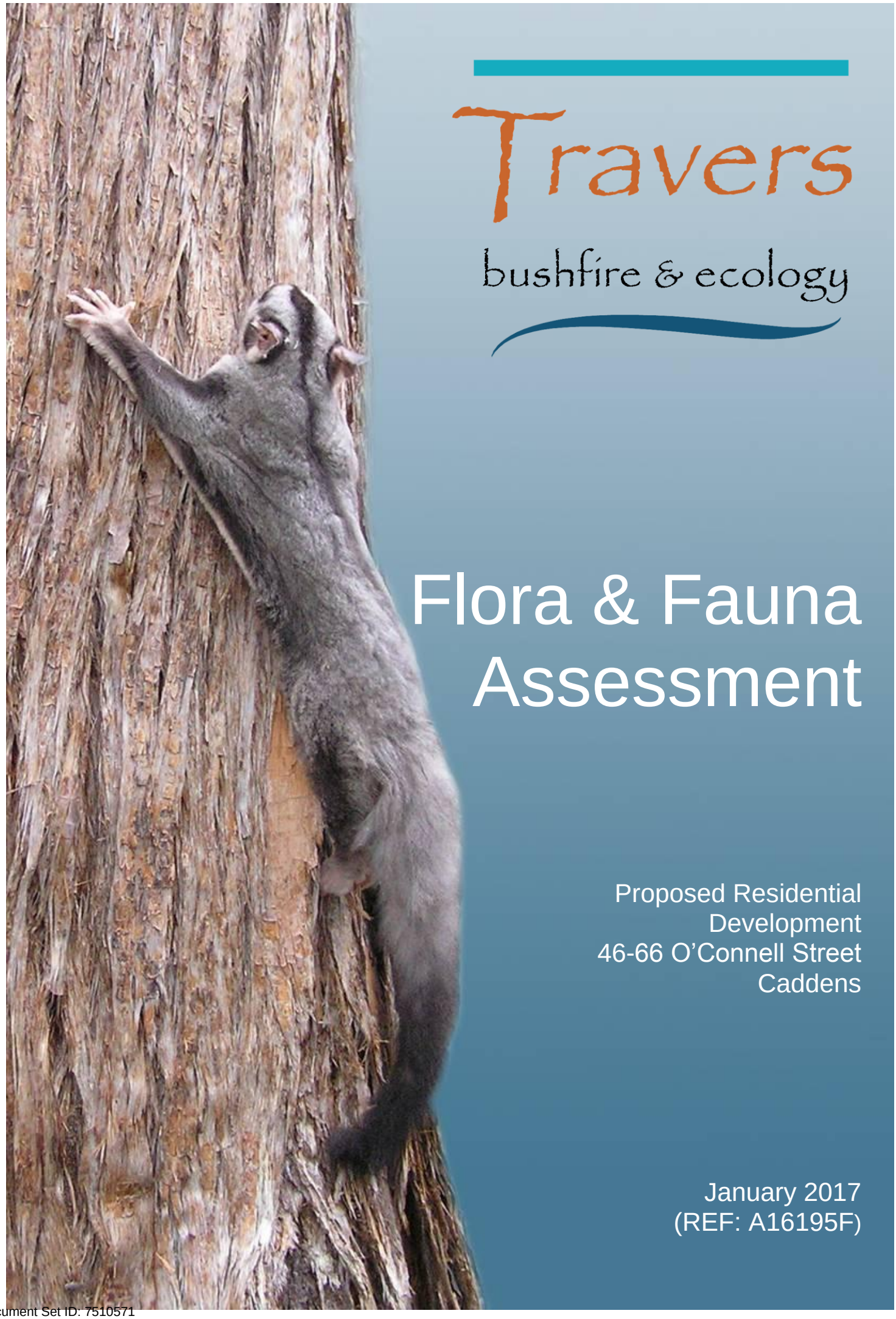

Travers

bushfire & ecology

Flora & Fauna Assessment

Proposed Residential Development
46-66 O'Connell Street
Caddens

January 2017
(REF: A16195F)

Flora & Fauna Assessment

Lot 3 DP 1103503
Lot 6 DP 593628,
46-66 and 29 O'Connell Street, Caddens

JANUARY 2017

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Date:	20/01/17
File:	A16004F

Disclaimer:

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Survey effort has been reduced to provide an indication of the insitu vegetation and fauna habitat present. The 7 part test of significance is based on this survey data and further survey may result in the observation of threatened species not considered in this assessment. Consequently, further target threatened species survey may be required by the determining authority. The mapping is indicative of available space and location of features which may prove critical in assessing the viability of the proposed works. Mapping has been produced on a map base with an inherent level of inaccuracy. Consequently, the location of all mapped features is to be confirmed by a registered surveyor.

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Table of Contents

Figures

Tables

Appendices

List of abbreviations

APZ	asset protection zone
BPA	bushfire protection assessment
CLUMP	conservation land use management plan
DCP	Development Control Plan
DEC	NSW Department of Environment and Conservation (superseded by DECC from April 2007)
DECC	NSW Department of Environment and Climate Change (superseded by DECCW from October 2009)
DECCW	NSW Department of Environment, Climate Change and Water (superseded by OEH from April 2011)
DEWHA	Commonwealth Department of Environment, Water, Heritage & the Arts (superseded by SEWPAC)
DoEE	Commonwealth Department of Environment & Energy
EEC	endangered ecological community
EPA	Environmental Protection Agency
EP&A Act	*Environmental Planning and Assessment Act*
EPBC Act	*Environment Protection and Biodiversity Conservation Act*
ESMP	ecological site management plan
FF	flora and fauna assessment
FM Act	*Fisheries Management Act*
FMP	fuel management plan
HTA	habitat tree assessment
IPA	inner protection area
LEP	Local Environment Plan
LGA	local government area
NES	national environmental significance
NPWS	NSW National Parks and Wildlife Service
NSW DPI	NSW Department of Industry and Investment
OEH	Office of Environment and Heritage (Part of the NSW Department of Premier and Cabinet)
OPA	outer protection area
PBP	*Planning for bushfire protection 2006*
POM	plan of management
RF Act	*Rural Fires Act*
RFS	NSW Rural Fire Service
ROTAP	rare or threatened Australian plants
SEPP 44	*State Environmental Protection Policy No 44 – Koala Habitat Protection*
SEWPAC	Commonwealth Dept. of Sustainability, Environment, Water, Population & Communities (superseded by DoEE)
SIS	species impact statement
SULE	safe useful life expectancy
TPO	tree preservation order
TPZ	tree preservation zone
TRRP	tree retention and removal plan
TSC Act	*Threatened Species Conservation Act*
VMP	vegetation management plan

Ecological Assessment

Travers bushfire & ecology has been engaged to undertake an ecological assessment within Lot 3 DP 1103503 46-66 O'Connell Street and Lot 6 DP 593628 29 O'Connell Street, Caddens, in the Penrith local government area (LGA). These lots are subject to subdivision and development and will hereafter be referred to as the 'subject site'. The proposal is currently at the concept plan stage.

1.0 Proposed development

The proposal is to subdivide the subject site of approximately 12.18 ha into 320 Multi-dwelling Housing Units and an undisclosed number of Apartment Units within ancillary infrastructure such as roads and services. The existing two residences and associated structures will be removed. The site is zoned B2 – Local Centre and R3 – Medium Density Residential. The proposed development proposes to remove approximately 0.1 ha (15.6%) of the Remnant Cumberland Plain Woodland (CPW) (loss of only 7) remnant trees) which is listed as a Critically Endangered Ecological Community (CEEC) within the NSW *TSC Act* (1995). The vegetation is not commensurate with the equivalent listing under the EPBC Act (refer to section 4.4 for details).

The proposal retains approximately 0.54 ha (84.3%) of this vegetation community and revegetate a further 0.16 ha of CPW within a proposed Native Bushland Reserve. This will result in 0.7 ha of CPW being retained or re-created within the subject site which is a net gain of 0.06 ha.

The site is part of a larger development concept for the local area, including a town centre to the south. Although this concept is understood, the ecological assessment of impacts is irrespective of the DCP or LEP plan unless biodiversity certification has been granted on the subject site to remove the existing native vegetation. In this case, biodiversity certification has not been granted and standard impact assessment protocol applies to this development application.

2.0 Survey

Botanical survey was undertaken on the 18-19th of January 2016 over a time frame of approximately 12 hrs.

Botanical survey included a random meander in accordance with *Cropper* (1993) to gain a full species list of the plants within the site, and then four (4) quadrats each of 0.04 ha size were undertaken. A review of the *Atlas of NSW Wildlife* (OEH 2016) and the EPBC *Protected Matters Search Tool* were undertaken prior to the site visit to determine threatened species previously recorded within 10km of the subject site, and relevant targeted searches were undertaken as suited.

As most of the subject site has been highly modified for household gardens, lawns and used for approximately 70 years as an orchard (see Figure 2), not all exotic specimens have been identified or have been identified to genus level only. All naturally occurring species were identified to species level. Figure 3 shows the subject site, the flora and fauna survey effort and the vegetation communities within.

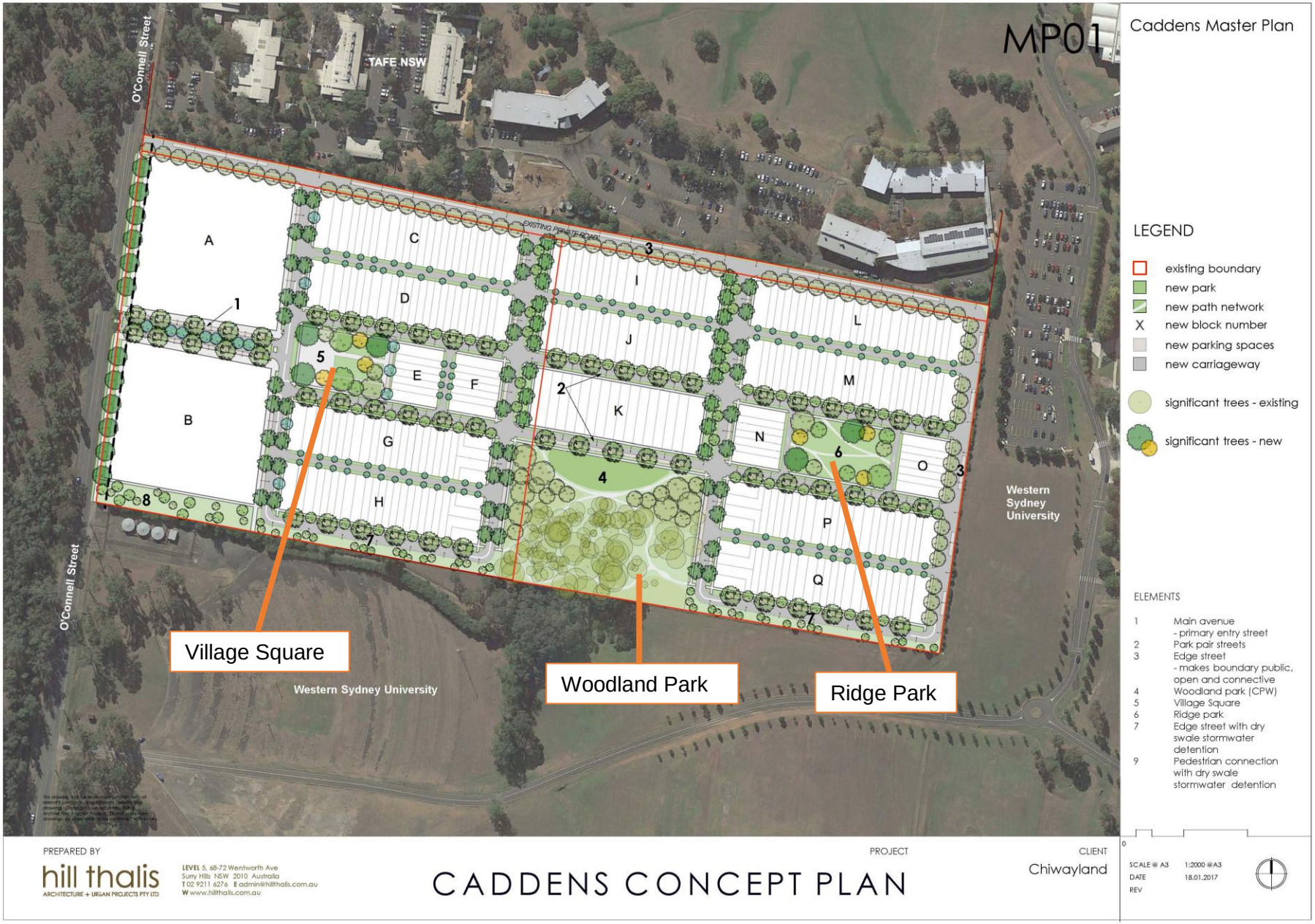

Figure 1 – Proposed development

3.0 Site description

Table 1 provides a summary of the planning, cadastral, topographical, and disturbance details of the subject site.

Table 1 – Site features

Location	Lot 3 DP 1103503, 46-66 O'Connell Street, Caddens Lot 6 DP 593628, 29 O'Connell Street, Caddens
Size	Approximately 12.18 ha
Local government area	Penrith City Council
Grid reference MGA-56	290430E 6261290N
Zoning	B2 – Local Centre (Part of Lot 3) R3 – Medium Density Residential (Part of Lot 3 and all of Lot 6)
Elevation	Approximately 55-70m AHD
Topography	Situated on a east-west running ridgeline with northerly, easterly and southerly aspects
Landscape and soils	Landscape: Undulating to low rolling hills on Wiannamatta Group shales. Local relief 50-80m, Slopes 5-20%. Soils: Luddenham Soil Landscape – Soils shallow (<100cm) dark podzolic soils or massive earthy clays on crests or upper slopes.
Catchment and drainage	Overland flow in a northerly or southerly direction. Constructed drainage channel located within property to the south. Drainage generally in a westerly direction into Werrington Creek which joins South Creek then to the Hawkesbury River near Windsor
Vegetation	Household gardens and lawns (2.22 ha) Disused Orchard (9.42 ha) Remnant Cumberland Plain Woodland (0.587 ha)
Existing land use	Disused agricultural (orchards)
Clearing	100% of the original canopy vegetation has been cleared. Regrowth of CPW has occurred in the central southern portion since 1940 (see Figure 2)

The whole of the subject site appears to have been cleared of native vegetation prior to 1943. As can be seen in Figure 2, there is a small area of native regrowth near the central southern boundary of the subject site. Although the Native Vegetation Act (2003) does not apply to this site, the vegetation on site would otherwise be recognised as protected regrowth vegetation.

