS not undertaken.
Neophema pulchella	Turquoise Parrot	V	-	Favours open, grassy woodland with dead trees near permanent water. Also inhabits coastal heaths and pastures with exotic grasses and weeds, along roadsides and in orchards.	Low	Lack of suitable habitat on site. The development footprint is highly degraded, small in size and does not support suitable microhabitat for the subject species. AoS not undertaken

Scientific Name	Common Name	Status		Habitat Requirement (EPBC Act SPRAT and/ or DPE Threatened Species Profiles)	Potential of occurrence	Outcome – Assessment of Significance (AoS)?
		BC Act	EPBC Act			
Ninox strenua	Powerful Owl	V	-	Woodland and open forest to tall moist forest and rainforest. Requires large tracts of forest or woodland habitat but may also occur in fragmented landscapes.	Low	Lack of suitable habitat on site. The development footprint is highly degraded, small in size and does not support suitable microhabitat for the subject species. AoS not undertaken
Petroica boodang	Scarlet Robin	V	-	Dry eucalypt forests and woodlands with an open and grassy understorey with few scattered shrubs. Both mature and regrowth vegetation are utilised; habitat usually contains abundant logs and fallen timber.	Low	Lack of suitable habitat on site. The development footprint is highly degraded, small in size and does not support suitable microhabitat for the subject species. AoS not undertaken
Polytelis swainsonii	Superb Parrot	V	V	Inhabit Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest.	Low	Lack of suitable habitat on site. The development footprint is highly degraded, small in size and does not support suitable microhabitat for the subject species. AoS not undertaken
Rhipidura rufifrons	Rufous Fantail	-	M	The Rufous Fantail is found in rainforest, dense wet forests, swamp woodlands and mangroves, preferring deep shade, and is often seen close to the ground. During migration, it may be found in more open habitats or urban areas.	Low	Lack of suitable habitat on site. The development footprint is highly degraded, small in size and does not support suitable microhabitat for the subject species. AoS not undertaken
Rostratula australis	Australian Painted Snipe	E	E	Well-vegetated shallows and margins of wetlands, dams, sewage ponds, wet pastures, marshy areas, irrigation systems, lignum, tea-tree scrub, and open timber.	None	Suitable habitat is absent from the subject site. AoS not undertaken.
Stagonopleura guttata	Diamond Firetail	V	-	Grassy eucalypt woodlands, open forest, mallee, temperate grassland, and secondary grassland derived from other communities, riparian areas, and sometimes in lightly wooded farmland.	Low	Lack of suitable habitat on site. The development footprint is highly degraded, small in size and does not support suitable microhabitat for the subject species. AoS not undertaken

Scientific Name	Common Name	Status		Habitat Requirement (EPBC Act SPRAT and/ or DPE Threatened Species Profiles)	Potential of occurrence	Outcome – Assessment of Significance (AoS)?
		BC Act	EPBC Act			
FISH						
Maccullochella peelii	Murray Cod	-	V	Warm water habitats that range from clear, rocky streams to slow flowing turbid rivers and billabongs.	None	Suitable habitat is absent from the subject site. AoS not undertaken.
MAMMALS						
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Near cave entrances and crevices in cliffs.	Low	Lack of suitable habitat on site. The development footprint is highly degraded, small in size and does not support suitable microhabitat for the subject species. AoS not undertaken.
Dasyurus maculatus	Spotted-tailed Quoll	V	E	Dry and moist eucalypt forests and rainforests, fallen hollow logs, large rocky outcrops.	Low	Lack of suitable habitat on site. The development footprint is highly degraded, small in size and does not support suitable microhabitat for the subject species. AoS not undertaken
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	V	-	Occurs in dry sclerophyll forest and woodland east of the Great Dividing Range. Roosts in tree hollows.	Low	Lack of suitable habitat on site. The development footprint is highly degraded, small in size and does not support suitable microhabitat for the subject species. AoS not undertaken
Miniopterus orianae oceanensis	Large Bent-winged Bat	V	-	Forest or woodland, roost in caves, old mines and stormwater channels.	Low	Lack of suitable habitat on site. The development footprint is highly degraded, small in size and does not support suitable microhabitat for the subject species. AoS not undertaken
Nyctophilus corbeni	Corben's Long-eared Bat	V	V	Inhabits a variety of vegetation types, including mallee, bulloke *Allocasuarina leuhmanni* and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-	Low	Marginal habitat, lack of substantial stand of remnant vegetation to support species.

