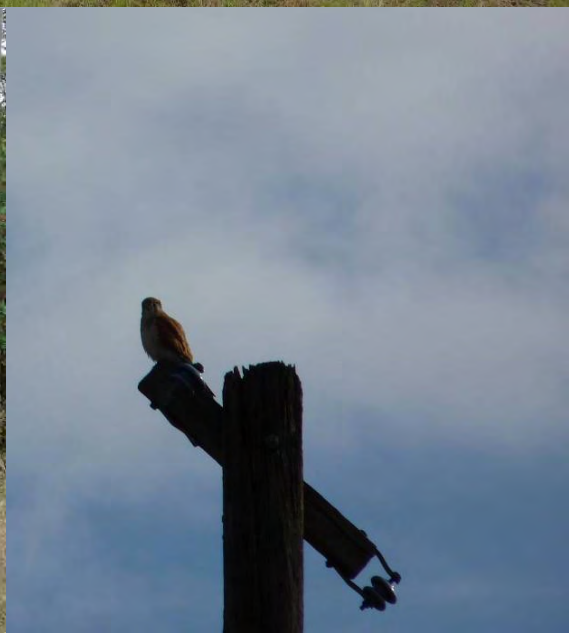
NORTH PENRITH

Flora and Fauna Assessment

Prepared for
Landcom

1st October 2010



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North Penrith

Flora and Fauna Assessment report

Summary

Objectives

The aims of this report are to:

- Report on the results of survey performed for threatened ecological communities, populations and species within the study area;
- Identify if drainage lines are present and if 'controlled activity' approvals will be required for works within riparian zones;
- Identify potential ecological constraints to the proposed development;
- Provide recommendations on land use constraints for any significant ecological values identified, and for any stands of native vegetation to be retained advice on mitigating impacts, buffer, and management requirements;
- Assess the impact of the proposed works on threatened ecological communities, populations and species in accordance with the 'Draft Guidelines for Threatened Species Assessment (Part 3A)' (DEC and DPI 2005) and under the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999* (EPBC Act).

Methods and findings

A flora and fauna assessment was undertaken through an initial desktop assessment, followed by field survey. One threatened ecological community was found onsite, Cumberland Plain Woodland. This community is listed as Critically Endangered under State and Commonwealth legislation. Flora and fauna species located on site were common to the Sydney Basin Bioregion, with no threatened species or populations recorded.

Consultation

Eco Logical Australia (Lucas McKinnon) undertook consultation with the Office of Hawkesbury Nepean, DECCW, pertaining to drainage lines under the *Water Management Act 2000*.

Landcom (Nicole Woodrow) undertook consultation with Environmental Protection and Regulation Division division of DECCW, on outcomes for the Cumberland Plain Woodland present at the Project Site.

Conclusions

- The flora and fauna assessment identified one threatened ecological community (TEC), Cumberland Plain Woodland, occurring at the Project Site;

- Cumberland Plain Woodland is listed under State and Commonwealth legislation, though due to the condition state of the remnant it does not meet the Commonwealth criteria to qualify as TEC;
- There will be some impacts to the Cumberland Plain Woodland remnants, though some will be incorporated into parkland (**Figure 10**);
- Impacts to this vegetation type were not considered to amount to a significant impact on the community using the DEC and DPI (2005) guidelines, consultation with DECCW supported this view;
- Drainage lines present on site were not considered to be riparian zones requiring 'controlled activity' approvals under the Water Management Act 2000, consultation with DECCW supported this view.

Recommendations

1. Landcom will prepare a Plan of Management for the Cumberland Plain Woodland within OS2. This Plan will include a suggested planting palette.
2. Landcom will create a Section 88B instrument within Block C3 to protect:
    - The Cumberland Plain Woodland identified for retention (**Figure 12**); and
    - Indigenous archaeological values.

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1. Objectives of assessment

At a glance

To report on the findings of a flora and fauna assessment at the Project Site, and inform Landcom of any potential ecological or regulatory constraints that may be present.

The aims of this report are to:

- Report on the results of survey performed for threatened ecological communities, populations and species within the study area;
- Identify if drainage lines are present and if 'controlled activity' approvals will be required for works within riparian zones;
- Identify potential ecological constraints to the proposed development;
- Provide recommendations on land use constraints for any significant ecological values identified, and for any stands of native vegetation to be retained advice on mitigating impacts, buffer, and management requirements;
- Assess the impact of the proposed works on threatened ecological communities, populations and species in accordance with the 'Draft Guidelines for Threatened Species Assessment (Part 3A)' (DEC and DPI 2005) and under the Commonwealth Environment Protection & Biodiversity Conservation Act 1999 (EPBC Act).

2. Site analysis

At a glance

A generally flat site located within 1km of the Nepean River and Great Escarpment, the majority of the site has been cleared for over 100 years with a small patches of intact vegetation across the site and larger remnant to the east. The site is dominated by exotic flora, with small patches of remnant vegetation mapped as Cumberland Plain Woodlands, a listed threatened ecological community under State and Commonwealth legislation.

Study Area

The North Penrith site is around 50 km from the Sydney CBD on the northern side of Penrith CBD. The land is marked on **Figure 1** below.

The site contains the following lots:

Property Description	Area
Lot 1 in DP 1020994	4815m²
Lot 2 in DP 1020994	1.357ha
Lot 4 in DP 1020994	987m²
Lot 5 in DP 1020994	1.863ha
Lot 6 in DP 1020994	1179m²
Lot 3 in DP 1017480	2795m²
Lot 4 in DP 1017480	446m²
Part Lot 1 in DP 33754	32.64ha
Lot 1 in DP 33753	1.977ha
Lot 1 in DP 532379	1.788ha
Total area	**40.6ha**

The area of Lot 1 in DP 33754 is 39.34ha, but 6.7ha has been excised from the lot. This includes 3.7ha for a Penrith Training Depot (PTD) and 3ha for a proposed commuter car park, leaving 32.64ha for the North Penrith project.

The site is Commonwealth-owned land and under federal government jurisdiction, having been used as an army base for the Royal Australian Engineers until 1994. The location and context are shown at **Figure 2** and **Figure 3**. It is anticipated that Landcom will purchase the site in August, 2010.

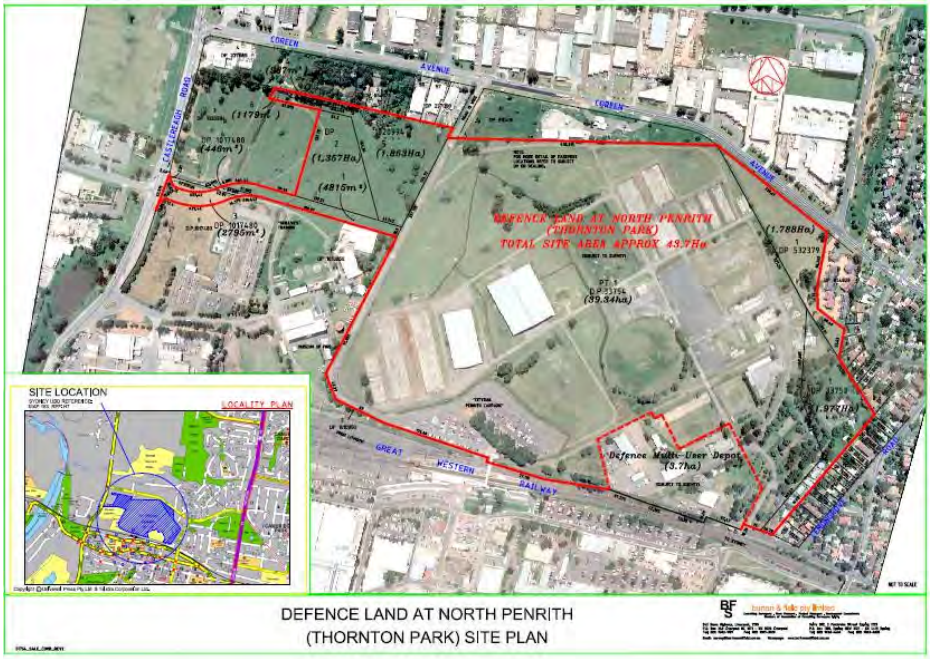

Figure 1: North Penrith Site Plan

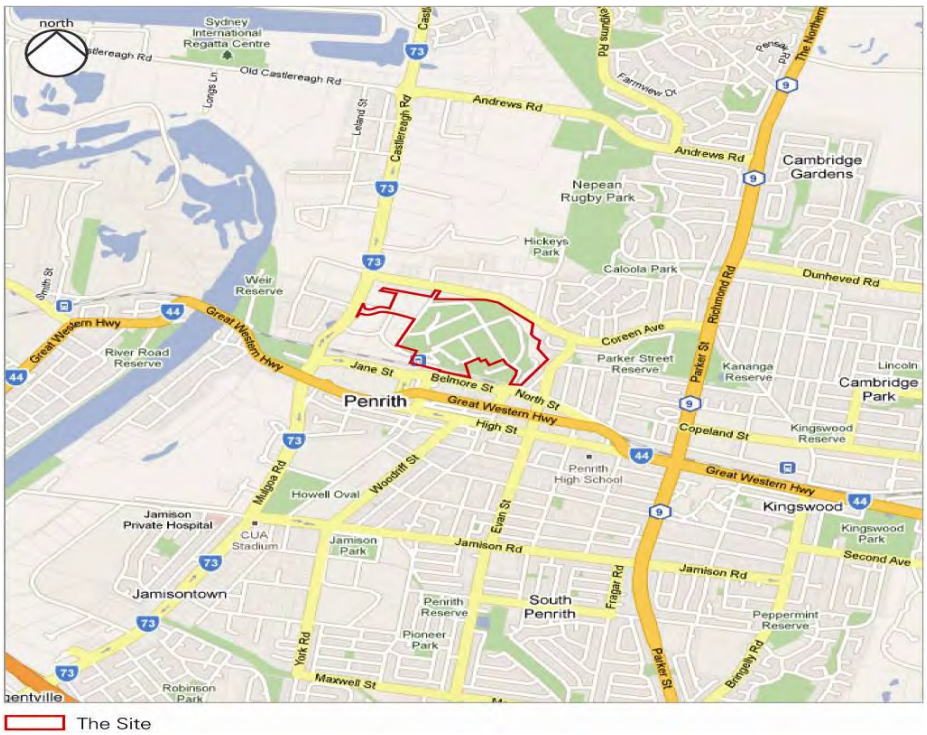

Figure 2: Location of North Penrith site

Figure 3: Aerial photograph of North Penrith site

Site characteristics

The site is generally flat with a slight rise to the east. It fronts onto, and has access from, Coreen Avenue and The Crescent.

The land is largely vacant following demolition and removal of most of the structures on it. Those remaining include:

- Thornton Hall and surrounds – listed on the Commonwealth Heritage List under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the Register of the National Estate;
- Land in the vicinity of Combewood – listed under the Penrith Local Environmental Plan (Urban Land) 1998 and Penrith Local Environmental Plan (Environmental Heritage Conservation) 1991; and
- Former building slabs, a disused oval, and an internal road and services network.

The site contains a mixture of native and exotic flora species. The majority of these species have been planted or are weeds that have colonised the site in the absence of management. One area of remnant vegetation remains onsite and has been mapped to be Shale Plains Woodland (NPWS 2002), a component of the Critically Endangered Ecological Community (CEEC), Cumberland Plain Woodland (CPW), as listed under State and Commonwealth

legislation (*Threatened Species Conservation Act 1995* and the *Environment Protection and Biodiversity Conservation Act 1999* respectively).

The climate of the area is typical of the Sydney region, which can generally be described as temperate.

Adjoining land uses

Adjoining land uses include:

- the Army's Penrith Training Depot (PTD) abutting the railway line to the south east;
- the Museum of Fire (a locally listed heritage item) and industrial uses to the north and west;
- the main western rail line to the south; and
- residential uses to the east.

There is a temporary commuter car parking area next to the railway station.

3. Regulatory context

At a glance

This report assesses flora and fauna requirements under one national and three State regulatory instruments, these are:

- *Environmental Protection and Biodiversity Conservation Act 1999* (Commonwealth)
- *Environmental Planning and Assessment Act 1979* (State)
- *Threatened Species Conservation Act 1995* (State)
- *Water Management Act 2000* (State)

Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) establishes a process for assessing the environmental impact of activities and developments where 'matters of national environmental significance' (NES) may be affected. Under the Act, any action which "has, will have, or is likely to have a significant impact on a matter of national environmental significance" is defined as a "controlled action", and requires approval from the Commonwealth Department of the Environment, Water, Heritage and the Arts (DEWHA) which is responsible for administering the EPBC Act.

Actions that may have a significant impact on one or more matters of NES need to be referred to the Department under the EPBC Act. The EPBC Act referrals process can produce one of four outcomes:

i. Refused – unacceptable levels of impact: At the referral stage the Minister may determine that the referred project will have unacceptable levels of impact on matters of NES and can determine that the project should not proceed to the assessment stage.

ii. Non-controlled action (NCA): Assessment and approval under the EPBC Act is **not required**. The project may proceed without further approval under the EPBC Act.

iii. Non-controlled action – specified manner (NCA-SM): Assessment and approval under the EPBC Act is **not required** provided the action is undertaken in a specific way (similar to conditions).

iv. Controlled Action (CA): The project will, or is likely, to have a significant impact on one or more matters of national environmental significance. The project **will require** full assessment and approval before it can proceed.

This report highlights any EPBC NES matters and advises if a referral to the DEWHA is required. There are eight listed Matters of NES, two of these will require assessment in this report. They include:

- listed threatened species and communities
- listed migratory species

In the case of listed threatened communities, it should be noted that definitions under the EPBC Act are generally narrower in scope than listings defined under State legislation, which means that vegetation listed under State legislation will not always meet Commonwealth definitions. This is discussed further in Section 4 of this report.

Environmental Planning and Assessment Act 1979

The NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) is the principal planning legislation for the State, providing a framework for the overall environmental planning and assessment of development proposals. Various legislation and instruments, such as the NSW *Threatened Species Conservation Act 1995* (TSC Act), are integrated with EP&A Act and have been reviewed separately.

The proposed development will be assessed under Part 3A of the NSW *Environmental Planning and Assessment Act 1979*, which provides the assessment and approvals process for major infrastructure projects. The Minister for Planning is the approval authority for all projects assessed under Part 3A.

Assessment for threatened ecological communities, populations and species is conducted in accordance with the 'Draft Guidelines for Threatened Species Assessment (Part 3A)' (DEC and DPI 2005).

Threatened Species Conservation Act 1995

The *Threatened Species Conservation Act 1995* (TSC Act) aims to protect and encourage the recovery of threatened species, populations and communities listed under the Act. The interactions between the TSC Act and the EP&A Act requires consideration of whether the proposed development is likely to significantly affect threatened species, populations, ecological communities or their habitat. This report assesses potential impact on threatened species, communities and populations and their habitat.

Water Management Act 2000

The NSW *Water Management Act 2000* has replaced the provisions of the *Rivers and Foreshores Improvement Act 1948*. The *Water Management Act 2000* controls the construction of works such as dams and weirs and the carrying out of activities in or near water sources in New South Wales. 'Water sources' are defined very broadly and include any river, lake, estuary, place where water occurs naturally on or below the surface of the ground and coastal waters.

If a 'controlled activity' is proposed on 'waterfront land', an approval is required under the *Water Management Act 2000* (s91).

'Waterfront land' is defined as the bed of any river or lake, and any land lying between the river or lake and a line drawn parallel to and forty metres (40m) inland from either the highest bank or shore (in relation to non-tidal waters) or the mean high water mark (in relation to tidal waters). It is an offence to carry out a controlled activity on waterfront land except in accordance with an approval.

'Controlled activities' include:

- the erection of a building or the carrying out of a work (within the meaning of the *Environmental Planning and Assessment Act 1979*), or
- the removal of material (whether or not extractive material) or vegetation from land, whether by way of excavation or otherwise, or
- the deposition of material (whether or not extractive material) on land, whether by way of landfill operations or otherwise, or
- the carrying out of any other activity that affects the quantity or flow of water in a water source.

Native Vegetation Act 2003

The *Native Vegetation Act 2003* (NV Act) aims to prevent broadscale clearing of native vegetation. Under Schedule 1 the Penrith local government area is excluded from the operation of the Act, and thus the NV Act does not apply to this proposal.

4. Methods and results

At a glance

A flora and fauna assessment was undertaken through an initial desktop assessment, followed by field survey. One threatened ecological community was found onsite, Cumberland Plain Woodland. This community is listed as *Critically Endangered* under State and Commonwealth legislation. Flora and fauna species located on site were common to the Sydney Basin Bioregion, with no threatened species or populations recorded.

