

Lot 3 DP 184056 Rickards Road, Castlereagh Flora and Fauna Assessment

Prepared for
Paul Lemm Planning Consultant on behalf of Eddy Hawach.

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Abbreviations

Abbreviation	Description
APZ	Asset Protection Zone
°C	Degrees Celsius
CRCIF	Cooks River Castlereagh Ironbark Forest
DA	Development Application
DotEE	Department of the Environment and Energy
EEC	Endangered Ecological Community
ELA	Eco Logical Australia Pty Ltd
EP&A Act	NSW <i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	Commonwealth <i>Environment Protection & Biodiversity Conservation Act 1999</i>
FFA	Flora and Fauna Assessment
GHFF	Grey-headed Flying-fox
GPS	Global Positioning System
HBT	Hollow-bearing Tree
LEP	Local Environment Plan
NES	National Environmental Significance
NW Act	NSW <i>Noxious Weeds Act 1993</i>
OEH	Office of Environment and Heritage
OSSM	On-site Sewage Management System
PCC	Penrith City Council
PCLs	Priority Conservation Lands
SEPP	State Environmental Planning Policy
TEC	Threatened Ecological Community
TSC Act	NSW <i>Threatened Species Conservation Act 1995</i>
VMP	Vegetation Management Plan
WoNS	Weeds of National Significance

Executive summary

Paul Lemm Planning Consultant on behalf of Eddy Hawach proposes to develop a three lot subdivision at Lot 3 DP 184056 Rickards Road, Castlereagh (hereafter referred to as the 'study area') (**Figure 1**). The proposed works will include bulk earthworks, Asset Protection Zone (APZ) and construction of an on-site sewage management system (OSSM), with an expected footprint of 1.56 ha (**Figure 2**).

Eco Logical Australia Pty Ltd (ELA) was commissioned by Paul Lemm Planning Consultant on behalf of Eddy Hawach to prepare a Flora and Fauna Assessment (FFA) for the above lot. This report assesses the full extent of direct and indirect impacts from the proposed works, and will form part of the development application (DA) to Penrith City Council (PCC) for the proposed sub-division.

The study area was surveyed by ecologist Rebecca Dwyer on 2 December 2015 for a total period of approximately eight person hours. The entire study area was traversed on foot, with all visible flora species identified. Each traverse included an assessment of all vegetation communities and their condition and floristic structure. Hollow bearing trees were also recorded. This assessment was to validate vegetation communities against the mapped vegetation (OEH 2013) and ensure that all potential habitat niches were examined. Potential habitat for threatened flora and fauna species were also assessed.

The field survey confirmed the presence of Cooks River Castlereagh Ironbark Forest (CRCIF) within the study area during the field survey. CRCIF corresponds to Threatened Ecological Community (TEC), Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion, listed as an endangered ecological community (EEC) under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and a critically endangered ecological community under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Two threatened flora species were recorded within the study area. *Dillwynia tenuifolia* and *Grevillea juniperina* subsp. *juniperina* are listed as vulnerable under the TSC Act. No additional threatened flora species were considered likely to occur within the study area. The field survey identified approximately 5.5 ha of known *D. tenuifolia* habitat and 4 ha of known *G. juniperina* subsp. *juniperina* habitat within the study area.

Potential foraging and/or breeding habitat was recorded within the study area for 11 threatened fauna species. No threatened fauna species listed under the TSC Act or EPBC Act were recorded within the study area during field survey.

Potential direct impacts of the proposed site layout will involve the removal and / or modification of 1.56 ha of CRCIF (including 1.03 ha listed under the EPBC Act) for a three lot subdivision. The proposed development will include three 2 ha lots, comprising the allowance of a street setback, residential dwelling, Asset Protection Zone (APZ) and On-site Sewage Management System (OSSM). Selective thinning of shrubs and suppression of the ground layer is required to maintain APZ.

The vegetation to be retained within the study area will be protected under a Biobanking agreement (8.65 ha) attached to the northern proposed lot, and Section 88B (s88B) covenant (2.94 ha), managed through the implementation of a VMP, on the southern two lots. Additional actions to mitigate the potential impacts of the proposed development on CRCIF, *D. tenuifolia* and *G. juniperina* subsp. *juniperina* have been provided in **Chapter 6**.

The proposed works will result in the removal of three *Dillwynia tenuifolia* individuals. No *Grevillea juniperina* subsp. *juniperina* individuals will be impacted as a result of the proposal. The assessment of significance under the EP&A Act has been applied to consider impacts to *D. tenuifolia* within the study area. The assessment of significance concluded that although the proposed development would remove four individuals, the proposed clearance is not significant due to the retention of 5.5 ha of known *D. tenuifolia* habitat in a 11.59 ha Conservation Zone protected under a Biobanking agreement and/or s88B covenant managed through the implementation of a VMP.

An Assessment of Significance consistent with s5A of the EP&A Act and application of the Significant Impact Criteria (SIC) under the EPBC Act was undertaken for CRCIF.

The Assessment of Significance (AoS) under the TSC Act, concluded that the removal and/or modification of 1.56 ha of CRCIF is not significant, given that it will result in a loss of 1.2% of the local occurrence, and a Species Impact Statement (SIS) is not required (**Appendix C**).

Based on the SIC under the EPBC Act, it is unlikely that the proposed works will lead to a significant impact on CRCIF, given the loss only 0.8% of the local extent. However, the EPBC significant impact guidelines (DotEE 2016) suggest that any reduction in extent of a CEEC may be significant. Therefore, it is recommended that a referral to the Commonwealth is required for this CEEC (**Appendix C**).

1 Introduction

Paul Lemm Planning Consultant on behalf of Eddy Hawach proposes to develop a three lot subdivision at Lot 3 DP 184056 Rickards Road, Castlereagh (hereafter referred to as the 'study area') (**Figure 1**). The study area covers a total area of 13.15 ha.

Eco Logical Australia Pty Ltd (ELA) was commissioned by Paul Lemm Planning Consultant on behalf of Eddy Hawach to prepare a Flora and Fauna Assessment (FFA) for the above lot. This report assesses the full extent of direct and indirect impacts from the proposed works, and will form part of the development application (DA) to Penrith City Council (PCC) for the proposed sub-division.

The proposed works will require the removal and / or modification of 1.56 ha of CRCIF (including 1.03 ha listed under the EPBC Act) for a three lot subdivision. The proposed development will include two 2 ha lots and one 9.15 ha lot, comprising the allowance of a street setback, residential dwelling, Asset Protection Zone (APZ) and On-site Sewage Management System (OSSM). The 9.15 ha lot will also comprise of an 8.65 ha Biobank site. Selective thinning of shrubs and suppression of the ground layer is required to maintain APZ (**Figure 2**).

1.1 Description of the subject site and study area

The study area is located approximately 55 kilometres (km) north-west of the Sydney Central Business District, to the east of Rickards Road, Castlereagh, within the Penrith Local Government Area (LGA). The location of the study area is shown in **Figure 1**.

The 'subject site' is the area directly impacted upon by the proposal and is defined as the area proposed for earthworks and subdivision, as shown in **Figure 2**. The 'study area' includes all areas surveyed as part of this assessment that may be directly or indirectly impacted by the proposal.

1.2 Objectives of this study

The key objectives of the FFA are to:

- identify and describe any threatened flora and fauna species, populations, ecological communities, as well as migratory species and their habitats, that may occur within the study area
- assess the impact of the proposed works on threatened flora and fauna species, populations and ecological communities, and migratory species, likely to occur in the study area through assessment of significance in accordance with the EP&A Act and the EPBC Act
- recommend measures to avoid, reduce or mitigate the impacts of the proposal on native flora and fauna and their habitats.

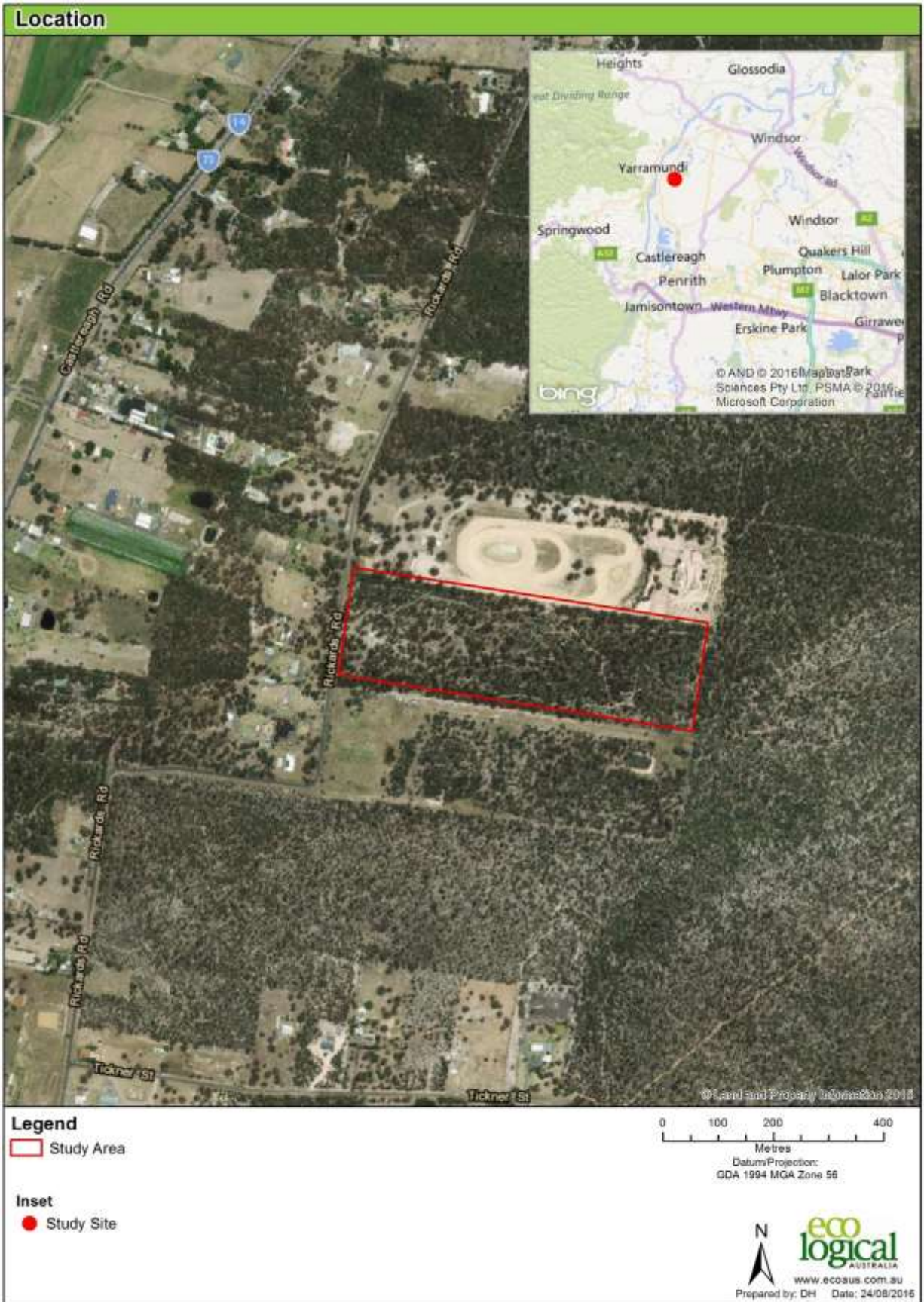


Figure 1: Location of the study area



Figure 2: Proposed site layout

2 Legislative requirements

Commonwealth and State legislation and policies, as well as local policies apply to the assessment, planning and management of ecological issues within the study area. A brief outline of the relevant Commonwealth and State Acts and Policies, and local policies, are provided below.

Table 1: Legislative context

Name	Relevance to the project	Section in this report
Commonwealth		
<i>Environment Protection and Biodiversity Conservation Act 1999</i>	The primary objective of the EPBC Act is to 'provide for the protection of the environment, especially those aspects of the environment that are matters of National Environmental Significance (NES). Matters of NES relevant to the study area are nationally listed threatened species and ecological communities and listed migratory species.	Chapter 5 and Appendix A
State		
<i>Environmental Planning and Assessment Act 1979</i>	The proposed development requires consent under the Penrith Local Environmental Plan and is to be assessed under Part 4 of the EP&A Act. Assessments of significance for impacts to threatened species and endangered ecological communities have been prepared in accordance with s5A of the Act.	Chapter 5 and Appendix A
<i>Threatened Species Conservation Act 1995</i>	The TSC Act aims to protect and encourage the recovery of threatened species, populations and communities listed under the Act. The Act is integrated with the NSW EP&A Act and requires consideration of whether a development (Part 4 of the EP&A Act) or an activity (Part 5 of the EP&A Act), is likely to significantly affect threatened species, populations and ecological communities or their habitats.	Chapter 5 and Appendix A
<i>Noxious Weeds Act 1993</i>	The NW Act defines the roles of government, councils, private landholders and public authorities in the management of noxious weeds.	Chapter 4 and Chapter 5
<i>Penrith LEP 2010</i>	Clause 7.3 of the Penrith LEP 2010 has the objective of protecting, enhancing and managing the ecological, hydrological, scientific, cultural and aesthetic values of biodiversity and wildlife habitat corridors, natural waterways and riparian land. The clause applies to the subject land and is triggered by subdivision, earthworks, clearing vegetation and irrigation with treated effluent. Before deciding an application, the consent authority must consider various objectives and must be satisfied that the development has avoided potential adverse impacts and if these are not avoided, the minimisation or mitigation of impacts.	Chapter 5

3 Methodology

3.1 Data review

The following information and data were reviewed prior to field survey:

- OEH Atlas of NSW Wildlife Database (OEH 2016a)
- EPBC Act Protected Matters Search Tool (DotEE 2016a)
- The Native Vegetation of the Cumberland Plain (NPWS 2002)
- aerial photographs
- site plans.

A search of the Atlas of NSW Wildlife and the EPBC Act Protected Matters Search Tool was performed on 1 December 2015 and 22 August 2016, using a radius of 5 km around the coordinates -33.647764, 150.688022 (Datum GDA94). Species from the database searches were combined to produce a list of threatened fauna and flora species that may potentially utilise the study area, with an assessment of the likelihood of occurrence for each species included in **Appendix A**. The likely occurrence of each species was determined by reviewing records in the area, considering the habitat available and using expert knowledge of the ecology of each species.

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

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

3.2 Field survey

The study area was surveyed by ecologist Rebecca Dwyer on 2 December 2015 for a total period of eight person hours. Temperature ranged from 20.2– 27.6°C during the survey period and conditions were clear with no rain (BOM 2016).

The entire study area was traversed on foot, with all visible flora species identified. Each traverse included an assessment of all vegetation communities and their condition, floristic structure, and various microhabitats on site. Hollow bearing trees were also recorded. This assessment was to validate vegetation communities against the mapped vegetation (OEH 2013) and ensure that all potential habitat niches were examined. Potential habitat for threatened flora and fauna species were assessed. Flora species recorded within the study area are provided in **Appendix B**.

3.2.1 Targeted flora surveys

Targeted searches for *Grevillea juniperina* subsp. *juniperina* and *Dillwynia tenuifolia* were undertaken in areas of potential habitat. The distribution for each species was recorded and mapped within the study area to minimise the proposed clearing of the species as much as possible. Due to the high number of individuals identified, the boundary of the *G. juniperina* subsp. *juniperina* and *D. tenuifolia* populations within the study area were marked with a GPS, and numbers were estimated. Individual plants outside the main population were also marked separately. Survey effort is shown in **Figure 3**.

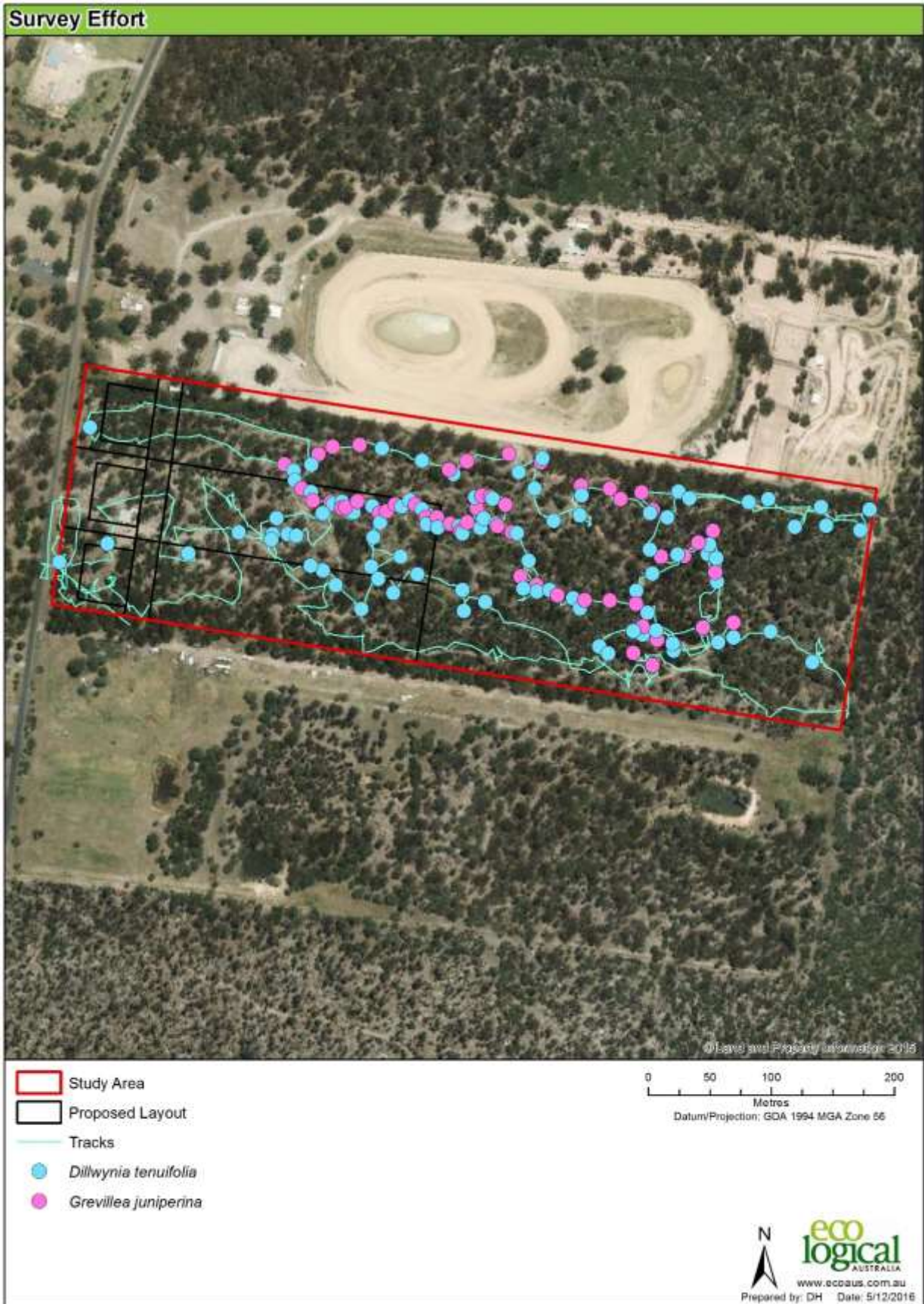


Figure 3: Survey effort (ELA 2015)

4 Results

4.1 Data review

A review of the Native Vegetation mapping of the Sydney Metropolitan Area (OEH 2013) identified two vegetation types within the study area:

- Castlereagh Swamp Woodland
- Cooks River Castlereagh Ironbark Forest.

