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Ecological Constraints Assessment



Lots 125, 126, 127 & 128 // DP 10336; 65 - 95
Ironbark Road, Bargo, NSW, 2574

Proposed rezoning

Prepared for: Precise Planning

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Glossary and abbreviations

Acronym	Description
BC Act	<i>Biodiversity Conservation Act 2016</i>
CEEC	Critically endangered ecological community
CPW	Cumberland Plain Woodland
DotEE	Commonwealth Department of the Environment and Energy
EEC	Endangered Ecological Community
EP&A Act	<i>NSW Environmental Planning and Assessment Act 1979</i>
EPBC Act	<i>Commonwealth Environment Protection and Biodiversity Conservation Act 1999</i>
ha	Hectares
HBT	Hollow bearing trees
LGA	Local Government Area
SPW	Shale Plains Woodland
SSTF	Shale Sandstone Transition Forest
WLEP	Wollondilly Local Environment Plan
WoNS	Weed of National Significance
*	Denotes exotic species

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Executive Summary

Ecoplanning were commissioned to undertake an Ecological Constraints Assessment for the proposed rezoning of Lots 125, 126, 127 & 128 // DP 10336, 65 - 95 Ironbark Road, Bargo, NSW. The purpose of this report is to identify and assess potential ecological values and constraints that may influence the proposed rezoning and subsequent development of the study area.

The study area is currently zoned RU4 – Primary Production Small Lots. The current proposal requires the rezoning of the land from RU2 – Primary Production Small Lots to R2 – Rural Residential, with a proposed minimum Lot size of 450 m². The study area is located within the Wollondilly Local Government Area (LGA) and comprises 8.76 ha of land containing exotic pasture, planted exotic vegetation and scattered paddock trees.

A portion of the study area is mapped as 'Biodiversity Values' on the Department of Planning and Environment's Biodiversity Value map. Consequently, any clearing on this land exceeds thresholds under Section 7.3 of the NSW *Biodiversity Conservation Act 2016* and will require assessment under the Biodiversity Assessment Methodology (BAM) including avoid and minimising impacts and determination of necessary offsets for any residual impacts.

Field assessment of the study area identified two native vegetation communities within the study area, namely:

- Shale Plains Woodland (MU10)
- Alluvial Woodland (MU11)

Shale Plains Woodland (SPW) is a sub-community of Cumberland Plain Woodland (CPW), which is listed as a Critically Endangered Ecological Community (CEEC) under the NSW *Biodiversity Conservation Act 2016* (BC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Alluvial Woodland forms part of the River-flat Eucalypt Forest on Coastal Floodplains ecological community, which is listed as an Endangered Ecological Community (EEC) under the BC Act. The SPW and Alluvial Woodland vegetation in the study area occurred as scattered paddock trees over a predominately exotic understorey.

No threatened flora or fauna species were recorded within the study area, although survey for fauna was limited to diurnal searches and habitat assessment. Based on assessment of habitat within the study area, eight threatened fauna species were assessed to have a 'moderate' likelihood of occurring in the study area, namely:

- *Daphoenositta chrysoptera* (Varied Sittella)
- *Petroica boodang* (Scarlet Robin)
- *Falsistrellus tasmaniensis* (Eastern False Pipistrelle)
- *Mormopterus norfolkensis* (Eastern Freetail-bat)
- *Myotis macropus* (Southern Myotis)
- *Scoteanax rueppellii* (Greater Broad-nosed Bat)
- *Phascolarctos cinereus* (Koala)
- *Petaurus norfolcensis* (Squirrel Glider)

Areas of ecological constraint were identified in the study area and ranked in accordance with their ecological value. Areas of 'high' ecological constraints, were limited to Hollow Bearing Trees (HBTs), including a 10 m radius surrounding each HBT. Areas of 'moderate' constraint included the heavily modified and disturbed areas of Alluvial Woodland and SPW. The remainder of the study area was cleared land, consisting predominantly of exotic grasses and herbaceous weeds. These areas were not identified as having any ecological constraint.

Despite the presence of Koala feed trees as listed under Schedule 2 of State Environmental Planning Policy 44 – Koala Habitat (SEPP 44), the site was not identified as core Koala habitat as defined by SEPP 44, as no resident Koala population was identified as occurring with the study area. A high (53) number of Koala observations have been made in the locality since the mid to late 1990's (OEH 2017a), although no signs of Koala's (scats, tree scratches) were recorded within the study area.

The proposed rezoning and subsequent residential development will need to consider impacts to areas of 'high' and 'moderate' ecological constraint as well as any habitat for threatened fauna species identified as having habitat within the study area. Given the timing of this proposal, this is likely to be through application of the BAM and offsetting of any residual impacts after avoiding and minimising impacts.

1. Introduction

1.1 Purpose of report and legislative context

This Ecological Constraints Assessment has been undertaken for the proposed rezoning of Lots 125, 126, 127 & 128 // DP 10336, 65 - 95 Ironbark Road, Bargo, NSW. The purpose of this report is to identify and assess ecological values and constraints that may affect the proposed rezoning and future development within the study area. This report addresses the legislative context provided in (Table 1.1).

It is noted that legislation regarding the assessment of impact to threatened flora, fauna and ecological community has recently changed following the NSW *Biodiversity Conservation Act 2016* (BC Act) coming into force (25th August 2017) and repealing the *NSW Threatened Species Conservation Act 1995* (TSC Act). The *Biodiversity Conservation (Savings and Transitional) Regulation 2017* provides timeframes in which different approval pathways can utilise the older TSC Act, including a 12 month period from the commencement of the BC Act in which an application for development consent under Part 4 of the *Environmental Planning & Assessment Act 1979* (EP&A Act), in an interim area (which includes the Wollondilly Local Government Area [LGA]), may be assessed under the TSC Act. Nonetheless, given the timing, nature and location of the proposal and the likely requirements for offsetting, potential impacts arising from the proposal are likely to be assessed under the BC Act.

Table 1.1: Legislative framework addressed in this report.

Instrument	Considerations	Context
Commonwealth		
<i>Environment Protection and Biodiversity Conservation (EPBC) Act 1999</i>	Matters of National Environmental Significance	An action will require approval from the Minister if the action has, will have, or is likely to have, a significant impact on a matter of national environmental significance.
State (New South Wales)		
<i>Biodiversity Conservation Act 2016</i> [#]	Part 4, Divisions 2 and 5 and Part 6 (Biodiversity Offsets)	Lists threatened species, populations, ecological communities and key threatening processes to be considered under Section 5A EP&A Act.
<i>Biosecurity Act 2015</i>	Priority weeds	Describes the state and regional priorities for weeds in New South Wales.

[#] The *Biodiversity Conservation Act 2017* (BC Act) came into force on the 25th August 2017 repealing the TSC Act and Section 5A of the EP&A Act.

1.2 Site description

1.2.1 Subject site and study area

Following the *Threatened species assessment guidelines: the assessment of significance* (DECC 2007) the **subject site** is defined as the area 'directly impacted upon by the proposal', and includes all vegetation proposed to be removed following approval of the subdivision. The **study area** is defined as the subject site and all areas that are indirectly impacted upon by the proposal. For the purposes of this report the subject site and study area are synonymous, as no substantial or significant indirect impacts have been identified.