Data Audit Methods

Vegetation communities present within the site were reviewed (NPWS 2002) along with aerial imagery of the site (Microsoft Virtual Earth 2010©) prior to field survey.

A search of the online EPBC Protected Matters Search Tool (DEWHA 2010), and Atlas of NSW Wildlife (DECCW 2010a) was performed on 21/05/2010. These searches focused on a 10 km radius from the site centred on Latitude: -33 ° 44 ' 50.30276 " and Longitude: 150 ° 41 ' 52.49906 (Datum GDA 94, Zone 56).

Species from both searches were combined to produce a list of threatened species that may possibly occur within the study area. A table of the 'likelihood of occurrence' of these species was prepared with likely occurrence determined by reviewing records in the area, considering the habitat available and using expert knowledge of the species ecology (**Appendix A**).

Five terms for the likelihood of occurrence of species are used in this report, as defined below:

- "known" = the species was or has been observed on the site.
- "likely" = a medium to high probability that a species uses the site.
- "potential" = suitable habitat for a species occurs on the site, but there is insufficient information to categorise the species as likely, or unlikely to occur.
- "unlikely" = a very low to low probability that a species uses the site.
- "no" = habitat on site and in the vicinity is unsuitable for the species.

Threatened species, populations and ecological communities considered to be 'known', 'likely' or 'potential' require impact assessment under the EP&A Act and EPBC Act.

The data audit included a review of a number of previous assessments that had been undertaken at the site, including flora (Clements 1999), fauna (Wildsearch 1999; Ecotone 1999) and arboricultural (English 1999).

Field Survey Methods

The study area was surveyed by two Eco Logical Australia ecologists, Lucas McKinnon and Andrew Whitford, 2nd and 3rd of June 2010. **Table 1** provides climate observations for Penrith at the time of the surveys (Bureau of Meteorology, 2010).

Table 1: Temperature observations during field survey 2nd and 3rd June, 2010.

Date	Temps		Rain	9am		Wind		3pm		Wind	
	Min	Max		Temp	RH	Dir	Spd	Temp	RH	Dir	Spd
	℃	℃	mm	℃	%		km/h	℃	%		km/h
2-Jun	8.7	20	0.2	11.6	100	SSE	6	19.5	46	SSW	9
3-Jun	11.6	20	1.4	15.3	92	SSW	17	15.5	98	SSW	15

Flora

The survey consisted of identifying vegetation communities and condition, habitat assessment, and targeted threatened flora searches. A random meander transect was used to survey the study area, particularly the areas of woody vegetation and mapped areas of Cumberland Plain Woodland to validate vegetation communities and potential threatened species habitat within the study area.

In the areas identified as Shale Plains Woodland, two 20x20m (0.04ha) survey quadrats were sampled. All species were identified, and cover abundance scores were allocated to the species present within the quadrat to determine proportional species assemblage of these remnants.

Fauna

Information on the methods and effort employed for surveying flora and fauna species are outlined in detail below, but generally, methods included:

- Diurnal birds: morning and evening census, habitat assessments, and opportunistic observations;
- Frogs: habitat assessments and opportunistic observations;
- Microbat species: Anabat detection and habitat assessments;
- Mammals (not including bats): habitat assessments and opportunistic observations;
- Cumberland Land Snail: targeted survey.

Diurnal Birds

Two diurnal bird censuses were undertaken at the site along with incidental recordings. The diurnal surveys were undertaken by two observers for a 20 minute period Wednesday afternoon (02/06/10; 1500-1520 hours) and Thursday morning (03/06/10; 0830-850). During censuses, observers moved through vegetation communities supporting potential habitat for

diurnal birds, and thus allowed for any cryptic species to be flushed. All species identified either by sight or call recognition during censuses were recorded.

One survey was undertaken in and around the area of Cumberland Plain Woodland (CPW) and another in the vicinity of the major drainage line towards the centre of the site. The majority of this drainage line was surrounded by *Acacia parramattensis* (Parramatta Wattle) with some large Eucalypts and exotic shrubs and grasses also present (Figure 3).

In addition to morning and evening censuses, diurnal birds were surveyed continuously during daytime hours over the 2 day survey period (2nd – 3rd June 2010) while traversing suitable habitat within the study area.

Frogs

All riparian areas identified on site were assessed for potential frog habitat and opportunistic sound recordings taken.

Microbats

Microchiropteran bats ('microbats') were surveyed for using Anabat detectors equipped with ZCAIM recording devices. One Anabat detector was placed in the area of Cumberland Plain Woodland and the other near standing water within the main Parramatta Wattle surrounded drainage line in the centre of the site. The Anabats detectors were placed out on the evening of 2nd June 2010 and recorded from approximately 1600 – 0900 (3rd of June).

Anabat calls were downloaded in the office and analysed by Alicia Lyons (Ecologist, Eco Logical Australia Pty Ltd).

Cumberland Plain Land Snail

Multiple searches under all mature native trees (>50 trees) in the area identified as Cumberland Plain Woodland were undertaken Wednesday 3rd June 2010. For each search under a mature native tree, an area of approximately 1m^2 was searched by removing leaf litter and woody debris within 1m of the tree trunk, for a search period of approximately 60 seconds.

Riparian areas

Prior to site survey, aerial imagery, contour and drainage maps were assessed for the presence drainage landforms and/or prescribed watercourses.

During the site survey areas determined likely to maintain drainage courses and areas identified by aerial imagery were assessed for their correlation with the definition of 'water course' under the *Water Management Act 2000*.

Post survey, areas of artificial drainage were referred to the Office of the Hawkesbury Nepean, DECCW, for confirmation of classification under this Act.

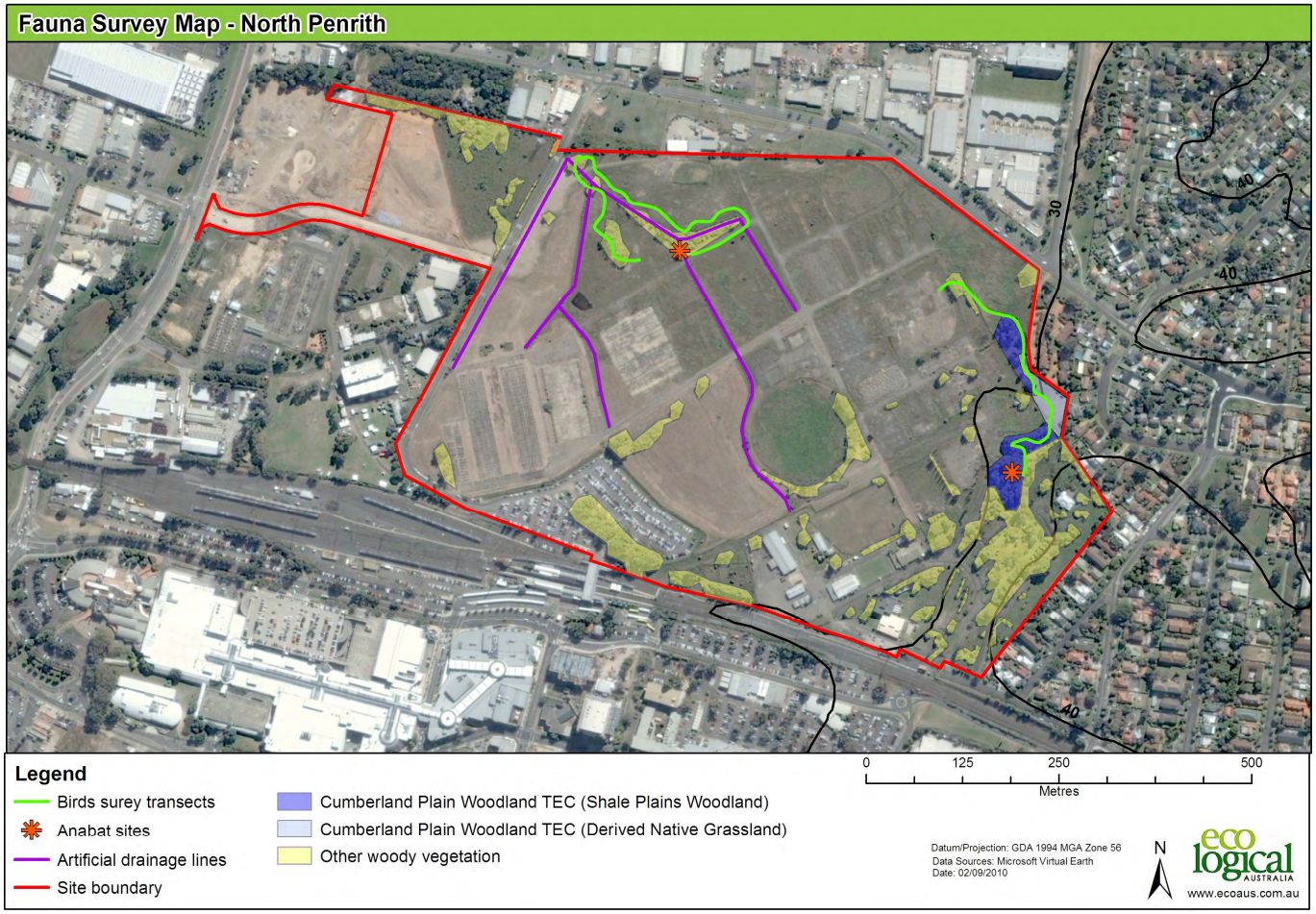

Figure 4: Fauna survey sites, North Penrith.

Data Audit Results

The data audit found 26 threatened flora and 56 threatened and migratory fauna species were previously recorded or were likely to occur within 10km of the project site. One threatened ecological community was mapped within the site boundary. A full summary and likelihood of occurrence table is found at **Appendix A.** Those either 'known to occur', considered 'likely to occur' or with the 'potential to occur' at the Project site, as outlined in **Table 2**.

Table 2: Threatened species and ecological communities known, likely to occur, or potentially occurring on site.

Scientific Name	Common Name	TSC Act	EPBC Act	Likelihood of Occurrence
Ecological Community				
Cumberland Plain Woodland		CE	CE	Known – recorded on site
Flora				
Persoonia nutans	*Nodding Geebung*	E	E	Potential – record on site from 2001 - accuracy of record was 1000m
Fauna - Birds				
Stagonopleura guttata	Diamond Firetail	V	-	Potential
Merops ornatus	Rainbow Bee-eater	-	M	Potential
Fauna - Bats				
Miniopterus orianae (sensu lat. *M. schreibersii oceanensis*)	Common, Eastern or Large Bent-wing Bat	V	-	Known – previously recorded flying over site
Fauna - Invertebrates				
Meridolum corneovirens	Cumberland (Large) Land Snail	E	-	Potential

CE = Critically Endangered; E = Endangered; V = Vulnerable; M = Migratory.

Field Survey Results

Vegetation Community Findings

Field survey revealed that one native vegetation community is present within the study area, as well as other woody vegetation and grassland which are not native vegetation communities, as shown in **Figure 5.** These vegetation communities are:

- Cumberland Plain Woodland (and derived native grasslands);
- Other woody vegetation; and
- Other grasslands.

Each of these vegetation communities are described below.

Cumberland Plain Woodland

The Cumberland Plain Woodland is located toward the eastern boundary of the subject site, and occurs in two condition states:

i) wooded remnants; and

ii) derived native grasslands.

The wooded remnant is considered to be Shale Plains Woodland (Tozer 2003), and the derived native grassland is considered to be a cleared remnant of this vegetation community.

The total area of wooded remnant is 0.63 ha (in two small patches of 0.21ha and 0.42 ha for the northern and southern patches respectively), and the area of derived native grasslands is 0.23 ha. Thus the total area of Cumberland Plain Woodland (counting all condition states) is 0.86 ha.

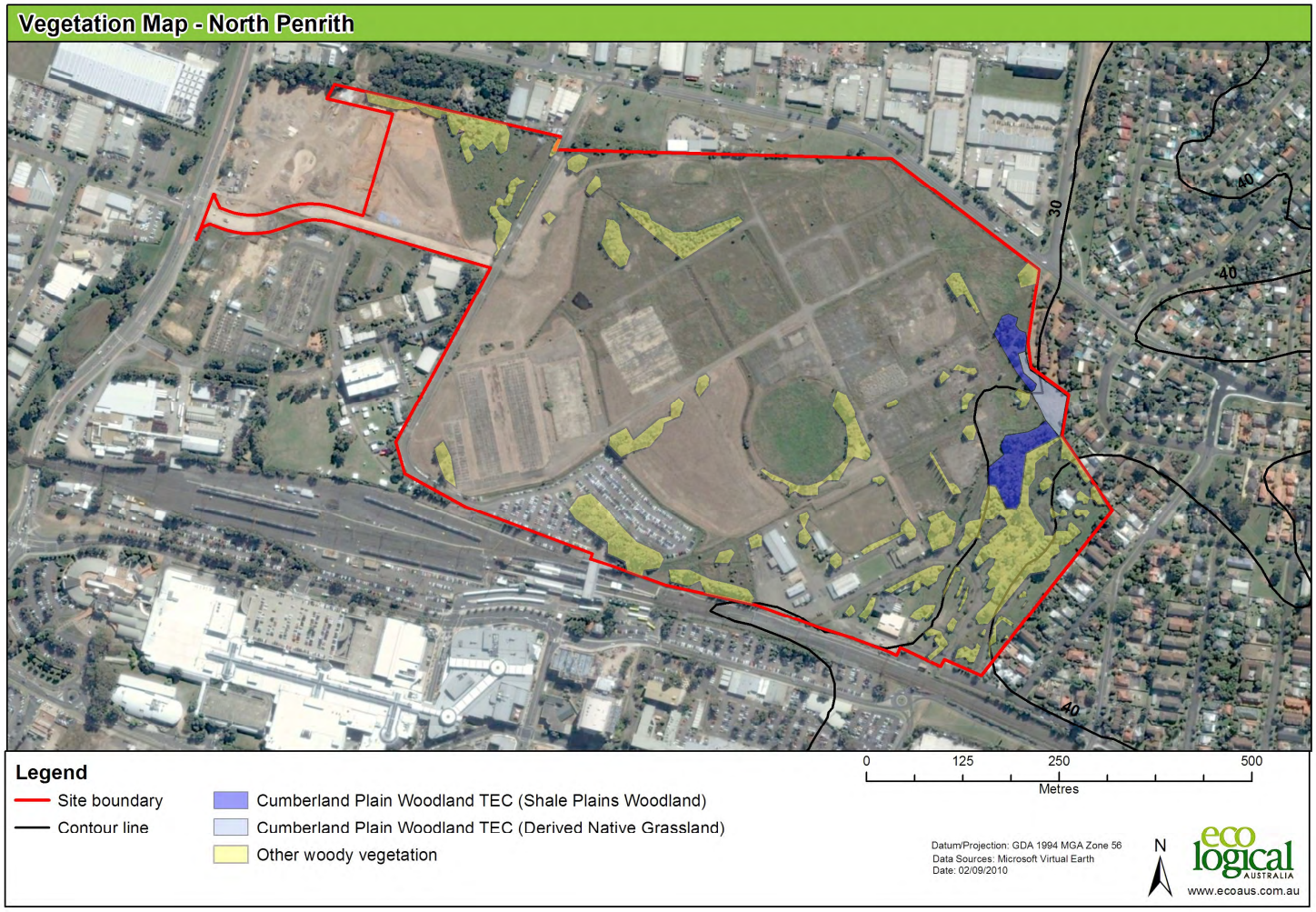

Figure 5: Vegetation map of North Penrith (unshaded grass areas are classified as 'Other Grasslands').

i) Wooded Remnants

Two small patches of modified Cumberland Plain Woodland (Tozer, 2003) are located to the north and west of the historic Thornton House, and occupy collectively approximately 0.63 ha. Both remnants are dominated by *Eucalyptus moluccana* (Grey Box), with other common indicator species of Cumberland Plain Woodland such as *Eucalyptus tereticornis* (Forest Red Gum) and *Corymbia maculata (*Spotted Gum) also present in the remnant (**Figure 6** and **Figure 7**). The canopy in these remnants is relatively intact with ~20-30% projected foliage cover (See **Appendix B** for full floristic data).

The understorey consisted of predominantly exotic species, though there were natives present in low abundance. Only one native shrub species was found in the patch, *Bursaria spinosa* (Native Box-thorn), other native species in the understorey included the herbs *Commelina cyanea*, (Native Wandering Jew), *Dichondra repens* (Kidney Weed), *Oxalis* sp. (Oxalis) and *Wahlenbergia* sp (Bluebell). Exotic shrub species in the understorey included *Ochna serrulata* (Mickey Mouse Plant), *Sida rhombifolia* (Paddy's Lucerne), *Bidens pilosa* (Cobblers Pegs) and *Asparagus aethiopicus* (Asparagus Fern). Other exotics found in the understorey included *Araujia sericifolia* (Moth Vine), *Plantago lanceolata* (Lambs Tongue) and *Solanum nigrum* (Black-berry Nightshade).

