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14 January 2014
Project No: 201318r1(a)

Flora and Fauna Assessment, Proposed South Werrington Urban Village, Penrith Local Government Area

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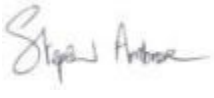
Signed:	
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1

INTRODUCTION

1.1 PURPOSE OF REPORT

This report assesses the potential impacts of the South Werrington Urban Village ("the proposed development") proposed for construction on the former eastern part of the Penrith campus of the University of Western Sydney in south Werrington (the "subject site") in the Penrith Local Government Area on the status of native flora and fauna and their habitats.

The flora and fauna assessment:

- identifies key flora and fauna habitats within the subject site;
- reviews flora and fauna literature and databases relevant to the subject site;
- describes the methodology and results of the flora and fauna surveys;
- addresses potential impacts on flora and fauna and their habitats resulting from the proposed development;
- proposes appropriate impact mitigation measures; and
- provides an assessment of the likelihood of significant impacts on threatened species, populations, ecological communities, according to Section 5A of the NSW *Environmental Planning and Assessment Act, 1979* (EP&A Act), NSW *Threatened Species Conservation Act, 1995* (TSC Act) and Commonwealth *Environmental Protection and Biodiversity Conservation Act, 1999* (EPBC Act). This was done to determine the need for a Species Impact Statement (SIS) under the TSC Act or an application for development under the EPBC Act.

1.2 GENERAL SITE DESCRIPTION

The subject site is an irregularly-shaped allotment that is approximately 28 ha in area, and which is located on the eastern side of the Penrith Campus of the University of Western Sydney (Figure 1). It is bounded to the:

- east by the Water Board and residential development;
- west by the Penrith Campus of the University of Western Sydney;
- south by Cobham Juvenile Justice Centre; and
- north by the Western Railway Line and residential development north of the line.

The subject site is relatively flat with a slope of 0.4% and is located on the floodplain of Claremont Creek, which is a tributary of South Creek.

The Luddenham soil landscape within which the subject site is located is underlain by the Wianamatta Group Ashfield Shale and Bringella Shale formations (Hazelton *et al*. 1989). Dominant soils associated with this geology are friable dark brown loams, hard-setting brown clay loams, pedal clay, mottled grey clay and apedal brown sandy clay, with greyish brown and brown loamy or clayey sand occurring less commonly (Bannerman & Hazelton 1990).

Most of the subject site has been cleared of its native vegetation and is dominated by exotic grasses that have been slashed or mown (Plate 1), and by herbaceous, shrubby and woody weeds (Plate 2). Regrowth woodland (Plates 3 to 5) is scattered throughout the north-western and central regions of the subject site, extending from the north-western to southern boundaries of the site (Figure 3).

The canopy height of the regrowth woodland ranges from 6 to 20 m (mean height = 12 m) and the diameters of the tree trunks at breast height (dbh) range from less than 0.10 to 0.40 m (mean dbh = 0.25 m). The native vegetation on the subject site has been mapped by the NSW Office of Environment and Heritage (OEH) as Shale Plains Woodland (Figure 4). This ecological community is a form of Cumberland Plain Woodland (CPW) which occurs on soils with a high shale and low sandstone influence. CPW is listed as a Critically Endangered Ecological Community under the schedules of the TSC and EPBC Acts. The native understorey and groundcover associated with CPW has largely been removed from the subject site as a result of livestock grazing and mowing/slashing, and have been replaced with exotic grasses and weeds.

A relatively dense stand of River She-oak (Casuarina cunninghamiana) have been planted along the western boundary of the neighbouring Sydney Water Board land east of the subject site. Consequently, a few she-oaks have colonised the western boundary area of the subject site (Plate 6).

Soils near the northern boundary of the subject site are water-logged as a result of stormwater runoff from the surrounding urban landscape. This is evidenced by the presence of reeds and sedges near the northern boundary (Plate 7).

A more comprehensive description of the structure and composition of vegetation communities on the subject site is provided in Chapter 3 of the present report.

1.3 PROPOSED DEVELOPMENT

Part 6 (Section 6.45 – South Werrington Urban Village) in the Penrith Development Control Plan 2006, adopted by Penrith Council on 4 August 2008, has zoned the subject site for the following uses (Figure 5):

- General residential (6.9 ha);
- Medium density residential (9.4 ha);
- Light industrial (7.0 ha); and
- Open Space/Environmental conservation (4.7 ha); and

The proposed development of the subject site (Figure 6) includes:

- detached single lot dwellings;
- medium density residential dwellings: a range of detached town houses and dual occupancy units;
- high density residential dwellings (apartments); and
- a commercial zone, i.e. a town centre consisting of a neighbourhood store, food outlets, bank, medical centre, local commercial enterprise, etc.

Figure 1 LOCATION OF SUBJECT SITE

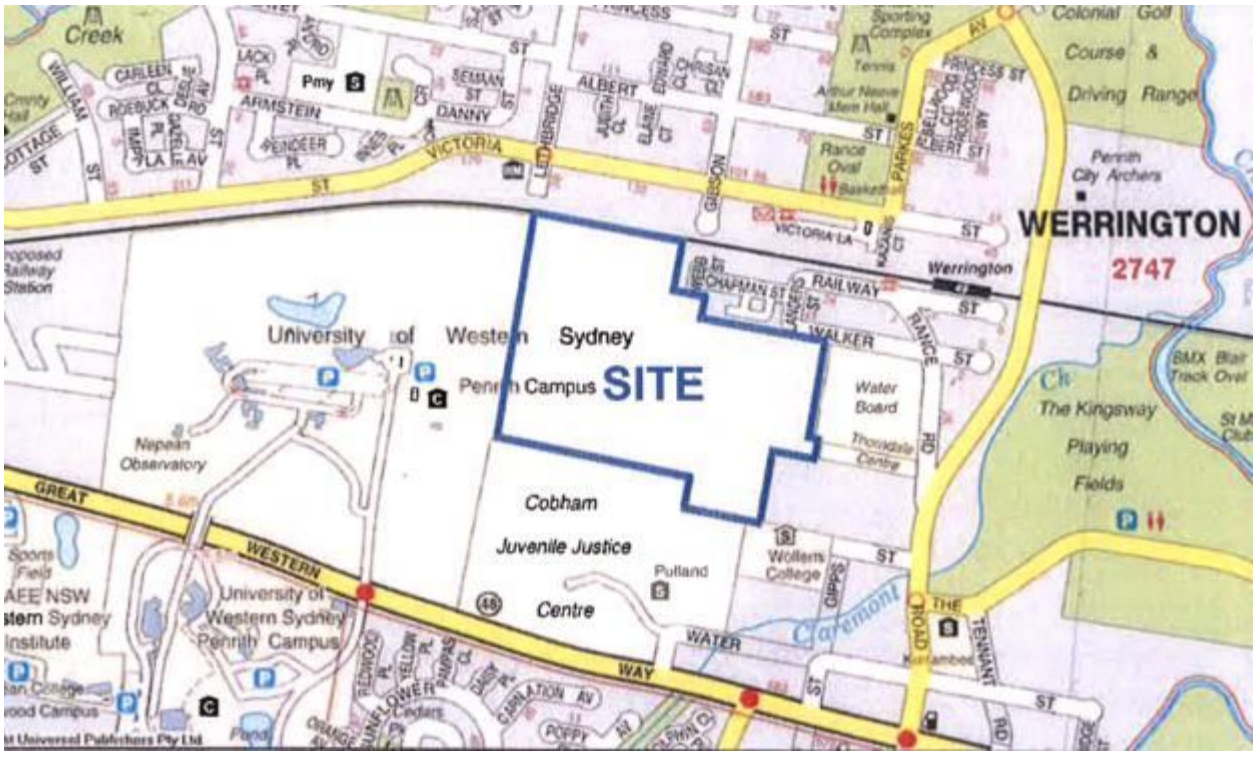

Figure 3 AERIAL VIEW OF SUBJECT SITE

Figure 4 DISTRIBUTION OF VEGETATION COMMUNTIES ON AND AROUND THE SUBJECT SITE (Source: OEH Cumberland Plain Vegetation Map Database http://www.environment.nsw.gov.au/surveys/GetHoldOfMapsDataAndReports.htm)

Purple boundary lines: subject site. **Solid colours:** canopy cover > 10%. **10:** Shale Plains Woodland. **11: Alluvial Woodland.** Solid colours: canopy cover > 10%. **Hatched colours:** canopy cover < 10%.

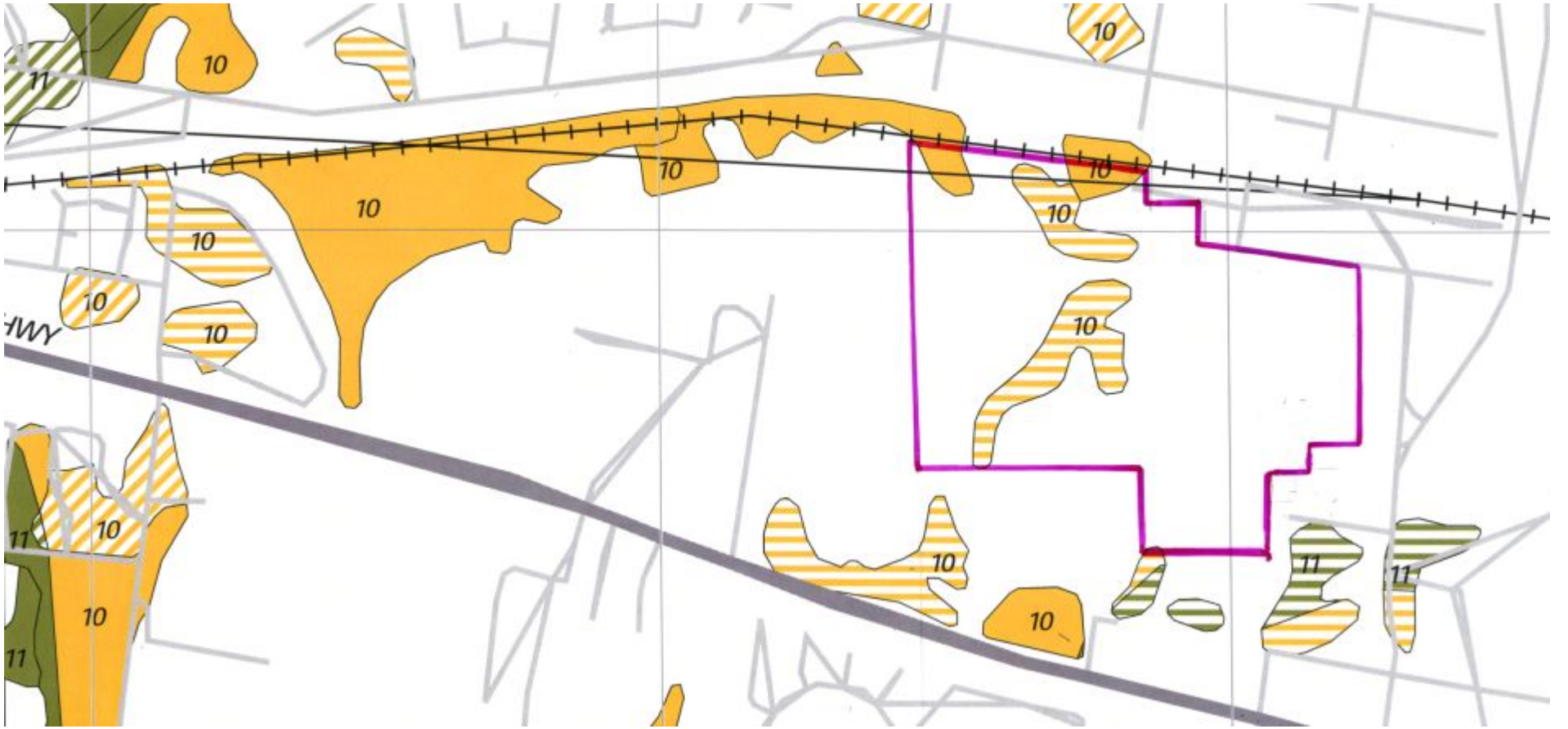

Figure 5 SOUTH WERRINGTON URBAN VILLAGE ZONING (PENRITH DCP 2006)