The study area included Lots 125, 126, 127 & 128 // DP 10336 (65 - 95 Ironbark Road, Bargo, NSW) (**Figure 1.1**), situated in the Wollondilly LGA. The study area comprised 8.76 ha of land containing exotic pasture, planted exotic vegetation and scattered paddock trees. *Eucalyptus* spp. were scattered through the study area, with the midstorey largely absent and the groundlayer dominated by exotic grasses and herbaceous weeds. The study area had a history of grazing and/or mowing, with horses actively grazing the majority of the study area at the time of survey. Several dwellings and associated infrastructure, including pools, tennis courts, driveways and sheds were located in the study area. No watercourses were mapped in the study area, although two constructed dams were located in the northern portion of the site.

1.2.2 Locality

Unless otherwise stated, the locality is described as the area within 5 km of the study area (**Figure 1.2**). The locality includes areas of land that is predominantly zoned RU4 – Primary Production Small Lots and R2 – Rural Landscape under the Wollondilly Local Environmental Plan (WLEP 2011). Native vegetation in the locality is well represented, particularly within the outer portion of the locality (2 – 5 km from the study area). Vegetated areas in the locality are mostly in association with the Bargo and Nepean Rivers and their tributaries and are zoned E2 – Environmental Conservation. The township of Thirlmere is situated approximately 3 km to the south of the study area.



Figure 1.1: Study area.

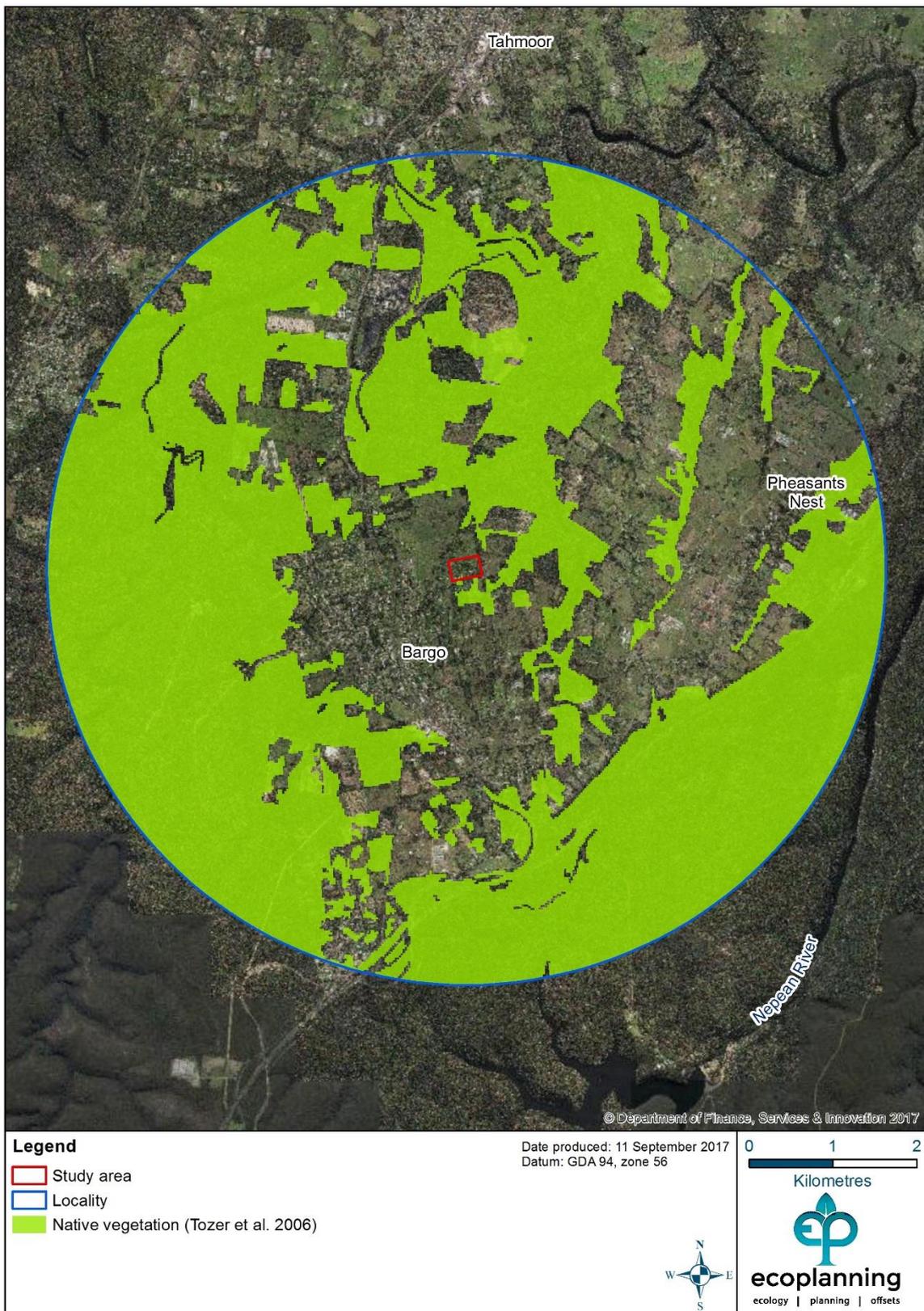


Figure 1.2: Showing areas of native vegetation in the locality (Tozer et al. 2010).

1.3 Description of the proposed development

The study area is currently zoned RU4 – Primary Production Small Lots under the WLEP (2011). It is proposed to rezone the land to R2 – Rural Residential, with a minimum Lot size of 450 m² to allow for future residential development.

2. Methods

2.1 Literature and database review

A site specific literature and database review was undertaken prior to undertaking field survey and the preparation of this report. This included desktop analysis of aerial photography and regional scale resources from the following sources:

- NSW Planning Viewer (NSW Dept. of Planning and Environment 2017)
- BioNet Atlas of NSW Wildlife (NSW Office of Environment and Heritage 2017)
- NSW Biodiversity Values Map
- Protected Matters Search Tool (Commonwealth Department of Environment and Energy 2017)
- Native vegetation of the Cumberland Plain (NPWS 2002)
- SIX Maps (LPI 2017)
- Atlas of Living Australia (NCRIS 2017)
- Native Vegetation of South East NSW (Tozer et al.2010)

Previous reports of relevance to study area reviewed include:

- Ecoplanning (2017a). Ecological Constraints Assessment (v1.1) – Lot 1 // DP 996286, 95 Great Southern Road, Bargo, NSW. Prepared for Precise Planning Pty Ltd.
- Ecoplanning (2017b). Flora and Fauna Assessment – Lot 252 // DP 257510, 25 Government Road, Bargo, NSW. Prepared for Precise Planning Pty Ltd.
- Ecoplanning (2017c). Flora and Fauna Assessment – Lot 2 // DP 596515, 55 Government Road, Bargo, NSW. Prepared for Precise Planning Pty Ltd.