The groundcover consisted of a mixture native and exotic species. The native species present were in low abundance and included *Aristida ramosa* (Purple Wiregrass), *Aristida vagans* (Three Awn Grass), *Austrodanthonia* sp. (Wallaby Grass), *Microlaena stipoides* (Weeping Grass), *Themeda australis* (Kangaroo Grass) and *Sporobolus* sp. The predominantly exotic groundcover was dominated by the grasses, *Chloris gayana* (Rhodes Grass), *Ehrharta erecta* (Panic Veldtgrass), *Eragrostis curvula* (African Lovegrass) and *Pennisetum clandestinum* (Kikuyu).

Figure 6: Western remnant of Cumberland Plain Woodland found on site near Thornton House.

ii) Derived Native Grassland

The area considered to be Derived Native Grassland is dominated by exotic grass species (Rhodes Grass, Kikuyu and African Lovegrass) and is currently managed as lawn with the area recently mown. Whilst it was difficult to ascertain the exact species assemblage in this area as the flowering heads were not available for identification, given its landscape position between the two woodland remnants, the close proximity of the remnants (separated by less than 50m) and the presence of the grasses native to the Cumberland Plain Woodlands in these wooded remnants (e.g. *Aristida* spp., *Austrodanthonia* spp., *Microlaena stipioides* and *Themeda australis*), it is likely they also occur in the grassed area. Other native herbs were noted in the grassed area including Kidney Weed and Bluebell. Given the above, this area is considered to be part of the patch of Cumberland Plain Woodland.

It is noted that the grassland to the west of the woodlands is likely to have a similar composition of understorey flora, though given current management (i.e. mowing) it is not possible to delineate a boundary between disturbed exotic grassland and possible derived native grassland. As with the majority of the site, it is heavily congested by exotic grasses and herbs and does not provide connectivity to other remnant vegetation. For these reasons it has not been included in the mapping of Cumberland Plain Woodland.

Figure 7: Cumberland Plain Woodland derived native grassland.

Note: Location of the photograph is to the north of the two remnants of Cumberland Plain Woodland on the site looking south. The northern remnant is in the left of the photo, the southern remnant can be seen to the rear of the shot with derived native grasslands between the two remnants.

Conservation Status – *Threatened Species Conservation Act 1995*

Cumberland Plain Woodland was reclassified by the NSW Scientific Committee in January 2009 from an Endangered Ecological Community to a Critically Endangered Ecological Community (CEEC) under the TSC Act. This reclassification has included 'Derived Native Grassland' as a component of the listed community. This means that areas of native grassland that were likely to have been Cumberland Plain Woodland in the past but currently exist in the absence of an overstorey, are now considered to be CEEC.

Under the TSC Act listing, there is no requirement for 'Derived Native Grassland' to maintain a certain percentage of native flora cover to be considered a part of the community, it need only maintain native grasses typical of the community, and to have likely once been Cumberland Plain Woodland.

For the purposes of this Act, both the woodland and the derived native grassland at the site are considered to be part of the CEEC listing for Cumberland Plain Woodland. Thus, the total area of Cumberland Plain Woodland vegetation subject to the TSC Act is 0.86 ha.

Conservation Status – *Environment Protection and Biodiversity Conservation Act 1999*

Cumberland Plain Woodland is included in the EPBC Act listed 'Cumberland Plain Woodlands and Shale Gravel Transition Forest' Critically Endangered Ecological Community.

The EPBC Act definition is, however, more narrow in scope than the TSC Act definition. Vegetation must meet the following criteria to come under the EPBC Act definition (**Table 3**).

Table 3: EPBC categories and thresholds for Cumberland Plain Woodland.

Category and rationale	Thresholds
A. Core thresholds that apply under most circumstances: patches with an understorey dominated by natives and a minimum size that is functional and consistent with the minimum mapping unit size applied in NSW.	Minimum patch size is ≥0.5ha; **AND** ≥50% of the perennial understorey vegetation cover is made up of native species.
OR	
B. Larger patches which are inherently valuable due to their rarity.	The patch size is ≥5ha; **AND** ≥30% of the perennial understorey vegetation cover is made up of native species.
OR	
C. Patches with connectivity to other large native vegetation remnants in the landscape.	The patch size is ≥0.5 ha; **AND** ≥30% of the perennial understorey vegetation cover is made up of native species; **AND** The patch is contiguous5 with a native vegetation remnant (any native vegetation where cover in each layer present is dominated by native species) that is ≥5ha in area.
OR	
D. Patches that have large mature trees or trees with hollows (habitat) that are very scarce on the Cumberland Plain.	The patch size is ≥0.5 ha in size; **AND** ≥30% of the perennial understorey vegetation cover is made up of native species; **AND** The patch has at least one tree with hollows per hectare or at least one large tree (≥80 cm dbh) per hectare from the upper tree layer species outlined in the Description and Appendix A.

Whilst the two remnants are collectively ≥0.5 ha (i.e. patch size = 0.63 ha) in area, the perennial understorey cover for both is dominated by exotic flora (i.e. >70%) and as such are not considered a TEC under the EPBC Act (See **Appendix B** for full floristic data).

Other Woody Vegetation

Other woody vegetation found at the site consisted of exotic and non-endemic flora (Australian species non-native to the Cumberland Plain). This vegetation has been mapped as 'Other Woody Vegetation' (**Figure 5**). In some cases these areas maintained possible local native remnant Eucalypts, but in no cases were they considered to form a remnant of a native ecological community due to the site disturbance and extent of introduced flora enclosing these trees.

Other Grasslands

Unmapped vegetation on the site generally consisted of exotic grasslands dominated by African Lovegrass and Rhodes Grass. These grasslands occur throughout the site in areas previously developed for roads and infrastructure. Due to the considerable changes that have

taken place to the native vegetation that previously occurred onsite, the soil profile and the introduction of foreign construction materials these areas are not considered to be native to the area or of conservation significance.

Flora Results

A total of 96 flora species were recorded within the study area, including 39 locally native species, 11 non-endemic (i.e. introduced native species) and 46 exotic species. None of these flora species recorded are listed as threatened under the TSC Act or EPBC Act (See **Appendix B** for full floristic data).

The field survey identified various flora habitat characteristics within the study area. These characteristics included the presence of a grassy groundcover, shrub-layer and intact canopy. Habitat characteristics assisted in determining threatened species that were likely to occur or had the potential to occur within the study area.

Twenty six threatened flora species have been recorded within a 10 kilometre radius of the site are listed under either the TSC or EPBC Acts (**Appendix A**). Of these, Nodding Geebung (*Persoonia nutans*) was the only species considered to potentially occur within the study area due to the presence of a record of this species on site from 2001. The accuracy of this record was 1000m.

Nodding Geebung is associated with dry woodland, Castlereagh Scribbly Gum Woodland, Agnes Banks Woodland and sandy soils associated with tertiary alluvium, occasionally poorly drained (Benson and McDougall 2000). It flowers between December and March. It is an easily recognised species and grows to approximately 1m tall. This species was not found during the site survey.

A total of 46 exotic flora species were recorded across the site (**Appendix B**). Five weed species listed as noxious within the Penrith LGA (DI&I 2010) under the *Noxious Weeds Act 1993* were recorded within the study area (Table 3). Two of these species, Bridal Creeper and Lantana are also classified as Weeds of National Significance (AWC, 2010).

Table 4: Noxious weeds recorded within the study area.

Scientific Name	Common Name	NW Act Class	Necessary Action
Asparagus asparagioides	Bridal Creeper	5	The requirements in the *Noxious Weeds Act 1993* for a notifiable weed must be complied with
Lantana camara	Lantana	5	As above
Ligustrum lucidum	Large-leaved Privet	4	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority
Ligustrum sinense	Small-leaved Privet	4	As above
Olea europea subsp. cuspidata	African Olive	4	As above

Fauna Results

Twenty five fauna species were recorded during the field survey; of which there were 21 bird species, one amphibian, two mammals and one reptile (See **Appendix C** for full species inventory). The bird species recorded are considered common in urban areas, including the introduced species Indian Myna (*Acridotheres tristis*), Common Rock Dove (*Columba livia*) Crested Pigeon (*Ocyphaps lophotes*) and Spotted Turtle Dove (*Streptopelia chinensis*). Other native fauna recorded included Red-bellied Black Snake (*Pseudechis porphyriacus*) and the Common Eastern Froglet (*Crinia signifera*). The introduced European Rabbit (*Oryctolagus cuniculus*) was sighted during survey work and a European Fox (*Vulpes vulpes*) scat was also recorded.

Survey for microbats using Anabat detectors recorded only one call during the survey period, though this call was too short for a positive identification. Previous survey using Anabat detectors identified Large Bentwing Bat (*Miniopterus orianeae* – formerly *M. shreibersii*) to possibly be flying over the site from two brief and poor quality recordings (Ecotone, 1999).

Fifty six fauna species listed as either threatened or migratory under either the TSC or EPBC Acts have been recorded within a 10 kilometre radius of the study area (**Appendix A**). Of these one threatened bird, Diamond Firetail (*Stagonopleura guttata*) and one threatened invertebrate, Cumberland Land Snail (*Meridolum corneovirens*) were considered to potentially occur onsite, one threatened bat, Large Bent-wing Bat, was considered known on site and one migratory species, Rainbow Bee-eater (*Merops ornatus*) was considered to potentially occur. None of these species were recorded during the field survey.

Habitat Elements

The study area provides two broad fauna habitat types associated with the two vegetation communities, namely open woodland and grassland. Within these habitat types specific habitat features including deep leaf litter, dense shrub layers, large woody debris and a stag tree with potential hollows.

The quality of faunal habitat within the study area varies considerably. Generally, woodland areas in the eastern portion of the site provide a higher quality potential fauna habitat than areas identified as 'Derived Native Grassland' or 'Other woody vegetation'.

Woodland habitat provides more complexity by possessing a canopy, shrub strata and ground cover. The woodland would contain a broad array of breeding, nesting, roosting and foraging habitat for a broad suite of fauna. Large woody debris also occurs within the woodland area, which may provide refuge for some native ground dwelling mammals, and reptiles.

The Derived Native Grassland generally provides low-moderate quality fauna habitat by increasing the range of foraging substrates. This area is currently managed as mown lawn and as such does not provide a shelter element for fauna migration.

Other Woody Vegetation found onsite also provides potential roosting and foraging habitat on the site for birds and arboreal mammals.

Although Other Grassland areas have been identified as exotic, the dense groundcover may provide refuge for native and exotic ground dwelling mammals, reptiles and birds.

One dead stag with possible hollow spouts was present towards the western boundary of the site, now encircled by a regrowth Eucalypt.

Another habitat element noted onsite were formerly used telephone poles. This provides perching habitat for passerine birds as well as birds of prey when prospecting for potential prey.

Riparian Area Results

Four artificial drainage lines where noted during field assessment infested with exotic grasses and weeds (**Figure 4**). These drainage lines were considered artificial due to their linear nature and the generally flat aspect of the site leading to no natural drainage line being present. They did maintain some fauna habitat with Eastern Common Toadlet (*Crinia signifera*) noted to be present.

A map of the site was referred to Greg Brady at the Office of the Hawkesbury Nepean, DECCW, 17th June 2010 (Figure 7). Mr Brady did not consider the drainage lines to be natural and as such they do not require assessment under the *Water Management Act 2000*.

Figure 8: Typical artificial drainage line found on site, overgrown with exotic grasses and weeds.

5. Assessment

At a glance

Only one ecological constraint was recorded at the project site, Cumberland Plain Woodland, a Critically Endangered Ecological Community, listed under the NSW TSC Act. The vegetation did not meet condition criteria for listing under the Commonwealth EPBC Act. The remnant found on site is small (0.9ha) and degraded, and impacts to this vegetation were not considered to be significant. Consultation with NSW Department of Environment, Climate Change and Water by Landcom supported this view. Recommendations to retain some ecological value for the retained native vegetation are provided.

Ecological Constraints

Site assessment and survey conducted for this study found that the primary ecological constraint is the presence of the Cumberland Plain Woodland (**Figure 5**). This vegetation is listed as a Critically Endangered Ecological Community (CEEC) under both the TSC Act and EPBC Act, though the vegetation on site does not comply with condition thresholds required to meet the EPBC Act definition.

Other potential constraints are threatened species *Persoonia nutans* (Nodding Geebung), Diamond Firetail (*Stagonopleura guttata*), Large Bent-wing Bat (*Miniopterus orianae*), Cumberland Land Snail (*Meridolum corneovirens*), and the migratory species, Rainbow Bee-eater (*Merops ornatus*), though none of these species were recorded during the field survey.

Impact Assessment

The proposed North Penrith development will result in the removal of a small area of Cumberland Plain Woodland CEEC (**Figure 9**). The final footprint includes some of the Cumberland Plain Woodland remnants in areas marked as OS2 and C3 (**Figure 10, Figure 11,** and **Figure 12**).

The OS2 Park will be landscaped as per **Figure 11**. The landscaping will remove trees in the middle of this patch to create sightlines, together with installation of retaining walls and a path with steps. Other paths will also be installed elsewhere in the park, resulting in the clearing of some trees and understorey / groundcover. Weeds will be removed and planting will occur (**Figure 11**).

In the C3 area some Cumberland Plain Woodland in the west and south of this area will be removed as a result of the proposal (**Figure 10**). Vegetation in the north and south of this area will be protected via a section 88b instrument (**Figure 12**).

The Cumberland Plain Woodland remnants are isolated from other native vegetation in the area and are in a degraded state. The impact was considered in accordance with the 'Draft Guidelines for Threatened Species Assessment' (DEC and DPI 2005), any they were not considered to amount to a significant impact (**Appendix E**). Recommendations are provided later in this section on future management and native planting of the Cumberland Plain Woodland retained.

No other threatened flora or fauna were recorded on site during this survey, though previous records of Eastern Bent-wing Bat and *Persoonia nutans* were noted during the data audit for this assessment. These species have been assessed in accordance with the Draft Guidelines for Threatened Species Assessment (DEC and DPI 2005), and it is not considered that the proposal will impact upon them (**Appendix E**). A summary of the reasoning provided by these assessments includes:

- Previous records for the Eastern Bent-wing Bat were not conclusive and considered to be communicative calls associated with fly over behaviour rather than foraging behaviour. No known roosting sites for this species are known within the site boundary or within the local area.
- The record of *Persoonia nutans* was provided to an accuracy of 1000m, and it is possible that it never occurred on-site. This species is associated with aeolian and alluvial sediments (Benson and MacDougall), and whilst the site is located on what is likely an old alluvial floodplain, the highly disturbed nature of the site means that the substrate now invariably consists of introduced fill and disturbed ground. A thorough field examination was undertaken for this species using random meander technique and it was not located.

The stag tree identified onsite has the potential to host hollow dependent fauna species, though given its location in the urban matrix of the Penrith LGA and its position in exclusion from any remnant vegetation it is not considered to provide a significant habitat resource and is not considered to be an ecological constraint.

Consultation

Eco Logical Australia (Lucas McKinnon) undertook verbal consultation with the Office of Hawkesbury Nepean, DECCW (Greg Brady, 18/06/2010), pertaining to drainage lines requiring assessment under the *Water Management Act 2000*. DECCW concurred with ELA's assessment that the drainage lines do not do not trigger a 'controlled activity' approval requirement under the *Water Management Act 2000*.

Upon receipt of the DGR's, Landcom (Nicole Woodrow) undertook verbal consultation with Environmental Protection and Regulation Division, DECCW (Fran Kelly, 29/06/2010), pertaining to the absence of any reference to the Cumberland Plain Woodland found on-site. It understood that DECCW's assessment was that given the small patch size and degraded nature of the remnant vegetation that any impacts upon this vegetation will not be significant to the survival of this threatened ecological community. DECCW has not sought an offset on this occasion for the removal of the Cumberland Plain Woodland.

