

A photograph of a koala climbing a tree trunk, positioned on the left side of the cover. The koala is grey with a white chest and is reaching up with its front paws. The tree bark is rough and textured.

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Biodiversity Constraints Assessment

Lot 21 DP 1000643
Glendower Street, Gilead

June 2019
(REF: 19HOP02BCA)



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Glendower Street, Gilead**

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File:	19HOP02BCA

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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, the location of all mapped features are to be confirmed by a registered surveyor.

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List of abbreviations

APZ	asset protection zone
BAM	Biodiversity Assessment Method
BAR	Biodiversity Assessment Report
<i>BC Act</i>	<i>Biodiversity Conservation Act (2016)</i>
<i>BC Reg</i>	<i>Biodiversity Conservation Regulation (2017)</i>
BCAR	Biodiversity Certification Assessment Report
BDAR	Biodiversity Development Assessment Report
BOS	Biodiversity Offset Scheme
BPA	bushfire protection assessment
BSSAR	Biodiversity Stewardship Site Assessment Report
CEEC	Critically endangered ecological community
<i>CM Act</i>	<i>Coastal Management Act 2016</i>
CPW	Cumberland Plain Woodland
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DEC	NSW Department of Environment and Conservation (superseded by DECC from April 2007)
DECC	NSW Department of Environment and Climate Change (superseded by DECCW from October 2009)
DECCW	NSW Department of Environment, Climate Change and Water (superseded by OEH from April 2011)
DEWHA	Commonwealth Department of Environment, Water, Heritage & the Arts (superseded by SEWPAC)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
<i>EP&A Act</i>	<i>Environmental Planning and Assessment Act (1979)</i>
<i>EPBC Act</i>	<i>Environment Protection and Biodiversity Conservation Act (1999)</i>
<i>FM Act</i>	<i>Fisheries Management Act</i>
IBRA	Interim Biogeographic Regionalisation for Australia
LEP	local environmental plan
LGA	local government area
<i>LLS Act</i>	<i>Local Land Services Act (2013)</i>
NES	national environmental significance
<i>NPW Act</i>	<i>National Parks and Wildlife Act (1974)</i>
NSW DPI	NSW Department of Industry and Investment
OEH	Office of Environment and Heritage
PCT	plant community type
PFC	projected foliage cover
RFS	NSW Rural Fire Service
ROTAP	rare or threatened Australian plants
SAII	Serious And Irreversible Impacts
SEPP	State Environmental Planning Policy
SEWPAC	Commonwealth Dept. of Sustainability, Environment, Water, Population & Communities (superseded by DOEE)
SIS	species impact statement
SULE	safe useful life expectancy
TEC	threatened ecological community
TPZ	tree preservation zone
<i>TSC Act</i>	<i>Threatened Species Conservation Act (1995) – Superseded by the Biodiversity Conservation Act (2016)</i>
VMP	vegetation management plan



Biodiversity Assessment

1.0 Background

Travers bushfire & ecology has been engaged to undertake a biodiversity constraints assessment within Lot 21 DP 1000643, Glendower Street, Gilead, within Campbelltown local government area (LGA). The extent of this entire lot is shown in Figure 1 and will hereafter be referred to as the 'study area'.



Figure 1 – Study area

1.1 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 21 DP 1000643, Glendower Street, Gilead
Size	Approximately 5.139ha
Local government area	Campbelltown
Grid reference	295569E 6223512N
Elevation	Approximately 130–166m AHD
Topography	Situated in a valley that is oriented east to west. Slopes vary from 5–25°.
Geology and soils	Geology: Ashfield Shale. Soil landscape: Blacktown
Catchment and drainage	Topographic maps show two first-order streams converging into a second-order stream that flows east to west into an unnamed tributary to Menangle Creek. A small farm dam exists in the eastern portion of the site.
Vegetation	Remnant vegetation covers most of the study area and is commensurate with disturbed Cumberland Plain Woodland. The remainder of the site is cleared.
Existing land use	Vacant. The site is zoned RU2 – Rural Landscape.
Clearing	40% of the original canopy vegetation has been previously cleared.

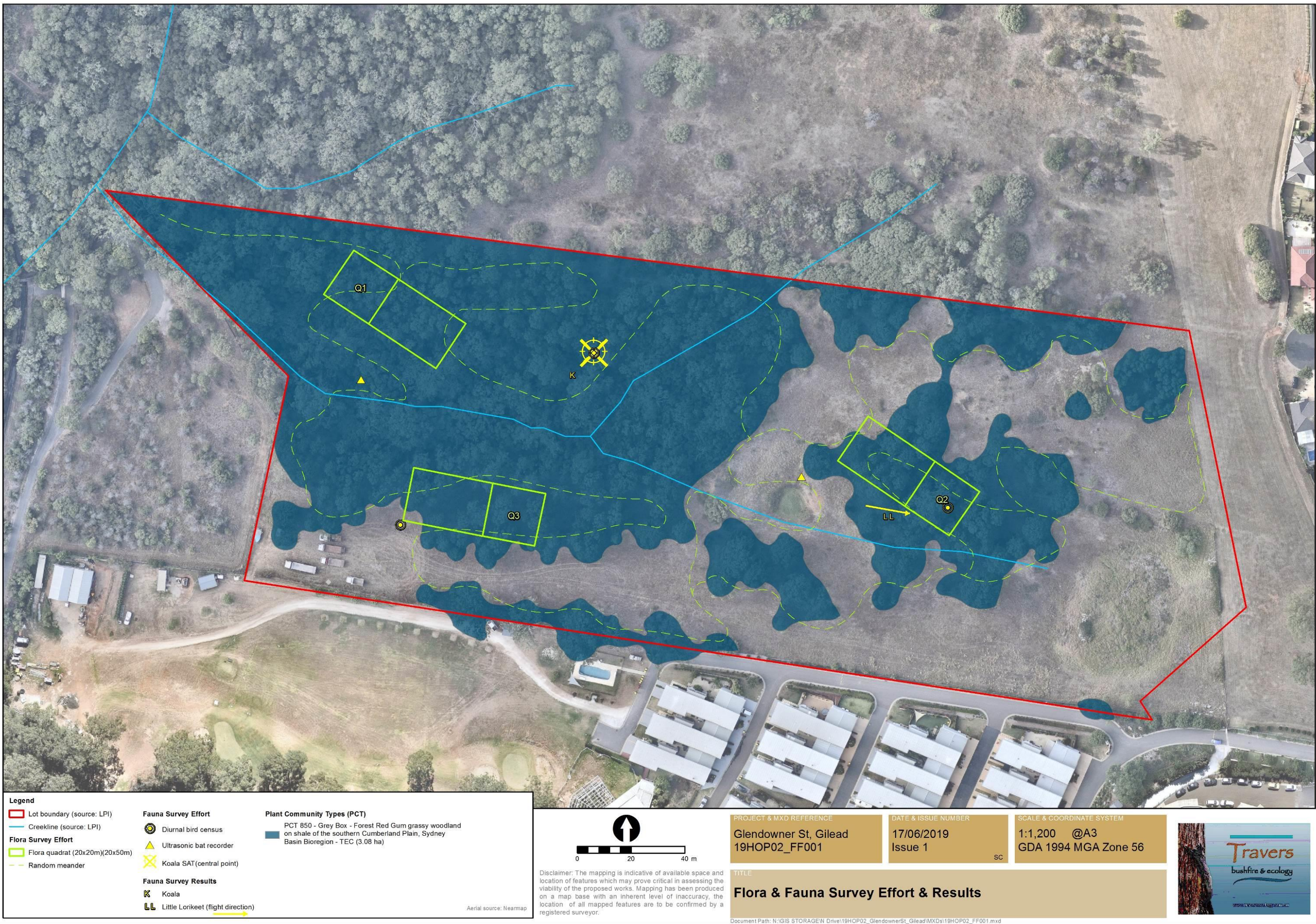


Figure 2 – Flora and fauna survey effort and results

2.0 Biodiversity Offsets Scheme (BOS)

The *BC Act* repeals the *Threatened Species Conservation Act 1995*, the *Nature Conservation Trust Act 2001* and the animal and plant provisions of the *National Parks and Wildlife Act 1974*.

Together with the [Biodiversity Conservation Regulation 2017](#), the *BC Act* establishes a new regulatory framework for assessing and offsetting biodiversity impacts on proposed developments and clearing. It establishes a framework to avoid, minimise and offset impacts on biodiversity from development through the Biodiversity Offsets Scheme (BOS). Where development consent is granted, the authority may impose as a condition of consent an obligation to retire a number and type of biodiversity credits determined under the new Biodiversity Assessment Method (BAM).

2.1 Threshold assessment

The BOS includes two (2) elements to the threshold test – an area trigger and a Sensitive Biodiversity Values Land Map trigger. If clearing exceeds either trigger, the BOS applies to the proposed clearing.

2.1.1 Sensitive Biodiversity Land Map

Sensitive Biodiversity Values Land has been mapped within the study area. Figure 3 shows the site (yellow) in relation to those areas (purple) as having biodiversity values. Clearing of native vegetation within the mapped biodiversity values land triggers this threshold and will require biodiversity offsets to be obtained.

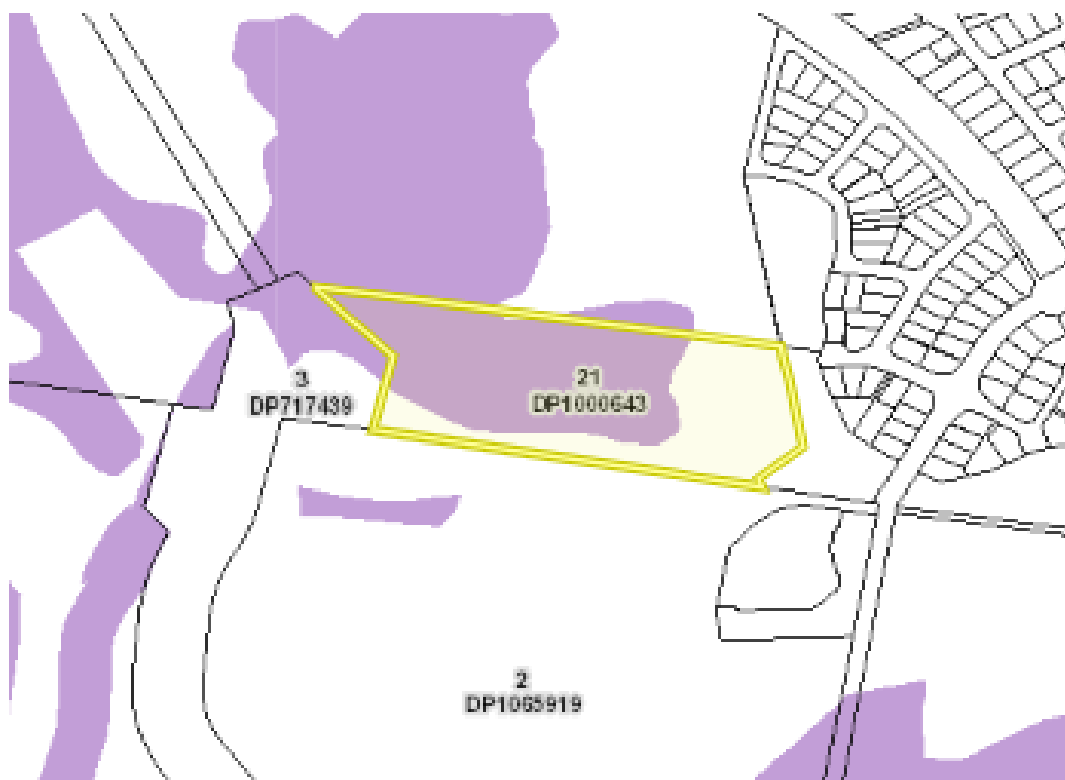


Figure 3 – Biodiversity value land (purple) relative to the study area (yellow)
(Source: OEH – Biodiversity Values Map – 03 June 2019)

2.1.2 Area clearing threshold

The area threshold varies depending on the minimum lot size (shown in the Lot Size Maps made under the relevant Local Environmental Plan (LEP)), or actual lot size (where there is no minimum lot size provided for the relevant land under the LEP).

