# Flora and Fauna Assessment

Nepean Hospital Redevelopment, Penrith

Total Earth Care Pty Ltd
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## Nepean Hospital Redevelopment, Penrith

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| Prepared by: | L Worthington | | |
| Authorised by: | R Blackall | | |
| Prepared for: | Hassell Pty Ltd | | |
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37 Irrawong Road
North Narrabeen NSW 2101
Telephone 02 9913 1432
Facsimile 02 9913 1434
www.totalearthcare.com.au
ABN: 14 043 484 770

admin@totalearthcare.com.au
bushregen@totalearthcare.com.au

consulting@totalearthcare.com.au
envirorehab@totalearthcare.com.au

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## 1 INTRODUCTION

Total Earth Care has been engaged by Hassell Pty Ltd to conduct an Ecological Assessment prior to proposed redevelopment at Nepean Hospital, Penrith. The current stage of the proposal includes the construction of a new Staff Accommodation building and East Block, following the demolition of the existing East Block. A number of trees are located within the development footprint of both the new Staff Accommodation Building, and the new East Block and redevelopment requires the removal of these trees. In relation to the current proposal, Hassell Pty Ltd requires a flora and fauna survey and assessment to determine the significance of potential effects of the proposed works on flora and fauna occurring on the subject site and study area.

The assessment is to include an Assessment of Significance according to the provisions of Section 5A of the *Environmental Planning and Assessment Act 1979* (EPA Act) for any threatened species, populations and ecological communities (or their habitats), as listed under the *Threatened Species Conservation Act 1995* (TSC Act) that are recorded during the field surveys or are likely to be present. This assessment will determine whether or not a Species Impact Statement (SIS) is required.

A preliminary desktop search indicated the presence of Shale Plains Woodland, a subset of Cumberland Plain Woodland, occurring within the subject site and study area (NPWS 2002) Cumberland Plain Woodland is listed as an Endangered Ecological Community under both the *Threatened Species Conservation Act 1995* and the *Commonwealth Environmental Protection and Biodiversity Conservation Act 1999.* As a result, an Assessment of Significance (7-part Test), and an Assessments of Significance under the EPBC Act, has been conducted for the endangered ecological community (EEC) Cumberland Plain Woodland (CPW).

The flora and fauna survey was carried out over the morning of July 10th 2009. The flora and fauna assessment was based on the condition of the proposed subject site and study area at the time of survey and the information provided by the client on the nature of the proposal at the date of publication of this document. For the purpose of this report, the subject site comprises the development footprints of East Block and Staff Accommodation building, as identified by Hassell Pty Ltd. The study area comprises the Nepean Hospital site, bound by the Great Western Highway, Somerset Street, Derby Street and Parker Street.

## 2 AIMS AND OBJECTIVES

The aims of the flora and fauna assessment for the current proposal are to:

- describe the flora and fauna within the development footprints of the East Block and Staff Accommodation building,
- determine the presence or likely occurrence of threatened species, populations and ecological communities (or their habitats) from the survey, as listed under the *NSW Threatened Species Conservation Act 1995* (TSC Act);
- determine the presence or likely occurrence of threatened species, migratory species, ecological communities (or their habitats) as listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- identify the need for any further assessments under State or Federal legislation; and
- describe the potential impact of the proposal, and propose a set of impact mitigation measures to avoid or reduce the potential impact of the development on the biodiversity of the locality, especially threatened species.

# 3 LEGISLATION AND POLICY

## 3.1 Environmental Planning and Assessment Act 1979

Total Earth Care has been advised that the NSW Department of Health is a determining authority under Part V of the *Environmental Planning & Assessment Act 1979*. Under Section 111 of the EP&A Act NSW Health is therefore responsible for the assessment of impacts of its activities, including the impacts on biodiversity.

Section 5A (s.5A) of the *Environmental Planning & Assessment Act 1979* (the so called '7-part test') lists seven factors that "must be taken into account" by a consent or determining authority in the administration of Sections 78A, 79C and 112 of the Act when considering an activity or development proposal. The aim of s.5A is to determine "whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats", as listed under Schedules 1 and 2 of the TSC Act, and hence whether a *Species Impact Statement* (SIS) is required for the activity.

## 3.2 Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) would only become relevant if it was considered that a significant impact on a 'matter of National Environmental Significance (NES)' were likely, thus providing a trigger for referral of the proposal to the Department of the Environment, Water, Heritage and the Arts (DEWHA).

Matters of national environmental significance identified in the Act are:

- world heritage properties;
- national heritage places;
- Ramsar wetlands;
- nationally threatened species and communities;
- migratory species protected under international agreements;
- the Commonwealth marine environment; and
- nuclear actions.

As part of this assessment, the matters listed within the Significant Impact Guideline have been completed in order to determine whether the action is likely to have a significant impact on a matter of national environmental significance, in this case Cumberland Plain Woodland, that is protected by the EPBC Act.

# 4 METHODS

## 4.1 Desktop Research

Prior to field surveys, records of all threatened species, populations and endangered ecological communities previously recorded within a 5 kilometre (km) radius of the subject site were obtained from the Department of Environment and Climate Change (DECC) Wildlife Atlas database. An EPBC Act Protected Matters Report was generated using the Commonwealth Department of Environment, Water, Heritage and the Arts (DEWHA) Protected Matters Search Tool for a 5km radius of the subject site. These reports identify matters of national environmental significance in each study area including threatened biodiversity and other matters protected by the EPBC Act.

Preliminary assessment of known records of threatened species, populations and endangered ecological communities from the locality identified the presence Shale Hills Woodland, a form of the endangered ecological community Cumberland Plain Woodlands, as occurring on the subject site (NPWS 2002a).

## 4.2 Background Research

### 4.2.1 Native Vegetation of the Cumberland Plain

At a regional scale *The native vegetation of the Cumberland Plain, western Sydney: systematic classification and field identification of communities* (Tozer, 2003), provides a survey of vegetation communities occurring on the Cumberland Plain and adjacent plateaus characterised by Wianamatta Shale soils. This study recognises that most of the native vegetation communities of the Cumberland Plain and neighbouring Wianamatta Shales are listed as endangered under the *Threatened Species Conservation Act 1995* and states that 'Due to the rate of urban development in western Sydney there is a large potential for development proposals to significantly impact on listed communities' (Tozer, 2003). As such, part of the rationale for the survey was to address the need for quantitative data to assist in the identification of native plant communities and provide an assessment of the conservation value of vegetation remnants.

The aim of the survey was to revise the existing plant community classification to take account of; recently described communities and other communities warranting recognition; provide quantitative data for characteristic species in each community (frequency of occurrence and relative abundance); identify species showing high fidelity to each community as a basis for diagnosing community type in the field; estimate the present cover of native vegetation; and derive a spatial model as a basis for predicting the vegetation type and conservation value of all remaining remnants (Tozer, 2003).

The survey incorporated systematic, stratified field sampling to record floristic structure and composition, a classification procedure based on hierarchical, agglomerative clustering analysis; spatial modelling of community distributions using geological, climatic and topographic variables; and the interpretation of patterns in canopy composition and remnant condition in aerial photographs. The resulting *Native Vegetation of the Cumberland Plain, Western Sydney − 1:25 000 Map Series* (NPWS, 2002a) incorporates Penrith LGA in Map 11 of the series.

### 4.2.2 Arboricultural Report

An Arboricultural report has been prepared (Treescan 2009) that has assessed 49 trees on the East Block section of the subject site and focused on trees potentially affected by the proposed development on that part of the site. In addition to a brief summary of the condition of vegetation on the subject site, the Arboricultural report includes;

- Descriptions of the overall condition and significant features of each surveyed tree; and
- Safe Use and Life Expectancy (SULE).

Based on a combination of criteria, including the SULE assessments, the report has identified the following:

- a total of 29 of the trees are proposed to be removed, 10 of which are of "landscape prominence and with medium to long life expectancy". The remaining trees are not prominent or have significant defects.
- a total of 18 trees are proposed to be retained, 10 of which which are of "landscape prominence and with medium to long life expectancy".
- a total of 2 trees are hazardous and are recommended to be removed independent of the assessed sigificance.

The arborist report noted the presence of canopy species characteristic of Cumberland Plain Woodland, but did not assess the other vegetation strata, and recommended an assessment by a ecologist to ascertain if Cumberland plain woodland is present on site.

## 4.3 Field Surveys

### 4.3.1 Flora

General botanical survey and targeted threatened flora searches was conducted within the study area on the morning of July 10th, 2009.

The survey involved:

- the identification of plant species according to *Field Guide to the Native Plants of Sydney* (Robinson 2003), other botanical reference books and the *Flora of NSW* (Harden 1992, 1993, 2000, 2002), with reference to recent taxonomic changes;
- the identification and mapping of plant communities to confirm previous mapping of the locality from *Native Vegetation of the Cumberland Plain, Western Sydney* (Tozer 2003), *Native Vegetation of the Cumberland Plain, Western Sydney − 1:25 000 Map Series* (NPWS, 2002) and with reference to the structural definitions of Specht & Specht (1999);
- assessing the condition and significance of plant communities. The distribution of any endangered ecological communities will be mapped; and
- targeted searches for plant species of conservation significance according to the "random meander" method of Cropper (1993). Location of threatened flora species will be marked with a GPS and included in accompanying maps.