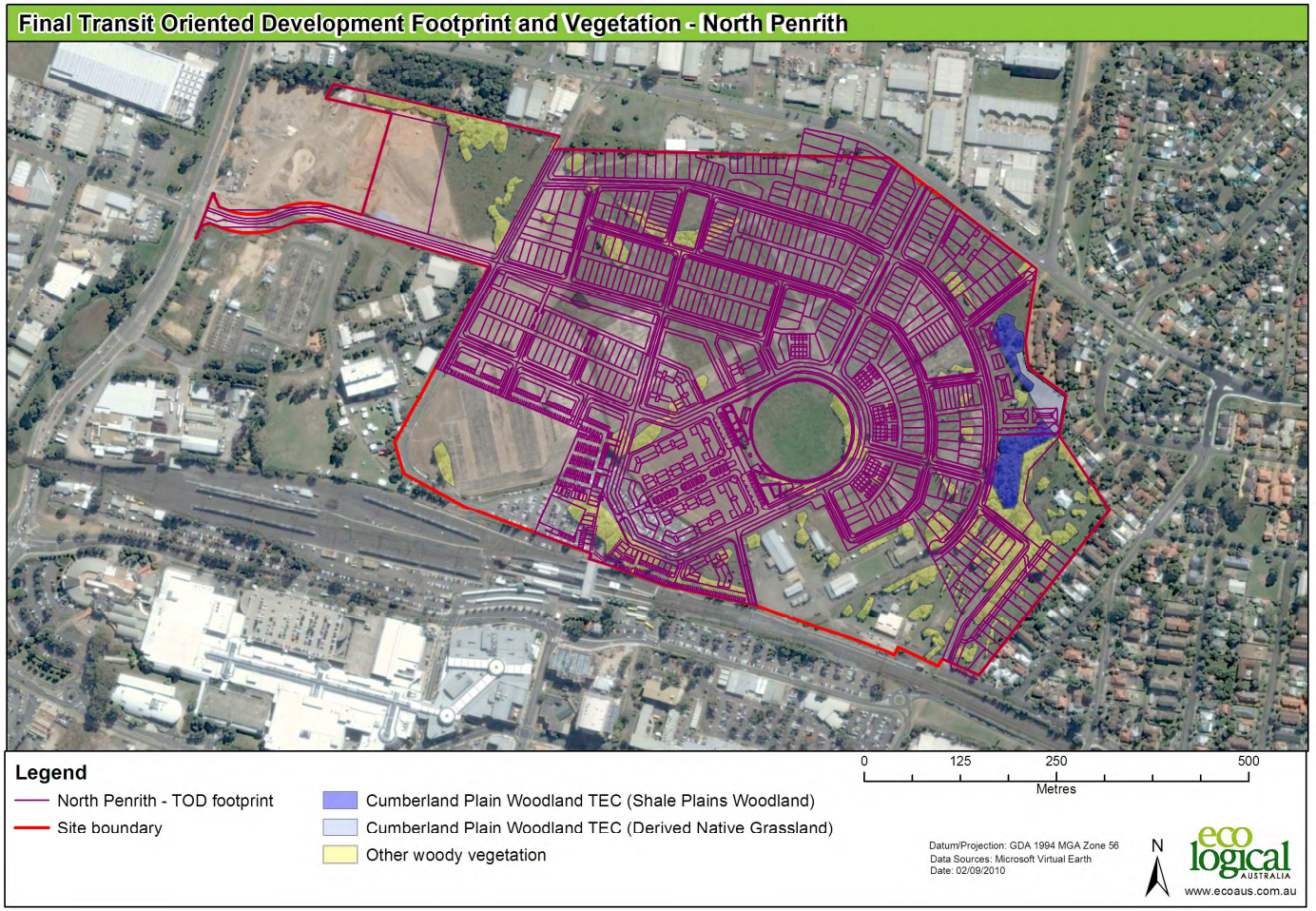

Figure 9: Final proposed development footprint, overlaid on vegetation mapping.

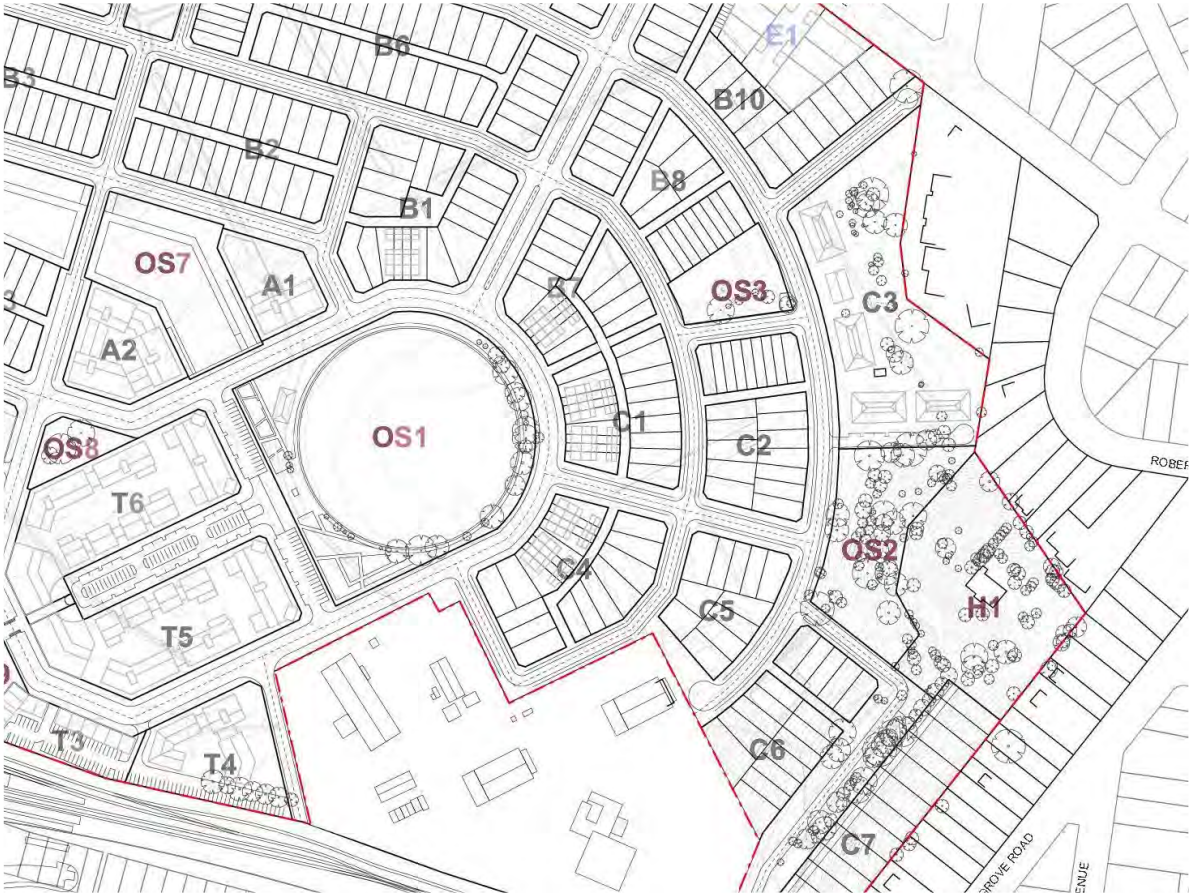

Figure 10: The Cumberland Plain Woodland remnants primarily occur in the areas marked as OS2 and C3.

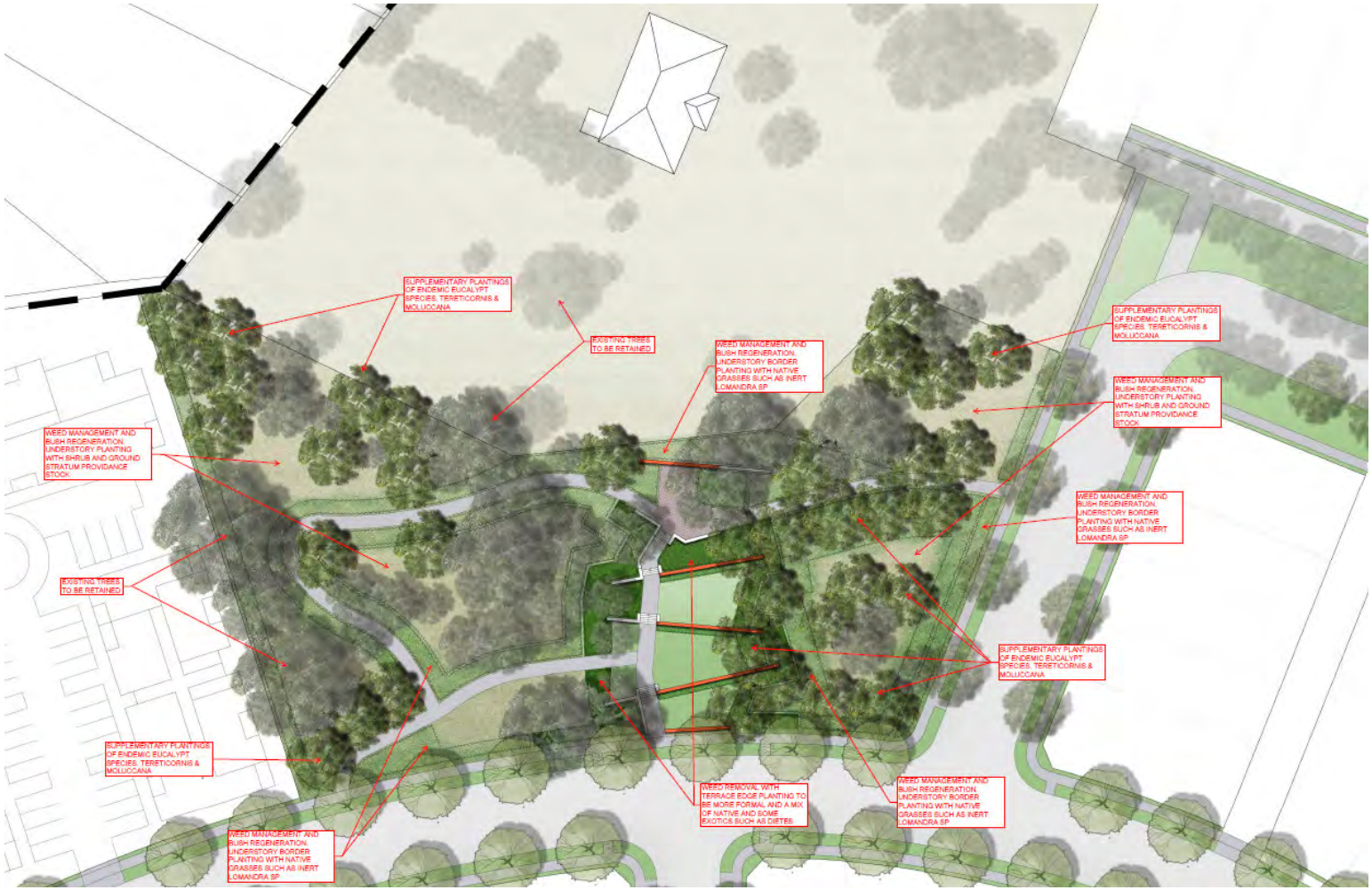

Figure 11: OS2 Park (by Place Design).

Figure 12: The shaded Cumberland Plain Woodland within the C3 will be protected via section 88b instrument.

Conclusions

- The flora and fauna assessment identified that 26 threatened flora, 56 threatened and/or migratory fauna and one threatened ecological community had the potential to occur at the proposed development site at North Penrith;
- Of these, only the threatened ecological community (TEC), Cumberland Plain Woodland was recorded on site;
- Cumberland Plain Woodland is listed under State and Commonwealth legislation, though due to the condition state of the remnant it does not meet the Commonwealth criteria to qualify as TEC;
- Impacts to this vegetation type were not considered to amount to a significant impact on the community using the DEC and DPI (2005) guidelines, and consultation with DECCW supported this view;
- Drainage lines present on site were not considered to be riparian zones requiring 'controlled activity' approvals under the *Water Management Act 2000*, and consultation with DECCW supported this view.

Recommendations

Landcom will prepare a Plan of Management for the Cumberland Plain Woodland within OS2. This Plan will include a suggested planting palette. A recommended planting palette is provided below (**Table 5** and **Table 6**).

Landcom will create a Section 88B instrument within Block C3 to protect:

- The Cumberland Plain Woodland identified for retention (**Figure 12**); and
- Indigenous archaeological values.

Table 5: Primary native flora species suggested for revegetation and landscaping on site.

Scientific Name	Common Name
Tree Stratum	
Acacia parramentensis	Parramatta Wattle
Eucalyptus moluccana	Grey Box
Eucalyptus tereticornis	Forest Red Gum
Ground stratum	
Austrodanthonia racemosa	Wallaby Grass
Bursaria spinosa	Native Blackthorn
Commelina cyanea	Native Wandering Jew
Dichondra repens	Kidney Weed
Glycine microphylla	
Glycine tabacina	Glycine
Microlaena stipoides	
Themeda australis	Kangaroo Grass
Wahlenbergia sp.	Bluebell

Additional species that could be considered for use are identified in **Table 6**. These species are considered native to this vegetation type. It should be recognised that the species in **Table 6** will not necessarily be easily accessible through traditional nursery pathways and investigation into their availability would be required.

Table 6: Secondary native flora species suggested for revegetation and landscaping on site.

Tree stratum	Ground stratum (continued)
Acacia implexa	*Dichondra repens*
Exocarpos cupressiformis	*Dichopogon fimbriatus*
Shrub stratum	*Dichopogon strictus*
Bossiaea prostrata	*Digitaria diffusa*
Bursaria spinosa	*Echinopogon caespitosus var. caespitosus*
Daviesia ulicifolia	*Einadia hastata*
Dillwynia sieberi	*Eragrostis leptostachya*
Dodonaea viscosa subsp. cuneata	*Eremophila debilis*
Indigofera australis	*Eriochloa pseudoacrotricha*
Phyllanthus virgatus	*Euchiton sphaericus*
Pultenaea microphylla	*Fimbristylis dichotoma*
Climbers	*Galium migrans*
Glycine clandestina	*Galium propinquum*
Glycine microphylla	*Geranium homeanum*
Glycine tabacina	*Geranium solanderi var. solanderi*
Hardenbergia violacea	*Glossogyne tannensis*
Ground stratum	*Goodenia hederacea subsp. hederacea*
Agrostis avenacea var. avenacea	*Hypericum gramineum*
Ajuga australis	*Hypoxis hygrometrica*
Aristida ramosa	*Hypoxis pratensis var. pratensis*
Aristida vagans	*Juncus usitatus*
Arthropodium milleflorum	*Lomandra filiformis subsp. filiformis*
Arthropodium minus	*Lomandra multiflora subsp. multiflora*
Asperula conferta	*Mentha diemenica*
Austrodanthonia racemosa var. racemosa	*Microlaena stipoides var. stipoides*
Austrodanthonia tenuior	*Opercularia diphylla*
Bothriochloa decipiens	*Oxalis perennans*
Bothriochloa macra	*Panicum effusum*
Brunoniella australis	*Paspalidium distans*
Centaurium spicatum	*Plantago debilis*
Centella asiatica	*Plantago gaudichaudii*
Cheilanthes sieberi subsp. sieberi	*Pratia purpurascens*
Chloris truncata	*Sporobolus creber*
Chloris ventricosa	*Sporobolus elongatus*
Chorizema parviflorum	*Stackhousia viminea*
Chrysocephalum apiculatum	*Themeda australis*
Commelina cyanea	*Tricoryne elatior*
Cymbonotus lawsonianus	*Vernonia cinerea var. cinerea*
Cymbopogon refractus	*Veronica plebeia*
Daucus glochidiatus	*Wahlenbergia gracilis*
Desmodium varians	*Wurmbea dioica subsp. Dioica*
Dianella longifolia	*Zornia dyctiocarpa var. dyctiocarpa*
Dichelachne parva	

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Appendix A: Threatened Species Likelihood of Occurrence in study area

An assessment of likelihood of occurrence was made for threatened and migratory species identified from the database search. Five terms for the likelihood of occurrence of species are used in this report. This assessment was based on database or other records, presence or absence of suitable habitat, features of the proposal site, results of the field survey and professional judgement. The terms for likelihood of occurrence are defined below:

- "known" = the species was or has been observed on the site
- "likely" = a medium to high probability that a species uses the site
- "potential" = suitable habitat for a species occurs on the site, but there is insufficient information to categorise the species as likely to occur, or unlikely to occur
- "unlikely" = a very low to low probability that a species uses the site
- "no" = habitat on site and in the vicinity is unsuitable for the species.