Figure 2 - Aerial view from 1943 (Source: SIX maps)

Given that the trees have been present since 1943, the existing patch of native vegetation onsite has a high degree of in-situ native vegetation resilience and can be supported in-situ with protection and bush regeneration works.

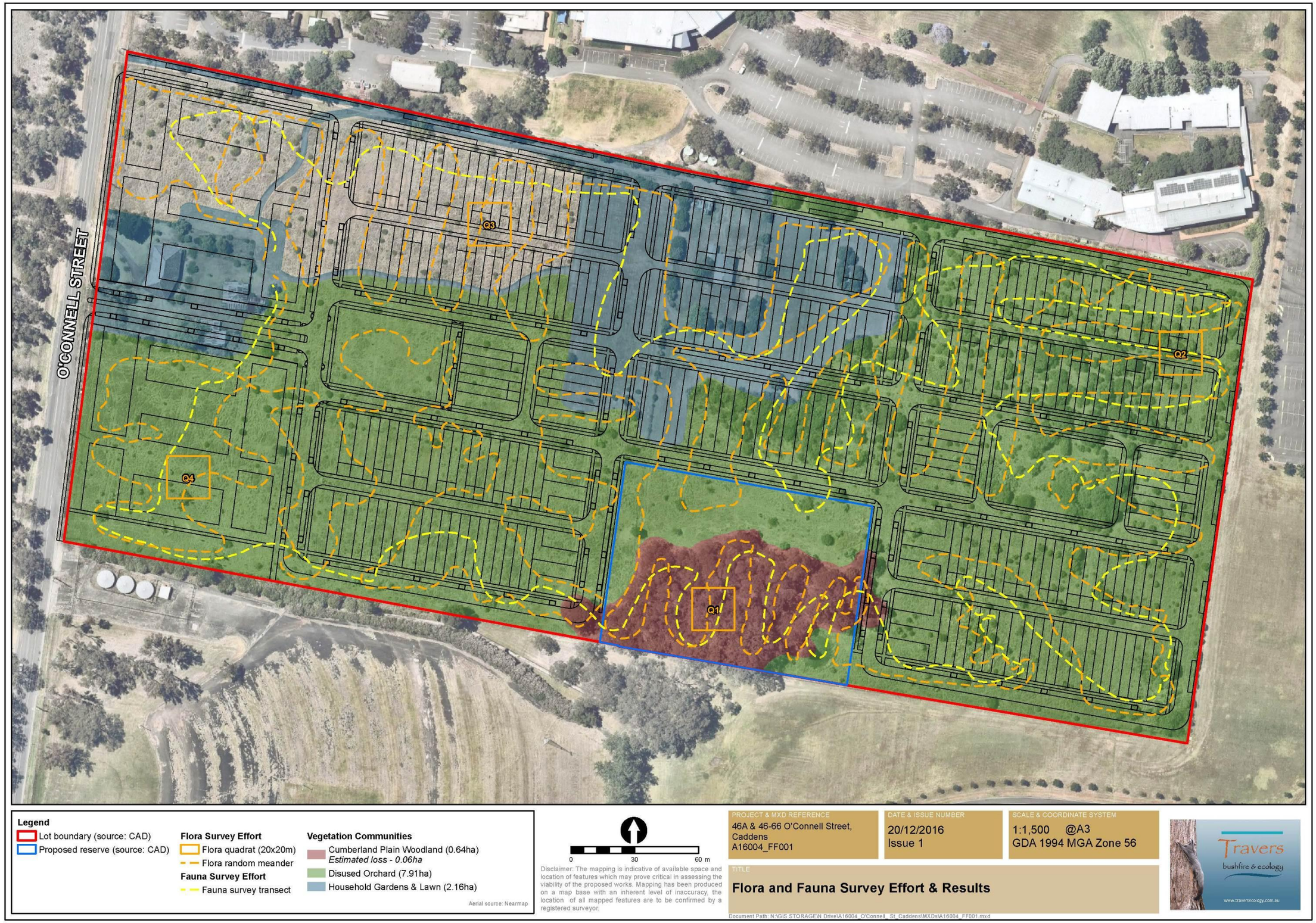

Figure 3 – Flora and fauna survey effort and results

Note: The proposed layout is a concept plan which was updated only slightly from that used in this figure, however all impact areas remain unchanged, and the orientation of the lots remain unchanged.

4.0 Flora

4.1 Vegetation communities

The Native Vegetation maps of the Cumberland Plain Western Sydney (NSW NPWS 2002) have mapped the majority of the site as cleared, while a small area was mapped on the central southern boundary as Map Unit 10 – Shale Plains Woodland. This vegetation community typically has a canopy of *Eucalyptus moluccana* (Grey Box) and *Eucalyptus tereticornis* (Forest Red Gum).

Field verification of the vegetation within the subject site found the following vegetation communities:

- Household Gardens and Lawns (2.16 ha)
- Disused Orchard (7.91 ha)
- Remnant Cumberland Plain Woodland (*CPW – Listed as a Critically Endangered Ecological Community*) (0.64 ha)

Household Gardens and Lawns (2.16ha)

This vegetation community generally occurs in areas surrounding the two dwellings and ancillary structures within the subject site as shown in Figure 3.

Photo 1 – Household Gardens and Lawns, looking north towards the rear of the dwelling within Lot 6

This vegetation consists of well-maintained lawns with numerous and varied exotic trees, shrubs and groundcovers. Many of the trees are while the shrubs are generally flowering. Groundcovers were a mixture of mostly exotic grasses and a variety of flowering and vegetable species.

Canopy – where present, the canopy is largely comprised of fruit or nut bearing species such as Mango, Fig, Lemon, Tangelo, Hazelnut, Pecan Nut, Mulberry, Avocado, Orange, and Paw Paw.

Mid-storey – where present, the mid-storey was found to contain exotic flowering shrubs such as Hibiscus, Oleander, Cotoneaster and Roses.

Ground-layer – was comprised of numerous but mostly exotic grasses such as Kikuyu, Common couch and Paspalum. Some flowering or vegetable species were also present.

Disused Orchard (7.91 ha)

This vegetation community occurs over the largest proportion of the subject site **(**7.91 ha). The whole of the subject site was cleared and established as orchards by 1943. These orchards were removed in approximately 2008 and were then left largely unmanaged to the present.

Canopy – The canopy consists of widely scattered individual orchard species, mostly stone-fruits such as apricot, peach, plum, nectarines and other varieties. Rare occurrences of single isolated individual eucalypt trees are present. These isolated eucalypts are 10 to 18 metres tall with less than 1% projected Foliage Cover (PFC). The scattered fruit trees are generally less than 5 metres tall with less than 2% PFC. A large number of African Olive and Common Olive trees (*Olea europa* subsp. *cuspidata* and *Olea europa* subsp. *europaea*) in various stages of growth are also present. These olive trees are scattered individuals or are in clumps throughout this vegetation community they are 2 to 15 metres in height with a patchy 15 to 20% PFC as can be seen in Figure 2.

Mid-storey – This consists of numerous scattered individual and clumps of juvenile African Olive and Common Olive trees (*Olea europaea* subsp. *cuspidata* and *Olea europaea* subsp. *europaea*). *Bursaria spinosa* (Blackthorn) is also a common shrub, especially on the south and east facing aspects. Other shrub species observed were Oleander, Grey-leaved Cotoneaster, Red Fruited Cotoneaster, Small-leaved Privet, Blackberry and African Boxthorn.

Photo 2 – Disused Orchard vegetation looking west from Quadrat 3

Ground Layer – The ground layer was comprised of exotic and native grasses, herbs and forbs. This layer was from 0.7 to 1.2 metres tall with a 95% PFC. It was dominated by exotic grass species such as *Ehrharta erecta* (Panic Veldtgrass), *Eragrostis curvula* (African Lovegrass), *Setaria parviflora* (Slender Pigeon Grass), *Sporobolus africanus* (Parramatta Grass), *Sorghum halpense* (Johnson Grass) and *Axonopus fissifolius* (Narrow-leaved Carpet Grass). Other common exotic species included *Foeniculum vulgare* (Fennel), *Bidens pilosa* (Cobblers Pegs), *Cirsium vulgare* (Spear Thistle), *Conyza bonariensis* (Fleabane), *Conyza*

sumatrensis (Tall Fleabane), *Senecio madagascariensis* (Fireweed), *Opuntia stricta* (Prickly Pear), *Sida rhombifolia* (Paddy's Lucerne) and *Solanum nigrum* (Black Nightshade).

There were some areas within the ground layer that were comprised of mono-specific stands of *Imperata cylindrica* var. *major* (Blady Grass). These areas are visible in Figure 3 and are located approximately 30 metres east of the Cumberland Plain Woodland vegetation.

Photo 3 – Disused Orchard vegetation, looking north-west towards Quadrat 3

Photo 4 – Disused Orchard vegetation, looking south-east from the centre of the subject site

Remnant Cumberland Plain Woodland (0.64 ha)

The vegetation within the subject site was mostly cleared prior to 1943, however an existing patch exists on this site and lands to the south of approximately 0.9ha of which 0.64ha is within the subject site. Historical aerial photography taken in 1943 shows the site established as orchards with a small area of regrowth (native trees) near the centre of the southern border as shown in Figure 2.

Trees were to 25 metres (mostly 20-22m) with 30-40% projected foliage cover (PFC). Species observed were *Eucalyptus tereticornis* (Forest Red Gum), with a few scattered *Eucalyptus amplifolia* (Cabbage Gum) and only two *Eucalyptus moluccana* (Grey Box).

Shrubs within this vegetation community were to 5m with a highly variable PFC of 4 to 70%. The shrub layer consisted of dense stands of *Olea europaea* subsp*. europaea* (Common Olive) with occasional *Olea europaea* subsp. *cuspidata* (African Olive) forming dense clumps to 10m high. Other shrubs present were African Boxthorn (*Lycium ferocissimum*), Nightshade (*Solanum sisymbriifolium*) Small-leaved privet (*Ligustrum sinense*), Large-leaved Privet (*Ligustrum lucidum*) and sparse occurrences of Blackthorn (*Bursaria spinosa*).

The groundlayer was to 1.2 m tall with 85-95% PFC consisting of mixed exotic and native grasses, herbs and forbs. Common species included native species such as Weeping Grass (*Microlaena stipoides*), Kangaroo grass (*Themeda triandra*), Barbwire Grass (*Cymbopogon refractus*), Wiry Panic (*Entolasia stricta*), and exotic species such as Narrow-leaved Carpet Grass (*Axonopus fissifolius*), African Lovegrass (*Eragrostis curvula*), Kikuyu (*Pennisetum clandestinum*), various Pigeon Grass (*Setaria*) species and Johnson Grass (*Sorghum halpense*).

Photo 5 – Cumberland Plain Woodland vegetation (Quadrat 1)

4.2 Threatened flora species

Threatened Species Conservation Act (TSC Act) – A search of the *Atlas of NSW Wildlife* (OEH, 2016) indicated a list of species that have been recorded within a 10 km radius of the subject site. These species are listed in Appendix 2 Table A2.1 and are considered for potential habitat within the subject site.

Environmental Protection and Biodiversity Conservation Act (EPBC Act) – A review of the schedules of the *EPBC Act* indicated the potential for a list of threatened flora species to occur within a 10km radius of the subject site. These species have also been listed in Appendix 2 Table A2.1 for consideration of potential to occur.

Based on the habitat assessment within Table A2.1 it is considered that the subject site provides potential habitat for the following threatened flora species. These species will be considered in the seven-part test within Appendix 3:

Table 2 – Threatened flora species with suitable habitat present

Scientific name	TSC Act	EPBC Act	Potential to occur
Acacia pubescens	E	V	Very Unlikely
Dillwynia tenuifolia	V	-	Very Unlikely
Grevillea juniperina ssp. *juniperina*	V	-	Low
Grevillea parviflora ssp. *parviflora*	V	V	Very Unlikely
Pimelea spicata	E	E	Low
Pultenaea parviflora	E	V	Low

Few threatened species in both the Bionet (NSW) and EPBC coordinate search (National) were considered to have suitable habitat because of previous clearing, long-term use of the land as an orchard, and past land management practices such as the use of fertilisers and chemical sprays for insect and weed control as well as factors such as unsuitable soils / geology, unsuitable previous vegetation type or large distance to known records.

4.3 Endangered flora populations

One endangered flora population occurs within the Penrith LGA, this is the "*Marsdenia viridiflora* subsp. *viridiflora* population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas".

This species is known to grow in vine thickets and open shale woodland. Recent records are from Prospect, Bankstown, Smithfield, Cabramatta Creek and St Marys. It was previously known north from Razorback Range. Previous records of this species exist all around the subject site, but at a distance of greater than 4 km.

Despite detailed targeted searches, this species was not observed within the subject site. Furthermore, it is considered that this species is unlikely to occur within the subject site due to past clearing of the site, long term use of the site as an orchard and for grazing, as well as past and ongoing land management practices such as the use of herbicides for weed control.

4.4 Endangered ecological communities

The site does contain an area (0.64 ha) of regrowth Cumberland Plain Woodland (CPW). According to historical aerial photography, it is apparent that the whole of the subject site was cleared prior to 1943. In Figure 2 it can be seen that there is a small patch of regrowth (saplings) near the central parts of the southern boundary and that orchards are well established across the majority of the subject site.

The vegetation within the regenerated patch of forest has been mapped as Map Unit 10 – Shale Plains Woodland within the Native Vegetation Maps of the Cumberland Plain, Western Sydney (NSW NPWS, 2002). Map Unit 10 - Shale Plains Woodland is commensurate with the "*Cumberland Plain Woodland in the Sydney Basin Bioregion*" which is listed as a Critically Endangered Ecological Community (CEEC) within the NSW *TSC Act* (1995).