Scientific Name	Common Name	Status		Habitat Requirement (EPBC Act SPRAT and/ or DPE Threatened Species Profiles)	Potential of occurrence	Outcome – Assessment of Significance (AoS)?
		BC Act	EPBC Act			
				pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. Roosts in tree hollows, crevices, and under loose bark.		May occur in greater locality associated with larger parcels of native vegetation. AoS not undertakem
Petaurus australis australis	Yellow-bellied Glider	V	V	Tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Dens in tree hollows of large trees, often in family groups. Forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south.	Low	Lack of suitable habitat on site. The development footprint is highly degraded, small in size and does not support suitable microhabitat for the subject species. AoS not undertaken
Petaurus norfolcensis	Squirrel Glider	V	-	Blackbutt, bloodwood and ironbark eucalypt forest with heath understorey in coastal areas, and box-ironbark woodlands and River Red Gum Forest inland.	**Moderate**	Potential foraging habitat within the site associated with Eucalypts. **AoS undertaken.**
Petrogale penicillata	Brush-tailed Rock Wallaby	E	V	North-facing cliffs and dry eucalypt forest and woodland, inhabiting rock crevices, caves, overhangs during the day, and foraging in grassy areas nearby at night.	None	Suitable habitat is absent from the subject site. AoS not undertaken.
Phascolarctos cinereus	Koala	E	E	Appropriate food trees in forests and woodlands, and treed urban areas.	**Moderate**	Potential foraging habitat within the site associated with Eucalypts. Some BioNet records within locality. **AoS undertaken.**
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	**Moderate**	Potential foraging habitat in the form of blossoming Eucalypts. Known records within the locality and know to foraging in urban areas. **AoS undertaken.**

Scientific Name	Common Name	Status		Habitat Requirement (EPBC Act SPRAT and/ or DPE Threatened Species Profiles)	Potential of occurrence	Outcome – Assessment of Significance (AoS)?
		BC Act	EPBC Act			
REPTILES						
Aprasia parapulchella	Pink-tailed Legless Lizard	V	V	Inhabits sloping, open woodland areas with predominantly native grassy groundlayers, particularly those dominated by Kangaroo Grass (*Themeda australis*).	Low	Lack of suitable habitat on site. The development footprint is highly degraded, small in size and does not support suitable microhabitat for the subject species. AoS not undertaken.
Myuchelys bellii	Bells Turtle	E	V	Upper reaches and smaller tributaries of major rivers flowing through granitic bedrock, preferring narrow stretches of river, 30 to 40 m wide, with pools up to 3 m deep, and sandy and rocky. Riverbeds, with small beds of weed.	None	Suitable habitat is absent from the subject site. AoS not undertaken.
Uvidicolus sphyrurus	Border Thick-tailed Gecko	V	V	Dry sclerophyll open forest and woodland associated with outcrops of granite, basalt, sandstone and metamorphic rocks.	Low	Lack of suitable habitat on site. The development footprint is highly degraded, small in size and does not support suitable microhabitat for the subject species. AoS not undertaken.

V = Vulnerable; E = Endangered; CE = Critically Endangered

Appendix F

BC Act Tests of Significance

Five-part Tests (BC Act listed species)

An *Assessment of Significance* has been undertaken for the following:

Threatened Fauna

Megachiropteran bats

- Grey-headed Flying-fox (*Pteropus poliocephalus*).

Woodland Birds

- Dusky Woodswallow (*Artamus cyanopterus cyanopterus*).
- Little Lorikeet (*Glossopsitta pusilla*).