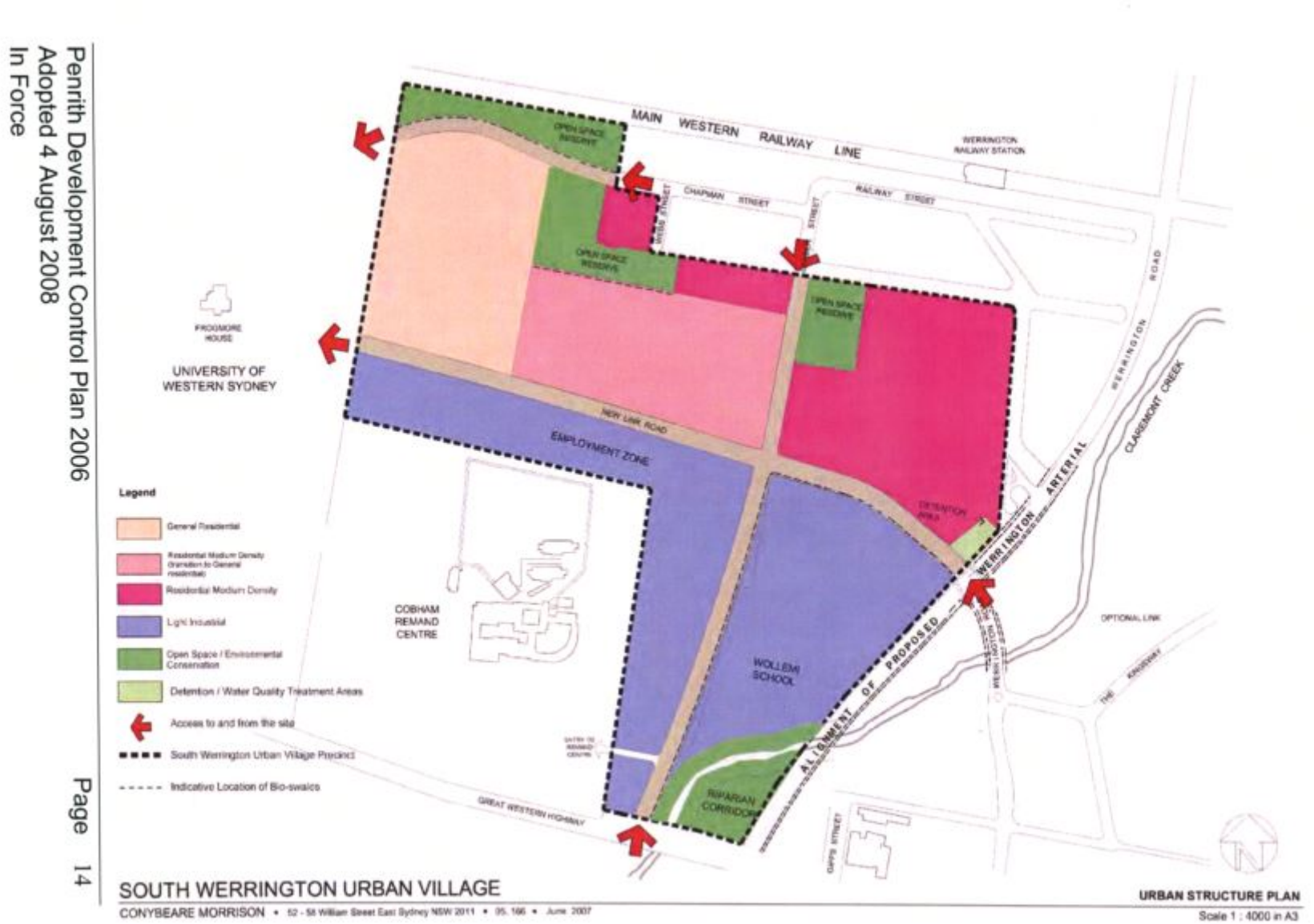

Figure 6 PROPOSED DEVELOPMENT

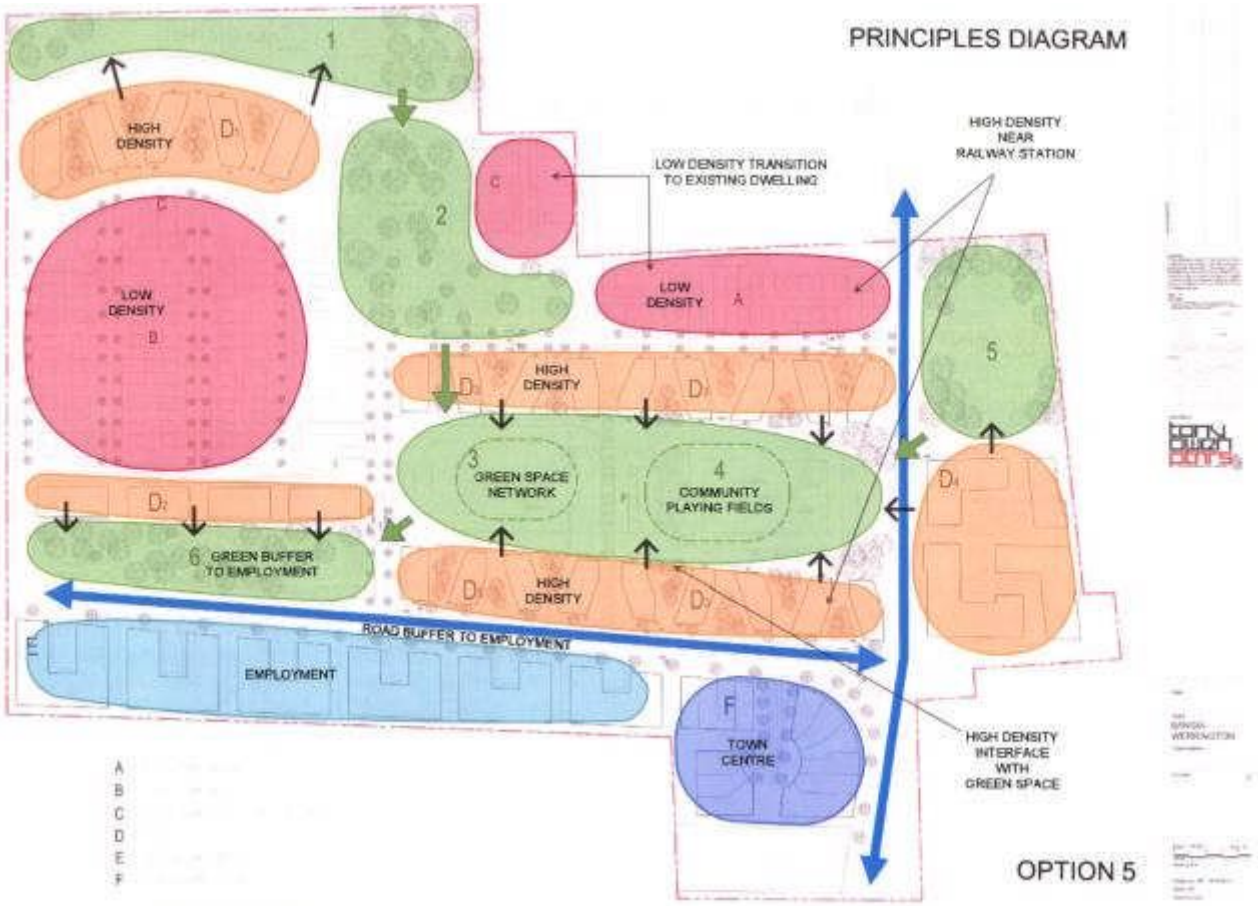

Plate 1 **Subject Site viewed from the central northern boundary**

Plate 2 **Exotic grasses and weeds in cleared areas of the subject site.**

Plate 3 **Regenerating Grey Box (*Eucalyptus moluccana*) woodland (a form of Cumberland Plain Woodland) in the north-western part of the subject site.**

Plate 4 **Regenerating Grey Box woodland in the northern central part of the subject site.**

Plate 5 **Prickly-leaved Paperbark (*Melaleuca nodosa*) woodland near the central regions of the subject site**

Plate 6 **River She-oak (*Casuarina cunninghamiana*) invading the eastern boundary areas of the subject site from the neighbouring Sydney Water Board land.**

Plate 7 Vegetation in moist areas in the northern part of the subject site

1.4 STATUTORY FRAMEWORK

1.4.1 NSW Legislation

(a) <u>Environmental Planning and Assessment Act, 1979 (EP&A Act)</u>

Section 78A of the EP&A Act enables a person to apply to a consent authority to carry out development that is permissible under an environmental planning instrument.

In assessing a development application a consent authority must, pursuant to 79C of the EP&A Act take into consideration, where relevant, the likely impacts of the development on the natural and built environments.

Section 5A of the EP&A Act lists the factors to be taken into consideration in assessing a development application in deciding whether there is likely to be a significant effect on a threatened species or population, endangered ecological community, or their habitats (the seven-part test). If a significant impact is likely to occur then a species impact statement (SIS) must be prepared in accordance with Division 2 of Part 6 of the TSC Act.

An SIS provides a more detailed assessment of threatened biota issues and proposes measures to manage and mitigate adverse impacts on the threatened species, populations or ecological communities, or their habitats, resulting from the proposal.

This report examines the factors, the likely impacts of the proposed development on threatened flora and fauna species and populations, threatened ecological communities, and their habitats, and determines whether or not an SIS is required to be prepared.

(b) Water Management Act, 2000

The *Water Management Act 2000* (WM Act), administered by the NSW Office of Water, protects the stability of river channels and lakes by regulating excavation, including dredging, and reclamation. A permit is usually required for works (or "controlled activities") in the bed, or within 40 m of the banks, unless the *Crown Lands Act 1989* applies, as is the case for most tidal waterways

1.4.2 Commonwealth Legislation

The *Environmental Protection and Biodiversity Conservation Act, 1999* (EPBC Act) regulates the assessment and approval of actions that have a significant impact on matters of national environmental significance. These may include:

- wetlands protected by international treaty (the Ramsar Convention);
- nationally listed threatened species and ecological communities; and
- nationally listed migratory species.

An action that is likely to have a significant impact requires the approval of the Commonwealth Minister for the Environment. Actions are projects, developments, undertakings, activities, series of activities or alteration of any of these actions. Guidelines for assessing the national significance of impacts are presented on the Department of Sustainability, Environment, Water, Population and the Community (SEWPAC) website.

This report assesses whether or not the proposed development would significantly impact on matters of national environmental significance. If a significant impact is likely, then the matter needs to be referred to SEWPAC.

1.4.3 Statutory Instruments

The following statutory instruments are also considered in the present report:

- State Environmental Planning Policy (SEPP) 44 – Koala Habitat Protection.
- Penrith Local Environment Plan 2010.
- Penrith Development Control Plan 2006.

1.5 STRUCTURE OF THE REPORT

The remainder of this report presents the results of field and desk top surveys of native flora and fauna that occur or potentially occur on the subject site, an analysis of the subject site's importance for native flora and fauna, and predicts the potential impacts of the proposed development on native flora and fauna species and habitat values of the site. The structure of the remaining chapters is outlined below:

Chapter 2 presents the methods used in conducting the flora and fauna survey and assessment of the conservation importance of the subject site.

Chapter 3 presents the results of the surveys and analyses of the flora and fauna values of the subject site.

Chapter 4 identifies potential impacts of the proposed development on the status of flora and fauna and their habitats. It also recommends appropriate measures for avoiding or minimising impacts on biota that may occur as a result of the proposed development.

Appendix A contains Seven-part Tests of Significance for threatened species ecological communities, and flora and fauna species and populations that may be impacted on by the proposed development.

2
METHODOLOGY

2.1 OVERVIEW

Flora and fauna issues relating to the application for the proposed development of the subject site were identified by reviewing relevant literature and databases and conducting a site survey. The methods by which this information was collected and analysed are presented below.

2.2 EXISTING RECORDS

Existing literature relevant to the subject site, in particular technical environmental reports produced by the Office of Environment & Heritage (OEH), other consultancies and Penrith Shire Council, were reviewed to determine the presence of terrestrial habitats, and flora and fauna species of conservation significance, within the locality (a 5 km radius around the subject site).

The following reports were consulted in the current assessment:

- Ambrose, S.J. (2012). Flora and Fauna Survey: Proposed Industrial Subdivision, Lot 1 DP 801995, Lot 1 DP 812984 & Lot 14 DP 707375 Water Street, Werrington.
- Penrith City Council (1995). *Penrith City Remnant Native Vegetation Survey*. Report prepared August 1995.
- Penrith Local Environmental Plan 2010.
- Part 6 (Section 6.45 – South Werrington Urban Village) in the Penrith Development Control Plan 2006.

The following databases were also consulted as part of the present study:

- OEH Wildlife Atlas Database;
- OEH Cumberland Plain Vegetation Map Database.
- Rare or Threatened Plants of Australia (RoTAP) Database;
- Cumberland Bird Observers Club Atlas Database;
- Birds Australia Atlas Database (1977-81) and (1998 onwards);
- EPBC database; and
- Australian Museum specimen collection database.

These databases only contain indicative records of flora and fauna species in the locality and are not the result of a systematic fauna survey. Database records for individual species will vary in quality, reliability and accuracy of the geographic co-ordinates. Therefore, some species records are highly accurate in space and time such as the Birds Australia Atlas Database and the Australian Museum Specimen Collection Database. However, others are more tentative or only contain estimates of geographical locations, for instance, records from the OEH Wildlife Atlas Database have a limited accuracy based on a 1 km^2 recording grid.

2.3 SITE INSPECTION

2.3.1 Overview

(a) Diurnal Surveys.

Diurnal surveys of the subject site were conducted from:

- 0830 to 1700 hrs on 9 December 2013; and
- 0730 to 1545 hrs on 10 December 2013.

These surveys included an assessment of the type and quality of habitats for native flora and fauna, compilation of a flora and fauna species list, and an assessment of the likelihood of threatened and nationally-listed migratory species occurring within the survey area.

During the diurnal site inspections, flora and fauna species lists were compiled, and the distribution and overall condition of vegetation communities and fauna habitats were documented.

(b) Nocturnal Surveys

Two Song Meters SM2BAT+ (Wildlife Acoustics Inc.) and one Anabat II Bat Detector (Titley Electronics) were set up to record animal sounds on the subject site between 1930 and 0600 hrs on 9-10 December, 10-11 December and 11-12 December 2013. The purpose of the Song Meters was to record the calls of nocturnal birds and mammals, and frogs (one microphone) and ultrasonic calls of bats (other microphone) on and adjacent to the subject site. The purpose of the Anabat Bat Detector was to record the ultrasonic calls of bats. Data files stored overnight on the Song Meters and Anabat recorder were downloaded onto a laptop while in the field on 10 December 2013 (at the start of the 2nd day of diurnal surveys) and 12 December 2013 (retrieval of sound recording equipment).

One Song Meter and the Anabat recorder were located within the woodland remnant in the north-western part of the subject site. The second Song Meter was located in scattered woodland in the central area of the subject site. The precise locations of the animal sound recorders are shown in Figure 7. These locations were in habitats where nocturnal birds and mammals where most likely to occur if present on the subject site. The Song Meters were also in close proximity to water-logged soil where adult frogs potentially occurred.

2.3.2 Flora Surveys

Vegetation sampling was conducted in twelve 20 x 20 m quadrats, eight of which were located in the remnant woodland, and the other four located in areas dominated by grasses or weeds. The locations of the quadrats are shown in Figure 7. The identities of tree and shrub species, their height and abundance were recorded in each quadrat. Herbaceous species and their percentage ground cover were recorded within a single 5 x 5 m sub-quadrat.

2.3.3 Fauna Habitat Surveys

It was not possible to determine with certainty all the fauna that utilise habitats on the subject site. This is because of the likely seasonal occurrences of some fauna species, the occasional occurrence of vagrant species, and because some species are difficult to detect because of their timid or cryptic behaviour. Therefore, fauna investigations comprised an assessment of fauna

Figure 7 LOCATIONS OF SONG METERS, ANABAT II BAT DETECTOR AND FLORA QUADRATS DURING THE SURVEY PERIOD

Legend: S: Song Meter 2MBAT+. **A:** Anabat II Bat Detector: **Q:** Flora Quadrat

habitats present on the site and an indication of their potential to support native wildlife populations and, in particular, threatened species.

The assessment criteria included:

Mammals:	extent of ground cover, shrub layer and tree canopy, hollow-bearing trees, substrate type (for burrowing etc), evidence such as droppings, diggings, footprints, scratches on trees, nests, burrow paths and runways.
Birds:	structural features such as the extent and nature of the canopy, understorey and ground strata and flowering characteristics, bird species.
Reptiles and Amphibians:	cover, shelter, suitable substrate, basking and breeding site availability. Reptiles and frogs sought in likely sheltering places.
Invertebrates	logs and other debris, leaf and bark accumulations around bases of trees, grass clumps, loose soil for burrowing.
Wildlife Corridor Values	Importance of the treed areas of the subject site as movement corridors for fauna, especially birds, aquatic fauna, mammals (e.g. microchiropteran bats) & amphibians.

2.3.4 Fauna Surveys

Information collected during the fauna surveys was used in conjunction with other surveys and records in determining fauna use of the subject site and, in particular, use or potential use of the subject site by threatened species.

