



# **Hornsby Hospital upgrade: Terrestrial Flora and Fauna Assessment**

**FINAL**

**September 2012**

**Report prepared for:  
Thinc**

## **Hornsby Hospital upgrade: Terrestrial Flora and Fauna Assessment**

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# ABBREVIATIONS/DEFINITIONS

|              |                                                                                                                                                 |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| CAMBA        | China-Australia Migratory Bird Agreement                                                                                                        |
| DECCW        | NSW Department of Environment, Climate Change and Water (formerly NSW Department of Environment and Conservation, now OEH)                      |
| DGR          | Director-General Requirements                                                                                                                   |
| DSEWPac      | Department of Sustainability, Environment, Water, Population and Communities (formerly Department of Environment, Heritage, Water and the Arts) |
| EEC          | Endangered Ecological Community                                                                                                                 |
| EP&A Act     | <i>Environmental Planning and Assessment Act 1979</i>                                                                                           |
| EPBC Act     | <i>Environment Protection and Biodiversity Conservation Act 1999</i>                                                                            |
| FM Act       | <i>Fisheries Management Act 1994</i>                                                                                                            |
| JAMBA        | Japan-Australia Migratory Bird Agreement                                                                                                        |
| LGA          | Local Government Area                                                                                                                           |
| Locality     | 5 km radius of study area                                                                                                                       |
| MNES         | Matter of National Environmental Significance                                                                                                   |
| NPWS         | NSW National Parks and Wildlife Service (now part of DECCW)                                                                                     |
| OEH          | Office of Environment and Heritage (formerly DECCW)                                                                                             |
| ROKAMBA      | Republic of Korea-Australia Migratory Bird Agreement                                                                                            |
| Study area   | Area of direct impact and any areas subject to potential indirect impacts                                                                       |
| Subject site | Area of direct impact                                                                                                                           |
| TSC Act      | <i>Threatened Species Conservation Act 1995</i>                                                                                                 |
| sp.          | Species (singular)                                                                                                                              |
| spp.         | Species (plural)                                                                                                                                |
| ssp.         | Subspecies                                                                                                                                      |
| var.         | Variety                                                                                                                                         |

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# EXECUTIVE SUMMARY

Biosis Pty. Ltd. was commissioned by Thinc Health on behalf of Health Infrastructure to undertake a terrestrial flora and fauna assessment to satisfy the Director General Requirements for the development application for the proposed Hornsby Hospital, Hornsby. The hospital site is bounded by Burdett Street to the south and Derby Street to the east.

The proposed upgrade for the Hornsby Hospital includes additional car-parking to be constructed on the eastern side of the hospital. This would require the removal of the current theatre buildings accessed along Derby Road. On the south eastern corner of the hospital ground at the intersection of Derby Road and Burdett Street a new building is proposed. This new building will require the removal of existing landscaping including mature trees and ten small buildings most of which are currently functioning as hospital facilities. These buildings are a mixture of older residential and demountable buildings.

As part of this proposal, the removal of some planted trees would be required. However, the proposed landscaping indicates that mature trees will continue to be an important landscaping feature within the Hornsby Hospital grounds. Where possible mature trees will be retained and replacement landscaping will incorporate young trees endemic to the locality to replace mature trees that will be removed to allow for the proposed works.

No threatened flora species were recorded within the study area during the survey. Two stands of potentially naturally occurring Sydney Red Gum *Angophora costata* and Turpentine *Syncarpia glomulifera* were identified as Sydney turpentine-ironbark forest Threatened Ecological Community (TEC) listed as endangered under the TSC Act. To further investigate the potential impacts of the proposal on the TEC, an assessment of significance was conducted which concluded that the proposal is unlikely to have a significant impact. These two areas did not comprise the critically endangered community 'Turpentine-Ironbark Forest of the Sydney Basin Bioregion', listed under the EPBC Act.

No threatened fauna species were recorded during the current survey. Potential habitat exists for seven threatened fauna species; Regent Honeyeater *Anthochaera phrygia*, Powerful Owl *Ninox strenua*, Barking Owl *Ninox connivens*, Little Eagle *Hieraaetus morphnoides*, Glossy Black Cockatoo *Calyptorhynchus lathami*, Grey-headed Flying-fox *Pteropus poliocephalus* and Eastern Bentwing-bat *Miniopterus schreibersii oceanensis* as well as three migratory species; Black-faced Monarch *Monarcha melanopsis*, Rufous Fantail and Satin Flycatcher *Myiagra cyanoleuca*. The proposal is considered unlikely to result in negative impacts to any of these species.

The proposal is considered unlikely to have a significant impact on terrestrial threatened species, populations or ecological communities listed under the TSC and/or the EPBC Acts.

While the proposal is considered unlikely to have a significant impact on threatened species, populations or ecological communities, a number of recommendations have been made to ensure any potential impacts on the flora and fauna of the study area are minimised, including:

- That all mature trees that are to be removed as part of the proposal be replaced. Indigenous species are recommended as replacement plantings, to ensure that there is no net loss of biodiversity as a result of the proposal;
- Mature planted trees should be retained where possible and adequate tree protection measures should be implemented to ensure retained trees are not impacted by the proposal during the construction phase;
- Naturally occurring, remnant trees including the Red Mahogany, Sydney Red Gum and Turpentine should be retained and adequate tree protection measures should be implemented to ensure retained trees are not impacted during the construction phase. Additionally, construction staff should be made aware of the locations of the TEC and its regional importance during the induction process;
- Trees being felled or trimmed should be checked for nesting fauna prior to works and if fauna is present an ecologist should be consulted to ensure no animals are injured during the works;
- Nestboxes (entrance measuring approximately 10cm diameter) should be installed to replace the hollow-bearing tree that is proposed to be removed; and,
- Any nest boxes that are displaced during construction and post removal of trees should be re-installed at a suitable location within the hospital grounds.

# 1.0 INTRODUCTION

## 1.1 Background

Biosis Pty. Ltd. was commissioned by Thinc Health on behalf of Health Infrastructure to undertake a terrestrial flora and fauna assessment for a proposed upgrade at Hornsby Hospital, Hornsby (hereafter referred to as 'the proposal').

This report evaluates the impact of the proposal in accordance with the Department of Planning and Infrastructure (DPI) Director General's requirements as the project will be assessed as a State Significant Development (SSD) under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

### 1.1.1 Description and Features of the Study Area

The Hornsby Hospital is located in Hornsby, within the Hornsby Shire LGA (Figure 1). The hospital grounds are bound by Lowe Street to the north, Burdett Street to the south, Palmerston Road to the west and Derby Road to the east. The proposed additional car park and new building are proposed to the south east of the hospital grounds near the corner of Burdett Road and Derby Streets.

The landscape within the hospital grounds like much of the surrounding area is highly modified. The hospital grounds themselves feature a range of facility buildings, extensive lawn areas, mature trees and maintained landscaped gardens.

For the purposes of this assessment, the **subject site** (area of *direct* impact) is defined as the theatre and day care building including trees as well as the ten buildings and associated landscaping within the south-east corner of the hospital grounds identified on the site & landscape plan to be removed (Thinc Health 2012).

*Indirect* impacts resulting from the proposal are likely to be minimal and are expected to be contained within the hospital grounds extending south of the George Lumby Unit building. Therefore, the total **study area** (subject site inclusive of areas of indirect impacts) is considered to be contained within the Hornsby Hospital grounds (Figure 2).

The **locality** is defined as the area located within a 5 km radius of the study area.

### 1.1.2 Proposed Development

The major upgrades considered within the Site and Landscape Plan (Thinc Health 2012) proposes the establishment of additional car-parking across the eastern side of the hospital grounds accessed via Derby Road to service the predicted patient and staff requirements. The proposal also includes the construction of an additional building at the intersection of Derby Road and Burdett Street.

The proposal would take place entirely within the Hornsby Hospital grounds (Figure 2). Details of these major upgrades include the following:

- The main additional car-park to be constructed is located at the Derby Road entrance on the eastern side of the hospital grounds. This car-park is proposed where the existing theatre and day care building currently exists.
- A new building is proposed to be constructed at the south-eastern corner of the hospital grounds on the corner of Derby Road and Burdett Street. Currently this area is an assortment of ten facility and residential buildings and some car spaces.
- All existing vegetation south of the access lane entering from Derby Road will be removed to enable the construction of the new building and loading dock. This includes the removal of several mature planted trees.
- As part of this proposal, the removal of some planted trees would be required. However, the landscaping within the Site & Landscape Plan indicates that mature trees will continue to be an important landscaping feature within the Hornsby Hospital grounds. Where feasible indigenous native trees will be incorporated into the landscaping to replace mature trees that are removed as part of the works.

## 1.2 Aims

The general aim of this report is to address the impacts on flora and fauna, including threatened species, populations and endangered ecological communities and their habitats and steps taken to mitigate any identified impacts to protect the environment (DGEAR 2012).

The specific aims are to:

- Conduct a literature review and database search for the study area focussing on threatened species, populations and ecological communities;
- Examine the nature, extent and condition of fauna habitats and vegetation associations within the study area, through a combination of desktop research and field survey;
- Undertake targeted field surveys for habitat of threatened terrestrial species, populations and ecological communities listed under the schedules of the TSC and/or EPBC Acts that are known or likely to occur within the study area;
- Assess the potential and actual occurrence of flora and fauna species and populations of conservation significance, in particular, threatened species, populations and Endangered Ecological Communities (EECs);
- Map the locations of significant flora and fauna;
- Where required, evaluate the impact of the proposal by undertaking impact assessments following the SSD Guidelines for Threatened Species Assessment (DEC & DPI 2005) of the EP&A Act for threatened biota as listed under the TSC Act;

- Where required, evaluate the impact on MNES listed under the EPBC Act for the proposal through consideration of the Significant Impact Guidelines for threatened biota and migratory species as outlined in *EPBC Act Policy Statement 1.1 Significant Impact Guidelines: Matters of National Environmental Significance* (DEWHA 2009b); and,
- Provide recommendations to minimise environmental impacts from the proposal on the natural environment, including in particular threatened species and their habitats.

## 2.0 LEGISLATIVE REQUIREMENTS

### ***Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)***

The EPBC Act is a Commonwealth mechanism that requires proposed actions to be assessed in terms of their potential impact upon “Matters of National Environmental Significance” (MNES). MNES currently listed under the EPBC Act are:

- World Heritage properties;
- Natural heritage places;
- Wetlands of international importance (Ramsar wetlands, CAMBA, JAMBA and ROKAMBA);
- Threatened species and ecological communities;
- Migratory species;
- Commonwealth marine areas; and,
- Nuclear actions (including uranium mining).

Where a potential impact on a MNES is likely to occur as a result of a proposed action, the significance of that impact must be assessed. Guideline criteria for determining whether an impact is significant are provided under the Act. Where a proposed action will, or is likely to, have a significant impact on a MNES, a Referral to the Commonwealth Environment Minister must be prepared. The purpose of the Referral is to determine whether a proposed action requires approval and/or controls under the EPBC Act.

### ***NSW Environmental Planning and Assessment Act 1979 (EP&A Act)***

The EP&A Act provides the statutory context for environmental assessment of the proposal and ultimately planning approval. The current proposal is to be assessed as a State Significant Development (SSD) under Part 4 and other relevant provisions of the EP&A Act. One objective of the EP&A Act is to encourage the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities and their habitats. A second objective is to encourage the principles of ecologically sustainable development, including the precautionary principle as defined under the *Protection of the Environment Administration Act 1991*.

### ***Threatened Species Conservation Act 1995 (TSC Act)***

The TSC Act protects all threatened plants and animals native to NSW (with the exception of fish and marine plants). It provides for the identification, conservation and recovery of threatened species and their populations and communities. It also aims to reduce the threats faced by those species.

If a planned development or activity is likely to have an impact on a threatened species, population or ecological community this must be taken into account in the development approval process. In some cases, the Minister for the Environment will also need to be consulted.

## **Hornsby Shire Council Local Environmental Plan 1994 (HSC LEP)**

The study area occurs within Hornsby Shire Council area where the Hornsby Shire Council Local Environmental Plan applies. The plan dates from 1994 however some amendments have been included during 2011. The aims of this plan are:

- To provide an updated and simplified plan for the area of Hornsby;
- To protect and enhance the environmental qualities of the area;
- To facilitate the orderly and economic development of land within the area; and
- To promote the well-being of the area's population.

The objectives of this plan are:

- To provide a land use framework for the preparation of detailed development control plans;
- To protect environmentally sensitive areas and the heritage of the area;
- To improve opportunities for ecologically sustainable development; and
- To provide for the cultural needs of and the equitable provision of services and facilities for the community.

Hornsby Hospital occurs within the urban areas division according to the Policy Plan map for the Hornsby Shire.

## **SEPP 44 Koala Habitat Protection**

State Environmental Planning Policy 44 Koala Habitat Protection (SEPP 44) aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for Koalas, ensuring a permanent free living population over their present range and attempting to reverse the current trend of Koala population decline.

SEPP 44 applies to land within the LGAs listed under SEPP 44, Schedule 1 (including the Hornsby LGA) for which Hornsby Hospital occurs within (SEPP 44, Section 6). Under this policy the distinction is made between 'potential' and 'core' Koala habitat.

## 3.0 METHODOLOGY

The study area was inspected on 5<sup>th</sup> September 2012 by a zoologist and a botanist. The general condition of the site was assessed and observations made of plant communities, habitats and plant and animal species (as detailed below). During the site inspection the weather was warm and sunny (approximately 26°C), with an occasional breeze.

### 3.1 Taxonomy

The plant taxonomy (method of classification) used in this report follows the most recent Flora of New South Wales (Harden 1990; Harden 1992; Harden 1993; Harden 2002). In the body of this report plants are referred to by both their common and scientific names when first mentioned. Subsequent references to these species cite the scientific name only. Common and scientific names are included in the Appendices.

Names of vertebrates follow the Australian Faunal Directory (AFD) maintained by the Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) (DEWHA 2009a). In the body of this report vertebrates are referred to by both their common and scientific names when first mentioned. Subsequent references to these species cite the common name only. Common and scientific names are included in the Appendices.

### 3.2 Literature and Database Review

A list of the documents used to prepare this report is located in *References*.

Records of threatened species, populations and communities were obtained from the OEH Atlas of NSW Wildlife from within a 5 km radius of the study area, using the Sydney 1:100,000 map sheet.

Records of threatened species, populations and ecological communities listed on the EPBC Act were obtained from the DSEWPaC Online EPBC Protected Matters Database from within a 5 km radius of the study area.

All database searches were conducted in September 2012.

### 3.3 Flora Survey

Plant species and their habitat were surveyed by undertaking general habitat assessments and targeted searches for threatened species previously recorded within the locality. A species inventory for the site was compiled.

#### 3.3.1 Flora Habitat Assessment

The condition of the vegetation was assessed according to the degree to which it resembled relatively natural, undisturbed vegetation using the following criteria:

- Species composition (species richness, degree of weed invasion); and,

- Vegetation structure (representation of each of the original layers of vegetation).

The four categories used to evaluate general vegetation community condition were Good, Moderate, Poor and Unnatural as detailed below:

**Good:** containing a high number of indigenous species; no weeds present or weed invasion restricted to edges and track margins; vegetation community contains original layers of vegetation; vegetation layers (ground, shrub, canopy etc) are intact;

**Moderate:** containing a moderate number of indigenous species; moderate level of weed invasion; weeds occurring in isolated patches or scattered throughout; one or more of original layers of vegetation are modified; vegetation layers (ground, shrub, canopy etc) are largely intact;

**Poor:** containing a low number of indigenous species; high level of weed invasion; weeds occurring in dense patches or scattered throughout; one or more of the original layers of vegetation are highly modified; one or more original vegetation layers (ground, shrub, canopy etc) are modified or missing; and,

**Unnatural landscape:** highly modified landscape containing few or no indigenous species; exotic species dominant; original native vegetation layers removed; natural soil profile disturbed; unable to be regenerated to natural condition; high input intervention required to revegetate.

## 3.4 Fauna Survey

Terrestrial animal species and their habitats were surveyed by undertaking general habitat assessments and active searching and listening, as well as recording incidental observations.

### 3.4.1 Fauna Habitat Assessment

Fauna habitat assessments were based on the presence of one or more of the following features:

- Vegetation cover;
- specific feed trees;
- Size range and abundance of tree hollows;
- Rock outcrops, overhangs or crevices;
- Freestanding water bodies, ephemeral drainage or seepage areas;
- Disturbances, including weed invasion, clearing, rubbish dumping or fire;
- Potential foraging, nesting or roosting resources;
- Connectivity to off site habitats; and,
- Surrounding habitat.

The three categories used to evaluate habitat value were Good, Moderate or Poor, as detailed below:

**Good:** ground flora containing a high number of indigenous species; vegetation community structure, ground, log and litter layer intact and undisturbed; a high level of breeding, nesting, feeding and roosting resources available; a high richness and diversity of native animal species;

**Moderate:** ground flora containing a moderate number of indigenous species; vegetation community structure, ground log and litter layer moderately intact and undisturbed; a moderate level of breeding, nesting, feeding and roosting resources available; a moderate richness and diversity of native fauna; and,

**Poor:** ground flora containing a low number of indigenous species, vegetation community structure, ground log and litter layer disturbed and modified; a low level of breeding, nesting, feeding and roosting resources available; a low richness and diversity of native animal species.