Arboreal mammals

- Squirrel Glider (*Petaurus norfolcensis*).
- Koala (*Phascolarctos cinereus*).

a) In the case of a threatened species, whether the proposed development or Activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

The Activity is unlikely to have an adverse effect on the life cycle of the subject species such that a viable local population is likely to be placed at risk of extinction as:

Grey-headed Flying-fox:

- The subject vegetation comprises limited potential foraging habitat.
- The subject vegetation does not include any areas identified as being significant roosting habitat and comprises a comparatively minor amount of potential foraging habitat in the context of the site and adjacent areas of suitable foraging habitat.
- The local movement potential of the subject species would not be impacted by the Activity.

Little Lorikeet & Dusky Woodswallow:

- The subject vegetation comprises a relatively minor amount of potential foraging and dispersal habitat for the subject avifauna in the context of the site and adjacent areas of suitable habitat.
- The subject vegetation comprises limited nesting habitat for these mobile birds in a local context.
- Given the occurrence of forested habitat within the locality, the Activity represents a minor reduction of foraging habitat which may be utilised by the subject species.

Koala:

- The works will result in the removal of Yellow Box (*Eucalyptus melliodora*) and Apple Box (*Eucalyptus bridgesiana*) (Secondary Koala feed trees). While Koala may forage on occasion in site, these species are spread within the locality and provides sufficient alternative foraging resources.
- The local movement potential of the subject species would not be impacted by the Activity.

Squirrel Glider:

- The subject vegetation comprises a relatively minor amount of potential foraging and dispersal habitat for the Squirrel Glider in the context of the site and adjacent areas of suitable habitat.
- The local movement potential of the subject species would not be impacted by the Activity.
- Given the occurrence of forested habitat within the locality, the Activity represents a minor reduction of foraging habitat which may be utilised by the subject species.

b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or Activity:

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

No consideration under this part of the assessment is required.

c) In relation to the habitat of a threatened species or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or Activity, and

- **Grey-headed Flying-fox***:* minor contraction of foraging habitat. Retained areas of adjacent trees will continue to provide foraging and refuge resources.
- **Little Lorikeet & Dusky Woodswallow**: minor contraction of foraging habitat. Retained areas of adjacent trees will continue to provide foraging, refuge and nest resources.
- **Koala***:* minor contraction of foraging (associated with feed tree removal) and refuge habitat. Retained areas of adjacent trees will continue to provide foraging, refuge and breeding resources.
- **Squirrel Glider:** minor contraction of foraging (associated with feed tree removal) and refuge habitat. Retained areas of adjacent trees will continue to provide foraging, refuge and breeding resources.

ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or Activity, and

No significant fragmentation of habitat would occur; the works (both in construction and operational phases) are unlikely to result in significant barriers to dispersal to any of the subject species listed.

iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.

The Activity would require removal of 31 trees (comprising 13 native trees and 17 exotic/ non-endemic trees) and one stag. Habitat of equivalent quality for the subject species is widespread (although similarly fragmented) in the broader locality.

Considering this and that the Activity is considered unlikely to have an adverse effect on the life cycle of any of the subject species such that a viable local population is likely to be placed at risk of extinction (refer to response to (a)); the habitat affected by the Activity is not considered significant to the long-term survival of the subject species in the locality.

d) whether the proposed development or Activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

No areas of outstanding biodiversity value have been declared in Tamworth Local Government Area.

e) whether the proposed development or Activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

A threatening process is a process that threatens, or that may threaten, the survival or evolutionary development of species or ecological communities. The current list of key threatening processes under the BC Act, and whether the Activity is recognised as a threatening process is shown in **Table F.1**.