Twenty-six threatened flora species, three endangered flora populations, 50 threatened and/or migratory fauna species and eight endangered fauna populations, listed under either the TSC Act and/or EPBC Act were identified by the data audit as known, or with the potential, to occur within a 5 km radius of the study area. The likelihood of these species occurring on site is presented in **Appendix A**.

4.2 Field survey

4.2.1 Vegetation communities

The field survey confirmed the presence of Cooks River Castlereagh Ironbark Forest (CRCIF) within the study area during the field survey. The Castlereagh Swamp Woodland mapped by NPWS (2002) was also found to be CRCIF (**Figure 4**).

CRCIF corresponds to Threatened Ecological Community (TEC), *Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion*, listed as an endangered ecological community (EEC) under the TSC Act and a critically endangered ecological community (CEEC) under the EPBC Act.

Cooks River Castlereagh Ironbark Forest

CRCIF ranges from open forest to low woodland, with a canopy dominated by *Eucalyptus fibrosa* (Broad-leaved Ironbark) and *Melaleuca decora* (White-feather Honey-myrtle). The canopy may also include other eucalypts such as *E. longifolia* (Woollybutt), *E. moluccana* (Grey Gum) and *E. capitellata* (Brown Stringybark). The dense shrubby understorey consists of *Melaleuca nodosa* (Prickly-leaved Paperbark) and *Lissanthe strigosa* (Peach Heath), with a range of 'pea' flower shrubs, such as *Dillwynia tenuifolia*, *Pultenaea villosa* (Hairy Bush-pea) and *Daviesia ulicifolia* (Gorse Bitter Pea) and *Grevillea juniperina* subsp. *juniperina*. Commonly occurring species in the ground stratum include *Entolasia stricta* (Wiry Panic), *Lepidosperma laterale* (Variable Sword-sedge), *Opercularia diphylla*, *Dianella revoluta* (Blue Flax-lily), *Themeda triandra* (Kangaroo Grass), *Microlaena stipoides* (Weeping Grass), *Cheilanthes sieberi* subsp. *sieberi* (Mulga Fern), *Goodenia hederacea* subsp. *hederacea* (Forest Goodenia) and *Pratia purpurascens* (Whiteroot).

The vegetation within the study area was found in three condition states; Good, moderate and low.

CRCIF- Good

The good condition CRCIF within the study area consisted of a canopy of *Eucalyptus fibrosa*, *E. crebra* (Thin-leaved Ironbark) and *Melaleuca decora*. The mid-storey consisted of *Bursaria spinosa* (Blackthorn), *Dillwynia tenuifolia*, *Dillwynia sieberi*, *Grevillea juniperina* subsp. *juniperina*, *Daviesia genistifolia* (Broom Bitter Pea), *Ozothamnus diosmifolius* (Dogwood), *Exocarpos cupressiformis*, *Micromyrtus ciliata* (Fringed Heath-myrtle), *Hakea dactyloides* (Finger Hakea), *Acacia decurrens* (Black Wattle) and *Acacia falcata* (Hickory Wattle). The groundcover was diverse consisting of *Austrodanthonia* spp., *Aristida vagans*

(Three-awn Speargrass), *Panicum simile* (Two-coloured Panic), *Austrostipa pubescens*, *Microlaena stipoides*, *Themeda triandra*, *Entolasia stricta*, *Echinopogon caespitosus* (Hedge-hog Grass), *Lepidosperma laterale*, *Imperata cylindrica* (Blady Grass), *Carex inversa*, *Goodenia hederacea* subsp. *hederacea*, *Cheilanthes sieberi* subsp. *sieberi* and *Pratia purpurascens* (**Plate 1**).

Exotic species were restricted to existing tracks and boundary fences and included *Eragrostis curvula* (African Love Grass), *Solanum nigrum* (Black Nightshade), *Sida rhombifolia* (Arrow-leaf Sida), *Tradescantia fluminensis* (Trad), *Araujia sericifera* (Moth Vine), *Senecio madagascariensis* (Fire Wed), *Lantana camara* (Lantana) and *Verbena bonariensis* (Purple Top).

The vegetation type is consistent with the EEC CRCIF, listed under the TSC Act and CEEC under the EPBC Act.

The CRCIF in good condition within the study area is categorised as Category D under the EPBC Act (**Table 2**).



Plate 1: CRCIF good condition, recorded within the study area

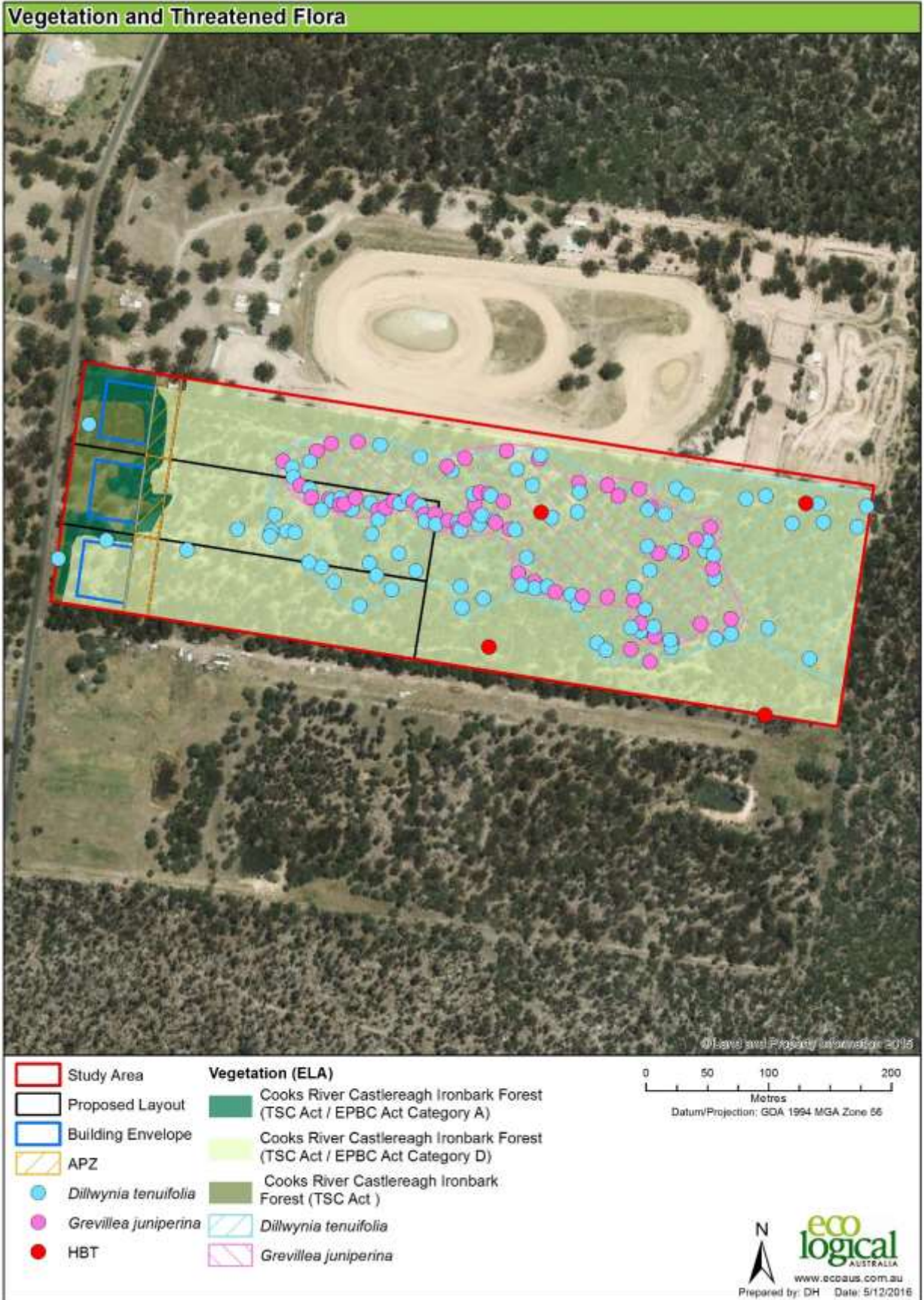


Figure 4: Vegetation communities and threatened flora species within the study area

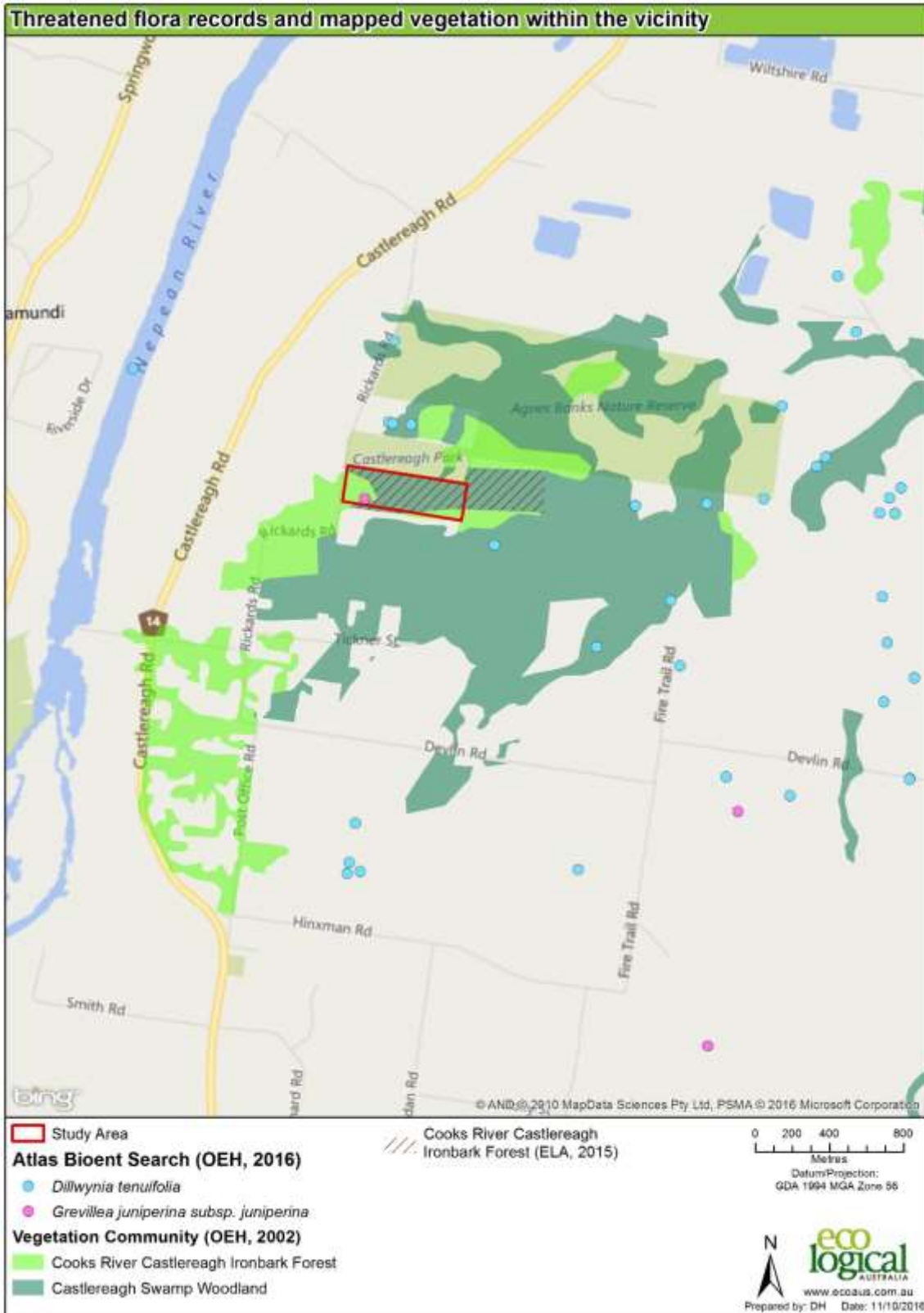


Figure 5: Threatened flora records and mapped vegetation within the vicinity of the study area

Table 2: EPBC Act condition thresholds for CRCIF

Category	Thresholds
A. Moderate condition class	<p>Patch size ≥ 0.5ha</p> <p>And</p> <p>$\geq 30\%$ of the perennial understorey vegetation cover is made up of native species.</p> <p>And</p> <p>The patch is contiguous with a native vegetation remnant (any native vegetation where cover in each layer present is dominated by native species) ≥ 1ha in area.</p> <p>And /or</p> <p>The patch has at least one tree with hollows or at least one large locally indigenous tree (>80cm dbh). Where patches are ≥ 1ha, a density of at least one mature tree/tree with hollows per hectare is required.</p>
B. Moderate condition class	<p>Patch size ≥ 0.5ha</p> <p>And</p> <p>$\geq 50\%$ of the perennial understorey vegetation cover is made up of native species.</p>
C. High condition class	<p>Patch size ≥ 0.5ha</p> <p>And</p> <p>$\geq 70\%$ of the perennial understorey vegetation cover is made up of native species.</p>
D. High condition class	<p>Patch size ≥ 2ha</p> <p>And</p> <p>$\geq 50\%$ of the perennial understorey vegetation cover is made up of native species.</p>

CRCIF – Moderate

The moderate condition CRCIF within the subject site consisted of a canopy of *Eucalyptus fibrosa* and *Melaleuca decora*. The mid-storey consisted of a scattered occurrence of *Dillwynia tenuifolia*, *Acacia decurrens*, *Ozothamnus diosmifolius*, *Exocarpos cupressiformis* and *Hakea dactyloides*. The ground cover consisted of $> 30\%$ native perennial species including *Aristida vagans*, *Austrostipa pubescens*, *Microlaena stipoides*, *Lepidosperma laterale*, *Imperata cylindrica*, *Cheilanthes sieberi subsp. sieberi*, *Themeda triandra* and *Carex inversa* (**Plate 2**).

The ground cover consisted of a scattered occurrence of exotic species including *Eragrostis curvula*, *Sida rhombifolia*, *Senecio madagascariensis* (Fire Weed), *Verbena bonariensis* (Purple Top) and *Lantana camara* (Lantana).

The CRCIF in moderate condition is consistent with the EEC CRCIF, listed under the TSC Act and CEEC under the EPBC Act. The CRCIF in moderate condition within the subject site is categorised as Category A under the EPBC Act (**Table 2**).



Plate 2: CRCIF moderate condition, recorded within the study area

CRCIF - Low

The low condition CRCIF within the study area consisted of a canopy of *Eucalyptus fibrosa*. The mid-storey consisted of a scattered occurrence of *Dillwynia tenuifolia*, *Acacia decurrens* and *Ozothamnus diosmifolius*. The ground cover consisted of <30 % native perennial species including *Aristida vagans*, *Austrostipa pubescens*, *Microlaena stipoides*, *Themeda triandra* and *Carex inversa* (**Plate 3**).

The ground covers and mid-storey were dominated by exotic species including *Eragrostis curvula*, *Paspalum dilatatum* (Paspalum), *Cirsium vulgare* (Spear Thistle), *Conyza bonariensis* (Flax-leaf Fleabane), *Hypochaeris radicata* (Cat's Ear), *Centaurium tenuiflorum*, *Solanum nigrum*, *Sida rhombifolia*, *Senecio madagascariensis*, *Verbena bonariensis* (Purple Top) and *Lantana camara*.

The vegetation type is consistent with the EEC CRCIF, listed under the TSC Act. However, this vegetation type does not meet the EPBC condition thresholds for the CEEC, given that it consisted of a ground cover with <30% native perennial species.



Plate 3: CRCIF low condition, recorded within the study area

4.2.2 Flora species

A total of 52 flora species were identified within the study area during field investigations, of which 14 are exotic species. Two noxious weeds, including two Weeds of National Significance (WoNS) were also recorded within the study area (**Appendix B**).

4.2.3 Threatened flora species

Two threatened flora species were recorded within the study area during the survey. *Dillwynia tenuifolia* and *Grevillea juniperina* subsp. *juniperina* are listed as vulnerable under the TSC Act (**Plate 3** and **Plate 4**). No additional threatened flora species are considered likely to occur within the study area.

The field survey identified approximately 5.5 ha of known *D. tenuifolia* habitat and 4 ha of known *G. juniperina* subsp. *juniperina* habitat within the study area. Distribution mapping illustrating the location of *D. tenuifolia* and *G. juniperina* subsp. *juniperina* within the study area are shown in **Figure 4**.

It is estimated the mapped habitat within the study area comprises two *D. tenuifolia* individuals per square metre and one *G. juniperina* subsp. *juniperina* individual per square metre, resulting in approximately 110,000 *D. tenuifolia* individuals and 40,000 *G. juniperina* subsp. *juniperina* individuals within the study area.



Plate 4: *Dillwynia tenuifolia* recorded within the study area



Plate 5: *Grevillea juniperina* subsp. *juniperina* recorded within the study area

4.2.4 Fauna habitat

A range of fauna habitat features are present throughout the study area:

- vegetated areas of tall open woodland
- hollow bearing trees
- leaf litter / woody debris
- dam.