### 3.5 Threatened and Migratory Species Likelihood of Occurrence Criteria

The likelihood of occurrence assessment for threatened flora and fauna and migratory species was based on previous records collated from database searches, data collected during the field survey, the current (known) distribution range of these species, and the presence and condition of suitable habitat in the Study Area. The criteria to assess the likelihood of threatened flora and fauna or migratory fauna species to occur within the study area is presented in Table 2.

The likelihood of occurrence assessments for threatened flora and fauna are provided in Table 3 and Table 4 (Appendix 4 & 5)

### 3.6 Limitations

Some plant species that occur within the locality are annuals (completing their life cycle within a single season) and are present only in the seed bank for much of the year. Other plant species are perennial, but are inconspicuous unless flowering or in fruit. Furthermore, some animal species are only detectable at certain times of the year. Therefore, as the field surveys were conducted over one day in September it is likely that some species that are present on the site were not detected.

Despite these limitations, the assessment of impact is based on the presence or absence of suitable habitat for threatened flora and fauna, and as such, species are taken into account during the assessment even though they may not have been detected during the survey.

## 4.0 RESULTS

A list of the flora and fauna recorded during the current survey is provided in Appendix 2 and Appendix 3 respectively.

### 4.1 Plant Communities

#### 4.1.1 Vegetation Mapping

The Native vegetation of southeast NSW (Tozer *et al* 2006) as shown in Figure 5 does not show any native vegetation community within the study area. This indicates that the vegetation occurring is within a largely modified urban environment and that the plant community is characterised by planted native and exotic species. Mapped TEC's surrounding the Study Area are Sydney Turpentine-Ironbark Forest and Blue Gum High Forest.

#### 4.1.2 Current Survey

##### **Study area**

The native vegetation within the study area has predominately been removed in all structural layers. The vegetation is characterised by planted exotic trees, lawns and landscaped gardens, however, a number of remnant trees are present. Where present, these remnant trees are isolated or in small clumps with limited shrub level vegetation present.

Sydney Red Gum *Angophora costata* is the most abundant locally native canopy species within the study area. Turpentine *Syncarpia glomulifera* and, to a lesser extent, Red Mahogany *E.resinifera* also occurs sparsely across the hospital grounds. Some of these are mature specimens and are likely to be naturally occurring as a remnant of the original vegetation community. A single Blackbutt *E.pilularis* was identified along with two Grey Ironbark *Eucalyptus paniculata* which, although locally native, were immature and located in a landscaped area and therefore not considered remnant.

Planted canopy species within the study area include two mature Flooded Gum *Eucalyptus grandis*, Spotted Gum *Corymbia maculata*, Broad-leaved Melaleuca *Melaleuca quinquenervia* and Ribbon Gum *E.viminalis*. In addition to these are planted mid-story species including Weeping Bottlebrush *Callistemon viminalis* and Sweet Pittosporum *Pittosporum undulatum*. The vegetation throughout is comprised of planted exotic species dominated by Jacaranda *Jacaranda mimosifolia*, Camphor Laurel *Cinnamomun camphora*, Chinese Tallow Tree *Sapium sebiferum* and Canary Island Date Palm *Phoenix canariensis*. Amongst these trees are common landscaping native and exotic shrubs including Blue Flax Lily *Dianella caerulea* Spiny-headed Mat-rush *Lomandra longifolia* Lily of the Nile *Agapanthus praecox subsp. orientalis* Lily of the Nile, Large-leaved Privet *Ligustrum lucidum* and Fishbone Fern *Nephrolepis cordifolia*.

The ground layer vegetation is predominately bare mulch with some maintained lawn containing a mixture of species including Buffalo Grass *Stenotaphrum secundatum*, Couch *Cynadon dactylon* and Kikuyu *Pennisetum clandestinum*.

According to the flora habitat assessment criteria detailed in Section 3.3 the vegetation within the study area is classed as being an Unnatural Landscape.

## 4.2 Flora

A list of flora species recorded from the subject site and within the study area is provided in Appendix 12.

A total of 33 flora species were identified during the survey, comprising 16 native species and 17 exotic species.

Two of the exotic species recorded in the study area are listed under the *Noxious Weeds Act* 1993 and the *Noxious Weeds Amendment Act* 2005 for the Hornsby LGA. These species and their control classes are:

- Broad Leafed Privet *Ligustrum lucidum*: Class 4.
- Camphor Laurel *Cinnamomum camphora*: Class 4.

The legal requirement for the control of a Class 4 weed is: The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority.

### 4.2.1 Significant Flora

A total of 29 threatened flora species have been recorded or are predicted to occur within a 5 km radius of the study area (OEH Atlas of NSW Wildlife and DSEWPaC Online EPBC Database) (Table 3). Of these, 28 are listed under the TSC Act and 22 under the EPBC Act. Historical threatened flora species records within 5 km of the study area are shown in Figure 5.

#### ***Threatened Species***

No threatened flora species were recorded in the study area during the current survey. All other threatened plants and endangered plant populations are considered to have a low likelihood of occurrence within the study area given the highly modified landscaping that occurs throughout the site.

#### ***Threatened ecological communities***

Two endangered and one critically endangered ecological communities have been mapped within the locality of the study area.

Sydney Turpentine-ironbark forest (STIF) is TEC listed as endangered under the TSC Act and as a critically endangered community under the EPBC Act. The canopy species composition is typically dominated by Turpentine, White Stringybark *Eucalyptus globoidea*, Red Mahogany, Grey Ironbark, Sydney Red Gum and Rough Barked Apple *Angophora floribunda*.

Clause 3 of the Final Determination this community states that 'the structure of this community was originally forest, but it may now exist as woodland or as remnant trees'. This is reiterated in clause 7 which suggests that in many of the LGS's know to contain STIF, the community is only present as remnant trees. Two stands of trees within the study area were identified as STIF community due to the presence of Turpentine and Sydney Red Gum that were deemed to be naturally occurring (Plate 1). These two areas of STIF are shown in Figure 4.

Blue gum high forest (BGHF) is a critically endangered ecological community, dominated Sydney Blue Gum *Eucalyptus saligna* and/or Blackbutt in conjunction with Sydney Red Gum and Rough-barked Apple. Although BGHF is mapped within the locality, the community was not identified within the study area.

## 4.3 Terrestrial Fauna

### 4.3.1 Terrestrial Fauna Habitat

Suitability, size and configuration of terrestrial vertebrate fauna habitats broadly correlate to the structure, connectivity and quality of local and regional vegetation types. The terrestrial fauna habitat within the study area consists of mature Eucalypts, fruiting palms and planted garden beds. Finer scale habitat features are limited within the study area but include hospital buildings, fruit bearing and flowering trees and mown lawn. Animal species may utilise some of these features wholly or partly, in conjunction with one another, or may depend entirely on one specific habitat type.

#### **Study area**

The Hornsby hospital grounds provide habitats for a range of mobile species through the well maintained landscaped features, extensive lawns and mature trees found on site. Scattered planted and potentially remnant Eucalypts provide abundant blossoms and sap for a range of honeyeaters and sap feeders including Rainbow Lorikeets *Trichoglossus haematodus* and Grey-headed Flying-foxes *Pteropus poliocephalus*. Scattered mature trees including fruiting palms and mature Eucalypt trees also provide food sources for a variety of native and exotic fauna species, including Ring-tailed Possums *Pseudocheirus peregrinus*.

Scratchings were observed along many of the trunks of smooth barked Eucalypts within the hospital grounds (Plate 3). It is likely that the scratchings are from Ring-tailed and Common Brush-tailed Possums which are evident in the area from the high density of scats found at the base of these trees. Despite the possum nest boxes installed, it is apparent that possums are likely to occupy the ceilings of some of the older hospital buildings where they are accessible. Dreys and nests were also recorded in dense vegetation.

One hollow bearing tree was observed to the rear of an older building identified to be removed as part of the upgrade works (Plate 1). This mature Liquid Amber tree had three hollows present

within the trunk of the tree. The entrance of these hollows measure approximately 10 cm by 5 cm but may open up within the tree trunk. These hollows are not suitable for nesting parrots or possums but may provide roosting opportunities for some microbat species.

The habitats available on site for fauna are limited however it is apparent that conscientious efforts are made to encourage the presence of wildlife within the campus grounds. This is evident through the abundance of native and fruiting trees selected as landscaping features and efforts to enhance habitat through the installation of nest boxes for resident possums.

Terrestrial fauna habitats within the study area are considered to be in Poor condition given the lack of diversity of habitat features in the ground and shrub layers; low abundance of remnant trees; scarcity of tree hollows; absence of fallen logs, lack of leaf litter and the highly modified urban nature of the site.

### 4.3.2 Terrestrial Animal Species

Three species of bird were recorded during the brief midday field survey while evidence of three mammals and one skink was also recorded (Appendix 3).

### 4.3.3 Significant Terrestrial Animal Species

A total of 52 threatened and/or migratory terrestrial animal species or their habitat (including two listed as endangered populations) have been previously recorded within a 5 km radius of the study area (OEH Atlas of NSW Wildlife and DSEWPC Online EPBC Database) (Appendix 5). Of these, 40 animal species are listed under the TSC Act and 34 animal species are listed under the EPBC Act (21 threatened and 15 migratory)<sup>1</sup>. Twenty-nine threatened and/or migratory terrestrial species and two threatened populations have been previously recorded within 5 km of the study area (Figure 6).

No threatened or migratory animal species were recorded during the current survey however a number of threatened and migratory species have been previously recorded within and surrounding the study area (Figure 6). Ten threatened or migratory species and one endangered population (Table 4, Appendix 5) are considered to have a moderate likelihood of occurrence within the study area: Regent Honeyeater *Anthochaera phrygia*, Powerful Owl *Ninox strenua*, Barking Owl *Ninox connivens*, Little Eagle *Hieraaetus morphnoides*, Glossy Black Cockatoo *Calyptorhynchus lathami*, Grey-headed Flying-fox *Pteropus poliocephalus*, Eastern Bentwing-bat *Miniopterus schreibersii oceanensis*, Black-faced Monarch *Monarcha melanopsis*, Rufous Fantail and Satin Flycatcher *Myiagra cyanoleuca*. Species with a moderate to high likelihood of occurrence within the study area have been considered further in Section 5.0 (Impact Assessment) of this report.

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<sup>1</sup> An individual species may be listed under one or both Acts and may be listed as threatened and/or migratory.

## 4.4 Endangered Populations

An Endangered Population is a population listed under Part 2 of Schedule 1 of the TSC Act and is defined as a population that, in the opinion of the NSW Scientific Committee, is facing a very high risk of extinction in NSW in the near future. A population is not eligible to be listed as an Endangered Population if it is a population of a species already listed in Schedule 1 or 1A (i.e. already listed as an Endangered or Critically Endangered species).

One Endangered Populations of animal has been previously recorded within 5 km of the study area:

- Gang-gang Cockatoo population in the Hornsby Ku-ring-gai Local Government Areas.

As shown Table 4 (Appendix 5), the Gang-gang Cockatoo Endangered Population is considered to have a low likelihood of occurrence within the study area.

## 4.5 Critical habitat

Critical habitat can be declared under both the EPBC and TSC Acts. Under the EPBC Act, it is an offence for a person to take an action that the person knows will significantly damage the critical habitat of a listed threatened species. Under the TSC Act, the declaration of critical habitat serves primarily as a guide for planning under Part 3 of the EP&A Act and a trigger which ensures a rigorous environmental assessment of all activities and developments proposed, and any other action that has the potential to damage the species or its habitat (NPWS 2002).

No areas of critical habitat for flora or fauna have been declared within the locality.

### 4.5.1 SEPP 44 Koala habitat

Under the provisions of SEPP 44, "Potential Koala habitat" means areas of native vegetation where the trees of the types listed in Schedule 2 of the Policy constitute at least 15% of the total number of trees in the upper or lower strata of the tree component. "Core Koala habitat" means an area of land with a resident population of Koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population.

The vegetation on site is highly modified with some stands of potentially remnant trees occurring scattered throughout the study area. Only one tree species listed under Schedule 2 of the SEPP 44 occurs on site in low densities. Two Ribbon Gum *Eucalyptus viminalis* occur as planted individuals in a maintained garden bed along Burdett Street. These two planted trees are young and isolated from any continuous areas of woodland or forest. The density of preferred Koala feed trees listed under Schedule 2 of the SEPP is less than 15% and although there have been four historical records of Koala within the locality, these records occur to the north of the study area within Ku-ring-gai Chase National Park and Berowra Valley Regional Park. These reserves are not directly connected to the study area and Koala's traversing the urban areas surrounding

the hospital are highly unlikely. Given this the Hornsby Hospital site does not support potential Koala habitat as defined under SEPP 44.

## 5.0 IMPACT ASSESSMENT

The primary direct impact on terrestrial flora and fauna values will be through the removal of planted vegetation and lawn areas. The likelihood of indirect impacts to result from the proposal is considered low, however these indirect impacts may include some weed invasion and increased erosion potential. Further discussions of impacts that are considered relevant to the proposal are provided below.

### 5.1 Potential impacts of the proposal

#### 5.1.1 Vegetation clearing and habitat loss

No areas classified as native plant community will be removed or disturbed by the proposal. The proposal will include the removal of some planted native and exotic species. Being planted, this vegetation is considered to be of lesser conservation significance than naturally occurring vegetation. This vegetation does have some habitat value for fauna species, however this value is limited and is likely to be restricted to the provision of habitat resources to common cosmopolitan fauna species. While this vegetation is not protected by threatened species legislation, TSC Act or the EPBC Act, recommendations are made in Section 7.0 to minimise impacts.

Two patches of the TEC STIF occur on site in proximity to buildings proposed to be removed. Although these trees will not be removed by the proposal, it presents an opportunity for indirect or accidental impacts on this threatened community. An assessment of significance for STIF TEC has been conducted (Appendix 6) and concludes the proposed works will not have a significant impact on this community.

One tree hollow was observed onsite within a mature Liquidamber, to the west of the meals on wheels building. This hollow bearing tree will be removed as part of the proposed upgrade, reducing the availability of habitat present for hollow dependent fauna. Loss of hollow bearing trees is listed as a Key Threatening Process (KTP) for various threatened fauna. There are no historical records for hollow dependent microbats within the locality and the hollow itself is considered to be low quality. For this reason, and because only one was identified, an assessment of significance for hollow dependent microbats is not considered necessary. Recommendations to mitigate the loss of this hollow bearing tree are given in Section 6.

A Common Ringtail Possum drey was identified within a large Sweet Pittosporum tree situated on the corner of Derby Street and the hospital access lane. This tree will be removed by the proposal.

A Large nest box is currently installed in the mature Spotted Gum *Corymbia maculata* located adjacent to the George Lumby Unit building. This tree is scheduled to be removed as part of the proposed upgrade.

### 5.1.2 Weed invasion

Invasion of native plant communities by exotic perennial grasses is listed as a KTP under Schedule 3 of the TSC Act. The subject site is largely devoid of intact native vegetation however it does contain some native and exotic plants. Weed invasion has the potential to occur in all areas cleared and disturbed by the proposal. The dominant weed species present in the subject site include both herbaceous weeds and exotic perennial grasses.

Weed propagules may be dispersed during the construction phase. Apart from altering local flora assemblages and competitively displacing native plant species, weed invasion also has the potential to modify habitat features for local fauna species. However, given that the subject site is mostly cleared of native vegetation and boasts well maintained landscaping, the proposal is considered unlikely to significantly increase the prevalence of weeds. Therefore, it is also unlikely that the proposal would result in the invasion of native plant communities by weeds.

### 5.1.3 Erosion

Erosion can result from vegetation clearing and soil disturbance associated with construction. Given the highly altered nature of the subject site, the likelihood of erosion impacting terrestrial flora and fauna habitats is considered to be negligible. Standard erosion control practices are expected to be employed throughout each phase of construction where necessary.

## 5.2 Part 4 SSD guidelines for threatened species assessment (EP&A Act)

The impacts of the proposal on threatened species, populations and ecological communities listed under the TSC Act have been undertaken following the Guidelines for Threatened Species Assessment under Part 4 of the EP&A Act for State Significant Development (DEC & DPI 2005). Where threatened species, populations and/or communities **are recorded** within a study area, an impact assessment is required under the EP&A Act. When threatened species, populations and/or communities **are not recorded** during a survey, the presence of potential habitat for a species (or population or community) is used to determine the need to undertake an impact assessment under the EP&A Act. Where there is no potential habitat in the study area for threatened species, populations and/or communities, there is unlikely to be any impact and therefore these species (or populations or communities) are not required to be considered further.

### Key Thresholds

The Part 4 Guidelines of the EP&A Act for State Significant Development (DEC & DPI 2005) set out a number of key thresholds which need to be addressed to justify the impacts of the proposal on threatened species, populations and ecological communities. The key thresholds are (DEC & DPI 2005):

- Whether or not the proposal, including actions to avoid or mitigate impacts or compensate to prevent unavoidable impacts, will maintain or improve biodiversity values;

- Whether or not the proposal is likely to reduce the long-term viability of a local population of the species, population or ecological community;
- Whether or not the proposal is likely to accelerate the extinction of the species, population or ecological community or place it at risk of extinction; and,
- Whether or not the proposal will adversely affect critical habitat.