Table F.1 Key Threatening Processes (KTP)

Listed Key Threatening Process (as described in the final determination of the Scientific Committee to list the threatening process)	Is the development or Activity proposed of a class of development or Activity that is recognised as a threatening process?		
	Likely	Possible	Unlikely
Alteration of habitat following subsidence due to longwall mining			✓
Aggressive exclusion of birds by noisy miners			✓
Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands			✓
Anthropogenic climate change			✓
Bush rock removal			✓
Clearing of native vegetation	✓		
Competition and grazing by the feral European Rabbit			✓
Competition and habitat degradation by feral goats			✓
Competition from feral honeybees			✓
Death or injury to marine species following capture in shark control programs on ocean beaches			✓
Entanglement in or ingestion of anthropogenic debris in marine and estuarine environments			✓
Forest Eucalypt dieback associated with over-abundant psyllids and bell miners			✓
Habitat degradation by Feral horses, Equus caballus			✓
High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition			✓
Herbivory and environmental degradation caused by feral deer			✓
Importation of red imported fire ants			✓
Infection by Psittacine circoviral (beak and feather) disease affecting endangered psittacine species and populations			✓
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis			✓
Infection of native plants by Phytophthora cinnamomi			✓
Introduction and Establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae			✓
Introduction of the large earth bumblebee			✓
Invasion and establishment of exotic vines and scramblers			✓
Invasion and establishment of Scotch broom			✓
Invasion and establishment of the Cane Toad			✓
Invasion, establishment and spread of Lantana camara			✓
Invasion of native plant communities by African Olive			✓
Invasion of native plant communities by Chrysanthemoides monilifera (bitou bush and boneseed)			✓
Invasion of native plant communities by exotic perennial grasses			✓
Invasion of the yellow crazy ant into NSW			✓
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants			✓
Loss of hollow-bearing trees	✓		
Loss or degradation (or both) of sites used for hill-topping by butterflies			✓
Predation and hybridisation of feral dogs			✓
Predation by the European red fox			✓
Predation by the feral cat			✓
Predation by Gambusia holbrooki			✓
Predation by the Ship Rat on Lord Howe Island			✓
Predation, habitat degradation, competition and disease transmission by feral pigs			✓
Removal of dead wood and dead trees	✓		

The Activity may be characteristic of three KTPs:

- Clearing of native vegetation.
- Loss of hollow-bearing trees.
- Removal of dead wood and dead trees.

Clearing of native vegetation and loss of hollow-bearing trees/ dead trees proposed is unlikely to be considered significant considering the modified habitat of impacted vegetation and the extent of similar habitat surrounding the Activity.

On this basis, the degree that the Activity would contribute to any threatening process is not considered likely to place the local population of any of the subject species or communities at significant risk of extinction.

Conclusion

The proposed activity would impact a small amount of planted native and exotic vegetation within an urban environment. It is unlikely that the proposed Activity would significantly impact any of the subject species given the context and scale of impacts proposed.

Appendix G

EPBC Act Assessment

An assessment in accordance with the *Matters of National Environmental Significance Significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999* (DoE, 2013) has been undertaken for EPBC Act listed threatened species known to occur on the site and whose habitat would be directly impacted by the proposed action, specifically, the:

- Koala (*Phascolarctos cinereus*) – Endangered.
- Grey-headed Flying-fox (*Pteropus poliocephalus*) – Vulnerable.

The purpose of the assessment is to determine the requirement to submit a referral to the Australian Government Department of Climate Change, Energy, the Environment and Water (the Department) for a decision by the Australian Government Environment Minister (the minister) on whether assessment and approval is required under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Under the EPBC Act an action will require approval from the minister if the action has, will have, or is likely to have, a significant impact on a matter of national environmental significance.

Koala (*Phascolarctos cinereus*)

According to the DoE (2013) 'significant impact criteria' for endangered species, an action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:

Lead to a long-term decrease in the size of a population of a species

A 'population of a species' is defined under the EPBC Act as an occurrence of the species in a particular area. In relation to critically endangered, endangered or vulnerable threatened species, occurrences include but are not limited to:

a. a geographically distinct regional population, or collection of local populations, or
b. a population, or collection of local populations, that occurs within a particular bioregion.

The National Recovery Plan for the Koala (DAWE 2022) defines a population as '…a set of individuals that live in the same habitat patch and interact with one another, commonly forming a breeding unit within which the exchange of genetic material is more or less unrestricted…'.