Weather conditions were recorded during the time of the survey. In addition to fauna habitat assessment, the results of systematic surveys and incidental sightings of terrestrial vertebrates were used to determine faunal assemblages on the subject site. These techniques are described in greater detail below:

(i) Bird Surveys

Area searches for birds were conducted in which the observer walked at random through the subject site, stopping at will, with a search effort equivalent to a 2 ha coverage over a 30-minute period. All bird species that were observed or heard during the survey were noted. Opportunistic observations of bird species on the subject site were also recorded.

(ii) Reptiles and Amphibians

Reptiles and amphibians were identified using indirect observation methods. Species were searched for in fallen logs, suitable basking substrates and underneath other fallen material during the diurnal survey period. Frog calls were recorded overnight (9-12 December 2013) with the call-activated Song Meters (see Section 2.3.1). These calls were then downloaded onto a computer and identified audibly at a later stage at the office of Ambrose Ecological Services Pty Ltd. Frogs heard opportunistically in water-logged parts of the subject site during the diurnal surveys of the subject site were also recorded.

(iii) Microchiropteran Bats

Microchiropteran bats often fly through woodland or forest habitats by moving along creeks and open areas of forest. They are most easily detected around dusk when they emerge from their day-time roosts and begin to actively forage for food. Two Song Meters and an Anabat II Bat Detector were used during the nocturnal survey period to record the ultrasonic calls of bats that may have been in or near the subject site (see Section 2.3.1).

Bat calls that are recorded during surveys are routinely identified with the assistance of Anabat 6.3 Software (Titley Electronics), Richards *et al*. (1993), Reinhold *et al*. (2001) and Pennay *et al*. (2004).

(iv) Mammals

Opportunistic observations were recorded if mammals were seen during the day. However, most of the evidence of the use of the subject site and neighbouring areas by mammals was through the use of indirect evidence of their presence, which was collected during the fauna habitat assessment.

2.4 ASSESSMENT OF CONSERVATION VALUE

The conservation value of flora and fauna habitats on the subject site and neighbouring bushland areas was determined by reference to the following criteria:

- *representativeness* - whether the vegetation communities of the site are unique, typical or common in the bioregion. In addition, the criteria takes into account whether or not such vegetation units are presently held in conservation reserves;
- the presence of threatened or regionally significant species on the site;
- The extent of human influence on the natural environment of the site and the condition of habitats (e.g. the presence of weeds, fire frequency etc.);
- the uniqueness of the natural values of the site;
- the amount of native vegetation to be cleared or modified by the proposed development in relation to what remnant vegetation will remain in the locality; and
- the relative importance of a site as a corridor for the movement of wildlife.

2.5 KOALA HABITAT ASSESSMENT

An assessment of Koala habitat on the subject site, according to the *State Environment Planning Policy No. 44 – Koala Habitat Protection* (SEPP 44), was completed on 10-11 December 2013 as part of the overall fauna survey and assessment.

It is necessary to identify whether the site consists of *potential* and/or *core* Koala habitat as defined under SEPP 44 when seeking development consent in local government areas to which the policy applies.

Potential Koala habitat is defined as "*areas of native vegetation where the trees of the types listed in Schedule 2 (of SEPP 44) constitute at least 15% of the total number of trees in the upper or lower strata of the tree componen*t". Trees listed in Schedule 2 are presented in Table 2.1

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 and historical*

records of a Koala population". The subject site in the present study is not Potential or Core Habitat according to these definitions.

In assessing the potential of the subject site as Koala habitat, a search for preferred roosting trees, according to Schedule 2 of SEPP 44 (Table 2.1).

Table 2.1 **KOALA FOOD AND ROOST TREES LISTED IN SCHEDULE 2 OF SEPP 44**

Scientific Name	Common Name
Eucalyptus albens	White Box
Eucalyptus camaldulensis	River Red Gum
Eucalyptus haemastoma	Broad-leaved Scribbly Gum
Eucalyptus microcorys	Tallowwood
Eucalyptus populnea	Bimble Box
Eucalyptus punctata	Grey Gum
Eucalyptus robusta	Swamp Mahogany
Eucalyptus signata	Scribbly Gum
Eucalyptus tereticornis	Forest Red Gum
Eucalyptus viminalis	Ribbon Gum

3

RESULTS

3.1 INTRODUCTION

This chapter presents the results of the field and database surveys for threatened and other biota on the subject site and in immediate neighbouring bushland areas. It also analyses the conservation values of the subject site and these neighbouring areas.

3.2 FLORA SPECIES

A total of 52 flora species, which are listed in Table 3.1, were recorded on the subject site. Twenty-three species (44.2% of the total number of plant species) are locally native, 27 species (51.9%) are weeds or exotic grasses, one species (1.9%) is an Australian species that is not native to the locality, and one (1.9%) is a cosmopolitan species. Descriptions of the vegetation communities on the subject site are provided in Section 3.3.

3.3 VEGETATION COMMUNITIES

3.3.1 Overview

The native vegetation that originally occurred on the subject site has mostly been cleared and replaced with introduced pasture grasses and weeds. Regrowth of native vegetation has occurred mainly in the north-western and central regions of the subject site. Two main vegetation communities occur on the subject site:

- Open pasture grassland; and
- Regrowth Cumberland Plain Woodland.

These communities are described in Sections 3.3.2 and 3.3.3.

3.3.2 Open Pasture Grassland

The dominant species is the exotic grass Paspalum with the cosmopolitan grass, Common Couch (*Cynodon dactylon*), being common and widespread. The height of the grass at the time of the site inspection was less than 30 cm. Other species growing in flooded parts of the grassland include Tall Sedge (*Carex appressa*) (native species), and Phalaris (*Phalaris aquatica*), Giant Paspalum (*Paspalum urvillei*), Tall Flatsedge (*Cyperus eragrostis*) and Carpet Grass (*Axonopus fissifolius*) (exotic species).

3.3.3 Cumberland Plain Woodland

Cumberland Plain Woodland is listed as a Critically-endangered Ecological Community under the schedules of both the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) and NSW *Threatened Species Conservation Act, 1995* (TSC Act). It comprises the Spotted Gum (*Corymbia maculata*) Forest (Map Unit 9b), Grey Box (*Eucalyptus moluccana*) Woodland (Map Unit 10c) and Grey Box-Ironbark Woodland (Map Unit 10d) that were described in the natural vegetation 1:100,000 map sheets of Penrith (Benson 1992) and Sydney (Benson & Howell 1994).

Table 3.1 **FLORA SPECIES RECORDED ON SUBJECT SITE, 9-10 DECEMBER 2013**

LNa: Locally-native species; **NNa:** Non-local native species; **Ex:** Exotic species (weed or introduced grass); **Co:** Cosmopolitan species.

Family	Scientific Name	Common Name	LNa	NNa	Ex	Co
DICOTYLEDONS						
Asteraceae	*Bidens pilosa*	Cobblers Pegs			X	
Asteraceae	*Cirsium vulgare*	Spear Thistle			X	
Asteraceae	*Conyza sumatrensis*	Fleabane			X	
Asteraceae	*Senecio madagascariensis*	Fireweed			X	
Casuarinaceae	*Casuarina cunninghamiana*	River She-oak	X			
Convolvulaceae	*Dichondra repens*	Kidney Weed	X			
Fabaceae	*Acacia parramattensis*	Parramatta Green Wattle	X			
Fabaceae	*Glycine clandestina*	Twining Glycine	X			
Myrtaceae	*Eucalyptus moluccana*	Grey Box	X			
Myrtaceae	*Melaleuca nodosa*	Prickly-leaved Paperbark	X			
Ochnaceae	*Ochna serrulata*	Mickey Mouse Plant			X	
Oleaceae	*Ligustrum lucidum*	Large-leaved Privet			X	
Oleaceae	*Ligustrum sinense*	Small-leaved Privet			X	
Oxalidaceae	*Oxalis corniculata*	Creeping Oxalis			X	
Pittosporaceae	*Bursaria spinosa*	Australian Boxthorn	X			
Plantaginaceae	*Plantago lanceolata*	Plantain			X	
Solanaceae	*Lycium ferocissimum*	African Boxthorn			X	
Solanaceae	*Solanum americanum*	Black Nightshade			X	
Verbenaceae	*Lantana camara*	Lantana			X	
MONOCOTYLEDONS						
Anthericaceae	*Tricoryne elatior*	Yellow Rush-lily	X			
Araceae	*Alocasia sp.*	Cunjevoi		X		
Asparagaceae	*Asparagus asparagoides*	Bridal Creeper			X	
Commelinaceae	*Commelina cyanea*	Scurvey Weed	X			
Commelinaceae	*Murdannia nudiflora*	Grass Lily			X	
Commelinaceae	*Tradescantia albiflora*	Wandering Jew			X	
Cyperaceae	*Carex appressa*	Tall Sedge	X			
Cyperaceae	*Cyperus eragrostis*	Tall Flatsedge	X			
Cyperaceae	*Cyperus rotundus*	Nut Grass			X	
Cyperaceae	*Lepidosperma laterale*	Variable Sword-sedge	X			
Juncaceae	*Juncus usitatus*	Common Rush	X			
Liliaceae	*Tricoryne elatior*	Yellow Rush-lily	X			
Poaceae	*Andropogon virginicus*	Whisky Grass			X	
Poaceae	*Axonopus fissifolius*	Carpet Grass			X	
Poaceae	*Aristida vagans*	Threeawn Speargrass	X			
Poaceae	*Austrostipa* sp.	Spear-grass sp.	X			
Poaceae	*Avena sativa*	Wild Oats			X	
Poaceae	*Bromus catharcticus*	Shivery Grass			X	
Poaceae	*Chloris gayana*	Rhodes Grass			X	
Poaceae	*Cynodon dactylon*	Common Couch				X
Poaceae	*Echinopogon caespitosus*	Tufted Hedgehog Grass	X			

Family	Scientific Name	Common Name	LNa	NNa	Ex	Co
Poaceae	*Eragrostis brownii*	Brown's Lovegrass	X			
Poaceae	*Eragrostis curvula*	African Lovegrass			X	
Poaceae	*Hypoxis pratensis* var. *tuberculata*	Golden Weather Grass	X			
Poaceae	*Lolium perenne*	Perennial Ryegrass			X	
Poaceae	*Microlaena stipoides*	Weeping Meadow Grass	X			
Poaceae	*Paspalum dilatatum*	Paspalum			X	
Poaceae	*Paspalum urvellei*	Vasey Grass			X	
Poaceae	*Pennisetum clandestinum*	Kikuyu			X	
Poaceae	*Phalaris aquatica*	Phalaris	X			
Poaceae	*Setaria gracilis*	Slender Pigeon Grass			X	
Poaceae	*Themeda australis*	Kangaroo Grass	X			
Xanthorrhoeaceae	*Caesia parviflora* var. *parviflora*	Pale Grass Lily	X			

NPWS (2000) identified and mapped two forms of CPW: Shale Plains Woodland (SPW) and Shale Hills Woodland (SHW). Shale Hills Woodland occurs mainly on the elevated and sloping southern half of the Cumberland Plain and Shale Plain Woodland occurs on other parts of the Cumberland Plain and is thus more widely distributed.

SPW occurs as regrowth woodland, which is scattered throughout the north-western and central regions of the subject site, extending from the north-western to southern boundaries of the site The distribution and ecological condition of this community on the subject site is shown in Figure 8. The canopy height of the regrowth woodland ranges from 6 to 20 m (mean height = 12 m) and the diameters of the tree trunks at breast height (dbh) range from less than 0.10 to 0.40 m (mean dbh = 0.25 m).

Grey Box (*Eucalyptus moluccana*) is the the most abundant canopy species within the remnant, occurring most commonly as young individuals in the north-western part of the subject site. Eucalypt saplings, mostly less than 0.5 m tall are distributed sparsely in this part of the remnant. The native canopy in the central region of the subject site transitions to scattered stands of Prickly-leaved Paperbark (*Melaleuca nodosa*), which typifies CPW that grows in moist soils.

Native shrubs within the treed areas are rare, contributing to about 2% cover, and include Australian Blackthorn (*Bursaria spinosa*) and Parramatta Green Wattle Wattle (*Acacia parramattensis*). Dense aggregations of African Boxthorn (*Lycium ferrocissimum*) dominate the shrub layer of the Grey Box regrowth areas, particularly in the ecotone along the eastern edge of the CPW and open pastureland.

The groundcover has a 60% projected foliage cover. Native grasses and graminoids include Kangaroo Grass (*Themeda australis*), Threeawn Speargrass (*Aristida vagans*), Weeping Meadow Grass (*Microlaena stipoides*) and Brown's Lovegrass *(Eragrostis brownii*). Other native species include Pale Grass Lily (*Caesia parviflora* var. *vittata*), Golden Weather Grass (*Hypoxis pratensis* var. *tuberculata*), Twining Glycine (*Glycine clandestina*) and Yellow Rush-lily (*Tricoryne elatior*). However, exotic species were more widespread within the remnant and included Paspalum (*Paspalum dilatatum*), African Lovegrass (*Eragrostis curvula*), Rhodes Grass (*Chloris gayana*), Bridal Creeper (*Asparagus asparagoides*), Slender Pigeon Grass (*Setaria gracilis*), Black Nightshade (*Solanum americanum*), Mother of Millions (*Bryophyllum delagoense*), Fleabane (*Conyza sumatrensis*) and Common Sow-Thistle (*Sonchus oleraceus*). The weeds were particularly dense along the eastern edge of the woodland remnant.

Figure 8 DISTRIBUTION AND CONDITION OF CUMBERLAND PLAIN WOODLAND ON SUBJECT SITE

Legend: Pink-bounded Areas: Poor-quality CPW habitat (extensive habitat clearance, poor representation of each native vegetation layer; extensive weed and/or exotic grass infestation). **Blue-bounded Areas:** Moderate-quality CPW habitat: all native vegetation layers present (tree canopy, shrub and groundcover layers, but habitat highly infested with shrubby and woody weeds an exotic grasses.

3.4 FAUNA HABITAT

The treed areas of the subject site offer the greatest value as habitat for native terrestrial fauna. The tree canopy has the potential of producing nectar and/or fruits for nectarivorous and frugivorous birds and bats, and arboreal mammals. The tree canopy also provides potential nesting sites for common native birds such as honeyeaters, Pied Currawongs (*Strepera graculina*) and Australian Magpies (*Cracticus tibicen*). There are no tree hollows on the subject site that are large enough for use as roosting and breeding habitat and shelter by microchiropteran bats, hollow-dependent birds (e.g. owls, cockatoos and parrots) or arboreal mammals (e.g. possums and gliders), lizards and frogs.