### **Maintenance of Biodiversity Values**

The subject site is a highly modified urban environment which contributes to biodiversity within the locality through the provision of foraging resources for fauna through the mature trees which occur on site. This contribution to biodiversity is not large, however Hornsby hospital recognises that mature trees are an asset to the hospital grounds and, where possible, commits to retaining all mature trees or if removal is unavoidable, native tree species which are naturally occurring within the locality be established as replacement plantings.

Through these commitments, there should be no net loss of trees on site. Provided that the mitigation measures detailed in Section 6.0 are implemented, the biodiversity values of the locality are likely to be maintained..

#### **5.2.1 Potential Impacts on Threatened Ecological Communities**

The TEC STIF occurs within the study area. Several trees representing the community occur within the study area. One Red Mahogany occurs to the north of the theatre building and a stand of Sydney Red Gum, and a mature Turpentine occurs immediately to the south of the theatre building. While works will include the replacement of the theatre, none of these trees are proposed to be removed as part of the upgrade works, however care should be taken to avoid any accidental damage to these trees during the construction phase of the project.

Blue Gum High Forest occurs within the Hornsby region and is listed as a critically endangered ecologically community, however no characteristic trees of this community were recorded within the study area.

Consequently the proposal will not reduce the long-term viability of any ecological community.

#### **5.2.2 Potential impacts on Endangered Populations**

The study area is considered to provide potential habitat to the Hornsby Ku-ring-gai endangered population of Gang-gang Cockatoo. This species is considered to have a low likelihood of occurrence (as described in Table 4, Appendix 5) on site given the lack of suitable nesting sites, minimal foraging resources and lack of historical records within the locality. No individuals of this species have been previously recorded within the study area.

During the site visit no evidence of Gang-gang Cockatoo foraging activity was detected, no preferred foraging resources will be removed and no nesting habitat in the form of hollow-bearing trees (diameter entrance >15cm) was observed throughout the study area.

Given that no records of this population have occurred within the study area and that there is no evidence of habitats being used by this species, the proposal is considered unlikely to:

- Reduce the long-term viability of this local population;
- Accelerate the extinction of this population or place it at risk of extinction; or,
- Adversely affect critical habitat.

### **5.2.3 Potential Impacts on Threatened Flora Species**

No threatened flora species as listed under the TSC Act were recorded in the study area. Furthermore, no threatened flora species listed on the TSC Act, are considered to have potential habitat in the study area and consequently, impacts to threatened flora species are considered negligible due to the following:

- Impacts resulting from the proposal will be contained to the previously modified landscape of the Hornsby Hosptial grounds;
- The proposal will not result in the isolation or fragmentation of potential habitat; and,
- The proposal is unlikely to interfere with the pollination and dispersal of remnant native flora species.

On the basis of the above, detailed impact assessments for threatened flora species are not considered, and as such, no threatened flora species have been considered further.

### **5.2.4 Potential Impacts on Terrestrial Fauna**

Where there is potential habitat (foraging or breeding resources) for threatened species in the study area, further consideration must be given to the potential impact of the proposal on these species. The proposal may impact on threatened species by causing any of the following:

- Death or injury of individuals;
- Loss or disturbance of limiting foraging resources; and/or,
- Loss or disturbance of limiting breeding resources.

Limiting resources are specialised habitat components that species are dependent on for their ongoing survival. Such limiting resources are predominantly associated with specialised breeding habitats (such as tree hollows or suitable nest/maternity roost sites) that occur at low densities, with high levels of competition from a range of species. However, for some species, limiting

resources include specialised foraging habitats that have a restricted distribution (e.g. Koalas feeding only on specific tree species).

Table 4 summarises the possible impacts from the proposal on the seven TSC Act-listed threatened fauna species with known and/or potential habitat in the study area, and determines the need for assessment according to Appendix 3 of the Draft Guidelines for Threatened Species Assessment (DEC & DPI 2005). Based on the nature of the proposal (see Section 2.1.2), database interrogation, literature review regarding the ecology of each species, and information gathered during the field survey within the study area, each of these species are considered as unlikely to be subject to negative impacts resulting from the proposal. Accordingly, no assessments have been prepared for these species.

**Table 1: Potential impact and assessment requirements for threatened fauna listed on the TSC Act with potential habitat in the study area**

|              | EPBC Act | TSC Act | Potential Impacts on Threatened Species |                                                     |                                                     | Impact Assessment required? | Reasoning                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------|----------|---------|-----------------------------------------|-----------------------------------------------------|-----------------------------------------------------|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|              |          |         | Individual death or injury?             | Loss or disturbance of limiting foraging resources? | Loss or disturbance of limiting breeding resources? |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Birds        |          |         |                                         |                                                     |                                                     |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Powerful Owl | -        | V       | No                                      | No                                                  | No                                                  | No                          | These Owls have each been recorded within the locality. Tree hollows are an important habitat feature for these species to nest but also to support their prey. A single hollow bearing tree is proposed to be as a result of the proposal. The sizes of the hollows within this tree are unsuitable to support owl or possum nesting (preferred prey for these owls) as the entrance is only 10cm wide. Some possum nest boxes will be relocated during construction however the temporary removal of this habitat is unlikely to reduce occupancy of possums on site or limit the food availability to locally resident owls. The foraging habitat present within the study area is not limiting for either of these species. Given that no breeding habitat or limiting foraging resources would be impacted no further assessment according to Appendix 3 of the Draft Guidelines for Threatened Species Assessment is required for this species.                                                                            |
| Barking Owl  |          |         |                                         |                                                     |                                                     |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Little Eagle | -        | V       | No                                      | No                                                  | No                                                  | No                          | The Little Eagle has been recorded on four occasions within the locality. This species occupies habitats rich in prey within open eucalypt forest, woodland or open woodland. It requires a tall living tree within a remnant patch in which to nest. The study area is highly modified operating as a Hospital since 1933 (HKHS 2012).Some remnant trees may occur on site however the surrounding urban residential landscape may dissuade use of these habitats by the Little Eagle. No conspicuous large raptor nests were detected during the field survey. Given the proximity of Ku-ring-gai Chase National Park to the east and Berowra Valley Regional Park to the north-west, the Little Eagle may move from these wooded areas over the study area, however is unlikely to rely on resources within the site given the highly modified landscape they occur within. Given no significant limiting foraging or breeding resources will be impacted by the proposal no further assessment is required for this species. |

|                       | EPBC Act | TSC Act | Potential Impacts on Threatened Species |                                                     |                                                     | Impact Assessment required? | Reasoning                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------|----------|---------|-----------------------------------------|-----------------------------------------------------|-----------------------------------------------------|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                       |          |         | Individual death or injury?             | Loss or disturbance of limiting foraging resources? | Loss or disturbance of limiting breeding resources? |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Glossy Black Cockatoo | -        | V       | No                                      | No                                                  | No                                                  | No                          | The Glossy Black Cockatoo preferentially forages on the fruits of the <i>Allocasuarina torulosa</i> tree. This tree species occurs on site at the Palmerston Road entrance on the western side of the hospital grounds. The Glossy Black Cockatoo relies on large tree hollows in which to breed. No hollow-bearing trees large enough to support Glossy Black Cockatoo breeding occur within the study area. Consequently there would not be any loss of breeding habitat for this species. The proposed upgrade on the eastern side of the Hospital grounds would not require any removal to <i>A.torulosa</i> trees. Given that no breeding habitat occurs on site and no feed trees will be impacted by the proposed upgrade, the proposal is considered unlikely to impact on the Glossy Black Cockatoo and no further assessment is required for this species. |
| Regent Honeyeater     | E        | E1      | No                                      | No                                                  | No                                                  | No                          | The Regent Honeyeater has been recorded fourteen times within 5 km of the study area. The regent Honeyeater preferentially forages on winter flowering Eucalypts including <i>Corymbia maculata</i> which occur on the site in low densities. The few mature trees of these species that occur on site will be largely retained, however one mature tree will be removed. The Regent Honeyeater may traverse the study area from time to time, however this single tree is unlikely to be a food source this species relies on regularly. Given no significant limiting foraging or breeding resources will be impacted by the proposal no further assessment is required for this species.                                                                                                                                                                          |
| <b>Mammals</b>        |          |         |                                         |                                                     |                                                     |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Eastern Bentwing-bat  | -        | V       | Unlikely                                | No                                                  | No                                                  | No                          | The Eastern Bentwing-bat has been previously recorded within the locality of the study area. This species requires caves or culverts in order to breed which are not found on the Hornsby Hospital grounds. This species forages for insects throughout a range of habitats and may forage throughout the study area within the hospital grounds. Foraging habitats for this species are not considered limiting and given that the proposal will not impact limiting habitat for this species, the Eastern Bentwing-bat has not been considered further.                                                                                                                                                                                                                                                                                                            |

|                        | EPBC Act | TSC Act | Potential Impacts on Threatened Species |                                                     |                                                     | Impact Assessment required? | Reasoning                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------------------------|----------|---------|-----------------------------------------|-----------------------------------------------------|-----------------------------------------------------|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                        |          |         | Individual death or injury?             | Loss or disturbance of limiting foraging resources? | Loss or disturbance of limiting breeding resources? |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Grey-headed Flying-fox | V        | V       | Unlikely                                | No                                                  | No                                                  | No                          | The Grey-headed Flying-fox is a large and conspicuous species and no evidence of a roost site was observed on site. Numerous records of this species occur within the locality and in proximity to Hornsby Hospital. Grey-headed Flying-foxes may forage within flowering and fruiting mature trees found throughout the study area. The species is highly mobile; known to forage up to 50 km from the roost site (DEC 2005i), feeding on a range of fruits and blossoms. The feeding resources provided within the hospital grounds are not considered to be a limiting resource for this species. No limiting breeding or foraging resources would be impacted by the proposal. Given the proposal would not impact limiting breeding or foraging resources, that some mature trees will be replaced, and the high mobility of this species, it is considered unlikely that the proposal would impact on the Grey-headed Flying-fox and therefore further assessment according to Appendix 3 of the Draft Guidelines for Threatened Species Assessment is not recommended for this species. |

## 5.3 Commonwealth Significant Impact Criteria (EPBC Act)

Under the Commonwealth EPBC Act, if the proposal has the potential to have an adverse impact on threatened species, populations and/or ecological communities as listed under the Act, the proposal must be referred to the Federal Minister for the Environment for further consideration. The Significant Impact Criteria are used to assess the likelihood of impact in accordance with the former Department of Environment, Heritage, Water and the Arts (DEWHA) publication *EPBC Act Policy Statement 1.1 Significant Impact Guidelines: Matters of National Environmental Significance* (DEWHA 2009b).

### 5.3.1 Potential Impacts on Endangered Ecological Communities

Sydney turpentine-ironbark and blue gum high forest EEC's are listed as critically endangered under the EPBC Act. Two stands of STIF, as classified by the TSC Act scientific determination, were identified within the study area during the site visit. The EPBC Act determination for Turpentine-Ironbark Forest of the Sydney Basin Bioregion states that 'the ecological community excludes patches where either the native midstorey/understorey or native canopy trees are absent' (DSEWPac 2005). Given that the two stands identified within the study area are comprised of remnant canopy species with a landscaped midstorey, it is not consistent with the critically endangered community under the EPBC Act and therefore does not require an assessment of significance under this legislation.

### 5.3.2 Potential Impacts on Threatened Flora Species

No threatened flora species listed under the EPBC Act were recorded in the study area, or are considered to have potential habitat within the study area.

### 5.3.3 Potential Impacts on Terrestrial Fauna

#### Endangered Fauna

No fauna species listed as Endangered under the EPBC Act are considered to have potential habitat within the study area.

#### Vulnerable Fauna

One species listed as Vulnerable under the EPBC Act, the Grey-headed Flying-fox has potential habitat in the study area. As shown above (Table 4) no limiting breeding habitat or foraging habitat for this species is expected to be impacted. If present within the study area, individuals of this species are not considered 'important populations' as they are not likely to be key source populations either for breeding or dispersal; populations that are necessary for maintaining genetic diversity; and/or populations that are near the limit of the species range. In addition, the proposal is not likely to:

- Adversely affect habitat critical to the survival of this species;

- Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that any of this species are likely to decline;
- Result in invasive species that are harmful to this Vulnerable species becoming established in this Vulnerable species' habitat;
- Introduce disease that may cause any of this species to decline; or
- Interfere substantially with the recovery of any of this species.

As such, no assessment has been carried out for the Grey-headed Flying-fox, in accordance with the Significant Impact Criteria (DEH 2006).

A Referral to the Federal Environment Minister is not considered necessary for any threatened fauna.

### **Migratory Fauna**

The list of migratory species under the EPBC Act is a compilation of species listed under four international conventions: China-Australia Migratory Bird Agreement (CAMBA), Japan-Australia Migratory Bird Agreement (JAMBA), Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA), and the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).

Three species listed under the 'migratory' provisions of the EPBC Act listed are considered to have a moderate likelihood of occurring within the study area and have been previously recorded within 5 km of the study area. These species; Black-faced Monarch, Rufous Fantail and Satin Flycatcher have been given further consideration. Individuals of these species that may be recorded in the study area are not considered likely to be an ecologically significant proportion of the population. Potential habitat in the study area is not considered important<sup>2</sup> for these migratory species. Minimal impact is expected on the potential habitat for these species in the study area. As such, no assessments of significance have been carried out for the Black-faced Monarch, Rufous Fantail or the Satin Flycatcher in accordance with the Significant Impact Criteria (DEWHA 2009b).

---

<sup>2</sup> Where 'important' habitat for a migratory species is defined by SEWPaC (2009b).

## 6.0 RECOMMENDATIONS

The following recommendations have been made to reduce the impact of the proposal on native flora and fauna occurring in the study area:

- That all mature trees that are to be removed as part of the proposal be replaced. Indigenous species are recommended as replacement plantings, to ensure that there is no net loss of biodiversity as a result of the proposal;
- Mature planted trees should be retained where possible and adequate tree protection measures should be implemented to ensure retained trees are not impacted by the proposal during the construction phase;
- Naturally occurring, remnant trees including the Red Mahogany, Sydney Red Gum and Turpentine should be retained where possible and adequate tree protection measures should be implemented to ensure retained trees are not impacted during the construction phase;
- Trees being felled or trimmed should be checked for nesting fauna prior to works and if fauna is present an ecologist should be consulted to ensure no animals are injured during the works;
- Tree removal and trimming should be conducted by a suitably qualified arborist;
- Nestboxes (entrance measuring approximately 10cm diameter) should be installed to replace the hollow-bearing tree that is proposed to be removed; and,
- Any nest boxes that are displaced during construction and post removal of trees should be re-installed at a suitable location within the hospital grounds.

## 7.0 CONCLUSION

This report assesses the ecological significance of threatened flora and fauna species, endangered populations and TEC's that occur, or have the potential to occur, within the area affected by the proposed Hornsby Hospital upgrade, in accordance with the EP&A Act, TSC Act and the EPBC Act.

The vegetation within the study area is predominately planted exotic and native species. Mature, and potentially naturally occurring trees are sparsely distributed across the garden areas throughout the study area. The flora habitat assessment has found the study area to be considered an Unnatural Landscape.

Two stands of potentially naturally occurring Sydney Red Gum and Turpentine were identified as STIF as listed under the TSC Act. To further investigate the potential impacts of the proposal on these areas of EEC, an assessment of significance was carried out which concluded that the proposal is unlikely to have a significant impact on the TEC. These two areas do not represent the critically endangered community 'Turpentine-Ironbark Forest of the Sydney Basin Bioregion', listed under the EPBC Act.

The study area contains potential habitat for seven threatened and three migratory fauna species. There will be no loss of potential breeding and or foraging habitat for any of these species. Consequently, it is unlikely that the proposal would result in a significant impact to any fauna species with potential habitat within the study area.

The proposal is considered unlikely to have a significant impact on terrestrial threatened species, populations or ecological communities listed under the TSC and/or the EPBC Acts. An EPBC Referral is not required for any threatened or migratory flora or fauna as a result of the proposal.

A range of mitigation measures are proposed (Section 6.0) to minimise the impacts of the proposal on biodiversity.