Detailed survey and examination of the survey data has confirmed that this regrowth vegetation is commensurate with CPW. This patch of vegetation has been impacted by invasion of exotic species, particularly in the shrub and ground layers. Despite this the vegetation is listed as critically endangered and its protection and restoration is warranted on this basis. Typical exotic species within this patch are Olives, Large and small-leaved Privets, African Boxthorn, African Lovegrass, two Nightshade species and numerous small herbs and forbs.

It has been recommended by Penrith Council within Key Issue 4 of the Pre-lodgement Meeting to "preserve the existing significant vegetation" by the use of 'Communal Open Space' ideally to ensure that the majority of the CPW be retained (see Recommendations within Section 6.1).

Figure 4 - Native Vegetation of the Cumberland Plain mapping showing Map Unit 10 within and adjacent to the subject site (Source: NSW NPWS 2002)

This Map Unit 10 (CPW) community is indicative of "*Cumberland Plain Shale Woodlands and Shale Gravel Transition Forest*" which is also listed as a CEEC within the Commonwealth *EPBC Act* (1999), however to be classified for listing under the EPBC Act, there are some select minimum criteria that is required. In accordance with Figure 5, the patch of vegetation fails to meet the criteria to be eligible for the CEEC as per the EPBC definition as the understorey vegetation is approximately 15-20% native species coverage only.

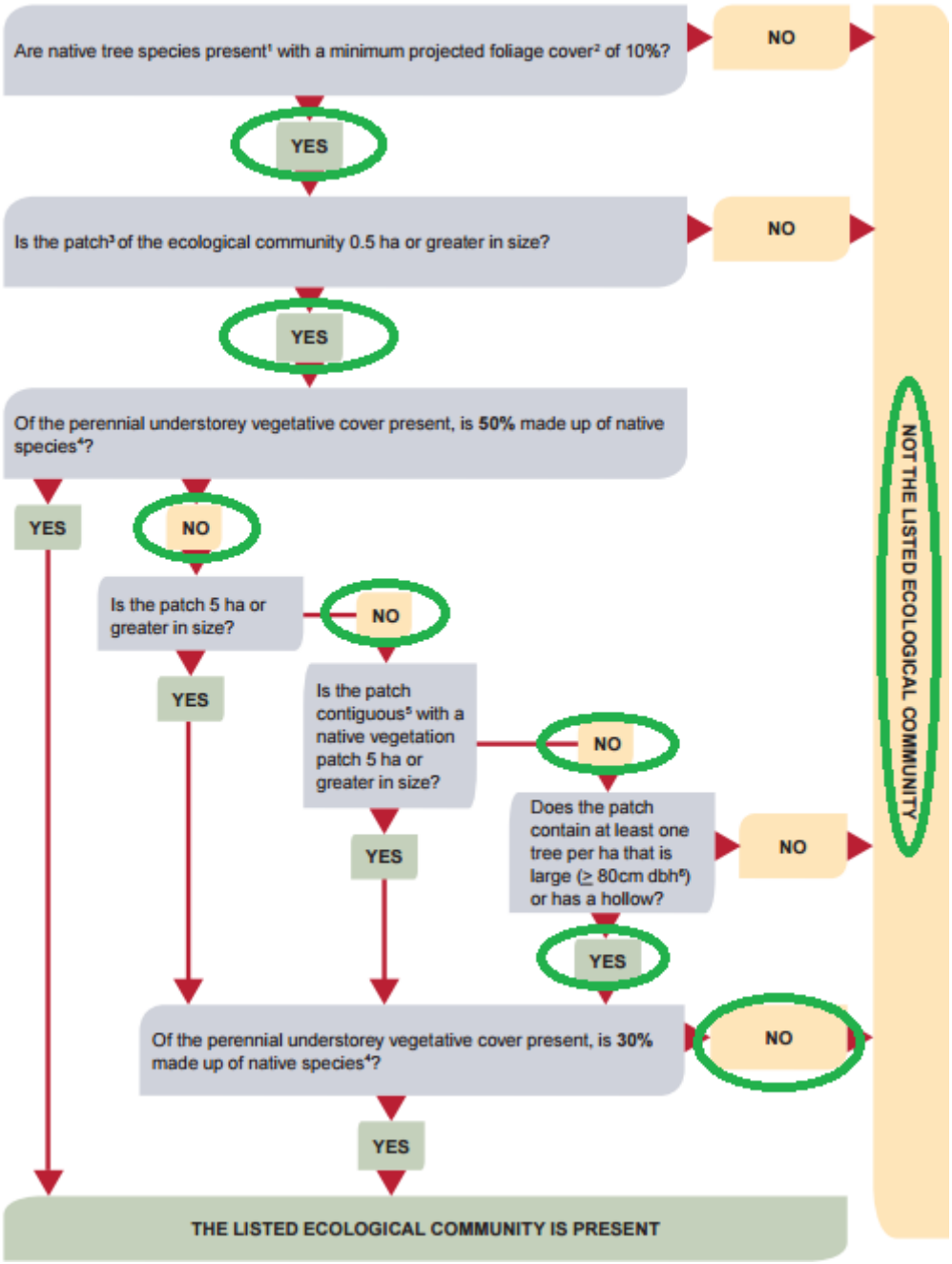

Figure 5 – EPBC criteria for listing as Cumberland Plain Shale Woodlands and Shale Gravel Transition Forest

5.0 Fauna

5.1 Habitat assessment

The fauna assessment is based on desktop analysis, threatened species records (OEH 2016 and the output from the Protected Matters Search Tool (DoEE 2016) and habitat attributes identified during the flora survey. Particular note was taken to search for the following potential threatened fauna species habitat:

- Observations for presence of potential *Allocasuarina* trees for foraging by Glossy Black-Cockatoo.
- A count of tree species present to determine 'Potential Koala Habitat' according to the definitions of SEPP 44.
- Hollow-bearing trees present.

- Caves and overhangs present for microbat roosting.
- Terrestrial shelters, burrows and/or hollows.
- Presence of drainages for frog species habitat.
- Detailed searches for 1 hour within leaf litter in native vegetation and within / under scattered debris for presence of Cumberland Plain Land Snail.

The following habitat was present:

- No hollow-bearing trees were present within the subject site. Several dead trees were observed to contain small cracks and fissures suitable for roosting by microchiropteran bats.
- One Common Ringtail Possum nest was observed within the regrowth CPW vegetation, in a small tree fissure approximately 1.3m from the ground (the location and nature of this nest is indicative of the lack of hollows on-site)
- No sandstone outcrops or rock overhangs
- No ground hollows
- Large areas of mixed (mostly) exotic and native open grassland
- Moderate to dense ground cover of mixed native and exotic species
- Loose soil suitable for foraging
- No permanent open water bodies such as dams or creeks
- No drainages, although an intermittent constructed drain is located just outside the south-western boundary of the of the subject site
- Minor artificial debris
- Some patches of dense to moderate leaf litter

5.2 Fauna species observed

The following fauna species were observed within the subject site over a total of 17 hours of opportunistic diurnal observations.

Table 3 – Fauna species observed onsite

Common name	Scientific name	Method observed
Birds		**Jan 2016**
Australian Magpie	*Gymnorhina tibicen*	O W
Australian Raven	*Corvus coronoides*	O W
Black-shouldered Kite	*Elanus axillaris*	O
Crested Pigeon	*Ocyphaps lophotes*	O W
Laughing Kookaburra	*Dacelo novaeguineae*	O W
Little Corella	*Cacatua sanguinea*	O W
Magpie-lark	*Grallina cyanoleuca*	O W
Masked Lapwing	*Vanellus miles*	O W
Noisy Miner	*Manorina melanocephala*	O W
Rainbow Lorikeet	*Trichoglossus haematodus*	O W
Superb Fairy-wren	*Malurus cyaneus*	O W
Willie Wagtail	*Rhipidura leucophrys*	O W
Mammals		
Brown Hare *	*Lepus lepus*	O
Common Ringtail Possum	*Pseudocheirus peregrinus*	E
Domesticated Cattle *	*Bos taurus*	O
Domesticated Dog *	*Canis familiaris*	O
European Red Fox *	*Vulpes vulpes*	O
Rabbit *	*Oryctolagus cuniculus*	O

Common name	Scientific name	Method observed
Note: * indicates introduced species TS indicates threatened species All species listed are identified to a high level of certainty unless otherwise noted as: PR indicates species identified to a 'probable' level of certainty – more likely than not PO indicates species identified to a 'possible' level of certainty – recorded to a moderate to high level of uncertainty usually applied to a threatened species of note.		

E	- Nest/roost	H	- Hair/feathers/skin	P	- Scat	W	- Heard call
F	- Tracks/scratchings	K	- Dead	Q	- Camera	X	- In scat
FB	- Burrow	O	- Observed	T	- Trapped/netted	Y	- Bone/teeth/shell
G	- Crushed cones	OW	- Obs & heard call	U	- Anabat/ultrasound	Z	- In raptor/owl pellet

5.3 Threatened fauna species

TSC Act – A search of the *Atlas of NSW Wildlife* (OEH, 2016) provided a list of threatened fauna species previously recorded within a 10km radius of the subject site. These species are listed in Appendix Table A2.2 and are considered for potential habitat within the subject site. Despite detailed searches the Cumberland Plain Land Snail was not observed present within the subject site.

Fisheries Management Act (FM Act) – No habitats suitable for threatened aquatic species were observed within the subject site and as such the provisions of this act do not require any further consideration.

EPBC Act – A review of the schedules of the *EPBC Act* and a database search using the *Protected Matters Search Tool* on the DoEE website identified a list of threatened fauna species or species habitat likely to occur within a 10km radius of the subject site. These species have also been listed in Appendix Table A2.2.

In accordance with Table A2.2 the following state and nationally listed threatened fauna species are considered to have suitable habitat with varying potential to occur within the subject site. The state listed species will be considered in the seven-part test (Appendix 3):

Table 4 – Threatened fauna species with suitable habitat present

Common name	TSC Act	EPBC Act	Potential to occur
Swift Parrot	E	E	✓
Dusky Woodswallow	V	-	✓
Grey-headed Flying-fox	V	V	✓
East-coast Freetail Bat	V	-	✓
Eastern Falsistrelle	V	-	✓
Little Bentwing-bat	V	-	✓
Eastern Bentwing-bat	V	-	✓
Little Eagle	V	-	low
Square-tailed Kite	V	-	low
Yellow-bellied Sheathtail-bat	V	-	low
Greater Broad-nosed Bat	V	-	low
Spotted Harrier	V	-	unlikely
Little Lorikeet	V	-	unlikely
Speckled Warbler	V	-	unlikely
Varied Sittella	V	-	unlikely
Diamond Firetail	V	-	unlikely
Cumberland Plain Land Snail	E	-	unlikely

Additionally protected migratory species listed under the *EPBC Act* are considered for habitat potential in Table A2.3.

It is concluded that there will be no likely significant impact any state or nationally listed threatened fauna species with considered potential to occur.

5.4 Endangered fauna populations

There are no endangered fauna populations identified specifically to the Penrith LGA, however the site does fall within the Sydney Metropolitan Catchment Management Authority area. An endangered population of White-fronted Chat (*Epthianura albifrons*) is identified to this area however this is made up of two known isolated sub-populations; one at Newington Nature Reserve on the Parramatta River and one at Towra Point Nature Reserve in Botany Bay. The subject site does not provide any suitable habitat for this species.

5.5 Connectivity

Figure 6 shows that there is no native vegetation connectivity within the subject site, or from the subject site to other areas of native vegetation. The connectivity values in the locality are highly fragmented, with limited canopy connectivity located along Werrington Creek to the west of the subject site. The CPW vegetation within the subject site is isolated and provides only a small “stepping stone” or island of habitat.

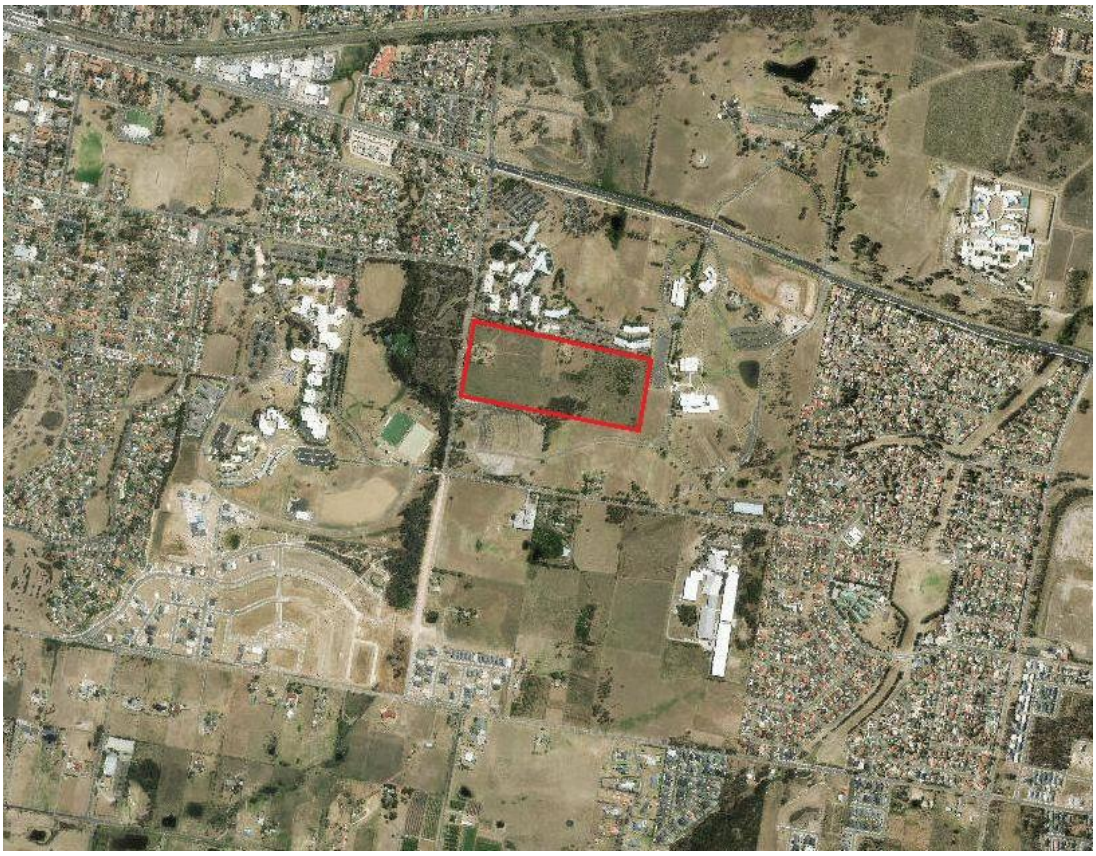

Figure 6 – Bushland connectivity in the local area

The subdivision proposal will see the loss of some vegetation within the subject site, however it will not further break any local vegetative connectivity attributes, nor further isolate any remnant patches of vegetation worthy of conservation for local fauna.