Table 2 – BOS entry threshold report

Date of Calculation	03/06/2019 4:04 PM	BDAR Required*
Total Digitised Area	2.38 ha	
Minimum Lot Size Method	Lot size	
Minimum Lot Size	5.14 ha	
Area Clearing Threshold	0.5 ha	
Area clearing trigger Area of native vegetation cleared	Unknown #	Unknown #
Biodiversity values map trigger Impact on biodiversity values map(not including values added within the last 90 days)?	yes	yes
Date of the 90 day Expiry	N/A	

Table 2 identifies that the BOS entry threshold report has determined the area threshold based on the actual lot size of 5.14ha, and the area clearing threshold for which the BOS applies is 0.5ha. Clearing of 'native vegetation' that exceeds 0.5ha will require a biodiversity offset to be obtained. Note that 'native vegetation' includes planted species native to NSW. Any future development proposal impacting 0.5ha or more will require offsetting under this trigger.

2.2 Serious and irreversible impacts on biodiversity values

The determination of serious and irreversible impacts (SAIL) is to be made in accordance with principles prescribed section 6.7 of the *BC Regulation* (2017). The principles have been designed to capture those impacts which are likely to contribute significantly to the risk of extinction of a threatened species or ecological community in New South Wales.

Candidate SAIL entities recorded or with potential to occur within the study area include:

- Cumberland Plain Woodland
- Eastern Bentwing-bat
- Little Bentwing-bat
- Large-eared Pied Bat
- Swift Parrot
- Regent Honeyeater

Impacts on Cumberland Plain Woodland (CPW) are considered as a potential SAIL as Cumberland Plain Woodland meets two (2) of the four (4) principles for nomination as a potential SAIL. Therefore, for any future impact on CPW, a biodiversity assessment of the additional impact assessment provisions for SAIL entities will need to be completed in accordance with Section 10.2.3 of the Biodiversity Assessment Method (BAM 2017).

None of the above listed candidate fauna species have been recorded during surveys to date and the Regent Honeyeater is only considered with an unlikely potential to occur. There is no breeding habitat (caves) present for these select microbat species and the site is not likely to provide important foraging for the migratory Swift Parrot or Regent Honeyeater. Therefore any future development within the study area is not considered to constitute an SAIL on the above listed fauna species.

3.0 Flora

3.1 Survey

Botanical survey was undertaken on 7 June 2019 over a time frame of approximately 2hrs.

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 three (3) BAM quadrats of 0.1ha undertaken within areas of native vegetation. A review of the *Atlas of NSW Wildlife* (OEH 2019) was undertaken prior to the site visit to determine threatened species previously recorded within 10km of the subject site, and relevant target searches were undertaken as suited during the random meander and quadrat surveys.

All naturally occurring species were identified to species level where possible, and are listed in Appendix 1.

3.2 Vegetation communities

The Cumberland Plain West vegetation mapping (NPWS 2002) has mapped the majority of the remnant vegetation on site as Shale Hills Woodland (equivalent to PCT 850 Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion), with smaller portions of Shale Sandstone Transition Forest (Low Sandstone Influence) (equivalent to PCT 1395 Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion) and Shale Plains Woodland (equivalent to PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion) in the west of the site.

Field verification of the study area found the following vegetation communities:

- PCT 850 Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion
- Managed Lands

PCT 850 - Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion

This community occupies 3.08ha within the study area.

Canopy – Dominated by *Eucalyptus tereticornis*, with *Eucalyptus crebra*, *Eucalyptus moluccana* and *Eucalyptus fibrosa* occurring in lower abundance. The canopy is of a height of 15-30m with a projected foliage cover (PFC) of approximately 35–50%.

Mid-storey – In the south and eastern parts of the site the vegetation has been underscrubbed in the past and the mid-storey is generally absent. In central and western areas there is a moderate to dense midstorey of native and exotic species. Native species are represented by *Bursaria spinosa*, *Acacia implexa* and *Acacia parramattensis* providing up to 50% PFC. In many areas the exotic shrubs *Olea europaea* and *Ligustrum lucidum* are very dense, particularly along the creek lines, although weed control works appear to have been undertaken recently.

Ground layer – Native species provide up to 37% PFC and include *Microlaena stipoides*, *Dichondra repens*, *Glycine tabacina*, *Carex inversa*, *Cyperus gracilis*, *Brunoniella australis*, *Lomandra filiformis*, *Einadia* spp., *Desmodium varians*, *Cheilanthes sieberi*, *Themeda triandra*, *Chloris ventricosa* and *Solanum prinophyllum*. Exotic species provide 1–10% PFC and include *Asparagus asparagoides*, *Ehrharta erecta*, *Bidens pilosa*, *Senecio madagascariensis*, *Sida rhombifolia*, *Plantago lanceolata* and *Solanum pseudocapsicum*.

Classification - This vegetation is commensurate with Cumberland Plain Woodland (CPW) which is listed within the NSW *BC Act* (2016) as a Critically Endangered Ecological Community (CEEC). It is also commensurate with Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest which is also listed within the the Commonwealth *EPBC Act* (1999) as a Critically Endangered Ecological Community (CEEC). The vegetation meets the *EPBC* condition thresholds as the patch size is greater than 0.5ha and there is greater than 30% native groundcover.

Managed Lands

This vegetation community describes the majority of the study area where remnant trees are absent. There are occasional exotic and non-indigenous trees or shrubs including *Olea europaea*, *Ligustrum sinense*, *Schinus molle*, *Lycium ferocissimum*, *Rubus fruticosus* sp. agg. and naturalised *Corymbia citriodora* (Photo 6). The ground layer is dominated by exotic grasses and groundcovers including *Paspalum dilatatum*, *Ehrharta erecta*, *Bidens pilosa*, *Cenchrus clandestinus*, *Setaria parvifolia*, *Cirsium vulgare* and *Verbena bonariensis*.



Photo 1 – PCT 850 - Grey Box - Forest Red Gum grassy woodland within Quadrat 1 in the north-west of the study area.



Photo 2 – Underscrubbed PCT 850 - Grey Box - Forest Red Gum grassy woodland within Quadrat 3 in the south-west of the study area.



*Photo 3 – PCT 850 - Grey Box - Forest Red Gum grassy woodland with a dense midstorey of *Olea europaea* (African olive) and *Ligustrum lucidum* (Large-leaved privet) along the main creek line.*



Photo 4 – PCT 850 - Grey Box - Forest Red Gum grassy woodland in the east of the study area surrounded by managed lands.



Photo 5 – Managed lands in the east of the study site.



*Photo 6 – Managed land containing naturalised *Corymbia citriodora* in the east of the study site.*



Photo 5 – Managed lands in the centre of the study site.

3.3 Threatened flora species

BC Act – A search of the *Atlas of NSW Wildlife* (OEH, 2019) 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.

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 need to be considered in detail for any future development application.

Table 2 – Threatened flora species with suitable habitat present

Scientific name	BC Act	EPBC Act	Potential to occur	Survey period (OEH)
<i>Pimelea spicata</i>	E1	E	✓	All months
<i>Pultenaea pedunculata</i>	E1	-	low	Sept–Nov
<i>Pterostylis saxicola</i>	E1	E	unlikely	Sept–Nov

Survey for threatened flora has been limited to opportunistic searches during stratified surveys. Targeted searches will be needed in the appropriate survey period for *Pimelea spicata*, *Pultenaea pedunculata* and *Pterostylis saxicola*, as shown in Table 2, depending on the nature of any future development proposal.

All remaining threatened species in both the BioNet (NSW) and *EPBC Act* coordinate search (National) were considered to have low potential suitable habitat within the study area because of previous clearing, past and ongoing land management practices, unsuitable soils / geology, unsuitable previous vegetation type or large distance to known specimens.

3.4 Endangered flora populations

One (1) endangered flora population occurs within the Campbelltown LGA:

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

The study area contains potential habitat for this species, however the closest record is 7km away to the north-west. It is considered that this population has very unlikely potential to occur within the study area.

No specimens of *Marsdenia viridiflora* subsp. *viridiflora* were observed within the study area during the flora survey.

3.5 Threatened ecological communities

One (1) threatened ecological community (TEC) was observed within the study area:

- Cumberland Plain Woodland in the Sydney Basin Bioregion (CPW)

CPW is listed within the NSW *BC Act* (2016) as a Critically Endangered Ecological Community (CEEC) and occupies 3.08ha within the study site. This vegetation community is also commensurate with the Critically Endangered Ecological Community (CEEC) listed within the Commonwealth *EPBC Act* (1999) which is known as Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest.

3.6 State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017

The *State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017* (Vegetation SEPP) was one of a suite of Land Management and Biodiversity Conservation (LMBC) reforms that commenced in New South Wales on 25 August 2017. The Vegetation SEPP (the SEPP) works together with the *Biodiversity Conservation Act 2016* and the *Local Land Services Amendment Act 2016* to create a framework for the regulation of clearing of native vegetation in NSW.

The SEPP will ensure the BOS (established under the Land Management and Biodiversity reforms) will apply to all clearing of native vegetation that exceeds the offset thresholds in urban areas and environmental conservation zones that does not require development consent.

Vegetation SEPP applies to the following local government areas:

Bayside, City of Blacktown, Burwood, Camden, City of Campbelltown, Canterbury-Bankstown, Canada Bay, Cumberland, City of Fairfield, Georges River, City of Hawkesbury, Hornsby, Hunter's Hill, Georges River, Inner West, Ku-ring-gai, Lane Cove, City of Liverpool, Mosman, Newcastle, North Sydney, Northern Beaches, City of Parramatta, City of Penrith, City of Randwick, City of Ryde, Strathfield, Sutherland Shire, City of Sydney, The Hills Shire, Waverley, City of Willoughby, Woollahra.