Threatened species, populations and migratory species recorded during the literature and database review were consolidated and their likelihood of occurrence was considered by:

- review of location and date of recent (<5 years) and historical (>5-20 years) records
- review of available habitat within the study area and surrounding areas
- review of the scientific literature pertaining to each species and population
- applying expert knowledge of each species

The potential for threatened species, populations and/or migratory species to occur was then considered and the necessity for targeted field surveys was determined. Following field surveys and review of available habitat within the study area, the potential for species to utilise the site and to be affected directly or indirectly by the proposal were considered as either:

- “Recent record” = species has been recorded in the study area within the past 5 years
- “High” = species has previously been recorded in the study area (>5 years ago) or in proximity to (for mobile species), and/or habitat is present that is likely to be used by a local population
- “Moderate” = suitable habitat for a species is present onsite but no evidence of a species detected and relatively high number of recent records (5-20 years) in the locality or species is highly mobile
- “Low” = suitable habitat for a species is present onsite but limited or highly degraded, no evidence of a species detected and relatively low number of recent records in the locality
- “Not present” – suitable habitat for the species is not present onsite or adequate survey has determined species does not occur in the study area

2.2 Field survey

A field survey was undertaken on 25 August 2017 by Thomas Hickman (Ecologist) over a total of 3.5 person hours. Weather conditions on the day were fine, with no rain 24 hours prior to field assessment (**Table 2.1**).

Table 2.1: Daily weather observation at Camden Airport (30 km to the north-east of the study area).

Date	Temp (°C)		Rainfall (mm)	Max wind	
	Min	Max		Direction	Speed (km/h)
25/08/17	7.1	18.1	0	SE	35

2.2.1 Vegetation communities and flora

Field survey involved traversing the study area whilst recording all visible flora species and identifying viable habitat for threatened flora species. Areas of intact, resilient vegetation were surveyed more extensively than degraded areas of the site. Nomenclature follows the Flora of NSW (Harden 1990-2002) and updates provided in PlantNET (RBGDT 2017).

Field survey was undertaken to validate regional vegetation mapping of NPWS (2002) and Tozer (et. al 2010) within the study area. Vegetation communities were checked against described threatened ecological communities (TEC) listed under either the EPBC Act or the BC Act.

2.2.2 Fauna and fauna habitat

Opportunistic observations of fauna were recorded along with signs of direct and indirect occupancy (i.e. scats, owl pellets, fur, bones, tracks, bark scratches, foliage chew marks and chewed cones of *Allocasuarina* spp. or *Pinus* spp. as well as some of the other cultivars known to be used).

Fauna habitat searches were conducted for potential foraging, roosting, breeding or nesting habitat of nocturnal and diurnal species. This includes inspection for the presence of tree hollows, stags, bird nests, possum dreys, decorticating bark, rock shelters, rock outcrops/crevices, mature / old growth trees, food trees (*Banksia* spp., *Allocasuarina* spp., and

winter-flowering eucalypts), culverts, dens, dams, riparian areas and refuge habitats of man-made structures.

Primary sources of literature accessed for species nomenclature were:

- Birds - Christidis and Boles (2008)
- Mammals - Van Dyck and Strahan (2008)
- Reptiles and amphibians - Cogger (2014)
- Terrestrial invertebrates - Australian Faunal Directory (AG 2015)

2.2.3 Survey limitations

The surveys undertaken aimed to record as many species as possible, although it is acknowledged that this is not a definitive list of the flora within the study area, more species would be recorded during a longer survey over various seasons. Nevertheless, the techniques used in this survey are adequate for gathering the data necessary to validate the location and extent of vegetation communities and condition onsite, and to detect any threatened flora with the potential to occur.

Full fauna surveys following threatened species survey guidelines (DEC 2004 and DECC 2009) were not undertaken as sufficient detail to determine the likelihood of occurrence of threatened and migratory species was achieved through habitat assessment. Therefore, further detailed fauna surveys were not considered necessary.

2.3 Ecological constraints

Ecological values identified through literature review and field survey were ranked according to their rarity and abundance as ecological constraints. Ecological values were scored from “no value” to “high” ecological values (refer to **Table 2.2**).

Table 2.2: Ranking ecological constraints

Level of Ecological Constraint	Description
High	<ul style="list-style-type: none">• 10 m radius around hollow bearing trees
Moderate	<ul style="list-style-type: none">• TEC in low condition, mostly consisting of scattered paddock trees and heavily grazed vegetation.
None	<ul style="list-style-type: none">• Cleared land consisting predominantly of exotics and planted ‘exotic’ vegetation.

3. Results

3.1 Literature and database review

3.1.1 Topography, drainage, soils and biodiversity layer

The study area does not contain any mapped watercourses. A 1st order watercourse is situated to the west of the study area. The study area contains two small farm dams, which are located within the northern portion of the site. The study area is gently sloped in a north westerly direction and channels overland flow into the 1st order watercourse to the west of the study area.

Regional scale soil landscape mapping (OEH 2017b) maps the soils of study area as belonging to the Lucas Heights (lh) Residual (z) soil landscape. Soils of the Lucas Heights Group are derived from the Mittagong Formation, which is located stratigraphically between the Ashfield Shale and Hawkesbury Sandstone, usually as a shallow layer. Minor areas of Hawkesbury Sandstone and Ashfield Shale sporadically form surface soil materials within this landscape.

DECCW (2009) provide the following relevant soil formation descriptions:

- *Lucas Heights Residual soil landscape – lhz: plateaued on Hawkesbury Sandstone and Mittagong Formation (of sandstone-quartz, shale, siltstone/mudstone and sandstone/lithic). The soils are Yellow and Brown Kurosols (Yellow and Brown Podzolic Soils), Yellow and Brown Kandosols (Yellow and Brown Earths) and Lateritic Red Kurosols/Kandosols (Lateritic Red Earths/Podzolic Soils). This soil landscape is used extensively for urban development and can be affected by sheet and wind erosion if vegetation cover is not maintained.*

3.1.2 NSW Biodiversity Values Map

A portion of the study area is mapped as 'Biodiversity Values' on the Department of Planning and Environment's Biodiversity Value map (**Figure 3.1**). Consequently, any clearing on this land exceeds thresholds under Section 7.3 of the BC Act and will require assessment under the Biodiversity Assessment Methodology (BAM) including determination of necessary offsets.