6.0 Conclusions

The proposed subdivision and future development of the subject site is (in its current form) likely to require the removal of approximately 0.1 ha of regrowth forest (which includes 7 remnant trees) that is commensurate with Cumberland Plain Woodland (CPW). As a result, approximately 0.54 ha of CPW will be retained and managed within a Native Bushland Reserve. In addition, 0.16 ha of CPW will be revegetated / planted within the Native Bushland Reserve This CPW vegetation is commensurate with the "*Cumberland Plain Woodland in the Sydney Basin Bioregion*" which is listed as a Critically Endangered Ecological Community (CEEC) within the NSW TSC Act (1995).

This Map Unit 10 (CPW) community is also indicative of "*Cumberland Plain Shale Woodlands and Shale Gravel Transition Forest*" which is also listed as a CEEC within the Commonwealth EPBC Act (1999). The vegetation however does not meet the criteria for classification under the EPBC Act listing (Figure 5), thus a referral to DoEE is not required for impacts upon a threatened ecological community.

The proposed development and establishment of a Native Bushland Reserve to be conserved, managed and improved via a Vegetation Management Plan will result in the retention of 84.3% of the existing patch of CPW vegetation. Replanting of 0.16 ha of CPW will be undertaken within the Native Bushland Reserve. This will result in 0.7 ha of CPW being retained or re-created within the subject site which is a net gain of 0.06 ha.

After completion the total area of CPW within the subject site will be 0.7 ha which is a 9.3% increase over the total original area of CPW within the site

It is considered that adequate mitigation measures are proposed to minimise the removal, and to augment areas of CPW within the subject site. This will result in a net gain of 0.06 ha of CPW at the completion of the proposal.

No threatened flora species have been observed during surveys with very limited likelihood given past land uses and isolation of the patch.

The proposed development is unlikely to further fragment or isolate local wildlife corridors or patches, provided that the CPW vegetation within the subject site is largely retained, and augmented by re-vegetated areas, all of which are to be managed and improved under a Vegetation Management Plan (VMP) (see Recommendations below).

Whilst fauna survey has not been undertaken, it is considered that the habitat attributes within the subject site do not provide any significant or unique habitat of breeding importance or central to the home range for any threatened fauna species. Remnant / Regrowth and planted vegetation may provide low key foraging value only.

The 7 part test of significance, which is included as Appendix 3, concludes that the proposal will not have a significant impact on threatened flora, threatened fauna, endangered populations or EECs. A Species Impact Statement is not required for the proposal. The proposal will not isolate or fragment vegetation or habitats, but it will place additional pressures on key threatening processes. Mitigation measures are discussed briefly in the recommendations section (6.1) and will be detailed in a Vegetation Management Plan.

There are no matters of National Environmental Significance (EPBC Act) that are being impacted and require separate assessment by DoEE.

The proposal appears to be suitable for the locality based on the assessment of ecological features, and the retention of the majority of remnant vegetation with proposed mitigation works and future revegetation / native landscaping.

6.1 Recommendations

To minimise adverse ecological impacts, the following mitigation measures are proposed:

1. The current development plan will retain 0.54 ha, and will require the removal of approximately 0.1 ha of CPW which is 15.6% of the total 0.64 ha of CPW within the subject site. The total CPW patch size within the subject site and on adjoining land to the south is approximately 9019m^2.
2. As discussed in the Pre-lodgement Meeting with Penrith Council: as much CPW vegetation as possible should be conserved within a Native Bushland Reserve to maintain this vegetation type within the locality and to provide, maintain and improve a “stepping stone” to other similar vegetation in the region.
3. A Vegetation Management Plan should be produced to specify in detail the location and extent of the proposed CPW Native Bushland Reserve and to specify strategies, methods and works required to maintain or improve the quality and diversity of the CPW remnant.
4. The Vegetation Management Plan shall specify the species, densities and locations of revegetation planting within the Native Bushland Reserve. This will be done to ensure the creation of the structure and diversity of Cumberland Plain Woodland.
5. The suggested Native Bushland Reserve should contain the majority of the CPW vegetation currently within the subject site. This recommended Native Bushland Reserve within the subject site would likely be supported by council.
6. Sediment and erosion control measures are required to minimise impact to local drainage lines.
7. Replacement landscaping throughout the whole of the proposed development shall use locally occurring (endemic) species including ground covers, shrubs and trees commensurate with Cumberland Plain Woodland to consolidate and preserve this Critically Endangered Ecological Community within the development and to increase the coverage and quality of CPW within the development.

Appendix 1
Flora Species List

Table A1.1 – Flora species recorded

Family	Scientific name	Common name
TREES		
Anacardiaceae	*Mangifera indica**	Mango Tree
Annonaceae	*Asimina triloba**	Paw Paw Tree
Betulaceae	*Corylus avellana**	Hazel Nut Tree
Casuarinaceae	*Casuarina cunninghamiana subsp. cunninghamiana*	River Oak
Juglandaceae	*Carya illinoensis**	Pecan
Lauraceae	*Cinnamomum camphora**	Camphor Laurel
Lauraceae	*Persea americana**	Avocado
Lythraceae	*Lagerstroemia indica** (Cultivar)	Crepe Myrtle
Meliaceae	*Melia azedarach*	White Cedar
Moraceae	*Ficus carica**	Fig Tree
Moraceae	*Morus alba**	Mulberry
Myrtaceae	*Eucalyptus amplifolia*	Cabbage Gum
Myrtaceae	*Eucalyptus moluccana*	Grey Box
Myrtaceae	*Eucalyptus tereticornis*	Forest Red Gum
Oleaceae	*Olea europaea* subsp. *cuspidata**	African Olive
Oleaceae	*Olea europaea* subsp. *europaea**	Common Olive Tree
Rutaceae	*Citrus limon** (Cultivar)	Lemon Tree
Rutaceae	*Citrus sinensis** (Cultivar)	Orange Tree
Rutaceae	*Citrus tangelo*	Tangelo
Rutaceae	*Citrus* x *paradisi** (Cultivar)	Grapefruit Tree
Salicaceae	*Populus alba**	White Poplar
SHRUBS		
Apocynaceae	*Nerium oleander**	Oleander Bush
Chenopodiaceae	*Atriplex semibaccata*	Creeping Saltbush
Malaceae	*Cotoneaster glaucophyllus**	Grey-leaved Cotoneaster
Malaceae	*Cotoneaster pannosus**	Cotoneaster (cultivar)
Malvaceae	*Hibiscus sp.* (Cultivar)	Hibiscus
Oleaceae	*Ligustrum lucidum**	Large-leaved Privet
Oleaceae	*Ligustrum sinense**	Small-leaved Privet
Pittosporaceae	*Bursaria spinosa subsp. spinosa*	Native Blackthorn
Rosaceae	*Rosa* sp. (cultivar)*	Rose
Rosaceae	*Rubus fruticosus sp. agg.**	Blackberry complex
Rubiaceae	*Opercularia diphylla*	-
Solanaceae	*Lycium ferocissimum**	African Boxthorn
Solanaceae	*Solanum sisymbriifolium**	-
GROUNDCOVERS		
Acanthaceae	*Brunoniella australis*	Blue Trumpet
Anthericaceae	*Arthropodium milleflorum*	Pale Vanilla Lily
Apiaceae	*Centella asiatica*	Swamp Pennywort
Apiaceae	*Foeniculum vulgare**	Fennel

Family	Scientific name	Common name
Asteraceae	*Bidens pilosa**	Cobbler's Pegs
Asteraceae	*Cirsium vulgare**	Spear Thistle
Asteraceae	*Conyza bonariensis**	Flax-leaf Fleabane
Asteraceae	*Conyza sumatrensis**	Tall Fleabane
Asteraceae	*Euchiton sphaericus*	-
Asteraceae	*Hypochaeris radicata**	Flatweed
Asteraceae	*Senecio madagascariensis**	Fireweed
Asteraceae	*Sigesbeckia orientalis subsp. orientalis*	Indian Weed
Asteraceae	*Sonchus oleraceus**	Common Sow-thistle
Asteraceae	*Taraxacum officinale**	Dandelion
Cactaceae	*Opuntia stricta**	Prickly Pear
Campanulaceae	*Wahlenbergia gracilis*	Australian Bluebell
Campanulaceae	*Wahlenbergia stricta* subsp. *stricta*	Austral Bluebell
Carophyllaceae	*Cerastium glomeratum**	Mouse-ear Chickweed
Chenopodiaceae	*Einadia hastata*	Berry Saltbush
Chenopodiaceae	*Einadia polygonoides*	-
Clusiaceae	*Hypericum gramineum*	Small St Johns Wort
Commelinaceae	*Commelina cyanea*	Scurvy Weed
Convolvulaceae	*Dichondra repens*	Kidney Weed
Cyperaceae	*Carex inversa*	Knob Sedge
Cyperaceae	*Cyperus brevifolius**	Mullumbimby Couch
Cyperaceae	*Cyperus eragrostis**	Umbrella Sedge
Cyperaceae	*Cyperus gracilis*	Slender Flat Sedge
Euphorbiaceae	*Phyllanthus virgatus*	-
Faboideae	*Trifolium repens**	White Clover
Gentianaceae	*Centaurium erythraea**	Common Centaury
Lobeliaceae	*Pratia purpurascens*	Whiteroot
Malvaceae	*Sida corrugata*	Corrugated Sida
Malvaceae	*Sida rhombifolia**	Paddy's Lucerne
Oxalidaceae	*Oxalis latifolia**	Pink Fishtail
Oxalidaceae	*Oxalis perrenans*	Yellow-flowered Wood Sorrel
Plantaginaceae	*Plantago debilis*	Slender Plantain
Plantaginaceae	*Plantago lanceolata**	Ribwort
Poaceae	*Aristida ramosa*	Purple Wiregrass
Poaceae	*Aristida vagans*	Three-awn Speargrass
Poaceae	*Axonopus fissifolius**	Narrow-leaved Carpet Grass
Poaceae	*Briza subaristata**	-
Poaceae	*Cymbopogon refractus*	Barbwire Grass
Poaceae	*Cynodon dactylon*	Common Couch
Poaceae	*Dichelachne micrantha*	Short-hair Plume Grass
Poaceae	*Ehrharta erecta**	Panic Veldtgrass
Poaceae	*Entolasia stricta*	Wiry Panic

Family	Scientific name	Common name
Poaceae	*Eragrostis brownii*	Brown's Lovegrass
Poaceae	*Eragrostis curvula**	African Lovegrass
Poaceae	*Eragrostis leptostachya*	Paddock Lovegrass
Poaceae	*Holcus spp.**	-
Poaceae	*Imperata cylindrica*	Blady Grass
Poaceae	*Microlaena stipoides*	Weeping Grass
Poaceae	*Paspalum dilatatum**	Paspalum
Poaceae	*Paspalum urvillei**	Vasey Grass
Poaceae	*Pennisetum clandestinum**	Kikuyu, Kikuyu Grass
Poaceae	*Poa labillardierei var. labillardierei*	Tussock Grass
Poaceae	*Rytidosperma tenuius*	Wallaby Grass
Poaceae	*Setaria parviflora**	Slender Pigeon Grass
Poaceae	*Setaria pumila**	Pale Pigeon Grass
Poaceae	*Sorghum halpense**	Johnson Grass
Poaceae	*Sporobolus africanus**	Parramatta Grass
Poaceae	*Sporobolus creber*	Slender Rat's Tail Grass
Poaceae	*Sporobolus elongatus*	Rat's Tail Grass
Poaceae	*Themeda triandra*	Kangaroo Grass
Primulaceae	*Anagallis arvensis**	Scarlet Pimpernel
Rosaceae	*Acaena ovina*	Acaena
Scrophulariaceae	*Veronica plebeia*	Creeping Speedwell
Solanaceae	*Solanum nigrum**	Black Nightshade
Solanaceae	*Solanum prinophyllum*	Forest Nightshade
Urticaceae	*Urtica incisa*	Stinging Nettle
Verbenaceae	*Verbena bonariensis**	Purpletop
Verbenaceae	*Verbena rigida var. rigida**	Veined Verbena
Violaceae	*Viola hederacea*	Ivy-leaved Violet
Asteraceae	*Xanthium spp.**	
CLIMBERS		
Asclepiadaceae	*Araujia sericifera**	Mothvine
Faboideae	*Desmodium varians*	Slender Tick-trefoil
Faboideae	*Glycine clandestina*	Twining Glycine
Faboideae	*Glycine tabacina*	Twining Glycine
Faboideae	*Vicia sativa* subsp. *sativa**	Common Vetch
Passifloraceae	*Passiflora herbertiana*	Native Passionfruit
Ranunculaceae	*Clematis aristata*	Old Man's Beard
* denotes exotic species		

It should be noted that not all exotic garden, orchard or landscape species have been identified as part of the assessment.