The conservation significance of plant species and plant communities was determined according to:

- *Threatened Species Conservation Act 1995* for significance within NSW; and
- *Environment Protection & Biodiversity Conservation Act 1999* (EPBC Act) for significance within Australia.

All flora species and their occurrence on the subject site and study area were recorded and an inventory of species was compiled (Appendix B).

### 4.3.2 Fauna

A brief fauna survey was conducted on the subject site over the morning of July 10th 2009 and involved;

- identifying fauna habitats, assessing their condition and assessing their value to threatened fauna species;
- incidental observations of animal activity and indirect evidence of fauna (such as scats, nests, burrows, hollows, tracks, scratches and diggings).

The conservation significance of fauna species and populations was determined according to:

- TSC Act for significance within NSW; and
- EPBC Act for significance within Australia.

All fauna sightings as well as fauna habitat types and evidence of fauna activity were recorded and an inventory of species was compiled (Appendix B).

## 4.4 Limitations

The field survey was conducted over one morning in July 2009. The brevity of the survey and its timing mean that the full spectrum of flora and fauna species and ecological processes likely to occur on the site cannot be fully quantified or described in this report. These limitations have been addressed by identifying potential flora and fauna habitats and assessing the potential for these species to occur on the site based on previous records, the type and condition of habitats present, the land use of the site and its landscape context.

# 5 RESULTS

## 5.1 Landscape

The study area is bound by The Great Western Highway to the north, Somerset St to the east, Derby St to the south and Parker St to the west. Nepean Hospital covers an area of approximately 15 hectares. The majority of the study area is built upon and open areas are dominated by paved parking areas. Vegetation of the study site is primarily retained in garden beds and landscaped areas. The larger landscaped areas are located along the northern and western boundaries of the study area.

The study area is mapped by Hazelton *et al* (1989) as occurring on the Luddenham Soil Landscape unit of the Penrith 1:100, 000 map sheet. The Luddenham Soil Landscape is described by Bannerman and Hazelton (1990) as being characterised by "undulating to rolling low hills on Wianamatta Group Shales, often associated with Minchinbury Sandstone". Topographic features of the area include narrow ridges, hillcrests and valleys. Soils are summarised as being shallow, dark podzolic soils on crests, moderately deep red podzolic soils on upper slopes, moderately deep yellow podzolic soils on lower slopes and drainage lines. Soil limitations include high soil erosion hazard, localised impermeable highly plastic subsoil, and moderately reactive. The construction of the proposed development at Nepean Hospital would most likely have led to a high degree of soil disturbance, however this report includes standard erosion and sedimentation controls be incorporated into the management of the site.

## 5.2 Flora

### 5.2.1 Plant Species

A total of 33 plant species were recorded within the subject site during the current survey, including 13 native species and 20 introduced species (Appendix B). Of the 20 introduced species, one is listed as noxious under Order 20 of the *NSW Noxious Weeds Act 1993* for Penrith LGA.

**Table 1** Plant species recorded within the subject site listed under the *NSW Noxious Weeds Act 1993* for Penrith LGA (Order No.20).

| Scientific Name | Common Name | Control Class[1] |
|---|---|---|
| *Ligustrum lucidum* | Large-leaved Privet | 3 |

### 5.2.2 Plant Communities

Mapping of the native vegetation of the Cumberland Plain by NPWS (2002) has identified Shale Plains Woodland (SPW) as occurring within the subject site and study area. Shale Plains Woodland is a sub unit of the Cumberland Plain Woodland Endangered Ecological Community, listed under Schedule 1 of the TSC Act and under the EPBC Act. The NSW Scientific Committee (1997) has identified an assemblage of species that characterise CPW and a detailed description of the CPW Endangered Ecological Community can be found in Section 5.2.5 of this report. The floristics of the vegetation of the subject site is described below.

The SPW community present on the subject site persists primarily as mature canopy trees characteristic of the community, including *Eucalyptus moluccana* Grey Box and *Corymbia maculata* Spotted Gum. Other canopy species occurring within the subject site, most of which have been planted, include native species such as *Eucalyptus microcorys* Tallowood and exotic or non-

[1]
Class 1 State Prohibited Weeds. The plant must be eradicated from the land and the land must be kept free of the plant.
Class 2 Regionally Prohibited Weeds. The plant must be eradicated from the land and the land must be kept free of the plant.
Class 3 Regionally Controlled Weeds. The plant must be fully and continuously suppressed and destroyed.
Class 4 Locally Controlled Weeds. 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.
Class 5 Restricted Plants. The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with.

indigenous species such as *Jacaranda mimosifolia* Jacaranda, and *Schefflera actinophylla* Umbrella Tree.

The mid-storey and understorey have been removed over much of the site. *Melaleuca decora*, a characteristic species of the mid-storey of CPW, is scattered over the site in low abundances and has most likely been planted. Where present over the remainder of the site, the understorey has largely been planted and comprises native species such as *Callistemon salignus* Willow Bottlebrush.

Species of the groundcover stratum mainly comprise horticultural plantings retained in landscaped garden beds and include *Hardenbergia violacae* Purple Coral Pea, *Hibbertia scandens* Climbing Guinea Flower and exotic species such as *Trachelospermum jasminoides* Star Jasmine. Open grassy areas are mown and support a mixture of native and exotic grasses and herbaceous species, such as *Cynodon dactylon* Couch, *Pennisetum clandestinum* Kikuyu Grass, *Setaria gracilis* Slender Pigeon Grass and *Plantago lanceolata* Lamb's Tongues. Mowing limits the opportunity for groundcovers to naturally regenerate.

This vegetation community has undergone significant modification as a result of disturbance related to construction of hospital buildings and associated infrastructure, clearing, and maintenance regimes such as mowing. As mentioned previously, CPW persists mainly as canopy trees and scattered mid-storey trees. The soil profile has been significantly disturbed as a result of the construction of the hospital and other infrastructure on the site. The likelihood of CPW regenerating on the site from soil seedbank is minimal, as the soil seedbank was most probably removed prior to the original construction works or it has since been built over. Additionally, current mowing regimes further reduce the potential for native groundcover to regenerate.

### 5.2.3 Threatened Plant Species

A search of the DECC Wildlife Atlas and EPBC Protected Matters Report identified 12 threatened plant species, and one threatened population previously recorded within 5km of the subject site (Table 2).

**Table 2** Threatened flora species previously recorded within the locality (5km of the subject site) from the DECC Wildlife Atlas and EPBC Protected Matters Report.

| Scientific Name | Common Name | Status under TSC Act | Status under EPBC Act |
|---|---|---|---|
| *Hibbertia puberula* | | E1 | - |
| *Dillwynia tenuifolia* | | V | V |
| *Pultanaea villifera var. villifera* | Pultanaea villifera var. villifera population in the Blue Mountains LGA | E2 | - |
| *Eucalyptus benthamii* | Camden White Gum | V | - |
| *Melaleuca deanei* | Deane's Paperbark | V | - |
| *Syzgium paniculatum* | Magenta Lilly Pilly | V | - |
| *Persoonia hirsuta* | Hairy Geebung | E1 | - |
| *Persoonia hirsuta subsp. hirsuta/evoluta* | | E1 | - |
| *Zieria involucrata* | | E1 | - |
| *Cynanchum elegans* | White-flower Wax Plant | - | E |
| *Persoonia nutans* | | - | E |
| *Pomaderris brunnea* | Rufous Pomaderris | - | V |
| *Pultanaea parviflora* | | - | V |

No threatened flora species were identified on the subject site during the current survey.

### 5.2.4 Threatened Populations

No threatened flora populations were identified on the subject site during the current survey.

### 5.2.5 Endangered Ecological Communities

As mentioned previously, Shale Plains Woodland, one of two subsets of the endangered ecological community Cumberland Plain Woodland, has been identified as occurring on the subject site (NPWS 2002a). Cumberland Plain Woodland occurs on well structured clay soils, derived from Wianamatta shale. Shale Plains Woodland sub unit is the most widely distributed form of CPW (Tozer 2003) with *Eucalyptus moluccana* Grey Box, *Eucalyptus tereticornis* Forest Red Gum, *Corymbia maculata* Spotted Gum and *Eucalyptus eugenioides* Thin-leaved Stringybark the dominant tree species with *Bursaria spinosa* Blackthorn the dominant shrub species (NPWS 2004). Both Shale Plains Woodland and Shale Hills Woodland, the second sub unit of CPW, have a diverse groundcover stratum sharing a similar suite of native grasses and herbs such as *Brunoniella australis* Blue Trumpet, *Dichondra repens* Kidney Weed, *Microlaena stipoides* var *stipoides* Weeping Grass and *Themeda australis* Kangaroo Grass (NPWS 2004a).

Prior to European settlement, Cumberland Plain Woodland was extensive across western Sydney and it has been estimated it once covered 125,000 hectares. This community has been significantly reduced from its original extent due to clearing for agricultural and urban development. Estimates of the remaining original extent include 6% from the Final Determination (NSW Scientific Committee, 1997) to 9% with a further 14% remaining as scattered trees (NPWS, 2004). The community is known from the Auburn, Bankstown, Baulkham Hills, Blacktown, Camden, Campbelltown, Fairfield, Hawkesbury, Holroyd, Liverpool, Parramatta, Penrith and Wollondilly local government areas (NPWS 2004a).