Habitat within the study area provides potential foraging, breeding and nesting resources for a range of fauna. A total of four hollow bearing trees (HBTs) were recorded within the subject site. All HBTs contained small-medium hollows.

The habitat features relevant to each fauna group are identified in **Table 3** below.

Table 3: Key fauna habitat features present across the study area

Habitat features	Fauna species
Vegetated areas of tall open woodland/forest	Birds, arboreal mammals, microchiropteran bats and owls
HBTs	Birds, reptiles, microchiropteran bats and marsupials
Dam	Amphibians; birds, microchiropteran bats, reptiles and marsupials
Leaf litter / woody debris	Amphibians and reptiles

4.2.5 Fauna species

Opportunistic sightings of fauna were undertaken during the survey, with 10 fauna species recorded, consisting of six indigenous bird species, one exotic bird, one amphibian, and two native mammals (Table 4).

No threatened fauna species listed under the TSC Act or EPBC Act were recorded within the study area during field survey. The likelihood of these species occurring on site is presented in **Appendix A**.

Table 4: Fauna species recorded at the study area

Class	Family	Scientific name	Common name
Aves	Acanthizidae	<i>Acanthiza pusilla</i>	Brown Thornbill
	Artamidae	<i>Cracticus tibicen</i>	Australian Magpie
	Corvidae	<i>Corvus coronoides</i>	Australian Raven
	Meliphagidae	<i>Caligavis chrysops</i>	Yellow-faced Honeyeater
	Psittacidae	<i>Trichoglossus haematodus</i>	Rainbow Lorikeet
	Rhipidurae	<i>Rhipidura leucophrys</i>	Willie Wagtail
	Sturnidae	<i>Acridotheres tristis</i> *	Common Myna
Amphibia	Myobatrachidae	<i>Crinia signifera</i>	Common Froglet
Mammalia	Macropodidae	<i>Macropus giganteus</i>	Eastern Grey Kangaroo
		<i>Wallabia bicolor</i>	Swamp Wallaby

* Exotic species

5 Impact assessment

5.1 Summary of impacts

The proposed works will require the removal and / or modification of 1.56 ha of CRCIF (including 1.03 ha listed under the EPBC Act) for a three lot subdivision. The proposed development will include two 2 ha lots and one 9.15 ha lot, comprising the allowance of a street setback, three residential dwellings, Asset Protection Zone (APZ) and On-site Sewage Management System (OSSM). Selective thinning of shrubs and suppression of the ground layer is required to maintain APZ and setback, all canopy trees will be maintained.

The vegetation to be retained within the study area is proposed to be protected under a Biobanking agreement (8.65 ha) attached to the 9.15 ha proposed lot to the north, and a s88B covenant over the remaining two lots (2.94 ha), managed through the implementation of a VMP, on the southern two lots (**Figure 2**).

The key concepts and objectives of the development will be to:

- permit low density residential development
- allow for a 25 m setback from Rickards Road
- allow for establishment of a 25m APZ - selective thinning of shrubs and suppression of the ground layer is required to maintain APZ, the canopy will remain intact.
- incorporate and maximise the existing landscape and topographical characteristics of the site
- retain existing native vegetation, much of which is in good condition, and protect and enhance biodiversity and sensitive habitats
- protect threatened flora

A summary of the proposed impacts are provided in **Table 5**.

Table 5: Areas of native vegetation and impacts due to the proposed works

Vegetation community	Building envelope (ha)	APZ (ha)	Setback (ha)	Total impact (ha)	Retained vegetation (ha)	Grand Total (ha)
Cooks River Castlereagh Ironbark Forest (TSC Act / EPBC Act – Category A)	0.15	0.14	0.24	0.53	0.01	0.54
Cooks River Castlereagh Ironbark Forest (TSC Act / EPBC Act – Category D)	0.18	0.22	0.1	0.5	11.58	12.08
Cooks River Castlereagh Ironbark Forest (TSC Act)	0.22	0.02	0.29	0.53	-	0.53
Total	0.55	0.38	0.63	1.56	11.59	13.15

5.1.1 Threatened Ecological Communities

One EEC, CRCIF, was recorded within the study area. Impacts to CRCIF have been considered in the proposed footprint design in consultation with ELA Paul Lemm Planning Consultant and Eddy Hawach. Measures taken to avoid, reduce or mitigate impacts on biodiversity are discussed in **Section 6**.

The proposed development will result in the removal of 0.55 ha of CRCIF (0.22 ha listed under the TSC Act and 0.33 ha listed under the EPBC Act only) and the modification of 1.01 ha of CRCIF (0.31 ha listed under the TSC Act and 0.7 ha listed under the EPBC Act only), for a three lot subdivision.

An Assessment of Significance consistent with s5A of the EP&A Act and application of the Significant Impact Criteria (SIC) under the EPBC Act was undertaken for CRCIF.

The Assessment of Significance (AoS) under the TSC Act, concluded that the removal and/or modification of 1.56 ha of CRCIF is not significant, given that it will result in a loss of 1.2% of the local occurrence, and a Species Impact Statement (SIS) is not required.

As CRIF is listed under the EPBC Act, a referral of the proposed development was made to the Commonwealth on 6 December 2016. The referral concluded that the impact was not likely to be significant for the following reasons:

- The proposal will reduce the current extent of CRCIF through the removal of only 0.33 ha of EPBC Act listed CRCIF and the modification of 0.7 ha of EPBC Act listed CRCIF, which represents 0.8% of the CRCIF in the locality.
- Selective thinning of trees and shrubs and suppression of the ground layer is required to maintain APZ and setback, all tree will be retained in this zone.
- 11.59 ha of CRCIF in the subject site will be conserved and a VMP will be prepared to provide suitable management practices to protect and maintain the diversity within this patch.
- The proposed action would not fragment CRCIF within the subject site, or in the surrounding landscape.

A decision is yet to be received from the Commonwealth.

See **Appendix C** for an AoS under the TSC Act and SIC under the EPBC Act, for this CEEC.

5.1.2 Threatened flora

Two threatened flora species were recorded within the study area during the survey. *Dillwynia tenuifolia* and *Grevillea juniperina* subsp. *juniperina* listed as vulnerable under the TSC Act were found within the study area. No additional threatened flora species are likely to occur at the site.

Impacts to *D. tenuifolia* and *G. juniperina* subsp. *juniperina* have been considered in the proposed footprint design in consultation with ELA, Paul Lemm Planning Consultant and Eddy Hawach. Measures taken to avoid, reduce or mitigate impacts on biodiversity are discussed in **Section 6**.

The proposed works will result in the removal of three *Dillwynia tenuifolia* individuals. No *Grevillea juniperina* subsp. *juniperina* individuals will be impacted as a result of the proposed action.

The assessment of significance under the EP&A Act has been applied to consider impacts to *D. tenuifolia* and *G. juniperina* within the study area. The assessment of significance concluded that although the proposed development would remove three *D. tenuifolia* individuals although the population of *D. tenuifolia* within the study area is estimated at approximately 110,000 individuals, therefore the removal of four individuals is not considered a significant impact to the population.

The proposal will also impact 1.56 ha of known *D. tenuifolia* and *G. juniperina* habitat, however the proposed clearance is not considered significant as it is intended that 11.59 ha would be protected under a Biobanking agreement and/or s88B covenant managed through the implementation of a VMP.

5.1.3 Threatened fauna

Potential foraging habitat has been recorded within the study area for seven threatened fauna species:

- *Anthochaera phrygia* (Regent Honeyeater)
- *Daphoenositta chrysoptera* (Varied Sittella)
- *Glossopsitta pusilla* (Little Lorikeet)
- *Ninox connivens* (Barking Owl)
- *Ninox strenua* (Powerful Owl)
- *Pteropus poliocephalus* (Grey-headed Flying-fox)
- *Miniopterus schreibersii oceanensis* (Eastern Bentwing-bat).

Potential foraging and breeding habitat was also recorded for an additional four threatened fauna species:

- *Miniopterus australis* (Little Bentwing-bat)
- *Mormopterus norfolkensis* (Eastern Freetail-bat)
- *Myotis macropus* (Southern Myotis)
- *Petaurus australis* (Yellow-bellied Glider).

Assessments of Significance consistent with s5A of the EP&A Act and impact assessment under the EPBC Act was undertaken for the above listed fauna species. The proposed works will result in the removal of 0.55 ha and modification of 1.01 ha of remnant vegetation. Given the small area to be removed, 11.59 ha will be protected in perpetuity, and higher quality habitat is available in the surrounding landscape, any impact from the proposed works is not considered to be significant the long-term survival of these 11 threatened fauna species (**Appendix C**).

5.1.4 Natural Resource Sensitivity Land

Clause 7.3 of the Penrith LEP 2010 has the objective of protecting, enhancing and managing the ecological, hydrological, scientific, cultural and aesthetic values of biodiversity and wildlife habitat corridors, natural waterways and riparian land. This clause requires the proponent to consider whether the proposed impacts can be avoided and if not, whether they have been mitigated.

Impacts to CRCIF, *D. tenuifolia* and *G. juniperina* subsp. *juniperina* were considered in consultation with ELA, Paul Lemm Planning Consultant and Eddy Hawach. A number of development scenarios were considered with the intent of avoiding and minimising impact to CRCIF, *D. tenuifolia* and *G. juniperina* subsp. *juniperina* within the study area.

The proposed works will require the removal and / or modification of 1.56 ha of CRCIF for a three lot subdivision. The proposed works will also result in the removal of three *Dillwynia tenuifolia* individuals. No *Grevillea juniperina* subsp. *juniperina* individuals will be impacted as a result of the proposed action.

Paul Lemm Planning Consultant on behalf of Eddy Hawach propose to retain and manage 8.65 ha under a Biobanking agreement attached to the northern proposed lot, and 2.94 ha under a s88B covenant, managed through the implementation of a VMP, on the southern two lots. This will protect 11.59 ha of CRCIF, 5.5 ha of *D. tenuifolia* habitat and 4 ha of *G. juniperina* subsp. *juniperina* habitat, in perpetuity. Additional actions to mitigate the potential impacts of the proposed development on CRCIF, *D. tenuifolia* and *G. juniperina* subsp. *juniperina* have been provided in **Chapter 6**.

5.2 Indirect impacts

The indirect impacts of construction and occupation of a future dwelling considered within this FFA include potential increases in:

- spread of weeds into native vegetation to the east
- dust during construction from disturbed soils and stockpiles
- surface and stormwater runoff from increased impervious areas of future dwellings
- increases in human trampling over areas subject to VMP or BioBanking
- increase in rubbish and dumping of garden plants and lawn clippings in areas of high conservation value
- increased light around future developments penetrating remnant vegetation
- Indirect impacts will be managed through the mitigation measures provided in **Chapter 6**.

6 Mitigation measures

Measures taken to avoid, reduce or mitigate impacts on biodiversity are discussed below.

6.1 Avoidance

Impacts to CRCIF, *D. tenuifolia* and *G. juniperina* subsp. *juniperina* were considered in consultation with ELA, Paul Lemm Planning Consultant and Eddy Hawach. A number of development scenarios were considered with the intent of avoiding and minimising impact to CRCIF, *D. tenuifolia* and *G. juniperina* subsp. *juniperina* within the study area, and to ensure that an appropriate balance is achieved between retention and enhancement of the significant biodiversity values of the subject site and surrounds.

In developing the site layout, a number of alternatives were considered including:

1. An increased number of lots
2. BioBanking the entire site
3. Considering other land use proposals that are permissible under the current zoning eg. cattle grazing

However, while impact on CRCIF and *D. tenuifolia* could not be avoided, impacts have been minimised (**Section 6.2**) as far as practicable to maintain the financial viability of the proposal. The proposed site layout was selected as the preferred option as the subject site is zoned for a minimum of 2 ha lots, and it strives to protect the majority of the existing vegetation onsite while realising some development potential.

6.2 Minimise impacts

The extent of CRCIF and the distribution and relative abundance of *D. tenuifolia* and *G. juniperina* subsp. *juniperina* were recorded and mapped to minimise the proposed clearing as much as possible. The proposed development footprint was designed to avoid the highest quality of CRCIF and highest density of plants within the site and to ensure that connectivity was maintained to the local extent and/or population located on an adjacent lot to the north and east (**Figure 5**).

It should be noted that a large portion of the study area was mapped as Castlereagh Swamp Woodland by NPWS (2002), however it was confirmed to be CRCIF during the field survey. CRCIF was also noted to extent into the adjacent lot to the east. The local extent of CRCIF is estimated to be 126 ha.

The study area is located within the Priority Conservation Lands (PCLs) identified in the Cumberland Plain Recovery Plan (DECCW 2010). The PCLs have been identified as the lands that represent the best remaining opportunities in the region to secure long-term biodiversity benefits for the lowest possible cost. Therefore, the importance of retaining as much as possible of the highest quality CRCIF, and to ensure that connectivity was maintained within the priority lands, was of high importance during the design process.

6.3 Mitigate impacts

Paul Lemm Planning Consultant on behalf of Eddy Hawach propose to retain and manage 8.65 ha under a Biobanking agreement attached to the northern proposed lot, and 2.94 ha under a s88B covenant, managed through the implementation of a VMP, on the southern two lots. This will protect 11.59 ha of CRCIF, 5.5 ha of *D. tenuifolia* habitat and 4 ha of *G. juniperina* subsp. *juniperina* habitat, in perpetuity.

Additional actions to mitigate the potential impacts of the proposed development on CRCIF, *D. tenuifolia* and *G. juniperina* subsp. *juniperina* have been provided below. These actions have been drawn from mitigation measures recommended for the associated proposed works where applicable.

- 8.65 ha will be protected under a Biobanking Agreement in consultation with the Office of Environment and Heritage (OEH). An options agreement has been signed between Eddy Hawach and CPB Dragados Samsung Contractors of the sale of 40 credits.
- 2.94 ha will be protected in perpetuity through a s88B covenant under the NSW *Conveyancing Act 1919*.
- The Conservation Zone through a s88B covenant will be done so under the guidance of a Vegetation Management Plan (VMP). This plan is designed to ensure the protection of CRCIF, *D. tenuifolia* and *G. juniperina* subsp. *juniperina*, and should be reviewed every five years.
- The clearing boundary is to be clearly marked using steel pickets and flagged bunting to ensure that all clearing operations occur within the approved clearing footprint.
- All access during the pre-construction, construction and operational phases should be limited to existing roads and designated access tracks.
- Install suitable fencing and signage around areas to be conserved.
- A regular audit program carried out by a suitably qualified ecologist will be implemented. The audit will be undertaken annually for the first two years and thereafter at two yearly intervals. Audit results will be submitted to PCC.
- Erosion and Sedimentation Plan (ESCP) should be prepared and strict erosion and sediment control measures must be implemented on site to protect the retained CEEC.
- Sediment control is to be routinely inspected after rainfall events and periodically inspected during normal conditions.

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Appendix A: Threatened species, populations and communities likelihood of occurrence

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence	Impact Assessment Required
THREATENED ECOLOGICAL COMMUNITIES						
Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion		V	E	Occurs within the local government areas of Bankstown, Blacktown, Campbelltown, Hawkesbury, Liverpool and Penrith. Mainly found in the Castlereagh area of the Cumberland Plain, with small patches occurring at Kemps Creek and Longneck Lagoon; also present around Holsworthy. Occurs almost exclusively on soils derived from Tertiary alluvium, or on sites located on adjoining shale or Holocene alluvium. Often adjacent to and on slightly higher ground than Castlereagh Ironbark Forest or Shale Gravel Transition Forest in the Sydney Basin Bioregion.	No	No
Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion		E	CE	Occurs in western Sydney, with the most extensive stands occurring in the Castlereagh and Holsworthy areas. Smaller remnants occur in the Kemps Creek area and in the eastern section of the Cumberland Plain. Mainly occurs on clay soils derived from the deposits of ancient river systems (alluvium), or on shale soils of the Wianamatta Shales.	Known	Yes
Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest		CE	CE	Endemic to the shale hills and plains of the Sydney Basin Bioregion in NSW, occurring primarily in, but not limited to, the Cumberland Sub-region. Flat to undulating or hilly terrain, at elevations up to approximately 350 metres above sea level. Predominantly associated with clay soils, that are derived from Wianamatta Shale geology. Minor occurrences may be present on other soil groups, notably Holocene Alluvium and soils derived from the Mittagong Formation.	No	No