Appendix 2

Threatened Flora and Fauna Species Habitat Assessment

Table A2.1 – Threatened flora species habitat assessment

Scientific name DATABASE SOURCE	***TSC Act***	***EPBC Act***	**Growth form and habitat requirements**	**Recorded on site (✓)**	**If not recorded onsite**				**Considered in 7 part test of significance (✓) Refer to Appendix 3**
					Suitable habitat present (✓)	**Nearby and / or high number of record(s) (✓)** *Notes 1,2 & 3*	**Record(s) from recent years (✓)** *Notes 1,2 & 3*	**Potential to occur**	
Acacia bynoeana OEH EPBC	E1	V	Erect or spreading shrub to 0.3m high growing in heath and dry sclerophyll Open Forest on sandy soils. Often associated with disturbed areas such as roadsides. Distribution limits N-Newcastle S-Berrima.	x	x	-	-	x	x
Acacia pubescens OEH	V	V	Spreading shrub 1-4m high open sclerophyll growing in open forest and woodlands on clay soils. Distribution limits N-Bilpin S-Georges River.	x	✓	6.5km E (7)	✓	Very Unlikely	✓
Allocasuarina glareicola OEH EPBC	E1	E	Small shrub 1-2m high growing in open sclerophyll forest on lateritic soils derived from tertiary alluviums. Distribution limits Castlereagh NR region.	x	x	-	-	x	x
Asterolasia elegans EPBC	E1	E	Erect shrub 1-3m high growing in moist sclerophyll forests on Hawkesbury sandstone slopes hillsides. Distribution limits Maroota region.	x	x	-	-	x	x
Cryptostylis hunteriana EPBC	V	V	Saprophytic orchid. Grows in swamp heath on sandy soils. Distribution limits N-Gibraltar Range S-south of Eden.	x	x	-	-	x	x
Cynanchum elegans EPBC	E1	E	Climber or twiner to 1m. Grows in rainforest gullies, scrub & scree slopes. Distribution limits N-Gloucester S-Wollongong.	x	x	-	-	x	x
Dillwynia tenuifolia OEH	V	-	Erect shrub 0.6-1m high. Grows in Woodlands and Open Forest on sandstone shale or laterite. Distribution limits N-Howes Valley S-Cumberland Plain.	x	✓	2km E (397)	✓	Very unlikely	✓

Scientific name DATABASE SOURCE	***TSC Act***	***EPBC Act***	**Growth form and habitat requirements**	**Recorded on site (✓)**	**If not recorded onsite**				**Considered in 7 part test of significance (✓) Refer to Appendix 3**
					Suitable habitat present (✓)	**Nearby and / or high number of record(s) (✓)** *Notes 1,2 & 3*	**Record(s) from recent years (✓)** *Notes 1,2 & 3*	**Potential to occur**	
Eucalyptus aggregata EPBC	V	-	Small or medium sized tree to approximately 18m tall. Grows usually on alluvial soils, on cold, poorly-drained flats and hollows adjacent to creeks and small rivers. Higher altitude species. Distributed near to Blayney, Crookwell, Goulburn, Braidwood and Bungendore.	x	x	-	-	x	x
Eucalyptus benthamii OEH	V	V	Blue gum to 40m high. Wet forest on sandy alluvial soils. Distribution limits N-Yarramundi S-Bents Basin.	x	x	-	-	x	x
Genoplesium baueri EPBC	E1	E	A terrestrial orchid that grows in sparse sclerophyll forest and moss gardens over sandstone. Distribution limits N – Hunter Valley S – Nowra	x	x	-	-	x	x
Grevillea juniperina subsp. *juniperina* OEH	V	-	Erect to spreading shrub 0.5-1.5m tall. Grows on laterite and Tertiary alluvium. Distribution limits St Marys-Londonderry-Prospect.	x	✓	Lots all round (1174)	✓	Low	✓
Grevillea parviflora subsp. *parviflora* OEH EPBC	V	V	Open to erect shrub to 1m. Grows in woodland on light clayey soils Distribution limits N-Cessnock S-Appin.	x	✓	6.5 km SE (1)	x	Very unlikely	✓
Haloragis exalata subsp. *exalata* EPBC	V	V	Shrub to 1.5m high. Grows in damp places near watercourses. Distribution limits N-Tweed Heads S-south of Eden.	x	x	-	-	x	x
Hypsela sessiliflora OEH	E1	Ext.	Prostrate herb, rooting at nodes, growing in damp places on the Cumberland Plain.	x	x	-	-	x	x
Leucopogon fletcheri subsp. *fletcheri* OEH	E1	-	Shrub to 1.8m high growing in woodland on lateritic soils. Distribution limits N-St Albans S-Springwood.	x	x	-	-	x	x

Scientific name DATABASE SOURCE	***TSC Act***	***EPBC Act***	**Growth form and habitat requirements**	**Recorded on site (✓)**	**If not recorded onsite**				**Considered in 7 part test of significance (✓) Refer to Appendix 3**
					Suitable habitat present (✓)	**Nearby and / or high number of record(s) (✓)** *Notes 1,2 & 3*	**Record(s) from recent years (✓)** *Notes 1,2 & 3*	**Potential to occur**	
Melaleuca deanei EPBC	V	V	Shrub to 3m high. Grows in heath on sandstone. Distribution limits N-Gosford S-Nowra.	x	x	-	-	x	x
Micromyrtus minutiflora OEH EPBC	E1	V	Spreading shrub to 2m high. Grows in dry sclerophyll forest dominated by Scribbly gums and Ironbarks on Tertiary Alluviums. Distribution limits Western part of Cumberland Plain.	x	x	-	-	x	x
Pelargonium sp. *Striatellum* EPBC	E1	E	Herb to 90cm tall which grows in damp places especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance. Varied distribution from SE NSW to QLD.	x	x	-	-	x	x
Persoonia hirsuta OEH	E1	E	Erect to decumbent shrub. Grows in dry sclerophyll forest and woodland on Hawkesbury sandstone with infrequent fire histories. Distribution limits N-Glen Davis S-Hill Top.	x	x	-	-	x	x
Persoonia nutans OEH EPBC	E1	E	Erect to spreading shrub. Grows in dry sclerophyll forest and woodland on laterite and alluvial sands. Distribution limits Cumberland Plain.	x	x	-	-	x	x
Pimelea curviflora var. *curviflora* OEH EPBC	V	V	Woody herb or sub-shrub to 0.2-1.2m high. Grows on Hawkesbury sandstone near shale outcrops. Distribution Sydney.	x	x	-	-	x	x
Pimelea spicata OEH EPBC	E1	E	Decumbent or erect shrub to 0.5m high. Occurs principally in woodland on soils derived from Wianamatta Shales. Distribution limits N-Lansdowne S-Shellharbour.	x	✓	3km N (8)	✓	Low	✓

Scientific name DATABASE SOURCE	***TSC Act***	***EPBC Act***	**Growth form and habitat requirements**	**Recorded on site (✓)**	**If not recorded onsite**				**Considered in 7 part test of significance (✓) Refer to Appendix 3**
					Suitable habitat present (✓)	**Nearby and / or high number of record(s) (✓)** *Notes 1,2 & 3*	**Record(s) from recent years (✓)** *Notes 1,2 & 3*	**Potential to occur**	
Pomaderris brunnea EPBC	V	V	Shrub to 3m high. Confined to Upper Nepean and Colo Rivers where it grows in open forest.	x	x	-	-	x	x
Pterostylis gibbosa EPBC	E1	E	Terrestrial orchid which occurs near Wollongong and in Hunter Valley in sclerophyll forest, sometimes with paperbarks.	x	x	-	-	x	x
Pterostylis saxicola OEH EPBC	E1	E	Terrestrial orchid. Grows in shallow sandy soil above rock shelves, usually near Wianamatta / Hawkesbury transition. Distribution limits N-Hawkesbury River S-Campbelltown.	x	x	-	-	x	x
Pultenaea glabra EPBC	V	V	Erect shrub. Grows in moist, sheltered section of dry sclerophyll forest on sandstone in Higher Blue Mountains and Glen Davis areas.	x	x	-	-	x	x
Pultenaea parviflora OEH EPBC	E1	V	Erect shrub. Grows in dry sclerophyll forest at the intergrade between Tertiary Alluviums and Wianamatta Shales. Distribution limits Cumberland Plain.	x	✓	2.5km all round (374)	✓	Low	✓
Rhizanthella slateri EPBC	V	E	Underground orchid that is poorly known. Grows in sclerophyll forests. Usually only seen if the soil is disturbed. Flowers in Oct – Nov.	x	x	-	-	x	x
Thelymitra sp. 'Kangaloon' *(Thelymitra kangaloonica)* EPBC	CE	CE	A terrestrial orchid with dark blue flowers, presented in mid-late spring. Only known from the Robertson area in the Southern Highlands. Often in association with the endangered ecological community *Temperate Highland Peat Swamps on Sandstone.*	x	x	-	-	x	x

Scientific name DATABASE SOURCE	***TSC Act***	***EPBC Act***	**Growth form and habitat requirements**	**Recorded on site (✓)**	**If not recorded onsite**				**Considered in 7 part test of significance (✓) Refer to Appendix 3**
					Suitable habitat present (✓)	**Nearby and / or high number of record(s) (✓)** *Notes 1,2 & 3*	**Record(s) from recent years (✓)** *Notes 1,2 & 3*	**Potential to occur**	
Thesium australe EPBC	V	V	Erect herb to 0.4m high. Root parasite. Themeda grassland or woodland often damp. Distribution limits N-Tweed Heads S-south of Eden.	x	x	-	-	x	x

OEH	- Denotes species listed within 10km of the subject site on the *Atlas of NSW Wildlife*
EPBC	- Denotes species listed within 10km of the subject site in the *EPBC Act* habitat search
V	- Denotes vulnerable listed species under the relevant Act
E or E1	- Denotes endangered listed species under the relevant Act
CE	- Denotes critically endangered listed species under the relevant Act
NOTE:	1. This field is not considered if no suitable habitat is present within the subject site 2. 'records' refer to those provided by the *Atlas of NSW Wildlife* 3. 'nearby' or 'recent' records are species specific accounting for home range, dispersal ability and life cycle

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Table A2.2 – Threatened fauna species habitat assessment

Common name ***Scientific name*** DATABASE SOURCE	TSC Act	EPBC Act	Preferred habitat ***Distribution limit***	If not recorded on-site				Considered in 7 part test (✓) (Refer to Appendix 3)
				Suitable habitat present (✓)	Nearby and/or high number of record(s) (✓) *Notes 1,2 & 3*	Record(s) from recent years (✓) *Notes 1,2 & 3*	Potential to occur	
Giant Burrowing Frog *Heleioporus australiacus* OEH EPBC	V	V	Inhabits open forests and riparian forests along non-perennial streams, digging burrows into sandy creek banks. *Distribution Limit: N-Near Singleton S-South of Eden.*	x	-	-	x	x
Red-crowned Toadlet *Pseudophryne australis* OEH	V	-	Prefers sandstone areas, breeds in grass and debris beside non-perennial creeks or gutters. Individuals can also be found under logs and rocks in non-breeding periods. *Distribution Limit: N-Pokolbin. S-near Wollongong.*	x	-	-	x	x
Green and Golden Bell Frog *Litoria aurea* OEH EPBC	E	V	Prefers the edges of permanent water, streams, swamps, creeks, lagoons, farm dams and ornamental ponds. Often found under debris. *Distribution Limit: N-Byron Bay S-South of Eden.*	x	-	-	x	x
Littlejohn's Tree Frog *Litoria littlejohnii* EPBC	V	V	Found in wet and dry sclerophyll forest associated with sandstone outcrops at altitudes 280-1,000m on eastern slopes of Great Dividing Range. Prefers flowing rocky streams. *Distribution Limit: N-Hunter River S-Eden.*	x	-	-	x	x
Broad-headed Snake *Hoplocephalus bungaroides* EPBC	E	V	Sandstone outcrops, exfoliated rock slabs and tree hollows in coastal and near coastal areas. *Distribution Limit: N-Mudgee Park. S-Nowra.*	x	-	-	x	x

Common name *Scientific name* DATABASE SOURCE	TSC Act	EPBC Act	Preferred habitat *Distribution limit*	If not recorded on-site				Considered in 7 part test (✓) (Refer to Appendix 3)
				Suitable habitat present (✓)	Nearby and/or high number of record(s) (✓) *Notes 1,2 & 3*	Record(s) from recent years (✓) *Notes 1,2 & 3*	Potential to occur	
Freckled Duck *Stictonetta naevosa* OEH	V	-	Occurs mainly within the Murray-Darling basin and the channel country within large cool temperate to sub-tropical swamps, lakes and floodwaters with cumbungi, lignum or melaleucas. *Distribution Limit: N- Tenterfield. S-Albury.*	x	-	-	x	x
Black-necked Stork *Ephippiorhynchus asiaticus* OEH	E	-	Occurs in tropical to warm temperate terrestrial wetlands, estuarine and littoral habitats such as mangroves, tidal mudflats, floodplains, open woodlands, irrigated lands, bore drains, sub-artesian pools, farm dams and sewerage ponds. *Distribution Limit: N-Tweed Heads. S-Nowra.*	x	-	-	x	x
Australasian Bittern *Botaurus poiciloptilus* OEH EPBC	E	E	Found in or over water of shallow freshwater or brackish wetlands with tall reedbeds, sedges, rushes, cumbungi, lignum and also in ricefields, drains in tussocky paddocks, occasionally saltmarsh, brackish wetlands. *Distribution Limit: N-North of Lismore. S- Eden.*	x	-	-	x	x
Black Bittern *Ixobrychus flavicollis* OEH	V	-	Found in shadowy, leafy waterside trees such as callistemons, casuarinas, paperbarks, eucalypts, mangroves and willows along tidal creeks, freshwater and brackish streams and ponds, sheltered mudflats and oyster slats. *Distribution Limit: N-Tweed Heads. S-South of Eden.*	x	-	-	x	x

Common name *Scientific name* DATABASE SOURCE	TSC Act	EPBC Act	Preferred habitat *Distribution limit*	If not recorded on-site				Considered in 7 part test (✓) (Refer to Appendix 3)
				Suitable habitat present (✓)	Nearby and/or high number of record(s) (✓) *Notes 1,2 & 3*	Record(s) from recent years (✓) *Notes 1,2 & 3*	Potential to occur	
Spotted Harrier *Circus assimilis* OEH	V	-	Utilises grassy plains, crops and stubblefields; saltbush, spinifex associations; scrublands, mallee, heathlands; open grassy woodlands. *Distribution Limit: N-Tweed Heads. S-South of Eden.*	✓	x	x	unlikely	✓
White-bellied Sea-eagle	V	-	distributed around the Australian coastline, including Tasmania, and well inland along rivers and wetlands of the Murray Darling Basin.	x	-	-	x	x
Little Eagle *Hieraaetus morphnoides* OEH	V	-	Utilises plains, foothills, open forests, woodlands and scrublands; river red gums on watercourses and lakes. *Distribution Limit - N-Tweed Heads. S-South of Eden.*	✓	x	✓	low	✓
Square-tailed Kite *Lophoictinia isura* OEH	V	-	Utilises mostly coastal and sub-coastal open forest, woodland or lightly timbered habitats and inland habitats along watercourses and mallee that are rich in passerine birds. *Distribution Limit: N-Goondiwindi. S-South of Eden.*	✓	x	x	low	✓
Black Falcon *Falco subniger* OEH	V	-	Inhabits plains, grasslands, foothills, timbered watercourses, wetland environs, crops; occasionally over towns and cities. *N-Tweed Heads. S-South of Eden*	✓	x	x	Not likely	x
Bush Stone-curlew *Burhinus grallarius* OEH	E	-	Utilises open forests and savannah woodlands, sometimes dune scrub, savannah and mangrove fringes. *Distribution Limit: N-Border Ranges National Park. S-Near Nowra.*	marginal	x	x	Not likely	x