The cleared and open grass areas of the subject site provide potential foraging habitat for common ground-foraging bird species, such as Masked Lapwings (*Vanellus miles*), Sulphur-crested Cockatoos (*Cacatua galerita*), Galahs (*Eolophus roseicapilla*), Crested Pigeons (*Ocyphaps lophotes*), Magpie-larks (*Grallina cyanoleuca*), Australian Magpies and Australian Pipits (*Anthus novaeseelandiae*).

3.5 FAUNA SPECIES

The extremely modified nature of the subject site and its relatively small size suggests it has limited value as habitat for native fauna. Fourteen (14) fauna species (three reptile species, eight bird species and three mammal species) were recorded on the subject site on 2-3 December 2013 (Table 3.2). All of these species are woodland- and urban-generalists and are very common and widespread throughout the locality and Sydney Basin Bioregion. Two of these species, the Spotted Turtle-Dove and Domestic Cat, is an introduced species. No threatened fauna species were recorded on the subject site.

Table 3.2 **FAUNA SPECIES RECORDED IN ON SUBJECT SITE, 9-11 DECEMBER 2013**

Family	Scientific Name	Common Name	Methods of Detection
AMPHIBIANS			
Myobatrachidae	*Crinia signifera*	Common Eastern Froglet	C
REPTILES			
Scincidae	*Lampropholis guichenoti*	Grass Sun-skink	O
Scincidae	*Eulamprus quoyi*	Eastern Water Skink	O
BIRDS			
Columbidae	*Streptopelia chinensis* *	Spotted Turtle-dove	O, C
Columbidae	*Ocyphaps lophotes*	Crested Pigeon	O, C
Falconidae	*Falco cenchroides*	Australian Kestrel	O
Charadriidae	*Vanellus miles*	Masked Lapwing	O, C
Cacatuidae	*Eolophus roseicapillus*	Galah	O,C
Halcyonidae	*Dacelo novaeguinea*	Laughing Kookaburra	O, C
Maluridae	*Malurus cyaneus*	Superb Fairy-wren	O, C
Acanthizidae	*Acanthiza nana*	Yellow Thornbill	O, C
Meliphagidae	*Anthochaera carunculata*	Red Wattlebird	O, C
Meliphagidae	*Manorina melanocephala*	Noisy Miner	O, C
Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail	O, C

Family	Scientific Name	Common Name	Methods of Detection
Artamidae	*Cracticus torquatus*	Grey Butcherbird	O, C
Artamidae	*Strepera graculina*	Pied Currawong	O, C
Artamidae	*Cracticus tibicen*	Australian Magpie	O, C
Corvidae	*Corvus coronoides*	Australian Raven	O, C
Hirundinidae	*Hirundo neoxena*	Welcome Swallow	O, C
Motacillidae	*Anthus novaeseelandiae*	Australian Pipit	O
MAMMALS			
Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat	An
Felidae	*Felis catus* *	Cat	O

3.6 THREATENED AND REGIONALLY-SIGNIFICANT BIOTA

3.6.1 Critically-endangered and Endangered Ecological Communities

The following Critically Endangered or Endangered Ecological Communities occur in the Penrith LGA:

- Shale/Sandstone Transition Forest;
- Castlereagh Swamp Woodland (including Agnes Banks Woodland);
- Cumberland Plain Woodland;
- Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin & South East Bioregions;
- River-flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin & South East Bioregions;
- Western Sydney Dry Rainforest;
- Sydney Turpentine Ironbark Forest; and
- Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin & South East Bioregions

The regrowth woodland on the subject site is Cumberland Plain Woodland. Alluvial Woodland, a form of River-flat Eucalypt Forest on Coastal Flooplains, does not occur on the subject site, but occurs along the banks of Claremont Creek, south-east of the subject site.

Potential impacts of the proposed development on the status of Cumberland Plain Woodland and River-flat Eucalypt Forest are discussed in Chapter 4 and Appendix A (Seven-part Tests of Significance) of the present report.

3.6.2 Threatened Plant Species & Populations

Threatened plant species and populations that have been recorded within the locality (a 5 km-radius around the subject site), and their habitat requirements, are shown in Table 3.3. None of these species or populations was detected, or are likely to occur, on the subject site.

3.6.3 Threatened Fauna Species & Populations

Threatened fauna species that have been recorded within the locality, and their habitat requirements, are shown in Table 3.4.

No threatened fauna species were recorded on the subject site. Potential marginal habitat occurs on the subject site for the Gang-gang Cockatoo (*Callocephalum fimbriatum*), Swift Parrot *(Lathamus discolor*), Varied Sittella (*Dapheonositta chrysoptera*), Scarlet Robin (*Petroica boodang*), Regent Honeyeater (*Anthochaera phrygia*), Diamond Firetail (*Stagonopleura guttata*), Grey-headed Flying-fox (*Pteropus poliocephalus*), Eastern Freetail-bat (*Mormopterus norfolkensis*), Large-eared Pied Bat (*Chalinolobus dwyeri*), Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*), Large-eared Mouse-eared Bat (*Myotis macropus*), Greater Broad-nosed Bat (*Scoteanax ruepellii*) and the Cumberland Land Snail (*Meridolum corneovirens*).

Potential impacts of the proposed development on other threatened species are discussed in Chapter 4 and Appendix B (Seven-part Tests of Significance) of the present report.

3.6.4 Regionally Significant Species

Flora species that are considered rare in the western regions of Sydney's coastal plain include Pitted Bluegrass (*Bothriochloa decipiens*), Windmill Grass (*Chloris ventricosa*), Yellow Buttons (*Chrysocephalum apiculatum*), *Cymbonotus lawsonianus*, Hop Bush (*Dodonaea viscosa* ssp. *viscosa*), *Glossogyne tannensis*, *Glycine microphylla, Oxalis exilis*, *Phyllanthus virgatus, Senecio quadridentatus*, Slender Rat's Tail Grass (*Sporobolus elongatus*) and *Vittadinia cuneata*. None of these species was detected on the subject site.

Fauna species that are considered rare on the Cumberland Plain Woodland of the Western Sydney region include the Buff-rumped Thornbill (*Acanthiza reguloides*), White-winged Chough (*Corcorax melanorhamphos*), Eastern Grey Kangaroo (*Macropus giganteus*), Swamp Wallaby (*Wallabia bicolor*) and Red-necked Wallaby (*Macropus rufogriseus*). No regionally significant fauna species were observed during the site inspection.

3.5.5 Nationally-listed Migrated Species

Migratory species are listed under the schedules of the EPBC Act. Tree canopies on the subject site provide potential marginal foraging habitat for the Black-faced Monarch (*Monarcha melanopsis*), Satin Flycatcher (*Myiagra cyanoleuca*), Rufous Fantail (*Rhipidura rufifrons*), Swift Parrot (*Lathamus discolor*) and Regent Honeyeater (*Anthochaera phrygia*). However, these species are, at most, very occasional vagrants to the locality and areas of potential habitat on the subject site are negligible amounts available to them. Therefore, the proposed development would not significantly impact on the status of these species or their habitats.

Fork-tailed Swifts and White-throated Needletails may occasionally fly high over the subject site. These latter species would not be impacted by the proposed development.

3.7 KOALA HABITAT ASSESSMENT

No food and roost tree species, as defined under Schedule 2 of SEPP 44, occurs on the subject site. There are no records of Koalas occurring in the locality or on the subject site in the last 20 years. No Koala scats or tree scratchings were observed on or near trees within the subject site, suggesting that Koalas do not use the site. Koalas are most unlikely to occur on the subject site because of the modified landscape (including the surrounding residential areas with busy roads), the site's isolation from other remnant areas of bushland and the lack of recent records of Koalas occurring in the locality in recent times.

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Table 3.3 **THREATENED FLORA SPECIES RECORDED IN THE LOCALITY (5 KM RADIUS AROUND SUBJECT SITE) OVER LAST 20 YEARS**

Scientific Name	Common Name	EPBC Act Status	TSC Act Status	RoTAP STATUS	Habitat and likelihood of occurrence	Seven-part Test Required?
Marsdenia viridiflora ssp. *viridiflora* in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool & Penrith LGAs	Native Pear		EP		Grows in vine thickets and open shale woodland on the Cumberland Plain. One record from locality. Not detected on subject site. Unlikely to occur there.	No
Eucalyptus benthamii	Camden White Gum (Nepean River Gum)	V*	V	2VCi	Grows on sandy alluvial soils of river valleys to the south-west of Sydney. Eight records from locality. Not detected on subject site. Unlikely to occur there	No
Grevillea juniperina var. *juniperina.*	Juniper-leaved Grevillea		V		Restricted to the western suburbs of Sydney around Rooty Hill, Plumpton, Castlereagh Nature Reserve and the Pitt Town area. It grows chiefly in clay-loam soils and sandy gravels. One record from locality. Not detected on subject site. Unlikely to occur there.	No
Pimelea spicata	Spine-leaved Rice-flower	E*	E	2VCa	Endemic to the Central Coast of NSW where it is restricted to a few small populations on clay soils derived from Wianamatta Shale. One record from locality. Not detected on subject site. Unlikely to occur there.	No

1. Habitat requirements for plants taken from Harden (1990, 1991, 1992, 1993).
** = Listed under the Commonwealth Endangered Species Protection Act, 1992.*
E = Endangered under Schedule 1 of the TSC Act 1995.
E= Endangered under the Commonwealth Environmental Protection and Biodiversity Conservation Act 1999.*
V= Vulnerable under Schedule 2 of the TSC Act 1995.
V= Vulnerable under the Commonwealth Environmental Protection and Biodiversity Conservation Act 1999.*
*E** = Endangered under Schedule 4 of the TSC Act 1995.*

Distribution: 2 = Geographic range in Australia less than 100 km; 3 = Geographic range in Australia greater than 100 km
ROTaP CONSERVATION CODES

Conservation Status: E = Endangered;; V = Vulnerable; R = Rare; K = Poorly known; C = Reserved.
Size Class of all Reserved Populations:
a = 1,000 or more are known to occur within a conservation reserve(s); i = Less than 1,000 are known to occur within a conservation reserve(s); - = Reserved population size is not accurately known; t =Total known population reserved; + = Overseas occurrence.

Table 3.4 **THREATENED FAUNA SPECIES RECORDED IN THE LOCALITY (5 KM RADIUS OF SUBJECT SITE) OVER THE LAST 20 YEARS**

Scientific Name	Common Name	EPBC Act Status	TSC Act Status	Habitat Requirements and Likelihood of Occurrence	Seven Part Test required?
AMPHIBIANS					
Litoria aurea	Green and Golden Bell Frog	V*	E	Large permanent swamps and ponds with plenty of emergent vegetation, especially bulrushes. In areas free of the Plague Minnow (*Gambusia holbrooki*). One record in locality. No potential habitat on subject site. No detected during site surveys.	No
Pseudophryne australis	Red-crowned Toadlet		V	Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings. Breeding congregations occur in dense vegetation and debris beside ephemeral creeks and gutters. Red-crowned Toadlets have not been recorded breeding in waters that are even mildly polluted or with a pH outside the range 5.5 to 6.5. Disperses outside the breeding period, when they are found under rocks and logs on sandstone ridges and forage amongst leaf-litter. One record in locality. No potential habitat on subject site. No detected during site surveys.	No
BIRDS					
Lophoictinia isura	Square-tailed Kite		V	Open forests, riverine woodlands, scrubs and heathlands, mostly in inland NSW. One record in locality. No potential habitat on subject site. No detected during site surveys.	No
Ephippiorhynchus asiaticus	Black-necked Stork		E	Inhabits wetlands, such as floodplains of rivers with large shallow swamps and pools, and deeper permanent bodies of water. One record in locality. No potential habitat on subject site. No detected during site surveys.	No
Limosa limosa	Black-tailed Godwit		V	Found in fresh and brackish wetlands, as well as on intertidal mudflats, usually on softer substrates than Bar-tailed Godwit. One record in locality. No potential habitat on subject site. No detected during site surveys.	No
Callocephalon fimbriatum	Gang-gang Cockatoo		V	In summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In winter, may occur at lower altitudes in drier more open eucalypt forests and woodlands, and often found in urban areas.	Yes

Scientific Name	Common Name	EPBC Act Status	TSC Act Status	Habitat Requirements and Likelihood of Occurrence	Seven Part Test required?
				There are 4 records of this species occurring in the locality in the last 20 years. Remnant woodland on the subject site provides potential foraging habitat during spring and summer. Not detected on the subject site.	
Calaptorhynchus lathami	Glossy Black-Cockatoo		V	Eucalypt forests of eastern Australia. Feeds almost exclusively on *Allocasuarina* (sheoak) seeds, particularly *A. littoralis* and *A. torulosa,* occasionally on the seed of *Casuarina* species. There are 4 records of this species occurring in the locality in the last 20 years. No foraging or nesting habitat on subject site. Not detected during site surveys.	No
Lathamus discolor	Swift Parrot	E*	V*	Breeds in Tasmania and migrates to mainland between March and September to feed on eucalypt blossoms. There are 2 records of this species occurring in the locality in the last 20 years. Remnant woodland on the subject site provides potential foraging habitat during spring and summer. Not detected on the subject site.	Yes
Daphoenositta chrysoptera	Varied Sittella		V	Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. There are 6 records of this species occurring in the locality in the last 20 years. Remnant woodland on the subject site provides potential nesting and foraging habitat. Not detected on the subject site.	Yes
Petroica boodang	Scarlet Robin			The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and regrowth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps. Scarlet Robin habitat usually contains abundant logs and fallen timber: these are important components of its habitat. One record of this species from within the locality. Potential habitat occurs within woodland remnant on the the subject site. Not detected on site.	Yes
Melanodryas cucullata	Hooded Robin		V	Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses. There is one record of this species occurring in the locality in the last 20 years. There is no remnant understorey in retained woodland area of the subject site. Therefore, no	No