Much of the extent of the community persists as modified or disturbed remnants and the NSW Scientific Committee (1997) has stated that 'regrowth which is likely to achieve a near natural structure or is a seral stage towards that structure' is classified as Cumberland Plain Woodland. The community can regenerate naturally once threats, including mowing/slashing, are controlled (DEC, 2004) and one of the management techniques for Cumberland Plain Woodland remnants includes removal of slashing and mowing. Other threats to the survival of the community include: clearance for agriculture, grazing, hobby and poultry farms; housing and other developments; invasion by exotic plants; altered fire regimes; and increased nutrient loads due to fertiliser run off from gardens and farmland, dumped refuse or sewer discharge (NSW Scientific Committee, 1997).

## 5.3 Fauna

### 5.3.1 Fauna Species

A total of six vertebrate fauna species were recorded during the current field survey (Appendix B). Six species of birds were visually and aurally identified and these species are generally typical of urban, peri-urban and surrounding natural areas within the Sydney Basin BioRegion. Furthermore, these species are widespread in distribution and common to abundant within their ranges.

### 5.3.2 Fauna Habitats and Corridors

Fauna habitats of the subject site and study area are assessed in two main categories for the current survey. Fauna habitat features and resources at a locality scale form part of the broader fauna habitat landscape of the study area. Site specific fauna habitat features and resources provide the key elements required by native fauna for the maintenance of life cycles. Fauna habitats identified in the current survey and associated general fauna are summarised in Table 3.

**Table 3** Fauna habitat types and resources of the subject site.

| Area | Habitat Feature | Potential Habitat Resources and Fauna |
|---|---|---|
| Locality | Large continuous tracts of native and derived plant communities within Blue Mountains National Park | Foraging, nesting, roosting and sheltering for common protected and threatened birds, reptiles, amphibians, arboreal and terrestrial mammals and bat species. |
| Subject Site | Scattered native and exotic trees | Foraging, nesting, roosting and sheltering for common protected small, medium and large birds, arboreal mammals. |
| | Sparse understorey of native and exotic small trees and shrubs | Foraging, nesting, roosting and sheltering for small and medium birds, reptiles and common arboreal mammals. |
| | Native and exotic groundcovers | Foraging for common protected small terrestrial mammals, small and medium birds and reptiles. |
| | Open grassy areas | Foraging for birds and terrestrial mammals |

The subject site offers limited fauna habitat. The majority of the site is built upon and open areas are dominated by paved parking areas. As a result, there is a substantial lack of many of the natural habitat features and resources that are important in the maintenance of native fauna diversity and life cycles. Important fauna habitat features that are missing from the subject site include fully structured vegetation, a diverse shrub layer for food sources and protection, rocky outcrops, loose rocks, leaf litter, and logs.

Canopy trees may offer some foraging, nesting, roosting and sheltering habitat to medium and large-sized birds. There was a lack of small birds and mammals recorded during the current survey and this may be due to the limited understorey on the site. Sparse ground layer vegetation, scattered leaf litter and an absence of ground timber and loose rocks offers little habitat to small terrestrial mammals and reptiles.

The site is bound by major barriers to fauna movement, including the Great Western Highway and rail corridor to the north, major roads and residential areas to the east, south and west. Such barriers limit the movement of less mobile species such as terrestrial mammals to and through the subject site. It is possible however, that highly mobile fauna species (birds, for example) that commonly occur in highly modified environments may utilise the subject site for sheltering and foraging on a permanent or transitory basis. High levels of vehicle and pedestrian traffic within the site and permanent lighting may further reduce the likelihood of fauna inhabiting the subject site.

Relative to the modified condition of native vegetation on the subject site, limited connectivity to bushland, and a general lack of many habitat features and resources described above, the subject site has a poor level of fauna habitat value.

### 5.3.3 Threatened Fauna Species

A search of the DECC Wildlife Atlas and EPBC Protected Matters (Table 4) identified 32 threatened fauna species recorded within 5km of the subject site.

**Table 4** Threatened fauna species previously recorded within the locality (5km of the site) on the DECC Wildlife Atlas and EPBC Protected Matters Report.

| Scientific Name | Common Name | Status under TSC Act | Status under EPBC Act |
|---|---|---|---|
| *Botaurus poiciloptilus* | Australasian Bittern | V | - |
| *Callocephalon fimbriatum* | Gang-gang Cockatoo | V | - |
| *Calyptorhynchus lathami* | Glossy Black-Cockatoo | V | - |
| *Cercartetus nanus* | Eastern Pygmy Possum | V | |
| *Chalinolobus dwyeri* | Large-eared Pied Bat | V | V |
| *Dasyurus maculatus maculatus* | Spotted-tailed Quoll | V | E |
| *Falsistrellus tasmaniensis* | Eastern False Pipistrelle | V | - |
| *Heleioporus australiacus* | Giant Burrowing Frog | V | V |
| *Hoplocephalus bungaroides* | Broad-headed Snake | E1 | V |
| *Lathamus discolor* | Swift Parrot | E1 | E |
| *Litoria aurea* | Green and Golden Bell Frog | E1 | V |
| *Lophoictinia isura* | Square-tailed Kite | V | |
| *Meridolum corneovirens* | Cumberland Plain Land Snail | E1 | - |
| *Miniopterus schreibersii oceanensis* | Eastern Bentwing-bat | V | - |
| *Mixophyes iteratus* | Giant Barred Frog | E1 | V |
| *Mormopterus norfolkensis* | Eastern Freetail-bat | V | - |
| *Myotis adversus* | Large-footed Myotis | V | - |
| *Neophema pulchella* | Turquoise Parrot | V | |
| *Ninox connivens* | Barking Owl | V | - |
| *Ninox strenua* | Powerful Owl | V | - |
| *Petalura gigantea* | Giant Dragonfly | E1 | - |
| *Petrogale penicillata* | Brush-tailed Rock-wallaby | E1 | V |
| *Phascolarctos cinereus* | Koala | V | - |
| *Potorous tridactylus tridactylus* | Long-nosed Potoroo | V | V |
| *Pseudophryne australis* | Red-crowned Toadlet | V | - |
| *Ptaurus australia* | Yellow-bellied Glider | V | - |
| *Pteropus poliocephalus* | Grey-headed Flying-fox | V | V |
| *Rostratula australis* | Australian Painted Snipe | E1 | E |
| *Scoteanax rueppellii* | Greater Broad-nosed Bat | V | - |
| *Tyto novaehollandiae* | Masked Owl | V | - |
| *Tyto tenebricosa* | Sooty Owl | V | - |
| *Xanthomyza phrygia* | Regent Honeyeater | E1 | E |

No threatened fauna species were identified on the subject site during the current survey.

### 5.3.4 Threatened Populations

No threatened fauna populations were identified on the subject site during the current survey.

# 6 HABITAT POTENTIAL FOR THREATENED SPECIES

## 6.1 Flora

Table 5 summarises the habitat potential of the subject site for the threatened flora species previously recorded as occurring within 5km of the site on the DECC Wildlife Atlas.

**Table 5** Habitat potential for threatened flora species previously recorded within the locality (5km of the site) DECC Wildlife Atlas and EPBC Protected Matters Report.

| Species | Preferred Habitat | Likelihood of Occurrence |
|---|---|---|
| *Cynanchum elegans* | A climber or twiner with a highly variable form. Mature stems have a fissured corky bark and can grow to 10 metres long and 3.5 cm thick. Restricted to eastern NSW where it is distributed from Brunswick Heads to in the Illawarra region, including the Cumberland and Wollemi areas. Occurs occurs on the edge of dry rainforest vegetation, also found in littoral rainforest, Coastal Tea-tree – Coastal Banksia scrub, Forest Red Gum open forest and woodland, Spotted Gum Eucalyptus open forest and woodland and Bracelet Honeymyrtle/ *Melaleuca armillaris* scrub. | Nil.<br>Species not found during the current survey.<br>Subject site does not support preferred habitat.<br>Subject site is located outside of species natural range. |
| *Dillwynia tenuifolia* | A low spreading pea-flower shrub to a metre high. Occurs within the Liverpool Shire and The Hills Shire. The Liverpool population occurs on a small outlier of the Berkshire Park Soil Landscape that supports a transition from Castlereagh Ironbark Forest to Castlereagh Scribbly Gum Woodland (also some Shale Gravel Transition Forest). The Hills Shire populations occur in vegetation similar to Cumberland Plain Woodland, on Wianamatta Shale soils. | Nil.<br>Species not found during the current survey.<br>Subject site does not support preferred habitat.<br>Subject site is located outside of species natural range. |
| *Eucalyptus benthamii* | Atree that grows to 40m and has smooth white bark with long hanging bark ribbons and a persistent flaky bark stocking at the base. Occurs only in wet open forest on sandy alluvial soils along valley floors at an elevation of 140- 750m. It is known from two main locations, Bents Basin and the Kedumba Valley. | Nil.<br>Species not found during the current survey.<br>Subject site does not support preferred habitat.<br>Subject site is located outside of species natural range. |

**Table 5 cont'** Habitat potential for threatened flora species previously recorded within the locality (5km of the site) DECC Wildlife Atlas and EPBC Protected Matters Report.