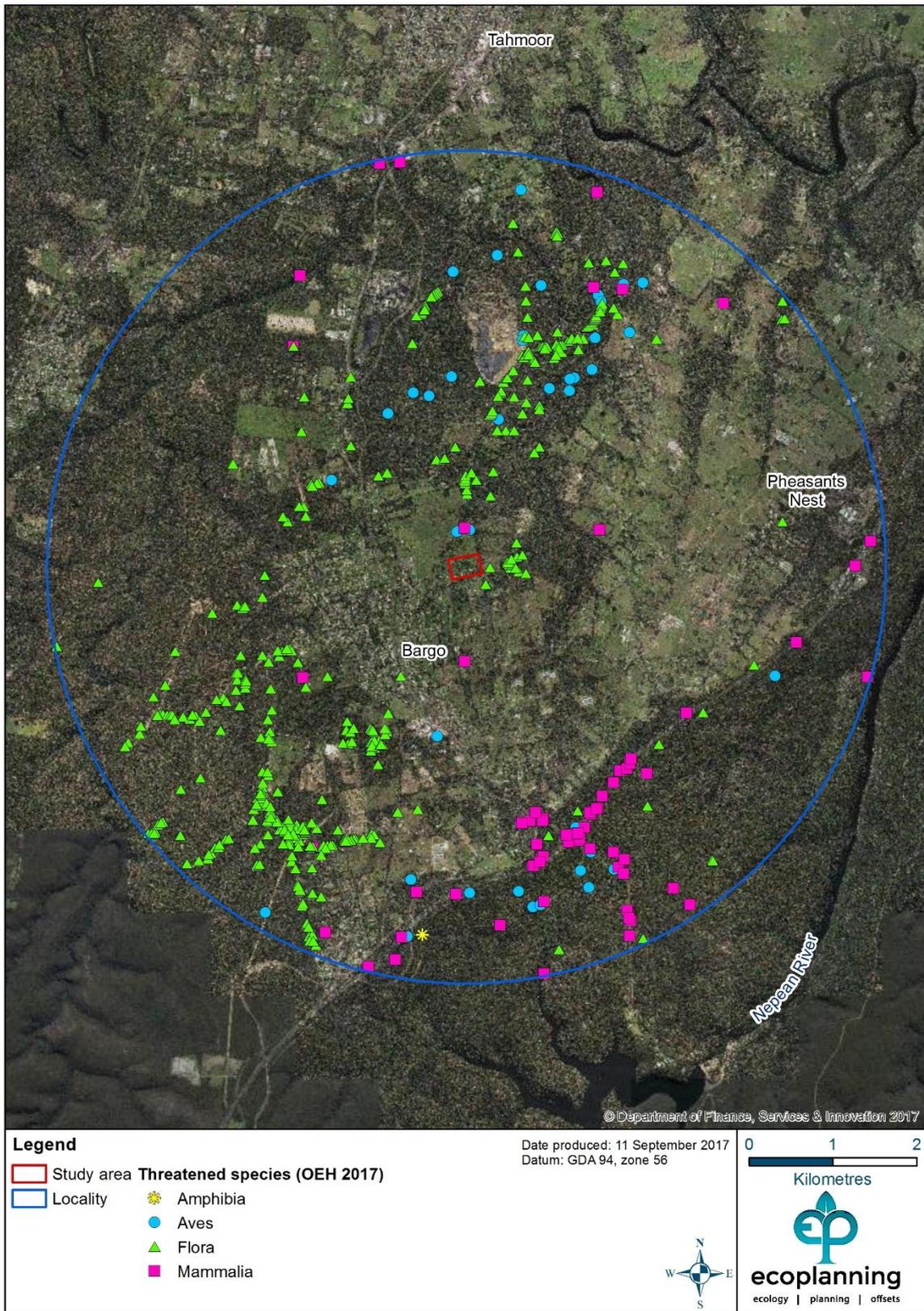


Figure 3.2: Threatened species records (OEH 2017a).

3.1.4 Vegetation and threatened ecological communities

NPWS (2002) mapping for the study area identified one native vegetation community, 'Shale Sandstone Transition Forest – High Sandstone Influence' (SSTF – High Sandstone Influence; MU2), within the western portion of the study area with 'unclassified vegetation' mapped across the eastern portion of the study area (**Figure 3.3**). SSTF – High Sandstone Influence forms part of the 'Shale Sandstone Transition Forest in the Sydney Basin Bioregion' ecological community which is listed as a Critically Endangered Ecological Community (CEEC) under the EPBC Act and BC Act (**Table 3.1**).

Table 3.1: Vegetation community nomenclature

NPWS (2002)	NSW BC Act	Commonwealth EPBC Act
Shale Sandstone Transition Forest -High Sandstone Influence (MU2)	Shale Sandstone Transition Forest in the Sydney Basin Bioregion – Critically Endangered	Shale Sandstone Transition Forest of the Sydney Basin Bioregion – Critically Endangered

CE = critically endangered

Additional regional vegetation mapping of the study area (Tozer et al. 2010) has mapped a small area in the south west of the study area as 'Sydney Hinterland Transition Woodland' (p.146; **Figure 3.4**). No native vegetation community is mapped across the remainder of the study area by Tozer et al. (2010).

3.1.5 SEPP 44 – Koala Habitat Protection

State Environmental Planning Policy 44 (SEPP 44) applies to the study area as it is located within Wollondilly LGA and is greater than one hectare in area. Assessment of Koala habitat in accordance with SEPP 44 will be required as part of any future development applications. Consideration of koala habitat within the study area in accordance with SEPP 44 is outlined within **Section 3.2.5**.



Figure 3.3: Vegetation communities and condition classes (NPWS 2002).



Figure 3.4: Vegetation communities in the study (Tozer et al. 2010).

3.2 Field survey

3.2.1 Native vegetation communities

Identification of native vegetation communities within the study area was based on the floristic composition of the vegetation in the study area, abiotic factors influencing vegetation community distribution, including topography and previous field assessments conducted in adjacent lots (Ecoplanning, 2017a). Two native vegetation communities were identified within the study area, namely:

- Shale Plains Woodland (MU10)
- Alluvial Woodland (MU11)

Both of these vegetation communities were present as scattered canopy individuals over a largely absent midstorey and a predominately exotic ground layer. As the canopy layer was the most intact portion of these communities, the condition of these communities has been referred to as 'scattered paddock trees' (SPTs; **Figure 3.4** and **Table 3.2**).

Shale Plains Woodland (SPW) is a sub-community of the Cumberland Plain Woodland (CPW) ecological community listed as Critically Endangered under the TSC Act and EPBC Act, listed as 'Cumberland Plain Woodland in the Sydney Basin Bioregion' and 'Cumberland Plain Shale Woodland and Shale Gravel Transition Forest' respectively. Alluvial Woodland is a sub-community of the 'River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions' (RFEF) Endangered Ecological Community (EEC) listed under the BC Act.

Shale Plains Woodland (MU10)

The assemblage of native species within the southern and eastern portions of the study area was consistent with the vegetation community SPW (MU10) (NPWS 2002 and OEH 2017d). This vegetation type occurred in the condition class; scattered paddock trees 'SPT' and covered approximately 2.37 ha (**Figure 3.6**). The native canopy species included *Eucalyptus crebra* (Narrow-leaved Stringybark), *Eucalyptus eugenioides* (Thin-leaved Stringybark), *Eucalyptus fibrosa* (Red Ironbark), *Eucalyptus moluccana* (Grey Box) and *Eucalyptus tereticornis* (Forest Red Gum). The abundance of *E. moluccana* was reduced in the north west of the study area, where the dominant canopy species was *Eucalyptus amplifolia* (Cabbage Gum).

Due to past under-scrubbing and grazing of the study area, the midstorey was poorly represented and was absent through most of the study area. Occasional shrub species, such as *Bursaria spinosa* subsp. *spinosa* (Blackthorn) were scattered through the study area in low abundance and cover. The groundlayer was mostly dominated by exotic grasses and herbaceous weeds, including *Cenchrus clandestinus** (Kikuyu), *Cynodon dactylon** (Couch), *Paspalum dilatatum** (Paspalum) and *Taraxacum officinale** (Dandelion). Despite the dominance of exotic species in the understorey some areas contained a moderate assemblage of native grasses and forbs, including *Aristida vagans* (Threeawn Speargrass), *Einadia hastata* (Berry Saltbush), *Microlaena stipoides* subsp. *stipoides* (Weeping Grass), *Pratia purpurascens* (Whiteroot) and *Themeda triandra* (Kangaroo Grass). The greatest cover of native ground layer species was observed in the eastern portion of the study area (Lot 125 // DP 10336), particularly in the north of the lot.

Alluvial Woodland (MU11)

Alluvial Woodland occupies river flats of the coastal floodplains, particularly in areas that are periodically inundated by water, such as river terraces and drainage lines (OEH 2017c). Field assessment determined the vegetation in the north west of the study area to be consistent with Alluvial Woodland, which covered approximately 0.28 ha. This vegetation was in relatively close proximity to a 1st order watercourse mapped outside of the western boundary of the study area. The 1st order watercourse flowed into Lot 1 // DP 996286 (95 Great Southern Road) to the north. The vegetation adjacent to the 1st order watercourse in 95 Great Southern Road has also been field validated to contain Alluvial Woodland (Ecoplanning 2017a).