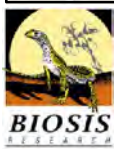
# FIGURES



**Figure 1: Location of the Study Area**

Date: 06 September 2012 Matter: 15385  
 Checked By: JKD Drawn By: JMS  
 Location: P:\15300s\15385\Mapping\15385\_F1\_Locality.mxd

0 125 250 375 500 625  
 Metres  
 Scale: 1:25,000 at A4



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 Alexandria  
 NSW, 2015

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**Legend**

Subject Site

Study Area



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**Figure 2: Overview of the study area**

Acknowledgements: Imagery (c) Nearmap  
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Date: 06 September 2012  
Checked by: JKD  
Drawn by: JMS  
File number: 15385  
Path: P:\15300s\15385\Mapping\15385\_F2\_StudyArea.mxd

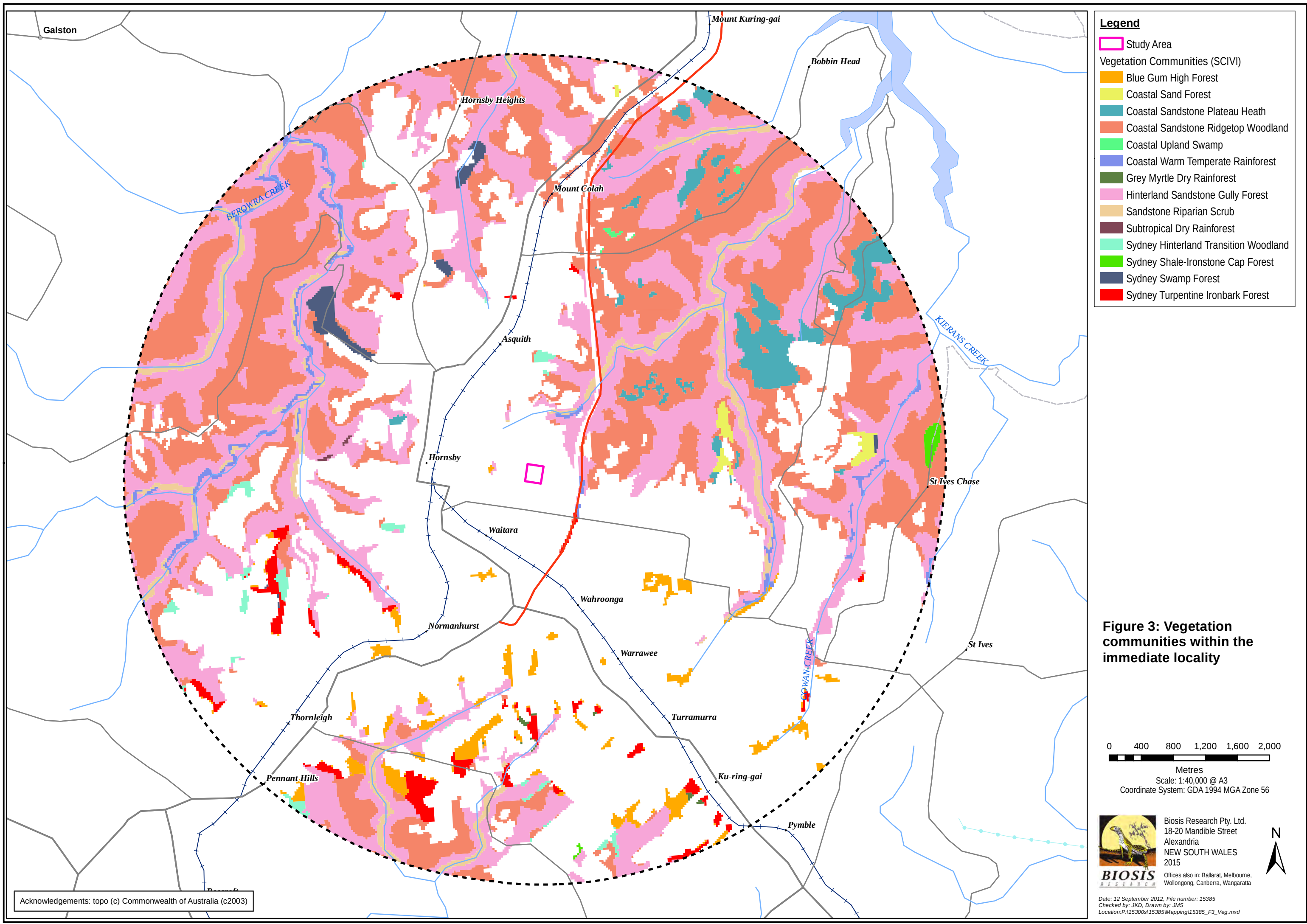
0 10 20 30 40 50

Metres

Scale 1:1,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56







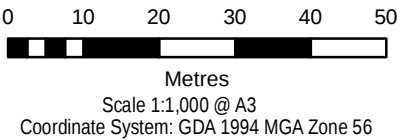
**Legend**

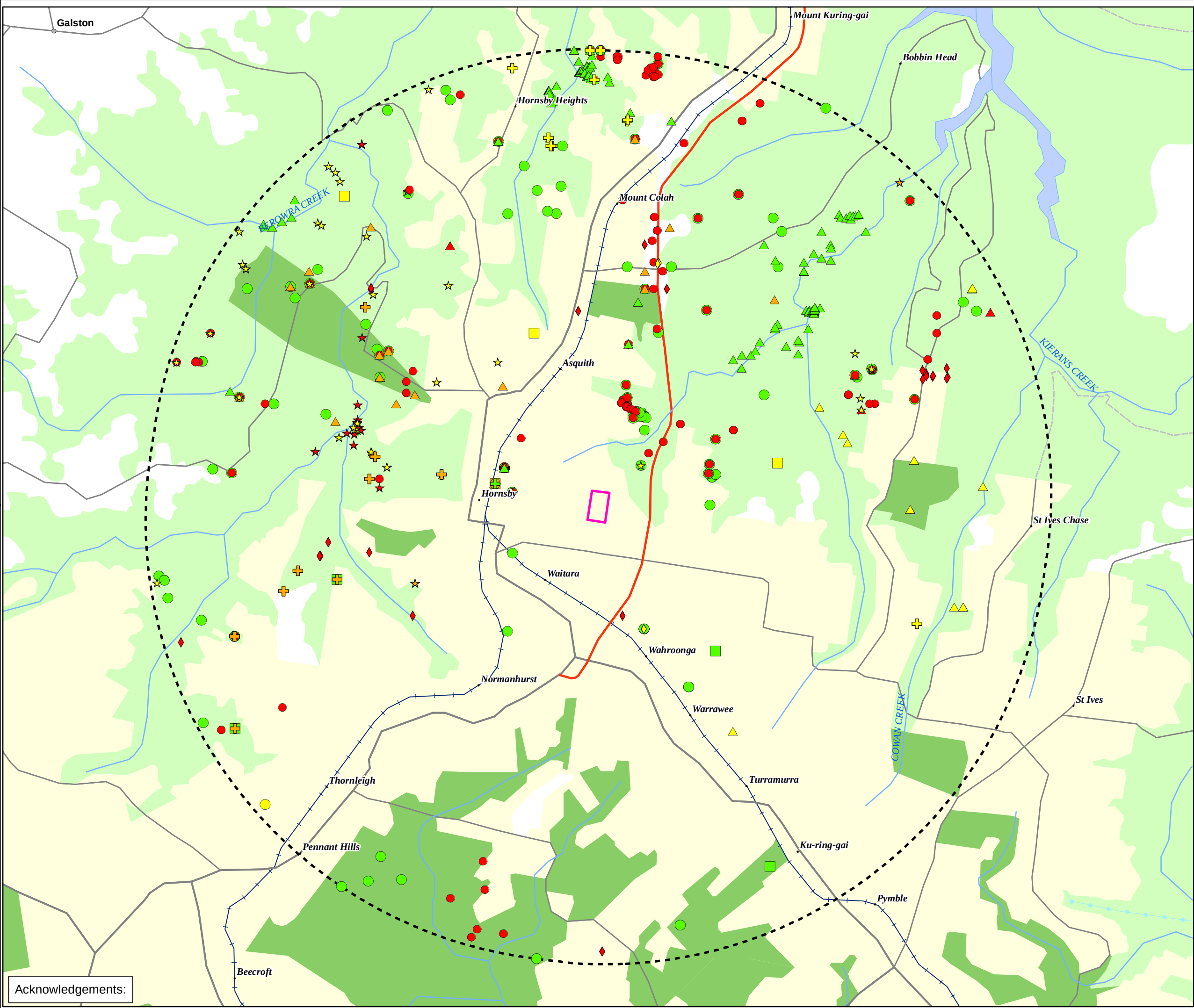
- Sydney Turpentine Ironbark Forest (individual tree)
- ▨ Sydney Turpentine Ironbark Forest
- ▭ Subject Site
- ▭ Study Area

**Figure 4: Sydney Turpentine Ironbark Forest threatened ecological community recorded in proximity to proposed building upgrades within the study area**

Acknowledgements: Imagery (c) Nearmap  
Copyright:© 2012 Esri, DeLorme, NAVTEQ, TomTom

Date: 11 September 2012  
Checked by: JKD  
Drawn by: JMS  
File number: 15385  
Path: P:\15300s\15385\Mapping\15385\_F4\_TEC.mxd





**Legend**

Threatened Flora

- ▲ *Acacia bynoeana*
- ✚ *Acacia gordonii*
- *Callistemon linearifolius*
- *Darwinia biflora*
- ★ *Darwinia peduncularis*
- ◆ *Epacris purpurascens* var. *purpurascens*
- ▲ *Eucalyptus camfieldii*
- ✚ *Galium australe*
- *Genoplesium baueri*
- *Genoplesium plumosum*
- ★ *Grammitis stenophylla*
- ◆ *Grevillea caleyi*
- ▲ *Haloragodendron lucasii*
- ✚ *Lasiopetalum joyceae*
- *Leptospermum deanei*
- *Melaleuca biconvexa*
- ★ *Melaleuca deanei*
- ◆ *Persoonia hirsuta*
- ▲ *Persoonia mollis* subsp. *maxima*
- ✚ *Pterostylis nigricans*
- *Syzygium paniculatum*
- *Tetratheca glandulosa*

- Study Area
- 5km Locality

**Figure 5: Threatened Flora within 5km of the study**

0 400 800 1,200 1,600 2,000

Metres  
Scale: 1:40,000 @ A3  
Coordinate System: GDA 1994 MGA Zone 56

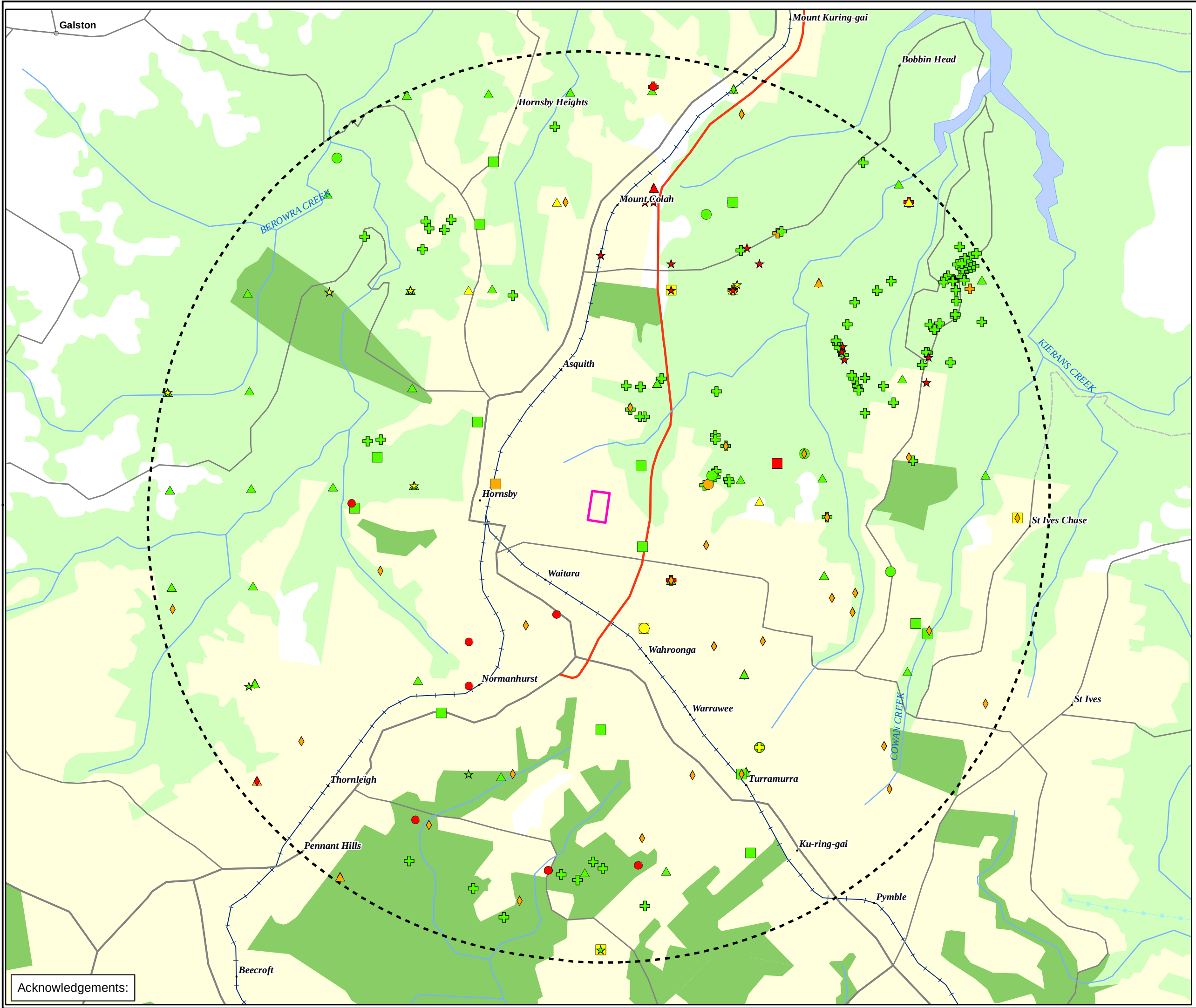


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Acknowledgements:

Date: 04 September 2012, File number: 15385  
Checked by: JKD, Drawn by: JMS  
Location: P:\15300s\15385\Mapping\15385\_F5\_ThrFlora.mxd



**Legend**

Threatened and Migratory Fauna

- ▲ Barking Owl
- ⊕ Broad-billed Sandpiper
- Curlew Sandpiper
- Eastern Bentwing-bat
- ★ Eastern Pygmy-possum
- ◆ Gang-gang Cockatoo
- ▲ Gang-gang Cockatoo population in the Hornsby and Ku-ring-gai Local Government Areas
- ⊕ Giant Burrowing Frog
- Glossy Black-Cockatoo
- Green and Golden Bell Frog
- ★ Grey Falcon
- ◆ Grey-headed Flying-fox
- ▲ Koala
- ⊕ Large-eared Pied Bat
- Little Eagle
- Little Lorikeet
- ★ Masked Owl
- ◆ Pied Oystercatcher
- ▲ Powerful Owl
- ⊕ Red-crowned Toadlet
- Regent Honeyeater
- Rosenbergs Goanna
- ★ Scarlet Robin
- ◆ Sooty Owl
- ▲ Sooty Oystercatcher
- ⊕ Southern Brown Bandicoot (eastern)
- Spotted-tailed Quoll
- Superb Fruit-Dove
- ★ Superb Parrot
- ◆ Varied Sittella

Study Area (pink rectangle)

5km Locality (dashed line)

**Figure 6: Threatened and migratory fauna within 5km**

0 400 800 1,200 1,600 2,000  
Metres  
Scale: 1:40,000 @ A3  
Coordinate System: GDA 1994 MGA Zone 56

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Date: 04 September 2012, File number: 15385  
Checked by: JKD, Drawn by: JMS  
Location: P:\15300s\15385\Mapping\15385\_F6\_ThrFauna.mxd

N

Acknowledgements:

# PLATES



**Plate 1: Potential remnant trees constituting Sydney Turpentine Ironbark Forest immediately south of building 45 theatres and day surgery to be upgraded.**



**Plate 2: Tree hollow within mature Liquidamber *Liquidamber styraciflua* to be removed.**



**Plate 3: Arboreal mammal scratches on a mature Spotted Gum.**



**Plate 4: Red Mahogany in garden bed north of building 45.**



**Plate 5: Stump of remnant tree adjacent to *E.resinifera***



**Plate 6: Typical tree and shrub vegetation to be removed.**



**Plate 7: Mature Flooded Gum *Eucalyptus grandis* to be removed.**



**Plate 8: Spotted Gum with possum nest box proposed to be removed within central car park of hospital grounds.**

# APPENDICES

# Appendix 1

## Likelihood of Occurrence Criteria

**Table 2 Likelihood of occurrence criteria for threatened flora and fauna or migratory fauna species.**

| Likelihood of occurrence | Assessment Criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Low                      | <p>Species considered to have a low likelihood of occurrence include species not recorded in the field surveys that fit one or more of the following criteria:</p> <ul style="list-style-type: none"> <li>• Have not been recorded previously in the study area or locality and the study area is beyond the known distribution or range.</li> <li>• Are dependant on a narrow range or specific habitats that do not or are not likely to occur in the study area.</li> <li>• Are considered locally extinct.</li> <li>• Are a non-cryptic perennial flora species that were targeted during field surveys.</li> <li>• Are flora species that have a very limited range and highly specific dispersal mechanisms.</li> </ul>                      |
| Moderate                 | <p>Species considered to have a moderate likelihood of occurrence include species not recorded in the field surveys that fit one or more of the following criteria:</p> <ul style="list-style-type: none"> <li>• There are infrequent records for the species in the study area and locality.</li> <li>• Preferential habitats of the species are present in the study area but these are mainly in a poor or modified condition.</li> <li>• May use or occur in habitats within the study area opportunistically during seasonal migration but are unlikely to be present on permanent basis as a populations or vagrant individuals.</li> <li>• Are cryptic flowering flora species that were not seasonally targeted during surveys.</li> </ul> |
| High                     | <p>Species considered to have a high likelihood of occurrence include species recorded during the field surveys or species not recorded that fit one or more of the following criteria:</p> <ul style="list-style-type: none"> <li>• Have a high incidence of previous records in the study area and locality.</li> <li>• Preferentially use habitats that are present in the study area which are abundant and/or in good condition.</li> <li>• Resident populations are known in the study area or locality.</li> <li>• Are known to regularly use habitats of the site or locality or are highly likely to visit the site during seasonal dispersal or migration.</li> </ul>                                                                    |