FLORA

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Acacia bynoeana	Bynoe's Wattle	E	V	The species is found in central eastern NSW, from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains. It has recently been found in the Colymea and Parma Creek areas west of Nowra (DECC 2007). It is found in heath and dry sclerophyll forest, typically on a sand or sandy clay substrate, often with ironstone gravels (DECC 2007). The species seems to prefer open and sometimes slightly disturbed sites (DECC 2007). Characteristic overstorey species include: *Corymbia gummifera*, *Eucalyptus haemastoma*, *E. gummifera, E. parramattensis*, *E. sclerophylla*, *Banksia serrata* and *Angophora bakeri*. Shrubs often associated with the species include *B. spinulosa*, *B. serrata, A. oxycedrus*, *A. myrtifolia* and *Kunzea* spp. (Winning 1992; James 1997). It flowers from September to March and fruits mature in November.	No

FLORA

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Allocasuarina glareicola		E	E	This species grows on tertiary alluvial gravels, with yellow clayey subsoil and lateritic soil. These soils are low in fertility and are strongly to very strongly acidic. Rainfall in the area is lower than surrounding regions. The median annual rainfall is 803 mm (measured at the University of Western Sydney), with a summer peak (Wilson & Johnson 1989; Matthes et al. 1996). It is found in the Castlereagh open woodland community, with *Eucalyptus parramattensis, E. fibrosa, E. sclerophylla, Angophora bakeri* and *Melaleuca decora.* Common associated understorey species include *Melaleuca nodosa, Hakea dactyloides, H.sericea, Dillwynia tenuifolia, Micromyrtus minutiflora, Acacia elongata, A. brownei, Themeda australis* and *Xanthorrhoea minor* (Matthes et al. 1996).	No

FLORA

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Apatophyllum constablei		-	E	Occurs in dry sclerophyll forest on slopes with a north to north-westerly aspect. It typically grows near cliffs (i.e. near the base or just above). The soils at sites are sandy and skeletal, mostly on Narrabeen sandstone. Found in association with Eucalyptus piperita, E. punctata, E. sparsifolia, Banksia serrata, Acacia linifolia, Cleistochloa rigida, Lomandra obliqua. Previously known from four sites, three of which are within Wollemi National Park near Gospers Mountain and Coorongooba Creek, the fourth of which is about 2 km from Glen Davis. A. constablei was surveyed in 2005 and the total numbers are estimated to be 5200-6000 mature individuals and about 500-600 seedlings/juveniles (S Clarke unpublished data, Scott and Keith 2006). There are estimated to be between nine and 13 populations of A. constablei, currently known over an area of approximately 230km².	No

FLORA

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Cryptostylis hunteriana	*Leafless Tongue Orchid*	V	V	It is known from a range of vegetation communities including swamp-heath and woodland (DECC 2007). The larger populations typically occur in woodland dominated by Scribbly Gum (*Eucalyptus sclerophylla*), Silvertop Ash (*E. sieberi*), Red Bloodwood (*Corymbia gummifera*) and Black Sheoak (*Allocasuarina littoralis*); where it appears to prefer open areas in the understorey of this community and is often found in association with the Large Tongue Orchid (*C. subulata*) and the Tartan Tongue Orchid (*C. erecta*) (DECC 2007). Bell (2001) has identified Coastal Plains Scribbly Gum Woodland and Coastal Plains Smoothed-barked Apple Woodland as potential habitat on the Central Coast. Flowers between November and February, although may not flower regularly (DECC 2007; Bell 2001).	No

FLORA

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Cynanchum elegans	White-flowered Wax Plant	E	E	Climber or twiner with a variable form (DECC 2007). It occurs in dry rainforest gullies, scrub and scree slopes (NPWS 1997). It prefers the ecotone between dry subtropical rainforest and sclerophyll woodland/forest. However has been found in littoral rainforest; *Leptospermum laevigatum – Banksia integrifolia* subsp *integrifolia* coastal scrub; *Eucalyptus tereticornis* aligned open forest/ woodland; *E. maculata* aligned open forest/woodland; and *Melaleuca armillaris* scrub to open scrub (DECC 2007). Flowers between August and May, peaking in November (DECC 2007). Seeds are unlikely to persist in the seedbank (DECC 2007).	No
Dillwynia tenuifolia		V	V	It has a core distribution within the Cumberland Plain, where it may be locally abundant within scrubby, dry heath areas within Castlereagh Ironbark Forest and Shale/Gravel Transition Forest on tertiary alluvium or laterised clays (DECC 2007). May also be common in the ecotone between these areas and Castlereagh Scribbly Gum Woodland (*ibid.*). Flowers sporadically from August to March.	No

FLORA

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Eucalyptus benthamii	Camden White Gum	V	V	Occurs in wet open forest on well drained sandy alluvial soils along stream channels, small terraces and alluvial flats on valley floors (DECC 2007).	No
Grevillea juniperina subsp. juniperina		V	-	Restricted to red sandy to clay soils – often lateritic on Wianamatta Shale and Tertiary alluvium in Cumberland Plain Woodland and Castlereagh Woodland (NSW Scientific Committee 2000).	Unlikely
Hibbertia puberula		E1	-	Has not been seen for over 40 years. Early records of this species are from the Hawkesbury River area and Frenchs Forest in northern Sydney, South Coogee in eastern Sydney, the Hacking River area in southern Sydney, and the Blue Mountains.	No
Leucopogon fletcheri var. *fletcheri*		E	-	Occurs in dry eucalypt woodland or in shrubland on clayey lateritic soils, generally on flat to gently sloping terrain along ridges and spurs. Restricted to north-western Sydney between St Albans in the north and Annangrove in the south, within the local government areas of Hawkesbury, Baulkham Hills and Blue Mountains.	No

FLORA

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Marsdenia viridiflora var. *viridiflora*	*Marsdenia viridiflora* R. Br. subsp. *viridiflora* population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	E2	-	Grows in vine thickets and open shale woodland. Recent records are from Prospect, Bankstown, Smithfield, Cabramatta Creek and St Marys. Previously known north from Razorback Range.	Unlikely
Melaleuca deanei	Deane's Paperbark	V	V	Found in heath on sandstone (DECC 2007), and also associated with woodland on broad ridge tops and slopes on sandy loam and lateritic soils (Benson and McDougall 1998).	No
Micromyrtus minutiflora	Small-flowered Micromyrtus	-	V	Grows in Castlereagh Scribbly Gum Woodland, Ironbark Forest, Shale/Gravel Transition Forest, open forest on tertiary alluvium and consolidated river sediments. Restricted to the general area between Richmond and Penrith, western Sydney.	No

FLORA

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Persoonia hirsuta	Hairy Geebung	E	E	This species occurs in dry sclerophyll eucalypt woodland/forest (Weston & Johnson 1991; Weston 1995), and in shrub-woodland (Harden 1991; Blombery & Maloney 1992). It grows in sandy to stony soils derived from sandstone (Weston & Johnson 1991; Weston 1995b) or very rarely on shale (Harden 1991), from near sea level to 600 m altitude (Weston & Johnson 1991; Weston 1995).	Unlikely
Persoonia nutans		E	E	Associated with dry woodland, Castlereagh Scribbly Gum Woodland, Agnes Banks Woodland and sandy soils associated with tertiary alluvium, occasionally poorly drained (Benson and McDougall 2000). Endemic to the Western Sydney (Benson and McDougall 2000).	Potential – record on site
Pimelea curviflora var curviflora		V	E	Associated with the Duffys Forest Community, shale lenses on ridges in Hawkesbury sandstone geology (Pittwater Council 2000).	No

FLORA

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Pimelea spicata		E	E	In western Sydney, it occurs on an undulating topography of well structured clay soils, derived from Wianamatta shale (DEC 2004). It is associated with Cumberland Plains Woodland (CPW), in open woodland and grassland often in moist depressions or near creek lines (*Ibid.*). Has been located in disturbed areas that would have previously supported CPW (*Ibid.*).	Unlikely
Pomaderris brunnea	Rufous Pomaderris	V	V	Associated with open forests (Harden, 1990) in association with *Eucalyptus amplifolia, Angophora floribunda, Acacia parramattensis, Bursaria spinosa* and *Kunzea ambigua* (Maryott-Brown & Wilks 1993). It is found on the Colo River, the Nepean R. floodplain at Menangle, in creeklines at Wirrumbirra Sanctuary (Bargo) and on the Hawkesbury R. (Harden 1990; Peacock 1996; Fairley & Moore 2000). The distribution may extend into the southern section of Yengo NP along major creeklines and floodplains (Maryott-Brown & Wilks 1993).	Unlikely

FLORA

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Pterostylis saxicola		E	E	Terrestrial orchid predominantly found in Hawkesbury Sandstone Gully Forest growing in small pockets of soil that have formed in depressions in sandstone rock shelves (NPWS 1997). Known from Georges River National Park, Ingleburn, Holsworthy, Peter Meadows Creek, St Marys Tower (NSW Scientific Committee 1999).	No
Pultenaea glabra	Smooth Bush-Pea	V	V	Grows in swamp margins, hillslopes, gullies and creekbanks and occurs within dry sclerophyll forest and tall damp heath on sandstone (DECC 2007). Flowers September to November, fruit matures October to December (*ibid.*).	No

FLORA

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Pultenaea parviflora		E	V	May be locally abundant, particularly within scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays (DECC 2007). May also be common in ecotone between these communities and Castlereagh Scribbly Gum Woodland (*ibid.*). *Eucalyptus fibrosa* is usually the dominant canopy species (*ibid.*). *E. globoidea, E. longifolia, E. parramattensis, E. sclerophylla and E. sideroxylon* may also be present or co-dominant, with *Melaleuca decora* frequently forming a secondary canopy layer (*ibid.*). Associated species may include *Allocasuarina littoralis, Angophora bakeri, Aristida spp. Banksia spinulosa, Cryptandra spp., Daviesia ulicifolia, Entolasia stricta, Hakea sericea, Lissanthe strigosa, M. nodosa, Ozothamnus diosmifolius* and *Themeda australis* (*ibid.*). Often found in association with other threatened species such as *Dillwynia tenuifolia, Dodonaea falcata, Grevillea juniperina, Micromyrtus minutiflora, Persoonia nutans* and *Styphelia laeta* (*ibid.*). Flowering may occur between August and November (*ibid.*).	Unlikely

FLORA

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Pultenaea villifera	Pultenaea villifera Sieber ex DC. population in the Blue Mountains local government area	E2	-	The population in the Blue Mountains LGA is currently known from a few small sites in the Springwood-Woodford Area. Associated with sheltered open forests on sandy soils (Fairly and Moore 2000).	No
Rhizanthella slateri	Eastern Australian Underground Orchid	V	V	An Underground Orchid with a whitish, fleshy underground stem to 15 cm long and 15 mm diameter (DECC 2005). Occurs from south-east Queensland to south-east NSW. In NSW, currently known from fewer than 10 locations, including near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wiseman's Ferry area, Agnes Banks and near Nowra. Habitat requirements are poorly understood and no particular vegetation type has been associated with the species, although it is known to occur in sclerophyll forest. Highly cryptic given that it grows almost completely below the soil surface, with flowers being the only part of the plant that can occur above ground. Therefore usually located only when the soil is disturbed. Flowers October to November (DECC 2005).	No

FLORA

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Syzygium paniculatum	Magenta Lillypilly	V	V	This species occupies a narrow coastal area between Bulahdelah and Conjola State Forests in NSW. On the Central Coast, it occurs on Quaternary gravels, sands, silts and clays, in riparian gallery rainforests and remnant littoral rainforest communities (Payne 1997). In the Ourimbah Creek valley, *S. paniculatum* occurs within gallery rainforest with *Alphitonia excelsa, Acmena smithii, Cryptocarya glaucescens, Toona ciliata, Syzygium oleosum* with emergent *Eucalyptus saligna*. At Wyrrabalong NP, *S. paniculatum* occurs in littoral rainforest as a co-dominant *with Ficus fraseri, Syzygium oleosum, Acmena smithii, Cassine australe*, and *Endiandra sieberi*. Payne (1991) reports that the species appears absent from Terrigal formation shales, on which the gully rainforests occur. *S. paniculatum* is summer flowering (November-February), with the fruits maturing in May (DECC 2007).	Unlikely

FLORA

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Thelymitra sp. Kangaloon	Kangaloon Sun-orchid	-	CE	The Kangaloon Sun-orchid occurs in NSW and is known from three locations near Robertson in the Southern Highlands. This species occurs within the Southern Rivers Natural Resource Management Region.The species has an estimated extent of occurrence of 300 km². The Kangaloon Sun-orchid has an estimated area of occupancy of 10 km². The three localities are Butler's Swamp (0.125 km²), Stockyard Swamp (once known as Molly Morgan Swamp) (7 km²) and Wildes Meadow Swamp (3 km²), and are all located above what is known as the Kangaloon Aquifer	No

Disclaimer: Data extracted from the Atlas of NSW Wildlife and EPBC Act Protected Matters Report are only indicative and cannot be considered a comprehensive inventory.

FAUNA

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
FISH					
Macquarie australasica	Macquarie Perch	-	E	Habitat for the Macquarie perch is bottom or mid-water in slow-flowing rivers with deep holes, typically in the upper reaches of forested catchments with intact riparian vegetation. Macquarie perch also do well in some upper catchment lakes. In some parts of its range, the species is reduced to taking refuge in small pools which persist in midland–upland areas through the drier summer periods.	No

FAUNA

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Prototroctes maraena	Australian Grayling	-	V	Historically, this species occurred in coastal streams from the Grose River southwards through NSW, Vic. and Tas. On mainland Australia, this species has been recorded from rivers flowing east and south of the main dividing ranges. This species spends only part of its lifecycle in freshwater, mainly inhabiting clear, gravel-bottomed streams with alternating pools and riffles, and granite outcrops but has also been found in muddy-bottomed, heavily silted habitat. Grayling migrate between freshwater streams and the ocean and as such it is generally accepted to be a diadromous (migratory between fresh and salt waters) species.	No
FROGS					
Heleioporus australiacus	Giant Burrowing Frog	V	V	Forages in woodlands, wet heath, dry and wet sclerophyll forest (Ehmann 1997). Associated with semi-permanent to ephemeral sand or rock based streams (Ehmann 1997), where the soil is soft and sandy so that burrows can be constructed (Environment Australia 2000).	No

FAUNA

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Litoria aurea	Green and Golden Bell Frog	E	V	This species has been observed utilising a variety of natural and man-made waterbodies (Pyke & White 1996) such as coastal swamps, marshes, dune swales, lagoons, lakes, other estuary wetlands, riverine floodplain wetlands and billabongs, stormwater detention basins, farm dams, bunded areas, drains, ditches and any other structure capable of storing water (DECC 2007). Fast flowing streams are not utilised for breeding purposes by this species (Mahony 1999). Preferable habitat for this species includes attributes such as shallow, still or slow flowing, permanent and/or widely fluctuating water bodies that are unpolluted and without heavy shading (DECC 2007). Large permanent swamps and ponds exhibiting well-established fringing vegetation (especially bulrushes–Typha sp. and spikerushes–Eleocharis sp.) adjacent to open grassland areas for foraging are preferable (Ehmann 1997; Robinson 1993). Ponds that are typically inhabited tend to be free from predatory fish such as Mosquito Fish (Gambusia holbrooki) (DECC 2007).	No

FAUNA

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Litoria littlejohni	Littlejohn's Tree Frog, Heath Frog	V	V	Littlejohn's Tree Frog has a distribution that includes the plateaus and eastern slopes of the Great Dividing Range from Watagan State Forest (90 km north of Sydney) south to Buchan in Victoria (DECC 2007). It occurs along permanent rocky streams with thick fringing vegetation associated with eucalypt woodlands and heaths among sandstone outcrops. It appears to be restricted to sandstone woodland and heath communities at mid to high altitude (NSW Scientific Committee 2000). It forages both in the tree canopy and on the ground, and it has been observed sheltering under rocks on high exposed ridges during summer (NSW Scientific Committee 2000). It hunts either in shrubs or on the ground. Breeding is triggered by heavy rain and can occur from late winter to autumn, but is most likely to occur in spring when conditions are favourable. Males call from low vegetation close to slow flowing pools. Eggs and tadpoles are mostly found in slow flowing pools that receive extended exposure to sunlight, but will also use temporary isolated pools (DECC 2007).	No

FAUNA

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Mixophyes balbus	Stuttering Frog	E	V	A variety of forest habitats from rainforest through wet and moist sclerophyll forest to riparian habitat in dry sclerophyll forest (DECC 2007) that are generally characterised by deep leaf litter or thick cover from understorey vegetation (Ehmann 1997). Breeding habitats are streams and occasionally springs. Not known from streams disturbed by humans (Ehmann 1997) or still water environments (NSW Scientific Committee 2002).	No
Mixophyes iteratus	Giant Barred Frog	E	E	Found on forested slopes of the escarpment and adjacent ranges in riparian vegetation, subtropical and dry rainforest, wet sclerophyll forests and swamp sclerophyll forest (DECC 2007; Ehmann 1997). This species is associated with flowing streams with high water quality, though habitats may contain weed species (Ehmann 1997). This species is not known from riparian vegetation disturbed by humans (NSW Scientific Committee 1999). During breeding eggs are kicked up onto an overhanging bank or the streams edge (DECC 2007).	No