Shale/Sandstone Transition Forest		E	E	Occurs at the edges of the Cumberland Plain in western Sydney, most now occurs in the Hawkesbury, Baulkham Hills, Liverpool, Parramatta, Penrith, Campbelltown and Wollondilly local government areas. Intergrade between clay soils from the shale rock and earthy and sandy soils from sandstone, or where shale caps overlay sandstone.	No	No
Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion			E	"Generally confined to the Sydney Basin bioregion, including the Moss Vale, Ettrema, Burragorang, Sydney Cataract, and Wollemi IBRA sub-regions. However, some patches may extend into in the Kanangra and Oberon IBRA sub-regions of the South Eastern Highlands bioregion. Found on igneous rock (predominately Tertiary basalt and microsyenite). Typically occurs at elevations between 650 and 1050 m above sea level.	No	No
Western Sydney Dry Rainforest and Moist Woodland on Shale		E	CE	Cumberland Plain Sub-region of the Sydney Basin Bioregion. It generally occurs in rugged terrain and other patches may occur on undulating terrain, with dry rainforest patches typically occupying steep lower slopes and gullies, and moist woodland patches typically occupying upper sections of the slope. Occurs almost exclusively on clay soils derived from Wiannamatta Group shales.	No	No
FLORA						
<i>Acacia bynoeana</i>	Bynoe's Wattle	E1	V	Found in central eastern NSW, from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains. Heath or dry sclerophyll forest on sandy soils.	No, not recorded during field surveys	No
<i>Allocasuarina glareicola</i>		E1	E	Primarily restricted to the Richmond (NW Cumberland Plain) district, but with an outlier population found at Voyager Point, Liverpool. Castlereagh woodland on lateritic soil. Found in open woodland with <i>Eucalyptus parramattensis</i> , <i>Eucalyptus fibrosa</i> , <i>Angophora bakeri</i> , <i>Eucalyptus sclerophylla</i> and <i>Melaleuca decora</i> .	No, not recorded during field surveys	No
<i>Asterolasia elegans</i>		E1	E	Occurs north of Sydney, in the Baulkham Hills, Hawkesbury and Hornsby local government areas. Also likely to occur in the western part of Gosford	No	No

				local government area. Hawkesbury sandstone. Found in sheltered forests on mid- to lower slopes and valleys.		
<i>Cryptostylis hunteriana</i>	Leafless Tongue Orchid	V	V	In NSW, recorded mainly on coastal and near coastal ranges north from Victoria to near Forster, with two isolated occurrences inland north-west of Grafton. Coastal heathlands, margins of coastal swamps and sedgelands, coastal forest, dry woodland, and lowland forest.	No, outside of species range	No
<i>Dillwynia tenuifolia</i>	Dillwynia tenuifolia, Kemps Creek	E2,V		Occurs in the area bounded by Western Road, Elizabeth Drive, Devonshire Road and Cross Street, Kemps Creek in the Liverpool Local Government Area. Transition from Castlereagh Ironbark Forest to Castlereagh Scribbly Gum Woodland.	No, outside of population extent	No
<i>Dillwynia tenuifolia</i>	Dillwynia tenuifolia Sieber ex D.C. in the Baulkham Hills LGA	E2,V		Near the junction of Wisemans Ferry and Sackville Roads within the Baulkham Hills local government area. Vegetation similar to Cumberland Plain Woodland, on Wianamatta Shale soils.	No, outside of population extent	No
<i>Dillwynia tenuifolia</i>		V		Mainly on the Cumberland Plain, but also Bulga Mountains at Yengo in the north, and Kurrajong Heights and Woodford in the Lower Blue Mountains. Scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest, transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland, and disturbed escarpment woodland on Narrabeen sandstone.	Known	Yes
<i>Epacris sparsa</i>	Sparse Heath	V	V	Restricted to the lower Grose River, within the Hawkesbury and Blue Mountains LGAs. Riparian Sandstone Scrub, on the base of cliffs or rock faces, on rock ledges or among rocks in the riparian flood zone. Also pockets of damp clay soil, chiefly on south-west facing slopes.	No, outside of species range	No
<i>Eucalyptus aggregata</i>	<i>Eucalyptus aggregata</i> H.Deane & Maiden population in	E2,V		Population located in the Wingecarribee local government area, at Berrima, Medway and Sutton Forest. Alluvial soils, on cold, poorly-drained flats and hollows adjacent to creeks and small rivers. Usually occurs in open woodland with a grassy groundlayer.	No, lack of suitable habitat	No

	the Wingecarribee LGA					
<i>Eucalyptus aggregata</i>	Black Gum	V		In NSW, found in the Central and Southern Tablelands, in the South Eastern Highlands Bioregion and on the western fringe of the Sydney Basin Bioregion. Alluvial soils, on cold, poorly-drained flats and hollows adjacent to creeks and small rivers. Usually occurs in open woodland with a grassy groundlayer.	No, lack of suitable habitat	No
<i>Genoplesium baueri</i>	Bauer's Midge Orchid	E1	E	Has been recorded from locations between Nowra and Pittwater and may occur as far north as Port Stephens. Dry sclerophyll forest and moss gardens over sandstone.	No, lack of suitable habitat	No
<i>Grammitis stenophylla</i>	Narrow-leaf Finger Fern	E1		In NSW it has been found on the south, central and north coasts and as far west as Mount Kaputar National Park near Narrabri. Rainforest and moist eucalypt forest, usually near streams, on rocks or in trees.	No, lack of suitable habitat	No
<i>Grevillea juniperina</i> subsp. <i>juniperina</i>	Juniper-leaved Grevillea	V		Endemic to Western Sydney, centred on an area bounded by Blacktown, Erskine Park, Londonderry and Windsor with outlier populations at Kemps Creek and Pitt Town. Cumberland Plain Woodland, Castlereagh Ironbark Woodland, Castlereagh Scribbly Gum Woodland and Shale/Gravel Transition Forest, on reddish clay to sandy soils derived from Wianamatta Shale and Tertiary alluvium.	Known	Yes
<i>Haloragis exalata</i> subsp. <i>exalata</i>	Square Raspwort	V	V	Disjunct distribution in the Central Coast, South Coast and North Western Slopes botanical subdivisions of NSW. Protected and shaded damp situations in riparian habitats.	No, lack of suitable habitat	No
<i>Haloragodendron lucasii</i>		E1	E	Confined to a very narrow distribution on the north shore of Sydney. Dry sclerophyll forest and low open woodland on sheltered slopes near creeks, in moist sandy loam soils.	No, outside of species range	No
<i>Melaleuca deanei</i>	Deane's Paperbark	V	V	Ku-ring-gai/Berowra area, Holsworthy/Wedderburn area, Springwood (in the Blue Mountains), Wollemi National Park, Yalwal (west of Nowra) and Central Coast (Hawkesbury River) areas. Heath on sandstone.	No, lack of suitable habitat	No

<i>Micromyrtus minutiflora</i>		E1	V	Restricted to the general area between Richmond and Penrith, western Sydney. Castlereagh Scribbly Gum Woodland, Ironbark Forest, Shale/Gravel Transition Forest, open forest on tertiary alluvium and consolidated river sediments.	No, not recorded during field surveys	No
<i>Persoonia nutans</i>	Nodding Geebung	E1	E	Restricted to the Cumberland Plain in western Sydney, between Richmond in the north and Macquarie Fields in the south. Northern populations: sclerophyll forest and woodland (Agnes Banks Woodland, Castlereagh Scribbly Gum Woodland and Cooks River / Castlereagh Ironbark Forest) on aeolian and alluvial sediments. Southern populations: tertiary alluvium, shale sandstone transition communities and Cooks River / Castlereagh Ironbark Forest.	No, not recorded during field surveys	No
<i>Pimelea curviflora</i> var. <i>curviflora</i>		V	V	Confined to the coastal area of the Sydney and Illawarra regions between northern Sydney and Maroota in the north-west and Croom Reserve near Albion Park in the south. Woodland, mostly on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes.	No, lack of suitable habitat	No
<i>Pimelea spicata</i>	Spiked Rice-flower	E1	E	Two disjunct areas; the Cumberland Plain (Marayong and Prospect Reservoir south to Narellan and Douglas Park) and the Illawarra (Landsdowne to Shellharbour to northern Kiama). Well-structured clay soils. Eucalyptus moluccana (Grey Box) communities and in areas of ironbark on the Cumberland Plain. Coast Banksia open woodland or coastal grassland in the Illawarra.	No, not recorded during field surveys I	No
<i>Pomaderris brunnea</i>	Brown Pomaderris	E	V	In NSW, found around the Colo, Nepean and Hawkesbury Rivers, including the Bargo area and near Camden. It also occurs near Walcha on the New England tablelands. Moist woodland or forest on clay and alluvial soils of flood plains and creek lines.	No, not recorded during field surveys	No
<i>Pterostylis gibbosa</i>	Illawarra Greenhood	E1	E	Known from a small number of populations in the Hunter region (Milbrodale), the Illawarra region (Albion Park and Yallah) and the Shoalhaven region	No, outside of species range	No

				(near Nowra). Open forest or woodland, on flat or gently sloping land with poor drainage.		
<i>Pterostylis saxicola</i>	Sydney Plains Greenhood	E1	E	Restricted to western Sydney between Freemans Reach in the north and Picton in the south. Small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines, adjacent to sclerophyll forest or woodland on shale/sandstone transition soils or shale soils.	No, lack of suitable habitat	No
<i>Pultenaea glabra</i>	Smooth Bush-Pea	V	V	Restricted to the higher Blue Mountains and has been recorded from the Katoomba-Hazelbrook and Mount Victoria areas, with unconfirmed sightings in the Mount Wilson and Mount Irvine areas. Swamp margins, hillslopes, gullies and creekbanks, within dry sclerophyll forest and tall damp heath on sandstone.	No, outside of species range	No
<i>Pultenaea parviflora</i>		E1	V	Endemic to the Cumberland Plain. Mainly from Windsor to Penrith and east to Dean Park, with outlier populations at Kemps Creek and Wilberforce. Dry sclerophyll forest, especially Castlereagh Ironbark Forest, Shale Gravel Transition Forest and transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland.	No, not recorded during field surveys	No
<i>Rhizanthella slateri</i>	Eastern Australian Underground Orchid	V	E	In NSW, currently known from fewer than 10 locations, including near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wiseman's Ferry area, Agnes Banks and near Nowra. Sclerophyll forest in shallow to deep loams.	No, lack of suitable habitat	No
<i>Thelymitra kangaloonica</i>	Kangaloon Sun Orchid	E4A	CE	Only known to occur on the southern tablelands of NSW in the Moss Vale / Kangaloon / Fitzroy Falls area at 550-700 m above sea level. Swamps in sedgeland over grey silty grey loam soils.	No, outside of species range	No
<i>Thesium australe</i>	Austral Toadflax	V	V	In eastern NSW it is found in very small populations scattered along the coast, and from the Northern to Southern Tablelands. Grassland on coastal headlands or grassland and grassy woodland away from the coast.	No, outside of species range	No
FAUNA						
<i>Anthochaera phrygia</i>	Regent Honeyeater	E4A	CE	Inland slopes of south-east Australia, and less frequently in coastal areas. In NSW, most records are from the North-West Plains, North-West and	Potential	Yes

				South-West Slopes, Northern Tablelands, Central Tablelands and Southern Tablelands regions; also recorded in the Central Coast and Hunter Valley regions. Eucalypt woodland and open forest, wooded farmland and urban areas with mature eucalypts, and riparian forests of <i>Casuarina cunninghamiana</i> (River Oak).		
<i>Apus pacificus</i>	Fork-tailed Swift	P	C,J,K, Mar	Recorded in all regions of NSW. Riparian woodland. swamps, low scrub, heathland, saltmarsh, grassland, Spinifex sandplains, open farmland and inland and coastal sand-dunes.	No, lack of suitable habitat	No
<i>Ardea alba</i>	Great Egret	P	C, J, Mar	Widespread, occurring across all states/territories. Also a vagrant on Lord Howe and Norfolk Island. Swamps and marshes, grasslands, margins of rivers and lakes, salt pans, estuarine mudflats and other wetland habitats.	No, lack of suitable habitat	No
<i>Ardea ibis</i>	Cattle Egret	P	C,J, Mar	Widespread and common across NSW. Grasslands, wooded lands and terrestrial wetlands.	No, lack of suitable habitat	No
<i>Botaurus poiciloptilus</i>	Australasian Bittern	E1	E	Found over most of NSW except for the far north-west. Permanent freshwater wetlands with tall, dense vegetation, particularly <i>Typha</i> spp. (bullrushes) and <i>Eleocharis</i> spp. (spikerushes).	No, lack of suitable habitat	No
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo population in the Hornsby and Ku-ring-gai LGAs	E2,V		The population is believed to be largely confined to an area bounded by Thornleigh and Wahroonga in the north, Epping and North Epping in the south, Beecroft and Cheltenham in the west and Turramurra/South Turramurra to the east. Forest and woodland, urban fringes.	No, outside of population range	No
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V		In NSW, distributed from the south-east coast to the Hunter region, and inland to the Central Tablelands and south-west slopes. Isolated records known from as far north as Coffs Harbour and as far west as Mudgee. Tall mountain forests and woodlands in summer; in winter, may occur at lower altitudes in open eucalypt forests and woodlands, and urban areas.	Unlikely, lack of suitable habitat	No

<i>Calyptorhynchus lathamii</i>	Glossy Black-Cockatoo, Riverina population	E2,V		Within the Narrandera Range and to the north-west in the Brobenah Hills, McPhersons Range, Cocoparra Range, Lachlan Range and Jimberoo State Forests, and the Naradhan Range. Largely restricted to hills and low ridges where suitable stands of its food plant <i>Allocasuarina verticillata</i> (Drooping Sheoak) remain.	No, outside of population range	No
<i>Calyptorhynchus lathamii</i>	Glossy Black-Cockatoo	V		In NSW, widespread along coast and inland to the southern tablelands and central western plains, with a small population in the Riverina. Open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur.	Unlikely, lack of suitable habitat	No
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	Recorded from Rockhampton in Qld south to Ulladulla in NSW. Largest concentrations of populations occur in the sandstone escarpments of the Sydney basin and the NSW north-west slopes. Wet and dry sclerophyll forests, Cyprus Pine dominated forest, woodland, sub-alpine woodland, edges of rainforests and sandstone outcrop country.	Unlikely, lack of suitable habitat	No
<i>Chthonicola sagittata</i>	Speckled Warbler	V		From south-eastern Qld, the eastern half of NSW and into Victoria, as far west as the Grampians, mostly on hills and tablelands of the Great Dividing Range and rarely on coast. Eucalyptus-dominated communities with a grassy understorey and sparse shrub layer, often on rocky ridges or in gullies.	Unlikely, lack of suitable habitat	No
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V		Distribution in NSW is nearly continuous from the coast to the far west. Inhabits eucalypt forests and woodlands, mallee and Acacia woodland.	Potential	Yes
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E	Found on the east coast of NSW, Tasmania, eastern Victoria and north-eastern Qld. Rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	No, lack of suitable habitat	No
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V		South-east coast and ranges of Australia, from southern Qld to Victoria and Tasmania. In NSW, records extend to the western slopes of the Great Dividing Range. Tall (greater than 20m) moist habitats.	Unlikely, lack of suitable habitat	No

<i>Gallinago hardwickii</i>	Latham's Snipe	P	C,J,R, Mar	Migrant to east coast of Australia, extending inland west of the Great Dividing Range in NSW. Freshwater, saline or brackish wetlands up to 2000 m above sea-level; usually freshwater swamps, flooded grasslands or heathlands.	No, lack of suitable habitat	No
<i>Glossopsitta pusilla</i>	Little Lorikeet	V		In NSW, found from the coast westward as far as Dubbo and Albury. Dry, open eucalypt forests and woodlands, including remnant woodland patches and roadside vegetation.	Potential	Yes
<i>Grantiella picta</i>	Painted Honeyeater	V		Widely distributed in NSW, predominantly on the inland side of the Great Dividing Range but avoiding arid areas. Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests.	No, lack of suitable habitat	No
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	P	C	Distributed along the coastline of mainland Australia and Tasmania, extending inland along some of the larger waterways, especially in eastern Australia. Freshwater swamps, rivers, lakes, reservoirs, billabongs, saltmarsh and sewage ponds and coastal waters. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, forest and urban areas.	No, lack of suitable habitat	No
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	V	V	South eastern NSW and Victoria, in two distinct populations: a northern population in the sandstone geology of the Sydney Basin as far south as Ulladulla, and a southern population occurring from north of Narooma through to Walhalla, Victoria. Heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based.	No, lack of suitable habitat	No
<i>Hieraaetus morphnoides</i>	Little Eagle	V		Throughout the Australian mainland, with the exception of the most densely-forested parts of the Dividing Range escarpment. Open eucalypt forest, woodland or open woodland, including sheoak or Acacia woodlands and riparian woodlands of interior NSW.	Unlikely, marginal habitat only	Yes
<i>Hirundapus caudacutus</i>	White-throated Needle-tail	P	C,J,K	All coastal regions of NSW, inland to the western slopes and inland plains of the Great Divide. Occur most often over open forest and rainforest, as well as heathland, and remnant vegetation in farmland.	Unlikely, marginal habitat only	No

<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	E1	V	Largely confined to Triassic and Permian sandstones within the coast and ranges in an area within approximately 250 km of Sydney. Dry and wet sclerophyll forests, riverine forests, coastal heath swamps, rocky outcrops, heaths, grassy woodlands.	No, lack of suitable habitat	No
<i>Lathamus discolor</i>	Swift Parrot	E1	E	Migrates from Tasmania to mainland in Autumn-Winter. In NSW, the species mostly occurs on the coast and south west slopes. Box-ironbark forests and woodlands.	Unlikely, lack of suitable habitat	No
<i>Litoria aurea</i>	Green and Golden Bell Frog	E1	V	Since 1990, recorded from ~50 scattered sites within its former range in NSW, from the north coast near Brunswick Heads, south along the coast to Victoria. Records exist west to Bathurst, Tumut and the ACT region. Marshes, dams and stream-sides, particularly those containing Typha spp. (bullrushes) or Eleocharis spp. (spikerushes). Some populations occur in highly disturbed areas.	No, lack of suitable habitat	No
<i>Litoria littlejohni</i>	Littlejohn's Tree Frog	V	V	Plateaus and eastern slopes of the Great Dividing Range from Watagan State Forest south to Buchan in Victoria. The species has not been recorded in southern NSW within the last decade. Breeding habitat is the upper reaches of permanent streams and perched swamps. Non-breeding habitat is heath-based forests and woodlands	No, lack of suitable habitat	No
<i>Lophoictinia isura</i>	Square-tailed Kite	V		In NSW, it is a regular resident in the north, north-east and along the major west-flowing river systems. It is a summer breeding migrant to the south-east, including the NSW south coast. Timbered habitats including dry woodlands and open forests, particularly timbered watercourses.	Unlikely, lack of suitable habitat	Yes
<i>Meridolum corneovirens</i>	Cumberland Plain Land Snail	E1		Areas of the Cumberland Plain west of Sydney, from Richmond and Windsor south to Picton and from Liverpool, west to the Hawkesbury and Nepean Rivers at the base of the Blue Mountains. Primarily inhabits Cumberland Plain Woodland. Also known from Shale Gravel Transition Forests, Castlereagh Swamp Woodlands and the margins of River-flat Eucalypt Forest.	No, lack of suitable habitat	No