The Vegetation SEPP also applies to land within a variety of zones as set out in the legislation 'Land to which the policy applies'.

3.6.1 Is an authority to clear vegetation required

As 'development consent' is required for any future DA, the Vegetation SEPP does not apply.

4.0 Fauna

4.1 Survey and habitat

Preliminary fauna survey and threatened species habitat assessment was undertaken on the 11/6/19. Diurnal fauna survey included:

- Snail habitat searches in the eastern and northern portions,
- 3x bird census points (out to a radius of 30-40m for a minimum of 15 minutes),
- Opportunistic bird call and activity survey between census points,
- 1x Koala Spot Assessment Technique SAT – searching 2m around the base of 30 trees (>10cm DBH) for scats indicating presence and then activity levels in accordance with *Phillips & Callaghan* (2008).

Consideration to the presence of hollows, their size and type was also undertaken.

Weather conditions at the time of diurnal survey was 2/8 cloud, light west wind, no rain, 24-16°C between 13:45 – 17:15. Adjacent survey to the south was undertaken on the 18/3/19,

the weather conditions at this time were 8/8 cloud, light south wind, previous rain, 20°C between 14:50 – 18:20.

Nocturnal fauna survey included:

- Spot lighting,
- Frog call identification,
- Ultrasonic microbat recording (x2 passive recording stations),
- Owl call-playback (Powerful Owl, Masked Owl & Barking Owl),
- Bush Stone-curlew call-playback,
- Glider call-playback (Yellow-bellied Glider & Squirrel Glider), and
- Koala call-playback.

Weather conditions at the time of nocturnal survey were 4/8 cloud, no wind, no rain, 2/4 moon, 16-13°C between 17:15 – 20:00. Adjacent nocturnal survey to the south on the 18/3/19, had 7/8 cloud, no wind, no rain, 20°C between 19:00 – 20:30.

Specific survey effort locations and results are shown on Figure 2. All fauna species recorded during survey within the subject site and nearby surrounds are listed in Table A1.2 in Appendix 1.

A review of the Atlas of NSW Wildlife (OEH 2019) was undertaken prior to the site visit to determine threatened species previously recorded within 10km of the subject site.

The following notable habitat features were observed present:

- Recorded Koala habitat with notable use of larger Forest Red Gum and Grey Box trees in the gully areas,
- Large and significant habitat trees containing good quality large and medium hollows
- Summer, winter and spring nectar producing tree species, principally *Eucalyptus sp*
- Fruit producing fig trees
- Ephemeral deeply scoured drainage lines
- Dense mid and upper-storey foliage areas in the gully areas attributed to African Olive and Privet weed species,
- A small dam at low level and weed choked during survey

4.2 Fauna survey limitations

Further more detailed fauna survey is required within the study area before an effective assessment on threatened fauna species can be made in accordance with the *BC Act*. This future survey is to include:

- All habitat tree locations within the proposed subject site (proposed development area). Significant habitat tree locations within the study area – these being any large (30cm+) hollow-bearing trees, trees containing two or more medium (10-30cm) hollows and/or trees containing several small (<10cm) hollows. Significant habitat trees status may also be provided for a tree of threatened fauna species value, such as a high use Koala tree.
- Microbat ultrasonic recording during warmer months (Oct-Mar). Recent March 2019 survey on the adjacent lot to the south has been incorporated to account for a separate season and reduce this limitation.
- Complete snail habitat searches.
- Further Koala activity survey within vegetated areas identified for development.

4.3 Threatened fauna species

BC Act – A search on *Bionet* (OEH, 2019) 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.

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* 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 significance of impact test (Appendix 3):

Table 3 – Threatened fauna species with suitable habitat present

Common name	BC Act	EPBC Act	Potential to occur
Little Lorikeet	V	-	recorded
Koala	V	V	recorded
Grey-headed Flying-fox	V	V	recorded
Little Eagle	V	-	✓
Gang-gang Cockatoo	V	-	✓
Swift Parrot	E	E	✓
Powerful Owl	V	-	✓
Varied Sittella	V	-	✓
Dusky Woodswallow	V	-	✓
Yellow-bellied Sheath-tail-bat	V	-	✓
East-coast Freetail Bat	V	-	✓
Large-eared Pied Bat	V	V	✓
Eastern Falsistrelle	V	-	✓
Little Bentwing-bat	V	-	✓
Eastern Bentwing-bat	V	-	✓
Large-footed Myotis	V	-	✓
Greater Broad-nosed Bat	V	-	✓
Cumberland Plain Land Snail	E	-	✓
White-bellied Sea Eagle	V	-	low
Scarlet Robin	V	-	low
Spotted Harrier	V	-	unlikely
Masked Owl	V	-	unlikely
Brown Treecreeper	V	-	unlikely
Speckled Warbler	V	-	unlikely
Regent Honeyeater	E4A	CE	unlikely
Black-chinned Honeyeater	V	-	unlikely
Hooded Robin	V	-	unlikely
Flame Robin	V	-	unlikely
Diamond Firetail	V	-	unlikely
Yellow-bellied Glider	V	-	unlikely
Squirrel Glider	V	-	unlikely
Greater Glider	-	V	unlikely

The recorded Koala will cause constraint to development. Any future survey recording of Little Lorikeet utilising hollows on site for nesting / roosting would also cause constraint to development. The Grey-headed Flying-fox will not constrain development.

Koala

As a result of the recorded presence of Koala by scats, the study area appears to form 'Core Koala Habitat' (CKH) under the definitions of SEPP 44 Koala Habitat Protection. This policy is a three step process whereby the final stage requires the preparation of a Koala Plan of Management (KPoM) to be prepared where an area is identified as CKH.

A Draft Comprehensive Koala Plan of Management (KPoM 2016) for the Campbelltown Council LGA has been prepared and will need to be addressed by appropriate further survey, habitat conclusions and subsequent site management requirements. A detailed review of this document is required which will likely impose restriction on clearance of native Eucalyptus trees present as well as other strict Koala management measures.

Other threatened fauna with most potential to occur

Further site fauna survey is required to satisfy minimum requirements. Of the non-recorded threatened species the Cumberland Plain Land Snail is considered with most potential to occur. This species may be relocated from development areas only provided that suitable recipient areas are supported by DA approval. Such recipient areas would also need to have recorded presence. Most notably here is that the higher slopes are expected to provide most suitable habitat, if present. Searches in these areas thus far have concentrated in the east and northern portions.

The recording of other important habitat features for threatened fauna with potential to occur, and likely causing additional constraint to development, are currently not expected based on survey observations so far. Such habitat if found to be present include recorded nesting by Little Eagle, Gang-gang Cockatoo, Powerful Owl, Yellow-bellied Sheath-tail-bat, East-coast Freetail Bat, Eastern Falsistrelle and/or Greater Broad-nosed Bat.

4.4 Protected migratory species (National)

The EPBC Act Protected Matters Report provides additionally listed terrestrial, wetland and marine migratory species of national significance likely to occur, or with habitat for these species likely to occur, within a 10km radius of the subject site. The habitat potential of migratory species is considered in Table A2.3 (Appendix 2). The habitat potential of threatened migratory species is considered in Table A2.3 Table A2.2 (Appendix 2).

No nationally protected migratory bird species were recorded present within the study area during the preliminary survey. If found to be present and breeding within the vegetated gully areas only the Black-faced Monarch and Rufous Fantail may cause constraint in the areas. Otherwise protected migratory species protected under the *EPBC Act* and with potential to occur are not likely to cause constraint to development.

4.5 Endangered fauna populations

There are no endangered fauna populations within the Campbelltown LGA.

4.6 Connectivity

The vegetation within the study area is mostly confined to the gully areas which flow and connect with further vegetation to the west. This combined connectivity of gully, woodland and disturbed grassland habitats west of Rosemeadow are now partially fragmented from larger woodland habitat of Noorumba Reserve to the south-east, which continues across Appin Road to more extensive open forest habitat along and beyond the Georges River (refer to Figure 4). These more extensive open forest and woodland habitats heading south-east from the Mount Gilead Retirement Village are well known Koala habitat areas of the local population. A review of local threatened species records and site survey results identifies local connectivity as being most valued for Koala movements, above all others.

The Mount Gilead Retirement Village has undergone progressive development over the last eight years. Whilst this development was constructed mostly on existing cleared and disturbed landscape it has reduced a more direct cross-field dispersal of Koala between these habitat areas. The recording of Koala activity within the study area now highlights the need to restore connectivity for Koala between these parcels.

As the activity within the study area is likely to demonstrate Core Koala Habitat under the definitions of SEPP 44 then any future development will require a Koala Plan of Management (KPoM). Such a KPoM will need to address connectivity for Koala to ensure the current habitat areas remain viable long-term and any development maintains Koala protection, both for habitat and individuals.

Fencing along the western boundary of the retirement village combined with a constructed canal provide partial barriers to Koala movements directly to the west. There is a passage around this canal further north and further south. The northern passage is via the western portions of the study area and connects more directly to large habitats further to the north-west. These habitats form part of the Gilead Biodiversity Offset Site. The Hume Motorway further west creates a barrier to any further westward movements and therefore the combined connective landscape for Koala incorporating the study area is nearing its end point.

Connectivity between the study area and Noorumba Reserve may be restored / enhanced by either restoration of vegetation along the lower cleared areas of the Mount Gilead Retirement Village or by similar restoration within the two adjacent blocks to the east of the study area. This second option is more direct however is perhaps less viable as it would direct Koala movements across Glendower Street. These two options currently permit passage across open disturbed landscape as depicted on Figure 4.

In conclusion, the habitat within the study area does provide local connectivity values for Koala to now warrant protection within a designated conservation corridor area.