FAUNA

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Pseudophryne australis	Red-crowned Toadlet	V	-	Red-crowned Toadlets are found in steep escarpment areas and plateaus, as well as low undulating ranges with benched outcroppings on Triassic sandstones of the Sydney Basin (DECC 2007). Within these geological formations, this species mainly occupies the upper parts of ridges, usually being restricted to within about 100 metres of the ridgetop. However they may also occur on plateaus or more level rock platforms along the ridgetop (DECC 2007). Associated with open forest to coastal heath (Ehmann 1997). Utilises small ephemeral drainage lines which feed water from the top of the ridge to the perennial creeks below for breeding, and are not usually found in the vicinity of permanent water (Ehmann 1997). Breeding sites are often characterised by clay-derived soils and generally found below the first sandstone escarpment in the talus slope (NPWS 1997).	No

FAUNA

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
REPTILES					
Hoplocephalus bungaroides	Broad-headed Snake	E	V	Typical sites consist of exposed sandstone outcrops and benching where the vegetation is predominantly woodland, open woodland and/or heath on Triassic sandstone of the Sydney Basin (DECC 2007). They utilise rock crevices and exfoliating sheets of weathered sandstone during the cooler months and tree hollows during summer (Webb & Shine 1998b). Some of the canopy tree species found to regularly co-occur at known sites include *Corymbia eximia, C. gummifera, Eucalyptus sieberi, E. punctata* and *E.piperita* (DECC 2007).	No
DIURNAL BIRDS					
Botaurus poiciloptilus	Australasian Bittern	V	-	Terrestrial wetlands with tall dense vegetation, occasionally estuarine habitats (Marchant & Higgins 1993). Reedbeds, swamps, streams, estuaries (Simpson & Day 1999).	No

FAUNA

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Burhinus grallarius	Bush Stone-curlew	E	-	Associated with dry open woodland with grassy areas, dune scrubs, in savanna areas, the fringes of mangroves, golf courses and open forest / farmland (Pittwater Council 2000; Marchant & Higgins 1993). Forages in areas with fallen timber, leaf litter, little undergrowth and where the grass is short and patchy (Environment Australia 2000; Marchant & Higgins 1993). Is thought to require large tracts of habitat to support breeding, in which there is a preference for relatively undisturbed in lightly disturbed.	Unlikely
Callocephalon fimbriatum	Gang-gang Cockatoo	V-E2	-	During summer in dense, tall, wet forests of mountains and gullies, alpine woodlands (Morcombe 2004). In winter they occur at lower altitudes in drier more open forests and woodlands, particularly box-ironbark assemblages (Shields & Chrome 1992). They sometimes inhabit woodland, farms and suburbs in autumn/winter (Simpson & Day 2004).	Unlikely

FAUNA

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	-	Associated with a variety of forest types containing Allocasuarina species, usually reflecting the poor nutrient status of underlying soils (Environment Australia 2000; NPWS 1997; DECC 2007). Intact drier forest types with less rugged landscapes are preferred (DECC 2007). Nests in large trees with large hollows (Environment Australia 2000).	Unlikely
Ephippiorhynchus asiaticus	Black-necked Stork	E	-	Associated with tropical and warm temperate terrestrial wetlands, estuarine and littoral habitats, and occasionally woodlands and grasslands floodplains (Marchant & Higgins 1993). Forages in fresh or saline waters up to 0.5m deep, mainly in open fresh waters, extensive sheets of shallow water over grasslands or sedgeland, mangroves, mudflats, shallow swamps with short emergent vegetation and permanent billabongs and pools on floodplains (Marchant & Higgins 1993; DECC 2007).	No

FAUNA

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Glossopsitta pusilla	Little Lorikeet	V	-	In New South Wales Little Lorikeets are distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri. Little Lorikeets mostly occur in dry, open eucalypt forests and woodlands. They have been recorded from both old-growth and logged forests in the eastern part of their range, and in remnant woodland patches and roadside vegetation on the western slopes. They feed primarily on nectar and pollen in the tree canopy, particularly on profusely-flowering eucalypts, but also on a variety of other species including melaleucas and mistletoes. On the western slopes and tablelands White Box Eucalyptus albens and Yellow Box E. melliodora are particularly important food sources for pollen and nectar respectively.	Unlikely
Grantiella picta	Painted Honeyeater	V	-	A nomadic species that typically inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests with abundant mistletoe (DECC 2007). It is a specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias, preferring Amyema sp mistletoe (DECC 2007).	Unlikely

FAUNA

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Lathamus discolor	Swift Parrot	E	E	Breeds in Tasmania between September and January. Migrates to mainland in autumn, where it forages on profuse flowering Eucalypts (Blakers et al. 1984; Schodde and Tidemann 1986; Forshaw and Cooper 1981). Hence, in this region, autumn and winter flowering eucalypts are important for this species. Favoured feed trees include winter flowering species such as Swamp Mahogany (Eucalyptus robusta), Spotted Gum (Corymbia maculata), Red Bloodwood (C. gummifera), Mugga Ironbark (E. sideroxylon), and White Box (E. albens) (DECC 2007).	Unlikely
Lophoictinia isura	Square-tailed Kite	V	-	In coastal areas associated tropical and temperate forests and woodlands on fertile soils with an abundance of passerine birds (Marchant & Higgins 1993, DECC 2007). May be recorded inland along timbered watercourses (DECC 2007). In NSW it is commonly associated with ridge or gully forests dominated by Woollybutt (*Eucalyptus logifloria*), Spotted Gum (*E. maculata*), or Peppermint Gum (*E. elata, E. smithii*) (DECC 2007).	Unlikely

FAUNA

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	V	-	Predominantly associated with box-ironbark association woodlands and River Red Gum (NSW Scientific Committee, 2001). Also associated with drier coastal woodlands of the Cumberland Plain and the Hunter, Richmond and Clarence Valleys (NSW Scientific Committee, 2001).	No
Neophema pulchella	Turquoise Parrot	V	-	Steep rocky ridges and gullies, rolling hills, valleys and river flats and the plains of the Great Dividing Range compromise the topography inhabited by this species (Marchant & Higgins 1993). Spends much of the time on the ground foraging on seed and grasses (DECC 2007). It is associated with coastal scrubland, open forest and timbered grassland, especially low shrub ecotones between dry hardwood forests and grasslands with high proportion of native grasses and forbs (Environment Australia 2000).	Unlikely

FAUNA

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Petroica rodinogaster	Pink Robin	V	-	The Pink Robin is found in Tasmania and the uplands of eastern Victoria and far south-eastern NSW, almost as far north as Bombala. On the mainland, the species disperses north and west and into more open habitats in winter, regularly as far north as the ACT area, and sometimes being found as far north as the central coast of NSW. Inhabits rainforest and tall, open eucalypt forest, particularly in densely vegetated gullies. Breeds between October and January and can produce two clutches in a season.	No
Rostratula australis (a.k.a. R. Benghalensis)	Painted Snipe (Australian subspecies)	E	E, M	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber (DECC 2007). Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds (*ibid.*). Breeding is often in response to local conditions; generally occurs from September to December (DECC 2007). Roosts during the day in dense vegetation (NSW Scientific Committee 2004). Forages nocturnally on mud-flats and in shallow water (DECC 2007). Feeds on worms, molluscs, insects and some plant-matter (*ibid.*).	No

FAUNA

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Stagonopleura guttata	Diamond Firetail	V	-	Typically found in grassy eucalypt woodlands, but also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities (DECC 2007). It is often found in riparian areas and sometimes in lightly wooded farmland (DECC 2007). Appears to be sedentary, though some populations move locally, especially those in the south (DECC 2007).	Potential
Stictonetta naevosa	Freckled Duck	V	-	Associated with a variety of plankton-rich wetlands, such as heavily vegetated, large open lakes and their shores, creeks, farm dams, sewerage ponds and floodwaters (DECC 2007).	No
Xanthomyza phrygia *AKA Anthochaera*	Regent Honeyeater	E	E, M	SEE: *Xanthomyza australis*	SEE: *Xanthomyza australis*

FAUNA

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
NOCTURNAL BIRDS					
Ninox connivens	Barking Owl	V	-	Associated with a variety of habitats such as savanna woodland, open eucalypt forests, wetland and riverine forest. The habitat is typically dominated by Eucalypts (often Redgum species), however often dominated by Melaleuca species in the tropics (DECC 2007). It usually roosts in dense foliage in large trees such as River She-oak (Allocasuarina cunninghamiana), other Casuarina and Allocasuarina, eucalypts, Angophora, Acacia and rainforest species from streamside gallery forests (NPWS 2003). It usually nests near watercourses or wetlands (NPWS 2003) in large tree hollows with entrances averaging 2-29 metres above ground, depending on the forest or woodland structure and the canopy height (Debus 1997).	Unlikely
Ninox strenua	Powerful Owl	V	-	Powerful Owls are associated with a wide range of wet and dry forest types with a high density of prey, such as arboreal mammals, large birds and flying foxes (Environment Australia 2000, Debus & Chafer 1994). Large trees with hollows at least 0.5m deep are required for shelter and breeding (Environment Australia 2000).	Unlikely

FAUNA

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Tyto novaehollandiae	Masked Owl	V	-	Associated with forest with sparse, open, understorey, typically dry sclerophyll forest and woodland (DECC 2007) and especially the ecotone between wet and dry forest, and non forest habitat (Environment Australia 2000). Known to utilise forest margins and isolated stands of trees within agricultural land (Hyem 1979) and heavily disturbed forest where its prey of small and medium sized mammals can be readily obtained (Kavanagh & Peake 1993).	Unlikely
Tyto tenebricosa	Sooty Owl	V	-	Sooty Owls are associated with tall wet old growth forest on fertile soil with a dense understorey and emergent tall Eucalyptus species (Environment Australia 2000, Debus 1994). Pairs roost in the daytime amongst dense vegetation, in tree hollows and sometimes in caves. The Sooty Owl is typically associated with an abundant and diverse supply of prey items and a selection of large tree hollows (Debus 1994, Garnett 1993, Hyem 1979).	Unlikely

FAUNA

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
MAMMALS (EXCLUDING BATS)					
Cercartetus nanus	Eastern Pygmy-possum	V	-	Found in wet and dry eucalypt forest, subalpine woodland, coastal banksia woodland and wet heath (Menkhorst & Knight 2004). Pygmy-Possums feed mostly on the pollen and nectar from banksias, eucalypts and understorey plants and will also eat insects, seeds and fruit (Turner & Ward 1995). The presence of Banksia sp. and Leptospermum sp. are an important habitat feature (DECC 2007). Small tree hollows are favoured as day nesting sites, but nests have also been found under bark, in old birds nests and in the branch forks of tea-trees (Turner & Ward 1995).	No

FAUNA

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Dasyurus maculatus *Dasyurus maculatus maculatus*	Spotted-tailed Quoll Spotted-tailed Quoll (SE Mainland Population)	V -	- E	The Spotted-tailed Quoll inhabits a range of forest communities including wet and dry sclerophyll forests, coastal heathlands and rainforests (Mansergh 1984; DECC 2007j), more frequently recorded near the ecotones of closed and open forest. This species requires habitat features such as maternal den sites, an abundance of food (birds and small mammals) and large areas of relatively intact vegetation to forage in (DECC 2007). Maternal den sites are logs with cryptic entrances; rock outcrops; windrows; burrows (Environment Australia 2000).	No
Petaurus australis	Yellow-bellied Glider	V	-	This species is restricted to tall mature forests, preferring productive tall open sclerophyll forests with a mosaic of tree species including some that flower in winter (Environment Australia 2000, Braithwaite 1984, Davey 1984, Kavanagh 1984; DECC 2007). Large hollows within mature trees are required for shelter, nesting and breeding (Henry and Craig 1984; DECC 2007).	No

FAUNA

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Petaurus norfolcensis	Squirrel Glider	V	-	Associated with dry hardwood forest and woodlands (Menkhorst et al. 1988; Quin 1995). Habitats typically include gum barked and high nectar producing species, including winter flower species (Menkhorst et al. 1988). The presence of hollow bearing eucalypts is a critical habitat value (Quin 1995).	No
Petrogale penicillata	Brush-tailed Rock-wallaby	E	V	Rocky areas in a variety of habitats, typically north facing sites with numerous ledges, caves and crevices (Strahan 1995).	No
Phascolarctos cinereus	Koala	V-E2	-	Associated with both wet and dry Eucalypt forest and woodland that contains a canopy cover of approximately 10 to 70% (Reed et al. 1990), with acceptable Eucalypt food trees. Some preferred Eucalyptus species are: Eucalyptus tereticornis, E. punctata, E. cypellocarpa, E. viminalis	No
Potorous tridactylus *Potorous tridactylus tridactylus*	Long-nosed Potoroo Long-nosed Potoroo (SE Mainland Population)	V -	- V	Associated with dry coastal heath and dry and wet sclerophyll forests (Strahan 1998) with dense cover for shelter and adjacent more open areas for foraging (Menkhorst & Knight 2004).	No

MAMMALS (BATS)

FAUNA

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	The Large-eared Pied Bat has been recorded in a variety of habitats, including dry sclerophyll forests, woodland, sub-alpine woodland, edges of rainforests and wet sclerophyll forests (Churchill 1998; DECC 2007). This species roosts in caves, rock overhangs and disused mine shafts and as such is usually associated with rock outcrops and cliff faces (Churchill 1998; DECC 2007).	Unlikely
Miniopterus orianae (sensu lat. *M. schreibersii oceanensis*)	Common, Eastern or Large Bent-wing Bat	V	-	Associated with a range of habitats such as rainforest, wet and dry sclerophyll forest, monsoon forest, open woodland, paperbark forests and open grassland (Churchill 1998). It forages above and below the tree canopy on small insects (AMBS 1995, Dwyer 1995, Dwyer 1981). Will utilise caves, old mines, and stormwater channels, under bridges and occasionally buildings for shelter (Environment Australia 2000, Dwyer 1995).	Yes

FAUNA

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Mormopterus norfolkensis	East Coast Freetail Bat	V	-	Most records of this species are from dry eucalypt forest and woodland east of the Great Dividing Range (Churchill 1998). Individuals have, however, been recorded flying low over a rocky river in rainforest and wet sclerophyll forest and foraging in clearings at forest edges (Environment Australia 2000; Allison & Hoye 1998). Primarily roosts in hollows or behind loose bark in mature eucalypts, but have been observed roosting in the roof of a hut (Environment Australia 2000; Allison & Hoye 1998).	Unlikely
Myotis macropus	Southern Myotis	V	-	Commonly cave dwellers but also known to roost in tree hollows, amongst vegetation, in clumps of Pandanus, under bridges, in mines, tunnels and stormwater drains. They usually select roosts close to water, often choosing caves that overhang pools even when caves are rather open (Churchill, 1998).	No
Pteropus poliocephalus	Grey-headed Flying-Fox	V	V	Inhabits a wide range of habitats including rainforest, mangroves, paperbark forests, wet and dry sclerophyll forests and cultivated areas (Churchill 1998, Eby 1998). Camps are often located in gullies, typically close to water, in vegetation with a dense canopy (Churchill 1998).	Unlikely

FAUNA

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	Associated with moist gullies in mature coastal forest, or rainforest, east of the Great Dividing Range (Churchill, 1998), tending to be more frequently located in more productive forests (Hoye & Richards 1998). Within denser vegetation types use is made of natural and man made openings such as roads, creeks and small rivers, where it hawks backwards and forwards for prey (Hoye & Richards 1998).	No
INVERTEBRATES					
Meridolum corneovirens	Cumberland (Large) Land Snail	E	-	Associated with open eucalypt forests, particularly Cumberland Plain Woodland described in Benson (1992). Found under fallen logs, debris and in bark and leaf litter around the trunk of gum trees or burrowing in loose soil around clumps of grass (NPWS 1997; Rudman 1998). Urban waste may also form suitable habitat (NSW NPWS 1997; Rudman 1998).	Potential
Petalura gigantean	Giant Dragonfly	E	-	Swamps, streamlines and seepages in mainly natural condition with short to moderate vegetation and a relatively deep soil base (Trueman 2005). Larvae permanently burrow into soil and so do not survive in permanent ponds or other open water (Trueman 2005).	No