The Alluvial Woodland in the study area consisted of early mature to mature *E. amplifolia*, which mostly consisted of regrowth approximately 2 - 5 m in height (**Figure 3.7**). As is the case with SPW, the Alluvial Woodland midstorey has been under-scrubbed and was poorly represented by native shrub species. The groundlayer was partly intact and contained a low to moderate cover and diversity of native groundlayer species, including *Desmodium varians* (Slender Tick-trefoil), *Dichondra repens* (Kidney Weed), *Einadia polygonoides*, *Eragrostis leptostachya* (Paddock Lovegrass), *Microlaena stipoides* var. *stipoides*, *Poranthera microphylla*, and *Pratia purpurascens*. Exotic species, including *Cirsium vulgare** (Spear Thistle), *Ehrharta erecta** (Panic Veldtgrass), *Plantago lanceolata** (Lamb's Tongues) and *Rubus fruticosus** (Blackberry) occurred sporadically through the patch of this vegetation community.

3.2.2 Other vegetation

Plantings 'exotic'

This vegetation zone consists of planted exotics and was mostly located around the residential property and immediate surrounds and comprised 0.13 ha (**Figure 3.8**). Species found within this area included *Acer negundo** (Box-elder Maple), *Agapanthus praecox** (African Lily), *Photinia serratifolia** (Chinese Photinia), *Pinus radiata** (Radiata Pine), *Schinus areira** (Pepper Tree) and *Syagrus romanzoffiana** (Queen Palm).

Farm Dam

Two small farm dams were located in the study area. These dams provided habitat for a range of fauna guilds, including waterfowl and frogs. Several native species were observed or heard from the dam during field assessment, including *Chenonetta jubata* (Australian Wood Duck) and *Crinia signifera* (Common Eastern Froglet).

Cleared land - exotics and built structures

This included all cleared areas of the study area (**Figure 3.9**) including built structures and areas where native vegetation had been cleared. Vegetation within this zone was dominated by exotic grasses and herbaceous weeds, including *Cenchrus clandestinus**, *Cirsium vulgare**, *Cynodon dactylon**, *Marrubium vulgare** (White Horehound), *Paspalum dilatatum**, *Plantago lanceolata* and *Sonchus oleraceus** (Sowthistle). This zone covered 5.99 ha or approximately 68.4% of the study area.

Table 3.2: Vegetation types found in the study area showing the condition and area.

Vegetation type (NPWS 2002)	Vegetation zone (condition class)	Description	Area (ha)
Shale Plains Woodland (MU10)	SPT	Scattered paddock trees consisting of <i>E. crebra</i> , <i>E. eugenioides</i> , <i>E. fibrosa</i> , <i>E. moluccana</i> and <i>E. tereticornis</i> .	2.37
Alluvial Woodland (MU11)	SPT	Scattered individuals of <i>E. amplifolia</i> defined this vegetation zone. This vegetation community was mapped in close proximity to the 1 st order watercourse outside the western boundary of the study area.	0.28
Total native vegetation			2.65
Other vegetation	Plantings – exotic	Planted vegetation found in close proximity to the residential properties and immediate surrounds.	0.13
	Farm dam	Two constructed farm dams located in the northern portion of the study area.	5.99
	Cleared land - exotics and built structures	Consists of all cleared areas of the study area dominated by exotic grasses and herbaceous weeds.	
Total other vegetation			6.12
Total vegetation			8.77

* Total area of vegetation subject to rounding errors



Figure 3.5: Field validated vegetation in the study area.



Figure 3.6: Shale Plains Woodland 'SPT' in the study area.



Figure 3.7: Alluvial Woodland 'SPT' in the north of the study area.



Figure 3.8: Planted 'exotic' vegetation (*Pinus radiata*) in the study area.



Figure 3.9: Cleared land 'exotics and built structures' in the south west of the study area.

3.2.3 Flora species

A total of 66 flora species were identified in the study area during the field survey, of which 28 were native and 38 were exotic (**Appendix B**). No threatened flora species listed under the BC Act or the EPBC Act were recorded within the study area.

Three weeds listed under the NSW *Biosecurity Act 2015* for the Wollondilly LGA were recorded within the study area. All three of these species are Weeds of National Significance WoNS (**Table 3.3**).

Table 3.3. Priority weeds and Weeds of National Significance (WoNS).

Common name	Scientific name	WoNS	Duty
Bridal Creeper	<i>Asparagus asparagoides</i>	Y	<p>Mandatory Measure <i>Must not be imported into the State or sold</i> *this requirement also applies to the Western Cape form of bridal creeper</p> <p>Regional Recommended Measure Exclusion zone: whole region except the core infestation area of Wingecarribee, Wollongong, Kiama, Shellharbour, Shoalhaven, Eurobodalla and Bega <i>Whole region: Land managers should mitigate the risk of new weeds being introduced to their land. Exclusion zone: The plant should be eradicated from the land and the land kept free of the plant.</i></p>
Blackberry	<i>Rubus fruticosus</i> species agg.	Y	<p>Mandatory Measure <i>Must not be imported into the State or sold</i></p> <p>All species in the <i>Rubus fruticosus</i> species aggregate have this requirement, except for the varieties Black Satin, Chealem, Chester Thornless, Loch Ness, Murrindindi, Silvan, Smooth Stem and Thornfree.</p>
Fireweed	<i>Senecio madagascariensis</i>	Y	<p>Mandatory Measure <i>Must not be imported into the State or sold</i></p> <p>Regional Recommended Measure Exclusion zone: whole region except the core infestation area of Wollongong, Kiama, Shellharbour, Eurobodalla, Shoalhaven, Bega Valley and Wingecarribee councils <i>Whole region: Land managers should mitigate the risk of new weeds being introduced to their land. Exclusion zone: The plant should be eradicated from the land and the land kept free of the plant.</i></p>

¹ <http://www.environment.gov.au/biodiversity/invasive/weeds/weeds/lists/wons.html>

3.2.4 Fauna habitat

The site contains a range of habitat values, with the potential to provide refuge for a range of native fauna (**Table 3.4**):

- Hollow bearing trees (**Figure 3.11**)
- Open pasture
- Coarse woody debris
- Two small farm dams (**Figure 3.10**)

Habitat within the study area provides potential foraging, roosting, breeding and nesting resources. Ten hollow bearing trees (HBTs) were identified in the study area. The HBTs are scattered through the study area and include a range of dimensions that would be suitable nesting and roosting habitat for microbats, birds and mammals. *Platycercus eximius* (Eastern Rosella) was seen inspecting one of the HBTs during field survey. It is possible that the study area contains additional HBTs that were not identified during field assessment.

The small farm dams in the study area provide habitat for a range of fauna guilds, particularly waterfowl and amphibians. Several fauna species were recorded utilising the small dam during the field assessment, including Common Eastern Froglet (*Crinia signifera*) and Australian Wood Duck (*Chenonetta jubata*). Small piles of coarse woody debris are located throughout the study area, which may provide potential habitat for small mammals and reptiles.

Table 3.4: Key fauna habitat features present within the study area.