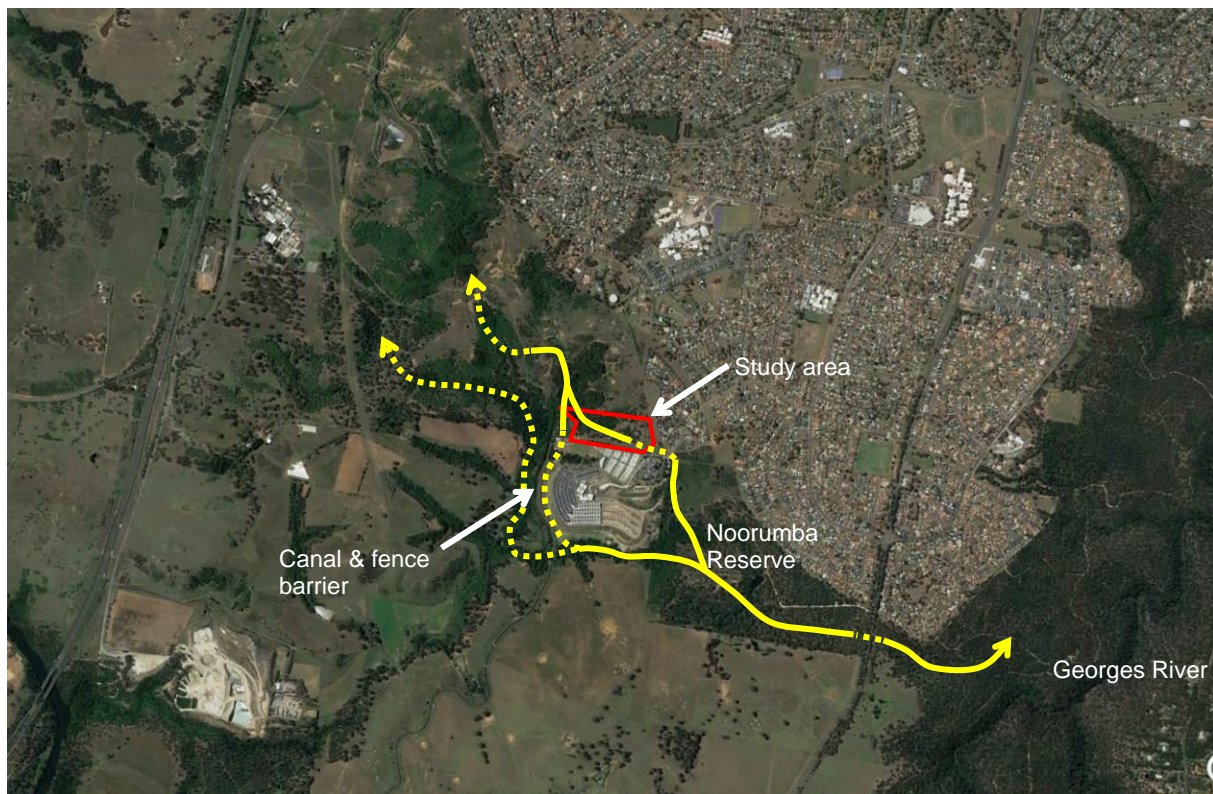


Figure 4 – Local connectivity

5.0 Watercourses and wetlands

5.1 Endangered wetland communities

A number of wetland communities have been listed as an 'endangered ecological community' under the NSW *BC Act*. We note that 'wetlands' are included in the definition of 'waterfront lands' in accordance with the *Water Management Act (WM Act) 2000*, due to their inclusion in the definition of a 'lake' under the same act.

Impacts on wetland communities must be assessed under the *BC Act* and if present the management of wetland communities must be given due consideration in accordance with the objectives and principles of management as contained within the NSW Wetlands Policy (2010), and appropriate management as determined by NSW DPI - Office of Water in their general terms of approval (GTAs). This may include but not limited to the provision of buffers, management of stormwater runoff and maintenance of natural inflows or runoff into those wetland communities.

- Artesian springs ecological community - endangered ecological community listing
- Castlereagh swamp woodland community - endangered ecological community listing
- Coastal saltmarsh in the NSW North Coast, Sydney Basin and South East Corner bioregions - endangered ecological community listing
- Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions - endangered ecological community listing
- Kurri sand swamp woodland in the Sydney Basin Bioregion - endangered ecological community listing
- Lagunaria swamp forest on Lord Howe Island - endangered ecological community listing
- Maroota Sands swamp forest - endangered ecological community listing

- Newnes Plateau Shrub Swamp in the Sydney Basin Bioregion - endangered ecological community listing
- Swamp oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions - endangered ecological community listing
- Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions - endangered ecological listing
- Sydney Freshwater Wetlands in the Sydney Basin Bioregion - endangered ecological community listing
- The shorebird community occurring on the relict tidal delta sands at Taren Point - endangered ecological community listing
- Upland wetlands of the drainage divide of the New England Tableland Bioregion - endangered ecological community listing
- Wingecarribee Swamp - endangered ecological community listing

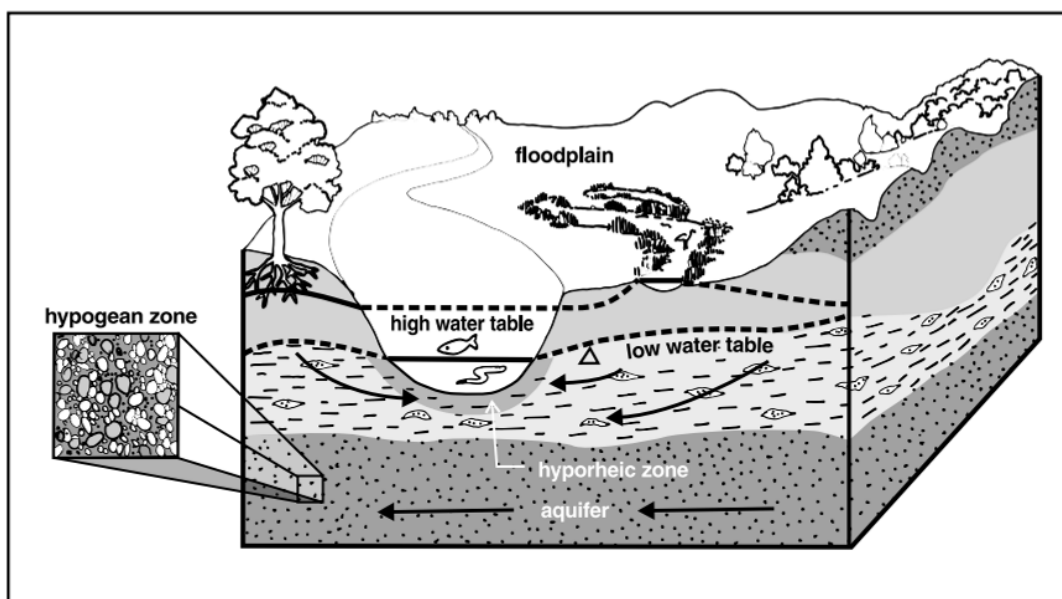
In accordance with the *WM Act*, endangered wetland communities are through the definition of 'lakes' potentially classed as waterfront land. Referral to DPI WaterNSW may be required for determination under the *WM Act* as a controlled activity. As well as protection, a buffer may be applied to these communities as specified by DPI WaterNSW.

No endangered wetland communities were present within the subject site and therefore a referral to WaterNSW is not required.

5.2 Groundwater dependent ecosystems (GDEs)

Groundwater dependent ecosystems are communities of plants, animals and other organisms whose extent and life processes are dependent on groundwater. Some examples of ecosystems which depend on groundwater are:

- wetlands;
- red gum forests, vegetation on coastal sand dunes and other terrestrial vegetation;
- ecosystems in streams fed by groundwater;
- limestone cave systems;
- springs; and
- hanging valleys and swamps.



Alluvial groundwater system discharging into a river

Groundwater dependent ecosystems are therefore ecosystems which have their species composition and their natural ecological processes determined by groundwater (NSW State Groundwater Dependent Ecosystems Policy April 2002).

Groundwater Dependent Ecosystems (GDEs) were not observed within the subject site and therefore the policy does not require any further consideration. A referral to WaterNSW is not required.

5.3 Watercourse assessment

Two (2) ephemeral first-order streams flow south-west and west to a confluence in the western portion of the site where they form a second-order stream. This second-order stream then continues west beyond the site. Protected riparian buffers are to be placed 10m from top-of-bank (TOB) of the first order streams, and of 20m from the second-order stream TOB. Controlled activity approval is required under the *WM Act* for any controlled activity within these buffers.

6.0 Conclusions

Ecological survey and biodiversity constraints assessment has been undertaken within Lot 21 DP 1000643, Glendower Street, Gilead, within Campbelltown local government area (LGA). Assessment has been undertaken in consideration to the *BC Act* through the relevant process outlined by the *EP&A Act*. The schedules and assessment criteria under the *EPBC Act* and the *FM Act* have also been considered.

No threatened flora species have been observed, however targeted searches will be needed in the appropriate survey period for *Pimelea spicata*, *Pultenaea pedunculata* and *Pterostylis saxicola*, as shown in Table 2, depending on the nature of any future development proposal.

Preliminary fauna survey has recorded presence of three (3) threatened fauna species including Koala (*Phascolarctos cinereus*), Little Lorikeet (*Glossopsitta pusilla*) and Grey-headed Flying-fox (*Pteropus poliocephalus*). The recorded presence of Koala likely indicates Core Koala Habitat under SEPP 44 Koala Habitat Protection and also given this is a nationally threatened species will therefore constrain development. This is not to say that clearing of habitat cannot occur, but development is to be designed as Koala friendly under a management plan approved by OEH. Any hollow found to be utilised by Little Lorikeet as part of further survey would also warrant protection. Further fauna survey is required to satisfy minimum requirements of guidelines.

Native vegetation within the study area is commensurate with Cumberland Plain Woodland (CPW) which is listed within the NSW *BC Act* (2016) as a Critically Endangered Ecological Community (CEEC). It is also commensurate with Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest which is also listed within the the Commonwealth *EPBC Act* (1999) as a Critically Endangered Ecological Community (CEEC).

Cumberland Plain Woodland is considered a potential SAI (*Reference - Guidance to assist a decision-maker to determine a serious and irreversible impact Office of Environment & Heritage - OEH 2017*). OEH have not published any thresholds to determine what meets the criteria for determining an SAI.

6.1 Biodiversity Conservation Act

The Biodiversity Offsets Scheme (BOS) and The Regulation (2017) and Biodiversity Assessment Method (2017) came into force under the *BC Act* on the 25th of August, 2017. There are two (2) elements to the threshold test – an area trigger and a Sensitive Biodiversity Values Land Map trigger. If clearing exceeds either trigger, the BOS applies to the proposed clearing.

- Sensitive Biodiversity Values Land has been mapped within the study area. Clearing of native vegetation within the mapped biodiversity values land triggers this threshold and will require a biodiversity offset to be obtained.
- The threshold for clearing above which the BAM and offsets scheme apply is 0.5ha or more. Any future development proposal impacting 0.5ha or more will require offsetting.

Any future development proposal will need to be assessed in accordance with the Significance of Impact Test of the *BC Act* to determine if the proposal constitutes a significant impact upon threatened species, endangered populations or threatened ecological communities.

As Koala is listed under the *EPBC Act* and potential habitat impacts of development, a referral to the Commonwealth Department of Environment and Energy (DOEE) would likely be required in respect to this species.