| Species | Preferred Habitat | Likelihood of Occurrence |
|---|---|---|
| *Hibbertia puberula* | Shrublets with few spreading but ultimately wiry branches up to 30 cm long, sparsely branched, pubescent, often becoming hairless. Has not been seen for over 40 years. Early records of this species are from the Hawkesbury River area and Frenchs Forest in northern Sydney, South Coogee in eastern Sydney, the Hacking River area in southern Sydney, and the Blue Mountains. Occurs on sandy soil often associated with sandstone. | Nil.<br>Species not found during the current survey.<br>Subject site does not support preferred habitat.<br>Subject site is located outside of species natural range. |
| *Melaleuca deanei* | A shrub to 3m with fibrous-flaky bark and narrow elliptic to oblanceolate leaves 12 to 25mm. Flowering in summer the inflorescence is a many-flowered spike to 6cm long and white in colour. The species grows in wet heath on sandstone (Harden 1991) and occurs in two areas in the north and south of Sydney (Ku-ring-gai/Berowra and Holsworthy/Wedderburn areas) with isolated occurrences in the Blue Mountains, Nowra and Central Coast areas (NPWS 2003). | Nil.<br>Species not found during the current survey.<br>Subject site does not support preferred habitat.<br>Subject site is located outside of species natural range. |
| *Persoonia hirsuta* | The Hairy Geebung is best distinguished by its hairiness - long coarse hairs on flowers and branchlets and short stiff ones on the leaves. The Hairy Geebung has been recorded in the Sydney coastal area, the Blue Mountains area and the Southern Highlands. The Hairy Geebung is found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone. It is usually present as isolated individuals or very small populations. | Nil.<br>Species not found during the current survey.<br>Subject site does not support preferred habitat.<br>Subject site is located outside of species natural range. |
| *Persoonia hirsuta subsp. hirsuta/evoluta* | Persoonia hirsuta subsp. hirsuta occurs from Gosford south to Royal National Park within 20 km of the coast and below altitudes of 300m. Persoonia hirsuta subsp. evoluta is sporadically distributed from Putty District to Glen Davis to Hill Top between elevations of 350m to 600m. | Nil.<br>Species not found during the current survey.<br>Subject site does not support preferred habitat.<br>Subject site is located outside of species natural range. |
| *Persoonia nutans* | An erect to spreading shrub to 2.5 m high with hairy young branches. Restricted to the Cumberland Plain in western Sydney, between Richmond in the north and Macquarie Fields in the south. Confined to aeolian and alluvial sediments and occurs in a range of sclerophyll forest and woodland vegetation communities, with the majority of individuals occurring within Agnes Banks Woodland or Castlereagh Scribbly Gum Woodland. | Nil.<br>Species not found during the current survey.<br>Subject site does not support preferred habitat.<br>Subject site is located outside of species natural range. |

**Table 5 cont'** Habitat potential for threatened flora species previously recorded within the locality (5km of the site) DECC Wildlife Atlas and EPBC Protected Matters Report.

| Species | Preferred Habitat | Likelihood of Occurrence |
|---|---|---|
| *Pomaderris brunnea* | A shrub to 3 m tall that has distinctively hairy stems. The small flowers have no petals, are yellowish and form dense clusters at the ends of the branches. Brown Pomaderris is found in a very limited area around the Nepean and Hawkesbury Rivers, including the Bargo area. Grows in moist woodland or forest on clay and alluvial soils of flood plains and creek lines | Nil.<br>Species not found during the current survey.<br>Subject site does not support preferred habitat.<br>Subject site is located outside of species natural range. |
| *Pulteaea parviflora* | A small erect branching shrub up to 1.8 m. Flowers occur towards the ends of the branchlets, and are 5 - 7 mm long, yellow and pea-like with reddish markings. Flowering may occur between August and November depending on environmental conditions. The species is endemic to the Cumberland Plain with distribution ranging from Windsor to Penrith and east to Dean Park. Isolated populations are recorded from Kemps Creek and Wilberforce. May be locally abundant, particularly within scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays and may also be common in transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland. Eucalyptus fibrosa is usually the dominant canopy species | Nil.<br>Species not found during the current survey.<br>Subject site does not support preferred habitat.<br>Subject site is located outside of species natural range. |
| *Pultenaea villifera var. villifera* | A spreading to erect shrub to 1 m tall with moderately hairy stems. The yellow to orange pea-like flowers are 10 - 12 mm long. Distribution of the species within NSW is patchy, occurring within the South and Central Coasts and Southern Tablelands. Grows in dry sclerophyll forest and woodlands on sandy soil and appears to favour sheltered spots. | Nil.<br>Species not found during the current survey.<br>Subject site does not support preferred habitat.<br>Subject site is located outside of species natural range. |
| *Syzgium paniculatum* | A tall shrub or small tree with flaky bark; leaves lanceolate to obovate; up to 10 cm long; glabrous on the upper surface and with distinct but small oil glands. Flowers from December to March and the inflorescence is terminal in the upper axils with the fruit developing to 25mm diameter, ovoid in shape and magenta in colour. Occurs in subtropical and littoral rainforest on sandy soils or stabilised sand dunes near the sea. Occurs in disjunct populations between Jervis Bay and Bulahdelah (Harden 1991) | Nil.<br>Species not found during the current survey.<br>Subject site does not support preferred habitat.<br>Subject site is located outside of species natural range. |
| *Zieria involucrata* | A small, erect, sparse shrub, growing 1 – 2 metres in height.and leaves are densely covered with hairs. Has a disjunct distribution north and west of Sydney, in the Baulkham Hills, Hawkesbury, Hornsby and Blue Mountains local government areas.Occurs primarily on Hawkesbury sandstone. Also occurs on Narrabeen Group sandstone and on Quaternary alluvium. Found primarily in sheltered forests on mid- to lower slopes and valleys, e.g. in or adjacent to gullies which support sheltered forest, although some populations extend upslope into drier vegetation. | Nil.<br>Species not found during the current survey.<br>Subject site does not support preferred habitat.<br>Subject site is located outside of species natural range. |

## 6.2 Fauna

Table 6 summarises the habitat potential of the subject site for the threatened fauna species previously recorded as occurring within 5km of the site on the DECC Wildlife Atlas.

**Table 6** Habitat potential for threatened fauna species previously recorded within the locality (5km of the site) DECC Wildlife Atlas and EPBC Protected Matters Report.

| Species | Preferred Habitat | Likelihood of Occurrence |
|---|---|---|
| *Botaurus poiciloptilus* | The Australasian Bittern may be found across muchiof NSW except for the far north-west. Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes and spikerushes. Breeding occurs in summer from October to January. Nests are built in secluded places in densely-vegetated wetlands on a platform of reeds. | Nil.<br>Subject site does not support preferred habitat. |
| *Callocephalon fimbriatum* | The Gang-gang Cockatoo is a relatively small, dark grey cockatoo. Males have a bright red head and crest while females have a grey head. Found in the central NSW coast and Tableland areas, including Canberra and the Hawkesbury/Nepean and Sydney Metro region. However the Hornsby and Ku-rin-gai Endangered population is the last known breeding population in the Sydney metro region. Usually frequents forested areas with old growth attributes required for nesting and roosting purposes. Also utilises less heavily timbered woodlands and urban fringe areas to forage, but appears to favour well timbered country. | Nil-low.<br>Subject site does not support preferred habitat.<br>Species may pass over the subject site on occasion. |
| *Calyptorhynchus lathami* | The Glossy Black Cockatoo is distributed along the Australian east coast and inland districts, the species occurs from western Victoria to Rockhampton in Queensland and as far west as Cobar and Griffith in NSW. Locally nomadic; flocking habitat is limited to dryer forest types of suitable feeding habitat with the species feeding exclusively on seeds from Casuarina species. Breeding occurs in autumn and winter; one chick is raised by both parents in a nest constructed in a large tree-hollow. | Nil-low.<br>Subject site does not support preferred habitat.<br>Species may pass over the subject site on occasion. |
| *Cercartetus nanus* | The Eastern Pygmy-possum is found from the NSW coast inland as far as the Pillaga, Dubbo, Parkes and Wagga Wagga on the western slopes. Found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred, except in north-eastern NSW where they are most frequently encountered in rainforest. They feed largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes. Shelters in tree hollows, rotten stumps, holes in the ground, abandoned bird-nests, Ringtail Possum (Pseudocheirus peregrinus) dreys or thickets of vegetation, (eg. grass-tree skirts). Nest-building appears to be restricted to breeding females, where tree hollows are favoured but spherical nests have been found under the bark of eucalypts and in shredded bark in tree forks. | Nil.<br>Subject site does not support preferred habitat. |

**Table 6 cont'** Habitat potential for threatened fauna species previously recorded within the locality (5km of the site) DECC Wildlife Atlas and EPBC Protected Matters Report.