Habitat features	Fauna species
Paddock trees	Diurnal and nocturnal birds and arboreal mammals
Hollow bearing trees	Birds, microchiropteran bats and arboreal mammals
Constructed dams	Amphibians; birds, microchiropteran bats, reptiles and mammals
Exotic grassland	Birds, microchiropteran bats and reptiles
Coarse woody debris	Reptiles, small terrestrial mammals and invertebrates



Figure 3.10: Small farm dam, providing habitat for waterbirds and frogs.



Figure 3.11: Hollow bearing trees in the study area.

3.2.5 Fauna species

The field survey undertaken for this report recorded a total of 26 fauna species, of which two are introduced species. Of the 26 species, there were 24 birds (including the introduced *Sturnus tristis** [Common Myna]), one frog species and the introduced *Oryctolagus cuniculus**(Rabbit) (**Appendix D**). No threatened fauna was recorded during the field survey.

One threatened species, Squirrel Glider, was potentially detected during surveys conducted in Lot 1 // DP 996286, 95 Great Southern Road, to the north of the study area during spotlighting on the 6th and 7th of May 2015 (**Figure 3.12**; Ecoplanning 2017a). It is notable that the individual seen in the picture has a white tail spot, which is generally indicative of Sugar Glider (see for example, Menkhorst and Knight 2009), although some individuals observed and not photographed were noted to be distinctly larger in appearance or had tail dimensions more similar to a Squirrel Glider.

The **Figure 3.12** and other less clear images were circulated amongst fauna experts for further determination, but the opinions were contrary, suggesting further survey is required. Given that a *Petaurus* sp. glider, possibly a Squirrel Glider, was observed utilising a hollow in the riparian corridor immediately to the north of the study area, there is a reasonable likelihood that this species may also be utilising the numerous hollow bearing trees within the study area. It is recommended that further fauna survey is conducted, and an attempt should be made to capture some individuals to provide a more definitive identification, should *Petaurus* sp. be identified onsite.



Figure 3.12: Glider (*Petaurus* sp.) observed in Lot 1 // DP 996286 (95 Great Southern Road).

Koala

Across the entire study area the listed (SEPP 44) Koala feed tree *Eucalyptus tereticornis* constituted greater than 15% of the total number of trees, therefore the study area constitutes potential koala habitat as defined under SEPP 44.

No signs of Koalas were recorded within the study area, such as scratch marks or scats during field assessment. The most recent Koala record in the locality (5 km) was recorded on the 30/07/2017, approximately 3.13 km from the study area, whereas the most proximal record was recorded on the 30/06/2006, approximately 1.13 km from the study area. A high number (53) of Koala observations have been made in the locality since the late 1990's (OEH 2017a).

The baseline survey of Koalas in Wollondilly Shire Council (Colman 2016) did not observe any Koalas (sightings or scratchings) within close proximity to the study area. The closest record observed by Colman (2016) was approximately 12 km to the south east of the study area to the south of Wilton. However, Colman (2016) also noted previous Koala records in close proximity to the Township of Bargo to the south of the study area, which likely correspond with the BioNet Atlas of NSW Wildlife records (OEH 2017a).

The study area is unlikely to constitute core Koala habitat, as defined under SEPP 44, as there are no signs of a resident population in the immediate surrounds of the study area. Although, further survey in the study area and the immediate surrounds at the Development Application stage may be justified, given the reasonable number of observations recorded in the locality.

4. Ecological Constraints

Ecological constraints were identified in the study area (**Figure 4.1**) and ranked in accordance with **Table 2.2**. Areas of high ecological constraints, included HBTs and the area within 10 m radius of each individual tree. Due to the degraded condition of the vegetation in the study area, the Alluvial Woodland and SPW in a 'SPT' condition class have been classified as a 'moderate' constraint. It is noted that the distribution of Alluvial Woodland and SPW is relatively homogeneous through the study area. The remainder of the study area is cleared land, consisting predominantly of exotic grasses and herbaceous weeds. Therefore, these areas have not been assessed as areas of ecological constraint.

Additionally, a number of threatened fauna species have been identified as having a moderate likelihood of occurring within the study area, namely:

- Threatened birds
 - *Daphoenositta chrysoptera* (Varied Sittella)
 - *Petroica boodang* (Scarlet Robin)
- Threatened microbats
 - *Falsistrellus tasmaniensis* (Eastern False Pipistrelle)
 - *Mormopterus norfolkensis* (Eastern Freetail-bat)
 - *Myotis macropus* (Southern Myotis)
 - *Scoteanax rueppellii* (Greater Broad-nosed Bat)
- Threatened mammals:
 - *Phascolarctos cinereus* (Koala)
 - *Petaurus norfolkensis* (Squirrel Glider)

Further consideration of potential impacts to these species, including through application of the Biodiversity Assessment Methodology (where appropriate), should be undertaken.



Figure 4.1: Ecological constraints in the study area.

5. Conclusion and recommendations

Across the study area areas of high, moderate and no ecological constraint have been identified. Additionally, a portion of the study area is mapped as 'Biodiversity Values' on the Department of Planning and Environment's Biodiversity Value map and any clearing on this land will require assessment under the Biodiversity Assessment Methodology including determination of necessary offsets.

Areas identified as being of 'high' ecological constraint included ten HBTs which were identified as being suitable for a range of fauna guilds, including threatened fauna species with a moderate likelihood of occurring within the study area.

Areas identified as being of moderate ecological constraint included areas of the CEEC Cumberland Plain Woodland (Shale Plains Woodland) and the area of the RFEF (Alluvial Woodland) EEC. The areas of these CEECs have been assessed as a 'moderate' and not 'high' ecological constraint, due to the degraded condition of the vegetation including a largely absent midstorey and substantially modified groundlayer.

Any future development associated with the proposed rezoning will need to consider potential impacts to the areas of 'high' and 'moderate' ecological values identified, most likely through application of the BAM. As part of the BAM impacts to these values will need to be avoided and minimised with any residual impacts requiring offsetting.

Additional, ecological values which may require further assessment include those fauna species identified as having a 'moderate' likelihood of occurring in the study area (see **Section 3.1.2**), but which have not been subjected to targeted surveys. The potential for impacts to these species should be considered in the application of zoning and the Biodiversity Layer of the WLEP. Impacts that are unavoidable will need to be considered for any future DA, including through application of the BAM (where applicable), and will likely require offsetting for impacts that cannot be avoided or minimised.