<i>Merops ornatus</i>	Rainbow Bee-eater	P	J	Distributed across much of mainland Australia, including NSW. Open forests and woodlands, shrublands, farmland, areas of human habitation, inland and coastal sand dune systems, heathland, sedgeland, vine forest and vine thicket.	No, lack of suitable habitat	No
<i>Miniopterus australis</i>	Little Bentwing-bat	V		East coast and ranges south to Wollongong in NSW. Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub.	Potential	Yes
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V		In NSW it occurs on both sides of the Great Dividing Range, from the coast inland to Moree, Dubbo and Wagga Wagga. Rainforest, wet and dry sclerophyll forest, monsoon forest, open woodland, paperbark forests and open grassland.	Potential	Yes
<i>Monarcha melanopsis</i>	Black-faced Monarch	P	Bonn, Mar	In NSW, occurs around the eastern slopes and tablelands of the Great Divide, inland to Coutts Crossing, Armidale, Widden Valley, Wollemi National Park and Wombeyan Caves. It is rarely recorded farther inland. Rainforest, open eucalypt forests, dry sclerophyll forests and woodlands, gullies in mountain areas or coastal foothills, Brigalow scrub, coastal scrub, mangroves, parks and gardens.	Unlikely, lack of suitable habitat	No
<i>Monarcha trivirgatus</i>	Spectacled Monarch	P	Bonn, Mar	Coastal eastern Australia south to Port Stephens in NSW. Mountain/lowland rainforest, wooded gullies, riparian vegetation including mangroves.	No, lack of suitable habitat	No
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	V		Found along the east coast from south Qld to southern NSW. Dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range.	Potential	Yes
<i>Motacilla flava</i>	Yellow Wagtail	P	C,J,K	Regular summer migrant to mostly coastal Australia. In NSW recorded Sydney to Newcastle, the Hawkesbury and inland in the Bogan LGA. Swamp margins, sewage ponds, saltmarshes, playing fields, airfields, ploughed land, lawns.	No, lack of suitable habitat	No

<i>Myiagra cyanoleuca</i>	Satin Flycatcher	P	Bonn, Mar	In NSW, widespread on and east of the Great Divide and sparsely scattered on the western slopes, with very occasional records on the western plains. Eucalypt-dominated forests, especially near wetlands, watercourses, and heavily-vegetated gullies.	Unlikely, lack of suitable habitat	No
<i>Myotis macropus</i>	Southern Myotis	V		In NSW, found in the coastal band. It is rarely found more than 100 km inland, except along major rivers. Foraging habitat is waterbodies (including streams, or lakes or reservoirs) and fringing areas of vegetation up to 20m.	Potential	Yes
<i>Ninox connivens</i>	Barking Owl	V		Wide but sparse distribution in NSW, avoiding the most central arid regions. Core populations exist on the western slopes and plains and in some northeast coastal and escarpment forests. Woodland and open forest, including fragmented remnants and partly cleared farmland, wetland and riverine forest.	Potential	Yes
<i>Ninox strenua</i>	Powerful Owl	V		In NSW, it is widely distributed throughout the eastern forests from the coast inland to tablelands, with scattered records on the western slopes and plains. Woodland, open sclerophyll forest, tall open wet forest and rainforest.	Potential	Yes
<i>Petauroides volans</i>	Greater Glider population in the Eurobodalla local government area	E2		This population on the south coast of NSW is bounded by the Moruya River to the north, Coila Lake to the south and the Princes Highway and cleared land exceeding 700 m in width to the west. Eucalypt forests and woodlands.	No, outside of population range	No
<i>Petaurus australis</i>	Yellow-bellied Glider population on the Bago Plateau	E2,V		The endangered population of the Yellow-bellied Glider occurs on the Bago Plateau; a westward extension of the Kosciuszko highlands in southern NSW. The habitat on the Bago Plateau consists of tall wet sclerophyll forest dominated by <i>Eucalyptus delegatensis</i> (Alpine Ash), <i>E. dalrympleana</i> (Mountain Gum), <i>E. radiata</i> (Narrow-leaved Peppermint), and <i>E. rubida</i> (Candlebark).	Potential	Yes

<i>Petaurus australis</i>	Yellow-bellied Glider	V		Along the eastern coast to the western slopes of the Great Dividing Range, from southern Qld to Victoria. Tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils.	Potential	Yes
<i>Petaurus norfolcensis</i>	Squirrel Glider in the Wagga Wagga Local Government Area	E2,V		The extent of the endangered population is legally defined by the boundaries of the Wagga Wagga LGA. Open forest, woodland and riverine forest habitats.	No, outside of population range	No
<i>Petaurus norfolcensis</i>	Squirrel Glider on Barrenjoey Peninsula, north of Bushrangers Hill	E2,V		The endangered population is within the Pittwater Local Government Area on the Barrenjoey Peninsula, north of Bushrangers Hill. In NSW, occurs in a range of coastal habitats from low scrubby eucalypt woodlands and banksia thickets to tall, wet eucalypt forests bordering on rainforest.	No, outside of population range	No
<i>Petaurus norfolcensis</i>	Squirrel Glider	V		Widely though sparsely distributed on both sides of the Great Dividing Range in eastern Australia, from northern Qld to western Victoria. Mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas.	Unlikely, lack of suitable habitat	No
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	E1	V	In NSW they occur from the Qld border in the north to the Shoalhaven in the south, with the population in the Warrumbungle Ranges being the western limit. Rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges.	No, lack of suitable habitat	No
<i>Petroica boodang</i>	Scarlet Robin	V		In NSW, it occurs from the coast to the inland slopes. Dry eucalypt forests and woodlands, and occasionally in mallee, wet forest, wetlands and tea-tree swamps.	Unlikely, lack of suitable habitat	No
<i>Petroica phoenicea</i>	Flame Robin	V		In NSW, breeds in upland areas, and in winter many birds move to the inland slopes and plains, or occasionally to coastal areas. Likely that there are two separate populations in NSW, one in the Northern Tablelands, and another ranging from the Central to Southern Tablelands. Breeds in upland tall moist	No, lack of suitable habitat	No

				eucalypt forests and woodlands. In winter uses dry forests, open woodlands, heathlands, pastures and native grasslands. Occasionally occurs in temperate rainforest, herbfields, heathlands, shrublands and sedgeland at high altitudes.		
<i>Phascolarctos cinereus</i>	Koala, Hawks Nest and Tea Gardens population	E2,V	V	Known from, and in the immediate vicinity of, the towns of Hawks Nest and Tea Gardens in the Great Lakes Local Government Area. Eucalypt forest and woodland communities, including coastal forests, rainforest, riparian areas, swamp sclerophyll forests, heathland and shrubland.	No, outside of population range	No
<i>Phascolarctos cinereus</i>	Koala in the Pittwater Local Government Area	E2,V	V	The endangered population occurs within the Pittwater Local Government Area, with most recent records occurring on the Barrenjoey Peninsula. Eucalypt forests and woodlands. Key likely habitats within Pittwater Council are: Swamp Mahogany Forest, ecotone between Spotted Gum Forest & Hawkesbury Sandstone Open-Forest, Northern form of Coastal Sandstone Woodland at Whale Beach, Red Bloodwood - Scribbly Gum Woodland, Bilgola Plateau Forest and the Grey Ironbark - Grey Gum form of the Newport Bangalay Woodland.	No, outside of population range	No
<i>Phascolarctos cinereus</i>	Koala	V	V	In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. There are sparse and possibly disjunct populations in the Bega District, and at several sites on the southern tablelands. Eucalypt woodlands and forests.	Unlikely, lack of suitable habitat	No
<i>Pseudomys novaehollandiae</i>	New Holland Mouse	P	V	Fragmented distribution across eastern NSW. Open heathlands, woodlands and forests with a heathland understorey, vegetated sand dunes.	No, lack of suitable habitat	No
<i>Pseudophryne australis</i>	Red-crowned Toadlet	V		Confined to the Sydney Basin, from Pokolbin in the north, the Nowra area to the south, and west to Mt Victoria in the Blue Mountains. Open forests, mostly on Hawkesbury and Narrabeen Sandstones. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings.	No, lack of suitable habitat	No

<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	Along the eastern coast of Australia, from Bundaberg in Qld to Melbourne in Victoria. Subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	Potential	Yes
<i>Rhipidura rufifrons</i>	Rufous Fantail	P	Bonn, Mar	Coastal and near coastal districts of northern and eastern Australia, including on and east of the Great Divide in NSW. Wet sclerophyll forests, subtropical and temperate rainforests. Sometimes drier sclerophyll forests and woodlands.	No, lack of suitable habitat	No
<i>Rostratula australis</i>	Australian Painted Snipe	E1	E, Mar	In NSW most records are from the Murray-Darling Basin. Other recent records include wetlands on the Hawkesbury River and the Clarence and lower Hunter Valleys. Swamps, dams and nearby marshy areas.	No, lack of suitable habitat	No
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V		Both sides of the great divide, from the Atherton Tableland in Qld to north-eastern Victoria, mainly along river systems and gullies. In NSW it is widespread on the New England Tablelands. Woodland, moist and dry eucalypt forest and rainforest.	Unlikely, lack of suitable habitat	Yes
<i>Tringa nebularia</i>	Common Greenshank	P	C,J,K	Summer migrant to Australia. Recorded in most coastal regions of NSW; also widespread west of the Great Dividing Range, especially between the Lachlan and Murray Rivers and the Darling River drainage basin, including the Macquarie Marshes, and north-west regions. Terrestrial wetlands (swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans, saltflats, sewage farms and saltworks dams, inundated rice crops and bores) and sheltered coastal habitats (mudflats, saltmarsh, mangroves, embayments, harbours, river estuaries, deltas, lagoons, tidal pools, rock-flats and rock platforms).	No, lack of suitable habitat	No

TSC Act Key: E1 = Endangered species, E2 = endangered population, E4A = critically endangered species, V = vulnerable

EPBC Act Key: E = endangered, CE = critically endangered, V = vulnerable, C, J, K = migratory species under CAMBA, JAMBA, ROKAMBA, Bonn = Migratory under the Bonn Convention.

Appendix B: Flora species recorded within the study area

Family	Scientific Name	Common Name	Native / Exotic
Fabaceae	<i>Acacia decurrens</i>	Black Wattle	N
Fabaceae	<i>Acacia falcata</i>	Hickory Wattle	N
Casuarinaceae	<i>Allocasuarina littoralis</i>	Black She-oak	N
Apocynaceae	<i>Araujia sericifera</i>	Moth Vine	E
Poaceae	<i>Aristida vagans</i>	Threeawn Speargrass	N
Poaceae	<i>Austrodanthonia racemosa</i> var. <i>racemosa</i>		N
Poaceae	<i>Austrostipa pubescens</i>		N
Pittosporaceae	<i>Bursaria spinosa</i>	Blackthorn	N
Myrtaceae	<i>Callistemon linearis</i>	Narrow-leaved Bottlebrush	N
Cyperaceae	<i>Carex inversa</i>		N
Gentianaceae	<i>Centaurium tenuiflorum</i>		E
Pteridaceae	<i>Cheilanthes sieberi</i>		N
Asteraceae	<i>Cirsium vulgare</i>	Spear Thistle	E
Asteraceae	<i>Conyza bonariensis</i>	Flaxleaf Fleabane	E
Fabaceae	<i>Daviesia genistifolia</i>	Broom Bitter Pea	N
Phormiaceae	<i>Dianella revoluta</i>	Blueberry Lily	N
Poaceae	<i>Dichelachne micrantha</i>	Shorthair Plumegrass	N
Convolvulaceae	<i>Dichondra repens</i>	Kidney Weed	N
Fabaceae	<i>Dillwynia sieberi</i>		N
Fabaceae	<i>Dillwynia tenuifolia</i>		N
Poaceae	<i>Echinopogon caespitosus</i>	Bushy Hedgehog Grass	N
Poaceae	<i>Entolasia stricta</i>	Wiry Panic	N
Poaceae	<i>Eragrostis curvula</i>	African Lovegrass	E
Myrtaceae	<i>Eucalyptus crebra</i>	Narrow-leaved Ironbark	N
Myrtaceae	<i>Eucalyptus fibrosa</i>	Red Ironbark	N
Santalaceae	<i>Exocarpos cupressiformis</i>	Cherry Ballart	N
Fabaceae	<i>Glycine clandestina</i>		N

Family	Scientific Name	Common Name	Native / Exotic
Goodeniaceae	<i>Goodenia hederacea</i> subsp. <i>hederacea</i>	Ivy Goodenia	N
Proteaceae	<i>Hakea dactyloides</i>	Finger Hakea	N
Asteraceae	<i>Hypochaeris radicata</i>	Catsear	E
Poaceae	<i>Imperata cylindrica</i>	Blady Grass	N
Juncaceae	<i>Juncus usitatus</i>		N
Verbenaceae	<i>Lantana camara</i>	Lantana	E (WoNS)*
Cyperaceae	<i>Lepidosperma laterale</i>		N
Lomandraceae	<i>Lomandra filiformis</i>	Wattle Mat-rush	N
Lomandraceae	<i>Lomandra longifolia</i>	Spiny-headed Mat-rush	N
Myrtaceae	<i>Melaleuca decora</i>		N
Poaceae	<i>Microlaena stipoides</i>	Weeping Grass	N
Myrtaceae	<i>Micromyrtus ciliata</i>	Fringed Heath-myrtle	N
Oxalidaceae	<i>Oxalis perennans</i>		N
Asteraceae	<i>Ozothamnus diosmifolius</i>	Rice Flower	N
Poaceae	<i>Panicum simile</i>	Two-coloured Panic	N
Poaceae	<i>Paspalum dilatatum</i>	Paspalum	E
Lobeliaceae	<i>Pratia purpurascens</i>	Whiteroot	N
Fabaceae	<i>Pultenaea villosa</i>	Hairy Bush Pea	N
Asteraceae	<i>Senecio madagascariensis</i>	Fireweed	E (WoNS)*
malvaceae	<i>Sida rhombifolia</i>	Paddy's Lucerne	E
Solanaceae	<i>Solanum mauritianum</i>	Wild Tobacco Bush	E
Solanaceae	<i>Solanum nigrum</i>	Blackberry NightShade	E
Poaceae	<i>Themeda triandra</i>	Kangaroo Grass	N
Commelinaceae	<i>Tradescantia fluminensis</i>	Wandering Jew	E
Verbenaceae	<i>Verbena bonariensis</i>	Purpletop	E

Key: WoNS = Weed of National Significance under NW Act 1993, * = class 4 noxious weed under Penrith LGA.

Appendix C: Assessments of significance

EP&A Act Assessment of Significance (7-Part Test)

The Assessment of Significance (7-part test) is applied to species, populations and ecological communities listed on Schedules 1, 1A and 2 of the TSC Act and Schedules 4, 4A and 5 of the *Fisheries Management Act*. The assessment sets out 7 factors, which when considered, allow proponents to undertake a qualitative analysis of the likely impacts of an action and to determine whether further assessment is required via a Species Impact Statement (SIS). All factors must be considered and an overall conclusion made based on all factors in combination. An SIS is required if, through application of the 7-part test, an action is considered likely to have a significant impact on a threatened species, population or ecological community.

Threatened species, populations and ecological communities which may be directly or indirectly affected by the current proposal include:

Threatened Ecological Communities

- Cooks River Castlereagh Ironbark Forest

Threatened flora

- *Dillwynia tenuifolia*
- *Grevillea juniperina* subsp. *juniperina*

Forest dwelling birds

- *Anthochaera phrygia* (Regent Honeyeater)
- *Daphoenositta chrysoptera* (Varied Sittella)
- *Glossopsitta pusilla* (Little Lorikeet)

Large Forest Owls

- *Ninox connivens* (Barking Owl)
- *Ninox strenua* (Powerful Owl)

Mammals

- *Petaurus australis* (Yellow-bellied Glider)

Megachiropteran bats

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

Microchiropteran bats

- *Miniopterus schreibersii oceanensis* (Eastern Bentwing-bat)
- *Miniopterus australis* (Little Bentwing-bat)
- *Mormopterus norfolkensis* (Eastern Freetail-bat)
- *Myotis macropus* (Southern Myotis).

TEC- Cooks River Castlereagh Ironbark Forest

Cooks River Castlereagh Ironbark Forest in the Sydney Basin Bioregion (CRCIF) is an open forest typically of a low structure containing a canopy of eucalypt species. CRCIF usually occurs on clay soils on tertiary alluvium, shales soils on Wianamatta Shale and associated shale lowlands in the Castlereagh area. CRCIF is listed as endangered under the TSC Act.

CRCIF was found to exist in three conditions within the subject site, good, moderate and low quality. The proposed action will result in the removal and/or modification 1.56 ha of CRCIF.

All CRCIF to be modified as part of the proposed action will undergo selective thinning of the canopy and midstorey and suppression of the groundcover to meet the APZ requirements. All canopy species will be retained.

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

Not applicable. CRCIF is not a threatened species.

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

Not applicable. CRCIF is not a threatened species.

- c. in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:**

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

Actions likely to have an adverse effect on the extent of the local occurrence of CRCIF include substantial clearing of native vegetation and modification of habitat, including fragmentation, changes to hydrology, increased nutrients, erosion and sedimentation and weed invasion.

The local occurrence of CRCIF extends to the north, east and south of the study area and forms a large contiguous patch. For the purpose of this assessment the local occurrence will include all CRCIF mapped within the study area and to the north, east and south.

The proposed action will result in the direct removal of 0.55 ha of CRCIF and the modification of 1.01 ha of CRCIF for the establishment of an APZ and setback (selective thinning of shrubs and suppression of the ground layer), within the study area, all canopy trees will be maintained.

Approximately 11.59 ha of CRCIF will be retained and protected under a conservation agreement (8.65 ha under a Biobanking agreement attached to the northern proposed lot, and 2.94 ha under a s88B covenant). The local occurrence of CRCIF is approximately 126 ha, therefore, the proposed action will result in the impact to 1.2% of the local occurrence.

Given the retention of 11.59 ha of CRCIF within the study area and an additional 112.85 ha will be retained within the locality, the proposed action is considered unlikely to place the local occurrence of this TEC at risk of extinction.

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

The proposed action will result in the removal of 0.55 ha of CRCIF and the modification of 1.01 ha of CRCIF. The area of CRCIF to be modified will require selective thinning of the midstorey and groundcover layers to maintain the APZ.

Approximately 11.59 ha of CRCIF will be retained throughout the study area under a Biobanking agreement and/or s88B covenant. The implementation of a Vegetation Management Plan (VMP), as part of the above conservation agreements, will control any potential weed invasion associated with the proposed action, and mitigation measures have been provided to reduce the impacts during and post construction.

The composition of the CEEC within the study area will be modified with the removal of 0.55 ha and the modification of 1.01 ha consisting of a canopy of *Eucalyptus fibrosa* with a sparse mid-storey of *Dillwynia tenuifolia*, *Acacia decurrens*, *Ozothamnus diosmifolius* and *Melaleuca decora*, and a ground cover of native forbs and grasses. However, 11.59 ha will be retained in the study area consisting of all strata.