| Species | Preferred Habitat | Likelihood of Occurrence |
|---|---|---|
| *Chalinolobus dwyeri* | The Large-eared Pied Bat is a microchiropteran bat found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. It is generally rare with a very patchy distribution in NSW. There are scattered records from the New England Tablelands and North West Slopes. Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (Hirundo ariel). Forage in low to mid-elevation dry open forest and woodland and well-timbered areas containing gullies close to roosting habitat, typically roof domes in sandstone caves and have a high fidelity to the same cave over many years. This species probably forages for small, flying insects below the forest canopy and likely to hibernate through the coolest months. | Nil.<br>Subject site does not support preferred habitat. |
| *Dasyurus maculatus maculatus* | Currently found along the escarpments, tablelands and coast of the eastern seaboard from the Bundaberg area in south-east Qld south through NSW to Victoria and Tasmania. Spotted-tailed Quolls are found in a variety of forest types including dry and moist eucalypt forests and rainforest. They tend to move along drainage lines and make dens in fallen hollow logs or among large rocky outcrops. They are usually nocturnal but are known to hunt and bask during the day. They are known to hunt on the ground an in trees. | Nil.<br>Subject site does not support preferred habitat. |
| *Falsistrellus tasmaniensis* | The Eastern False Pipistrelle is found on the south-east coast and ranges of Australia, from southern Queensland to Victoria and Tasmania. Prefers moist habitats, with trees taller than 20 m. Generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings. Hunts beetles, moths, weevils and other flying insects above or just below the tree canopy. Hibernates in winter. Females are pregnant in late spring to early summer. | Nil.<br>Subject site does not support preferred habitat. |
| *Heleioporus australiacus* | The Giant Burrowing Frog inhabits urban areas, forests, woodlands and heath. Mostly restricted to Hawkesbury Sandstone found around sandy creek banks, with crayfish burrows. The females lay eggs in burrows in creek banks. Burrows into deep litter or loose soil, emerging to feed or breed after rain. | Nil.<br>Subject site does not support preferred habitat. |
| *Hoplocephalus bungaroides* | The Broad Headed Snake is found in rocky outcrops and adjacent sclerophyll forest and woodland. Most suitable sites occur in sandstone ridgetops. Near Bathurst snakes occur in forest growing on shale or conglomerate slopes and bluffs. Snakes prefer sites with a W to NW aspect. Occupied crevices have a sunny aspect and rocks used by snakes are those that receive the most warmth from the sun. The majority of occupied retreat sites occur on exposed cliff edges. In woodland, snakes shelter in hollows in a variety of tree species Snakes show preferences for large trees, trees with multiple hollows, and dead trees (DEH 2005). | Nil.<br>Subject site does not support preferred habitat. |

**Table 6 cont'** Habitat potential for threatened fauna species previously recorded within the locality (5km of the site) DECC Wildlife Atlas and EPBC Protected Matters Report.

| Species | Preferred Habitat | Likelihood of Occurrence |
|---|---|---|
| *Lathamus discolor* | The Swift Parrot migrates from breeding grounds in Tasmania to the Australian mainland in winter the species ranges from south-eastern South Australia across inland and coastal areas to southeast Queensland. The preferred habitat on mainland Australia is woodlands and riparian vegetation where there are winter flowering eucalypts such as the Swamp Mahogany and Eucalyptus robusta in coastal areas. | Nil-low.<br>Subject site does not support preferred habitat. Species may pass over the subject site during migratory movements. |
| *Litoria aurea* | In NSW, the Green and Golden Bell Frog inhabits wetlands, marshes, dams and stream verges. Preferred habitat includes unshaded water bodies with adjacent grassy areas and suitable diurnal sheltering sites such as emergent vegetation and rocks and is known to inhabit highly disturbed sites within the Greater Sydney region Breeding usually occurs in summer when conditions are warm and wet and water-bodies used for breeding usually have a substrate of sand, rock or clay, are still and shallow and are free of predatory fish. | Nil.<br>Subject site does not support preferred habitat. |
| *Lophoictinia isura* | In NSW, scattered records of the Square-tailed Kite throughout the state indicate that the species is a regular resident in the north, north-east and along the major west-flowing river systems. It is a summer breeding migrant to the south-east, including the NSW south coast, arriving in September and leaving by March. Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. | Nil.<br>Subject site does not support preferred habitat.<br>Species may pass over the subject site during migratory movements. |

**Table 6 cont'** Habitat potential for threatened fauna species previously recorded within the locality (5km of the site) DECC Wildlife Atlas and EPBC Protected Matters Report.

| Species | Preferred Habitat | Likelihood of Occurrence |
|---|---|---|
| *Meridolum corneovirens* | The Cumberland Plain Land Snail typically occurs in woodland of the Cumberland Plain, under logs and other debris, amongst leaf and bark accumulations around bases of trees and sometimes under grass clumps. Where possible it will burrow into loose soil, especially around the bases of large trees. The species can persist for some time under isolated trees or logs in otherwise poor habitat. | Nil.<br>Subject site does not support preferred habitat.<br>Species was not found during targeted search. |
| *Miniopterus schreibersii oceanensis* | In NSW, the Eastern Bent-wing Bat has been recorded from the coast to the western slopes of the Great Dividing Range. Occurring in forests and woodlands the species live in colonies and roost in caves, old mines and occasionally buildings. Females form nursing colonies in spring utilising specific nursery caves with high humidity and temperature. The species forages for insects above the tree canopy. | Nil-low.<br>Subject site does not support preferred habitat.<br>Species may pass over the subject site on occasion. |
| *Mixophyes iteratus* | Distribution of the Giant Barred Frog is along the coast and ranges from south-eastern Queensland to the Hawkesbury River in NSW. The species inhabits deep, damp leaf litter in rainforests, moist eucalypt forest and nearby dry eucalypt forest, at elevations below 1000 m. Breed around shallow, flowing rocky streams from late spring to summer. | Nil.<br>Subject site does not support preferred habitat. |
| *Mormopterus norfolkensis* | The Eastern Freetail-bat occurs in dry sclerophyll forest and woodland east of the Great Dividing Range from south Queensland to southern NSW. Roosts mainly in tree hollows but also known to roost under bark or in man-made structures. | Nil-low.<br>Subject site does not support preferred habitat.<br>Species may pass over the subject site on occasion. |
| *Myotis adversus* | The Large-footed Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. It is rarely found more than 100 km inland, except along major rivers. Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forages over streams and pools catching insects and small fish by raking their feet across the water surface. | Nil.<br>Subject site does not support preferred habitat. |
| *Neophema pulchella* | Distribution of the Turquoise Parrot extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range. Inhabits the margins of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Nests in tree hollows, logs or posts, from August to December. It lays four or five white, rounded eggs on a nest of decayed wood dust. | Nil.<br>Subject site does not support preferred habitat.<br>Species may pass over the subject site during migratory movements. |
| *Ninox connivens* | Distribution of the Barking Owl is throughout Australia except for the central arid regions and Tasmania. The species inhabits eucalypt woodland, open forest, swamp woodlands and, especially in inland areas, timber along watercourses. Roosts along creek lines, usually in tall understorey trees with dense foliage such as Acacia and Casuarina species, or the dense clumps of canopy leaves in large eucalypts. Home range is 30 to 200 hectares. | Nil-low.<br>Subject site does not support preferred habitat.<br>Species may pass over the subject site on occasion. |

**Table 6 cont'** Habitat potential for threatened fauna species previously recorded within the locality (5km of the site) DECC Wildlife Atlas and EPBC Protected Matters Report.

| Species | Preferred Habitat | Likelihood of Occurrence |
|---|---|---|
| *Ninox strenua* | The Powerful Owl is found throughout forests and woodlands of south eastern Australia from southeast Queensland to southeast South Australia. Occupies a large home range of more than 1000 ha. Roosts by day in dense vegetation, commonly on drainage lines and in gullies. Requires tree-hollows of more than 50cm depth for nesting. | Nil-low. Subject site does not support preferred habitat. Species may pass over the subject site on occasion. |
| *Petalura gigantea* | The Giant Dragonfly is found along the east coast of NSW. It is not found west of the Great Dividing Range. There are known occurrences in the Blue Mountains and Southern Highlands, in the Clarence River catchment, and on a few coastal swamps from north of Grafton to Nadgee in the south. The species inhabitats permanent swamps and bogs with some free water and open vegetation. | Nil. Subject site does not support preferred habitat. |
| *Petrogale penicillata* | In NSW, the Brush-tailed Wallaby occurs from the Queensland border in the north to the Shoalhaven in the south, with the population in the Warrumbungle Ranges being the western limit. The species occurs on rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges facing north. The species forages at night and during the day, shelters or basks in rock crevices, caves and overhangs. Highly territorial and have strong site fidelity with an average home range size of about 15 ha. | Nil. Subject site does not support preferred habitat. |
| *Potorous tridactylus tridactylus* | Long-nosed Potoroos are generally restricted to areas with an annual rainfall greater than 760 mm where they inhabit dry and wet sclerophyll forests and woodland with a heathy understorey with the preferred habitat in north eastern NSW being dry and wet open shrubland. The species requires relatively thick ground cover growing on friable soils. | Nil. Subject site does not support preferred habitat. |
| *Pseudophryne australis* | Distribution of the Red-crowned Toadlet is confined to the Sydney Basin where the species occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings, sheltering under rocks and amongst dense vegetation in thick leaf litter. Breeds in damp leaf litter. | Nil. Subject site does not support preferred habitat. |
| *Petaurus australis* | The Yellow-bellied Glider is found along the eastern seaboard to the western slopes of the Great Divide, from southern Queensland to Victoria. The species inhabits tall mature eucalypt forests and nests in large tree hollows where they build substantial, spherical nests of eucalypt leaves. Yellow-bellied Gliders feed from a range of sources, including winter-flowering eucalypts that provide nectar and pollen, and sap-trees, which are eucalypt trees into which they chew V-shaped incisions to collect sap. | Nil. Subject site does not support preferred habitat. |

**Table 6 cont'** Habitat potential for threatened fauna species previously recorded within the locality (5km of the site) DECC Wildlife Atlas and EPBC Protected Matters Report.