For the purpose of this assessment, the Koala population has been defined as the Tamworth Koala population meaning all Koalas within the Tamworth Local Government Area (LGA).

The EPBC PMST report identified the Koala as 'known to occur' in the study area (within a 10km buffer of the site). A search of the BioNet Wildlife Atlas returned a total of 90 records of Koala within the Tamworth LGA and 12 records of Koala within a 10 km x 10 km grid centred on the site.

The site does not occur within any mapped Area of Regional Koala Significance (NSW Department of Planning and Environment, 2018). Low-density populations also occur west of the Great Dividing Range in semi-arid environments. Habitat in these areas is fragmented and this has resulted in a patchy distribution of koalas across their range with significant numbers occurring on privately owned land (Department of Agriculture Water and the Environment, 2022). In 2012, the mean population estimates for koalas within bioregions indicated that the highest numbers of individuals occurred in the bioregions of South Brigalow and Nandewar (11,133 individuals) (Department of Agriculture Water and the Environment, 2022)

The ecological investigations undertaken for the BAR identified the following:

- 7 x Yellow Box (*Eucalyptus melliodora*) and 1 x Apple Box (*Eucalyptus bridgesiana*) (both secondary Koala feed trees).
- No Koala faecal pellets under Koala use trees.
- No primary Koala habitat within the site.

The proposed action would incur the loss of 13 native trees including two Koala secondary feed trees (Yellow Box and Apple Box) on site. The trees represent relatively small portion of Koala feed trees associated with the site and greater locality. Although the proposal will represent the loss of potential habitat and secondary feed trees, the development footprint will only be a small component of locally occurring habitat that will be utilised by the species. The proposed impact will predominately impact already disturbed vegetation of which is planted in nature. Any identified population of Koala in the locality will not be restricted to habitat within the development site. Therefore, the proposal is not considered likely to significantly contribute to a long-term decline in the size of a population of the species.

Reduce the area of occupancy of the species

The proposed action would reduce the area of occupancy of the Koala population by 13 native trees including two Koala secondary feed trees (Yellow Box and Apple Box) on site. Although the proposal will result in the loss of potential foraging habitat, the incremental loss of a small area of potential habitat, only represents a small component of similar locally occurring resources accessible to these species. It is considered that the proposal would not reduce the area of occupancy of this species given the amount of accessible habitat in the locality and greater region.

Fragment an existing population into two or more populations

Although not identified as core Koala habitat, the site contains secondary Koala feed trees forms part of a broader urbanised home range occurring within and adjacent to the site. The site does not occur within any mapped wildlife corridor nor would the proposal fragment any remnant vegetation in which would cause an existing population to be fragment. Retained vegetation on site and vegetation adjacent to site would continue to provide habitat for Koala and facilitate movement of the species.

Based on the above considerations, the proposed action would not fragment an existing population into two or more populations.

Adversely affect habitat critical to the survival of a species

Habitat critical to the survival of a species or ecological community' refers to areas that are necessary:

- For activities such as foraging, breeding, roosting, or dispersal,
- For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators),
- To maintain genetic diversity and long term evolutionary development, or
- For the reintroduction of populations or recovery of the species or ecological community.

The site contains Koala secondary feed trees which are of some importance for foraging along with other trees that may facilitate Koala movement across an urban landscape. In context of the scale and nature of impacts it is unlikely that proposed action would adversely impact any Koalas that may utilise the site as part of their home range. In addition, it is unlikely that the trees being impacted within the site are considered of vital importance to the survival of the species within the region. Based on the extent of habitat available for the local population in the Tamworth LGA, the impacts of the proposed action on habitat critical to the survival of the local Tamworth Koala population is not significant.

Disrupt the breeding cycle of a population

Koala home range size varies with quality of habitat, ranging from less than two hectares to several hundred hectares in size. Koalas live for between 10 and 20 years, and generally breed between September and February. Female koalas can breed from about 2 years of age, and have a gestation period of about two months, producing one koala a year. On rare occasions they may produce twins.