Scientific Name	Common Name	EPBC Act Status	TSC Act Status	Habitat Requirements and Likelihood of Occurrence	Seven Part Test required?
				potential habitat.	
Anthochaera phrygia	Regent Honeyeater	E*	E	Semi-nomadic, occurring in temperate eucalypt woodland forest in south-eastern Australia. Most records are from box-ironbark forests dominated by Swamp Mahogany, Spotted Gum and Riverina Casuarina woodlands. There is one record of this species occurring in the locality in the last 20 years. Potential habitat occurs within remnant woodland on subject site.	Yes
Stagonopleura guttata	Diamond Firetail		V	Distributed predominantly west of the Great Dividing Range, although populations are known from drier coastal areas such as the Cumberland Plain of western Sydney and the Hunter, Clarence, Richmond and Snowy River valleys Occurs in eucalypt woodlands, forests and mallee where there is a grassy understorey. Firetails build bottle-shaped nests in trees and bushes, and forage on the ground, largely for grass seeds and other plant material, but also for insects. There is one record of this species occurring in the locality in the last 20 years. Potential habitat occurs within remnant woodland on subject site.	Yes
MAMMALS					
Pteropus policephalus	Grey-headed Flying-fox		V	Wet and dry sclerophyll forests, rainforests, paperbark swamps and mangroves to 700 m elevation. There are 3 records of this species occurring in the locality in the last 20 years. Potential wildlife corridor and foraging habitat in the woodland areas on the subject site.	Yes
Mormopterus norfolkensis	Eastern Freetail Bat		V	Sclerophyll forests, woodlands and, occasionally, rainforests. There are 2 records of this species occurring in the locality in the last 20 years. Potential wildlife corridor and foraging habitat in the woodland areas on the subject site.	Yes
Chalinolobus dwyeri	Large-eared Pied Bat		V	Found most commonly in dry sclerophyll forests and woodlands, but also occur in sub-alpine woodland, the edge of rainforest, wet sclerophyll forest, *Callitris*-dominated forest and sandstone outcrop country. In the Sydney basin they are common in areas of high fertility soils in wet sclerophyll forests along the edges of sandstone escarpments. There is one record of this species occurring in the locality in the last 20 years. Potential wildlife corridor and foraging habitat in the woodland areas on the subject site.	Yes
Miniopterus schreibersii oceanensis	Eastern Bent-wing Bat		V	From Kimberly to the Top End and from Cape York Peninsula on eastern side of the Great Dividing Range through to the south-east corner of South Australia. Found in	Yes

Scientific Name	Common Name	EPBC Act Status	TSC Act Status	Habitat Requirements and Likelihood of Occurrence	Seven Part Test required?
				rainforest, wet and dry sclerophyll forests, woodland and grasslands. Roosts in culverts and mines. There is one record of this species occurring in the locality in the last 20 years. Potential wildlife corridor and foraging habitat in the woodland areas on the subject site.	
Myotis macropus	Large-footed Mouse-eared Bat		V	Sclerophyll forests, mangroves, paperbark swamps, woodlands and rainforests near slow-moving creeks, lakes and estuaries. There is one record of this species occurring in the locality in the last 20 years. Potential wildlife corridor and foraging habitat in the woodland areas on the subject site..	Yes
Scoteanax ruepellii	Greater Broad-nosed Bat		V	Found in sclerophyll forests, rainforests, woodlands and moist gullies below 500 m above sea level. There is one record of this species occurring in the locality in the last 20 years. Potential wildlife corridor and foraging habitat in the woodland areas on the subject site.	Yes
INVERTEBRATES					
Meridolum corneovirens	Cumberland Land Snail		E	Restricted to the Cumberland Plain and Castlereagh Woodlands of Western Sydney and also along the fringes of River Flat Forest, especially where it meets Cumberland Plain Woodland. There are 26 records of this species occurring in the locality in the last 20 years. Potential habitat available in woodland areas of subject site.	Yes

Notes: Habitat requirements for birds taken from Simpson & Day (2010).
Habitat requirements for reptiles and amphibians taken from Cogger (2000) and Swan et al. (2004).
Habitat requirements for mammals taken from Strahan (2000) and Menkhorst & Knight (2001).
** = Listed under the Commonwealth Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act).*
E = Endangered under Schedule 1 of the NSW Threatened Species Conservation Act 1995 (TSC Act).
E = Endangered under Schedule 1 of the TSC Act and EPBC Act.*
V = Vulnerable under Schedule 2 of the TSC Act.
V = Vulnerable under Schedule 2 of the TSC Act and EPBC Act.*

4

IMPACTS AND RECOMMENDATIONS

4.1 OVERVIEW

This chapter evaluates if the proposed development would significantly impact on ecological processes and the conservation value of the subject site and adjacent areas, especially with respect to threatened flora and fauna and listed migratory species, their habitats, and on the ecological integrity of the landscape. It also recommends ways in which impacts can be minimised or avoided.

The potential impacts may be grouped into the following categories:

- loss of flora and fauna habitat;
- impacts on a critically endangered ecological community (CPW), and threatened flora and fauna species and their habitats; and
- impacts on nationally-listed migratory species;

Each of these impacts already occurs on the subject site and in neighbouring areas to a significant extent. However, each of these categories is discussed in detail below with respect to the proposed development.

4.1 IMPACTS

4.2.1 Loss of Flora and Fauna Habitat

The subject site provides habitat only for woodland and urban-generalist flora and fauna species that have a widespread distribution in the Sydney Basin Bioregion. This habitat area is a negligible proportion of the total habitat available for these species at a local level (Penrith LGA) and regional level (Sydney Basin Bioregion). Therefore, its removal will not have a significant impact on the status of flora and fauna species or the extent of their habitats.

4.2.2 Impacts on Threatened Biota.

(a) Threatened Ecological Communities

A Seven-part test of Significance for Cumberland Plain Woodland is shown in Appendix A. The proposed development would result in the removal of 2.5 ha of regrowth CPW that exists as scattered trees and shrubs in the central parts of the subject site. Approximately 2.3 ha of CPW in the north-western part of the subject site would be retained in proposed Open Space Areas. The CPW to be removed is highly degraded because of previous habitat clearance and subsequent weed and exotic grass infestation. The CPW that would be retained is better-quality habitat as a result of more extensive native vegetation cover and more intact native vegetation layers. Approximately 10,612 ha of CPW occur on the Cumberland Plain (DECCW 2011) and 2,067 ha occur in the Penrith LGA (NPWS 2000). Therefore, the proposed development would result in the removal of only 0.02% of the total area of CPW on the Cumberland Plain and 0.12% of CPW that occurs in the Penrith LGA. Consequently, it is unlikely that the proposed development would adversely affect CPW to the extent that its occurrence in the locality or broader geographical region would be placed at risk of extinction.

(b) Threatened Flora Species

No threatened flora species were detected on the subject site. Therefore, the proposed development will not impact the status of threatened flora or their habitats. Therefore, Species Impact Statements are not required for threatened fauna.

(c) Threatened Fauna Species

Seven-part tests of Significance for the Gang-gang Cockatoo (*Callocephalum fimbriatum*), Swift Parrot *(Lathamus discolor*), Varied Sittella (*Dapheonositta chrysoptera*), Scarlet Robin (*Petroica boodang*), Regent Honeyeater (*Anthochaera phrygia*), Diamond Firetail (*Stagonopleura guttata*), Grey-headed Flying-fox (*Pteropus poliocephalus*), Eastern Freetail-bat (*Mormopterus norfolkensis*), Large-eared Pied Bat (*Chalinolobus dwyeri*), Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*), Large-eared Mouse-eared Bat (*Myotis macropus*), Greater Broad-nosed Bat (*Scoteanax ruepellii*) and Cumberland Land Snail (*Meridolum corneovirens*) (Appendix A) concluded that the proposed development would not significantly impact on the status of NSW-threatened fauna or their habitats. Therefore, Species Impact Statements are not required for threatened fauna.

One nationally vulnerable fauna species, the Grey-headed Flying-fox may potentially use the treed areas of the subject site for foraging or roosting. Under the EPBC Act, a nationally vulnerable species is significantly impacted on if a proposal is likely to:

- lead to a long-term decrease in the size of an important population of a species; or
- reduce the area of occupancy of an important population; or
- fragment an existing important population into two or more populations; or
- adversely affect habitat critical to the survival of a species; or
- disrupt the breeding cycle of an important population; or
- modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline; or
- result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat; or
- interfere substantially with the recovery of a species.

There are no Grey-headed Flying-fox roosts on the subject site or in neighbouring properties.

In the Sydney area, the favoured food trees of Grey-headed Flying-foxes are Swamp Mahoganies (*Eucalytpus robusta*) and Old Man Banksias (*Banksia serrata*), but will also eat the pollen and nectar of other species of *Eucalyptus*, *Angophora* and *Corymbia*. No favoured food trees will be removed from the subject site as part of the proposed development.

Therefore, the proposed development is unlikely to impact on the local or national status of the Grey-headed Flying-fox or its habitats.

Two nationally endangered fauna species, the Swift Parrot and Regent Honeyeater, may potentially use the treed areas of the subject site for foraging or roosting. Under the EPBC Act, a nationally endangered species is significantly impacted on if a proposal is likely to:

- lead to a long-term decrease in the size of a population; or
- reduce the area of occupancy of a species; or
- fragment an existing population into two or more populations; or
- adversely affect habitat critical to the survival of a species; or

- disrupt the breeding cycle of a population; or
- modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline; or
- result in invasive species that are harmful to a endangered species becoming established in the endangered species' habitat; or
- interfere substantially with the recovery of a species.

Swift Parrots and Regent Honeyeaters are, at best, likely to be very occasional vagrants to the subject site and adjacent areas. The removal of trees from the subject site will not limit resources available to Swift Parrots or Regent Honeyeaters. Therefore, the proposed development will not negatively impact on the national status of these species, or their habitats.

4.2.3 Impacts on Nationally-listed Migratory Species

Under the EPBC Act, a migratory species is significantly impacted on if a proposal will or is likely to:

- substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat of the migratory species; or

- result in invasive species that are harmful to the migratory species becoming established in an area of important habitat of the migratory species; or

- seriously disrupt the life cycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of the species.

Tree canopies on the subject site provide potential marginal foraging habitat for the Black-faced Monarch (*Monarcha melanopsis*), Satin Flycatcher (*Myiagra cyanoleuca*), Rufous Fantail (*Rhipidura rufifrons*), Swift Parrot (*Lathamus discolor*) and Regent Honeyeater (*Anthochaera phrygia*). However, these species are, at most, very occasional vagrants to the locality and areas of potential habitat on the subject site are negligible amounts available to them. Therefore, the proposed development would not significantly impact on the status of these species or their habitats.

Fork-tailed Swifts and White-throated Needletails may occasionally fly high over the subject site. These latter species would not be impacted by the proposed development.

4.3 MITIGATION MEASURES

4.3.1 Prior to Construction

- **Trees or shrubs that will be cleared from the subject site, should be checked beforehand for the presence of active nests of birds (that is, those nests containing fertile eggs or nestlings) and arboreal mammals (such as possums).** These plants should not be removed or pruned until animals that are nesting in them have completed their breeding cycle.

- **Trees or shrubs that will be cleared or pruned should be checked for animals before and after felling or pruning**. Injured animals should be taken to a local vet or the local wildlife rescue service should be notified.

4.3.2 Construction Period

- **Silt fences, sediment ponds and hay bales should be appropriately placed around construction areas** to prevent runoff of sediment and nutrient-enriched waters into proposed conservation areas on the subject site and water runoff areas to Claremont Creek and its riparian zone. The effectiveness of these traps should be closely monitored during construction, ensuring that treated site run-off meets EPA guidelines.

- **Trees and other vegetation that will be removed from the subject site for the proposed development should be conducted with minimal disturbance to the soil.**

- **Construction wastes should be managed appropriately to prevent accidental discharge of chemicals or other pollutants into waterways and vegetation downs-slope of the subject site.** Demolition and construction materials should not be stored in garden areas of the subject site once construction has been completed so that the risk of weed outbreaks is minimised.

4.3.3 Post-Construction Period

- **An appropriate and ongoing Weed Management Plan should be implemented in retained native vegetation remnants and landscaped areas.**

- **Landscaped areas should contain characteristic CPW species, representative of all vegetation layers (trees, shrubs and groundcover species).**

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Appendix A

Seven-part Tests of Significance

APPENDIX A
SEVEN-PART TESTS OF SIGNIFICANCE

INTRODUCTION

The Seven-Part Test is a standard set of questions devised by the Scientific Committee established under the *Threatened Species Conservation Amendment Act 2002.* The Test should be applied individually to all threatened species, populations and ecological communities and their habitats that are to be, or likely to be, on the site to be developed.

The results of a Seven-Part Test help determine the nature and significance of impacts of the proposed development or activity on threatened species, populations or ecological communities, or their habitats, and whether the preparation of *Species Impact Statement* (SIS) is required.

An SIS provides a more detailed assessment of threatened biota issues and proposes measures to manage and mitigate adverse impacts on the threatened species, populations or ecological communities, or their habitats, resulting from the proposal.

Appendix A provides Seven-part tests for the following threatened biota in relation to the proposed development:

Threatened Ecological Community

- Cumberland Plain Woodland

Threatened Bird Species

- Gang-gang Cockatoo (*Callocephalum fimbriatum*).
- Swift Parrot (*Lathamus discolor*).
- Varied Sittella (*Dapheonositta chrysoptera*).
- Scarlet Robin (*Petroica boodang*).
- Regent Honeyeater (Anthochaera *phrygia*).
- Diamond Firetail (*Stagonopleura guttata*)

Threatened Bat Species

- Grey-headed Flying-fox (*Pteropus poliocephalus*).
- Eastern Freetail-bat (*Mormopterus norfolkensis*).
- Large-eared Pied Bat (*Chalinolobus dwyeri*).
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*).
- Large-eared Mouse-eared Bat (*Myotis macropus*).
- Greater Broad-nosed Bat (*Scoteanax ruepellii*).

Threatened Invertebrate Species

- Cumberland Land Snail (*Meridolum corneovirens*).

CUMBERLAND PLAIN WOODLAND

1. COMMUNITY PROFILE

Cumberland Plain Woodland is listed as a Critically-endangered Ecological Community under the schedules of both the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) and NSW *Threatened Species Conservation Act, 1995* (TSC Act). It comprises the Spotted Gum (*Corymbia maculata*) Forest (Map Unit 9b), Grey Box (*Eucalyptus moluccana*) Woodland (Map Unit 10c) and Grey Box-Ironbark Woodland (Map Unit 10d) that were described in the natural vegetation 1:100,000 map sheets of Penrith (Benson 1992) and Sydney (Benson & Howell 1994).

NPWS (2000) identified and mapped two forms of CPW: Shale Plains Woodland (SPW) and Shale Hills Woodland (SHW). Shale Hills Woodland occurs mainly on the elevated and sloping southern half of the Cumberland Plain and Shale Plain Woodland occurs on other parts of the Cumberland Plain and is thus more widely distributed.

The dominant canopy trees of SHW include Grey Box (*Eucalyptus moluccana*), Forest Red Gum (*E. tereticornis*) and Narrow-leaved Ironbark (*E. crebra*). It has a shrub layer dominated by Blackthorn (*Bursaria spinosa*), with other shrubs, such as Acacia *Acacia implexa*, *Indigofera australis* and *Dodonaea viscosa* ssp*. cuneata*.

Bursaria spinosa is the dominant shrub species of SPW and there are canopy trees such as Grey Box (*E. moluccana*), Forest Red Gum (*E. tereticornis*), Spotted Gum (*Corymbia maculata*) and Thin-leaved Stringybark (*E. eugenoides*).