## Appendix 2

### Flora Results

Flora species recorded in the study area:

| Family                         | Scientific Name                             | Common Name             |
|--------------------------------|---------------------------------------------|-------------------------|
| Native Species                 |                                             |                         |
| Myrtaceae                      | <i>Angophora costata</i>                    | Sydney Red Gum          |
| Myrtaceae                      | <i>Callistemon sp</i>                       | Bottlebrush             |
| Myrtaceae                      | <i>Callistemon viminalis</i>                | Weeping Bottlebrush     |
| Myrtaceae                      | <i>Corymbia maculata</i>                    | Spotted Gum             |
| Poaceae                        | <i>Cynodon dactylon</i>                     | Common Couch            |
| Phormiaceae                    | <i>Dianella caerulea</i>                    | Blue Flax-lily          |
| Myrtaceae                      | <i>Eucalyptus grandis</i>                   | Flooded Gum             |
| Myrtaceae                      | <i>Eucalyptus resinifera</i>                | Red Mahogany            |
| Pittosporaceae                 | <i>Hymenosporum flavum</i>                  | Native Frangipani       |
| Lomandraceae                   | <i>Lomandra longifolia</i>                  | Spiny-headed Mat-rush   |
| Myrtaceae                      | <i>Melaleuca quinquenervia</i>              | Broad-leaved Paperbark  |
| Myrtaceae                      | <i>Melaleuca styphelioides</i>              | Prickly-leaved Tea Tree |
| Meliaceae                      | <i>Melia azedarach</i>                      | White Cedar             |
| Davalliaceae                   | <i>Nephrolepis cordifolia</i>               | Fishbone Fern           |
| Pittosporaceae                 | <i>Pittosporum undulatum</i>                | Sweet Pittosporum       |
| Myrtaceae                      | <i>Syncarpia glomulifera</i>                | Turpentine              |
| Exotic Species                 |                                             |                         |
| Alliaceae                      | <i>Agapanthus praecox subsp. orientalis</i> |                         |
| Theaceae                       | <i>Camellia japonica</i>                    | Camellia                |
| Lauraceae                      | <i>Cinnamomum camphora</i>                  | Camphor Laurel          |
| Moraceae                       | <i>Ficus microcarpa</i>                     |                         |
| Fabaceae<br>(Caesalpinioideae) | <i>Gleditsia triacanthos</i>                | Honey Locust            |
| Malvaceae                      | <i>Hibiscus sp</i>                          | Low Hibiscus            |
| Bignoniaceae                   | <i>Jacaranda mimosifolia</i>                | Jacaranda               |
| Oleaceae                       | <i>Ligustrum lucidum</i>                    | Large-leaved Privet     |
| Hamamelidaceae                 | <i>Liquidambar styraciflua</i>              | Sweetgum                |
| Poaceae                        | <i>Pennisetum clandestinum</i>              | Kikuyu Grass            |
| Arecaceae                      | <i>Phoenix canariensis</i>                  | Canary Island Date Palm |
| Pinaceae                       | <i>Pinus radiata</i>                        | Radiata Pine            |
| Ericaceae                      | <i>Rhododendron spp.</i>                    | Rhododendron, Azalea    |
| Araliaceae                     | <i>Schefflera actinophylla</i>              | Umbrella Tree           |

|          |                                |                     |
|----------|--------------------------------|---------------------|
| Malaceae | <i>Spiraea cantoniensis</i>    | Reeves' meadowsweet |
| Poaceae  | <i>Stenotaphrum secundatum</i> | Buffalo Grass       |
| Ulmaceae | <i>Ulmus parvifolia</i>        | Chinese Elm         |

# APPENDIX 3

## Fauna Results

Fauna species recorded in the study area:

| Family Name     | Latin Name                      | Common Name             | Observation type |
|-----------------|---------------------------------|-------------------------|------------------|
| <b>Birds</b>    |                                 |                         |                  |
| Artamidae       | <i>Strepera graculina</i>       | Pied Currawong          | OH               |
| Meliphagidae    | <i>Manorina melanocephala</i>   | Noisy Miner             | OH               |
| Psittacidae     | <i>Trichoglossus haematodus</i> | Rainbow Lorikeet        | OH               |
| <b>Mammals</b>  |                                 |                         |                  |
| Phalangeridae   | <i>Trichosurus vulpecula</i>    | Common Brushtail Possum | S                |
| Phalangeridae   | <i>Pseudocheirus peregrinus</i> | Common Ringtail Possum  | S                |
| Canidae         | <i>Canis familiaris</i>         | Domestic Dog            | S                |
| <b>Reptiles</b> |                                 |                         |                  |
| Scincidae       | <i>Lampropholis delicata</i>    | Garden Skink            | O                |

Key: O = observed;  
H = heard; and,  
S = scat.

# APPENDIX 4

## Flora Habitat Table

**Table 3: Terrestrial flora listed on the TSC and/or EPBC Acts that may occur in the local area**

Key: 1) Listed on the EPBC Act as Extinct (X), Endangered (E) or Vulnerable (V)  
2) Listed on the TSC Act as Endangered (E1), Endangered Population (E2), Presumed Extinct (E4) or Vulnerable (V)

| Scientific name        | Common name    | EPBC status | TSC status | Year   | Species Info                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Likelihood of occurrence                                              |
|------------------------|----------------|-------------|------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|
| <i>Acacia bynoeana</i> | Bynoe's Wattle | VU          | E1         | 2001/# | <i>Acacia bynoeana</i> is found in central eastern NSW, in the following catchment regions – Hawkesbury/Nepean, Hunter/Central Rivers, Southern Rivers, and Sydney Metropolitan. More specifically it is found from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains. It has recently been found in the Colymea and Parma Creek areas west of Nowra. It seems to prefer open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and recently burnt patches. It grows in sandy clay soils often containing ironstone gravels. Main vegetation types include heath or dry sclerophyll forest on sandy soils. Associated overstorey species include <i>Corymbia gummifera</i> , <i>Corymbia maculata</i> , <i>Eucalyptus parramattensis</i> , <i>Banksia serrata</i> and <i>Angophora bakeri</i> . Flowering period is mainly summer. | Low. The study area does not provide suitable habit for this species. |
| <i>Acacia gordonii</i> |                | EN          | E1         | 1933   | Restricted to the north-west of Sydney. Has a disjunct distribution, occurring in the lower Blue Mountains in the west, and in the South Maroota/Glenorie area in the east. Occurs within the Hawkesbury, Blue Mountains and Baulkham Hills local government areas. Grows in dry sclerophyll forest and heathlands amongst or within rock platforms on sandstone outcrops. Flowers August to September and produces fruit October to February.                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Low. The study area does not provide suitable habit for this species. |

| Scientific name                  | Common name            | EPBC status | TSC status | Year | Species Info                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Likelihood of occurrence                                                                                                                         |
|----------------------------------|------------------------|-------------|------------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Asterolasia elegans</i>       |                        | EN          | E1         | #    | Occurs north of Sydney, in the Baulkham Hills, Hawkesbury and Hornsby local government areas. Also likely to occur in the western part of Gosford LGA. Known from only six populations in the catchments of the Colo and Hawkesbury Rivers, only one of which is wholly within a conservation reserve. Found in sheltered forests on mid- to lower slopes and valleys which support sheltered forest on Hawkesbury Sandstone. The canopy at known sites includes <i>Syncarpia glomulifera</i> , <i>Angophora costata</i> , <i>Eucalyptus piperita</i> , <i>Allocasuarina torulosa</i> and <i>Ceratopetalum gummiferum</i> . The species is considered to be fire sensitive and reliant on seed germination after disturbance to maintain populations. A soil seedbank appears to be established by this species, so for a number of years following fire or other disturbance the species may not be apparent, but be present only as seed in the soil. The size of the seedbank depends not only on the amount of seed contributed by mature plants each season, but on the level of dormancy of the seed which can vary from year to year. The longevity of each crop of seed in the soil is perhaps 5 - 10 years. | Low. The study area does not provide suitable habit for this species. No historical records within the locality.                                 |
| <i>Callistemon linearifolius</i> | Netted Bottle Brush    |             | V          | 1914 | Occurs chiefly from Georges River to the Hawkesbury River where it grows in dry sclerophyll forest (Harden 2002), open forest, scrubland (Fairley and Moore 2000) or woodland on sandstone. Found in damp places, usually in gullies (Robinson, 1994                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Low. The study area does not provide suitable habit for this species.                                                                            |
| <i>Cryptostylis hunteriana</i>   | Leafless Tongue Orchid | VU          | V          | #    | This species typically grows in swamp-heath on sandy soils chiefly in coastal districts but has also been recorded on steep bare hillsides. Within the Central Coast bioregion, this species has been recorded within Coastal Plains Smooth-barked Apple Woodland and Coastal Plains Scribbly Gum Woodland. This species does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland. The larger populations typically occur in woodland dominated by <i>Eucalyptus sclerophylla</i> , <i>E. sieberi</i> , <i>Corymbia gummifera</i> and <i>Allocasuarina littoralis</i> ; appears to prefer open areas in the understorey of this community and is often found in association with the <i>Cryptostylis subulata</i> .<br>It occurs in the following Catchment Management Regions<br>Hawkesbury/Nepean, Hunter/Central Rivers, Northern Rivers and Southern Rivers. Inconsistent flowering times Dec-February; Jan-February (in Victoria)                                                                                                                                                                                                  | Low. The study area does not provide suitable habit for this species. Associated species not present. No historical records within the locality. |

| Scientific name                                      | Common name              | EPBC status | TSC status | Year   | Species Info                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Likelihood of occurrence                                                                                                                        |
|------------------------------------------------------|--------------------------|-------------|------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Darwinia biflora</i>                              |                          | VU          | V          | 2009/# | Occurs in the following Catchment Management Authority Regions - Hawkesbury/Nepean and Sydney Metropolitan. Is found on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone. Most sites are on the Lucas Heights Soil Landscape where this intergrades with either the Gynea or the Hawkesbury Soil Landscapes. Vegetation communities include: Sydney Coastal Dry Sclerophyll Forest and Sydney Coastal Heaths. Associated overstorey species include <i>Eucalyptus haemastoma</i> , <i>Corymbia gummifera</i> and/or <i>E. squamosa</i> . Prefers moist shallow depressions. Flowering occurs throughout the year but is concentrated in autumn, with mature fruits being produced from May to August.         | Low. Many records within the locality however the study area does not provide suitable habitat for this species.                                |
| <i>Darwinia peduncularis</i>                         |                          |             | V          | 2009   | Occurs in the Hawkesbury/Nepean Catchment area, from Hornsby to Hawkesbury River and west to near Glen Davis. It grows in dry sclerophyll forest on sandstone hillsides and ridges (Harden 2002). Usually grows on or near rocky outcrops on sandy, well drained soil.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Low. Although recent records fall within the locality, the landscaped areas of the study area do not provide suitable habitat for this species. |
| <i>Epacris purpurascens</i> var. <i>purpurascens</i> |                          |             | V          | 2009   | Located in the Hawkesbury/Nepean, Hunter/Central Rivers/and Sydney Metropolitan catchment authority region - from Gosford in the north, to Narrabeen in the east, Silverdale in the west and Avon Dam vicinity in the South (DEC 2005d).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Low. The study area does not provide suitable habit for this species.                                                                           |
| <i>Eucalyptus camfieldii</i>                         | Heart-leaved Stringybark | VU          | V          | 2003/# | Restricted distribution in a narrow band from Waterfall in the south to Raymond Terrace in the north. Localised and scattered distribution in the following Catchment Management Authority Regions - Hawkesbury/Nepean, Hunter/Central Rivers, and Sydney Metropolitan. Grows in Dry Sclerophyll forest and coastal heath, in shallow sandy soils overlying exposed Hawkesbury sandstone. Occurring mainly in small scattered stands near the boundary of tall coastal heaths and low open woodland of the slightly more fertile inland areas. Associated species frequently include stunted species of <i>Eucalyptus oblonga</i> , <i>E. capitellata</i> and <i>E. haemastoma</i> . Flowering period is irregular, flowers recorded throughout the year. | Low. The study area does not provide suitable habit for this species.                                                                           |
| <i>Galium australe</i>                               | Tangled Bedstraw         |             | E1         | 2011   | In NSW Tangled Bedstraw has been found in moist gullies of tall forest, <i>Eucalyptus tereticornis</i> forest, coastal Banksia shrubland, and Allocasuarina nana heathland. (DEC 2005e). Known from the Towamba Valley near Bega, Lake Yarrunga near Kangaroo                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Low. No suitable habitat within the study area.                                                                                                 |

| Scientific name                | Common name             | EPBC status | TSC status | Year   | Species Info                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Likelihood of occurrence                                                                                                      |
|--------------------------------|-------------------------|-------------|------------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| <i>Genoplesium baueri</i>      | Bauer's Midge Orchid    |             | V          | 2009   | This terrestrial orchid species grows in open sclerophyll forest or moss gardens on sandstone. Typically the habitat is a drier heathy forest (Harden 1993) (Bishop 1996). The species has been recorded from locations between Nowra and Pittwater.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Low. No suitable habitat within the study area.                                                                               |
| <i>Genoplesium plumosum</i>    | Tallong Midge Orchid    | EN          | E4A        | 1949   | The Tallong Midge Orchid was originally collected at Kurnell in 1947; presumably it also occurred south of there, but it is now only known from two areas - the village of Tallong and its immediate environs, and a site in Morton National Park.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Low. Current known populations are in south west NSW.                                                                         |
| <i>Grammitis stenophylla</i>   | Narrow-leaf Finger Fern |             | E1         | 2005   | Occurs in eastern NSW in the Sydney Metropolitan, Hawkesbury/Nepean, and Northern Rivers Catchment. It has been found on the south, central and north coasts and as far west as Mount Kaputar National Park near Narrabrai (DEC 2005g).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Low. No suitable habitat within the study area.                                                                               |
| <i>Grevillea caleyi</i>        | Caley's Grevillea       | EN          | E1         | 1917   | Occurs in Hawkesbury/Nepean and Sydney Metropolitan Catchment Authority Regions. Restricted to an 8km square area around Terrey Hills, approximately 20km north of Sydney. Occurs in three major areas of suitable habitat, namely Belrose, Ingleside and Terrey Hills/Duffys Forest within the Ku-ring-gai, Pittwater and Warringah Local Government Areas. All sites occur on ridge tops in association with laterite soils and a vegetation community of open forest, generally dominated by <i>Eucalyptus sieberi</i> and <i>E. gummifera</i> . Commonly found in the endangered Duffys Forest ecological community. Killed by fire and relies entirely on seed that is stored in the soil for regeneration. Generally seedlings do not flower and produce seed before 2-5 years of age. Flowering is sporadic throughout the year, but with a definite spring pulse. | Low. The only record within the locality is almost a century old. No habitat and no associated species within the study area. |
| <i>Haloragodendron lucasii</i> |                         | EN          | E1         | 1996/# | Grows in dry sclerophyll forest or low open woodland on sheltered sandstone slopes near creeks in moist sandy loam soil. Associated with high soil moisture and relatively high soil-phosphorus levels. Often found below cliff lines with an understorey of ferns and sedges. The known locations of this species are confined to a very narrow distribution on the north shore of Sydney in St Ives and Turramurra. Catchment Management Regions include Sydney Metropolitan, and Hawkesbury/Nepean.                                                                                                                                                                                                                                                                                                                                                                    | Low. The study area does not provide suitable habitat for this species.                                                       |