Therefore, given the retention of 11.59 ha of CRCIF within the study area, and potential indirect impacts will be managed through a VMP, the proposed action is considered unlikely to substantially or adversely modify the composition of CRCIF such that the local occurrence is placed at risk of extinction

d. in relation to the habitat of a threatened species, population or ecological community:

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

The proposed action will result in the removal of 0.55 ha of CRCIF and the modification of 1.01 ha of CRCIF for the establishment of an APZ and setback.

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

The CRCIF to be removed is located on the western fringe of the existing community and is bordered by Rickards Road to the north. In addition, the CRCIF to be retained within the study area forms part of a larger, contiguous patch to the east and south, consisting of 126 ha (**Figure 5**). Thus, the proposed action will not prevent the dispersal and pollination of flora and fauna species within the CRCIF patch. As such, the proposed action will not result in the isolation or fragmentation of CRCIF within the study area.

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

The CRCIF within the study area exists as one connected patch, containing moderate and good quality vegetation. The proposed action will result in the removal of 0.55 ha of CRCIF and the modification of 1.01 ha of CRCIF. The majority of the vegetation within the development footprint is in poor condition (30% or less native vegetation ground cover) and subject to edge effects from the surrounding land use, therefore is not considered to represent the ecological community in all its structural layers.

Approximately 11.59 ha of good quality CRCIF is to be retained within the study area, and forms part of a larger, contiguous patch, consisting of 126 ha, to the south and east of the study area. Given the large extent of CRCIF to be retained within the study area, and removal / modification of a minor extent of CRCIF (1.2%) within the locality, the CRCIF to be impacted as a result of the proposal is not considered important to the long term survival of this EEC within the locality.

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

No critical habitat has been declared for CRCIF.

f. whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

A recovery plan for the Cumberland Plain has been prepared that address the conservation of TECs, including CRCIF within the Cumberland Plain. No relevant threat abatement plans have been prepared for this community and 18 priority actions that have been identified for TECs in the Cumberland Plain relevant to CRCIF (DECCW 2010).

The study area is located within the PCLs identified in the Cumberland Plain Recovery Plan (DECCW 2010). The PCLs have been identified as the lands that represent the best remaining opportunities in the region to secure long-term biodiversity benefits for the lowest possible cost. Although the proposed action will result in the removal and/or modification of 1.56 ha of CRCIF, approximately 11.59 ha will be retained and managed under a proposed Biobanking Agreement and / or s88B Covenant. Thus, the proposed action is consistent with the aims of the Cumberland Plain Recovery Plan.

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

Three KTPs are relevant to the proposal and include:

- clearing of native vegetation,
- invasion of native plant communities by exotic perennial grasses,
- removal of dead wood and dead trees.

The proposed action will result in the direct removal of 0.55 ha of CRCIF and the modification of 1.01 ha of CRCIF. However, given the proposed works will impact only 1.2% of the local occurrence and 11.59 ha of good quality CRCIF will be retained under a conservation agreement within the study area, the proposed action is not considered to exacerbate the impacts of clearing native vegetation or the removal of dead wood and dead trees.

The implementation of a VMP and adoption of mitigation measures will also prevent the invasion of exotic grasses within the study area.

Conclusion

The proposed action is unlikely to have a significant impact on CRCIF given the following:

- The proposed action will result in the removal and/or modification 1.56 ha of CRCIF
- Approximately 11.59 ha is proposed be retained within the study area under a conservation agreement
- The area of CRCIF to be removed represents a minor extent (1.2%) of the local occurrence of the community
- The proposed action will not fragment or isolate any patches of CRCIF within the study area.
- The majority of the vegetation within the development footprint is in poor condition (30% or less native vegetation ground cover) and subject to edge effects from the surrounding land use.

Therefore, the proposal is unlikely to have a significant impact on CRCIF and a Species Impact Statement (SIS) is not required.

THREATENED FLORA

Dillwynia tenuifolia

Dillwynia tenuifolia is known to occur within scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays and in transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland. Abundance of this species is commonly influenced by disturbance history (OEH 2016).

D. tenuifolia is listed as vulnerable under the TSC Act and was recorded within the study area during field survey. A map showing the distribution and relative abundance of the species within the study area is shown in **Figure 4**.

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

Threats to *D. tenuifolia* include clearance and fragmentation of habitat, inappropriate modification of habitat (eg. removal or thinning of canopy) inappropriate fire regimes, uncontrolled access, and dumping.

The proposed action will result in the removal of 1.56 ha of known habitat, including three *D. tenuifolia* individuals. The population of *Dillwynia tenuifolia* within the study area is estimated at approximately 110,000 individuals, based on transects undertaken in CRCIF within the study area.

Approximately 11.59 ha of *D. tenuifolia* habitat (including approximately 110,000 known individuals) will be retained and managed in perpetuity under a BioBanking Agreement and / or s88B Covenant. In addition, the study area is connected to a larger, contiguous, patch of known *D. tenuifolia* habitat (**Figure 5**). Given the above, the proposed action is considered unlikely to adversely affect the species such that a viable local population would be placed at risk of extinction as a result.

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

Not applicable. *D. tenuifolia* is not an endangered population.

- c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:**

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

Not applicable. *D. tenuifolia* is not an endangered ecological community or critically endangered ecological community.

- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.**

Not applicable. *D. tenuifolia* is not an endangered ecological community or critically endangered ecological community.

- d) in relation to the habitat of a threatened species, population or ecological community:**

- (i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and**

The proposed action will result in the removal of 1.56 ha of known *D. tenuifolia* habitat and three *D. tenuifolia* individuals as a result of the proposed action. There is approximately 11.59 ha of known *D. tenuifolia* habitat within the study area which will be retained under conservation agreement, and approximately 82.73 of potential habitat which extends to the south, east and north of the study area.

- (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**

The area of known habitat to be removed is located on the western fringe and is bordered by Rickards Road to the north. In addition, 11.59 ha of known habitat containing approximately 110,000 individuals will be retained within the study area, and forms part of a larger, contiguous patch to the east and south. Thus, the proposed action will not fragment or isolate any areas of habitat for *D. tenuifolia*.

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

The proposed action will result in the removal of 1.56 ha of known *D. tenuifolia* habitat including three *D. tenuifolia* individuals. However, 0.71 ha of known habitat has been highly modified

and only four species were recorded in this area. There is 11.59 ha of high quality known habitat containing approximately 110,000 individuals to the east of the proposed development footprint which will be retained within the study area under a conservation agreement. The vegetation to be retained also forms part of a larger, contiguous patch to the east and south, containing known *D. tenuifolia* records, which will ensure connectivity is maintained with the local population.

Therefore, the loss of approximately 1.2% of habitat and three individuals is not considered to be critical to the survival of the species in the locality.

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

No critical habitat has been declared for *D. tenuifolia*.

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

No recovery plan or threat abatement plan has been approved for *D. tenuifolia*. Five priority actions have been identified to help recover this species. The current proposal is not in conflict with any of these priority actions.

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

Three Key Threatening Processes (KTPs) are relevant to this proposal:

- clearing of native vegetation,
- invasion of native plant communities by exotic perennial grasses,
- ecological consequences of high frequency fires.

The proposal will result in the removal of approximately 1.56 ha of known habitat including the removal of three individuals. As such, the proposal is considered part of a KTP. However, the retention of 11.59 ha of *D. tenuifolia* habitat and approximately 110,000 individuals will not result in the exacerbation of the Clearing of native vegetation KTP.

The invasion of native plant communities by exotic perennial grasses will not be exacerbated by the proposed action given the implementation of mitigation measures within the VMP. Therefore, it is unlikely that any areas would become infested by exotic species as a consequence of the proposal.

High fire frequency is listed as a threat to *D. tenuifolia*. However, APZs will be implemented and maintained as part of the proposed action.

Conclusion

The proposed action is unlikely to have a significant impact on *D. tenuifolia* given the following:

- Approximately 11.59 ha of *D. tenuifolia* habitat consisting of approximately 110,000 individuals is proposed to be retained and managed in perpetuity within the study area, once a buyer for the Biobanking site is established.
- The proposed action will remove 1.56 ha of known habitat, including three individuals, which constitutes a minor disturbance to *D. tenuifolia*

- The proposed action will not isolate or fragment any areas of *D. tenuifolia* habitat within the study area
- Mitigation measures will be implemented to prevent indirect impacts of the proposal on the remaining areas of known and potential habitat

Consequently, a SIS is not required for the proposed development with respect to this species.

Grevillea juniperina* subsp. *juniperina

Grevillea juniperina subsp. *juniperina* is known to occur, within scrubby/dry heath areas within Cumberland Plain Woodland, Castlereagh Ironbark Woodland, Castlereagh Scribbly Gum Woodland and Shale/Gravel Transition Forest on reddish clay to sandy soils derived from Wianamatta Shale and Tertiary alluvium (often with shale influence), typically containing lateritic gravels (OEH 2016).

G. juniperina subsp. *juniperina* is listed as vulnerable under the TSC Act and was recorded within the study area during field survey. A map showing the distribution and relative abundance of the species within the study area is shown in **Figure 4**.

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

Threats to *G. juniperina* subsp. *juniperina* include clearance and fragmentation of habitat, inappropriate modification of habitat (eg. removal or thinning of canopy) inappropriate fire regimes, uncontrolled access, and dumping.

The proposed action will result in the removal of *G. juniperina* subsp. *juniperina* 1.56 ha of potential habitat. No known individuals will be directly impacted. The population of *G. juniperina* subsp. *juniperina* within the study area is estimated at approximately 40,000 individuals, based on transects undertaken in CRCIF within the study area.

Approximately 11.59 ha of *G. juniperina* subsp. *juniperina* habitat (including approximately 40,000 known individuals) will be retained and managed in perpetuity under a BioBanking Agreement and / or s88B Covenant.. In addition, the study area is connected to a larger, contiguous, patch of known *G. juniperina* subsp. *juniperina* habitat (**Figure 5**). Given the above, the proposed action is considered unlikely to adversely affect the species such that a viable local population would be placed at risk of extinction as a result.

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

Not applicable. *G. juniperina* subsp. *juniperina* is not an endangered population.

j) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- (iii) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**

Not applicable. *G. juniperina* subsp. *juniperina* is not an endangered ecological community or critically endangered ecological community.

(iv) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable. *G. juniperina* subsp. *juniperina* is not an endangered ecological community or critically endangered ecological community.

k) in relation to the habitat of a threatened species, population or ecological community:

(iv) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The proposed action will result in the removal of 1.56 ha of potential *G. juniperina* subsp. *juniperina* habitat as a result of the proposed action. No known individuals will be directly impacted. There is approximately 11.59 ha of known *G. juniperina* subsp. *juniperina* habitat within the study area which will be retained under conservation agreement, and approximately 82.73 of potential habitat which extends to the south, east and north of the study area.

(v) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The area of known habitat to be removed is located on the western fringe and is bordered by Rickards Road to the west. In addition, 11.59 ha of known habitat containing approximately 40,000 individuals will be retained within the study area, and forms part of a larger, contiguous patch to the east and south. Thus, the proposed action will not fragment or isolate any areas of habitat for *G. juniperina* subsp. *juniperina*.

(vi) the importance of the habitat to be removed, modified, fragmented or isolated to the long term survival of the species, population or ecological community in the locality,

The proposed action will result in the removal of 1.56 ha of potential *G. juniperina* subsp. *juniperina* habitat. No known individuals will be directly removed. There is 11.59 ha of high quality known habitat containing approximately 40,000 individuals to the east of the proposed development footprint which will be retained within the study area under a conservation agreement. The vegetation to be retained also forms part of a larger, contiguous patch to the east and south, containing known *G. juniperina* subsp. *juniperina* records, which will ensure connectivity is maintained with the local population.

Therefore, the loss of approximately 1.2% of habitat and three individuals is not considered to be critical to the survival of the species in the locality.

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

No critical habitat has been declared for *G. juniperina* subsp. *juniperina*.

m) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

No recovery plan or threat abatement plan has been approved for *G. juniperina* subsp. *juniperina*. Five priority actions have been identified to help recover this species. The current proposal is not in conflict with any of these priority actions.

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

Three Key Threatening Processes (KTPs) are relevant to this proposal:

- clearing of native vegetation,
- invasion of native plant communities by exotic perennial grasses,
- ecological consequences of high frequency fires.

The proposal will result in the removal of approximately 1.56 ha of potential habitat. No known individuals will be directly removed. As such, the proposal is considered part of a KTP. However, the retention of 11.59 ha of *G. juniperina* subsp. *juniperina* habitat and approximately 40,000 individuals will not result in the exacerbation of the Clearing of native vegetation KTP.

The invasion of native plant communities by exotic perennial grasses will not be exacerbated by the proposed action given the implementation of mitigation measures within the VMP. Therefore, it is unlikely that any areas would become infested by exotic species as a consequence of the proposal.

High fire frequency is listed as a threat to *G. juniperina* subsp. *juniperina*. However, APZs will be implemented and maintained as part of the proposed action.

Conclusion

The proposed action is unlikely to have a significant impact on *G. juniperina* subsp. *juniperina* given the following:

- Approximately 11.59 ha of potential *G. juniperina* subsp. *juniperina* habitat consisting of approximately 40,000 individuals is proposed to be retained and managed in perpetuity within the study area, once a buyer for the Biobanking site is established.
- The proposed action will remove 1.56 ha of potential habitat, no known individuals will be impacted, which constitutes a minor disturbance to *G. juniperina* subsp. *juniperina*
- The proposed action will not isolate or fragment any areas of *G. juniperina* subsp. *juniperina* habitat within the study area.
- Mitigation measures will be implemented to prevent indirect impacts of the proposal on the remaining areas of known and potential habitat

Consequently, a SIS is not required for the proposed development with respect to this species.

FOREST DWELLING BIRDS

The following three forest and open habitat dwelling bird species are regarded as having potential to occur within the study area and, consequently, have been grouped together for this Assessment of Significance. This is because they have certain similarities in their foraging and/or roosting behaviours, habitat requirements and consequently predicted impacts are considered to be the same or similar. Where obvious differences are apparent between each species, they are discussed separately.

The Varied Sittella and Little Lorikeet are listed as Vulnerable under the TSC Act. The Regent Honeyeater is listed as Critically Endangered under the TSC Act.

No individuals of these species were recorded during the field survey, although all three species are known from records within a 5 km radius of the study area (OEH 2016b). There is potential that the study area is used occasionally by the Varied Sittella, Little Lorikeet and Regent Honeyeater, although it is unlikely that individuals of these species are dependent upon the study area. The potential impact of the removal of 0.55 of CRCIF has been assessed below. The 1.01 ha of CRCIF to be modified has not been assessed, as the canopy will be retained.

Daphoenositta chrysoptera (Varied Sittella)

Daphoenositta chrysoptera (Varied Sittella) is a small, short-tailed bird (10-11 cm long). It has a widespread range across mainland Australia, excluding some areas of the arid interior (Nullarbor, Pilbara and Simpson Desert). The species inhabits eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums with dead branches, mallee and *Acacia* woodland. The Varied Sittella feeds on arthropods gleaned from crevices in rough bark, dead branches, standing dead trees, and from small branches and twigs in the tree canopy (OEH 2016).

Glossopsitta pusilla (Little Lorikeet)

Glossopsitta pusilla (Little Lorikeet) is distributed widely across the coastal and Great Divide regions of eastern Australia from Cape York to South Australia. NSW provides a large portion of the species' core habitat, with lorikeets found westward as far as Dubbo and Albury. The species feeds mostly on nectar and pollen and forage primarily on Eucalypts in open woodland but also utilise other trees such as Angophora and Melaleuca (OEH 2016).

Anthochaera phrygia (Regent Honeyeater)

Anthochaera phrygia (Regent Honeyeater) inhabits temperate woodlands and open forests of the inland slopes of south-east Australia, particularly Box-Ironbark Woodland and riparian forests comprised of River Sheoak. There are two known breeding sites for the Regent Honeyeater in NSW; Capertee Valley and the Bundarra-Barraba regions. The species forms an open cup-shaped nest in the forks of trees.

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

Impacts likely to have an adverse effect on the lifecycle of the Varied Sittella, Little Lorikeet and Regent Honeyeater include:

- the loss or degradation of forest and woodland habitat including clearing for agricultural purposes,

- the loss of hollow-bearing trees.

The proposed action will result in the removal of 0.55 ha of CRCIF, which represents potential foraging habitat for the Varied Sittella, Little Lorikeet and Regent Honeyeater. All HBTs within the study area will be retained.

Approximately 11.59 ha of potential foraging habitat will be retained within the study area, and forms part of a larger, contiguous patch beyond the boundaries of the study area. Given the highly mobile nature of this species, the minor extent of the works and the retention of 11.59 ha of potential foraging habitat within the study area, the proposed action is unlikely to have an adverse impact on the life cycle of these species such that the local population is placed at risk of extinction.

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

Not applicable. The Varied Sittella, Little Lorikeet and Regent Honeyeater are not an endangered population.

- c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:**

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

Not applicable. Varied Sittella, Little Lorikeet and Regent Honeyeater are not an endangered ecological community or a critically endangered ecological community.

- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,**

Not applicable. Varied Sittella, Little Lorikeet and Regent Honeyeater are not an endangered ecological community or a critically endangered ecological community.

- d) In relation to the habitat of a threatened species, population or ecological community:**

- (i) The extent to which habitat is likely to be remove or modified as a result of the action proposed, and**

The proposal will result in the removal of 0.55 ha of CRCIF, which is potential foraging habitat for the Varied Sittella, Little Lorikeet and Regent Honeyeater. No hollow bearing trees or known breeding habitat will be impacted. These species are likely to use the study area on an occasional basis and would not be dependent on the foraging resources within the subject site.

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

The area of foraging habitat to be removed exists on the western fringe of the community, and is bordered by Rickards Road to the west. Approximately 11.59 ha of CRCIF, which is considered potential foraging habitat for these species, will be retained within the study area. The habitat to be retained also forms part of a larger, contiguous patch of potential habitat to the east and south. Thus, the proposed action will not fragment or isolate any areas of habitat for the Varied Sittella, Little Lorikeet and Regent Honeyeater.