The diverse understorey layer is similar for both forms of CPW. It is common to find grasses, such as Kangaroo Grass (*Themeda australis*), Weeping Meadow Grass (*Microlaena stipoides* var. *stipoides*) and herbs such as Kidney Weed (*Dichondra repens*), Blue Trumpet (*Brunoniella australis*) and *Desmodium varians*.

Before European settlement, CPW was extensive across western Sydney, covering 122,000 ha. Today, there is only 8% of the original extent, with a further 13% remaining as scattered trees across the landscape. It occurs on well structure clay soils that are derived from the Wianamatta Shale.

There are bushland remnants of CPW in an area bounded by Scheyville (north), Penrith (west), Parramatta (east) and Thirlmere (south). CPW occurs in Auburn, Bankstown, Baulkham Hills, Blacktown, Camden, Campbelltown, Fairfield, Hawkesbury, Holroyd, Liverpool, Parramatta, Penrith and Wollondilly local government areas.

Clearing for agriculture and urban development is the greatest threat to CPW. Because it presently exists only as isolated fragments, CPW is vulnerable to disturbances, such as weed invasion, increased soil nutrients, rubbish dumping and fire. Weeds such as African Lovegrass, African Olive Bridal Veil Creeper and Rhodes Grass are a major threat.

2. SEVEN-PART TEST

(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.

Not applicable. CPW is not a threatened species.

(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.

Not applicable. CPW is not an endangered population.

(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.

(i) The proposed development would result in the removal of 2.5 ha of regrowth CPW that exists as scattered trees and shrubs in the central parts of the subject site. Approximately 2.3 ha of CPW in the north-western part of the subject site would be retained in proposed Open Space Areas. The CPW to be removed is highly degraded because of previous habitat clearance and subsequent weed and exotic grass infestation. The CPW that would be retained is better-quality habitat as a result of more extensive native vegetation cover and more intact native vegetation layers. Approximately 10,612 ha of CPW occur on the Cumberland Plain (DECCW 2011) and 2,067 ha occur in the Penrith LGA (NPWS 2000). Therefore, the proposed development would result in the removal of only 0.02% of the total area of CPW on the Cumberland Plain and 0.12% of CPW that occurs in the Penrith LGA. Consequently, it is unlikely that the proposed development would adversely affect CPW to the extent that its local occurrence would be placed at risk of extinction.

(ii) No CPW species would disappear from the Penrith LGA or have a significantly elevated risk of becoming locally extinct, as a result of the proposed development.

(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.

(i) See comments under Part (c) of Seven-part Test.

(ii) The proposed development would not result in fragmentation or isolation of CPW or Alluvial Woodland habitat.

(iii) The CPW on the subject site is a regenerating vegetation community on land that was formerly cleared. This vegetation potentially contributes to the genetic diversity of more intact local remnants of both CPW by exchanging pollen with individual plants in these remnants through dispersal by wind, insect, bird and arboreal vectors, and stormwater runoff. However, these trees are a negligible proportion of the total gene pool for CPW. Therefore, the removal of up

2.5 ha of CPW habitat for proposed development is unlikely to significantly impact on the genetic diversity of local occurrences of this ecological community.

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

No critical habitat for CPW occurs in the locality.

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

OEH has identified the following priority actions to help in the recovery CPW in NSW:

1. Management of CEECs is to be included in school environmental management plans where the school land contains CEECs.

2. Management of CEECs to be included in the conditions for Crown land trusts, lease and licence holders.

3. Prepare and implement community awareness, education and involvement strategy.

4. Support community conservation by providing nursery or other facilities, for regeneration activities.

5. Local Govt prepare plans of management in accordance with the Local Government Act for reserves containing CEECs, which have conservation as a primary objective, or where conservation is compatible.

6. Promote best practice management guidelines.

7. Incorporate consideration of CEEC protection in regional open space planning.

8. Encourage planning authorities to address CEECs in development of environmental planning instruments and, where possible, seek biodiversity certification.

9. Manage, to best practice standards, areas of CEECs which have conservation as a primary objective, or where conservation is compatible. Priorities are to be based on DEC conservation significance assessment.

10. Encourage and promote best-practice management of CEECs on private land.

11. Ensure the consideration of impacts on CEECs when enforcing noxious weed or pest species control in CEECs.

12. Develop and implement Cumberland Plain Reservation Strategy and create a protected bushland network through targeted land acquisition as land becomes available.

13. Public authorities will promote management agreements to landholders through their ongoing land use planning activities.

14. Investigate the preparation of a recommendation for the declaration of critical habitat.

15. Investigate the development of a regular monitoring program to assess the change in extent of vegetation across the Cumberland Plain.

16. Finalise the multi-EEC recovery plan as a State priority in accordance with contractual obligations with DEH, by July 2007.

17. Liaise with institutions to facilitate research relevant to the recovery of Cumberland Plain EECs.

The proposed development is consistent with the priority actions for protecting CPW in NSW.

(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.

"Clearing of Native Vegetation" is a Key Threatening Process listed in Schedule 3 of the *Threatened Species Conservation Act, 1995*. However, the area of CPW to be cleared is relatively small. The proposed development would not result in the loss of CPW species from the locality, and is unlikely to result in a significant loss of genetic diversity within CPW, either at a local or broader geographical level.

3. CONCLUSION

The proposed development of the subject site would not significantly impact on the status of CPW or its habitats. Therefore, a Species Impact Statement is NOT required for this threatened ecological community in relation to the proposed development.

4. REFERENCES

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THREATENED BIRD SPECIES

1. SPECIES PROFILES

Gang-gang Cockatoo (*Callocephalon fimbriatum*)

The Gang-gang Cockatoo is distributed from southern Victoria through south- and central-eastern New South Wales. In New South Wales, the species is distributed from the south-east coast to the Hunter region, and inland to the Central Tablelands and south-west slopes. It occurs regularly in the Australian Capital Territory. It is rare at the extremities of its range, with isolated records known from as far north as Coffs Harbour and as far west as Mudgee.

In summer, it is generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In winter, may occur at lower altitudes in drier more open eucalypt forests and woodlands, and often found in urban areas. However, it may also occur in sub-alpine Snow Gum *Eucalyptus pauciflora* woodland and occasionally in temperate rainforests.

Populations move to lower altitudes in winter, preferring more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas. Breeding pairs favour old growth attributes for nesting and roosting.

Swift Parrot (*Lathamus discolor*)

The Swift Parrot is a gregarious species that breeds in eucalypt forests in eastern and northern Tasmania and it over-winters in south-eastern mainland Australia. During the breeding season the species feeds on the nectar of the flowering Tasmanian Blue Gum (*Eucalyptus globulus*).

In late March almost the entire population moves to mainland Australia. Most over-winter in Victoria and central and eastern NSW, but each year a few are recorded from south-eastern Qld and occasionally from as far west in Tasmania (Blakers *et al.* 1984). Migrants return to Tasmania in September (Brown 1989).

Swift Parrots inhabit *Eucalyptus* forests, breeding in mature and senescent trees. They breed where Tasmanian Blue Gums are flowering well, and in poor flowering seasons the amount of breeding is reduced. On the mainland Swift Parrot movements are little understood. It congregates in areas where eucalypts are flowering profusely, often returning regularly to the same places. It is consequently dependent on winter-flowering species, particularly Red Ironbark (*Eucalyptus sideroxylon*), Yellow Gum (*E. leucoxylon*), White Box (*E. albens*) and Swamp Gum (*E. ovata*) (Brown 1989). It also feeds in Manna Gum (*E. viminalis*) in autumn. It often occurs in remnant patches of mature eucalypts of agricultural land and is also common in some Melbourne suburbs (Emison *et al. 1987*).

In Tasmania the abundance of Blue Gums has been greatly reduced by clearance of land for agriculture, saw log production and clear-felling for woodchips (Garnett 1993). Individual parkland trees are now often the most important food sources.

Similarly, on the mainland most of the best-quality stands of favoured food tree species have been cleared for agriculture and many of those remaining have been heavily cut-over to produce poles for firewood. The resulting immature stands may be poorer and less reliable sources of nectar (Brown 1989). In 1959 there were several reports of large concentrations of Swift Parrots from Victoria and NSW during winter (Hindwood and Sharland 1964). However, in NSW, there appear

to be few records from the period 1988-90 (Garnett 1993) and, apart from 100+ birds being observed in Temora in May 1990, all observations were of fewer than four birds (A. Morris in Garnett 1993).

Some Swift Parrots are also taken illegally for the commercial bird trade and, in recent years, a number of trappers have been prosecuted in NSW (J. Hardy in Garnett 1993).

Varied Sittella (*Daphoenositta chysoptera*)

The Varied Sittella is a small (10 cm) songbird with a sharp, slightly upturned bill, short tail, barred undertail, and yellow eyes and feet. In flight the orange wing-bar and white rump are prominent. In NSW most individuals have a grey head and are streaked with dark brown, but in the extreme north-east they have a white head, and in the extreme south-west a black cap. Varied Sittellas are more active and acrobatic among branches than the larger treecreepers. They fly into the heads of trees, typically working their way down branches and trunk with constant motion.

The Varied Sittella is sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands. Distribution in NSW is nearly continuous from the coast to the far west. The Varied Sittella's population size in NSW is uncertain but is believed to have undergone a moderate reduction over the past several decades.

This species inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and acacia woodland.
It feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees and small branches and twigs in the tree canopy.

Breeding pairs build a cup-shaped nest of plant fibres and cobwebs in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years. Generation length is estimated to be 5 years.

Scarlet Robin (*Petroica boodang*)

The Scarlet Robin is a small Australian robin that reaches 13 cm in length. The male has a black head and upperparts, with a conspicuous white forehead patch, white wing stripes and white tail-edges. The male has a bright scarlet-red chest and a white belly. The female is pale brown, darker above, and has a dull reddish breast and whitish throat. The whitish mark on the female's forehead is smaller than the male's. The female Scarlet Robin also has white wing and tail markings. Immature males resemble females. The main call of Scarlet Robin is a soft, warbling trill.

The Scarlet Robin is found from SE Queensland to SE South Australia and also in Tasmania and SW Western Australia. In NSW, it occurs from the coast to the inland slopes. After breeding, some Scarlet Robins disperse to the lower valleys and plains of the tablelands and slopes. Some birds may appear as far west as the eastern edges of the inland plains in autumn and winter.

The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. The species lives in both mature and regrowth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps.
Scarlet Robin habitat usually contains abundant logs and fallen timber: these are important components of its habitat.

The Scarlet Robin breeds on ridges, hills and foothills of the western slopes, the Great Dividing Range and eastern coastal regions; this species is occasionally found up to 1000 metres in altitude.

It is primarily a resident in forests and woodlands, but some adults and young birds disperse to more open habitats after breeding.

In autumn and winter many Scarlet Robins live in open grassy woodlands, and grasslands or grazed paddocks with scattered trees.

Birds forage from low perches, fence-posts or on the ground, from where they pounce on small insects and other invertebrates which are taken from the ground, or off tree trunks and logs; they sometimes forage in the shrub or canopy layer.

Scarlet Robin pairs defend a breeding territory and mainly breed between the months of July and January; they may raise two or three broods in each season.

This species' nest is an open cup made of plant fibres and cobwebs and is built in the fork of tree usually more than 2 metres above the ground; nests are often found in a dead branch in a live tree, or in a dead tree or shrub. Eggs are pale greenish-, bluish- or brownish-white, spotted with brown; clutch size ranges from one to four.

Birds usually occur singly or in pairs, occasionally in small family parties; pairs stay together year-round. In autumn and winter, the Scarlet Robin joins mixed flocks of other small insectivorous birds which forage through dry forests and woodlands.

Regent Honeyeater (*Anthochaera phrygia*)

The Regent Honeyeater is semi-nomadic and occurs in temperate eucalypt woodlands and open forest. The distribution of this species is extremely patchy, with the population having declined to less than 1,500 individuals (NPWS 1997). Within NSW, individuals range from the coast to the western slopes of the Great Dividing Range as far inland as Narrabri, Parkes and Warrumbungle National Park (Peters 1979).

Most records of the species are from box-ironbark eucalypt associations, and wet lowland coastal forests dominated by Swamp Mahogany, Spotted Gum and Riverina Casuarina woodlands. Remnant stands of timber, roadside reserves, travelling stock routes and street trees also provide important habitat at certain times (Ayers *et al*. 1996).

Nectar and arthropods are the major foods and Regent Honeyeaters appears to return to regions, sites and tree species that provide reliable nectar flows. Favoured sources of nectar are Red Ironbark (*Eucalyptus sideroxylon*), White Box (*Eucalyptus albens*), Yellow Box (*Eucalyptus melliodora*) and Yellow Gum (*Eucalyptus leucoxylon*), as well as heavy infestations of mistletoe (Loranthaceae) on River Oak (Garnett 1993).

Threats to this species include:

- Loss and fragmentation of habitat through clearing for agriculture, fenceposts and firewood, particularly in box-ironbark woodlands;
- slow incremental reduction in tree age classes;
- reduction in the number of large flowering eucalypts;
- grazing by domestic stock and rabbits which prevents habitat regeneration;
- competition with other honeyeaters for limited resources; and
- tree decline and dieback on rural properties.

Diamond Firetail (*Stagonopleura guttata*)

The Diamond Firetail is distributed through central and eastern NSW, extending north into southern and central Queensland and south through Victoria to the Eyre Peninsula, South Australia. In NSW, the species occurs predominantly west of the Great Dividing Range, although populations are known from drier coastal areas such as the Cumberland Plain of western Sydney and the Hunter, Clarence, Richmond and Snowy River valleys (Blakers *et al*. 1984, Schodde and Mason 1999).

The species is a brightly coloured finch that occupies eucalypt woodlands, forests and mallee where there is a grassy understorey. The species is considered sedentary with some local movements recorded. Firetails build bottle-shaped nests in low trees and bushes, and forage on the ground, largely for grass seeds and other plant material, but also for insects (Blakers *et al*. 1984, Reid 1994).

The Diamond Firetail has disappeared from parts of its former range and has declined in numbers in many areas. Declines have been recorded in the Cumberland Plain, western Sydney (Hoskin 1991, Keast 1995) with a local extinction near Scheyville (Egan *et al.* 1997). On the New England Tableland, declines in populations are apparent (Barrett et al. 1994) and the species has become extinct within Imbota Nature Reserve and surrounds (H.A. Ford in NSW Scientific Committee 2001b). Reid (1999) identified the species as a 'decliner' in a review of bird status in the NSW sheep-wheatbelt. Fisher (1997) predicted that Diamond Firetails would significantly decline from the Bathurst District if current trends in land management persisted.