Common name ***Scientific name*** DATABASE SOURCE	TSC Act	EPBC Act	Preferred habitat ***Distribution limit***	If not recorded on-site				Considered in 7 part test (✓) (Refer to Appendix 3)
				Suitable habitat present (✓)	Nearby and/or high number of record(s) (✓) *Notes 1,2 & 3*	Record(s) from recent years (✓) *Notes 1,2 & 3*	Potential to occur	
Australian Painted Snipe *Rostratula australis* EPBC	E	E	Most numerous within the Murray-Darling basin and inland Australia within marshes and freshwater wetlands with swampy vegetation. *Distribution Limit: N-Tweed Heads. S-South of Eden.*	x	-	-	x	x
Black-tailed Godwit *Limosa limosa* OEH	V	-	Regular summer migrant that forages along tidal mudflats, estuaries, sandspits, shallow river margins, sewerage ponds, inland on large shallow frsh or brackish waters. *Distribution Limit: N-Tweed Heads. S-South of Eden*.	x	-	-	x	x
Gang-gang Cockatoo *Callocephalon fimbriatum* OEH	V	-	Prefers wetter forests and woodlands from sea level to > 2,000m on the Great Dividing Range, timbered foothills and valleys, timbered watercourses, coastal scrubs, farmlands and suburban gardens. *Distribution Limit: mid north coast of NSW to western Victoria.*	x	-	-	x	x
Glossy Black-Cockatoo *Calyptorhynchus lathami* OEH	V	-	Open forests with *Allocasuarina* species and hollows for nesting. *Distribution Limit: N-Tweed Heads. S-South of Eden.*	x	-	-	x	x
Little Lorikeet *Glossopsitta pusilla* OEH	V	-	Inhabits forests, woodlands; large trees in open country; timbered watercourses, shelterbeds, and street trees. *Distribution Limit: N-Tweed Heads. S-South of Eden*.	✓	x	✓	unlikely	✓

Common name ***Scientific name*** DATABASE SOURCE	TSC Act	EPBC Act	Preferred habitat ***Distribution limit***	If not recorded on-site				Considered in 7 part test (✓) (Refer to Appendix 3)
				Suitable habitat present (✓)	Nearby and/or high number of record(s) (✓) *Notes 1,2 & 3*	Record(s) from recent years (✓) *Notes 1,2 & 3*	Potential to occur	
Swift Parrot *Lathamus discolour* OEH EPBC	E	E	Inhabits eucalypt forests and woodlands with winter flowering eucalypts. *Distribution Limit: N-Border Ranges National Park. S-South of Eden*.	✓	✓	✓	✓	✓
Turquoise Parrot *Neophema pulchella* OEH	V	-	Inhabits coastal scrubland, open forest and timbered grassland, especially ecotones between dry hardwood forests and grasslands. *Distribution Limit: N-Near Tenterfield. S-South of Eden.*	✓	x	x	Not likely	x
Barking Owl *Ninox connivens* OEH	V	-	Inhabits principally woodlands but also open forests and partially cleared land and utilises hollows for nesting. *Distribution Limits: N-Border Ranges National Park. S-Eden.*	marginal	x	x	Not likely	x
Powerful Owl *Ninox strenua* OEH	V	-	Forests containing mature trees for shelter or breeding and densely vegetated gullies for roosting. *Distribution Limits: N-Border Ranges National Park. S-Eden.*	marginal	x	✓	Not likely	x
Masked Owl *Tyto novaehollandiae* OEH	V	-	Open forest and woodlands with cleared areas for hunting and hollow trees or dense vegetation for roosting. *Distribution Limit: N-Border Ranges National Park. S-Eden.*	marginal	x	x	Not likely	x
Sooty Owl *Tyto tenebricosa* OEH	V	-	Tall, dense, wet forests containing trees with very large hollows. *Distribution Limit: N-Border Ranges National Park. S-South of Eden.*	x	-	-	x	x

Common name ***Scientific name*** DATABASE SOURCE	TSC Act	EPBC Act	Preferred habitat ***Distribution limit***	If not recorded on-site				Considered in 7 part test (✓) (Refer to Appendix 3)
				Suitable habitat present (✓)	Nearby and/or high number of record(s) (✓) *Notes 1,2 & 3*	Record(s) from recent years (✓) *Notes 1,2 & 3*	Potential to occur	
Speckled Warbler *Chthonicola sagittata* OEH	V	-	Found in temperate eucalypt woodland and open forest including forest edges, wooded farmland and urban areas with mature eucalypts. *Distribution Limit: N-Urbanville. S-Eden.*	✓	x	✓	unlikely	✓
Regent Honeyeater *Xanthomyza phrygia* OEH EPBC	E4A	CE	Found in temperate eucalypt woodland and open forest including forest edges, wooded farmland and urban areas with mature eucalypts. *Distribution Limit: N-Urbanville. S-Eden.*	✓	x	x	Not likely	x
Painted Honeyeater *Grantiella picta* OEH EPBC	V	V	A nomadic bird occurring in low densities within open forest, woodland and scrubland feeding on mistletoe fruits. Inhabits primarily Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. *Distribution Limit: N-Boggabilla. S-Albury with greatest occurrences on the inland slopes of the Great Dividing Range.*	✓	x	x	Not likely	x
Black-chinned Honeyeater *Melithreptus gularis gularis* OEH	V	-	Found in woodlands containing box-ironbark associations and River Red Gums, also drier coastal woodlands of the Cumberland Plain and Hunter Richmond and Clarence. *Distribution Limit: N-Cape York Pen. Qld. S-Victor H. Mt Lofty Ra & Flinders Ra. SA.*	✓	x	x	Not likely	x
Varied Sittella *Daphoenositta chrysoptera* OEH	V	-	Open eucalypt woodlands / forests (except heavier rainforests); mallee, inland acacia, coastal tea-tree scrubs; golf courses, shelterbelts, orchards, parks, scrubby gardens. *Distribution Limit: N-Border Ranges National Park. S-South of Eden*.	✓	x	✓	unlikely	✓

Common name ***Scientific name*** DATABASE SOURCE	TSC Act	EPBC Act	Preferred habitat ***Distribution limit***	If not recorded on-site				Considered in 7 part test (✓) (Refer to Appendix 3)
				Suitable habitat present (✓)	Nearby and/or high number of record(s) (✓) *Notes 1,2 & 3*	Record(s) from recent years (✓) *Notes 1,2 & 3*	Potential to occur	
Dusky Woodswallow *Artamus cyanopterus cyanopterus* OEH	V	-	Found in woodlands and dry open sclerophyll forests, usually dominated by eucalypts, including mallee associations. It has also been recorded in shrublands and heathlands and various modified habitats, including regenerating forests; very occasionally in moist forests or rainforests. Prefers habitat with an open understorey. Often observed in farmland tree patches or roadside remnants. *Widespread in eastern, southern and southwestern Australia.*	✓	1km SW	2005	Likely	✓
Hooded Robin *Melanodryas cucullata cucullata* OEH	V	-	Found in Eucalypt woodlands, *Acacia* scrubland, open forest, and open areas adjoining large woodland blocks, with areas of dead timber. *Distribution Limit: N-Central Qld. S-Spencer Gulf SA.*	marginal	x	x	Not likely	x
Scarlet Robin *Petroica boodang* OEH	V	-	Found in foothill forests, woodlands, watercourses; in autumn-winter, more open habitats: river red gum woodlands, golf courses, parks, orchards, gardens. *Distribution Limit: N-Tweed Heads. S-South of Eden.*	Sub-optimal	x	x	Not likely	x
Flame Robin *Petroica phoenicea* OEH	V	-	Summer: forests, woodlands, scrubs, from sea-level to *c.* 1800 m. Autumn-winter: open woodlands, plains, paddocks, golf courses, parks, orchards. *Distribution Limit: N northern NSW tablelands. S-South of Eden.*	Sub-optimal	x	x	Not likely	x

Common name ***Scientific name*** DATABASE SOURCE	TSC Act	EPBC Act	Preferred habitat ***Distribution limit***	If not recorded on-site				Considered in 7 part test (✓) (Refer to Appendix 3)
				Suitable habitat present (✓)	Nearby and/or high number of record(s) (✓) *Notes 1,2 & 3*	Record(s) from recent years (✓) *Notes 1,2 & 3*	Potential to occur	
Pink Robin *Petroica rodinogaster* OEH	V	-	Found in dense gullies, rainforests and open forests, dispersing into drier more open habitats in winter. *Distribution Limit: N-Sydney. S-South of Eden.*	x	-	-	x	x
Diamond Firetail *Stagonopleura guttata* OEH	V	-	Found in Eucalypt woodlands, forests and mallee where there is grassy understorey west of the Great Div. also drier coastal woodlands of the Cumberland Plain and Hunter Richmond and Clarence River Valleys. *Distribution Limit: N-Rockhampton Q. S-Eyre Pen Kangaroo Is. SA.*	✓	x	✓	unlikely	✓
Spotted-tailed Quoll *Dasyurus maculatus* OEH EPBC	V	E	Dry and moist open forests containing rock caves, hollow logs or trees. *Distribution Limit: N-Mt Warning National Park. S-South of Eden.*	x	-	-	x	x
Brush-tailed Phascogale *Phascogale tapoatafa* OEH	V	-	A largely arboreal mammal of open forests and woodlands using hollows as nesting in hollow bearing trees. *Distribution Limit: N-Border Ranges National Park. S-Eden.*	x	-	-	x	x
Koala *Phascolarctos cinereus* OEH EPBC	V	V	Inhabits both wet and dry eucalypt forest on high nutrient soils containing preferred feed trees. *Distribution Limit: N-Tweed Heads. S-South of Eden.*	x	-	-	x	x

Common name ***Scientific name*** DATABASE SOURCE	TSC Act	EPBC Act	Preferred habitat ***Distribution limit***	If not recorded on-site				Considered in 7 part test (✓) (Refer to Appendix 3)
				Suitable habitat present (✓)	Nearby and/or high number of record(s) (✓) *Notes 1,2 & 3*	Record(s) from recent years (✓) *Notes 1,2 & 3*	Potential to occur	
Eastern Pygmy Possum *Cercatetus nanus* OEH	V	-	Found in a variety of habitats from rainforest through open forest to heath. Feeds on insects but also gathers pollen from banksias, eucalypts and bottlebrushes. Nests in banksias and myrtaceous shrubs. *Distribution Limit: N-Tweed Heads. S-Eden.*	x	-	-	x	x
Yellow-bellied Glider *Petaurus australis* OEH	V	-	Tall mature eucalypt forests with high nectar producing species and hollow bearing trees. *Distribution Limit- N-Border Ranges National Park. S-South of Eden*.	x	-	-	x	x
Squirrel Glider *Petaurus norfolcensis* OEH	V	-	Mixed aged stands of eucalypt forest & woodlands including gum barked & high nectar producing species & hollow bearing trees. *Distribution Limit: N-Tweed Heads. S-Albury.*	x	-	-	x	x
Greater Glider *Petauroides volans* EPBC	-	V	Favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species. Population density is optimal at elevation levels at 845 m above sea level. Prefer overstorey basal areas in old-growth tree stands. Highest abundance typically in taller, montane, moist eucalypt forests, with relatively old trees and abundant hollows *Distribution Limit: N-Border Ranges National Park. S- South of Eden.*	x	-	-	x	x

Common name ***Scientific name*** DATABASE SOURCE	TSC Act	EPBC Act	Preferred habitat ***Distribution limit***	If not recorded on-site				Considered in 7 part test (✓) (Refer to Appendix 3)
				Suitable habitat present (✓)	Nearby and/or high number of record(s) (✓) *Notes 1,2 & 3*	Record(s) from recent years (✓) *Notes 1,2 & 3*	Potential to occur	
Brush-tailed Rock-wallaby *Petrogale penicillata* EPBC	E	V	Found in rocky gorges with a vegetation of rainforest or open forests to isolated rocky outcrops in semi-arid woodland country. *Distribution Limit: N-North of Tenterfield. S-Bombala.*	x	-	-	x	x
Grey-headed Flying-fox *Pteropus poliocephalus* OEH EPBC	V	V	Found in a variety of habitats including rainforest, mangroves, paperbark swamp, wet and dry open forest and cultivated areas. Forms camps commonly found in gullies and in vegetation with a dense canopy. *Distribution Limit: N-Tweed Heads. S-Eden.*	✓	✓	✓	✓	✓
Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris* OEH	V	-	Rainforests, sclerophyll forests and woodlands. *Distribution Limit: N-North of Walgett. S-Sydney.*	✓	x	✓	low	✓
East-coast Freetail Bat *Micronomus norfolkensis* OEH	V	-	Inhabits open forests and woodlands foraging above the canopy and along the edge of forests. Roosts in tree hollows, under bark and buildings. *Distribution Limit: N-Woodenbong. S-Pambula.*	✓	✓	✓	✓	✓
Large-eared Pied Bat *Chalinolobus dwyeri* OEH EPBC	V	V	Warm-temperate to subtropical dry sclerophyll forest and woodland. Roosts in caves, tunnels and tree hollows in colonies of up to 30 animals. *Distribution Limit: N-Border Ranges National Park. S-Wollongong.*	x	-	-	x	x