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Appendix A: Species likelihood of occurrence

The potential for each threatened species, population and/or migratory species to occur was then considered and the necessity for targeted field surveys was determined. Following field surveys and review of available habitat within the study area, the potential for species to utilise the site and be affected directly or indirectly by the proposal were considered as either:

- “Recent record” = species has been recorded in the study area within the past 5 years
- “High” = species has previously been recorded in the study area (>5 years ago) or in proximity (for mobile species), and/or habitat is present that is likely to be utilised by a local population
- “Moderate” = suitable habitat for a species is present onsite but no evidence of a species detected and relatively high number of recent records (5-20 years) in the locality or species is highly mobile
- “Low” = suitable habitat for a species is present onsite but limited or highly degraded, no evidence of a species detected and relatively low number of recent records in the locality
- “Not present” = suitable habitat for the species is not present onsite or adequate survey has determined species does not occur in the study area

Scientific Name Common Name	Legal Status	Number of records	Closest record and date	Most recent and proximity	Likelihood of occurrence	
					Prior to field assessment	Post field assessment
KINGDOM: Animalia; CLASS: Amphibia						
<i>Pseudophryne australis</i> Red-crowned Toadlet	BC Act: V	1	4.45km (29/03/2016)	29/03/2016 (4.45km)	Low	Not present
KINGDOM: Animalia; CLASS: Aves						
<i>Artamus cyanopterus cyanopterus</i> Dusky Woodswallow	BC Act: V	5	2.18km (20/08/2003)	22/02/2006 (3.42km)	Moderate	Low
<i>Collocephalon fimbriatum</i> Gang-gang Cockatoo	BC Act: V	1	4.16km (22/02/2006)	22/02/2006 (4.16km)	Low	Low
<i>Calyptorhynchus lathami</i> Glossy Black-Cockatoo	BC Act: V	2	3.88km (24/07/2002)	19/09/2014 (4.49km)	Moderate	Low
<i>Climacteris picumnus victoriae</i> Brown Treecreeper (eastern subsp.)	BC Act: V	14	2.06km (3/05/2003)	26/06/2015 (3.58km)	Moderate	Low
<i>Daphoenositta chrysoptera</i> Varied Sittella	BC Act: V	10	0.43km (14/05/2011)	11/05/2017 (3.95km)	Moderate	Moderate
<i>Haliaeetus leucogaster</i> White-bellied Sea-Eagle	EPBC Act: C BC Act: V	1	0.46km (14/05/2011)	14/05/2011 (0.46km)	Moderate	Low
<i>Hieraaetus morphnoides</i> Little Eagle	BC Act: V	5	3.4km (20/02/2013)	19/04/2017 (4.04km)	Moderate	Low
<i>Melithreptus gularis gularis</i> Black-chinned Honeyeater (eastern subsp.)	BC Act: V	5	2.1km (21/06/2006)	21/06/2006 (2.1km)	Low	Low
<i>Ninox strenua</i> Powerful Owl	BC Act: V	1	2.06km (31/10/1997)	31/10/1997 (2.06km)	Low	Low
<i>Petroica boodang</i> Scarlet Robin	BC Act: V	6	2.86km (20/06/2006)	19/07/2017 (3.91km)	Moderate	Moderate

Scientific Name Common Name	Legal Status	Number of records	Closest record and date	Most recent and proximity	Likelihood of occurrence	
					Prior to field assessment	Post field assessment
<i>Stagonopleura guttata</i> Diamond Firetail	BC Act: V	2	2.29km (21/06/2006)	21/06/2006 (2.29km)	Low	Low
KINGDOM: Animalia; CLASS: Mammalia						
<i>Chalinolobus dwyeri</i> Large-eared Pied Bat	BC Act: V EPBC Act: V	1	3.36km (12/02/2008)	12/02/2008 (3.36km)	Moderate	Low
<i>Dasyurus maculatus</i> Spotted-tailed Quoll	BC Act: V EPBC Act: E	1	4.76km (26/06/2006)	26/06/2006 (4.76km)	Low	Not present
<i>Falsistrellus tasmaniensis</i> Eastern False Pipistrelle	BC Act: V	1	2.23km (13/02/2008)	13/02/2008 (2.23km)	Moderate	Moderate
<i>Miniopterus schreibersii oceanensis</i> Eastern Bentwing-bat	BC Act: V	1	2.23km (13/02/2008)	13/02/2008 (2.23km)	Low	Low
<i>Mormopterus norfolkensis</i> Eastern Freetail-bat	BC Act: V	2	3.36km (12/02/2008)	12/02/2008 (3.36km)	Moderate	Moderate
<i>Myotis macropus</i> Southern Myotis	BC Act: V	3	1.65km (15/06/2015)	15/06/2015 (1.65km)	Moderate	Moderate
<i>Petauroides volans</i> Greater Glider	EPBC Act: V	4	3.29km (27/04/1999)	5/01/2017 (4.02km)	Low	Low
<i>Phascolarctos cinereus</i> Koala	BC Act: V EPBC Act: V	53	1.13km (30/06/2006)	30/07/2017 (3.13km)	High	Moderate
<i>Pteropus poliocephalus</i> Grey-headed Flying-fox	BC Act: V EPBC Act: V	2	0.46km (14/05/2011)	7/02/2017 (3.82km)	Moderate	Low
<i>Scoteanax rueppellii</i> Greater Broad-nosed Bat	BC Act: V	4	2.23km (13/02/2008)	28/02/2012 (4.97km)	Moderate	Moderate

Scientific Name Common Name	Legal Status	Number of records	Closest record and date	Most recent and proximity	Likelihood of occurrence	
					Prior to field assessment	Post field assessment
KINGDOM: Plantae						
<i>Acacia bynoeana</i> Bynoe's Wattle	BC Act: E1 EPBC Act: V	1	4.72km (13/04/2012)	13/04/2012 (4.72km)	Low	Low
<i>Epacris purpurascens</i> var. <i>purpurascens</i>	BC Act: V	29	0.31km (7/05/2015)	11/06/2015 (0.5km)	High	Not present
<i>Grevillea parviflora</i> subsp. <i>parviflora</i> Small-flower Grevillea	BC Act: V EPBC Act: V	62	0.54km (22/04/2010)	31/01/2017 (2.12km)	High	Low
<i>Persoonia bargoensis</i> Bargo Geebung	BC Act: E1 EPBC Act: V	242	0.28km (22/04/2010)	31/01/2017 (2.12km)	High	Not present
<i>Persoonia glaucescens</i> Mittagong Geebung	BC Act: E1 EPBC Act: V	38	0.59km (17/11/2005)	19/01/2017 (2.6km)	High	Not present
<i>Persoonia hirsuta</i> Hairy Geebung	BC Act: E1 EPBC Act: E	210	2.27km (30/08/1997)	11/06/2013 (3.83km)	High	Low
<i>Pomaderris brunnea</i> Brown Pomaderris	BC Act: V EPBC Act: V	5	1.59km (13/12/2005)	27/05/2008 (2.41km)	High	Not present

Unless other stated, text is taken from the OEH Threatened Species (<http://www.environment.nsw.gov.au/threatenedspecies/>); Legal Status codes from the Atlas of NSW Wildlife: V = Vulnerable, E1 = Endangered, E2 = Endangered Population, E4A = Critically Endangered, C = China and Australia Migratory Bird Agreement (CAMBA), J = Japan and Australia Migratory Bird Agreement (JAMBA); BC Act = NSW *Threatened Species Conservation Act 1995*, EPBC Act = Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