The area impacted by the proposed action represents a minor proportion of the core home range of the Koala population associated with the study area, including potential usage as breeding habitat.

Koala feed trees on site would be retained and areas of mapped primary and secondary habitat are available more broadly in the locality. The home range (and breeding cycle) of the majority of Koalas associated with the local population would not be impacted by the proposed action.

Based on these considerations the proposed action would be unlikely to significantly disrupt the breeding cycle of the local population.

Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The proposed action would impact two secondary Koala feed trees and other trees that provide shade or movement opportunities.

This area represents a relatively small proportion of the potential Koala habitat for the population of this species that occurs in the locality.

The proposed action would not result in a significant fragmentation (resulting in isolation) of Koala habitat or reduce the availability of access to Koala habitat in the locality as connectivity would be maintained by surrounding urban trees.

Given the relatively small proportion of habitat that would be impacted it is unlikely that there will be an overall decline to the species.

Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

Flora

Slight increases in the risk of weed incidence at the site would be expected as a result of vegetation clearing. Weed control measures would be implemented to mitigate this risk.

The introduction and/ or spread of weeds is unlikely to decrease the value of potential foraging habitat for this species. Koala feed trees occur within maintained hospital grounds where weeds area already managed.

Fauna

Pest animal (domestic cats/ dogs) is listed as a 3rd order threat to Koala.

The action is unlikely to increase the risk of domestic dog/ cat encounters with Koalas at the site to that which currently occurs.

The broader existing threat level for the local Koala population is unlikely to be significantly increased by the action.

Introduce disease that may cause the species to decline, or

The proposed action is not expected to significantly exacerbate either chlamydiosis or Koala Retrovirus (KoRV) in the Koala population. The project in unlikely to introduce any new disease that may cause the species to decline.

Interfere with the recovery of the species.

The National Recovery Plan for the Koala (DAWE, 2022) notes:

'*…it is clear that in order to halt decline and promote the recovery of the listed Koala, the following should be avoided:*

- *clearing of habitat used by Koalas for feeding and resting*
- *reducing connectivity between patches of habitat used by Koalas for feeding, resting, commuting and dispersing (either by clearing of vegetation or by the erection of barriers to passage)*
- *clearing of habitat used by Koalas during extreme events (heat waves, drought/fire refuge)*
- *avoiding activities that will expose Koalas to additional threats (e.g. dogs, cars) in places where Koalas must use the ground to move between resting and feeding trees'*.

The proposed action is consistent with the above due to Koala feed tree clearing, although not to the point of putting the local population at risk of extinction.

Section 8 of the Plan (DAWE, 2022) lists strategies and actions. The proposed action is unlikely to interfere with the implementation of these strategies and actions.

Conclusion of Assessment of Significance

The Action would have negative (incremental and cumulative) impacts on the site Koala habitat values, although the magnitude of these impacts is unlikely to result in a significant impact on the local Koala population. Overall, the proposal is unlikely to result in a significant impact on the Koala.

Grey-headed Flying Fox (*Pteropus poliocephalus*)

According to the DoE (2013c) 'significant impact criteria' for vulnerable species, an action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

Lead to a long-term decrease in the size of an important population of a species

There are no roost camps located within the site. The nearest listed camp sites for this species are approximately 2.5-3.5 km south-east of the proposed action located (Nationally Important Flying-fox Camps 257 and 530). The proposed action would not directly impact these camps.

The Grey-headed Flying fox feeds on nectar and pollen from flowers of canopy trees and fleshy fruits from rainforest trees and vines. The species generally moves through the landscape feeding on suitable trees when they come into flower/ fruit. The proposed action would involve the removal of 24 native trees that would provide food for this species at certain times of the year when in fruit/ flower.

Given the high mobility of this species and the proximity of native vegetation containing foraging habitat in the locality, impacts to this species relatively small area are very unlikely to lead to a long-term decrease in the size of the population.

The proposed action would not isolate any areas of habitat or cause significant habitat fragmentation that would affect the breeding, foraging or dispersive movements of this highly mobile species.