FAUNA

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
MIGRATORY TERRESTRIAL SPECIES LISTED UNDER EPBC ACT					
Haliaeetus leucogaster	White-bellied Sea-Eagle	-	M	Forages over large open fresh or saline waterbodies, coastal seas and open terrestrial areas (Marchant & Higgins 1993, Simpson & Day 1999). Breeding habitat consists of tall trees, mangroves, cliffs, rocky outcrops, silts, caves and crevices and is located along the coast or major rivers. Breeding habitat is usually in or close to water, but may occur up to a kilometre away (Marchant & Higgins 1993).	No
Hirundapus caudacutus	White-throated Needletail	-	M	Forages aerially over a variety of habitats usually over coastal and mountain areas, most likely with a preference for wooded areas (Marchant & Higgins 1993; Simpson & Day 1999). Has been observed roosting in dense foliage of canopy trees, and may seek refuge in tree hollows in inclement weather (Marchant & Higgins 1993).	Unlikely

FAUNA

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Merops ornatus	Rainbow Bee-eater	-	M	Resident in coastal and subcoastal northern Australia; regular breeding migrant in southern Australia, arriving September to October, departing February to March, some occasionally present April to May (Pizzey and Doyle 1988). Occurs in open country, chiefly at suitable breeding places in areas of sandy or loamy soil: sand-ridges, riverbanks, road-cuttings, sand-pits, occasionally coastal cliffs (*ibid*). Nest is a chamber a the end of a burrow, up to 1.6 m long, tunnelled in flat or sloping ground, sandy back or cutting (*ibid*).	Potential
Monarcha melanopsis	Black-faced Monarch	-	M	Rainforest and eucalypt forests, feeding in tangled understorey (Blakers et al. 1984).	No
Myiagra cyanoleuca	Satin Flycatcher	-	M	Wetter, denser forest, often at high elevations (Simpson & Day 2004).	No
Rhipidura rufifrons	Rufous Fantail	-	M	The Rufous Fantail is a summer breeding migrant to southeastern Australia (Morcombe, 2004). The Rufous Fantail is found in rainforest, dense wet eucalypt and monsoon forests, paperbark and mangrove swamps and riverside vegetation (Morcombe, 2004). Open country may be used by the Rufous Fantail during migration (Morcombe, 2004).	No

FAUNA

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Xanthomyza phrygia	Regent Honeyeater	E	E, M	SEE DIURNAL BIRDS ABOVE	SEE DIURNAL BIRDS ABOVE
MIGRATORY WETLAND SPECIES LISTED UNDER EPBC ACT					
Ardea alba	Great Egret	-	M	The Great Egret is common and widespread in Australia (McKilligan, 2005). It forages in a wide range of wet and dry habitats including permanent and ephemeral freshwaters, wet pasture and estuarine mangroves and mudflats (McKilligan, 2005).	No
Ardea ibis	Cattle Egret	-	M	Cattle Egrets forage on pasture, marsh, grassy road verges, rain puddles and croplands, but not usually in the open water of streams or lakes and they avoid marine environments (McKilligan, 2005). Some individuals stay close to the natal heronry from one nesting season to the next, but the majority leave the district in autumn and return the next spring. Cattle Egrets are likely to spend the winter dispersed along the coastal plain and only a small number have been recovered west of the Great Dividing Range (McKilligan, 2005).	No

FAUNA

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Gallinago hardwickii	Latham's Snipe	-	M	A variety of permanent and ephemeral wetlands, preferring open fresh water wetlands with nearby cover (Marchant and Higgins 1999). Occupies a variety of vegetation around wetlands (Marchant and Higgins 1999) including wetland grasses and open wooded swamps (Simpson and Day 1999).	No
Rostratula benghalensis s. lat.	Painted Snipe	-	M	SEE: DIURNAL BIRDS ABOVE	No

Disclaimer: Data extracted from the Atlas of NSW Wildlife and DEW Protected Matters Report are only indicative and cannot be considered a comprehensive inventory. 'Migratory marine species' and 'listed marine species' listed on the EPBC Act (and listed on the DEW protected matters report) have not been included in this table, since they are considered unlikely to occur within the study area due to the absence of marine habitat.

E = Endangered; E2 = Endangered Population; V = Vulnerable; M = Migratory.

Appendix B: Flora inventory

Scientific Name	Common Name	Native, Exotic, Introduced	Noxious Weed class	Form	Cumberland Plain Woodland (Q1)	Cumberland Plain Woodland (Q2)	Other Woody Vegetation
*Acacia baileyiana**	Cootamundra Wattle	I		Shrub			x
Acacia parramentensis	Parramatta Wattle			Shrub			x
*Aloe maculata**	Aloe Vera	E		Herb			x
Andropogon virginicus	Whiskey Grass			Grass			x
*Araujia sericifera**	Moth Vine	E		Vine	3	2	x
Aristida ramosa	Purple Wiregrass			Grass	2		
Aristida vagans	Threeawn Speargrass			Grass	2		
*Asparagus aethiopicus**	Asparagus Fern	E		Shrub		1	
*Asparagus asparagoides**	Bridal Creeper	E	5	Shrub			x
Asperula conferta	Common Woodruff			Herb			x
Austrodanthonia spp.				Grass	3		
*Bidens pilosa**	Cobbler's Pegs	E		Shrub		2	x
Bothriochloa macra	Red-leg Grass			Grass			x
*Brachychiton acerifolius**	Illawarra flame tree	I		Tree			x
*Brachychiton populneus**	Kurrajong	I		Tree			x
Bursaria spinosa	Native Blackthorn			Shrub	1		
Cassinia aculeata	Dolly bush			Shrub			x
Casuarina glauca	Swamp Oak			Tree			x
*Celtis sinensis**	Hackberry	E		Tree			x
Centella asiatica	Indian Pennywort			Herb			x
Cheilanthes sieberi subsp. sieberi				Herb			x
*Chloris gayana**	Rhodes Grass	E		Grass	5		x

Scientific Name	Common Name	Native, Exotic, Introduced	Noxious Weed class	Form	Cumberland Plain Woodland (Q1)	Cumberland Plain Woodland (Q2)	Other Woody Vegetation
*Cinnamomum camphora**	Camphor Laurel	E		Tree			x
*Cirsium vulgare**	Spear Thistle	E		Herb			x
*Citrus hystrix**	Kaffir Lime	E		Tree			x
*Citrus sp.**		E		Tree			x
Commelina cyanea	Native Wandering Jew			Herb		2	
*Conyza bonariensis**	Flaxleaf Fleabane	E		Herb			x
*Cortaderia selloana**	Pampas Grass	E		Grass			x
Corymbia maculata	Spotted Gum			Tree		4b	x
*Cotoneaster glaucophyllus**	Cotoneaster	E		Tree		1	
*Cupressus sp.**	Cypress	E		Tree			x
Cynodon dactylon	Common Couch			Grass			x
Dendropthoe vitellina	A Misteltoe			Mistletoe			x
Dichondra repens	Kidney Weed			Herb	2	2	
*Ehrharta erecta**	Panic Veldtgrass	E		Grass		3	
*Eragrostis curvula**	African Lovegrass	E		Grass		5	x
*Eucalyptus bicosta**	Southern Blue Gum	I		Tree			x
*Eucalyptus camaldulensis**	River Red Gum	I		Tree			x
Eucalyptus eugenioides	Thin-leaved Stringybark			Tree			x
Eucalyptus globoidea	White Stringbark			Tree			x
*Eucalyptus grandis**	Flooded Gum	I		Tree			x
*Eucalyptus microcorys**	Tallowwood	I		Tree			x
Eucalyptus moluccana	Grey Box			Tree	4b	4b	x
*Eucalyptus pulverulenta**	Silver-leaved Mountain Gum	I		Tree			x
*Eucalyptus smithii**	Gully Gum	I		Tree			x

Scientific Name	Common Name	Native, Exotic, Introduced	Noxious Weed class	Form	Cumberland Plain Woodland (Q1)	Cumberland Plain Woodland (Q2)	Other Woody Vegetation
Eucalyptus tereticornis	Forest Red Gum			Tree		1	x
Euphorbia sp.				Herb			x
*Foeniculum vulgare**	Fennel	E		Herb			x
*Galium aparine**		E		Herb			x
Glycine microphylla				Vine	1	3	
Glycine tabacina	Glycine			Vine		3	x
*Gomphrena celosioides**	Gomphrena Weed	E		Herb			x
*Grevillea robusta**	Silky Oak	I		Tree			x
*Hypochaeris radicata**	Catsear	E		Herb			x
*Ipomea indica**	Blue Morning Glory	E		Vine			x
Isolepis sp.				Sedge			x
Juncus usitatus				Sedge			x
*Lantana camara**	Lantana	E	5	Tree			x
*Ligustrum lucidum**	Large-leaved Privet	E	4	Tree		2	x
*Ligustrum sinense**	Small-leaved Privet	E	4	Tree		2	x
*Lophostemon confertus**	Brush Box	I		Tree			x
*Lycium ferocissimum**	African Boxthorn	E	4	Tree			x
Melia azedarach	White Cedar			Tree	1	2	x
Microlaena stipoides				Grass		3	x
*Nerium oleander**	Oleander	E		Tree			x
*Ochna serrulata**	Mickey Mouse Plant	E		Shrub	1		
*Olea europaea ssp. cuspida**	African Olive	E		Tree	2	3	x
Omalanthus populifolius	Bleeding-heart tree			Tree			x
Oxalis spp.				Herb		2	x

Scientific Name	Common Name	Native, Exotic, Introduced	Noxious Weed class	Form	Cumberland Plain Woodland (Q1)	Cumberland Plain Woodland (Q2)	Other Woody Vegetation
*Paspalum dilatatum**	Paspalum	E		Grass			x
*Paspalum urvillei**	Vasey Grass	E		Grass			x
*Pennisetum clandestinum**	Kikuyu Grass	E		Grass	4b		x
Persicaria hydropiper				Herb			x
*Phoenix sp.**	Date Palm	E		Tree	1		x
*Pinus spp.**	Pine Tree	E		Tree			x
*Plantago lanceolata**	Lamb's Tongues	E		Herb		2	x
Rumex spp.				Herb			x
*Schinus terebinthifolius**	Brazilian Pepper Tree	E		Shrub			x
*Senecio madagascariensis**	Fireweed	E		Herb			x
*Setaria gracilis**	Slender Pigeon Grass	E		Grass			x
*Sida rhombifolia**	Paddy's Lucerne	E		Shrub	3	3	x
*Solanum nigrum**	Black-berry Nightshade	E		Herb		1	
*Sorghum halepense**	Johnson Grass	E		Grass			x
Sporobolus sp.				Grass	1		
*Tecoma capensis**	Cape Honeysuckle	E		Shrub			x
Themeda australis	Kangaroo Grass			Grass	3		x
*Trifolium pratense**		E		Herb			x
*Trifolium sp. **		E		Herb			x
Typha orientalis	Broad-leaved Cumbungi			Sedge			x
Unknown Herb 1 (Pea)				Herb			x
Unknown Herb 2				Herb			x
*Verbena bonariensis**	Purpletop	E		Herb			x
Viola hederacea	Ivy-leaved Violet			Herb			x

Scientific Name	Common Name	Native, Exotic, Introduced	Noxious Weed class	Form	Cumberland Plain Woodland (Q1)	Cumberland Plain Woodland (Q2)	Other Woody Vegetation
Wahlenbergia communis	Waxy Bluebell			Herb			x
Wahlenbergia sp.	Bluebell			Herb	1		
Zornia dictiocarpa				Herb			X

Cover abundance scores: 1 = <5% rare; 2 = <5% (uncommon); 3 = <5% common; 4a = <5% abundance; 4b = 5-25%; 5 = 25-50%; 6 = 50-75%; 7 = 75-100;

* Denotes exotic or non-endemic flora species).

Appendix C: Fauna inventory

Kingdom	Scientific Name	Common Name	Incidental	Acacia Grove Survey	CPW Survey
Amphibia	*Crinia signifera*	Eastern Common Froglet	H		
Aves	*Acridotheres tristis**	Indian Myna	O		
	Anthochaera carunculata	Red Wattlebird	O		
	Cacatua galerita	Sulpher Crested Cockatoo	H		
	*Columba livia**	Common Rock Dove	O		
	Coracina novaehollandiae	Black-faced Cuckoo Shrike	O		
	Corvus coronoides	Australian Raven	O		O
	Cracticus tibicen	Australian Magpie	H	O	O
	Dacelo novaeguineae	Laughing Kookaburra	H		
	Falco cenchroides	Nankeen Kestrel	O	O	
	Grallina cyanoleuca	Magpie Lark	O	O	H
	Hirundo neoxena	Welcome Swallow	O	O	O
	Lichenostomus penicillatus	White-plumed Honeyeater		O	
	Malurus cyaneus	Superb Fairy Wren	O	O	
	Manorina melanocephala	Noisy Miner	O	O	O
	*Ocyphaps lophotes**	Crested Pigeon			O
	Pycnonotus jocosus	Red-whiskered Bulbul	O	O	
	Rhipidura leucophrys	Willy Wagtail	O	O	
	Strepera graculina	Pied Currawong	O	O	
	*Streptopelia chinensis**	Spotted Turtledove			O
	Sturnus vulgaris	European Starling		O	
	Trichoglossus haematodus	Rainbow Lorikeet	O	O	O
Mammalia	*Oryctolagus cuniculus**	European Rabbit	O		
	*Vulpes vulpes**	European Red Fox	Scat		
Reptilia	*Pseudechis porphyriacus*	Red-bellied Black Snake	Anecdotal		
		Totals	21	12	8

O=Observed; H=Heard; Anecdotal = observed on site 2nd June by person other than Lucas McKinnon and Andrew Whitford;
*Denotes introduced fauna species.

Appendix D: Abbreviations

Term	Meaning
ADF	Australian Defence Force
CPW	Cumberland Plain Woodland and Derived Native Grasslands
CEEC	Critically Endangered Ecological Community
DECC	NSW Department of Environment & Climate Change (now DECCW)
DECCW	NSW Department of Environment, Climate Change and Water (formerly DECC)
DEWHA	Commonwealth Department of Environment, Water, Heritage and the Arts
DGEARs	Director Generals Environmental Assessment Requirements
DNG	Derived Native Grassland
EEC	Critically Endangered Ecological Community, listed under the TSC Act and/or EPBC Act
ELA	Eco Logical Australia
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
Ecologically Sustainable Development	Ecologically sustainable development requires the effective integration of economic and environmental considerations in decision-making. It can be achieved by implementing the following principles and programs: ▪ the precautionary principle ▪ inter-generational equity ▪ conservation of biological diversity and ecological integrity ▪ improved valuation, pricing and incentive mechanisms.
Local Area	Within 10km of the Project Site, as depicted in Figure 2.
NES	Matters of National Environmental Significance under the EPBC Act
NPWS	NSW National Parks and Wildlife Service (now part of the DECCW)
Project Site	North Penrith Defence Lands, as depicted in Figure 2.
SHW	Shale Plains Woodland
Study Area	North Penrith Defence Lands, as depicted in Figure 2.
TEC	Threatened Ecological Community, i.e. an ecological community listed under the TSC Act and/or EPBC Act, as Critically Endangered, Endangered, or Vulnerable.
TOD	Transit Orientated Development
TSC Act	NSW *Threatened Species Conservation Act 1995*

Appendix E: Assessments of Significance

The following assessments of significance have been made to determine if the proposed development will significantly impact on threatened species, populations or ecological communities, ion accordance with NSW 'Draft Guidelines for the Threatened Species Assessment' (DEC and DPI 2005), for developments under Part 3A, *Environmental Planning and Assessment Act 1979*, and the Commonwealth 'Significant impact guidelines 1.1' (DEWHA 2008), under the *Environment Protection and Biodiversity Conservation Act 1999*.

State Significance Criteria (DEC and DPI 2005)

Cumberland Plain Woodland

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

N/A

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

a) disturbs any permanent, semi-permanent or ephemeral water bodies;

N/A

b) degrades soil quality;

N/A

c) clears or modifies native vegetation;

The proposed action will clear and modify native vegetation that forms part of the Cumberland Plain Woodland (CPW) ecological community. The proposal will likely result underscrubbing of all non-eucalypt species in the remnants and the derived native grassland, though it should be noted that the proportion of native vegetation in these areas is quite low compared to exotics.

d) introduces weeds, vermin or feral species or provides conditions for them to increase and/or spread;

The area of CPW is already heavily infested with weeds as outlined in this report, The proposed action is not likely introduce further weeds or feral animals. Given the future proposed land use of the site, it likely there will be a reduction in the numbers of any feral animals at the site (e.g. European rabbits and foxes).

e) removes or disturbs key habitat features such as trees with hollows, caves and rock crevices, foraging habitat;

The remnant trees of the CPW will mostly remain intact, subject to health and vigour assessments of a qualified Arborist. The remaining trees in the remnant CPW do not contain hollows. Other habitat features

of the area include fallen timber and grassy foraging areas, though they are not considered to provide a significant habitat resource for native fauna.

f) affects natural revegetation and recolonisation of existing species following disturbance;

The proposal will affect the recolonisation of CPW native flora species, as the area will be managed as a community park.