| Species | Preferred Habitat | Likelihood of Occurrence |
|---|---|---|
| *Pteropus poliocephalus* | The Grey-headed Flying-Fox occurs along the east coast of Australia from Bundaberg in Queensland to Melbourne in Victoria and to the western slopes of the Great Diving Range in northern NSW.. The species roosts in aggregations of up to tens of thousands of animals and migrates depending on availability of food resources, which may be seasonal. Nectar, pollen and fruits or foraged from native trees and vines or sometimes fruit crops. | Nil-low.<br>Subject site does not support preferred habitat.<br>Subject site does not support a camp for this species.<br>Species may pass over the subject site on occasion. |
| *Rostratula australis* | The Painted Snipe inhabits shallow freshwater wetlands, vegetated ephemeral and permanent lakes and swamps, and inundated grasslands. The Painted Snipe roosts during the day in dense vegetation and is active at dusk, throughout the night and dawn. It nests on the ground amongst tall reed-like vegetation near water, and feeds near the water's edge and on mudflats, taking invertebrates, such as insects and worms, and seeds. | Nil.<br>Subject site does not support preferred habitat. |
| *Scoteanax rueppellii* | The Greater Broad-nosed Bat is found mainly in the gullies and river systems that drain the Great Dividing Range. In NSW it is widespread on the New England Tablelands, however does not occur at altitudes above 500 m. This species utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings. Maternity sites are often located in suitable trees. | Nil.<br>Subject site does not support preferred habitat. |
| *Tyto novaehollandiae* | Masked owls are sparsely distributed in coastal and near-coastal regions of Australia. In NSW they are recorded sporadically in the north-east along the coast and tablelands in dry eucalypt forest and woodlands from sea level to 1100m. Masked Owls are forest owls but often hunt along the edges of forests, including roadsides. They have large home-ranges of 500 to 1000 hectares per pair, covering forested and partly open country. Masked Owls roost and breed in moist eucalypt forested gullies, using large tree hollows, or sometimes caves, for nesting. | Nil-low.<br>Subject site does not support preferred habitat.<br>Subject site does not support a camp for this species.<br>Species may pass over the subject site on occasion. |
| *Tyto tenebricosa* | The Sooty Owl occurs within eastern NSW, occurring on the coast, coastal escarpment and eastern tablelands. There is no seasonal variation in its distribution. Occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests. Roosts by day in the hollow of a tall forest tree or in heavy vegetation. Nests in very large tree-hollows. | Nil-low.<br>Subject site does not support preferred habitat.<br>Subject site does not support a camp for this species.<br>Species may pass over the subject site on occasion. |

**Table 6 cont'** Habitat potential for threatened fauna species previously recorded within the locality (5km of the site) DECC Wildlife Atlas and EPBC Protected Matters Report.

| Species | Preferred Habitat | Likelihood of Occurrence |
|---|---|---|
| *Xanthomyza phrygia* | In NSW the Regent Honeyeater has been recorded from coastal areas to as far west as Narrabri with important breeding areas west of Armidale. The species is semi-nomadic and occurs in temperate eucalypt woodlands with most records from box-ironbark associations and wet lowland coastal forests. Nests in eucalypts, casuarinas or mistletoes. | Nil-low.<br>Subject site does not support preferred habitat.<br>Subject site does not support a camp for this species.<br>Species may pass over the subject site during migratory movements. |

## 7 IMPACT ASSESSMENT AND CONCLUSION

As mentioned previously, Shale Plains Woodland, a subset of Cumberland Plain Woodland, has been mapped across the subject site (NPWS 2002a). Cumberland Plain Woodland is listed as an Endangered Ecological Community under Schedule 1 of the TSC Act. The current proposal requires the removal of approximately 29 trees (Treescan 2009), including two species that are diagnostic canopy species of Cumberland Plain Woodland: *Eucalyptus molucanna* Grey Box (5 trees to be removed) and *Corymbia maculata* Spotted Gum (22 trees to be removed). As a result, an Assessment of Significance (s5A of the EP&A Act) has been carried out for this community (Appendix A).

The likely presence of each of the locally recorded threatened species was assessed using knowledge of each species habitat and lifecycle requirements in relation to the habitats present within the study area (Table 5 and 6). The location and number of nearby, recent records were also considered in determining likelihood of occurrence. In accordance with the *Threatened Species Assessment Guidelines* (DECC 2007), an assessment of significance does not need to be carried out for a species that:

- Does not occur in the study area; or
- Will not use on-site habitats in occasion; or
- Will not be influenced by off-site impacts of the proposal.

As a result of the highly modified state of the subject site, threatened species previously known to occur within 5km of the site were predominately assessed as having a Nil or Low likelihood of occurring on the subject site (Table 5 and 6). Therefore, an assessment of significance was not carried out for these species.

### 7.1 Potential Impacts and Impact minimisation

A direct impact of the current proposal is the removal of 29 mature trees, 5 of which are *Eucalyptus molucanna* Grey Box and 22 of which are *Corymbia maculata* Spotted Gum. As discussed in the attached 7-part tests, the removal of these trees will not fragment or significantly modify remaining vegetation, or habitat occurring on the study area. The vegetation to be removed does not comprise a significant area of habitat for protected flora and fauna species or endangered vegetation communities that occur on the site, study area or within the locality. As a result, the current proposal is unlikely to result in a significant effect on the long term survival or habitats of native flora and fauna occurring on the site, in the locality or the region.

Potential indirect impacts of the current proposal may include loss of shade/shelter, weed invasion, and/or sedimentation. The loss of shade/shelter is directly related to the trees to be removed. However, the absence of a mid-storey and understorey means shade/shelter is already minimal. Disturbance to the soil related to works may contribute to the invasion or spread of weeds from adjacent areas, and potential sedimentation downslope. The potential impact of sedimentation during works may be minimised by appropriate mitigation measures outlined below. Run-off and sedimentation will most probably not increase from their present levels following the completion of works.

The potential for impacts can be reduced or controlled through the implementation of impact minimisation measures. Minimisation measures and additional recommendations in relation to the current proposal are summarised below.

- The current proposal is to be carried out in accordance with all policies operational procedures and guidelines in place relating to environmental management or impact minimisation for construction projects of the scope for current proposal;
- Appropriate measures should be undertaken to reduce potential detrimental effects of construction on trees proposed to be retained, as outlined in the Arborist's report (Treescan 2009);
- Machinery is to be cleaned of soil and debris before bringing it on site to reduce the potential spread of weeds and the fungal pathogen *Phytophthora cinnamomi*;
- Installation, maintenance and decommissioning of sediment and erosion controls as required and as specified in any consent;
- Temporary fencing should be installed to exclude the passage of native fauna through construction or storage compounds to minimise opportunities for fauna to shelter in machinery or materials stockpiles;
- Any landscaping or revegetation is to incorporate locally indigenous plant species that are characteristic of Cumberland Plain Woodland; and
- The site is to be made good on completion of construction with no excess construction materials or debris to remain on the site.

## 7.2 Conclusion

Total Earth Care has conducted a flora and fauna assessment, which involved the research and review of previous data and literature of relevance to the subject site and study area, including data from the NPWS Wildlife Atlas and EPBC Protected Matters report. A diurnal survey of the subject site and study area was conducted on July 10th to identify vegetation communities, flora species, fauna species, and fauna habitats.

During the current survey, 33 plant species (including 13 native species and 20 introduced species) and 6 fauna species were recorded within the subject site. An assessment of significance was not carried out for those species assessed of having a Nil, Low or Low-medium likelihood of occurring on the subject site.

Disturbance related to the construction of the hospital and associated infrastructure such as access roads and car parks, has resulted in the loss of much of the vegetation, while maintenance regimes such as mowing limit the potential for the regeneration of native species. Soil disturbance associated with the original construction has most probably reduced the potential for Shale Plains Woodland to regenerate from the soil seedbank, even upon the cessation of mowing. The highly modified nature of the subject site has also resulted in the loss of many of the natural habitat features and resources that are important in the maintenance of native fauna diversity and life cycles. Important fauna habitat features that are missing from the subject site include fully structured vegetation, a diverse shrub layer for food sources and protection, rocky outcrops, loose rocks, leaf litter, and logs. Accordingly, the subject site has been assessed as having a poor level of fauna habitat value. In summary, the current proposal is unlikely to significantly affect the ecological function or long term survival and integrity of the vegetation, flora and fauna occurring in the locality.

One plant community were identified within the subject site and study area during the current survey; a highly modified form of Shale Plains Woodland, a subset of the Cumberland Plain Woodland. The highly modified remnant of Shale Plains Woodland identified as occurring on the subject site (NPWS 2002a) persists primarily as canopy trees (*Eucalytus molucanna* Grey Box*, Corymbia maculala* Spotted Gum*)* that are characteristic of the community. An Assessment of Significance and an assessment addressing the Significant Impact Guidelines have been carried out for Cumberland Plain Woodland (Appendix A). These assessments concluded that the proposal will not have a significant impact on the community, and therefore a Species Impact Statement or a Referral to the Commonwealth is not required.

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# Appendix A

# Assessments of Significance

Nepean Hospital Redevelopment, Penrith

## 3 ASSESSMENT OF SIGNIFICANCE – CUMBERLAND PLAIN WOODLAND

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

The TSC Act defines a "threatened species" as "a species specified in Part 1 or 4 of Schedule 1 or in Schedule 2" of the Act. Cumberland Plain Woodland is not a "threatened species", as defined under the TSC Act.