Common name ***Scientific name*** DATABASE SOURCE	TSC Act	EPBC Act	Preferred habitat ***Distribution limit***	If not recorded on-site				Considered in 7 part test (✓) (Refer to Appendix 3)
				Suitable habitat present (✓)	Nearby and/or high number of record(s) (✓) *Notes 1,2 & 3*	Record(s) from recent years (✓) *Notes 1,2 & 3*	Potential to occur	
Eastern Falsistrelle *Falsistrellus tasmaniensis* OEH	V	-	Recorded roosting in caves, old buildings and tree hollows. *Distribution Limit: N-Border Ranges National Park. S-Pambula.*	✓	✓	✓	✓	✓
Little Bentwing-bat *Miniopterus australis* OEH	V	-	Roosts in caves, old buildings and structures in the higher rainfall forests along the south coast of Australia. *Distribution Limit: N-Border Ranges National Park. S-Sydney.*	✓	x	✓	✓	✓
Eastern Bentwing-bat *Miniopterus orianae oceansis* OEH	V	-	Prefers areas where there are caves, old mines, old buildings, stormwater drains and well-timbered areas. *Distribution Limit: N-Border Ranges National Park. S-South of Eden.*	✓	✓	✓	✓	✓
Large-footed Myotis *Myotis macropus* OEH	V	-	Roosts in caves, mines, tunnels, buildings, tree hollows and under bridges. Forages over open water. *Distribution limits: N-Border Ranges National Park. S-South of Eden.*	x	-	-	x	x
Greater Broad-nosed Bat *Scoteanax rueppellii* OEH	V	-	Inhabits areas containing moist river and creek systems, especially tree lined creeks. *Distribution Limit: N-Border Ranges National Park. S-Pambula.*	✓	x	✓	low	✓

Common name ***Scientific name*** DATABASE SOURCE	TSC Act	EPBC Act	Preferred habitat ***Distribution limit***	If not recorded on-site				Considered in 7 part test (✓) (Refer to Appendix 3)
				Suitable habitat present (✓)	Nearby and/or high number of record(s) (✓) *Notes 1,2 & 3*	Record(s) from recent years (✓) *Notes 1,2 & 3*	Potential to occur	
New Holland Mouse *Pseudomys novaehollandiae* EPBC	-	V	Occurs in heathlands, woodlands, open forest and paperbark swamps and on sandy, loamy or rocky soils. Coastal populations have a marked preference for sandy substrates, a heathy understorey of leguminous shrubs less than 1m high and sparse ground litter. Recolonise of regenerating burnt areas. *Distribution Limit: N-Border Ranges National Park. S-South of Eden.*	x	-	-	x	x
Giant Dragonfly *Petalura gigantean* OEH	E	-	Inhabits large relatively deep permanent swamps and bogs with high water quality and moss or other soft vegetation along the edge for egg laying. *It occurs in the far NE NSW, south to Kempsey, & in a patch between Gosford & Nowra.*	x	-	-	x	x
Dural Woodland Snail *Pommerhelix duralensis* EPBC	-	E	Occurs on shale-sandstone transitional landscapes The species is found within the Local Government Areas of Blue Mountains City, Penrith City, The Hills Shire, Wollondilly Shire, Hornsby Shire and Parramatta City. The species has a strong affinity for communities in the interface region between shale-derived and sandstone-derived soils, with forested habitats that have good native cover and woody debris. It favours sheltering under rocks or inside curled-up bark. It does not burrow nor climb. The species has also been observed resting in exposed areas, such as on exposed rock or leaf litter, however it will also shelter beneath leaves, rocks and light woody debris.	x	-	-	x	x

Common name *Scientific name* DATABASE SOURCE	TSC Act	EPBC Act	Preferred habitat *Distribution limit*	If not recorded on-site				Considered in 7 part test (✓) (Refer to Appendix 3)
				Suitable habitat present (✓)	Nearby and/or high number of record(s) (✓) *Notes 1,2 & 3*	Record(s) from recent years (✓) *Notes 1,2 & 3*	Potential to occur	
Cumberland Plain Land Snail *Meridolum corneovirens* OEH	E	-	Inhabits remnant eucalypt woodland of the Cumberland Plan. Shelters under logs, debris, clumps of grass, around base of trees and burrowing into loose soil. *Distribution Limit: Cumberland Plain of Sydney Basin Region.*	poor	✓	x	unlikely	✓
Macquarie Perch *Macquaria australasica* EPBC	V (FM Act 1994)	E	Occurs in south east Australia at moderate to high altitudes in rivers and reservoirs. Historical records show the species was widespread and abundant in the upper reaches of the Lachlan, Murrumbidgee and Murray Rivers and their tributaries. Allen (1989) states that introduced populations are present in Nepean River and water supply dams in the Sydney area. Occurs in lakes and flowing streams, usually in deep holes.	x	-	-	x	x
Australian Greyling *Prototroctes maraena* EPBC	Part 2, Section 19 – Protected Fish (FM Act 1994)	V	Clear, moderate to fast flowing water in the upper reaches of rivers (sometimes to altitudes above 1,000m). Typically found in gravel bottom pools. Often forming aggregations below barriers to upstream movement (e.g. weirs, waterfalls).	x	-	-	x	x

OEH	-	Denotes species listed within 10km of the subject site on the *Atlas of NSW Wildlife*
EPBC	-	Denotes species listed within 10km of the subject site in the *EPBC Act* habitat search
V	-	Denotes vulnerable listed species under the relevant Act
E	-	Denotes endangered listed species under the relevant Act
NOTE:	1.	This field is not considered if no suitable habitat is present within the subject site
	2.	'records' refer to those provided by the *Atlas of NSW Wildlife*
	3.	'nearby' or 'recent' records are species specific accounting for home range, dispersal ability and life cycle

A detailed assessment in accordance with Section 5A of the *EPA Act* will be completed for these species in Appendix 3 of this report.

Table A2.3 provides an assessment of potential habitat within the subject site for nationally *protected* migratory fauna species recorded within 10km on the *EPBC Act* Protected Matters Tool. Nationally *threatened* migratory species are considered in Table A2.3.

Table A2.3 – Migratory fauna habitat assessment

Common name ***Scientific name***	**Preferred habitat** ***Migratory breeding***	**Suitable habitat present (✓)**	**Comments on potential impacts**
Oriental or Horsfield's Cuckoo (*Cuculus optatus*)	It mainly inhabits forests, occurring in coniferous, deciduous and mixed forest. It feeds mainly on insects and their larvae, foraging for them in trees and bushes as well as on the ground.	×	-
White-bellied Sea Eagle (*Haliaeetus leucogaster*)	Coasts, islands, estuaries, inlets, large rivers, inland lakes, reservoirs. *Sedentary; dispersive.*	×	-
White-throated Needletail (*Hirundapus caudacutus*)	Airspace over forests, woodlands, farmlands, plains, lakes, coasts, towns; companies forage often along favoured hilltops and timbered ranges. *Breeds Siberia, Himalayas, east to Japan. Summer migrant to eastern Australia.*	✓	No likely impact
Rainbow Bee-eater (*Merops ornatus*)	Open woodlands with sandy, loamy soil; sandridges, sandspits, riverbanks, road cuttings, beaches, dunes, cliffs, mangroves, rainforest, woodlands, golf courses. *Breeding resident in northern Australia. Summer breeding migrant to south east and south west Australia.*	×	-
Black-faced Monarch (*Monarcha melanopsis*)	Rainforests, eucalypt woodlands; coastal scrubs; damp gullies in rainforest, eucalypt forest; more open woodland when migrating. *Summer breeding migrant to coastal south east Australia, otherwise uncommon*.	×	-
Spectacled Monarch (*Monarcha trivirgatus*)	Understorey of mountain / lowland rainforest, thickly wooded gullies, waterside vegetation, mostly well below canopy. *Summer breeding migrant to south-east Qld and north-east NSW down to Port Stephens from Sept/Oct to May. Uncommon in southern part of range.*	×	-
Yellow Wagtail (*Motacilla flava*)	The yellow wagtail typically forages in damp grassland and on relatively bare open ground at edges of rivers, lakes and wetlands, but also feeds in dry grassland and in fields of cereal crops.	×	-
Satin Flycatcher (*Myiagra cyanoleuca*)	Heavily vegetated gullies in forests, taller woodlands, usually above shrub-layer; during migration, coastal forests, woodlands, mangroves, trees in open country, gardens. *Breeds mostly south east Australia and Tasmania over warmer months, winters in north east Qld.*	×	-
Rufous Fantail (*Rhipidura rufifrons*)	Undergrowth of rainforests / wetter eucalypt forests / gullies; monsoon forests, paperbarks, sub-inland and coastal scrubs; mangroves, watercourses; parks, gardens. On migration, farms, streets buildings. *Breeding migrant to south east Australia over warmer months. Altitudinal migrant in north east NSW in mountain forests during warmer months.*	✓	Removal of low potential foraging trees. No likely significant impact.

Common name *Scientific name*	Preferred habitat *Migratory breeding*	Suitable habitat present (✓)	Comments on potential impacts
Great Egret (*Ardea alba*)	Shallows of rivers, estuaries; tidal mudflats, freshwater wetlands; sewerage ponds, irrigation areas, larger dams, etc. *Dispersive; cosmopolitan.*	×	-
Cattle Egret (*Ardea ibis*)	Stock paddocks, pastures, croplands, garbage tips, wetlands, tidal mudflats, drains. *Breeds in summer in warmer parts of range including NSW*.	✓	No potential breeding habitat present and foraging habitat is otherwise well represented in the locality.
Latham's Snipe (*Gallinago hardwickii*)	Soft wet ground or shallow water with tussocks and other green or dead growth; wet parts of paddocks; seepage below dams; irrigated areas; scrub or open woodland from sea-level to alpine bogs over 2,000m; samphire on saltmarshes; mangrove fringes. *Breeds Japan. Regular summer migrant to Australia. Some overwinter.*	×	-
Osprey (*Pandion haliaetus*)	Favours coastal areas, especially the mouths of large rivers, lagoons and lakes. Feeds on fish over clear, open water. Breeds from July to September in NSW. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometer of the sea.	x	-
Fork-tailed Swift (*Apus pacificus*)	Aerial: over open country, from semi-arid deserts to coasts, islands; sometimes over forests, cities. *Breeds Siberia, Himalayas, east to Japan south east Asia. Summer migrant to east Australia. Mass movements associated with late summer low pressure systems into east Australia. Otherwise uncommon.*	✓	No likely impact
Common Greenshank *Tringa nebularia*	The Common Greenshank is found in a wide variety of inland wetlands and sheltered coastal habitats of varying salinity. Typically found in habitats containing large mudflats and saltmarsh, mangroves or seagrass.	x	-

Appendix 3
7 Part Test of Significance

7 Part Test of Significance

(Section 5A EPA Act 1979)

Council (or the determining authority) is required to consider the impact upon threatened species, populations and / or EECs from any development or activity via the process of a 7 part test of significance. The significance of the assessment is then used to determine the need for a more detailed SIS.

The following 7 part test of significance relies on the ecological assessment provided in Sections 4 and 5 of this report and should be read as such.

Flora investigations and fauna habitat assessments of the subject site have resulted in the identification of suitable habitat for the following threatened species and populations with varying potential to occur. Species recorded or with a considered potential to occur have been noted. The potential for any direct or indirect impacts on these species has also been considered and noted.

Threatened flora

Scientific name	TSC Act	Potential to occur	Potential impact
Acacia pubescens	E	Very Unlikely	Removal of very unlikely / disturbed habitat
Dillwynia tenuifolia	V	Very Unlikely	Removal of very unlikely / disturbed habitat
Grevillea juniperina ssp. *juniperina*	V	Low	Removal of low potential habitat
Grevillea parviflora ssp. *parviflora*	V	Very Unlikely	Removal of very unlikely / disturbed habitat
Pimelea spicata	E	Low	Removal of low potential habitat
Pultenaea parviflora	E	Low	Removal of low potential habitat

Endangered ecological communities

Cumberland Plain Woodland in the Sydney Basin Bioregion (CPW) – listed as a CEEC.

Threatened fauna

Common name	TSC Act	Potential to occur	Potential impact
Swift Parrot	E	✓	Direct - removal of suitable foraging habitat
Dusky Woodswallow	V	✓	Direct - removal of suitable foraging habitat
Grey-headed Flying-fox	V	✓	Direct - removal of likely foraging habitat
East-coast Freetail Bat	V	✓	Direct - removal of potential foraging habitat
Eastern Falsistrelle	V	✓	Direct - removal of potential foraging habitat
Little Bentwing-bat	V	✓	Direct - removal of potential foraging habitat
Eastern Bentwing-bat	V	✓	Direct - removal of likely foraging habitat
Little Eagle	V	low	Direct - removal of suitable foraging habitat
Square-tailed Kite	V	low	Direct - removal of suitable foraging habitat
Yellow-bellied Sheathtail-bat	V	low	Direct - removal of low potential foraging habitat
Greater Broad-nosed Bat	V	low	Direct - removal of low potential foraging habitat

Common name	TSC Act	Potential to occur	Potential impact
Spotted Harrier	V	unlikely	Direct - removal of unlikely foraging habitat
Little Lorikeet	V	unlikely	Direct - removal of unlikely foraging habitat
Speckled Warbler	V	unlikely	Direct - removal of unlikely habitat
Varied Sittella	V	unlikely	Direct - removal of unlikely habitat
Diamond Firetail	V	unlikely	Direct - removal of unlikely habitat
Cumberland plain Land Snail	E	unlikely	Direct - removal of unlikely habitat

Endangered populations

- *Marsdenia viridiflora* subsp. *viridiflora* population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas
- None for fauna

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

No threatened flora species or populations were recorded within the subject site during the botanical survey. The subject site contains highly modified vegetation in the form of Household Gardens and Lawns and large areas of Disused Orchards. These areas provide highly unlikely habitat for most threatened flora species known in the locality. The small area of CPW within the subject site provides low potential habitat for some threatened flora species.

Despite detailed searches throughout the subject site (see Figure 3), no threatened flora species or population was observed onsite.

Threatened fauna species survey was limited to snail searches; however a threatened fauna habitat assessment was undertaken as part of the botanical survey. The absence of small to large hollows, rock outcrops, creek lines, open water, quality or connective vegetation reduces the likelihood of threatened species utilising the site for any breeding or important roosting potential. No snails were recorded present. Therefore the subject site is considered unlikely to contain any important habitat for any threatened fauna species with considered potential to occur.

It is considered that as no threatened flora species have been recorded, and the absence of likely important habitat for threatened fauna species, the proposal is unlikely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

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

There is one endangered flora population in the Penrith LGA., this population is:

Marsdenia viridiflora subsp. *viridiflora* population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas.