| Scientific name             | Common name        | EPBC status | TSC status | Year   | Species Info                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Likelihood of occurrence                                                                          |
|-----------------------------|--------------------|-------------|------------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| <i>Lasiopetalum joyceae</i> |                    | VU          | V          | 2004/# | Grows in heath and open woodland in sandy soils on sandstone. Occurs on lateritic to shaley ridgetops of the Hornsby Plateau. It is currently known from 34 sites between Berrilee and Duffys Forest. Seventeen of these are reserved.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Low. The study area does not provide suitable habit for this species.                             |
| <i>Leptospermum deanei</i>  |                    | VU          | V          | #/1984 | The species grows on sandy alluvial soils and sand over sandstone on lower hill slopes and riparian zones. Associated vegetation communities include riparian shrubland, woodland and open forest. Associated species in riparian scrub are <i>Tristaniopsis laurina</i> and <i>Baeckea myrtifolia</i> ; woodland species include <i>Eucalyptus haemastoma</i> ; and open forest species are <i>Angophora costata</i> , <i>Leptospermum trinervium</i> , and <i>Banksia ericifolia</i> . This species occurs within the Hawkesbury/Nepean and Sydney Metro (NSW) Natural Resource Management Regions. Main occurrences around Hornsby, Warringah, Ku-ring-gai and Ryde LGAs. Flowers October-November. Probably killed by fire. | Low. This species is unlikely to be present in the highly modified landscape of Hornsby Hospital. |
| <i>Melaleuca biconvexa</i>  | Biconvex Paperbark | VU          | V          | 2008/# | Biconvex Paperbark is only found in NSW, with scattered and dispersed populations found in the Jervis Bay area in the south and the Gosford-Wyong area in the north. Catchment regions include: Hunter/Central Rivers, Hawkesbury/Nepean, Southern Rivers, and Northern River Catchments. Biconvex Paperbark generally grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects. Flowering occurs over just 3-4 weeks in September and October.                                                                                                                                                                                                                         | Low. This species is unlikely to be present in the highly modified landscape of Hornsby Hospital. |
| <i>Melaleuca deanei</i>     | Deane's Paperbark  | VU          | V          | 2005/# | <i>Melaleuca deanei</i> occurs in Catchment Management Regions Hawkesbury/Nepean, Southern Rivers, and Sydney Metropolitan. Distinctly it occurs in the Ku-ring-gai/Berowra and Holsworthy/Wedderburn areas. There are also more isolated occurrences at Springwood (in the Blue Mountains), Wollemi National Park, Yalwal (west of Nowra) and Central Coast (Hawkesbury River) areas. The species grows in wet heath on sandstone and Dry Sclerophyll Forests. Flowers appear in summer but seed production appears to be small and consequently the species exhibits a limited capacity to regenerate.                                                                                                                        | Low. This species is unlikely to be present in the highly modified landscape of Hornsby Hospital. |

| Scientific name                                            | Common name   | EPBC status | TSC status | Year   | Species Info                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Likelihood of occurrence                                                                                                                                     |
|------------------------------------------------------------|---------------|-------------|------------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Pelargonium</i> sp. <i>Striatellum</i> (G.W.Carr 10345) |               | EN          | E1         | #      | Omeo Storksbill Pelargonium sp. (G.W. Carr 10345), syn. <i>P. striatellum</i> , is a tufted perennial forb with leaves in basal rosettes arising from fleshy, often extensively branched rhizomes. Plants occur in clonal colonies that may be up to several metres wide. Known from only 3 locations in NSW, with two on lake-beds on the basalt plains of the Monaro and one at Lake Bathurst. A population at a fourth known site on the Monaro has not been seen in recent years. The only other known population is at Lake Omeo, Victoria. It occurs at altitudes between 680 to 1030 m. It is known to occur in the local government areas of Goulburn-Mulwaree, Cooma-Monaro, and Snowy River, but may occur in other areas with suitable habitat; these may include Bombala, Eurobodalla, Palerang, Tumbarumba, Tumut, Upper Lachlan, and Yass Valley local government areas. | Low. This species is unlikely to be present in the highly modified landscape of Hornsby Hospital.                                                            |
| <i>Persoonia hirsuta</i>                                   | Hairy Geebung | EN          | E1         | 2000/# | Occurs from Gosford to Royal NP and in the Putty district from Hill Top to Glen Davis where it grows in woodland to dry sclerophyll forest on sandstone or rarely on shale. Two subspecies are recognised, <i>P. hirsuta</i> ssp. <i>hirsuta</i> (Gosford to Berowra and Manly to Royal NP) and <i>P. hirsuta</i> ssp. <i>evoluta</i> (Blue Mountains, Woronora Plateau and Southern Highlands). Found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone and shale-sandstone transition areas.                                                                                                                                                                                                                                                                                                                                                            | Low. This species is unlikely to be present in the highly modified landscape of Hornsby Hospital.                                                            |
| <i>Persoonia mollis</i> subsp. <i>maxima</i>               |               | EN          | E1         | 2008/# | Grows in dry to wet sclerophyll forest or woodland on Hawkesbury sandstone. Highly restricted, known from the Hornsby Heights and Mt Colah. Occurs in sheltered aspects of deep gullies or on the steep upper hillsides of narrow gullies on Hawkesbury Sandstone. These habitats support relatively moist, tall forest vegetation communities, often with warm temperate rainforest influences. Flowers late December to March.                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Low. This species is unlikely to be present in the highly modified landscape of Hornsby Hospital.                                                            |
| <i>Pimelea curviflora</i> var. <i>curviflora</i>           |               | VU          | V          | #      | Occurring in Hawkesbury/Nepean and Sydney Metropolitan Catchment Authority Areas. Confined to the coastal area of Sydney between northern Sydney in the south and Maroota in the north-west. Occurs on lateritic soils and shale-sandstone transition soils on ridge tops in woodland. Associated with Dry Sclerophyll forests and Coastal valley grassy woodlands. Has an inconspicuous cryptic habit as it is fine and scraggly and often grows amongst dense grasses and sedges. It may not always be visible at a site as it appears to survive for some time without any foliage after fire or grazing, relying on energy reserves in its tuberous roots. Flowers October to May.                                                                                                                                                                                                 | Low. This species has not been historically recorded within the locality and is unlikely to be present in the highly modified landscape of Hornsby Hospital. |

| Scientific name               | Common name        | EPBC status | TSC status | Year | Species Info                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Likelihood of occurrence                                                                                                                                                    |
|-------------------------------|--------------------|-------------|------------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Pimelea spicata</i>        | Spiked Rice-flower | EN          | E1         | #    | <p>Once widespread on the Cumberland Plain, <i>Pimelea spicata</i> occurs in two disjunct areas, the Cumberland Plain and the Illawarra. Catchment areas are Hawkesbury/Nepean, Southern Rivers, and Sydney Metropolitan Catchment. In western Sydney, <i>P. spicata</i> occurs on an undulating topography of substrates derived from Wianamatta Shale in areas supporting, or that previously supported, the Cumberland Plain Woodland Vegetation Community. Associated species include: <i>Eucalyptus moluccana</i>, <i>E. tereticornis</i>, <i>E. crebra</i>, <i>Bursaria spinosa</i>, and <i>Themeda australis</i>.</p> <p>In the Illawarra region, <i>P. spicata</i> is found in open woodland and also in coastal grassland communities with emergent shrubs. Dominant species within the woodland habitat include <i>Eucalyptus tereticornis</i>, <i>E. eugenioides</i>, <i>Themeda australis</i>, and <i>Lomandra longifolia</i>. In the coastal Illawarra it occurs commonly in Coast Banksia open woodland with a more well developed shrub and grass understorey.</p> <p><i>Pimelea spicata</i> flowers sporadically throughout the year, with flowering likely to depend upon climatic conditions, particularly rainfall. Flowering times recorded for <i>P. spicata</i> vary. Rye (1990) noted flowering period as May - January; Benson and McDougall (2001) noted peak flowering period as March/ April.</p> | Low. This species has not been historically recorded within the locality and is unlikely to be present in the highly modified landscape of Hornsby Hospital.                |
| <i>Prostanthera marifolia</i> | Seaforth Mintbush  | CE          | E4A        | #    | <p>Grows in sclerophyll forest and woodland, usually near the coast, in sandy loamy soils, overlying sandstone; confined to the Sydney district. This species was previously recorded from the Sydney harbour region and was presumed extinct. All attempts to recollect this species were unsuccessful until 2001. Woodland dominated by <i>Eucalyptus sieberi</i> and <i>Corymbia gumnifera</i>. In deeply weathered clay soil with ironstone nodules.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Low. This species has not been historically recorded within the locality and is unlikely to be present in the highly modified landscape of Hornsby Hospital.                |
| <i>Pterostylis nigricans</i>  | Dark Greenhood     |             | V          | 1969 | <p>The Dark Greenhood occurs in north-east NSW north from Evans Head, and in Queensland. Grows in coastal heathland with Heath Banksia (<i>Banksia ericifolia</i>), and lower-growing heath with lichen-encrusted and relatively undisturbed soil surfaces, on sandy soil.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Low. The soil surface at Hornsby Hospital is highly disturbed ensuring that species such as the Dark Greenhood which do not tolerate disturbances would not be established. |

| Scientific name              | Common name         | EPBC status | TSC status | Year | Species Info                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Likelihood of occurrence                                                                                                                     |
|------------------------------|---------------------|-------------|------------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Streblus pendulinus</i>   | Whalebone Tree      | EN          |            | #    | Siah's Backbone is a tree or large shrub that grows to 6 m in height. The leaves are elliptic or egg-shaped to lanceolate, usually 5–8 cm long and 1–4 cm wide, with margins that are regularly toothed. The upper surface of the leaves may be either rough or smooth, whilst the underside is always rough. Leaves are attached by a stalk (petiole) 3–8 mm long. Siah's Backbone occurs from Cape York Peninsula to Milton, south-east New South Wales (NSW), as well as Norfolk Island. (DSEWPac 2005)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Low. This species has not been previously recorded within the locality and is unlikely to occur within the highly modified hospital grounds. |
| <i>Syzygium paniculatum</i>  | Magenta Lilly Pilly | VU          | E1         | 2008 | Subtropical and littoral rainforest on sandy soils or stabilised dunes near the sea. Found only in NSW, in a narrow, linear coastal strip from Bulahdelah to Conjola State Forest. On the south coast the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest. On the central coast Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities. The species occurs in the following Catchment Authority Regions - Hunter/Central Rivers, Hawkesbury/Nepean, Sydney Metropolitan, and Southern Rivers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Low. No littoral rainforest remnants occur within the study area.                                                                            |
| <i>Tetratheca glandulosa</i> |                     | VU          | V          | #    | Occurs in Hawkesbury/Nepean, Hunter/Central Rivers, Sydney Metropolitan Catchment Authority Regions. Restricted to the following Local Government Areas: Baulkham Hills, Gosford, Hawkesbury, Hornsby, Ku-ring-gai, Pittwater, Ryde, Warringah, and Wyong. Associated with shale-sandstone transition habitat where shale-capping occur over sandstone, with associated soil landscapes such as Lucas Heights, Gynea, Lambert and Faulconbridge. Topographically, the plant occupies ridgetops, upper-slopes and to a lesser extent mid-slope sandstone benches. Soils are generally shallow, consisting of a yellow, clayey/sandy loam. Stony lateritic fragments are also common in the soil profile on many of these ridgetops. Vegetation structure varies from heaths and scrub to woodlands/open woodlands, and open forest. Vegetation communities correspond broadly to Benson & Howell's (2004) Sydney Sandstone Ridgetop Woodland. Common woodland tree species include: <i>Corymbia gummifera</i> , <i>C. eximia</i> , <i>Eucalyptus haemastoma</i> , <i>E. punctata</i> , <i>E. racemosa</i> , and/or <i>E. sparsifolia</i> , with an understorey dominated by species from the families Proteaceae, Fabaceae, and Epacridaceae. Flowers July-November however residual flowers may persist until late December. | Low. This species has not been previously recorded within the locality and is unlikely to occur within the highly modified hospital grounds. |

# APPENDIX 5

## Fauna Habitat Table

**Table 4: Terrestrial fauna listed on the TSC and/or EPBC Acts that may occur in the local area**

Key: 1) Listed on the EPBC Act as Endangered (EN), Vulnerable (VU) or covered under migratory provisions (Mi) on the EPBC Act.  
2) Listed on the TSC Act as Endangered (E1), Critically Endangered (E4A), Endangered Population (E2) or Vulnerable (V).

| Scientific Name            | Common Name       | Year   | EPBC Status <sup>1</sup> | TSC Act Status <sup>2</sup> | Habitat                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Likelihood of occurrence in study area                                                                                                                                                             |
|----------------------------|-------------------|--------|--------------------------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Birds</b>               |                   |        |                          |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                    |
| <i>Anthochaera phrygia</i> | Regent Honeyeater | 1998/# | EN/Mi                    | E4A                         | A semi-nomadic species occurring in temperate eucalypt woodlands and open forests. Most records are from box-ironbark eucalypt forest associations and wet lowland coastal forests (NPWS 1999d; Pizzey and Knight 1997). Key eucalypt species include Mugga Ironbark, Yellow Box, Blakely's Red Gum, White Box and Swamp Mahogany. Also utilises: <i>E. microcarpa</i> , <i>E. punctata</i> , <i>E. polyanthemus</i> , <i>E. mollucana</i> , <i>Corymbia robusta</i> , <i>E. crebra</i> , <i>E. caleyi</i> , <i>C. maculata</i> , <i>E. mckieana</i> , <i>E. macrorhyncha</i> , <i>E. laevopinea</i> and <i>Angophora floribunda</i> . Nectar and fruit from the mistletoes <i>A. miquelii</i> , <i>A. pendula</i> , <i>A. cambagei</i> are also eaten during the breeding season (DEC 2005m). Regent Honeyeaters usually nest in horizontal branches or forks in tall mature eucalypts and sheoaks. Also nest in mistletoe haustoria. An open cup-shaped nest is constructed of bark, grass, twigs and wool by the female (DEC 2005m). | Moderate. Some mature preferred feed trees occur within the study area. Approximately 13 records of this species have been recorded within the locality. The most recent of these dates from 1998. |
| <i>Apus pacificus</i>      | Fork-tailed Swift | #/1987 | Mi                       | -                           | Almost exclusively aerial. The Fork-tailed Swift breeds in Asia but migrates to Australia from September to April (Higgins 1999). Individuals or flocks can be observed hawking for insects at varying heights from only a few metres from the ground and up to 300 metres high (Boehm 1944).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Low. Low quality foraging habitats occur throughout the study area. No recent records of this species occur within the locality.                                                                   |

| Scientific Name                 | Common Name            | Year | EPBC Status <sup>1</sup> | TSC Act Status <sup>2</sup> | Habitat                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Likelihood of occurrence in study area                                                                                                                                  |
|---------------------------------|------------------------|------|--------------------------|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Ardea modesta</i>            | Eastern Great Egret    | #    | Mi                       | -                           | Terrestrial wetlands, estuarine and littoral habitats and moist grasslands. Inland, prefer permanent waterbodies on floodplains; shallows of deep permanent lakes (either open or vegetated), semi-permanent swamps with tall emergent vegetation and herb dominated seasonal swamps with abundant aquatic flora. Also regularly use saline habitats including mangrove forests, estuarine mudflats, saltmarshes, bare salt pans, shallows of salt lakes, salt fields and offshore reefs. Breeding requires wetlands with fringing trees in which to build nests including mangrove forest, freshwater lakes or swamps and rivers (Marchant and Higgins 1990). | Low. No suitable habitats occur within the study area.                                                                                                                  |
| <i>Botaurus poiciloptilus</i>   | Australasian Bittern   | #    | EN                       | E1                          | The Australasian Bittern is distributed across south-eastern Australia. Often found in terrestrial and estuarine wetlands, generally where there is permanent water with tall, dense vegetation including <i>Typha</i> spp. and <i>Eleocharis</i> spp. (DEC 2005a; NPWS 1999a). Typically this bird forages at night on frogs, fish and invertebrates, and remains inconspicuous during the day. The breeding season extends from October to January with nests being built amongst dense vegetation on a flattened platform of reeds (DEC 2005a).                                                                                                             | Low. No suitable habitats occur within the study area.                                                                                                                  |
| <i>Calidris acuminata</i>       | Sharp-tailed Sandpiper | 2006 | Mi                       |                             | Inland waters, coastal (Simpson and Day 1996).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Low. No suitable habitats occur within the study area.                                                                                                                  |
| <i>Calidris ferruginea</i>      | Curlew Sandpiper       | 1993 | Mi                       | E1                          | Inhabits sheltered intertidal mudflats. Also non-tidal swamps, lagoons and lakes near the coast. Infrequently recorded inland (Higgins and Davies 1996).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Low. No suitable habitats occur within the study area.                                                                                                                  |
| <i>Callocephalon fimbriatum</i> | Gang-gang Cockatoo     | 2006 | -                        | E2, V                       | In summer, occupies tall montane forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests (Higgins 1999). Also occur in subalpine Snow Gum woodland and occasionally in temperate or regenerating forest (Forshaw and Cooper 1981). In winter, occurs at lower altitudes in drier, more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas (Shields and Crome 1992). It requires tree hollows in which to breed (Gibbons and Lindenmayer 1997).                                                                                                                | Low. One record of this species occurs approximately 5 km south-west of the study area. No tree hollow suitable for the Gang-gang Cockatoo occur within the study area. |