The Diamond Firetail is threatened by clearance and fragmentation of habitat. Isolation and reductions in remnant area inhibit dispersal and increase their vulnerability to local extinction via stochastic events (NSW Scientific Committee 2001b). Small, isolated populations also lose their long-term genetic viability (Barrett *et al.* 1994). Moreover, Diamond Firetail populations appear unable to persist in areas which lack remnants of native vegetation larger than 200 ha (N. Schrader in NSW Scientific Committee 2001b).

Habitat degradation, particularly overgrazing of the grass understorey, threatens the granivorous Diamond Firetail (NSW Scientific Committee 2001b). In addition, an increased abundance of predators such as the Pied Currawong and Australian Raven may increase nest predation in fragmented woodland remnants (Major *et al*. 1996).

2. SEVEN-PART TEST

(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.

No threatened woodland bird species were detected on the subject site, despite targeted surveys for them. However, woodland areas on the subject site provide potential foraging and wildlife corridor habitat for local populations of these species.

There is no breeding habitat on the subject site for hollow-dependent bird species (Gang-gang Cockatoo and Glossy Black-Cockatoo) because of the absence of suitable nesting hollows.

Tree canopies and understorey vegetation provide potential nesting habitat for Varied Sittellas, Scarlet Robins, Regent Honeyeaters and Diamond Firetails. However, the amount of woodland to be cleared is a negligible amount of habitat that is available in the locality and broader geographical

region. Better-quality breeding habitat for each of these species occurs in conservation areas in the locality.

The proposed development would remove a negligible amount of potential foraging habitat for threatened woodland bird species. The local wildlife corridor along Claremont Creek will not be significantly narrowed, fragmented or isolated as a result of the proposed subdivision.

Therefore, it is considered unlikely that the proposed development would adversely affect the life cycle of threatened woodland birds to the extent that it would place viable local populations of these species at risk of extinction.

(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.

Not applicable. Each woodland bird species is listed as a threatened species rather than as an endangered population.

(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

(i) 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.

Not applicable. Each woodland bird species is listed as a threatened species rather than as an endangered or critically endangered ecological community.

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(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.

(i) A negligible amount of potential habitat for threatened woodland birds will be cleared or modified as a result of the proposeddevelopment.

(ii) No area of habitat of threatened woodland birds will be fragmented or isolated as a result of the proposed development.

(iii) Woodland on the subject site is considered to be marginal habitat for threatened woodland birds because of the extensive weed and exotic grass invasion of the site and the absence of a native understorey and shrub layer in open woodland areas across the site. Better quality habitat occurs in conservation areas within the locality.

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

No critical habitat for threatened woodland bird species occurs in the locality.

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

Gang-gang Cockatoo

Priority actions proposed by OEH for the recovery of the Gang-gang Cockatoo in NSW are:

Description of priority action	Priority
Recovery strategy: Community and land-holder liaison/ awareness and/or education	
Increase landholder and public awareness of status, threats and priority actions.	Low
Recovery strategy: Disease and pathogens	
Determine the disease status of selected populations.	Medium
Recovery strategy: Establish management agreements with public authorities CMAs and land managers/owners	
Negotiate management agreements and covenants over important areas of habitat.	Medium
Recovery strategy: Habitat management: Fire	
Provide input to National Park and local bushfire mgt. plans to minimise impacts of fire on critical resources.	High
Recovery strategy: Habitat management: Ongoing EIA - Advice to consent and planning authorities	
Prepare and distribute information to decision makers.	Medium
Recovery strategy: Monitoring	
Determine the status of representative local populations distributed across the species range.	High
Recovery strategy: Other Action	
Model the impact of global warming and develop mitigation strategies.	High
Recovery strategy: Research	
Investigate the breeding biology of selected populations to improve understanding of threatening processes.	High
Investigate the impacts of wildfire and hazard reduction burns on foraging and nesting resources.	High
Investigate movement patterns of selected populations.	Low
Recovery strategy: Survey/Mapping and Habitat assessment	
Identify important nesting habitat on public lands.	Medium

The proposed development is in compliance with these priority actions.

Varied Sittella, Swift Parrot and Regent Honeyeater

Priority actions proposed by OEH for the recovery of the Varied Sittella, Swift Parrot and Regent Honeyeater in NSW are:

- Retain existing vegetation and remnant stands along roadsides and in paddocks.
- Increase the size of existing remnants by planting trees and establishing buffer zones.
- Where remnants have lost connective links, re-establish links by revegetating corridors or stepping stones.
- Limit firewood collection and retain dead timber in open forest and woodland areas.
- Encourage regeneration of habitat by fencing remnant stands and managing the intensity and duration of grazing.
- Control weeds in areas of known habitat.

The proposed development is in compliance with these priority actions.

Scarlet Robin and Diamond Firetail

Priority actions proposed by OEH for the recovery of the Scarlet Robin and Diamond Firetail in NSW are:

- Retain existing forest, woodland and remnant grassland vegetation, including paddock trees.
- Retain dead timber on the ground in open forest and woodland areas.
- Enhance potential habitat through regeneration by reducing the intensity and duration of grazing.
- Fence remnants to protect from long-term, intense grazing.
- Increase the size of existing remnants, by planting trees and establishing buffer zones of un-modified, uncultivated pasture around woodland remnants.
- Keep domestic cats indoors at night; desex domestic cats; assess the appropriateness of cat ownership in new subdivisions adjacent to Scarlet Robin and Diamond Firetail habitat.
- Avoid the use of exotic berry-producing shrubs in landscape and garden plantings in areas adjacent to Scarlet Robin and Diamond Firetail habitats.

The proposed development is in compliance with these priority actions.

(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.

"Clearance of native vegetation" is a Key Threatening Process that would impact on the status of each woodland bird species. However, woodland on the subject site proposed for removal is a negligible amount of habitat that is available in the locality to each woodland bird species and the habitat is highly degraded. Therefore, it is unlikely that the proposed development of the subject site would significantly increase the impact of this key threatening process.

3. CONCLUSION

The proposed development of the subject site would not significantly impact on the status of threatened woodland bird species or their habitats. Therefore, a Species Impact Statement is NOT required for this species in relation to the proposed development.

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THREATENED BAT SPECIES

1. SPECIES PROFILES

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

Historically, Grey-headed Flying-foxes had a greater range in Australia and numbers were estimated as being in the millions. Counts of flying-foxes over the past decade suggest that the national population may have declined up to 30% (Birt 2000; Richards 2000). Regular visits to flying-fox camps during this period have shown a marked decline in the numbers using these camps (Eby 2000; Parry-Jones 2000). It has also been estimated that the population will continue to decrease by at least 20% in the next three generations given the continuation of the current rate of habitat loss and culling (Martin 2000).

This species is a canopy-feeding frugivore and nectarivore of rainforests, open forests, woodlands, *Melaleuca* swamps and *Banksia* woodlands. It plays an important ecosystem function by providing a means of seed dispersal and pollination for many indigenous tree species (Eby 1996; Pallin 2000). The species also feed on introduced trees including commercial fruit crops.

Grey-headed Flying-foxes congregate in large numbers at roosting sites (camps) that may be found in rainforest patches, Melaleuca stands, mangroves, riparian woodland or modified vegetation in urban areas. Individuals generally exhibit a high fidelity to traditional camps and return annually to give birth and rear offspring (Lunney & Moon 1997; Augee & Ford 1999). They forage opportunistically, often at distances from camp of up to 60-70 km per night, in response to patchy food resources (Augee & Ford 1999).

Grey-headed Flying-foxes show a regular pattern of seasonal movement. Much of the population concentrates in May and Junes in northern NSW and Queensland where animals exploit winter-flowering trees such as Swamp Mahogany *Eucalyptus robusta*, Forest Red Gum *E. tereticornis* and Paperbark *Melaleuca quinqernervia* (Eby *et al*. 1999). Food availability, particularly nectar flow from flowering gums, varies between places and from year to year.

Movement patterns of Grey-headed Flying-foxes are also irregular and unpredictable towards the edges of their distributional range. For instance, it appears that numbers in Victoria are highest in years when flowering of eucalypts in the coastal forests of southern NSW is poor. Conversely, in years when flowering in southern NSW is prolific, the number visiting Victoria is very low (Aston 1987; Parry-Jones 1987).

Grey-headed Flying-foxes are relatively long-lived mammals, with a generation length of six to 10 years. They have a low rate of reproduction because sexual maturity is reached after at least three years and generally only one offspring is produced each year (Martin *et al*. 1996).
Although mating can be observed throughout the year, males are apparently fertile only for a short period during March and April, and breeding is highly seasonal (Nelson 1965a; Martin *et al*. 1987).

Gestation lasts about six months and mot females give birth to a single young each September or October. For the first four or five weeks of life they cling to their mothers' belly fur. For a further 12 weeks young are flightless and are left in the camp while their mother forages and are suckled on return. Young are weaned at five or six months (Martin *et al*. 1987). At the end of summer food becomes scarce and the large camps break up. Many adults then lead a dispersed nomadic existence (Nelson 1965a,b), but others travel hundreds of kilometres to congregate at winter camps near reliable food supplies.

The main threat to Grey-headed Flying-foxes in NSW is the clearing or modification of native vegetation. This removes appropriate camp habitat and limits the availability of natural food resources, particularly winter feeding habitat in north-eastern NSW. The urbanisation of coastal plains of south-eastern Queensland and northern NSW has seen the removal of critical feeding sites, and this threatening process continues (Catterall *et al*. 1997; Pressey & Griffith 1992).

The use of non-destructive deterrents, such as netting and noise generators, to limit flying-fox damage to fruit crops is not universal in the horticultural industry. While licences are issue to cull limited numbers of Grey-headed Fly-foxes, uncontrolled culling using destructive methods such as shooting and electrocution occurs and large numbers of bats are culled (Vardon & Tidemann 1995; Richards 2000). The impacts of destructive methods have not been measured, but are greatest when natural food is scarce. Also, culling has a disproportionate impact on lactating and pregnant females (Parry-Jones 1993).

The species is also threatened by direct harassment at roosts, the destruction of their camps and by being possible carriers for viral pathogens (Tidemann 1999).

Grey-headed Flying-foxes face potential competition and hybridisation from Black Flying-foxes *Pteropus alecto*, because this latter species is extending its range south in to northern NSW (Webb & Tidemann 1995).

Large-eared Pied Bat (*Chalinolobus dwyeri*)

Large-eared Pied Bats are found most commonly in dry sclerophyll forests and woodlands, but also occur in sub-alpine woodland, the edge of rainforest, wet sclerophyll forest, *Callitris*-dominated forest and sandstone outcrop country. In the Sydney basin they are common in areas of high fertility soils in wet sclerophyll forests along the edges of sandstone escarpments.

This species roosts in caves, crevices in cliffs and mines, in colonies of three to 40, clustered in indentations in the ceiling. They prefer the twilight areas of the caves near the cave entrance.

They usually forage by flying low along creek beds or at mid-canopy level (6-10 m above the ground).

Threats to the status of this species include:

- Clearing and isolation of forest and woodland habitats near cliffs, caves and old mine workings for agriculture or development.
- Loss of foraging habitat close to cliffs, caves and old mine workings from forestry activities and too-frequent burning, usually associated with grazing.
- Damage to roosting and maternity sites from mining operations, and recreational caving activities.
- Use of pesticides.

Eastern Freetail Bat (*Mormopterus norfolkensis*)

Most records of East Coast Freetail Bats are from dry eucalypt forest and woodland on the coastal side of the Great Dividing Range. This species is usually solitary when in flight, but Churchill (2008) indicates that one group was caught flying low over a rocky river in rainforest and wet sclerophyll forest. They forage in openings and gaps in the forest for aerial insects, usually within a few

kilometres of their roost, with one female recorded up to six kilometres away (Churchill 2008). They are more active in the upper slopes of forest areas rather than in riparian zones.

East Coast Freetail Bats roost in tree hollows, usually in hollow spouts of large mature trees, but there are several records from buildings, metal caps on the top of telegraph poles and under exfoliating bark on trees. Individuals sometimes share roosts with other bat species.

Threats to the status of this species include:

- Loss of hollow-bearing trees.
- Loss of foraging habitat.
- Application of pesticides in or adjacent to foraging areas.

Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*)

The Eastern Bentwing-bat is found in a range of habitats from grasslands through to subtropical rainforest but is typically found in well timbered valleys. Colonies are often established in caves to meet breeding and over-wintering needs (NPWS 1996), but also occur in man-made constructions such as abandoned mines and road culverts (Churchill 2008).

The diet consists of small airborne insects including moths and mosquitoes (NPWS, 1996), which the bats capture while in flight just above the tree canopy. Eastern Bentwing-bats can forage long distances from the roost site and several marked females have travelled up to 65 km in one night (Churchill 2008).

Females form colonies during spring and summer to give birth and nurture young. They give birth to a single young around December. Maternity caves serve animals from a radius of several hundred kilometres (Dwyer 1995).

Threats to the status of this species include:

- Damage to or disturbance of roosting caves, particularly during winter or breeding.
- Loss of foraging habitat.
- Application of pesticides in or adjacent to foraging areas.
- Predation by feral cats and foxes.

Large-footed Mouse-eared Bat (*Myotis macropus*)

This species forages on fish and insects from the permanent freshwater rivers, dams and creeks of coastal eastern and northern Australia. The species makes maternity roosts in caves close to freshwater, under bridges and buildings and other such structures, and among dense foliage and pandanus leaves. Its preferred natural habitats are sclerophyll forests, mangroves, paperbark swamps, woodlands and rainforests near slow-flowing creeks, lakes and estuaries. Individual colonies usually consist of 10-15 bats, but may have as many as 200 individuals.

Males are territorial and form harems of up to 12 females when breeding. At other times the males roost alone. A single litter is produced in November-December. The single young suckles for about 8 weeks from a teat in the mother's armpit, and remains with her until independent 3-4 weeks later.

Greater Broad-nosed Bat (*Scoteanax ruepelli*)

Found in sclerophyll forests, rainforests, woodlands and moist gullies below 500 m above sea level. Active from dusk to dawn, Greater Broad-nosed Bats are one of the first bat species to emerge after sunset.

Their flight path is low and direct, and they hunt 3-6 m above ground, making only slight deviations from their flight path to catch moths, beetles and other large, slow-flying insects. They forage in forests and woodlands, utilising openings in the forest and corridors above creeks and small rivers, hawking back and forth looking for prey, taking small animals from the ground and foliage. They roost by day in tree hollows and the roof spaces of abandoned buildings.

Pregnant females congregate at maternity sites in suitable trees where they give birth and raise their young, apparently excluding males. Little is known about the reproductive biology of this species, however, it is known that a single young is produced in January and it suckles from a teat in the mother's armpit.