**(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.**

The TSC Act defines an 'endangered population' as 'a population specified in Part 2 of Schedule 1' of the Act. Cumberland Plain Woodland is not an 'endangered population', as defined under the TSC Act.

**(c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:**

- **(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
- **(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.**

The proposed action comprises the removal of approximately 29 trees, some of which are characteristic species of CPW. Cumberland Plain Woodland is listed as an Endangered Ecological Community under Schedule 1 of the TSC Act. The Shale Plains Woodland subunit of Cumberland Plain Woodland occurring on the subject site contains two diagnostic canopy species for the community: *Eucalyptus moluccana* Grey Box (5 proposed to be removed) and *Corymbia maculata* Spotted Gum (22 proposed to be removed). A mid-storey species characteristic of CPW, *Melaleauca decora* occurs sporadically throughout the subject site and three individual trees are proposed to be removed.

The occurrence of the community on the subject site and in the study area has undergone significant modification as a result of disturbance related to construction of hospital buildings and associated infrastructure, clearing, and maintenance regimes such as mowing. The likelihood of CPW regenerating on the site from the soil seedbank is negligible as the original soil seedbank may have been removed prior to the original construction works, it has since been built over or on-going land-use precludes the presence of bushland at the site. Much of the community is degraded and comprises a floristically and structurally simple composition. As a result, the proposed actions are unlikely to have an adverse effect on the extent of CPW, nor will substantially or adversely modify the composition of the community, such that the local occurrence of the community is likely to be placed at greater risk of extinction.

**(d) In relation to a habitat of a threatened species, population or ecological community:**

- **(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and**
- **(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**
- **(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.**

It is estimated that prior to European settlement Cumberland Plain Woodland covered 125,000 hectares across western Sydney. Clearing for agriculture and urban development has resulted in a substantial loss and fragmentation of the community (NPWS, 2004). Estimates of the remaining original extent include between 6% from the Final Determination (NSW Scientific Committee, 1997) to

9%, with a further 14% remaining as scattered trees (NPWS, 2004). The Shale Plains Woodland subunit of Cumberland Plain Woodland occurring on the subject site is a highly modified remnant with no connectivity to other stands of Cumberland Plain Woodland.

At a locality scale the current proposal will not increase fragmentation or isolation of the community as the Shale Plains Woodland subunit of Cumberland Plain Woodland occurring on the subject site is highly disturbed with no connectivity to a significant stand of Cumberland Plain Woodland in the locality. The long-term viability of the community of the subject site is extremely low, with the persistence at the site mainly as mature canopy species, some shrub species and little to no ground layer species. This is due to the past and ongoing disturbance, the lack of vegetation layer structure and low species diversity.

As a result, the proposed action will not significantly remove or modify a significant extent of CPW occurring in the locality. The proposed action will not significantly increase fragmentation or isolation of the community on the in the locality. The long-term survival of CPW occurring on the subject site and in the locality will not be significantly affected by the removal of the canopy species as the site represents a very simplified vegetation structure that is within and surrounded by a highly modified urban environment.

**(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).**

No area has been designated as 'critical habitat' under Part 3 of the TSC Act 1995 for Cumberland Plain Woodland.

**(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.**

There is currently no Recovery Plan in place for Cumberland Plain Woodland. There are however 17 priority actions specified by the DECC to assist the recovery of this community. The proposed development is not inconsistent with the strategies and actions listed in the priority action statement. There are no Threat Abatement Plans currently in operation for any Key Threatening Processes threatening Cumberland Plain Woodland.

**(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.**

The TSC Act defines "threatening process" as "a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities". Schedule 3 of the TSC Act provides a list of the "key threatening processes" (KTP). Of the KTP's listed in Schedule 3 of the TSC Act the and in the context of the current and continuing land use the following KTP's are relevant to Cumberland Plain Woodland of the subject site:

- Clearing of Native Vegetation.

Clearing of native vegetation is recognised as the major KTP affecting Cumberland Plain Woodland. The proposed action will contribute to the clearing of native vegetation as this is required for the construction of the new building. However, as the area to be affected is small and the condition of the Cumberland Plain Woodland to be affected is low, the proposal will not significantly increase the impact of this KTP.

**Conclusion**

In light of the consideration of the above seven factors (1 -7), the proposed activity on the subject site is not likely to have "a significant effect" on Shale Plains Woodland on the subject site or wider locality as a result of the current proposal, as:

- The proposal will not adversely affect the lifecycle of the community;

- The proposal will not remove, modify or further fragment or isolate a significant area of habitat for the community; and
- The proposal does not significantly contribute to any KTP threatening the community.

Consequently, a Species Impact Statement is not required.

**EPBC Act Significant Impact Criteria – Critically endangered and endangered ecological communities – Cumberland Plain Woodland**

An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:

**reduce the extent of an ecological community**

CPW occurs on the Cumberland Plain and at some area of minor elevations in western Sydney and entirely within the Sydney Basin Bioregion. The community has been reported as occurring in the local government areas of Auburn, Bankstown, Baulkham Hills, Blacktown, Camden, Campbelltown, Fairfield, Hawkesbury, Holroyd, Liverpool, Parramatta, Penrith and Wollondilly (NSW Scientific Committee, 1997). As at the date of gazettal of the Final Determination for the community by the NSW Scientific Committee (1997) it was estimated that 9% of the original extent remained.

A very small remnant of CPW in low condition, persisting as predominately canopy species, is described and mapped in the current survey on the Nepean Hospital site, including the East Block area.

CPW of the subject site as described in poor condition, and is highly unlikely to regenerate to a fully formed community due to previous and on-going disturbance and current land-use at the site, and the proposed development will not significantly reduce the extent of Shale Hills Woodland at Nepean Hospital, the locality or over the known distribution of the community.

**fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines**

The area of CPW at the site is currently separated from other areas of the community by large expanses of urban residential, infrastructure and commercial development. Clearing of several characteristic CPW species at the subject site will occur as part of the proposed development, however this action will not further fragment the CPW or increase the current level of fragmentation of the community type at a locality or regional scale.

**adversely affect habitat critical to the survival of an ecological community**

No critical habitat for CPW is identified under the EPBC Act Register of Critical Habitat.

Key elements of the habitat for CPW such as parent geology, physiographic features and vegetation structure have been described by Tozer (2003). Clearing of vegetation and soil disturbance on the subject site has previously occurred, and the proposed development will not significantly affect key elements of habitat for the community including parent geology, soil types and typical vegetation structure such that it's continued existence and dispersal on the subject site, within the Hospital site, the locality or region threatens its survival.

**modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns**

Minor modification to abiotic factors that characterise the CPW of the subject site may occur as a result of the development. These modifications will only be relatively minor to those factors already in existence at the site and will not significantly alter the abiotic factors that are contributing to the survival of CPW at Nepean Hospital.

**cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting**

The proposed development will cause a minor change in species composition of the degraded CPW remnant of the subject site and slightly reduce the species richness due to removal of some canopy species.

It is unlikely that the development will substantially change the ecological function of the CPW of the subject site such that general species composition, keystone or integral species of the community type are substantially affected or lost entirely.

**cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to**

**assisting invasive species, that are harmful to the listed ecological community, to become established**

The integrity of the CPW on the subject site and the locality is limited by the current surrounding land use, previous and potential continuing disturbances (including weed invasion) and a high edge to area ratio. On-going maintenance and implementation of site landscaping using native species will reduce the potential for additional invasive species to become established in the stand of CPW on the subject site.

**or causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community**

Herbicides are unlikely to be used regularly in the control of exotic flora species in the CPW of the subject site and where there is potential for minor incidental damage to off target native species. weed control works should be carried out according to bush regeneration standard methods and according best practice guidelines for the management of Cumberland Plain plant communities (DEC, 2005). Landscape works or property maintenance activity that have the potential to cause a minor or substantial reduction in the integrity of CPW on the subject site should be avoided or cease.

**interfere with the recovery of an ecological community**

No federal or state recovery plan is currently in place for CPW and the potential of the stand of degraded Shale hills Woodland in the subject site to recover is currently limited by factors of past and current impact.

The DECC (2008c) have identified at total of 10 recovery strategies accompanied by 17 priority actions to assist in the recovery of CPW endangered ecological community in NSW. The proposed development is not inconsistent with relevant recovery strategies and priority actions identified by the DECC (2008c) to recover the community. The proposal, which should include the retention and protection of existing native species where possible, and landscape works using characteristic CPW species will not interfere with the recovery of CPW in the locality or throughout the region.

## Conclusion

Under the EPBC Act an action requires approval from the Australian Government Minister for the Environment, Water, Heritage and the Arts (the Minister) if the action has, will have, or is likely to have, a significant impact on a matter of national environmental significance such as CPW. The assessment above concludes that the proposed development will not have a significant impact on CPW of the subject site, locality or region and as such the action does not require referral to the DEWHA for a decision by the Minister on whether further assessment and approval is required under the EPBC Act.