| Scientific Name                  | Common Name           | Year | EPBC Status <sup>1</sup> | TSC Act Status <sup>2</sup> | Habitat                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Likelihood of occurrence in study area                                                                                                                                                                                          |
|----------------------------------|-----------------------|------|--------------------------|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Calyptorhynchus lathamii</i>  | Glossy Black-Cockatoo | 2006 | -                        | V                           | Inhabits forest with low nutrients, characteristically with key <i>Allocasuarina</i> species. Tends to prefer drier forest types (NPWS 1999b). Often confined to remnant patches in hills and gullies. Breed in hollows stumps or limbs, either living or dead (Higgins 1999).                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Moderate. One record of this species occurs within the locality approximately 1 km west of the study area. A small stand of preferred feed tree <i>Allocasuarina torulosa</i> occurs on the western boundary of the study area. |
| <i>Charadrius bicinctus</i>      | Double-banded Plover  | 1982 | Mi                       | -                           | Tidal mudflats, beaches, exposed reefs, salt marshes, freshwater wetlands, inland salt lakes, short grass on golf courses, airfields (Morcombe 2003).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Low. Not preferred habitat on site and no recent records within the locality.                                                                                                                                                   |
| <i>Cuculus saturatus</i>         | Himalayan Cuckoo      | 1982 | Mi                       | -                           | Canopy or shrub layer of monsoon rainforest, vine thickets, wet sclerophyll forest, or open casuarina, Acacia or Eucalyptus woodland (Higgins 1999).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Low. Not preferred habitat on site and no recent records within the locality.                                                                                                                                                   |
| <i>Daphoenositta chrysoptera</i> | Varied Sittella       | 2002 | -                        | V                           | The Varied Sittella is a sedentary species which inhabits a wide variety of dry eucalypt forests and woodlands, usually with either shrubby understorey or grassy ground cover or both, in all climatic zones of Australia. Usually inhabit areas with rough-barked trees, such as stringybarks or ironbarks, but also in mallee and acacia woodlands, paperbarks or mature Eucalypts (Higgins and Peter 2002; NSW Scientific Committee 2010b). The Varied Sittella feeds on arthropods gleaned from bark, small branches and twigs. It builds a cup-shaped nest of plant fibres and cobweb in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years (NSW Scientific Committee 2010b). | Low. Not preferred habitat on site.                                                                                                                                                                                             |
| <i>Dasyornis brachypterus</i>    | Eastern Bristlebird   | #    | EN                       | E1                          | Found in coastal woodlands, dense scrub and heathlands, particularly where it borders taller woodlands (Pizzey and Knight 1997).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Low. No records within the locality and no preferred habitat occurs on site.                                                                                                                                                    |

| Scientific Name                  | Common Name         | Year | EPBC Status <sup>1</sup> | TSC Act Status <sup>2</sup> | Habitat                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Likelihood of occurrence in study area                                              |
|----------------------------------|---------------------|------|--------------------------|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| <i>Erythrotriorchis radiatus</i> | Red Goshawk         | #    | VU                       | E4A                         | Occur in forest and woodland habitat near permanent water. In NSW prefer Melaleuca swamp forest and open eucalypt woodland (Marchant and Higgins 1993). Require greater than 20 m tall trees for nesting (Marchant and Higgins 1993).                                                                                                                                                                                                                                                                                                                                           | Low. No records within the locality and no preferred habitat occurs on site.        |
| <i>Falco hypoleucos</i>          | Grey Falcon         | 1960 | -                        | E1                          | Found over open country and wooded lands of tropical and temperate Australia. Mainly found on sandy and stony plains of inland drainage systems with lightly timbered acacia scrub (Marchant and Higgins 1993).                                                                                                                                                                                                                                                                                                                                                                 | Low. No recent records within the locality and no preferred habitat occurs on site. |
| <i>Glossopsitta pusilla</i>      | Little Lorikeet     | 1986 | -                        | V                           | Distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range in NSW, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri. Mostly occur in dry, open eucalypt forests and woodlands. They feed primarily on nectar and pollen in the tree canopy. Nest hollows are located at heights of between 2 m and 15 m, mostly in living, smooth-barked eucalypts. Most breeding records come from the western slopes (NSW Scientific Committee 2008).                                                                     | Low. No recent records within the locality and no preferred habitat occurs on site. |
| <i>Haematopus fuliginosus</i>    | Sooty Oystercatcher | 1974 | -                        | V                           | The Sooty Oystercatcher is found on undisturbed tidal rocks on ocean shores and islands. Occasionally it is observed on sandspits and mudflats (Pizzey and Knight 1997). It forages on exposed rock or coral at low tide for limpets and mussels. The Sooty Oystercatcher breeds in spring and summer almost exclusively offshore or on isolated promontories (DECCW 2005)                                                                                                                                                                                                      | Low. No preferred habitat occurs on site.                                           |
| <i>Haematopus longirostris</i>   | Pied Oystercatcher  | 1972 | -                        | E1                          | An intertidal forager found on undisturbed sandy beaches and spits, tidal mudflats and estuaries. Its food supply (beach macroinvertebrates) have been negatively affected by human impacts (NSW Scientific Committee 2010a). The Pied Oystercatcher is restricted to the littoral zone of beaches and estuaries, nesting on the ground above the tideline. A pair will re-nest in the same spot each year, rarely shifting their territory (NSW Scientific Committee 2010a). Occasionally the Pied Oystercatcher is found in paddocks near the coast (Pizzey and Knight 1997). | Low. No preferred habitat occurs on site.                                           |

| Scientific Name               | Common Name               | Year   | EPBC Status <sup>1</sup> | TSC Act Status <sup>2</sup> | Habitat                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Likelihood of occurrence in study area                                                                                                                                            |
|-------------------------------|---------------------------|--------|--------------------------|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Haliaeetus leucogaster</i> | White-bellied Sea-Eagle   | #/1994 | Mi                       | -                           | A migratory species that is generally sedentary in Australia, although immature individuals and some adults are dispersive (Marchant and Higgins 1993). Found in terrestrial and coastal wetlands; favouring deep freshwater swamps, lakes and reservoirs; shallow coastal lagoons and saltmarshes. It hunts over open terrestrial habitats. Feeds on birds, reptiles, fish, mammals, crustaceans and carrion. Roosts and makes nest in trees (Marchant and Higgins 1993).                                                                                                                                                                                                                                                                                                                                                                                                                 | Low. No preferred habitat occurs on site or recent records occur within the locality.                                                                                             |
| <i>Hieraaetus morphnoides</i> | Little Eagle              | 2002   | -                        | V                           | The Little Eagle is most abundant in lightly timbered areas with open areas nearby providing an abundance of prey species (NSW Scientific Committee 2009a). It has often been recorded foraging in grasslands, crops, treeless dune fields, and recently logged areas. The Little Eagle nests in tall living trees within farmland, woodland and forests (Marchant and Higgins 1993).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Moderate. No preferred habitat occurs on site however four records occur within the locality, the closest being only 1 km south of the study area.                                |
| <i>Hirundapus caudacutus</i>  | White-throated Needletail | #/1992 | Mi                       |                             | An aerial species found in feeding concentrations over cities, hilltops and timbered ranges. Breeds in Asia (Pizzey and Knight 1997).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Low. No preferred habitat occurs on site and no recent records occur within the study area.                                                                                       |
| <i>Lathamus discolor</i>      | Swift Parrot              | #      | EN                       | E1                          | The Swift Parrot occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen and associated insects (Forshaw and Cooper 1981). The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW (Shields and Crome 1992). Favoured feed trees include winter flowering species such as Swamp Mahogany <i>Eucalyptus robusta</i> , Spotted Gum <i>Corymbia maculata</i> , Red Bloodwood <i>C. gummifera</i> , Mugga Ironbark <i>E. sideroxylon</i> , and White Box <i>E. albens</i> . Commonly used lerp infested trees include Grey Box <i>E. microcarpa</i> , Grey Box <i>E. moluccana</i> and Blackbutt <i>E. pilularis</i> (DEC 2005p). This species is migratory, breeding in Tasmania and also nomadic, moving about in response to changing food availability (Pizzey and Knight 1997). | Low. One preferred feed tree occurs within the study area however this species has not been recorded within the locality previously and is not likely to frequent the study area. |

| Scientific Name             | Common Name            | Year   | EPBC Status <sup>1</sup> | TSC Act Status <sup>2</sup> | Habitat                                                                                                                                                                                                                                                                                                                                | Likelihood of occurrence in study area                                                                                  |
|-----------------------------|------------------------|--------|--------------------------|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <i>Limicola falcinellus</i> | Broad-billed Sandpiper | 1982   | Mi                       | V                           | Occurs in sheltered parts of coasts, such as estuaries, harbours, embayments and lagoons, which have shell or sandbanks nearby (Higgins and Davies 1996).                                                                                                                                                                              | Low. No preferred habitat occurs on site.                                                                               |
| <i>Merops ornatus</i>       | Rainbow Bee-eater      | #      | Mi                       | -                           | Usually occurs in open or lightly timbered areas, often near water. Nest in embankments, including banks of creeks and rivers, in sand dunes, in quarries and in roadside cuttings. Breeding occurs from November to January. It has complex migratory movement in Australia. NSW populations migrate north for winter (Higgins 1999). | Low. No preferred habitat occurs on site.                                                                               |
| <i>Monarcha melanopsis</i>  | Black-faced Monarch    | 2008/# | Mi                       |                             | A migratory species found during the breeding season in damp gullies in temperate rainforests. Disperses after breeding into more open woodland (Pizzey and Knight 1997).                                                                                                                                                              | Moderate. This species may seasonally move through the study area on occasion.                                          |
| <i>Myiagra cyanoleuca</i>   | Satin Flycatcher       | #/2004 | Mi                       |                             | Migratory species that occurs in coastal forests, woodlands and scrubs during migration. Breeds in heavily vegetated gullies (Pizzey and Knight 1997).                                                                                                                                                                                 | Moderate. This species may seasonally move through the study area on occasion.                                          |
| <i>Ninox connivens</i>      | Barking Owl            | 2003   | -                        | V                           | Generally found in open forests, woodlands, swamp woodlands and dense scrub. Can also be found in the foothills and timber along watercourses in otherwise open country (Pizzey and Knight 1997). Territories are typically 2000 ha in NSW habitats (DEC 2005b).                                                                       | Moderate. No breeding hollows occur on site however this species may forage for prey within the study area on occasion. |

| Scientific Name             | Common Name   | Year | EPBC Status <sup>1</sup> | TSC Act Status <sup>2</sup> | Habitat                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Likelihood of occurrence in study area                                                                                                             |
|-----------------------------|---------------|------|--------------------------|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Ninox strenua</i>        | Powerful Owl  | 2010 | -                        | V                           | The Powerful Owl occupies wet and dry eucalypt forests and rainforests. It may inhabit both un-logged and lightly logged forests as well as undisturbed forests where it usually roosts on the limbs of dense trees in gully areas (Debus and Chafer 1994b; Debus and Chafer 1994a). Large mature trees with hollows at least 0.5 m deep are required for nesting (Garnett 1992). Tree hollows are particularly important for the Powerful Owl because a large proportion of the diet is made up of hollow-dependent arboreal marsupials (Gibbons and Lindenmayer 1997). Nest trees for this species are usually emergent with a diameter at breast height of at least 100 cm (Gibbons and Lindenmayer 1997). It has a large home range of between 450 and 1450 ha (DEC 2005l). | Moderate. No breeding hollows occur on site however this species may forage for prey within the study area on occasion.                            |
| <i>Petroica boodang</i>     | Scarlet Robin | 2001 | -                        | V                           | During the breeding season the Scarlet Robin is found in eucalypt forests and temperate woodlands, often on ridges and slopes. During autumn and winter it moves to more open and cleared areas. It has dispersive or locally migratory seasonal movements. The Scarlet Robin forages amongst logs and woody debris for insects which make up the majority of its diet (NSW Scientific Committee 2009b). The nest is an open cup of plant fibres and cobwebs, sited in the fork of a tree (often a dead branch in a live tree, or in a dead tree or shrub) which is usually more than 2 m above the ground (NSW Scientific Committee 2009b). It is conspicuous in open and suburban habitats (Morcombe 2003).                                                                   | Low. No understory or midstory vegetation is present to provide preferred foraging and nesting opportunities for this species.                     |
| <i>Polytelis swainsonii</i> | Superb Parrot | 1986 | VU                       | V                           | Found mainly in open, tall riparian River Red Gum forest or woodland. Often found in farmland including grazing land with patches of remnant vegetation. Breeds in hollow branches of tall Eucalypt trees within 9 km of feeding areas (Higgins 1999)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Low. No breeding hollows or preferred foraging resources occur within the study area. No recent records of this species occur within the locality. |

| Scientific Name             | Common Name              | Year   | EPBC Status <sup>1</sup> | TSC Act Status <sup>2</sup> | Habitat                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Likelihood of occurrence in study area                                                                                                                     |
|-----------------------------|--------------------------|--------|--------------------------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Ptilinopus superbus</i>  | Superb Fruit-Dove        | 1992   | -                        | V                           | The Superb Fruit Dove's NSW distribution ranges from northern NSW to as far south as Moruya (DEC 2005o). It is found in rainforests, closed forests (including mesophyll vine forests) and sometimes in eucalypt and acacia woodlands where there are fruit-bearing trees (Higgins and Davies 1996). It forages in the canopy of fruiting trees such as figs and palms. Nests are constructed high in the canopy throughout September to January (DEC 2005o).                                                                                                                                                                                                                                                                                       | Low. Some isolated palms occur on site however the surrounding sparse vegetation is unlikely to support nesting opportunities or shelter for this species. |
| <i>Rhipidura rufifrons</i>  | Rufous Fantail           | 2008/# | Mi                       | -                           | Migratory species that prefers dense, moist undergrowth of tropical rainforests and scrubs. During migration it can stray into gardens and more open areas (Pizzey and Knight 1997).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Moderate. This species may move into open landscaped gardens including the study area seasonally.                                                          |
| <i>Rostratula australis</i> | Australian Painted Snipe | #      | VU/Mi                    | E1                          | Usually found in shallow inland wetlands including farm dams, lakes, rice crops, swamps and waterlogged grassland. They prefer freshwater wetlands, ephemeral or permanent, although they have been recorded in brackish waters (Marchant and Higgins 1993).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Low. No preferred habitat occurs on site.                                                                                                                  |
| <i>Tyto novaehollandiae</i> | Masked Owl               | 1995   | -                        | V                           | The Masked Owl may be found across a diverse range of wooded habitat that provide tall or dense mature trees with hollows suitable for nesting and roosting (Higgins 1999). It has mostly been recorded in open forests and woodlands adjacent to cleared lands. They nest in hollows, in trunks and in near vertical spouts or large trees, usually living but sometimes dead (Higgins 1999). The nest hollows are usually located within dense forests or woodlands (Gibbons and Lindenmayer 1997). Masked Owls prey upon hollow-dependent arboreal marsupials, but terrestrial mammals make up the largest proportion of the diet (Gibbons and Lindenmayer 1997; Higgins 1999). It has a large home range of between 500 to 1000 ha (DEC 2005k). | Low. No breeding hollows occur on site. No recent records of this species occurs within the locality.                                                      |

| Scientific Name                  | Common Name          | Year   | EPBC Status <sup>1</sup> | TSC Act Status <sup>2</sup> | Habitat                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Likelihood of occurrence in study area                                                                                                                  |
|----------------------------------|----------------------|--------|--------------------------|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Tyto tenebricosa</i>          | Sooty Owl            | 2008   | -                        | V                           | The Sooty Owl is often found in tall old-growth forests, including temperate and subtropical rainforests. In NSW it is mostly found on escarpments with a mean altitude <500 m. The Sooty Owl nests and roosts in hollows of tall emergent trees, mainly eucalypts (Higgins 1999) often located in gullies (Gibbons and Lindenmayer 1997). Nests have been located in trees 125 to 161 cm in diameter (Gibbons and Lindenmayer 1997).                                                                                                                                                                              | Low. No breeding hollows occur within the study area. One record of this species occurs within the locality approximately 5 km north of the study area. |
| <b>Reptiles</b>                  |                      |        |                          |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                         |
| <i>Hoplocephalus bungaroides</i> | Broad-headed Snake   | #      | VU                       | E1                          | Mainly occurs in association with communities occurring on Triassic sandstone within the Sydney Basin. Typically found among exposed sandstone outcrops with vegetation types ranging from woodland to heath. Within these habitats they generally use rock crevices and exfoliating rock during the cooler months and tree hollows during summer (Webb 1996; Webb and Shine 1998).                                                                                                                                                                                                                                | Low. No suitable habitats occur within the study area.                                                                                                  |
| <i>Varanus rosenbergi</i>        | Rosenberg's Goanna   | 2009   | -                        | V                           | This species is a Hawkesbury/Narrabeen sandstone outcrop specialist (Wellington and Wells 1985). Occurs in coastal heaths, humid woodlands and both wet and dry sclerophyll forests (Cogger 1992). Termite mounds are a critical habitat component (DEC 2005n).                                                                                                                                                                                                                                                                                                                                                    | Low. No suitable habitats occur within the study area.                                                                                                  |
| <b>Amphibians</b>                |                      |        |                          |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                         |
| <i>Heleioporus australiacus</i>  | Giant Burrowing Frog | 2010/# | VU                       | V                           | Prefers hanging swamps on sandstone shelves adjacent to perennial non-flooding creeks (Daly 1996; Recsei 1996). Can also occur within shale outcrops within sandstone formations. Known from wet and dry forests and montane woodland in the southern part range (Daly 1996). Individuals can be found around sandy creek banks or foraging along ridge-tops during or directly after heavy rain. Males often call from burrows located in sandy banks next to water (Barker <i>et al.</i> 1995). Spends the majority of its time in non-breeding habitat 20-250m from breeding sites (Penman <i>et al.</i> 2008). | Low. No suitable habitats occur within the study area.                                                                                                  |