2. SEVEN-PART TEST

(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.

Grey-headed Flying-fox

There are no roosting colonies of Grey-headed Flying-foxes on the subject site or in neighbouring bushland, the nearest permanent colonies occurring at Gordon, the Royal Botanic Gardens, Sydney and at Camden. In the Sydney area, Grey-headed Flying-foxes tend to congregate in areas where there is a concentration of Swamp Mahoganies (*Eucalytpus robusta*) and Old Man Banksias (*Banksia serrata*), which are favoured food trees of the species. The Swamp Mahogany and Old Man Banksia do not occur on the subject site..

Grey-headed Flying-foxes are occasionally observed flying over or adjacent to the subject site. Individuals of this species usually fly along the Nepean and Hawkesbury Rivers and their tributaries, and adjacent areas most nights, especially during spring and summer. No individuals were seen resting or feeding in trees on the subject site. They are only likely to occur in large numbers on the subject site when eucalypts are in flower. Potential food habitat on the subject site is a negligible proportion of what is available to Grey-headed Flying-fox within the locality.

Therefore, it is most unlikely that the proposed development would disrupt the lifecycle of the Grey-headed Flying-fox to the extent that it will place a local population at risk of extinction.

Microchiropteran Bats

There were no microchiropteran bat roost colonies detected on the subject site during the site inspections, nor were there any indirect signs (e.g. accumulations of bat droppings on or under trees) of roosts occurring there. There are no hollow-bearing trees on the subject site that are potential roost or nest sites for microchiropteran bats. Therefore, the proposed development would not remove significant roost or nesting sites of threatened microchiropteran bat species.

The proposed development would remove a negligible amount of potential foraging habitat for each threatened bat **species**. No bat flyways would be significantly narrowed, fragmented or isolated as a result of the proposed development.

Therefore, it is considered unlikely that the proposed development would adversely affect the life cycle of this species to the extent that it would place a viable local population at risk of extinction.

(a) 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.

Not applicable. Each bat species is listed as a threatened species rather than as an endangered population.

(b) 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

(i) 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.

Not applicable. Each bat species is listed as a threatened species rather than as an endangered or critically endangered ecological community.

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(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

(ii) 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.

(i) A negligible amount of potential foraging and corridor habitat for threatened bat species would be cleared or modified as a result of the approved rezoning and development.

(iii) No area of habitat will be fragmented or isolated as a result of the approved development.

(iii) No significant breeding or roosting habitat for threatened bat species would be removed as a result of the proposed development. The subject site is considered marginal habitat for bats because of the extent of past clearance of native vegetation. Better-quality habitat in the locality would not be impacted by the proposed development.

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

No critical habitat for threatened bat species occurs in the locality.

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

The priority actions for the protection of the Grey-headed Flying-fox in NSW are stated below:

1. Assess the impacts Grey-headed Flying-fox camps have on water quality, and publish results in a peer-reviewed journal (Low priority).

2. Assess the impacts on Grey-headed Flying-foxes of electrocution on powerlines and entanglement in netting and barbed wire, and implement strategies to reduce these impacts (Low priority).

3. Complete national recovery plan in 2006 (Medium priority).

4. Conduct range-wide assessments of the population size of Grey-headed Flying-foxes at least once during the 5-year recovery plan to monitor population trends (Low priority).

5. Describe the species, age structure & demographics of flying-foxes killed in fruit crops to improve the understanding of the impact by assessing trends in the species, sex, age & reproductive status of animals killed on crops (Medium priority).

6. Determine characteristics of optimal roosting habitat for Grey-headed Flying-foxes, exploring the roles of floristic composition, vegetation structure, microclimate and landscape features, and assess the status of camps (Medium priority).

7. Develop & provide to land managers & local community groups working with controversial flying-fox camps the resources needed for public education, highlighting species status, reasons for being in urban areas, reasons for decline etc (Medium priority).

8. Develop and implement a grower-based program to monitor trends in damage to commercial fruit crops by flying-foxes, and use the results to monitor the performance of actions to reduce crop damage (Medium priority).

9. Develop and promote mechanisms for widespread adoption of publicly subsidised incentives to reduce killing of flying-foxes in commercial fruit crops (High priority).

10. Develop guidelines to assist land managers dealing with controversial flying-fox camps (Medium priority).

11. Develop methods for rapid estimates of flying-fox damage on commercial crops, allowing the long-term monitoring of industry-wide levels and patterns of flying-fox damage (Medium priority).

12. Develop methods to monitor landscape scale nectar availability trends, to explain/potentially predict crop damage trends where crop protection is absent, & promote importance of foraging habitat productive in seasons critical to the horticulture industry (Low priority).

13. Document the levels of flying-fox damage to the horticulture industry within the range of the Grey-headed Flying-fox (Medium priority).

14. Establish & maintain a range-wide database of Grey-headed Flying-fox camps, including information on location, tenure, zoning & history of use, for distribution to land management/planning authorities, researchers & interested public (Medium priority).

15. Establish and maintain a Grey-headed Flying-fox recovery plan website to promote the recovery plan and to circulate other information on flying-foxes and their conservation (Low

priority).

16. Identify the commercial fruit industries that are impacted by Grey-headed Flying-foxes, to provide an information base for use by the various stakeholders (Medium priority).

17. Implement appropriate vegetation management actions at camps critical to the survival of Grey-headed Flying-foxes (Medium priority).

18. Improve knowledge of Grey-headed Flying-fox camp locations, targeting regional areas and seasons where information is notably incomplete, such as inland areas during spring and summer (Medium priority).

19. Increase the extent and viability of foraging habitat for Grey-headed Flying-foxes that is productive during winter and spring (generally times of food shortage), including habitat restoration/rehabilitation works (High priority).

20. Investigate between-year fidelity of Grey-headed Flying-fox individuals to seasonal camps (Low priority).

21. Investigate the age structure and longevity of Grey-headed Flying-foxes (Medium priority).

22. Investigate the differences in genetic relatedness, sex, age etc. between sedentary and transient Grey-headed Flying-foxes (Low priority).

23. Investigate the genetic structure within Grey-headed Flying-fox camps, including levels of relatedness within and between members of adult groups, occupants of individual trees etc (Low priority).

24. Investigate the patterns of juvenile Grey-headed Flying-fox dispersal and mortality, allowing identification of the specific habitat requirements of juveniles (Low priority).

25. Produce and circulate educational resources to improve public attitudes toward Grey-headed Flying-foxes (Medium priority).

26. Protect and enhance priority foraging habitat for Grey-headed Flying-foxes, for example through management plans, local environmental plans and development assessments, and through volunteer conservation programs for privately owned land (High priority).

27. Protect roosting habitat critical to the survival of Grey-headed Flying-foxes, for example through management plans, local environmental plans and development assessments, and through volunteer conservation programs for privately owned land (Medium priority).

28. Publish Grey-headed Flying-fox recovery plan newsletters to inform the public of the recovery plan, its progress, opportunities for participation in actions and lists of educational material and where to find them (Low priority).

29. Review & evaluate campsite management activities, summarising outcomes of past experiences at controversial camps. Noise impacts on neighbours of camps to be considered. For use in managing future conflicts with humans at flying-fox camps (Medium priority).

30. Review and improve methods used to assess population size of Grey-headed Flying-foxes (Low priority).

31. Set priorities for protecting foraging habitat critical to the survival of Grey-headed Flying-foxes and generate maps of priority foraging habitat (High priority).

The proposed development is consistent with the priority actions for the recovery of the Grey-headed Flying-fox in NSW.

Microchiropteran Bats

The priority actions for the protection of microchiropteran bats in NSW are stated below:

1. Develop and promote State-wide bat awareness programs for schools, CMAs, landholders and industry groups etc.

2. Raise awareness of the effects of pesticides.

3. Prepare EIA guidelines which address the retention of hollow bearing trees maintaining diversity of age groups, species diversity, structural diversity. Give priority to largest hollow bearing trees.

4. Ensure largest hollow bearing trees, inc. dead trees and paddock trees are given highest priority for retention in PVP assessments (offsets should include remnants in high productivity) and/or other land assessment tools.

5. Ensure the Code of Practice for private native forestry includes adequate measures to protect large, hollow-bearing trees and viable numbers of recruit trees.

6. Promote the conservation of these HCV private land areas using measures such as incentive funding to landholders, off-setting and biobanking, acquisition for reserve establishment or other means.

7. Identify the effects of fragmentation on the species in a range of fragmented landscapes, such as cleared coastal river valleys. For example movement and persistence across a range of fragment sizes.

8. Investigate the effectiveness of logging prescriptions.

9. Research the degree of long-term fidelity to roost trees and roosting areas in order to assess their importance and the effects of their removal.

10. Research the roosting ecology of tree-roosting bats, e.g. identifying the attributes of key roosts.

11. Study the ecology, habitat requirements and susceptibility to logging and other forestry practices of this little-known species

12. Identify important foraging range and key habitat components for this species.

13. Research the effect of different burning regimes.

14. Research the effectiveness of rehabilitation measures intended to increase bat populations in degraded landscapes, such as revegetating riparian zones.

15. Study the susceptibility of this species to pesticide accumulation.

16. Undertake long-term monitoring of populations cross tenure in conjunction with other bat species to document changes.

17. Quantify any benefits of local bat populations to reducing the impact of insect pests on commercial crops.

18. Identify areas of private land that contain high densities of large, hollow-bearing trees as areas of high conservation value in planning instruments and land management negotiations e.g. LEP, CAPs, PVPs.

19. Undertake a systematic survey of productive coastal river valleys to quantify the importance of private land relative to public lands.

The proposed development is consistent with the priority actions for the recovery of microchiropteran bats in NSW.

(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.

"Clearance of native vegetation" is a Key Threatening Process that would impact on the status of each bat species. However, woodland on the subject site requiring removal is a negligible amount of habitat that is available in the locality to each species and the habitat is highly degraded. Therefore, it is unlikely that the proposed development of the subject site would significantly increase the impact of this key threatening process.

3. CONCLUSION

The proposed development of the subject site wiould not significantly impact on the status of threatened bat species or their habitats. Therefore, a Species Impact Statement is NOT required for these species in relation to the proposed development.

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CUMBERLAND PLAIN LAND SNAIL (*Meridolum corneovirens*)

1. SPECIES PROFILE

Conservation Status

The Cumberland Plain Land Snail is listed as an endangered species on Schedule 1 of the *TSC Act 1995.*

Description

Meridolum corneovirens is a native snail species with a typical adult shell diameter ranging between 15-30 mm. The colour is generally tan to dark brown with a green or yellow tinge. The underside of the shell, especially in living individuals, tends to have a glossy appearance and is semi-transparent. The upper side of the shell has a coarse wrinkly appearance. In adult shells the edge of the aperture is reflected, forming a slight lip. This is typically white in colour. However, the feature is absent in both juvenile and sub-adult individuals. The juveniles have a more angular shell and tend to have an open area in the central part of the underside of the shell, known as the umbilicus. Generally, in adults the umbilicus is closed or partially covered. Sometimes there is a reddish brown patch around the umbilical area.

Distribution and Habitat

Meridolem corneovirens occurs within the Cumberland Plain region of western Sydney. It is currently known from over 100 locations. However, most of these locations are scatterd throughout the region and are often small and isolated. Populations are known from Baulkham Hills, Blacktown, Camden, Campbelltown, Fairfield, Hawkesbury, Holroyd, Liverpool, Penrith and Wollondilly local government areas.

Meridolem corneovirens is restricted to the Cumberland Plain and Castlereagh Woodlands, and also along the fringes of River Flat Forest, especially where it meets Cumberland Plain Woodland. The species typically occurs under logs and other debris, among leaf and bark accumulations around bases of trees and sometimes underneath grass clumps. Where possible, it will burrow into loose soil.

Threats

The bulk of the known populations are small, isolated and vulnerable to impacts from clearing and habitat modification such as weed invasion, inappropriate fire management and removal of ground cover. These forms of modification remove shelter, breeding habitat and sources of food.

2. SEVEN-PART TEST

(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.

There are 26 records of the Cumberland Plain Land Snail occurring in the locality. This species was not detected on the subject site despite targeted surveys of leaf litter, grass tussocks and fallen timber around the bases of remnant trees. If a Cumberland Plain Land Snail population does occur on the subject site, then it is likely to be isolated from other populations because of the

limited ability of this species to disperse across a cleared rural landscape to other woodland remnants.

The amount of woodland that would be cleared on the subject site is a negligible amount of woodland within the local wildlife corridor. The corridor will not be fragmented or isolated further from other remnants as a result of the proposed rezoning and development.

Moreover, the subject site would be considered marginal habitat for the Cumberland Plain land Snail because of the extent of past habitat clearance and infestation of the ground-layer of woodland areas by weeds and other exotic plants. Habitat clearance and weed invasion are two recognised key threatening processes that impact on the status of the Cumberland land Snail.

Therefore, it is considered unlikely that the proposed development would adversely affect the life cycle of the Cumberland Land Snail to the extent that it would place a viable local population of the species at risk of extinction.

(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.

Not applicable. The Cumberland Plain Land Snail listed as a threatened species rather than as an endangered population.

(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.

Not applicable. The Cumberland Plain Land Snail is listed as a threatened species rather than as an endangered or critically endangered ecological community.

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(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.

(i) Potential habitat for the Cumberland Plain Land Snail occurs around the bases of remnant canopy trees on the subject site. The proposed development would result in the removal of up to 2.5 ha or marginal and highly degraded habitat for this species.

(ii) No area of habitat for the Cumberland Plain Land Snail will become fragmented or isolated from other habitat areas as a result of the proposed development.

(iii) No Cumberland Plain Land Snails were found on the subject site. The area of potential habitat on the site represents a negligible amount of habitat that is available for this

species within the locality and the Sydney Basin Bioregion. Potential habitat for the Cumberland Land Snail on the subject site considered to be marginal habitat because of the extent of past habitat clearance and infestation of the ground-layer of woodland areas by weeds and other exotic plants. Habitat clearance and weed invasion are two recognised key threatening processes that impact on the status of the Cumberland land Snail.

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

No critical habitat for the Cumberland Plain Land Snail occurs in the locality.

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

There are currently no recovery plans or threat abatement plans for the Cumberland Plain Land Snail in NSW.

(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.

Habitat clearance is a recognised threat to the Cumberland Plain Land Snail. As mentioned earlier, the proportion of potential habitat that would be cleared for the proposed development is likely to be an insignificant proportion of the total habitat available for this species within the locality and Sydney Basin Bioregion.

3. CONCLUSION

The proposed development of the subject site would not significantly impact on the status of the Cumberland Plain Land Snail or its habitat. Therefore, a Species Impact Statement is NOT required for this species in relation to the proposed development.