6.2 Recommendations

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

1. Future development should be designed to avoid or minimise impacts on CPW.
2. Impacts within the mapped biodiversity values land, or clearing of 0.5ha or more of native vegetation, will trigger the BOS and offsetting will be required.
3. Further fauna survey incorporating habitat tree surveys and microbat detection in the warmer months.
4. Retain future identified hollow-bearing trees where possible particularly large hollows and large trees containing hollows.
5. Landscaping should consider the use of locally-occurring native species commensurate with Cumberland Plain Woodland including trees, shrubs and ground covers to encourage local fauna use, to consolidate remnant vegetation linkages and to provide 'island' refuges for native flora and fauna species within the locality.
6. Control and eradication of invasive ecological weeds should be undertaken to prevent further invasion by these species. Invasive species such as Lantana, Small-leaved Privet and African Olive were observed within the study area.

Appendix 1

Flora Species List

Table A1.1 – Flora species recorded

Family	Scientific name	Common name
TREES		
Fabaceae	<i>Acacia parramattensis</i>	Sydney Green Wattle
Myrtaceae	<i>Eucalyptus crebra</i>	Narrow-leaved Ironbark
Myrtaceae	<i>Eucalyptus fibrosa</i>	Broad Leaved Ironbark
Myrtaceae	<i>Eucalyptus moluccana</i>	Grey Box
Myrtaceae	<i>Eucalyptus tereticornis</i>	Forest Red Gum
Moraceae	<i>Ficus rubiginosa</i>	Port Jackson Fig
Oleaceae	<i>Olea europaea</i> subsp. <i>cuspidata</i> *	African Olive
Anacardiaceae	<i>Schinus molle</i> *	Pepper Tree
SHRUBS		
Fabaceae	<i>Acacia implexa</i>	Hickory Wattle
Pittosporaceae	<i>Bursaria spinosa</i>	Native Blackthorn
Oleaceae	<i>Ligustrum lucidum</i> *	Large-leaved Privet
Oleaceae	<i>Ligustrum sinense</i> *	Small-leaved Privet
Solanaceae	<i>Lycium ferocissimum</i> *	African Boxthorn
Rosaceae	<i>Rubus fruticosus</i> sp. agg.*	Blackberry complex
GROUNDCOVERS		
Adiantaceae	<i>Adiantum aethiopicum</i>	Common Maidenhair
Asphodelaceae	<i>Aloe striatula</i> *	
Amaranthaceae	<i>Alternanthera denticulata</i>	Lesser Joyweed
Primulaceae	<i>Anagallis arvensis</i> *	Scarlet Pimpernel
Poaceae	<i>Aristida ramosa</i>	Purple Wiregrass
Rubiaceae	<i>Asperula conferta</i>	Common Woodruff
Poaceae	<i>Rytidosperma fulvum</i>	Wallaby Grass
Asteraceae	<i>Bidens pilosa</i> *	Cobbler's Pegs
Poaceae	<i>Bothriochloa macra</i>	Red Grass
Acanthaceae	<i>Brunoniella australis</i>	Blue Trumpet
Convolvulaceae	<i>Calystegia sepium</i>	
Cyperaceae	<i>Carex inversa</i>	Knob Sedge
Apiaceae	<i>Centella asiatica</i>	Swamp Pennywort
Adiantaceae	<i>Cheilanthes sieberi</i>	Rock Fern
Poaceae	<i>Chloris ventricosa</i>	Tall Chloris
Asteraceae	<i>Cirsium vulgare</i> *	Spear Thistle
Asteraceae	<i>Conyza bonariensis</i> *	Flax-leaf Fleabane
Poaceae	<i>Cymbopogon refractus</i>	Barbwire Grass
Poaceae	<i>Cynodon dactylon</i>	Common Couch
Cyperaceae	<i>Cyperus eragrostis</i> *	Umbrella Sedge
Cyperaceae	<i>Cyperus gracilis</i>	Slender Flat Sedge
Convolvulaceae	<i>Dichondra repens</i>	Kidney Weed
Poaceae	<i>Ehrharta erecta</i> *	Panic Veldtgrass
Chenopodiaceae	<i>Einadia hastata</i>	Berry Saltbush
Chenopodiaceae	<i>Einadia polygonoides</i>	-
Chenopodiaceae	<i>Einadia trigonos</i>	Fishweed
Poaceae	<i>Eragrostis curvula</i> *	African Lovegrass
Poaceae	<i>Eragrostis leptostachya</i>	Paddock Lovegrass
Geraniaceae	<i>Geranium homeanum</i>	Northern Cranesbill

Family	Scientific name	Common name
Clusiaceae	<i>Hypericum gramineum</i>	Small St Johns Wort
Juncaceae	<i>Juncus usitatus</i>	Common Rush
Asteraceae	<i>Lagenophora stipitata</i>	-
Lomandraceae	<i>Lomandra filiformis</i>	Wattle Matt-rush
Poaceae	<i>Microlaena stipoides</i>	Weeping Grass
Poaceae	<i>Oplismenus imbecillis</i>	-
Cactaceae	<i>Opuntia aurantiaca</i> *	Tiger Pear
Oxalidaceae	<i>Oxalis perennans</i>	Yellow-flowered Wood Sorrel
Poaceae	<i>Panicum</i> sp.	-
Poaceae	<i>Paspalum dilatatum</i> *	Paspalum
Sinopteridaceae	<i>Pellaea falcata</i>	Sickle Fern
Poaceae	<i>Cenchrus clandestinus</i> *	Kikuyu, Kikuyu Grass
Poaceae	<i>Phalaris</i> sp.*	
Plantaginaceae	<i>Plantago lanceolata</i> *	Ribwort
Lamiaceae	<i>Plectranthus parviflorus</i>	Cockspur Flower
Asteraceae	<i>Senecio madagascariensis</i> *	Fireweed
Poaceae	<i>Setaria parviflora</i> *	
Malvaceae	<i>Sida rhombifolia</i> *	Paddy's Lucerne
Solanaceae	<i>Solanum prinophyllum</i>	Forest Nightshade
Solanaceae	<i>Solanum pseudocapsicum</i> *	Jerusalem Cherry
Asteraceae	<i>Sonchus oleraceus</i> *	Common Sow-thistle
Poaceae	<i>Sporobolus elongatus</i>	Slender Rat's Tail Grass
Poaceae	<i>Themeda triandra</i>	Kangaroo Grass
Verbenaceae	<i>Verbena bonariensis</i> *	Purpletop
VINES		
Asclepiadaceae	<i>Araujia sericifera</i> *	Mothvine
Asparagaceae	<i>Asparagus asparagoides</i> *	Bridal Creeper
Ranunculaceae	<i>Clematis aristata</i>	Old Man's Beard
Fabaceae/faboideae	<i>Desmodium varians</i>	Slender Tick-trefoil
Fabaceae/faboideae	<i>Glycine tabacina</i>	Twining Glycine
Fabaceae/faboideae	<i>Kennedia rubicunda</i>	Dusky Coral Pea
Bignoniaceae	<i>Pandorea pandorana</i>	Wonga Vine
AQUATIC / SEMI-AQUATIC		
Onagraceae	<i>Ludwigia peploides</i> subsp. <i>montevidensis</i>	Water Primrose
Cyperaceae	<i>Machaerina articulata</i>	Jointed Twig-Rush
Poaceae	<i>Paspalum distichum</i>	Water Couch
* denotes exotic species TS denotes threatened species		

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

Table A1.2 – Fauna species recorded

Common name	Scientific name	Method observed	
Birds		March 19	June 19
Australasian Grebe	<i>Tachybaptus novaehollandiae</i>	✓	
Australian King Parrot	<i>Alisterus scapularis</i>		W
Australian Magpie	<i>Cracticus tibicen</i>		O
Australian Raven	<i>Corvus coronoides</i>	✓	O W
Bar-shouldered dove	<i>Geopelia humeralis</i>		O
Bell Miner	<i>Manorina melanophrys</i>	✓	W
Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>		W
Brown Thornbill	<i>Acanthiza pusilla</i>		W
Common Myna *	<i>Sturnus tristis</i>	✓	
Eastern Rosella	<i>Platycercus eximius</i>	✓	
Fairy Martin	<i>Hirundo ariel</i>	✓	
Galah	<i>Eolophus roseicapillus</i>		O W
Grey Butcherbird	<i>Cracticus torquatus</i>	✓	O W
Lewin's Honeyeater	<i>Meliphaga lewinii</i>		W
Little Lorikeet ^{TS}	<i>Glossopsitta pusilla</i>		O W
Magpie-lark	<i>Grallina cyanoleuca</i>	✓	O
Masked Lapwing	<i>Vanellus miles</i>	✓	O W
Musk Lorikeet	<i>Glossopsitta concinna</i>	✓	W
Noisy Miner	<i>Manorina melanocephala</i>	✓	O W
Pied Butcherbird	<i>Cracticus nigrogularis</i>	✓	
Pied Currawong	<i>Strepera graculina</i>	✓	W
Purple Swamphen	<i>Porphyrio porphyrio</i>	✓	
Rainbow Lorikeet	<i>Trichoglossus haematodus</i>		O W
Red Wattlebird	<i>Anthochaera carunculata</i>		O W
Spotted Pardalote	<i>Pardalotus punctatus</i>		W
Spotted Turtle-Dove *	<i>Streptopelia chinensis</i>		W
Sulphur Crested Cockatoo	<i>Cacatua galerita</i>		W
Welcome Swallow	<i>Hirundo neoxena</i>	✓	
Willie Wagtail	<i>Rhipidura leucophrys</i>	✓	
Yellow-faced Honeyeater	<i>Caligavis chrysops</i>		W
Mammals			
Domesticated Dog *	<i>Canis lupus familiaris</i>		O
Eastern Freetail-bat	<i>Mormopterus ridei</i>	✓	U ^{PR}
European Red Fox *	<i>Vulpes vulpes</i>	✓	P
Gould's Wattled Bat	<i>Chalinolobus gouldii</i>	✓	U
Grey-headed Flying-fox ^{TS}	<i>Pteropus poliocephalus</i>	✓	
Koala ^{TS}	<i>Phascolarctos cinereus</i>		O
Forest Bat	<i>Vespadelus sp.</i>		U
Little Forest Bat	<i>Vespadelus vulturnus</i>		
Rabbit *	<i>Oryctolagus cuniculus</i>		P
Tawny frogmouth	<i>Podargus strigoides</i>		O
Wombat	<i>Vombatidae</i>		FB P