Due to the disturbed, isolated and regrowth nature of the native vegetation onsite, it is considered that the presence of *Marsdenia viridiflora* subsp. *viridiflora* is very unlikely to

occur onsite. Despite detailed searches throughout the subject site, this species was not observed.

There are no endangered fauna populations identified specifically to the Penrith LGA; however the site does fall within the Sydney Metropolitan Catchment Management Authority area. An endangered population of White-fronted Chat (*Epthianura albifrons*) is identified to this area however this is made up of two known isolated sub-populations; one at Newington Nature Reserve on the Parramatta River and one at Towra Point Nature Reserve in Botany Bay. The subject site is located well away from these localities and does not provide any suitable habitat for this species.

Therefore, it is considered that the action proposed is not likely to have an adverse effect on the life cycle of these species that constitute the endangered populations such that a viable local population of these species is likely to be placed at risk of extinction.

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

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

It has been recommended by Penrith Council within Key Issue 4 of the Pre-lodgement Meeting to "*preserve the existing significant vegetation*" by the use of Communal Open space (see Recommendation numbers 3 to 6 above).

A small area (0.64 ha) of vegetation within the central-southern portions of the subject site is commensurate with "*Cumberland Plain Woodland in the Sydney Basin Bioregion*" which is listed as a Critically Endangered Ecological Community (CEEC) within the NSW *TSC Act* (1995). The proposed development proposes to remove approximately 0.1 ha (15.6%) and retain approximately 0.54 ha (84.3%) of this vegetation community within a proposed Native Bushland Reserve. In addition, it is proposed to re-establish or re-vegetate an area of 0.16 ha within the Native Bushland Reserve with species commensurate with CPW. This revegetation will be undertaken, managed, audited and certified in accordance with the Vegetation Management Plan (VMP). The revegetation of 0.16 ha of CPW as well as the management and regeneration / weeding of the retained 0.54 ha of CPW will result in a total of 0.7 ha of CPW to be retained or created within the site. This total area of 0.7 ha of CPW is 9.3% larger than the currently existing CPW patch. The retained and revegetated areas of CPW within the site will be managed for the retention, management and improvement of the CPW patches under a Vegetation Management Plan (VMP). This strategy will improve the quality and the extent of this CEEC and will ameliorate the impact of the proposal upon the CPW and will retain and improve the overall outcome for this CEEC.

It is therefore considered that the proposed development in its current form is unlikely to have an adverse effect on the extent of any ecological community such that its local occurrence is likely to be placed at risk of extinction.

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

The presence of the current patch or the proposed retained patch of CPW in close proximity to the residential development has the potential for edge effects such as invasion by exotic / weed species, dumping of household or garden refuse and increased risk of fire and other anthropological disturbances. These factors all have the potential to modify the composition of the CPW remnant. However, a VMP is to be enacted to conserve, manage and improve the CPW remnant which will be improved in quality and extent. This VMP will include

protective exclusion fencing to minimise the potential anthropological impacts. Due to the proposed Native Bushland Reserve to be expanded and managed under a VMP it is considered that the proposed development will result in a net gain of 0.06 ha or 9.3% increase and will not modify the composition such that the local occurrence of CPW is likely to be placed at risk of extinction.

d) In relation to the habitat of threatened species, populations or ecological community:

It is considered that the habitat attributes of the subject site provide known or potential habitat for: *Acacia pubescens, Dillwynia tenuifolia, Grevillea juniperina* ssp. *juniperina, Grevillea parviflora* ssp. *parviflora, Pimelea spicata, Pultenaea parviflora,* Cumberland Plain Woodland, Spotted Harrier, Little Eagle, Dusky Woodswallow, Square-tailed Kite, Little Lorikeet, Swift Parrot, Speckled Warbler, Varied Sittella, Diamond Firetail, Grey-headed Flying-fox, Yellow-bellied Sheathtail-bat, East-coast Freetail Bat, Eastern Falsistrelle, Little Bentwing-bat, Eastern Bentwing-bat and Greater Broad-nosed Bat.

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

The current proposed subdivision of the site will remove all vegetation within the subject site except for 0.54 ha of CPW. This will require the removal of 0.1 ha of CPW. To ameliorate this proposed impact, it has been suggested by council and recommended within this report to establish a Native Vegetation Reserve which contains the retained 0.54 ha of the CPW vegetation within the subject site. When the Native Vegetation Reserve is enacted the extent of CPW removal (0.1 ha) will be minimal. In addition, it has been recommended that the 0.16 ha within the Native Bushland Reserve be planted with species commensurate with fully structured and diverse CPW and also managed according to the VMP for the Native Vegetation Reserve. The retention of 0.54 ha and the revegetation of 0.16 ha will result in 0.7 ha of CPW to be maintained within the Native Bushland Reserve in the southern portions of the subject site. This is a net gain of 0.06 ha or 9.3% of the existing CPW within the site.

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

The connectivity values are generally poor, with no direct canopy connectivity to any native vegetation to any other patches of vegetation. Part of the CPW patch is located onsite while the southern portion of the CPW patch is located on the property to the south as can be seen in Figures 3, 4 and 5. The total patch area is approximately 0.92 ha with 0.64 ha located onsite and approximately 0.33 ha located on the adjoining property to the south.

The proposal will see the loss of some vegetation within the subject site, however it will not break any local vegetative connectivity attributes, nor further isolate any remnant patches of vegetation worthy of conservation.

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

The importance of habitat to be impacted is considered to be moderate because it contains only a few remnant native canopy species (127x Forest Red Gum, 5x Dead Stags, 3x Cabbage Gums and 2x Grey Box), and highly disturbed shrub and ground layers which are significantly impacted by exotic species. Nonetheless, the shrub and ground layers do contain a high proportion of the expected flora species for CPW. It does contain low levels of

threatened flora habitat and very limited foraging value for threatened fauna. The subject site does not provide any likely important or unique habitat of breeding importance for any threatened fauna species with considered potential to occur. Endangered fauna populations are unlikely to utilise the site. The proposal will not break any local connectivity linkages nor further isolate native vegetation patches.

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

The site has not been identified as critical habitat within the provisions of the TSC Act. Therefore this matter does not require any further consideration at this time.

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

Approved state recovery plans have been prepared for the following threatened species with potential habitat within the subject site:

- *Acacia pubescens* (NPWS 2003)
- *Pimelea spicata* (DEC 2004)
- Cumberland Plain Recovery Plan (DECC 2011)

It is considered that the proposed development is generally consistent with the objectives or actions of the above-mentioned draft and approved recovery plans.

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

A key threatening process is defined in the *TSC Act* as a process that threatens, or could threaten, the survival or evolutionary development of species, populations or ecological communities.

The current list of key threatening processes under the *TSC Act*, and whether the proposed activity is recognised as a threatening process, is shown below.

Listed key threatening process (as described in the final determination of the Scientific Committee to list the threatening process)	**Is the development or activity proposed of a class of development or activity that is recognised as a threatening process?**		
	Likely	**Possible**	**Unlikely**
Alteration of habitat following subsidence due to longwall mining			✓
Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands			✓
Anthropogenic climate change			✓
Bushrock removal			✓
Clearing of native vegetation	✓		
Competition and habitat degradation by feral goats			✓
Competition and grazing by the feral European Rabbit (*Oryctolagus cuniculus*)		✓	
Competition from feral honeybees			✓
Death or injury to marine species following capture in shark control programs on ocean beaches			✓
Entanglement in, or ingestion of anthropogenic debris in marine and estuarine environments			✓

Listed key threatening process (as described in the final determination of the Scientific Committee to list the threatening process)	Is the development or activity proposed of a class of development or activity that is recognised as a threatening process?		
	Likely	**Possible**	**Unlikely**
Forest Eucalypt dieback associated with over-abundant psyllids and bell miners			✓
High frequency fire resulting in the disruption of life-cycle processes in plants and animals and loss of vegetation structure and composition		✓	
Herbivory and environmental degradation caused by feral deer			✓
Importation of red imported fire ants into NSW			✓
Infection by *Psittacine circoviral* (beak and feather) disease affecting endangered psittacine species and populations			✓
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis			✓
Introduction and establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae		✓	
Infection of native plants by *Phytophthora cinnamomi*		✓	
Introduction of the large earth bumblebee (*Bombus terrestris*)			✓
Invasion and establishment of exotic vines and scramblers		✓	
Invasion and establishment of Scotch Broom (*Cytisus scoparius*)			✓
Invasion and establishment of the Cane Toad (*Bufo marinus*)			✓
Invasion, establishment and spread of *Lantana camara*		✓	
Invasion of native plant communities by bitou bush & boneseed *Chrysanthemoides monilifera*			✓
Invasion of native plant communities by exotic perennial grasses	✓		
Invasion of native plant communities by African Olive (*Olea europaea* subsp. *cuspidata*)	✓		
Invasion of the Yellow Crazy Ant (*Anoplolepis gracilipes*)			✓
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants		✓	
Loss of Hollow-bearing trees			✓
Loss and/or degradation of sites used for hill-topping by butterflies			✓
Predation and hybridisation by feral dogs (*Canis lupus familiaris*)			✓
Predation by the European Red Fox (*Vulpes vulpes*)	✓		
Predation by the Feral Cat (*Felis catus*)	✓		
Predation by Plague Minnow or Mosquito Fish (*Gambusia holbrooki)*			✓
Predation by the Ship Rat (*Rattus rattus*) on Lord Howe Island			✓
Predation, habitat degradation, competition & disease transmission from Feral pigs (*Sus scofa*)			✓
Removal of dead wood and dead trees	✓		

The above key threatening processes have been considered in reference to the proposal. It was considered that the proposal may contribute to a small degree to a number these processes as described below. It was not considered that the proposal will have a large or significant impact on any of the following key threatening processes. Some mitigation measures have been listed under each process to minimise or reduce such impacts upon those processes.

Summary of "likely" or "possible" Key Threatening Processes

This section identifies what mitigation measures can be implemented to address threatening processes.

Clearing of native vegetation

The proposal contributes to this key threatening process via the removal of remnant native vegetation. Future landscaping should consider the replacement of landscaping vegetation with locally occurring (endemic) native species that provide shelter and foraging value to local fauna and compliment the native Cumberland Plain Woodland (CPW) vegetation within the proposed Native Vegetation Reserve. There will be a net gain of 0.139 ha (23%) of CPW within the site.

Competition and grazing by the feral European rabbit (Oryctolagus cuniculus)

It is expected that the proposed development will decrease the potential for rabbits which were observed within the site. Rabbit management and control such as through exclusion fencing, destruction of warrens and targeted "Pindone" baiting is recommended as a standard protocol.

High frequency fire resulting in the disruption of life-cycle processes in plants and animals and loss of vegetation structure and composition

The proposal will result in increased human presence surrounding the local bushland interface which is a vegetation structure susceptible to fire. Increased human presence results in increased potential for ignition points for fires into the surrounding landscape.

Introduction and establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae

'Myrtle Rust' may be spread via machinery, animals and humans as well as by environmental factors such as wind. The presence of machinery and construction works is likely to slightly increase the potential for spread of this key threatening process. Similar protocols as to *Phytophthora cinnamomi* should be applied.

Infection of native plants by Phytophthora cinnamomi

The proposal may temporarily increase the risk of fungal infection on site as it may be spread via vehicular movement and relocation of soil and vegetation. Consequently standard *Phytophthora cinnamomi* protocol applies to the cleaning of all plant, heavy machinery, equipment, hand tools and work boots prior to delivery onsite to ensure that there is no loose soil or vegetation material caught under or on the equipment and within the tyre tread or tracks of vehicles. Any equipment found to contain soil or vegetation material is to be cleaned in a quarantined work area or wash station and treated with anti-fungal pesticides.

Invasion and establishment of exotic vines and scramblers

The proposal is of a class of development recognised as a threatening process due to the potential presence of exotic vines and scramblers or their propagules within the site and the potential for these species to invade any sensitive vegetation onsite. Therefore a weed control program is recommended to ensure there is adequate eradication, and control of invasive vines species.

Invasion, establishment and spread of Lantana camara

The site currently does not contain this species, however it is expected that the proposed development will provide an opportunity to prevent the invasion of this species or to remove, control and manage this species throughout the whole of the site by the application of a bushland management plan, vegetation management plan or a weed control program.

Invasion of native plant communities by exotic perennial grasses

The proposal is a class of development recognised as a threatening process due to possible further incursions of grasses such as *Pennisetum clandestinum* (Kikuyu), Eragrostis curvula (African Lovegrass), *Axonopus fissifolius* (Narrow-leaved Carpet Grass) and other perennial grasses currently known to occupy the subject site. It is therefore recommended that native ground covers be utilised as part of the future landscaping works, or weed control is applied to reduce spread and establishment into remnant native vegetation.

Invasion of native plant communities by African Olive (Olea europaea subsp. *cuspidata)*

African Olive is present in large numbers within the subject site. However the proposed development is not expected to significantly increase the prevalence of African Olive. It is expected that the proposed development will provide an opportunity to manage the area with regard to weed invasion and will eradicate African Olive from the site.

Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants

Future development of the site will increase the prevalence or diversity of non-native species across the site through landscaping. This is likely to have little affectation on the proposed reserve whilst management it undertaken in regards to weed control, however post management this may become an issue.

Predation by the European red fox

This species was detected within the site. It is expected that the proposed development will provide an opportunity to manage the area with regard to European red fox invasion. European red fox management is encouraged for the retained vegetated areas of the subject site.

Predation by feral cat (Felis catus)

The proposed development may alter impacts on adjoining lands by increasing the numbers of domestic cat ownership and as such the action proposed may increase the impact of this threatening process.

Removal of dead wood and dead trees

The proposal will require the removal of deadwood and / or dead trees and as such is of a class of development recognised as a threatening process. Threatened fauna species with potential habitat within the subject site and likely dependent on dead wood or dead trees include Speckled Warbler, Varied Sittella, Diamond Firetail and Cumberland Plain Land Snail. These species are not considered likely to occur within the subject site. Given the low quality habitat associated with deadwood and dead trees present within the development areas, the removal of dead wood and dead trees is not considered likely to impact on threatened species or the biodiversity of the local area.