| Scientific Name            | Common Name                | Year   | EPBC Status <sup>1</sup> | TSC Act Status <sup>2</sup> | Habitat                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Likelihood of occurrence in study area                 |
|----------------------------|----------------------------|--------|--------------------------|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|
| <i>Litoria aurea</i>       | Green and Golden Bell Frog | 1998/# | VU                       | E1                          | Most existing locations for the species occur as small, coastal, or near coastal populations, with records occurring between south of Grafton and northern VIC (NSW Government 2009). The species is found in marshes, dams and stream sides, particularly those containing bullrushes or spikerushes. Preferred habitat contains water bodies that are unshaded, are free of predatory fish, have a grassy area nearby and have diurnal sheltering sites nearby such as vegetation or rocks (NPWS 1999c; White and Pyke 1996), although the species has also been recorded from highly disturbed areas including disused industrial sites, brick pits, landfill areas and cleared land. Breeding usually occurs in summer. Tadpoles, which take approximately 10-12 weeks to develop (DECC 2008), feed on algae and other vegetative matter. Adults eat insects as well as other frogs, including juveniles of their own species (DEC 2005h).                                                                                                                                                                                                                       | Low. No suitable habitats occur within the study area. |
| <i>Litoria littlejohni</i> | Littlejohn's Tree Frog     | #      | VU                       | V                           | The species is distributed along the eastern slopes of the Great Dividing Range from Watagan State Forest near Wyong, south to Buchan in north-eastern VIC. It is not known from coastal habitats (DEH 2005). Occurs in wet and dry sclerophyll forests and heath communities associated with sandstone outcrops between 280 and 1000 m (Barker <i>et al.</i> 1995). Littlejohn's Tree Frog prefers permanent and semi-permanent rock flowing streams, but individuals have also been collected from semi-permanent dams with some emergent vegetation (Barker <i>et al.</i> 1995). Forages both in the tree canopy and on the ground, and has been observed sheltering under rocks on high exposed ridges during summer. The species breeds in autumn but will also breed after heavy rainfall in spring and summer (NSW Scientific Committee 2000). The species has been recorded calling in all seasons with variously reported peak calling periods (DEH 2005). Eggs are laid in loose gelatinous masses attached to submerged twigs; eggs and tadpoles are most often recorded in slow-flowing pools that receive extended exposure to sunlight (DSEWPac 2012). | Low. No suitable habitats occur within the study area. |
| <i>Mixophyes balbus</i>    | Stuttering Frog            | #      | VU                       | E1                          | This species is usually associated with mountain streams, wet mountain forests and rainforests (Barker <i>et al.</i> 1995). It rarely moves very far from the banks of permanent forest streams, although it will forage on nearby forest floors. Eggs are deposited in leaf litter on the banks of streams and are washed into the water during heavy rains (Barker <i>et al.</i> 1995).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Low. No suitable habitats occur within the study area. |

| Scientific Name               | Common Name          | Year | EPBC Status <sup>1</sup> | TSC Act Status <sup>2</sup> | Habitat                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Likelihood of occurrence in study area                 |
|-------------------------------|----------------------|------|--------------------------|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|
| <i>Mixophyes iteratus</i>     | Giant Barred Frog    | #    | EN                       | E1                          | Occurs along coast and ranges from south-eastern Queensland to the Hawkesbury River in NSW. Found in rainforests, moist eucalypt forest and nearby dry eucalypt forest, at elevations below 1000 m, often hiding in leaf litter near permanent fast-flowing streams. Females lay eggs onto moist creek banks or rocks above water level, from where tadpoles drop into the water when hatched. When not breeding the frogs disperse hundreds of metres away from streams (DEC 2005f).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Low. No suitable habitats occur within the study area. |
| <i>Pseudophryne australis</i> | Red-crowned Toadlet  | 2005 |                          | V                           | Occurs on wetter ridge tops and upper slopes of sandstone formations on which the predominant vegetation is dry open forests and heaths. This species typically breeds within small ephemeral creeks characterised by a series of shallow pools that feed into larger semi-perennial streams (Thumm and Mahony 1997). Breeds all year round (Thumm and Mahoney 2002).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Low. No suitable habitats occur within the study area. |
| <b>Mammals</b>                |                      |      |                          |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                        |
| <i>Cercartetus nanus</i>      | Eastern Pygmy-possum | 2011 | -                        | V                           | Patchily distributed from the coast to the Great Dividing Range, and as far as Pillaga, Dubbo, Parkes and Wagga Wagga on the western slopes. Inhabits rainforest through to sclerophyll forest and tree heath. Banksias and myrtaceous shrubs and trees are a favoured food source. Soft fruits are eaten when flowers are unavailable and it also feeds on insects (DEC 2005c; Ward and Turner 2008). Will often nest in tree hollows, but can also construct its own nest (Turner and Ward 1995). Because of its small size it is able to utilise a range of hollow sizes including very small hollows (Gibbons and Lindenmayer 1997). Individuals will use a number of different hollows and an individual has been recorded using up to 9 nest sites within a 0.5 ha area over a 5 month period (Ward 1990). It is mainly solitary, and each individual uses several nests. Home ranges of males are generally less than 0.75 ha, and those of females are smaller (Ward and Turner 2008). | Low. No suitable habitats occur within the study area. |

| Scientific Name                 | Common Name                        | Year   | EPBC Status <sup>1</sup> | TSC Act Status <sup>2</sup> | Habitat                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Likelihood of occurrence in study area                 |
|---------------------------------|------------------------------------|--------|--------------------------|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|
| <i>Chalinolobus dwyeri</i>      | Large-eared Pied Bat               | #/1992 | VU                       | V                           | Occurs from the Queensland border to Ulladulla, with largest numbers from the sandstone escarpment country in the Sydney Basin and Hunter Valley (van dyck and Strahan 2008). Primarily found in dry sclerophyll forests and woodlands, but also found in rainforest fringes and subalpine woodlands (Churchill 2008; Hoyer and Schulz 2008). Forages on small, flying insects below the forest canopy. Roosts in colonies of between three and 80 in caves, Fairy Martin nests and mines, and beneath rock overhangs, but usually less than 10 individuals. Likely that it hibernates during the cooler months (Churchill 2008). The only known existing maternity roost is in a sandstone cave near Coonabarabran (Pennay 2008).                                                                                                                                                                                                                                            | Low. No suitable habitats occur within the study area. |
| <i>Dasyurus maculatus</i>       | Spotted-tailed Quoll               | 2010/# | EN                       | V                           | Occurs along the east coast of Australia and the Great Dividing Range (Belcher <i>et al.</i> 2008). Uses a range of habitats including sclerophyll forests and woodlands, coastal heathlands and rainforests (Dickman and Read 1992). Occasional sightings have been made in open country, grazing lands, rocky outcrops and other treeless areas (NPWS 1999k). Habitat requirements include suitable den sites, including hollow logs, rock crevices and caves, an abundance of food and an area of intact vegetation in which to forage (Edgar and Belcher 1995). Seventy per cent of the diet is medium-sized mammals, and also feeds on invertebrates, reptiles and birds. Individuals require large areas of relatively intact vegetation through which to forage (NPWS 1999e). The home range of a female is between 180 and 1000 ha, while males have larger home ranges of between 2000 and 5000 ha. Breeding occurs from May to August (Belcher <i>et al.</i> 2008). | Low. No suitable habitats occur within the study area. |
| <i>Isodon obesulus obesulus</i> | Southern Brown Bandicoot (eastern) | 2009/# | EN                       | E1                          | This species prefers sandy soils with scrubby vegetation and/or areas with low ground cover that are burn from time to time (Braithwaite 1995). A mosaic of post fire vegetation is important for this species (Maxwell <i>et al.</i> 1996).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Low. No suitable habitats occur within the study area. |

| Scientific Name                            | Common Name               | Year   | EPBC Status <sup>1</sup> | TSC Act Status <sup>2</sup> | Habitat                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Likelihood of occurrence in study area                                                                                                                                                                                                                               |
|--------------------------------------------|---------------------------|--------|--------------------------|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Miniopterus schreibersii oceanensis</i> | Eastern Bentwing-bat      | 2009   |                          | V                           | Occurs from Victoria to Queensland, on both sides of the Great Dividing Range. Forms large maternity roosts (up to 100,000 individuals) in caves and mines in spring and summer. Individuals may fly several hundred kilometres to their wintering sites, where they roost in caves, culverts, buildings, and bridges. They occur in a broad range of habitats including rainforest, wet and dry sclerophyll forest, paperbark forest and open grasslands. Has a fast, direct flight and forages for flying insects (particularly moths) above the tree canopy and along waterways (Churchill 2008; Hoyer and Hall 2008). | Moderate. No caves or culverts are present within the study area to provide roosting habitat however this species may forage throughout the study area.                                                                                                              |
| <i>Petrogale penicillata</i>               | Brush-tailed Rock-wallaby | #      | VU                       | E1                          | Occurs along the Great Dividing Range south to the Shoalhaven, and also occurs in the Warrumbungles and Mt Kaputar. Habitats range from rainforest to open woodland. It is found in areas with numerous ledges, caves and crevices, particularly where these have a northerly aspect. Individuals defend a specific rock shelter, emerging in the evening to forage on grasses and forbs, as well as browse in drier months. Home sizes range from 2-30 ha (Eldridge and Close 1995).                                                                                                                                     | Low. No suitable habitats occur within the study area.                                                                                                                                                                                                               |
| <i>Phascolarctos cinereus</i>              | Koala                     | #/1980 | VU                       | V                           | In NSW the Koala mainly occurs on the central and north coasts with some populations in the western region (DEC 2005j). Koalas feed almost exclusively on eucalypt foliage, and their preferences vary regionally (Martin <i>et al.</i> 2008). Primary feed trees include <i>Eucalyptus robusta</i> , <i>E. tereticornis</i> , <i>E. punctata</i> , <i>E. haemostoma</i> and <i>E. signata</i> (DoP 1995). They are solitary with varying home ranges. In high quality habitat home ranges may be 1-2 ha and overlap, while in semi-arid country they are usually discrete and around 100 ha (Martin <i>et al.</i> 2008). | Low. No recent records of the Koala occur within the locality. One preferred feed tree occurs on site however the lack of connectivity through the surrounding urban landscape and very low density of trees restrict the potential use of this feed tree by Koalas. |

| Scientific Name                         | Common Name            | Year   | EPBC Status <sup>1</sup> | TSC Act Status <sup>2</sup> | Habitat                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Likelihood of occurrence in study area                                                                                            |
|-----------------------------------------|------------------------|--------|--------------------------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| <i>Potorous tridactylus tridactylus</i> | Long-nosed Potoroo     | #      | VU                       | V                           | Occurs from Queensland to Victoria, normally within 50 km of the coast (Claridge <i>et al.</i> 2007). Inhabits coastal heath and wet and dry sclerophyll forests. Generally found in areas with rainfall greater than 760 mm. Requires relatively thick ground cover where the soil is light and sandy. Known to eat fungi, arthropods, fleshy fruit, seeds and plant tissue. It is solitary and sedentary, but tends to aggregate in small groups. It has two breeding seasons, one in late winter-early spring and the other in late summer (Johnston 2008). This species appears to benefit from a lack of recent disturbance (Claridge <i>et al.</i> 2007).                                                                                                                                                                                                                                                                                                                   | Low. No suitable habitats occur within the study area.                                                                            |
| <i>Pseudomys novaehollandiae</i>        | New Holland Mouse      | #/1980 | VU                       | -                           | The New Holland Mouse currently has a disjunct, fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. Across the species' range the New Holland Mouse is known to inhabit open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes. The home range of the New Holland Mouse can range from 0.44 ha to 1.4 ha. The New Holland Mouse is a social animal, living predominantly in burrows shared with other individuals. The species is nocturnal and omnivorous, feeding on seeds, insects, leaves, flowers and fungi, and is therefore likely to play an important role in seed dispersal and fungal spore dispersal. It is likely that the species spends considerable time foraging above-ground for food, predisposing it to predation by native predators and introduced species. Breeding typically occurs between August and January, but can extend into autumn (Threatened Species Scientific Committee 2010). | Low. No suitable habitats occur within the study area.                                                                            |
| <i>Pteropus poliocephalus</i>           | Grey-headed Flying-fox | 2010/# | VU                       | V                           | Occurs along the NSW coast, extending further inland in the north. This species is a canopy-feeding frugivore and nectarivore of rainforests, open forests, woodlands, melaleuca swamps and banksia woodlands. Roosts in large colonies (camps), commonly in dense riparian vegetation. Bats commute daily to foraging areas, usually within 15 km of the day roost (Tidemann 1995) although some individuals may travel up to 70 km (Augee and Ford 1999).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Moderate. Some fruiting palms and flowering trees occur within the study area which this species may forage on from time to time. |

# **APPENDIX 6**

## **Assessment of significance**

## Sydney Turpentine-Ironbark Forest

Sydney turpentine-ironbark forest (STIF) is listed as an Endangered Ecological Community (EEC) on Part 3 of Schedule 1 of the Threatened Species Conservation Act 1995 (TSC Act). The canopy of this community is dominated by Turpentine *Syncarpia glomulifera*, Grey Gum *Eucalyptus punctata*, Grey Ironbark *E. paniculata* and Thin-leaved Stringybark *E. eugenoides*. In addition to these Red Gum *Angophora costata*, Rough Barked Apple *A.floribunda* and Red Mahogany *E.resinifera* are often present. Sydney Blue Gum *E. saligna* is often dominant in areas of high precipitation.

The distribution of STIF is restricted to the Sydney basin bioregion and the community was once prevalent in the transition between Cumberland Plain Woodland and Blue Gum High Forest. STIF is now reduced to a few remanent patches that have been heavily disturbed and isolated by residential development. This is reflected in the Final Determination for STIF which states that 'The structure of the community was originally forest, but may now exist as woodland or as remnant trees'.

The SCIVI vegetation mapping for Hornsby LGA shows that 72.58 Ha of STIF community occurs within a 5km radius of the study area.

### **How is the proposal likely to affect the lifecycle of a threatened species and/or population?**

N/A - STIF is an endangered ecological community.

### **How is the proposal likely to affect the habitat of a threatened species, population or ecological community?**

Based on the SCIVI vegetation mapping, approximately 72.58 ha of STIF exists within the locality (5 km radius of the study area). The study area contains 0.0444 ha of STIF, however the scope of the proposed work does not include the removal of any tree species within the STIF community or any works within the area that would impact on habitat for the community. Given that the proposed demolition and construction work is immediately adjacent to the two stands of STIF, there is the potential for indirect and inadvertent impacts to this community.

Although regionally STIF has been heavily fragmented and is now reduced to a few small remnant patches, the two identified areas within the study area are not considered to be a strong representation of the EEC. The canopy species represent those found within the community however the midstory and ground covers have been removed and replaced with common landscaping species.

Provided adequate control measures are in place to ensure no harm to the trees identified within the study area as STIF and no works occur directly within these patches the proposal is unlikely to effect habitat for STIF.

**Does the proposal affect any threatened species or populations that are at the limit of its known distribution?**

N/A

**How is the proposal likely to affect current disturbance regimes?**

Regionally, STIF has been heavily affected by urban spread and residential development which is also the case within the locality and study area. Remnant patches of the community within residential areas are often incorporated into urban design and although the mature trees are retained, the midstory and groundcovers are replaced with landscaping species.

The current disturbance regimes within the study area are largely related to these landscaping practices. Across the study area, native midstory and ground covers have been replaced with exotics and non local indigenous species. Landscaping practices and adjacent construction works have also disturbed the soil profile encouraging the colonisation of annual weeds. In conjunction with this, wood chips have been used for weed suppression which has prevented natural recolonisation of indigenous species.

Provided the two patches of STIF are adequately fenced to prevent the entry of plant and construction staff, the proposal is not considered likely to affect or compound the current disturbance regimes.

**How is the proposal likely to affect habitat connectivity?**

STIF has been heavily fragmented by urban growth and residential developments, and remnant patches of the community are isolated with very limited, if any, connectivity. The closest patch of STIF, as mapped on the SCIVI vegetation map, is approximately 600 m south west of the study area. Patches of the community within the locality are scattered with very limited connectivity.

Given that the scope of the proposal does not include vegetation removal within the areas identified as STIF, and the development is replacing existing buildings, the proposal is considered unlikely to affect the habitat connectivity of this EEC.

**How is the proposal likely to affect critical habitat?**

Under the TSC Act, the Director-General of Department of Environment and Climate Change maintains a Register of Critical Habitat. To date, no critical habitat has been declared for STIF.

**Conclusion:**

The impact of the proposal on STIF is likely to be negligible as:

- The scope of the proposal does not include any vegetation removal within the areas identified as STIF.

- The areas identified as STIF are not considered to be a strong representation of the EEC, given the size of patches and lack of native midstory and ground layer species.
- Adequate fencing and tree protection along with well inducted construction staff will mitigate against potential indirect or inadvertent impacts to the EEC.

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