Common name		Scientific name	Method observed				
Reptiles							
Cream-striped Shining Skink		Cryptoblepharus virgatus	✓				
Delicate Skink		Lampropholis delicata	✓				
Eastern Water Skink		Eulamprus quoyii	✓				
Amphibians							
Common Eastern Froglet		Crinia signifera	✓	W			
Dwarf Tree Frog		Litoria fallax	✓				
Striped Marsh Frog		Limnodynastes peronii		O			
Spotted Marsh Frog		Limnodynastes tasmaniensis	✓				
Whistling Tree Frog		Litoria verreauxii	✓	W			
Mollusc							
Brown Garden Snail *		Cornu aspersum		O			
Invertebrates							
Monarch butterfly		Danaus plexippus		O			
<div>Note:</div> <div><div>* indicates introduced species</div><div>^{TS} indicates threatened species</div><div>^{MS} indicates Migratory species</div></div> <div>All species listed are identified to a high level of certainty unless otherwise noted as:</div> <div><div>^{PR} indicates species identified to a 'probable' level of certainty – more likely than not</div><div>^{PO} indicates species identified to a 'possible' level of certainty – low-moderate level of confidence</div></div>							
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

Appendix 2

Threatened Flora and Fauna Species Habitat Assessment

Table A2.1 – Threatened flora species habitat assessment

Scientific name DATABASE SOURCE1	BC Act	EPBC Act	Growth form and habitat requirements <i>Distribution limit</i>	Recorded on site (✓)	If not recorded on site				Further assessment required (✓)
					Suitable habitat present (✓)	Nearby and / or high number of record(s) (✓) <i>Notes 1,2 & 3</i>	Record(s) from recent years (✓) <i>Notes 1,2 & 3</i>	Potential to occur	
<i>Acacia bynoeana</i> 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. <i>Distribution limits N-Newcastle S-Berrima.</i>	x	x	-	-	x	x
<i>Acacia pubescens</i> OEH EPBC	V	V	Spreading shrub 1-4m high open sclerophyll growing in open forest and woodlands on clay soils. <i>Distribution limits N-Bilpin S-Georges River.</i>	x	✓	7km ENE	2008	not likely	x
<i>Allocasuarina glareicola</i> EPBC	E1	E	Small shrub 1-2m high growing in open sclerophyll forest on lateritic soils derived from tertiary alluviums. <i>Distribution limits Castlereagh NR region.</i>	x	x	-	-	x	x
<i>Astrotricha crassifolia</i> EPBC	V	V	Shrub to 2.4m high. Grows in dry sclerophyll woodland on sandstone. <i>Distribution limits N-Patonga S-Royal NP.</i>	x	x	-	-	x	x
<i>Caladenia tessellata</i> EPBC	E1	V	Terrestrial orchid. Clay-loam or sandy soils. LHCCREMS guidelines suggest the species grows in Map Unit 34 – Coastal Sand Wallum Woodland - Heath. Flowers in September – November. <i>Distribution limits N-Swansea S-south of Eden.</i>	x	x	-	-	x	x
<i>Callistemon linearifolius</i> OEH	V	-	Shrub to 4m high. Dry sclerophyll forest on coast and adjacent ranges. <i>Distribution limits N-Nelson Bay S-Georges River.</i>	x	x	-	-	x	x

Scientific name DATABASE SOURCE1	BC Act	EPBC Act	Growth form and habitat requirements Distribution limit	Recorded on site (✓)	If not recorded on site				Further assessment required (✓)
					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	
<i>Cryptostylis hunteriana</i> EPBC	V	V	Saprophytic orchid. Grows in swamp heath on sandy soils. <i>Distribution limits N-Gibraltar Range S-south of Eden.</i>	x	x	-	-	x	x
<i>Cynanchum elegans</i> OEH EPBC	E1	E	Climber or twiner to 1m. Grows in rainforest gullies, scrub & scree slopes. <i>Distribution limits N-Gloucester S-Wollongong.</i>	x	marginal	x	x	x	x
<i>Eucalyptus benthamii</i> OEH EPBC	V	V	Blue gum to 40m high. Wet forest on sandy alluvial soils. <i>Distribution limits N-Yarramundi S-Bents Basin.</i>	x	x	-	-	x	x
<i>Eucalyptus nicholii</i> OEH	V	-	This species is widely planted as an urban street tree and in gardens but is quite rare in the wild. <i>It is confined to the New England Tablelands of NSW, where it occurs from Nundle to north of Tenterfield, largely on private property.</i>	x	x	-	-	x	x
<i>Eucalyptus scoparia</i> OEH	E1	V	Smooth-barked tree only known from vicinity of Bald Rock.	x	x	-	-	x	x
<i>Genoplesium baueri</i> OEH EPBC	E1	E	A terrestrial orchid that grows in sparse sclerophyll forest and moss gardens over sandstone. Flowers Feb–Mar. <i>Distribution limits N – Hunter Valley S – Nowra.</i>	x	x	-	-	x	x
<i>Grevillea parviflora</i> subsp. <i>parviflora</i> OEH EPBC	V	V	Open to erect shrub to 1m. Grows in woodland on light clayey soils. <i>Distribution limits N-Cessnock S-Appin.</i>	x	x	-	-	x	x

Scientific name DATABASE SOURCE1	BC Act	EPBC Act	Growth form and habitat requirements Distribution limit	Recorded on site (✓)	If not recorded on site				Further assessment required (✓)
					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	
<i>Gyrostemon thesioides</i> OEH	E1	-	Multi-stemmed shrub to 70cm. Grows on hillsides and riverbanks. Confined to Georges and Nepean Rivers and believed extinct.	x	x	-	-	x	x
<i>Haloragis exalata</i> subsp. <i>exalata</i> 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
<i>Hibbertia puberula</i> OEH	E1	-	Shrublets with branches up to 30cm long. It favours dry sclerophyll woodland or low heath on sandy soils or rarely in clay, with or without rocks underneath. It extends from Wollemi National Park south to Morton National Park and the south coast near Nowra. Early records are from Hawkesbury River area in Sydney and the Blue Mountains.	x	x	-	-	x	x
<i>Leucopogon exolasius</i> OEH EPBC	V	V	Erect shrub to 2m high. Rocky hillsides and creek banks in Sydney Sandstone Gully Forest. Confined to Woronora and Georges Rivers and Stokes Creek.	x	x	-	-	x	x
<i>Leucopogon fletcheri</i> subsp. <i>fletcheri</i> OEH	E1	-	Shrub to 1.8m high growing in woodland on lateritic soils. Distribution limits N-St Albans S-Springwood.	x	x	-	-	x	x
<i>Melaleuca deanei</i> OEH EPBC	V	V	Shrub to 3m high. Grows in heath on sandstone. Distribution limits N-Gosford S-Nowra.	x	x	-	-	x	x

Scientific name DATABASE SOURCE1	BC Act	EPBC Act	Growth form and habitat requirements Distribution limit	Recorded on site (✓)	If not recorded on site				Further assessment required (✓)
					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	
<i>Persoonia bargoensis</i> OEH EPBC	E1	V	Erect shrub to 1m high. Grows in woodland to Dry sclerophyll forest, on sandstone and laterite. <i>Restricted to the Bargo area.</i>	x	x	-	-	x	x
<i>Persoonia hirsuta</i> OEH EPBC	E1	E	Erect to decumbent shrub. Grows in dry sclerophyll forest and woodland on Hawkesbury sandstone with infrequent fire histories. <i>Distribution limits N-Glen Davis S-Hill Top.</i>	x	x	-	-	x	x
<i>Persoonia nutans</i> EPBC	E1	E	Erect to spreading shrub. Grows in dry sclerophyll forest and woodland on laterite and alluvial sands. <i>Distribution limits Cumberland Plain.</i>	x	x	-	-	x	x
<i>Pimelea curviflora</i> var. <i>curviflora</i> EPBC	V	V	Woody herb or sub-shrub to 0.2-1.2m high. Grows on Hawkesbury Sandstone near shale outcrops. <i>Distribution Sydney.</i>	x	x	-	-	x	x
<i>Pimelea spicata</i> OEH EPBC	E1	E	Decumbent or erect shrub to 0.5m high. Occurs principally in woodland on soils derived from Wianamatta Shales. <i>Distribution limits N-Lansdowne S-Shellharbour.</i>	x	✓	2.5km NE	2018	✓	✓

Scientific name DATABASE SOURCE1	BC Act	EPBC Act	Growth form and habitat requirements Distribution limit	Recorded on site (✓)	If not recorded on site				Further assessment required (✓)
					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	
<i>Pomaderris adnata</i> OEH	E1	-	Occurs near the edge of the plateau behind the Illawarra escarpment. Associated vegetation is <i>Eucalyptus sieberi</i> (Silver-top Ash) - <i>Corymbia gummifera</i> (Red Bloodwood) forest with occasional <i>Hakea salicifolia</i> (Willow-leaved Hakea). Soil is a sandy loam over sandstone. Flowers in late September although buds are present on the plant for many months before the flowers open. Fruit matures in November - December. Estimated longevity of 10 to 25 years. Killed by fire	x	x	-	-	x	x
<i>Pomaderris brunnea</i> OEH EPBC	V	V	Shrub to 3m high. Confined to Upper Nepean and Colo Rivers where it grows in open forest.	x	x	-	-	x	x
<i>Pterostylis saxicola</i> 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	marginal	4km SW	2018	unlikely	✓
<i>Pultenaea aristata</i> OEH EPBC	V	V	A small shrub, mostly 20-40cm tall. Restricted to the Woronora Plateau, a small area between Helensburgh, south of Sydney, and Mt Kiera above Wollongong. Occurs in either dry sclerophyll woodland or wet heath on sandstone. Flowers in winter and spring.	x	x	-	-	x	x
<i>Pultenaea pedunculata</i> OEH	E1	-	Prostrate shrub. Grows in dry sclerophyll forest and disturbed sites. Confined to Prestons and Villawood in NSW.	x	✓	5km SW	2015	low	✓

Scientific name DATABASE SOURCE1	BC Act	EPBC Act	Growth form and habitat requirements Distribution limit	Recorded on site (✓)	If not recorded on site				Further assessment required (✓)
					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	
<i>Syzygium paniculatum</i> OEH EPBC	V	V	Small tree. Subtropical and littoral rainforest on sandy soil. <i>Distribution limits N-Forster S-Jervis Bay.</i>	x	x	-	-	x	x
<i>Thesium australe</i> OEH EPBC	V	V	Erect herb to 0.4m high. Root parasite. Themeda grassland or woodland often damp. <i>Distribution limits N-Tweed Heads S-south of Eden.</i>	x	marginal	6km ENE	1803	not likely	x
OEH	- Denotes species listed within 10km of the subject site on the <i>Atlas of NSW Wildlife</i>								
EPBC	- Denotes species listed within 10km of the subject site in the <i>EPBC Act</i> habitat search								
V	- Denotes vulnerable listed species under the relevant Act								
E or E1	- Denotes endangered listed species under the relevant Act								
E4A or 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 <i>Atlas of NSW Wildlife</i> 3. 'nearby' or 'recent' records are species specific accounting for home range, dispersal ability and life cycle								