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

N/A

How is the proposal likely to affect current disturbance regimes?

a) *modifies the intensity and frequency of fires;* N/A. It is likely that this area hasn't been burnt for 75+ years, as such there will be no change to disturbance regime.

b) *modifies flooding flows.* N/A. The area is not subject to flooding

How is the proposal likely to affect habitat connectivity?

a) creates a barrier to fauna movement;

The fauna assemblage recorded at the site consists of species common to the urban environment, and whilst the proposal will alter the habitat by removing grasslands and underscrubbing the existing woodland, proposed alteration are not likely to create a barrier to the movement of this fauna.

b) removes remnant vegetation or wildlife corridors;

The proposal will remove remnant CPW, though the trees will be incorporated into the final landuse with the inclusion of a community open space. The proposal will segregate the existing CPW remnants and will likely remove intact derived native grasslands. The area is not a wildlife corridor.

c) modifies remnant vegetation or wildlife corridors.

The proposal will modify the remnant vegetation by underscrubbing the overstorey and landscaping the groundlayer with plants of horticulture. It has been recommended in this report that plantings are sympathetic to the indigenous vegetation of the area, with planting palettes suggested.

How is the proposal likely to affect critical habitat? N/A. The area is not identified as Critical Habitat.

Conclusions:

With the above factors considered, impacts to the Cumberland Plain Woodland Critically Endangered Eoclogical Community, are not judged to be significant to the community as a whole. This judgement takes into account the isolated nature of the remnant, the degraded state of the remnant, the current landuses surrounding the remnant and its viabililty in the near to medium term.

Persoonia nutans – Nodding Geebung

A record of this species was recorded on site in 2001, to an accuracy of 1000m. A targeted search for this species was undertaken using random meander technique. This species was not recorded during field survey.

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

a) *displaces or disturbs threatened species and/or populations:* N/A

b) *disrupts the breeding cycle:* N/A

c) *disturbs the dormancy period:* N/A

d) *disrupts roosting behaviour:* N/A

e) *changes foraging behaviour:* N/A

f) *affects migration and dispersal ability:* N/A

g) *disrupts pollination cycle:* N/A

h) *disturbs seedbanks and i) disrupts recruitment (ie. germination and establishment of plants);*

In the situation that *Persoonia nutans* did occur on site and no longer occurs in plant form, a seedbank may be present somewhere at the site. This species is known to respond to fire and disturbance (DEC 2005b; Benson and MacDougall 2000). The specific type of disturbance required for *P.nutans* to germinate is not well documented (DEC 2005b; Benson and MacDougall 2000; DECCW 2010; Fairley 2004; Bernhardt and Weston 1996). Nothing is known of the longevity of the soil-stored seed bank (DEC 2005b).

The current disturbance regime of mowing / slashing in the open areas (i.e. Other Wooded Remants; Other Grasslands; Derived Native Grasslands), have not germinated any potential seedbank. There is no disturbance regime in the Wooded Remnants of CPW.

j) *affects the interaction between threatened species and other species in the community (eg. pollinators, host species, mychorrizal associations):* N/A

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

As discussed above, it is unlikely that this species is present onsite and as such this modification and clearance will not affect the habitat of *P.nutans*.

a) *disturbs any permanent, semi-permanent or ephemeral water bodies:* N/A

b) *degrades soil quality:* N/A

c) *clears or modifies native vegetation:* N/A

d) *introduces weeds, vermin or feral species or provides conditions for them to increase and/or spread:* N/A

e) *removes or disturbs key habitat features such as trees with hollows, caves and rock crevices, foraging habitat:* N/A

f) *affects natural revegetation and recolonisation of existing species following disturbance:* N/A. See above.

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

No.

How is the proposal likely to affect current disturbance regimes?

The current disturbance regime of mowing / slashing in the open areas (i.e. Other Wooded Remants; Other Grasslands; Derived Native Grasslands), will cease as these area will be developed. There is no disturbance regime in the Wooded Remnants of CPW, though the area will be underscrubbed for the future landuse as a parkland.

a) *modifies the intensity and frequency of fires:* N/A

b) *modifies flooding flows:* N/A

How is the proposal likely to affect habitat connectivity?

a) *creates a barrier to fauna movement;* N/A

b) *removes remnant vegetation or wildlife corridors; and c) modifies remnant vegetation or wildlife corridors.*

As discussed above, it not considered likely that the species occurs on site and as such the continuity of the habitat requirements for this species will not be affected.

How is the proposal likely to affect critical habitat?

N/A. The area is not identified as critical habitat.

Conclusions:

As discussed above, it is considered unlikely that *Persoonia nutans* occurs at the Project Site, and as such there can be significant impact to this threatened species by the proposed works.

Stagonopleura guttata – Diamond Firetail

The Diamond Firetail can be found in grassy eucalypt woodlands, heathlands and open grassland with scattered timber. This species can also be found in open forest, mallee and riparian vegetation. This species is usually seen in flocks of between five to forty birds, but can form flocks of up 150. This species is a ground feeder, feeding on ripe and partly-ripe grass, herb seeds, green leaves, and on insects (Simpson and Day 2004; Readers Digest 1990; DEC 2010).

Potential habitat for the Diamond Firetail to forage, breed or pass through exists within the Cumberland Plain Woodland (CPW) and grassland throughout the study area. No Diamond Firetails were recorded during the flora and fauna surveys.

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

a) *displaces or disturbs threatened species and/or populations:* N/A

b) *disrupts the breeding cycle:* N/A

c) *disturbs the dormancy period:* N/A

d) *disrupts roosting behaviour:* N/A

e) *changes foraging behaviour:* N/A

f) *affects migration and dispersal ability:* N/A

g) *disrupts pollination cycle:* N/A

h) *disturbs seedbank:* N/A

i) *disrupts recruitment (ie. germination and establishment of plants) :* N/A

k) *affects the interaction between threatened species and other species in the community (eg. pollinators, host species, mychorrizal associations):* N/A

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

The CPW onsite does provide potential habitat for the Diamond Firetail, though no sightings of this species have been recorded onsite or in close proximity to the site. It is unlikely the proposal will affect the habitat of Diamond Firetail.

a) *disturbs any permanent, semi-permanent or ephemeral water bodies:* N/A

b) *degrades soil quality:* N/A

c) *clears or modifies native vegetation:* N/A

d) *introduces weeds, vermin or feral species or provides conditions for them to increase and/or spread:* N/A

e) *removes or disturbs key habitat features such as trees with hollows, caves and rock crevices, foraging habitat:* N/A

f) *affects natural revegetation and recolonisation of existing species following disturbance:* N/A.

The site is already isolated in the urban matrix and further development around this small remnant is unlikely to make the site less conducive to colonisation by Diamond Firetail.

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

No.

How is the proposal likely to affect current disturbance regimes?

The current disturbance regime of mowing / slashing in the open areas (i.e. Other Wooded Remants; Other Grasslands; Derived Native Grasslands), will cease as these area will be developed. There is no disturbance regime in the Wooded Remnants of CPW, though the area will be underscrubbed for the future landuse as a parkland.

a) *modifies the intensity and frequency of fires:* N/A

b) *modifies flooding flows:* N/A

How is the proposal likely to affect habitat connectivity?

a) *creates a barrier to fauna movement;* N/A

b) *removes remnant vegetation or wildlife corridors; and c) modifies remnant vegetation or wildlife corridors.*

As discussed above, it not considered likely that the species occurs on site and as such the continuity of the habitat requirements for this species will not be affected. The closest significant remnant of native vegetation is >1.5km.

How is the proposal likely to affect critical habitat?

N/A. The area is not identified as critical habitat

Conclusions:

As discussed above, it is considered unlikely that Diamond Firetail uses the Project Site or is likely to colonise the existing remnant vegetation, and as such there can be significant impact to this threatened species by the proposed works.

Common, Eastern or Large Bent-wing Bat – *Miniopterus orianae (sensu lat. M. schreibersii oceanensis)*

The Eastern Bent-wing Bat is a wide ranging species and is essentially an obligate cave rooster (although it sometimes roosts in disused mines) that utilises a wide variety of habitats for foraging (Churchill 1998). The Eastern Bent-wing Bat hunts above forested areas, feeding upon moths and other flying insects above the tree tops (DECCW 2010).

This species was recorded flying over the site in 1999 (Ecotone 1999), though subsequent Anabat surveys during 2010 did not record any microbats at the site. No roosting caves are recorded on or near the site (DECCW 2010b).

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

a) *displaces or disturbs threatened species and/or populations:* N/A

b) *disrupts the breeding cycle:* N/A

c) *disturbs the dormancy period:* N/A

d) *disrupts roosting behaviour:* N/A

e) *changes foraging behaviour:* N/A

f) *affects migration and dispersal ability:* N/A

g) *disrupts pollination cycle:* N/A

h) *disturbs seedbanks and i) disrupts recruitment (ie. germination and establishment of plants);* N/A

l) *affects the interaction between threatened species and other species in the community (eg. pollinators, host species, mychorrizal associations):* N/A

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

As discussed above, it is unlikely that this species is present onsite or uses the site regularly, as such, the proposal is unlikely to affect the habitat of Eastern Bent-wing Bat.

a) *disturbs any permanent, semi-permanent or ephemeral water bodies:* N/A

b) *degrades soil quality:* N/A

c) *clears or modifies native vegetation:* N/A

d) *introduces weeds, vermin or feral species or provides conditions for them to increase and/or spread:* N/A

e) *removes or disturbs key habitat features such as trees with hollows, caves and rock crevices, foraging habitat:* N/A

f) *affects natural revegetation and recolonisation of existing species following disturbance:* N/A. See above.

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

No.

How is the proposal likely to affect current disturbance regimes?

The current disturbance regime of mowing / slashing in the open areas (i.e. Other Wooded Remants; Other Grasslands; Derived Native Grasslands), will cease as these area will be developed. There is no disturbance regime in the Wooded Remnants of CPW, though the area will be underscrubbed for the future landuse as a parkland.

a) modifies the intensity and frequency of fires: N/A

b) *modifies flooding flows:* N/A

How is the proposal likely to affect habitat connectivity?

a) creates a barrier to fauna movement; N/A

b) removes remnant vegetation or wildlife corridors; and c) modifies remnant vegetation or wildlife corridors.

As discussed above, it not considered likely that the species occurs on site and as such the continuity of the habitat requirements for this species will not be affected.

How is the proposal likely to affect critical habitat?

N/A. The area is not identified as critical habitat.

Conclusions:

As discussed above, it is considered unlikely that Eastern Bent-wing Bat uses the Project Site or is likely to colonise the existing remnant vegetation, and as such there can be significant impact to this threatened species by the proposed works.

Cumberland (Large) Land Snail – *Meridolum corneovirens*

Cumberland Plain Land Snail is a native snail species that primarily inhabits Cumberland Plain Woodland in Western Sydney, where it is currently known from over 100 locations. However, most of these populations are scattered throughout the region and are often small and isolated (DECCW 2010).

Current knowledge suggests that the Cumberland Plain Land Snail is restricted to the Cumberland Plain and Castlereagh Woodlands of Western Sydney and also along the fringes of River-flat Eucalypt Forest, especially where it meets Cumberland Plain Woodland. Cumberland Plain Land Snail typically occurs under logs and other debris, amongst leaf and bark accumulations and sometimes under grass clumps. Where possible it will burrow into loose soil (DECCW 2010b).

Potential habitat for the Cumberland Plain Land Snail within the study area exists within the areas of remnant CPW. A targeted search was undertaken in the leaf litter below mature *Eucalyptus molluccana, E. tereticornis and Corymbia maculata*, no shells or live specimens were found.

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

a) displaces or disturbs threatened species and/or populations: N/A

b) *disrupts the breeding cycle:* N/A

c) disturbs the dormancy period: N/A

d) disrupts roosting behaviour: N/A

e) changes foraging behaviour: N/A

f) affects migration and dispersal ability: N/A

g) disrupts pollination cycle: N/A

h) disturbs seedbanks: N/A

i) disrupts recruitment (i.e. germination and establishment of plants): N/A

j) affects the interaction between threatened species and other species in the community (e.g. pollinators, host species, mychorrizal associations): N/A

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

As discussed above, it is unlikely that this species is present onsite and is not likely to colonise the site given its isolation from areas where it has been recorded. As such, this modification and clearance will not affect the habitat of Cumberland Land Snail.

a) disturbs any permanent, semi-permanent or ephemeral water bodies: N/A

b) degrades soil quality: N/A

c) *clears or modifies native vegetation:* N/A

d) *introduces weeds, vermin or feral species or provides conditions for them to increase and/or spread:* N/A

e) *removes or disturbs key habitat features such as trees with hollows, caves and rock crevices, foraging habitat:* N/A

f) *affects natural revegetation and recolonisation of existing species following disturbance:* N/A.

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

No.

How is the proposal likely to affect current disturbance regimes?

The current disturbance regime of mowing / slashing in the open areas (i.e. Other Wooded Remants; Other Grasslands; Derived Native Grasslands), will cease as these area will be developed. There is no disturbance regime in the Wooded Remnants of CPW, though the area will be underscrubbed for the future landuse as a parkland.

a) *modifies the intensity and frequency of fires:* N/A

b) *modifies flooding flows:* N/A

How is the proposal likely to affect habitat connectivity?

a) *creates a barrier to fauna movement;* N/A

b) *removes remnant vegetation or wildlife corridors; and c) modifies remnant vegetation or wildlife corridors.*

As discussed above, it not considered likely that the species occurs on site and as such the continuity of the habitat requirements for this species will not be affected.

How is the proposal likely to affect critical habitat?

N/A. The area is not identified as critical habitat.

Conclusions:

As discussed above, it is considered unlikely that Cumberland Land Snail uses the Project Site or is likely to colonise the existing remnant vegetation, and as such there can be significant impact to this threatened species by the proposed works.

Commonwealth Criteria (DEWHA 2008)

Persoonia nutans – Nodding Geebung

A record of this species was recorded on site in 2001, to an accuracy of 1000m. A targeted search for this species was undertaken using random meander technique. This species was not recorded during field survey.

Criterion 1: lead to a long-term decrease in the size of a population;

N/A. A population was not identified on site.

Criterion 2: reduce the area of occupancy of the species;

N/A. A population was not identified on site.

Criterion 3: fragment an existing population into two or more populations;

N/A. A population was not identified on site.

Criterion 4: adversely affect habitat critical to the survival of a species;

N/A. No critical habitat has been declared for this species.

Criterion 5: disrupt the breeding cycle of a population;

N/A. A population was not identified on site.

Criterion 6: modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;

No. A population was not identified on site.

Criterion 7: result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat;

No.

Criterion 8: introduce disease that may cause the species to decline; or

No. Threats currently recognised for *Persoonia nutans* do not include the introduction of disease.

Criterion 9: interfere with the recovery of the species.

N/A. A population was not identified on site.

Conclusions

Based on the above assessment it is concluded that the proposed development is unlikely to have a significant impact on a population of *Persoonia nutans*. As such, no referral to the DEWHA for assessment and approval by the Environment Minister is necessary.

Rainbow Bee-eater – *Merops ornatus*

Resident in coastal and subcoastal northern Australia; regular breeding migrant in southern Australia, arriving September to October, departing February to March, some occasionally present April to May (Pizzey and Doyle 1988). Occurs in open country, chiefly at suitable breeding places in areas of sandy or loamy soil: sand-ridges, riverbanks, road-cuttings, sand-pits, occasionally coastal cliffs (ibid). Nest is a chamber a the end of a burrow, up to 1.6 m long, tunnelled in flat or sloping ground, sandy back or cutting (ibid).

This species was not recorded on site during this or previous survey (Wildsearch 1999).

An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:

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

The study area does not comprise important habitat for Rainbow Bee-eaters – the species is known to occur in a range of vegetation types, and the study area does not form part of a key long-distance migration corridor.

b) *result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or*

No. The proposed development is not considered to pose a real or potential risk of introducing an invasive species over and above those that already occur.

c) *seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.*

Rainbow Bee-eaters are widespread around mainland Australia, and given gene-flow is likely to be good given the migration habits of the species, populations of Bee-eaters are expected to be reasonably large. The study area could not support an ecologically significant proportion of the population.

Conclusions:

As discussed above, it is considered unlikely that the proposed works would significantly impact upon the population of the migratory species, Rainbow Bee-eater, in Australia.

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