# Appendix B

# Flora and Fauna Species Inventories

Nepean Hospital Redevelopment, Penrith

**Table B1** Native and exotic plant species of Nepean Hospital, Penrith

| | |
|---|---|
| **General Status** | |
| * | Exotic (not native to Australia) |
| N( ) | Noxious weeds and 'Control Class' as listed on the NSW Noxious Weeds Act 1993 for the Penrith LGA |
| ni | Non - indigenous native species (does not naturally occur at this locality) |
| (?) | Uncertain identification |
| **Conservation Status** | |
| CE | Critically Endangered - listed under Schedule 1A of the TSC Act |
| E | Endangered - listed under Schedule 1 of the TSC Act |
| V | Vulnerable - listed under Schedule 2 of the TSC Act |
| **Plant Community** | |
| 1 | Shale Plains Woodland |
| **Abundance** | |
| c | Common, species occur all over the site |
| o | Occasional, species occur over the survey area but not in large numbers at any occurrence |
| uc | Uncommon, species occur only once or twice during the survey |

| Status | Family | Genus species | Common Name | 1 |
|---|---|---|---|---|
| * | Amaranthaceae | *Alternanthera pungens* | Khaki Weed | c |
| * | Asparagaceae | *Asparagus virgatus* | Asparagus Fern | o |
| | Cyperaceae | *Baumea sp* | | uc |
| * | Buxaceae | *Buxus* | sp | c |
| | Myrtaceae | *Callistemon salignus* | Willow Bottlebrush | c |
| * | Amaryllidaceae | *Clivia minata* | Clivia | o |
| | Myrtaceae | *Corymbia maculata* | Spotted Gum | c |
| | Poaceae | *Cynodon dactylon* | Couch | c |
| | Phormiaceae | *Dianella caerulea* | Blue Flax-lily | c |
| * | Iridaceae | *Dietes sp* | | o |
| * | Poaceae | *Eleusine indica* | Crowsfoot Grass | c |
| * | Poaceae | *Eragrostis curvula* | African Lovegrass | c |
| | Myrtaceae | *Eucalyptus microcorys* | Tallowwood | o |
| | Myrtaceae | *Eucalyptus moluccana* | Grey Box | c |
| | Geraniaceae | *Geranium hort* | | c |
| ni | Proteaceae | *Grevillea sp hort* | | c |
| | Fabaceae - Faboideae | *Hardenbergia violacea* | Purple Coral Pea | c |
| | Dilleniaceae | *Hibbertia scandens* | Climbing Guinea Flower | o |
| * | Bignoniaceae | *Jacaranda mimosifolia* | Jacaranda | o |
| * | Verbenaceae | *Lantana montevidensis* | | o |
| | Brassicaceae | *Lepidium spp* | | c |
| N3 | Oleaceae | *Ligustrum lucidum* | Large Leaved Privet | uc |
| | Myrtaceae | *Melaleuca decora* | | c |
| * | Malvaceae | *Modiola caroliniana* | Red-flowered Mallow | c |
| | Oleaceae | *Olea europaea ssp cuspidata* | African Olive | o |
| * | Poaceae | *Pennisetum clandestinum* | Kikuyu Grass | c |
| * | Arecaceae | *Phoenix canariensis* | Canary Island Date Palm | o |
| * | Plantaginaceae | *Plantago lanceolata* | Lamb's Tongues | o |
| ni | Araliaceae | *Schefflera actinophylla* | Umbrella Tree | uc |
| * | Poaceae | *Setaria gracilis* | Slender Pigeon Grass | c |
| * | Asteraceae | *Sonchus oleraceus* | Common Sowthistle | c |
| * | Asteraceae | *Taraxacum officinale* | Dandelion | c |
| * | Apocynaceae | *Trachelospermum jasminoides* | Star Jasmine | o |

**Table B2** Native and exotic fauna species of Nepean Hospital, Penrith.

| | |
|---|---|
| **General Status** | |
| * | Exotic/introduced species |
| (?) | Uncertain identification |
| P | Protected |
| U | Unprotected |
| **Conservation Status** | |
| CE | Critically Endangered - listed under Schedule 1A of the TSC Act |
| E | Endangered - listed under Schedule 1 of the TSC Act |
| V | Vulnerable - listed under Schedule 2 of the TSC Act |
| **Record Type** | |
| Fl | Flying over the site |
| Vi | Visual observation |
| Au | Aural (call recognition) |
| Ul | Ultrasonic call recognition (Anabat) |
| Sc | Scat or scent |
| T | Tracks |
| Scr | Scratch marks on tree trunks or other |
| D | Diggings |
| N | Nest |
| B | Burrow |
| Hp | Harp |
| El | Elliot |
| An | Anabat |
| Cg | Cage |
| CP | Call Playback |
| Pt | Pittfalls |
| A | Anecdotal |
| E | Eggs or juvenille morphs |
| F | Fur or feathers |
| H | Hollows (in trees, trunks or other) |

| Status | Group | Family | Scientific Name | Common Name | Obs Type | Certainty |
|---|---|---|---|---|---|---|
| P | Aves | Passeriformes | *Cracticus torquatus* | Grey Butcherbird | O | |
| P | Aves | Passeriformes | *Gymnorhina tibicen* | Australian Magpie | O | |
| P | Aves | Passeriformes | *Manorina melanocephala* | Noisy Miner | O | |
| P | Aves | Passeriformes | *Strepera graculina* | Pied Currawong | W | |
| P | Aves | Psittaciformes | *Platycercus elegans* | Crimson Rosella | W | |
| P | Aves | Psittaciformes | *Trichoglossus haematodus* | Rainbow Lorikeet | O | |

# Appendix C

# Mapping

Nepean Hospital Redevelopment, Penrith

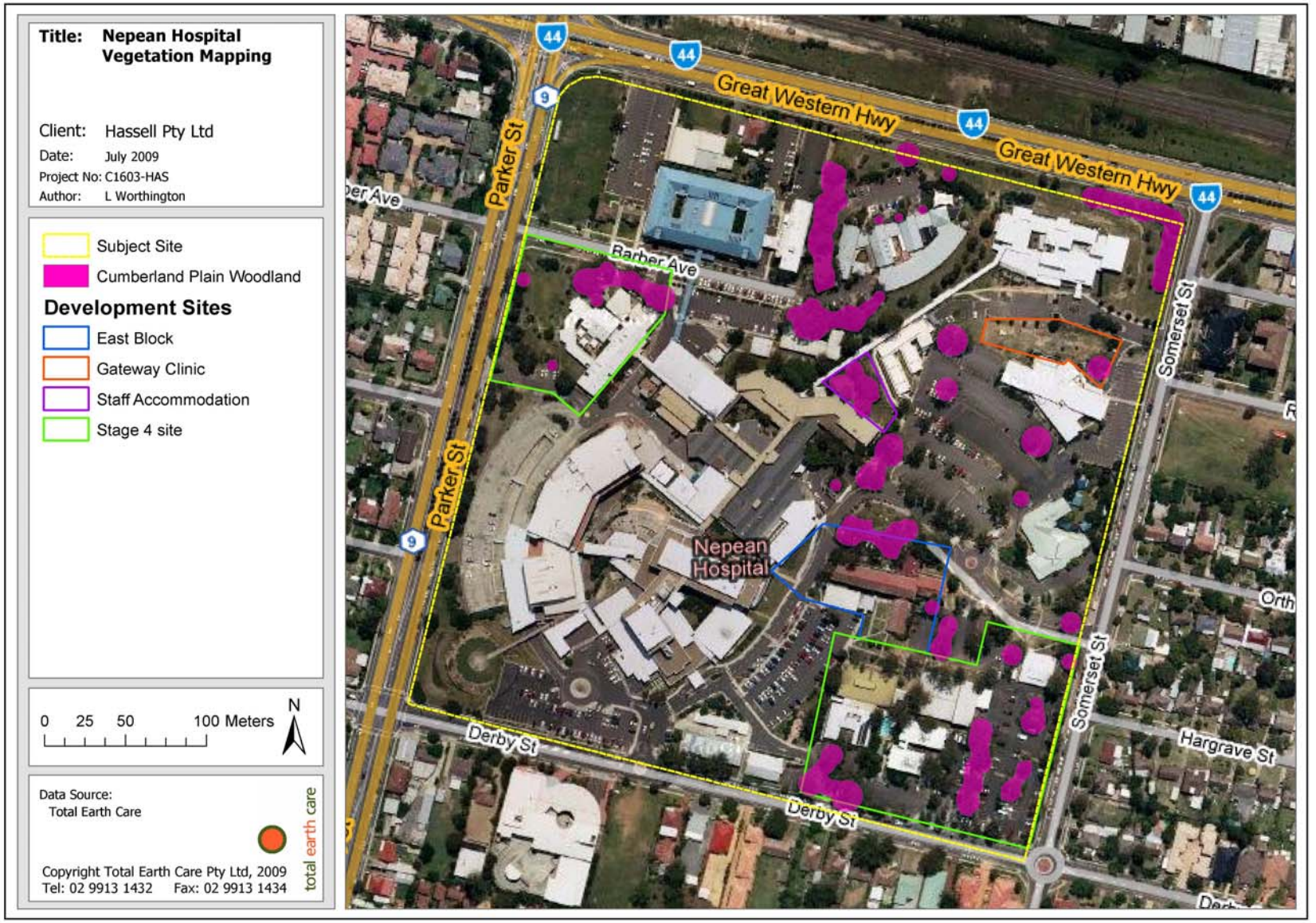


**Figure C1:** Extent of Cumberland Plains Woodland as mapped by NPWS (20O2)