Given that the proposed action would not impact on any roosting or breeding sites for this species and that areas of native vegetation in the locality would provide foraging habitat for this species, the removal of the small area of foraging habitat for the proposed action would be unlikely to lead to a long-term decrease in the size of the population.

Reduce the area of occupancy of an important population

The proposed action would not reduce the area of occupancy of this highly mobile species. The potential foraging habitat that would be impacted would constitute a negligible proportion of the available foraging habitat within the locality and would not create any barriers to movement or isolate any areas of habitat for this mobile species.

Fragment an existing important population into two or more populations

The proposed action would not isolate or fragment an existing important population of this highly mobile species.

At a local scale, the proposed action would fragment a negligible area of vegetation within the proposed action area which contains potential foraging habitat for this species. However the resulting gap in vegetation cover would be readily traversed by these highly mobile, aerial species. The proposed action would not impact on any camp/ roost sites for this species. The action would not prevent Grey-headed Flying-fox individuals from travelling between camps and foraging habitat.

On the basis of the above, the proposed action would not result in the fragmentation of the population of the Grey-headed Flying-fox into two or more populations.

Adversely affect habitat critical to the survival of the species

The Grey-headed Flying fox requires a temporal sequence of productive foraging habitats linked by migration corridors or stopover habitats combined with suitable roosting habitat in close proximity to foraging areas.

Habitats within the study area contain a number of Eucalyptus species which provide nectar food resources. The resources present in the site, however, are minor in comparison to available similar foraging resources in the broader landscape. In this context the Action is unlikely to threaten the survival of local populations of this mobile species.

Disrupt the breeding cycle of an important population

The proposed action would not create a barrier to migratory or dispersal movements for this species that could interfere with breeding behaviours nor would any breeding camps be impacted by the proposal. It would therefore be unlikely that the proposed action would, disrupt the breeding cycle of local populations.

Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The proposed action would remove 13 native trees, eight of which (5 x *Eucalyptus sideroxylon*, 1 x *Eucalyptus melliodora,* 1 x *Grevillea robusta* and 1 x *Melia azedarach*) contribute nectar, pollen or fruit to the diet of Grey-headed flying foxes. Given the highly mobile nature of this species the habitat would not be isolated and it is likely it would continue to be utilised by the species. There are areas of similar vegetation in adjoining areas and in the broader locality. It is therefore considered unlikely that the action would result in the decline of the species.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

No invasive species that are harmful to the Grey-headed Flying-fox are likely to become established as a result of the action.

Introduce disease that may cause the species to decline

Grey-headed Flying-foxes are reservoirs of a number of diseases including Australian bat lyssavirus, Hendra virus and Menangle virus. Although lyssavirus can cause clinical disease and mortality in Grey-headed Flying-foxes the incidence of disease in populations is generally low (<1%) and the virus is thought to be generally in equilibrium with the population. It has however been noted that when flying-foxes are exposed to significant ecological stress the incident of lyssavirus can increase and the population can be impacted. There are no clinical disease or mortality in flying-foxes associated with Hendra or Menangle virus. The proposed action is unlikely to result in ecological stresses to any of the nearby flying-fox populations such that the instances of lyssavirus would significantly increase.

No diseases that may cause the species to decline are likely to become established in the study area as a result of the proposed action.

Interfere substantially with the recovery of the species

As discussed above, foraging habitat within the study area is consistent with the definition of habitat critical to the survival of the Grey-headed Flying-fox as it contains flowering feed trees. The proposed action is therefore inconsistent with recovery objective 1 of the National Recovery Plan for Grey-headed Flying-fox (DAWE, 2021) which is to 'Identify, protect and increase native foraging habitat that is critical to the survival of the Grey-headed Flying-fox.

As discussed above, the 13 native trees proposed to be removed represent a very small proportion of available foraging habitat for this highly mobile species within the locality. It is considered unlikely, therefore, that the proposed action would substantially interfere with the recovery of the species.

Conclusion of Assessment of Significance

The proposed action is unlikely to have a significant impact on the Grey-headed Flying-fox.