Table A2.2 – Threatened fauna species habitat assessment

Common name Scientific name <small>Database source</small>	BC Act	EPBC Act	Preferred habitat Distribution limit	Recorded on site (✓)	If not recorded on site				To be Considered in assessment of significance test
					Suitable habitat present (✓)	Nearby and/or high number of record(s) (✓) <small>Notes 1,2 & 3</small>	Record(s) from recent years (✓) <small>Notes 1,2 & 3</small>	Potential to occur	
Giant Burrowing Frog <i>Heleioporus australiacus</i> <small>OEH EPBC</small>	V	V	Inhabits open forests and riparian forests along non-perennial streams, digging burrows into sandy creek banks. <i>Distribution limit: N-Near Singleton S-South of Eden.</i>	x	x	-	-	x	x
Red-crowned Toadlet <i>Pseudophryne australis</i> <small>OEH</small>	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. <i>Distribution limit: N-Pokolbin. S-near Wollongong.</i>	x	x	-	-	x	x
Green and Golden Bell Frog <i>Litoria aurea</i> <small>OEH EPBC</small>	E	V	Prefers the edges of permanent water, streams, swamps, creeks, lagoons, farm dams and ornamental ponds. Often found under debris. <i>Distribution limit: N-Byron Bay S-South of Eden.</i>	x	Sub-optimal	x	✓	Not likely	x
Littlejohn's Tree Frog <i>Litoria littlejohnii</i> <small>OEH EPBC</small>	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. <i>Distribution limit: N-Hunter River S-Eden.</i>	x	x	-	-	x	x

Common name Scientific name <small>Database source</small>	BC Act	EPBC Act	Preferred habitat Distribution limit	Recorded on site (✓)	If not recorded on site				To be Considered in assessment of significance test
					Suitable habitat present (✓)	Nearby and/or high number of record(s) (✓) <small>Notes 1,2 & 3</small>	Record(s) from recent years (✓) <small>Notes 1,2 & 3</small>	Potential to occur	
Rosenberg's Goanna <i>Varanus rosenbergi</i> OEH	V	-	Hawkesbury sandstone outcrop specialist. Inhabits woodlands, dry open forests and heathland sheltering in burrows, hollow logs, rock crevices and outcrops. <i>Distribution limit: N-Nr Broke. S-Nowra Located in scattered patches near Sydney, Nowra and Goulburn.</i>	x	x	-	-	x	x
Broad-headed Snake <i>Hoplocephalus bungaroides</i> OEH EPBC	E	V	Sandstone outcrops, exfoliated rock slabs and tree hollows in coastal and near coastal areas. <i>Distribution limit: N-Mudgee Park. S-Nowra.</i>	x	x	-	-	x	x
Blue-billed Duck <i>Oxyura australis</i> OEH	V	-	A completely aquatic species occurring mainly throughout the Murray-Darling basin in cool to warm temperate deep permanent freshwater lakes, lagoons and swamps with extensive reed-beds. <i>Distribution limit: N-Tenterfield. S-Albury.</i>	x	x	-	-	x	x
Freckled Duck <i>Stictonetta naevosa</i> 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. <i>Distribution limit: N- Tenterfield. S-Albury.</i>	x	x	-	-	x	x

Common name Scientific name <small>Database source</small>	BC Act	EPBC Act	Preferred habitat Distribution limit	Recorded on site (✓)	If not recorded on site				To be Considered in assessment of significance test
					Suitable habitat present (✓)	Nearby and/or high number of record(s) (✓) <small>Notes 1,2 & 3</small>	Record(s) from recent years (✓) <small>Notes 1,2 & 3</small>	Potential to occur	
Black-necked Stork <i>Ephippiorhynchus asiaticus</i> 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. <i>Distribution limit: N-Tweed Heads. S-Nowra.</i>	x	marginal	✓	x	Not likely	x
Australasian Bittern <i>Botaurus poiciloptilus</i> 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. <i>Distribution limit: N-North of Lismore. S- Eden.</i>	x	x	-	-	x	x
Spotted Harrier <i>Circus assimilis</i> OEH	V	-	Utilises grassy plains, crops and stubblefields; saltbush, spinifex associations; scrublands, mallee, heathlands; open grassy woodlands. <i>Distribution limit: N-Tweed Heads. S-South of Eden.</i>	x	✓	✓	x	Unlikely	✓
White-bellied Sea Eagle (<i>Haliaeetus leucogaster</i>) OEH	V	-	Occupies coasts, islands, estuaries, inlets, large rivers, inland lakes and reservoirs. <i>Sedentary; dispersive. N-Tweed Heads. S-South of Eden.</i>	x	marginal	✓	✓	low	✓
Little Eagle <i>Hieraetus morphnoides</i> OEH	V	-	Utilises plains, foothills, open forests, woodlands and scrublands; river red gums on watercourses and lakes. <i>Distribution limit - N-Tweed Heads. S-South of Eden.</i>	x	✓	✓	✓	✓	✓

Common name Scientific name <small>Database source</small>	BC Act	EPBC Act	Preferred habitat Distribution limit	Recorded on site (✓)	If not recorded on site				To be Considered in assessment of significance test
					Suitable habitat present (✓)	Nearby and/or high number of record(s) (✓) <small>Notes 1,2 & 3</small>	Record(s) from recent years (✓) <small>Notes 1,2 & 3</small>	Potential to occur	
Black Falcon <i>Falco subniger</i> OEH	V	-	Inhabits plains, grasslands, foothills, timbered watercourses, wetland environs, crops; occasionally over towns and cities. <i>N-Tweed Heads. S-South of Eden</i>	x	Sub-optimal	x	x	Not likely	x
Gang-gang Cockatoo <i>Callocephalon fimbriatum</i> 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. <i>Distribution limit: mid north coast of NSW to western Victoria.</i>	x	✓	✓	✓	✓	✓
Glossy Black-Cockatoo <i>Calyptorhynchus lathami</i> OEH	V	-	Open forests with <i>Allocasuarina</i> species and hollows for nesting. <i>Distribution limit: N-Tweed Heads. S-South of Eden.</i>	x	marginal	✓	✓	Not likely	x
Little Lorikeet <i>Glossopsitta pusilla</i> OEH	V	-	Inhabits forests, woodlands; large trees in open country; timbered watercourses, shelterbeds, and street trees. <i>Distribution limit: N-Tweed Heads. S-South of Eden.</i>	✓	-	-	-	-	✓
Swift Parrot <i>Lathamus discolor</i> OEH EPBC	E	E	Inhabits eucalypt forests and woodlands with winter flowering eucalypts. <i>Distribution limit: N-Border Ranges National Park. S-South of Eden.</i>	x	✓	✓	✓	✓	✓

Common name <i>Scientific name</i> <small>Database source</small>	BC Act	EPBC Act	Preferred habitat <i>Distribution limit</i>	Recorded on site (✓)	If not recorded on site				To be Considered in assessment of significance test
					Suitable habitat present (✓)	Nearby and/or high number of record(s) (✓) <small>Notes 1,2 & 3</small>	Record(s) from recent years (✓) <small>Notes 1,2 & 3</small>	Potential to occur	
Turquoise Parrot <i>Neophema pulchella</i> OEH	V	-	Inhabits coastal scrubland, open forest and timbered grassland, especially ecotones between dry hardwood forests and grasslands. <i>Distribution limit: N-Near Tenterfield. S-South of Eden.</i>	x	✓	x	x	Not likely	x
Eastern Ground Parrot <i>Pezoporus wallicus wallicus</i> OEH	V	-	Inhabits low heath, sedgeland and buttongrass plains with dense vegetation to provide suitable roosting cover. <i>Distribution limit: N-North of Tweed Heads. S-South of Eden.</i>	x	x	-	-	x	x
Powerful Owl <i>Ninox strenua</i> OEH	V	-	Forests containing mature trees for shelter or breeding and densely vegetated gullies for roosting. <i>Distribution limits: N-Border Ranges National Park. S-Eden.</i>	x	✓	✓	✓	✓	✓
Masked Owl <i>Tyto novaehollandiae</i> OEH	V	-	Open forest and woodlands with cleared areas for hunting and hollow trees or dense vegetation for roosting. <i>Distribution limit: N-Border Ranges National Park. S-Eden.</i>	x	✓	✓	x	unlikely	✓
Brown Treecreeper <i>Climacteris picumnus victoriae</i> OEH	V	-	Occupies eucalypt woodlands, open woodland lacking a dense understorey with fallen dead timber. <i>Distribution limit: (Sub species victoriae) Central NSW west of Great Div. Cumberland Plains, Hunter Valley, Richmond, Clarence, and Snowy River Valleys.</i>	x	✓	✓	x	unlikely	✓

Common name Scientific name <small>Database source</small>	BC Act	EPBC Act	Preferred habitat Distribution limit	Recorded on site (✓)	If not recorded on site				To be Considered in assessment of significance test
					Suitable habitat present (✓)	Nearby and/or high number of record(s) (✓) <small>Notes 1,2 & 3</small>	Record(s) from recent years (✓) <small>Notes 1,2 & 3</small>	Potential to occur	
Eastern Bristlebird <i>Dasyornis brachypterus</i> OEH EPBC	E	E	Coastal woodlands, dense scrubs and heathlands, especially where low heathland borders taller woodland or dense tall tea-tree. <i>Distribution limit: N-Tweed Heads. S-South of Eden.</i>	x	x	-	-	x	x
Speckled Warbler <i>Chthonicola sagittata</i> OEH	V	-	Found in temperate eucalypt woodland and open forest including forest edges, wooded farmland and urban areas with mature eucalypts. <i>Distribution limit: N-Urbanville. S-Eden.</i>	x	✓	x	✓	unlikely	✓
Regent Honeyeater <i>Xanthomyza Phrygia</i> OEH EPBC	E4A	CE	Found in temperate eucalypt woodland and open forest including forest edges, wooded farmland and urban areas with mature eucalypts. <i>Distribution limit: N-Urbanville. S-Eden.</i>	x	✓	✓	x	unlikely	✓
Black-chinned Honeyeater <i>Melithreptus gularis gularis</i> 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. <i>Distribution limit: N-Cape York Pen. Qld. S-Victor H. Mt Lofty Ra & Flinders Ra. SA.</i>	x	✓	x	x	unlikely	✓
Varied Sittella <i>Daphoenositta chrysoptera</i> OEH	V	-	Open eucalypt woodlands / forests (except heavier rainforests); mallee, inland acacia, coastal tea-tree scrubs; golf courses, shelterbelts, orchards, parks, scrubby gardens. <i>Distribution limit: N-Border Ranges National Park. S-South of Eden.</i>	x	✓	✓	✓	✓	✓