Appendix C: Flora and fauna species inventories

Flora

Family	Species	Common name	Native/Exotic	Form
Alliaceae	<i>Agapanthus praecox</i>	African Lily	Exotic	F
Anacardiaceae	<i>Schinus areira</i>	Pepper Tree	Exotic	T
Apiaceae	<i>Centella asiatica</i>	Indian Pennywort	Native	F
Apocynaceae	<i>Gomphocarpus fruticosus</i>	Narrow-leaved Cotton Bush	Exotic	F
Araliaceae	<i>Hedera helix</i>	English Ivy	Exotic	L
Arecaceae	<i>Syagrus romanzoffiana</i>	Queen Palm	Exotic	O
Asparagaceae	<i>Asparagus asparagoides</i>	Bridal Creeper	Exotic	L
Asteraceae	<i>Arctotheca calendula</i>	Capeweed	Exotic	F
	<i>Cirsium vulgare</i>	Spear Thistle	Exotic	F
	<i>Euchiton</i> sp.		Exotic	F
	<i>Senecio madagascariensis</i>	Fireweed	Exotic	F
	<i>Sonchus oleraceus</i>	Sowthistle	Exotic	F
	<i>Taraxacum officinale</i>	Dandelion	Exotic	F
Bignoniaceae	<i>Jacaranda mimosifolia</i>	Jacaranda	Exotic	T
Brassicaceae	<i>Cardamine hirsuta</i>	Common Bittercress	Exotic	F
Caryophyllaceae	<i>Cerastium glomeratum</i>	Mouse-ear Chickweed	Exotic	F
Chenopodiaceae	<i>Einadia hastata</i>	Berry Saltbush	Native	F
	<i>Einadia polygonoides</i>		Native	F
Convolvulaceae	<i>Dichondra repens</i>	Kidney Weed	Native	F
Euphorbiaceae	<i>Euphorbia peplus</i>	Petty Surge	Exotic	F
Fabaceae - Faboideae	<i>Desmodium varians</i>	Slender Tick-trefoil	Native	L
	<i>Desmodium varians</i>	Slender Tick-trefoil	Native	L
	<i>Hardenbergia violacea</i>	False Sarsaparilla	Native	L
	<i>Lotus angustissimus</i>	Slender Birds-foot Trefoil	Exotic	F
Fabaceae - Mimosoideae	<i>Acacia decurrens</i>	Black Wattle	Native	T
	<i>Acacia implexa</i>	Hickory Wattle	Native	S
	<i>Acacia</i> sp.		Native	S
Juncaceae	<i>Juncus usitatus</i>		Native	R
Lamiaceae	<i>Marrubium vulgare</i>	White Horehound	Exotic	F
	<i>Stachys arvensis</i>	Stagger Weed	Exotic	F
Lobeliaceae	<i>Pratia purpurascens</i>	Whiteroot	Native	F
Malvaceae	<i>Brachychiton populneus</i>	Kurrajong	Native	T
	<i>Modiola caroliniana</i>	Red-flowered Mallow	Exotic	F

Family	Species	Common name	Native/Exotic	Form
Myrtaceae	<i>Callistemon viminalis</i>	Weeping Bottlebrush	Exotic	S
	<i>Eucalyptus amplifolia</i>	Cabbage Gum	Native	T
	<i>Eucalyptus crebra</i>	Narrow-leaved Ironbark	Native	T
	<i>Eucalyptus fibrosa</i>	Red Ironbark	Native	T
	<i>Eucalyptus moluccana</i>	Grey Box	Native	T
	<i>Eucalyptus tereticornis</i>	Forest Red Gum	Native	T
	<i>Melaleuca decora</i>		Native	S
Oleaceae	<i>Ligustrum sinense</i>	Large-leaved Privet	Exotic	S
Phyllanthaceae	<i>Poranthera microphylla</i>		Native	F
Phytolaccaceae	<i>Phytolacca octandra</i>	Inkweed	Exotic	F
Pinaceae	<i>Pinus radiata</i>	Radiata Pine	Exotic	T
Pittosporaceae	<i>Bursaria spinosa</i> subsp. <i>spinosa</i>	Blackthorn	Native	S
	<i>Pittosporum undulatum</i>	Sweet Pittosporum	Native	T
Plantaginaceae	<i>Plantago lanceolata</i>	Lamb's Tongue	Exotic	F
Poaceae	<i>Aristida vagans</i>	Threeawn Speargrass	Native	G
	<i>Bothriochloa macra</i>	Red-leg Grass	Native	G
	<i>Cenchrus clandestinus</i>	Kikuyu	Exotic	G
	<i>Cynodon dactylon</i>	Couch	Exotic	G
	<i>Ehrharta erecta</i>	Panic Veldtgrass	Exotic	G
	<i>Eragrostis leptostachya</i>	Paddock Lovegrass	Native	G
	<i>Microlaena stipoides</i> subsp. <i>stipoides</i>	Weeping Grass	Native	G
	<i>Paspalum dilatatum</i>	Paspalum	Exotic	G
	<i>Themeda australis</i>	Kangaroo Grass	Native	G
<i>Vulpia</i> sp.		Exotic	G	
Primulaceae	<i>Lysimachia arvensis</i>	Scarlet Pimpernel	Exotic	F
Rosaceae	<i>Photinia serratifolia</i>	Chinese Photinia	Exotic	S
	<i>Rubus fruticosus</i>	Blackberry	Exotic	L
Rubiaceae	<i>Galium murale</i>	Small Bedstraw	Exotic	F
Santalaceae	<i>Exocarpos cupressiformis</i>	Cherry Ballart	Native	S
Sapindaceae	<i>Acer negundo</i>	Box-elder Maple	Exotic	S
Solanaceae	<i>Cestrum parqui</i>	Green Cestrum	Exotic	S
	<i>Solanum nigrum</i>	Blackberry Nightshade	Exotic	F
	<i>Solanum pseudocapsicum</i>	Madeira Winter	Exotic	F

Form: (T) Tree; (S) Shrub; (G) Grass; (L) Vine/Climber/Scrambler; (R) Rush; (F) Forb; (O) Other.

Fauna

Class	Scientific name	Common name	Native/ Exotic	Ecoplanning (25/08/17)
Amphibia	<i>Crinia signifera</i>	Common Eastern Froglet	Native	O
Aves	<i>Chenonetta jubata</i>	Australian Wood Duck	Native	OW
	<i>Egretta novaehollandiae</i>	White-faced Heron	Native	O
	<i>Cracticus tibicen</i>	Australian Magpie	Native	OW
	<i>Cracticus torquatus</i>	Grey Butcherbird	Native	OW
	<i>Cacatua roseicapilla</i>	Galah	Native	W
	<i>Calyptrorhynchus funereus</i>	Yellow-tailed Black-Cockatoo	Native	OW
	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike	Native	O
	<i>Vanellus miles</i>	Masked Lapwing	Native	OW
	<i>Ocyphaps lophotes</i>	Crested Pigeon	Native	OW
	<i>Corvus coronoides</i>	Australian Raven	Native	W
	<i>Neochmia temporalis</i>	Red-browed Finch	Native	O
	<i>Dacelo novaeguineae</i>	Laughing Kookaburra	Native	W
	<i>Hirundo neoxena</i>	Welcome Swallow	Native	OW
	<i>Anthochaera carunculata</i>	Red Wattlebird	Native	W
	<i>Manorina melanocephala</i>	Noisy Miner	Native	OW
	<i>Grallina cyanoleuca</i>	Magpie-lark	Native	OW
	<i>Pardalotus punctatus</i>	Spotted Pardalote	Native	W
	<i>Platycercus elegans</i>	Crimson Rosella	Native	W
	<i>Platycercus eximius</i>	Eastern Rosella	Native	O
	<i>Trichoglossus haematodus</i>	Rainbow Lorikeet	Native	W
<i>Porphyrio porphyrio</i>	Purple Swamphen	Native	W	
<i>Rhipidura albiscapa</i>	Grey Fantail	Native	W	
<i>Rhipidura leucophrys</i>	Willie Wagtail	Native	W	
<i>Sturnus tristis*</i>	Common Myna*	Exotic	OW	
Mammalia	<i>Oryctolagus cuniculus*</i>	Rabbit*	Exotic	O

* denotes exotic species; O = observed; W = heard and OW = Observed and heard