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

The proposed action will result in the removal of 0.55 ha of CRCIF, which is considered potential foraging habitat for the Varied Sittella, Little Lorikeet and Regent Honeyeater. The habitat to be removed / modified is not considered important to these species given that an additional 126 ha of CRCIF is located directly adjacent to the proposed works and is one contiguous patch of potential habitat to the east and south of the study area. This represents 0.5% of potential habitat within the locality.

Given the highly mobile nature of the Varied Sittella, Little Lorikeet and Regent Honeyeater, and the extent of foraging habitat within and surrounding the study area, the vegetation to be removed is not considered important to the long term survival of the Varied Sittella, Little Lorikeet and Regent Honeyeater.

e) Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for the Varied Sittella, Little Lorikeet or the Regent Honeyeater.

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

No recovery plan or threat abatement plan of relevance to the Varied Sittella or Little Lorikeet have been prepared. A National Recovery Plan has been adopted for the Regent Honeyeater. The Recovery Plan aims to:

- Reverse the long-term population trend of decline and increase the numbers of Regent Honeyeaters to a level where there is a viable, wild breeding population, even in poor breeding years; and to
- Enhance the condition of habitat across the Regent Honeyeaters Range to maximize survival; and reproductive success, and provide refugia during periods of extreme environmental fluctuation.

Although the proposed action will result in the removal of potential foraging habitat, approximately 11.59 ha of potential foraging habitat will be retained within the study area in perpetuity through a BioBanking Agreement and / or a s88B Covenant. This will ensure the retention and quality of the habitat. Further, the proposed action does not impact upon any known breeding sites for the Regent Honeyeater.

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

One key threatening process are relevant to this proposal with respect to Varied Sittella, Little Lorikeet and the Regent Honeyeater:

- Clearing of native vegetation.

Although the proposed action includes the clearing of native vegetation, the native vegetation to be cleared represents 0.5% of the local extent of potential foraging habitat for these species. In addition, no known breeding or roosting sites would be impacted as part of the proposed action. Given the highly mobile nature of these species, the proposed action is not considered to exacerbate the impacts of this KTP.

Conclusion

The proposal is unlikely to constitute a significant impact on Varied Sittella, Little Lorikeet and Regent Honeyeater given the following:

- The proposed action will result in the removal of 0.55 ha of potential foraging habitat,
- No breeding habitat or key breeding areas will be removed,
- 11.59 ha of potential foraging habitat will be retained within the study area which is to be managed in perpetuity under a BioBanking Agreement and an s88B Covenant,
- The proposed action will not fragment or isolate any areas of foraging habitat,
- Larger areas of suitable foraging habitat are present within the surrounding landscape and are contiguous with the retained vegetation within the study area,
- The species are highly mobile and are not considered to rely on the foraging habitat within the subject site.

Consequently, a SIS is not required for the Varied Sittella, Little Lorikeet or Regent Honeyeater.

LARGE FOREST OWLS

The following two large forest owl species are regarded as having potential to occur within the study area and have been grouped together for this Assessment of Significance due to similarities in their foraging and/or roosting behaviours and habitat requirements. Thus, predicted impacts are considered to be the same or similar. Where obvious differences are apparent between each species, they are discussed separately.

The Barking Owl and Powerful Owl are listed as Vulnerable under the TSC Act. No individuals of these species were recorded during the field survey, although both species are known from records within a 5 km radius of the study area (OEH 2016a). The proposed development would only impact on potential foraging habitat for these species, as all hollow-bearing trees are to be retained.

The potential impact of the removal of 0.55 of CRCIF has been assessed below. The 1.01 ha of CRCIF to be modified has not been assessed, as the canopy will be retained.

Ninox connivens (Barking Owl)

Ninox connivens (Barking Owl) is found throughout Australia except for the central arid regions and Tasmania. It is quite common in parts of northern Australia, but is generally considered uncommon in southern Australia. It has declined across much of its distribution across NSW and now occurs only sparsely. It is most frequently recorded on the western slopes and plains. It is rarely recorded in the far west or in coastal and escarpment forests.

This species inhabits eucalypt woodland, open forest, swamp woodlands and, especially in inland areas, timber along watercourses. Denser vegetation is used occasionally for roosting. Territories range from 30 to 200 hectares and birds are present all year. Barking Owls utilise hollows for nesting but are able to roost in dense tree canopies, and preferentially forage for arboreal marsupials but are also known to prey on birds, invertebrates and small terrestrial mammals (OEH 2016).

Ninox strenua (Powerful Owl)

Ninox strenua (Powerful Owl) is endemic to eastern and south-eastern Australia, mainly on the coastal side of the Great Dividing Range from Mackay to south-western Victoria and occurs at low densities. In NSW, it is widely distributed throughout the eastern forests from the coast inland to tablelands, with scattered, mostly historical records on the western slopes and plains (OEH 2016).

Powerful Owls occur primarily in densely vegetated gullies of open and tall open forest, but they are also found in a wider range of habitats, including forests and woodlands within the metropolitan regions of cities. However, optimal habitat requires large tracts of forest or woodland habitat, including a tall shrub layer and abundant hollows supporting high densities of arboreal marsupial prey species (OEH 2016).

This species roosts in dense mid-canopy trees (such as *Syncarpia glomulifera* (Turpentine), She-oaks and rainforest trees), or tall shrubs in sheltered gullies, typically on wide creek flats and at the heads of minor drainage lines. Nesting occurs from late autumn to mid-winter in large hollows (greater than 45 cm wide and greater than 100 cm deep) in eucalypts in unlogged, unburnt gullies and lower slopes within 100 m of streams or minor drainage lines. Nest trees are typically emergent, and are often the largest and oldest in a stand. Powerful Owls are

faithful to traditional nesting hollows but can also use other hollows within the nesting gully (OEH 2016).

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

Factors likely to have an adverse effect on the life cycle of the Barking Owl and Powerful Owl would include a substantial loss and/or fragmentation of foraging habitat and loss of suitable nesting and roosting habitat (e.g. large hollow bearing trees).

The proposed action will result in the removal of 0.55 ha of CRCIF which represents potential foraging habitat for the Powerful Owl and Barking Owl within the study area. Selective thinning of shrubs and suppression of the ground layer is required to maintain APZ within the lot layout, all canopy trees will be maintained. No hollow bearing trees will be removed. However, 11.59 ha of potential foraging habitat will be retained within the study area which is to be managed in perpetuity under a BioBanking Agreement and an s88B Covenant.

These species are highly mobile and given that 11.59 ha of potential foraging habitat will be retained within the study area, the proposed action is considered unlikely to have an adverse effect on the life cycle of the Barking Owl and Powerful Owl such that a viable local population of these species is placed at risk of extinction.

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

Not applicable. The Barking Owl and Powerful Owl are not endangered populations.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

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

Not applicable. The Powerful Owl and Barking Owl are not endangered or critically endangered ecological communities.

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

Not applicable. The Powerful Owl and Barking Owl are not endangered or critically endangered ecological communities.

d) in relation to the habitat of a threatened species, population or ecological community:

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

The proposed action will result in the removal of 0.55 ha of potential foraging habitat for the Powerful Owl and Barking Owl. No hollow bearing trees will be impacted as part of the proposed action.

The impact of the proposed action is considered minor due to the small area to be impacted relative to the home range of this species and the availability of habitat within the study area and adjacent areas.

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

The area of foraging habitat to be removed exists on the western fringe of the community, and is bordered by Rickards Road to the west. Approximately 11.59 ha of potential foraging habitat will be retained within the study area, which forms part of a larger, contiguous patch of potential habitat to the east and south of the study area. Thus, the proposed action will not fragment or isolate any areas of habitat for the Powerful Owl and Barking Owl.

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

The large forest owl species are highly mobile and the vegetation to be removed on site does not represent primary roosting (hollow bearing trees) or foraging habitat. Extensive areas of habitat are present within, and adjacent to the study area. In this context, the potential foraging habitat to be removed is unlikely to be important to the long-term survival of these species.

e) Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for the Powerful Owl and Barking Owl.

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

A recovery plan for the Large Forest Owls including the Barking Owl and Powerful Owl was produced by the former Department of Environment and Conservation (DEC 2006) with the following objectives or actions:

1. model and map owl habitat and validate with surveys;
2. monitor owl population parameters;
3. audit forestry prescriptions;
4. manage and protect habitat off reserves and state forests;
5. undertake research;
6. increase community awareness and involvement in owl conservation; and
7. provide organisational support and integration.

Although the proposed action will remove habitat outside of reserves and state forests, 11.59 ha of potential foraging habitat will be retained in the study area in perpetuity through a BioBanking Agreement and an s88B Covenant. In addition, the proposed action would involve only a minor disturbance to an area of potential foraging habitat and would not result in the fragmentation or loss of any breeding or roosting habitat.

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

One Key threatening process is relevant to the Barking Owl and Powerful Owl:

- clearing of native vegetation.

Although the proposed action will result in the clearing of native vegetation, this represents 0.5% of potential foraging habitat within the locality. Further, 11.59 ha of potential foraging habitat will be retained within the study area which forms part of a larger, contiguous patch that extends beyond the study area. This disturbance is considered minor due to the small extent of foraging habitat to be removed, the nature of the proposed thinning and the highly mobile nature of these species.

Conclusions

The proposed action is unlikely to have a significant impact on the Powerful Owl and Barking Owl given the following:

- The proposed action will result in the removal of 0.55 ha of potential foraging habitat
- No breeding / roosting habitat or key breeding areas will be removed
- Approximately 11.59 ha of potential foraging habitat will be retained within the study area which is to be managed in perpetuity under a BioBanking Agreement and / or an s88B Covenant
- The proposed action will not fragment or isolate any areas of foraging habitat
- Larger areas of suitable foraging habitat are present within the surrounding landscape and are contiguous with the retained vegetation within the study area
- The species are highly mobile and are not considered to rely on the foraging habitat within the subject site.

Consequently, a Species Impact Statement is not required for the Powerful Owl or Barking Owl.

MAMMALS

Petaurus australis (Yellow-bellied Glider)

Petaurus australis (Yellow-bellied Glider) is a large, active, sociable and vocal glider. Adults weigh 450 - 700 grams, have a head and body length of about 30 cm and a large bushy tail that is about 45 cm long. The Yellow-bellied Glider is found along the eastern coast to the western slopes of the Great Dividing Range, from southern Queensland to Victoria (OEH 2016).

The species occurs in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils, and dependent upon hollows for shelter. The Yellow-bellied Glider feeds primarily on plant and insect exudates, including nectar, sap, honeydew and manna with pollen and insects providing protein. The Yellow-bellied Glider is mobile and occupies large home ranges of 20 to 85 ha to encompass dispersed and seasonally variable food resources (OEH 2016).

This species is threatened by a number of processes including the loss and fragmentation of habitat through clearing, loss of hollow bearing trees, depletion of food resources by inappropriate fire regimes, and predation by foxes and cats (OEH 2016).

No Yellow-bellied Gliders were recorded during field surveys undertaken as part of this study, although records are known within 5 km of the study area and suitable habitat for this species was observed within the study area.

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

Factors likely to have an adverse effect on the life cycle of the Yellow-bellied Glider would include a substantial loss and/or fragmentation of foraging habitat, loss of hollows and increased presence of foxes and cats.

The proposed action will result in the removal of 0.55 ha of CRCIF and the modification of 1.01 ha of CRCIF, which is considered potential foraging habitat. No HBTs will be removed, thus no known breeding / roosting habitat will be impacted. There is one record within a 5km radius of the study area and it is unlikely that there is a viable locale population present within the study area.

Approximately 11.59 ha of CRCIF considered potential foraging habitat will be retained throughout the study area. This patch of CRCIF forms part of a larger, contiguous patch that extends beyond the boundaries to the east and south of the study area. Given the small extent of foraging habitat to be removed and the highly mobile nature of these species, the proposed action is unlikely to have an adverse effect on the life cycle of the Yellow-bellied Glider such that a viable local population is to be placed at risk of extinction.

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

Not applicable. The Yellow-bellied Glider is not an endangered population.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

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

Not applicable. The Yellow-bellied Glider is not an endangered or critically endangered ecological community.

- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction**

Not applicable. The Yellow-bellied Glider is not an endangered or critically endangered ecological community.

d) in relation to the habitat of a threatened species, population or ecological community:

- (i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and**

The proposed action will result in the removal of 0.55 ha and the modification of 1.01 ha of CRCIF considered potential foraging habitat for the Yellow-bellied Glider. No hollow bearing trees will be impacted as part of the proposed action.

The impact of the proposed action is considered minor due to the small area to be impacted relative to the home range of this species and the availability of habitat within the study area and adjacent areas.

- (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**

The area of foraging habitat to be removed exists on the western fringe of the community, and is bordered by Rickards Road to the west. The Yellow-bellied Glider is a very mobile species and occupy large home ranges between 20 to 85 ha.

Approximately 11.59 ha of CRCIF which is considered potential foraging habitat will be retained within the study area. In addition, the vegetation to be retained forms part of a larger, contiguous patch (approximately 126 ha) that extends beyond the boundaries to the east and south of the study area, which is also considered potential foraging habitat. No hollow bearing trees will be impacted.

Therefore, the proposed works will impact on 0.9 ha of potential foraging habitat, no breeding habitat will be impacted. Thus, the proposed action will not fragment or isolate any areas of habitat for the Yellow-bellied Glider.

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

The proposed action will result in the removal of 0.55 ha and the modification of 1.01 ha of CRCIF which is considered potential foraging habitat for the Yellow-bellied Glider. No breeding habitat in the form of hollow bearing trees will be impacted. The Yellow-bellied Glider is a very mobile species and occupy large home ranges between 20 to 85 ha, and extensive areas of habitat are present within, and adjacent to the study area (approximately 126 ha). In this context, the potential foraging habitat to be removed is unlikely to be important to the long-term survival of these species.

The food resources within the mid and understorey vegetation of the good quality CRCIF would form a component of the diet of Yellow-bellied Gliders, with the canopy species across the study area supplementing these resources. However, given the small amount of habitat to be removed and the retention of 11.59 ha of foraging habitat within the study area, and the availability of larger patches of foraging habitat outside the study area, the habitat proposed for removal is not considered important to the long-term survival of this species within the locality.

e) Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for the Yellow-bellied Glider.

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

No recovery plan or threat abatement plan has been prepared for the Yellow-bellied Glider. Additionally the proposal does not conflict with any of the nine Priority Actions identified for this species

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

One key threatening process listed under Schedule 3 of the TSC Act is relevant to the Yellow-bellied Glider:

- Clearing of native vegetation.

The removal of 0.55 ha of potential foraging habitat and the modification of 1.01 ha of potential habitat, including the selective thinning of shrubs, is not considered significant given the highly mobile nature of this species and the availability of habitat within the study area and surrounding landscape.

Conclusion

The proposal is unlikely to have a significant impact on the Yellow-bellied Glider given the following:

- No hollow bearing trees or known roosting / breeding habitat will be impacted by the proposal
- The proposed action will remove 0.55 ha of potential habitat and modify 1.01 ha of potential habitat, with the majority of this canopy remaining intact
- Approximately 11.59 ha of potential foraging habitat remains in the study area and will be managed in perpetuity under a BioBanking Agreement and / or s88B Covenant
- The proposed action would not isolate or fragment any areas of habitat.

Consequently, a Species Impact Statement is not required for the Yellow-bellied Glider.

MEGACHIROPTERAN BATS

Pteropus poliocephalus (Grey-headed Flying-fox)

Grey-headed Flying-fox is listed as a vulnerable species under the TSC Act. It is generally found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. It occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops, and has been recorded as travelling long distances on feeding forays (up to 50 km). Fruits and flowering plants of a wide variety of species are the main food source (OEH 2016).

The species roosts in large 'camps' of up to 200,000 individuals. Camps are usually formed within 20 km of a regular food source and are generally close to water and along gullies. However, the species has been known to form camps in urban areas (OEH 2016).

Key threats to the species are loss of roosting and foraging sites, electrocution on powerlines, entanglement in netting and on barbed-wire, heat stress, and conflict with humans (OEH 2016).

Grey-headed Flying-fox (GHFF) was not recorded during the survey. There are records of the species within a 5 km radius of the study area (OEH 2016a), and suitable foraging habitat is located within the study area. There is potential that the study area is used occasionally by this species, although it is unlikely that individuals of this species are dependent upon resources in the study area.

The closest known GHFF camp is located 5 km north of the study area at Yarramundi, and contains approximately 2,500 individuals (Hawkesbury City Council 2008).

The potential impact of the removal of 0.55 of CRCIF has been assessed below. The 1.01 ha of CRCIF to be modified has not been assessed, as the canopy will be retained.

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

Impacts likely to have an adverse effect on the life cycle of GHFF would include impacts which resulted in the loss of significant areas of foraging habitat, increases in the mortality rate, and increases in conflicts with humans.

The proposed action will result in the removal of 0.55 ha of CRCIF considered potential foraging habitat for the GHFF. No known camps would be impacted.

The species is highly mobile and has a large home range travelling long distances on feeding forays (up to 50 km). There is 11.59 ha of good quality habitat available in the study area and an additional 126 ha of potential foraging habitat adjacent to the study area, based NPWS (2002) mapping.

Some disturbance (noise, dust) is expected to occur during the construction phase. The extent of this has not been quantified. However, noise and dust impacts would be low-level, temporary and occurring during day-time hours, therefore, unlikely to degrade adjacent habitat.

The proposed action is taking place in an urbanised area and therefore is unlikely to increase mortality rates through heat stress or electrocution. Thus, the removal of potential foraging

habitat is unlikely to have a significant impact on life cycle of the GHFF such that a viable local population of the species would be placed at risk of extinction.

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

Not applicable. The GHFF is not an endangered population.

- c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:**

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

Not applicable. The GHFF is not an endangered or critically endangered ecological community.

- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.**

Not applicable. The GHFF is not an endangered or critically endangered ecological community.

- d) in relation to the habitat of a threatened species, population or ecological community:**

- (i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and**

The proposed action will result in the removal of 0.55 ha of CRCIF considered potential foraging habitat for the GHFF. No known camps would be directly impacted.