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					Suitable habitat present (✓)	Nearby and/or high number of record(s) (✓) <small>Notes 1,2 & 3</small>	Record(s) from recent years (✓) <small>Notes 1,2 & 3</small>	Potential to occur	
Dusky Woodswallow <i>Artamus cyanopterus cyanopterus</i> 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. <i>Widespread in eastern, southern and south-western Australia.</i>	x	✓	✓	✓	✓	✓
Hooded Robin <i>Melanodryas cucullata cucullata</i> OEH	V	-	Found in eucalypt woodlands, <i>Acacia</i> scrubland, open forest, and open areas adjoining large woodland blocks, with areas of dead timber. <i>Distribution limit: N-Central Qld. S-Spencer Gulf SA.</i>	x	✓	x	x	unlikely	✓
Scarlet Robin <i>Petroica boodang</i> OEH	V	-	Found in foothill forests, woodlands, watercourses; in autumn-winter, more open habitats: river red gum woodlands, golf courses, parks, orchards, gardens. <i>Distribution limit: N-Tweed Heads. S-South of Eden.</i>	x	✓	x	✓	low	✓
Flame Robin <i>Petroica phoenicea</i> OEH	V	-	Summer: forests, woodlands, scrubs, from sea-level to c. 1800 m. Autumn-winter: open woodlands, plains, paddocks, golf courses, parks, orchards. <i>Distribution limit: N northern NSW tablelands. S-South of Eden.</i>	x	✓	x	x	unlikely	✓

Common name Scientific name <small>Database source</small>	BC Act	EPBC Act	Preferred habitat Distribution limit	Recorded on site (✓)	If not recorded on site				To be Considered in assessment of significance test
					Suitable habitat present (✓)	Nearby and/or high number of record(s) (✓) <small>Notes 1,2 & 3</small>	Record(s) from recent years (✓) <small>Notes 1,2 & 3</small>	Potential to occur	
Diamond Firetail <i>Stagonopleura guttata</i> 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. <i>Distribution limit: N-Rockhampton Q. S-Eyre Pen Kangaroo Is. SA.</i>	x	✓	x	x	unlikely	✓
Spotted-tailed Quoll <i>Dasyurus maculatus</i> OEH EPBC	V	E	Dry and moist open forests containing rock caves, hollow logs or trees. <i>Distribution limit: N-Mt Warning National Park. S-South of Eden.</i>	x	Sub-optimal	x	x	Not likely	x
Southern Brown Bandicoot <i>Isodon obesulus</i> OEH EPBC	E	E	Utilises a range of habitats containing thick ground cover - open forest, woodland, heath, cleared land, urbanised areas and regenerating bushland. <i>Distribution limit: N-Kempsey. S-South of Eden.</i>	x	x	-	-	x	x
Koala <i>Phascolarctos cinereus</i> OEH EPBC	V	V	Inhabits both wet and dry eucalypt forest on high nutrient soils containing preferred feed trees. <i>Distribution limit: N-Tweed Heads. S-South of Eden.</i>	✓	-	-	-	-	✓

Common name Scientific name <small>Database source</small>	BC Act	EPBC Act	Preferred habitat Distribution limit	Recorded on site (✓)	If not recorded on site				To be Considered in assessment of significance test
					Suitable habitat present (✓)	Nearby and/or high number of record(s) (✓) <small>Notes 1,2 & 3</small>	Record(s) from recent years (✓) <small>Notes 1,2 & 3</small>	Potential to occur	
Eastern Pygmy Possum <i>Cercatetus nanus</i> 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. <i>Distribution limit: N-Tweed Heads. S-Eden.</i>	x	x	-	-	x	x
Yellow-bellied Glider <i>Petaurus australis</i> OEH	V	-	Tall mature eucalypt forests with high nectar producing species and hollow bearing trees. <i>Distribution limit: N-Border Ranges National Park. S-South of Eden.</i>	x	Sub-optimal	x	✓	unlikely	✓
Squirrel Glider <i>Petaurus norfolcensis</i> OEH	V	-	Mixed aged stands of eucalypt forest & woodlands including gum barked & high nectar producing species & hollow bearing trees. <i>Distribution limit: N-Tweed Heads. S-Albury.</i>	x	Sub-optimal	x	x	unlikely	✓
Greater Glider <i>Petauroides volans</i> 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 <i>Distribution limit: N-Border Ranges National Park. S- South of Eden.</i>	x	Sub-optimal	x	x	unlikely	✓

Common name Scientific name <small>Database source</small>	BC Act	EPBC Act	Preferred habitat Distribution limit	Recorded on site (✓)	If not recorded on site				To be Considered in assessment of significance test
					Suitable habitat present (✓)	Nearby and/or high number of record(s) (✓) <small>Notes 1,2 & 3</small>	Record(s) from recent years (✓) <small>Notes 1,2 & 3</small>	Potential to occur	
Grey-headed Flying-fox <i>Pteropus poliocephalus</i> 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. <i>Distribution limit: N-Tweed Heads. S-Eden.</i>	x	✓	✓	✓	✓	✓
Yellow-bellied Sheathtail-bat <i>Saccolaimus flaviventris</i> OEH	V	-	Rainforests, sclerophyll forests and woodlands. <i>Distribution limit: N-North of Walgett. S-Sydney.</i>	x	✓	✓	✓	✓	✓
East-coast Freetail Bat <i>Micronomus norfolkensis</i> 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. <i>Distribution limit: N-Woodenbong. S-Pambula.</i>	x	✓	✓	✓	✓	✓
Large-eared Pied Bat <i>Chalinolobus dwyeri</i> 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. <i>Distribution limit: N-Border Ranges National Park. S-Wollongong.</i>	x	✓	✓	✓	✓	✓

Common name <i>Scientific name</i> <small>Database source</small>	BC Act	EPBC Act	Preferred habitat <i>Distribution limit</i>	Recorded on site (✓)	If not recorded on site				To be Considered in assessment of significance test
					Suitable habitat present (✓)	Nearby and/or high number of record(s) (✓) <small>Notes 1,2 & 3</small>	Record(s) from recent years (✓) <small>Notes 1,2 & 3</small>	Potential to occur	
Eastern Falsistrelle <i>Falsistrellus tasmaniensis</i> OEH	V	-	Recorded roosting in caves, old buildings and tree hollows. <i>Distribution limit: N-Border Ranges National Park. S-Pambula.</i>	x	✓	✓	✓	✓	✓
Golden-tipped Bat <i>Kerivoula papuensis</i> OEH	V	-	Rainforest and adjoining moist open forest habitats, roosting in tree hollows and dense vegetation. <i>Distribution limit: N-Border Ranges Nation Park. S-South of Eden.</i>	x	x	-	-	x	x
Little Bentwing-bat <i>Miniopterus australis</i> OEH	V	-	Roosts in caves, old buildings and structures in the higher rainfall forests along the south coast of Australia. <i>Distribution limit: N-Border Ranges National Park. S-Sydney.</i>	x	✓	✓	✓	✓	✓
Eastern Bentwing-bat <i>Miniopterus orianae oceanensis</i> OEH	V	-	Prefers areas where there are caves, old mines, old buildings, stormwater drains and well-timbered areas. <i>Distribution limit: N-Border Ranges National Park. S-South of Eden.</i>	x	✓	✓	✓	✓	✓
Large-footed Myotis <i>Myotis macropus</i> OEH	V	-	Roosts in caves, mines, tunnels, buildings, tree hollows and under bridges. Forages over open water. <i>Distribution limit: N-Border Ranges National Park. S-South of Eden.</i>	x	✓	✓	✓	✓	✓

Common name <i>Scientific name</i> <small>Database source</small>	BC Act	EPBC Act	Preferred habitat <i>Distribution limit</i>	Recorded on site (✓)	If not recorded on site				To be Considered in assessment of significance test
					Suitable habitat present (✓)	Nearby and/or high number of record(s) (✓) <small>Notes 1,2 & 3</small>	Record(s) from recent years (✓) <small>Notes 1,2 & 3</small>	Potential to occur	
Greater Broad-nosed Bat <i>Scoteanax rueppellii</i> OEH	V	-	Inhabits areas containing moist river and creek systems, especially tree lined creeks. <i>Distribution limit: N-Border Ranges National Park. S-Pambula.</i>	x	✓	✓	✓	✓	✓
Cumberland Plain Land Snail <i>Meridolum corneovirens</i> 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. <i>Distribution limit: Cumberland Plain of Sydney Basin Bioregion.</i>	x	✓	✓	✓	✓	✓
OEH	Denotes species listed within 10km of the subject site on the <i>Atlas of NSW Wildlife</i>								
EPBC	Denotes species listed within 10km of the subject site in the <i>EPBC Act</i> habitat search								
V	Denotes vulnerable listed species under the relevant Act								
E or E1	Denotes endangered listed species under the relevant Act								
E4A or 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 <i>Atlas of NSW Wildlife</i> 3. 'nearby' or 'recent' records are species specific accounting for home range, dispersal ability and life cycle								
Unlikely	Represents such a low margin but not enough to 100% rule it one. A significance of impact test is required.								
Not likely	Means 0% change of occurring, despite there being potential habitat. A significance of impact test is not applied to these species.								

A detailed assessment in accordance with Section 1.7 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 <i>Scientific name</i>	Preferred habitat <i>Migratory breeding</i>	Suitable habitat present (✓)	Recorded (✓)	Comments on potential impacts
Oriental or Horsfield's Cuckoo (<i>Cuculus optatus</i>)	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.	✓	x	-
White-throated Needletail (<i>Hirundapus caudacutus</i>)	Airspace over forests, woodlands, farmlands, plains, lakes, coasts, towns; companies forage often along favoured hilltops and timbered ranges. <i>Breeds Siberia, Himalayas, east to Japan. Summer migrant to eastern Australia.</i>	✓	x	-
Black-faced Monarch (<i>Monarcha melanopsis</i>)	Rainforests, eucalypt woodlands; coastal scrubs; damp gullies in rainforest, eucalypt forest; more open woodland when migrating. <i>Summer breeding migrant to coastal south east Australia, otherwise uncommon.</i>	✓	x	-
Spectacled Monarch (<i>Monarcha trivirgatus</i>)	Understorey of mountain / lowland rainforest, thickly wooded gullies, waterside vegetation, mostly well below canopy. <i>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.</i>	x	-	-
Yellow Wagtail (<i>Motacilla flava</i>)	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.	x	-	-
Satin Flycatcher (<i>Myiagra cyanoleuca</i>)	Heavily vegetated gullies in forests, taller woodlands, usually above shrub-layer; during migration, coastal forests, woodlands, mangroves, trees in open country, gardens. <i>Breeds mostly south east Australia and Tasmania over warmer months, winters in north east Qld.</i>	x	-	-
Rufous Fantail (<i>Rhipidura rufifrons</i>)	Undergrowth of rainforests / wetter eucalypt forests / gullies; monsoon forests, paperbarks, sub-inland and coastal scrubs; mangroves, watercourses; parks, gardens. On migration, farms, streets buildings. <i>Breeding migrant to south east Australia over warmer months. Altitudinal migrant in north east NSW in mountain forests during warmer months.</i>	✓	x	-