- (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**

The area of foraging habitat to be removed exists on the western fringe of the community, and is bordered by Rickards Road to the west. Approximately 11.59 ha of CRCIF, which is considered potential foraging habitat, will be retained within the study area. The habitat to be retained forms part of a larger, contiguous patch of potential habitat to the east and south of the study area, totalling approximately 126 ha. In addition, selective thinning of shrubs and suppression of the ground layer within modified CRCIF, would not fragment the habitat of such a mobile species. No known roosting or breeding habitat in the form of camps would be impacted. Thus, the proposed action will not fragment or isolate any areas of habitat for the GHFF.

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

The potential foraging habitat to be removed and modified constitutes 0.5% of potential foraging habitat within the locality. No GHFF camps would be impacted. Given the small extent of vegetation to be removed / modified, the availability of 126 ha of contiguous habitat within and adjacent to the study area and the highly mobile nature of this species, the habitat to be removed is not considered important to the long term survival of the GHFF.

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

No critical habitat has been declared for this species.

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

A Draft National Recovery Plan exists for the GHFF (DECCW 2009). The overall objectives of the recovery plan are:

- To reduce the impact of threatening processes on the GHFF and arrest decline throughout the species' range,
- To conserve the functional roles of GHFF in seed dispersal and pollination,
- To improve the standard of information available to guide recovery of the GHFF, in order to increase community knowledge of the species and reduce the impact of negative public attitudes on the species.

Given the proposed action will result in the removal of 0.55 ha of potential foraging habitat for the species, the proposed development is consistent with the objectives of the draft National Recovery Plan (DECCW 2009).

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

One Key threatening process is relevant to this proposal:

- clearing of native vegetation.

Although the proposal will result in the clearing of native vegetation, the area to be removed comprises 0.5% of potential foraging habitat within the locality. This vegetation is accessible to the GHFF given their highly mobile nature and wide foraging range. Therefore, the proposed action does not exacerbate the impacts of this KTP.

Conclusion

The proposal is unlikely to have a significant impact on GHFF given the following:

- The area of foraging habitat to be removed comprises 0.5% of foraging habitat within the locality
- No known camps will be impacted
- Approximately 11.59 ha of potential foraging habitat will be retained in the study area and managed in perpetuity under a BioBanking Agreement and /or s88B Covenant
- No areas of foraging habitat would be fragmented or isolated.

Consequently, a SIS is not required for the GHFF.

MICROCHIROPTERAN BATS

The following four microchiropteran bat species are regarded as having potential to occur within the study area and, consequently, have been grouped together for this Assessment of Significance. This is because they have certain similarities in their foraging and/or roosting behaviours, habitat requirements and consequently predicted impacts are considered to be the same or similar. Where obvious differences are apparent between each species, they are discussed separately.

The Eastern Bentwing Bat, Little Bentwing-bat, Eastern Freetail Bat and Southern Myotis are listed as Vulnerable under the TSC Act. No individuals of these species were recorded during the field survey, although all species are known from records within a 5 km radius of the study area (OEH 2016a). The proposed development would only impact on potential foraging habitat for these species, as all hollow-bearing trees are to be retained.

The potential impact of the removal of 0.55 of CRCIF has been assessed below. The 1.01 ha of CRCIF to be modified has not been assessed, as the canopy will be retained.

Miniopterus schreibersii oceanensis (Eastern Bentwing Bat)

Eastern Bentwing-bat is listed as a vulnerable species under the TSC Act. This species occupies a range of forested environments (including wet and dry sclerophyll forests), along the coastal portion of eastern Australia, and through the Northern Territory and Kimberley area (subject to subdivision of this species) (OEH 2016).

This species has a fast, level flight exhibiting swift shallow dives. It forages from just above the tree canopy, to many times the canopy height in forested areas, and will utilise open areas where it is known to forage at lower levels. Moths appear to be the main dietary component. This highly mobile species is capable of large regional movements in relation to seasonal differences in reproductive behaviour and winter hibernation. Though individuals often use numerous roosts, it congregates in large numbers at a small number of nursery caves to breed and hibernate. Although roosting primarily occurs in caves, it has also been recorded in mines, culverts, stormwater channels, buildings, and occasionally tree-hollows. This species occupies a number of roosts within specific territorial ranges usually within 300 km of the maternity cave, and may travel large distances between roost sites (OEH 2016).

Miniopterus australis (Little Bentwing-bat)

Little Bent-wing Bat is listed as a vulnerable species under the TSC Act. The species is generally found in well-timbered areas, including moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Little Bentwing-bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats.

Little Bent-wing Bat was not recorded during field survey, however there are records for the specie within a 5 km radius of the study area. There is potential for the study area to be used occasionally by this species for roosting and foraging, although it is unlikely that individuals rely upon resources in the study area.

Mormopterus norfolkensis (Eastern Freetail-bat)

Eastern Freetail-bat is listed as vulnerable under Schedule 2 of the TSC Act. It is found along the east coast from south Queensland to southern NSW in dry eucalypt forests, woodlands, swamp forests and mangrove forests where they forage for insects among canopy gaps and on edges of vegetation and mainly roost in hollow-bearing trees. This species will utilise paddock trees and remnant vegetation in farmland where these are in proximity to larger forest remnants. This species usually forages within a few kilometres of its roost (OEH 2016).

Myotis macropus (Southern Myotis)

The Southern Myotis is listed as vulnerable under Schedule 2 of the TSC Act. The species generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, stormwater channels, buildings, under bridges and in dense foliage. It forages over streams and pools catching insects and small fish by raking their feet across the water surface.

The Southern Myotis was not recorded during field survey however, there are numerous records for this species within a 5 km radius of the study area. There is potential for the study area to be used by this species for foraging and roosting.

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

Factors likely to have an adverse effect on the life cycle of the Eastern Bentwing Bat, Little Bentwing-bat, Eastern Freetail Bat and Southern Myotis would include a substantial loss of roosting habitats such as cliffs, mines and caves, loss and/or fragmentation of foraging habitat around these roosting sites, pesticide usage and inappropriate fire regimes.

The proposed action will result in the removal of 0.55 ha of CRCIF considered potential foraging habitat for these species. No hollow bearing trees will be removed.

The species is highly mobile and has a large home range. No breeding habitat in the form of hollow bearing trees or culverts will be impacted. Approximately 11.59 ha of potential foraging habitat will be retained within the study area which forms part of a larger patch that extends beyond the boundaries of the study area. Thus, it is unlikely that the loss of vegetation/potential foraging habitat will significantly disrupt the life cycle of the Eastern Bentwing Bat, Little Bentwing-bat, Eastern Freetail Bat and Southern Myotis such that a viable local population is placed at risk.

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

Not applicable. Eastern Bentwing Bat, Little Bentwing-bat, Eastern Freetail Bat and Southern Myotis are not an endangered population.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

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

Not applicable. Eastern Bentwing Bat, Little Bentwing-bat, Eastern Freetail Bat and Southern Myotis are not an endangered or critically endangered ecological community.

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable. Eastern Bentwing Bat, Little Bentwing-bat, Eastern Freetail Bat and Southern Myotis are not an endangered or critically endangered ecological community.

d) in relation to the habitat of a threatened species, population or ecological community:

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

The proposed action will result in the removal of 0.55 ha of CRCIF considered potential foraging habitat for the Eastern Bentwing Bat, Little Bentwing-bat, Eastern Freetail Bat and Southern Myotis. No hollow bearing trees will be impacted.

Approximately 11.59 ha of potential foraging habitat will be retained in the study area. The area of habitat to be removed is considered minor, given it constitutes 0.5% of potential foraging habitat within the locality. Thus, the amount of potential foraging to be removed is not likely to represent a significant loss to the species.

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

The area of foraging habitat to be removed exists on the western fringe of the community, and is bordered by Rickards Road to the west. Approximately 11.59 ha of CRCIF considered potential foraging habitat will be retained within the study area, which forms part of a larger patch of habitat that extends beyond the study area, totalling 126 ha. In addition, selective thinning of shrubs and suppression of the ground layer within modified CRCIF, would not fragment the habitat of such mobile species. No known roosting or breeding habitat in the form of HBTs would be impacted. Thus, the proposed action will not fragment or isolate any areas of habitat for the Eastern Bentwing Bat, Little Bentwing-bat, Eastern Freetail Bat and Southern Myotis.

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

The potential foraging habitat to be removed and modified constitutes 0.5% of potential foraging habitat within the locality. No HBTs or roosting / foraging habitat would be impacted. Given the small extent of vegetation to be removed / modified, the availability of 126 ha of contiguous habitat within and adjacent to the study area and the highly mobile nature of these species, the habitat to be removed is not considered important to the long term survival of the Eastern Bentwing Bat, Little Bentwing-bat, Eastern Freetail Bat and Southern Myotis.

e) Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for the Eastern Bentwing Bat, Little Bentwing-bat, Eastern Freetail Bat and Southern Myotis.

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

No recovery plan or threat abatement plan has been prepared for the Eastern Bentwing Bat, Little Bentwing-bat, Eastern Freetail Bat and Southern Myotis.

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

One key threatening process is relevant to this proposal with respect to the Eastern Bentwing Bat, Little Bentwing-bat, Eastern Freetail Bat and Southern Myotis:

- Clearing of native vegetation.

Although the proposal will result in the clearing of native vegetation, the area to be removed comprises 0.5% of potential foraging habitat within the locality. This vegetation is accessible to these species given their highly mobile nature and wide foraging range. Therefore, the proposed action does not exacerbate the impacts of this KTP.

Conclusion

The proposal is unlikely to constitute a significant impact on Eastern Bentwing Bat, Little Bentwing-bat, Eastern Freetail Bat and Southern Myotis, given that:

- The area of foraging habitat to be removed comprises 0.5% of foraging habitat within the locality
- No HBTs or known roosting / breeding habitat would be impacted
- Approximately 11.59 ha of potential foraging habitat will be retained in the study area and managed in perpetuity under a BioBanking Agreement and /or s88B Covenant
- No areas of foraging habitat would be fragmented or isolated.

Consequently, a SIS is not required for the Eastern Bentwing Bat, Little Bentwing-bat, Eastern Freetail Bat and Southern Myotis

EPBC Act Impact Assessment

The EPBC Act Administrative Guidelines on Significance set out 'Significant Impact Criteria' that are to be used to assist in determining whether a proposed action is likely to have a significant impact on matters of national environmental significance. Matters listed under the EPBC Act as being of national environmental significance include:

- Listed threatened species and ecological communities
- Listed migratory species
- Wetlands of International Importance
- The Commonwealth marine environment
- World heritage properties
- National heritage places
- Nuclear actions.

Specific 'Significant Impact Criteria' are provided for each matter of national environmental significance except for threatened species and ecological communities in which case separate criteria are provided for species listed as critically endangered, endangered and vulnerable under the EPBC Act.

VEGETATION

Cooks River Castlereagh Ironbark Forest

Cooks River Castlereagh Ironbark Forest (CRCIF) is listed as a critically endangered ecological community (CEEC) under the EPBC Act.

An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it:

Criteria 1: will the action reduce the extent of an ecological community

The proposal will reduce the current extent of CRCIF through the removal of 0.33 ha of EPBC Act listed CRCIF (0.15 ha Category A and 0.18 ha Category D), and the modification of 0.7 ha of EPBC Act listed CRCIF (0.38 ha Category A and 0.32 ha Category D).

Proposed impacts to EPBC listed CRCIF are detailed in **Table 5** and shown in **Figure 2**.

The EPBC significant impact guidelines (DotEE 2016) recommended a minimum buffer zone of 30 m from the outer edge of the patch is provided to act as a barrier to further direct disturbance. Where the buffer is subject to existing land uses, such as cropping, grazing or fire breaks, these can continue. A 25 m APZ is proposed around the retained vegetation, this will involve selective thinning of trees and shrubs and suppression of the ground layer, all canopy trees will be maintained.

The EPBC significant impact guidelines (DotEE 2016) also suggest that any removal of a CEEC would be significant, however the patch of CRCIF within the subject site extends beyond the patch of CRCIF recorded within the subject site to the east, north and south, and is one connected patch (**Figure 5**). Therefore, based on the Cumberland Plain mapping (NPWS 2002), the proposed action will reduce the extent of an ecological community by 0.8 %.

In addition, the majority of the vegetation within the development footprint is in poor condition (30% or less native vegetation ground cover) and subject to edge effects from the surrounding land use.

Criterion 2: will the action fragment or increase fragmentation of an ecological community.

The lot layout has been designed to maximise the retention of CRCIF within the subject site. The proposal will result in the removal of 0.33 ha of EPBC Act listed CRCIF (0.15 ha Category A and 0.18 ha Category D), and the modification of 0.7 ha of EPBC Act listed CRCIF (0.38 ha Category A and 0.32 ha Category D).

The CRCIF to be removed / modified is located on the western fringe of the community and is bordered by Rickards Road to the west. The proposed action would not fragment CRCIF within the subject site, or in the surrounding landscape. Thus it is unlikely that the habitat would become fragmented or isolated from other habitats as a result of the proposed action.

Criterion 3: will the action adversely affect habitat critical to the survival of an ecological community.

Habitat critical to the survival of a species or ecological community' refers to areas that are necessary for activities such as foraging, breeding, roosting, or dispersal, for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators), to maintain genetic diversity and long term evolutionary development, or for the reintroduction of populations or recovery of the species or ecological community. Such habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/ or habitat listed on the Register of Critical Habitat maintained by the minister under the EPBC Act.

The CRCIF that would be removed / modified is not considered to be habitat critical to the survival of this community because of its small size (1.03 ha) in relation to the patch that will remain (approximately 126 ha). In addition, the size of the native vegetation retained in the community and in the surrounding landscape is able to support ecological processes (such as pollination) that would benefit the patch of CRCIF that would not be cleared.

Criterion 4: will the action modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns.

The proposal would not substantially alter the abiotic factors necessary for the survival of the CEEC given that the APZ will provide a buffer for the CEEC and an Erosion and Sedimentation Plan (ESCP) will be implemented to manage surface water drainage patterns so that they will not alter the adjacent retained vegetation. Sediment control will be routinely inspected after rainfall events and periodically inspected during normal conditions.

Criteria 5: will the action cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting

The proposal will result in the removal of 0.33 ha of EPBC Act listed CRCIF (0.15 ha Category A and 0.18 ha Category D), and the modification of 0.7 ha of EPBC Act listed CRCIF (0.38 ha Category A and 0.32 ha Category D).

The Category A CRCIF within the subject site has been highly modified and consists of scattered shrubs and approx. 30% native ground cover. In addition, 1.1 ha of CRCIF will be managed as an APZ, creating a buffer from the retained vegetation. The APZ will involve selective thinning of shrubs and suppression of the ground layer. However, a native ground cover will be retained.

11.59 ha of Category D CRCIF will be retained within the subject site under a conservation agreement. The vegetation proposed to be retained contains the community in all its strata's, and is in good condition.

Therefore, the proposed action is not considered to cause a substantial change in the species composition of an occurrence of an ecological community.

There is potential that the APZ management is likely to encourage a change in the composition of flora species such that weeds are favoured. To compensate, a VMP will be provided as part of the conservation agreements to assist in the management of exotic species.

Criteria 6: will the action cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:

- **assisting invasive species, that are harmful to the listed ecological community, to become established, or**
- **causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community, or**

The proposal will result in the removal of 0.33 ha of EPBC Act listed CRCIF (0.15 ha Category A and 0.18 ha Category D), and the modification of 0.7 ha of EPBC Act listed CRCIF (0.38 ha Category A and 0.32 ha Category D). However, 11.59 ha will be retained within the subject site under a conservation agreement. Potential indirect impacts on the local occurrence from invasive species, fertilisers and herbicides or other pollutants will be mitigated and managed through a VMP as part of the conservation agreements.

Therefore, the proposal would not cause a substantial reduction in the quality or integrity of an occurrence of CRCIF.

Criteria 7: will the action interfere with the recovery of an ecological community.

The proposal will result in a permanent loss of the extent of CRCIF within the study area for the proposed action. This action conflicts with the recovery of CRCIF community. Despite this, the works are considered minor considering the patch of CRCIF within the study area extends beyond the patch of CRCIF recorded within the study area to the east, north and south, and is one connected patch (**Figure 5**). Therefore, the proposed action will reduce the extent of an ecological community by 0.8%.

Additionally 11.59 ha of CRCIF in the study area will be retained and a VMP will be prepared to provide suitable management practices to protect and maintain the diversity within this patch.

Conclusion

Based on these criteria, it is unlikely that the proposed works will lead to a significant impact on CRCIF. However, the EPBC significant impact guidelines (DotEE 2016) suggest that any reduction in extent of a CEEC would be significant. Therefore, it is recommended that a referral to the Commonwealth is required for this CEEC.

Anthochaera phrygia (Regent Honeyeater)

Anthochaera phrygia (Regent Honeyeater) is listed as critically endangered under the EPBC Act. No individuals of the Regent Honeyeater were recorded during the field survey, although three records of the species, from 1998 to 2001, are known within a 5 km radius of the site (OEH 2016). There is potential that the subject site is used occasionally by the Regent Honeyeater, although it is unlikely that individuals of this species are dependent upon the study area. The potential impact of the removal of 0.55 of CRCIF has been assessed below. The 1.01 ha of CRCIF to be modified has not been assessed, as the canopy will be retained.

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

Criteria a: lead to a long-term decrease in the size of a population

The Regent Honeyeater returns each year to specific breeding grounds in western NSW during warmer months. During non-breeding season this species will traverse large areas in search of prolific flowering events. The removal of some low lying vegetation within an urbanised environment is highly unlikely lead to the long-term decrease in the size of the population for the following reasons:

- no impact will occur on breeding habitat,
- no individuals have previously been recorded within the study area,
- no increase in fragmentation will occur.

The study area represents potential foraging habitat for this species. The proposed removal of 0.55 ha of CRCIF is unlikely to lead in the long-term decrease in the size of the population, given the retention of 11.59 ha of CRCIF within the study area and the availability of habitat adjacent to the study area.

Criteria b: reduce the area of occupancy of the species

The area of occupancy has been predicted at 300 km² across Australia and 200 km² within NSW. It is currently contracting within its outer limits, particularly in the southern extent in Victoria (DotEE 2016). In NSW it is now largely absent from the Central Coast around Sydney region (DotEE 2016). The removal of vegetation may contribute towards the reduction in the area of occupancy for this species.

The proposed works will involve the removal of 0.55 ha of CRCIF considered potential foraging habitat for the Regent Honeyeater. The area of CRCIF to be modified will undergo only selective thinning of the canopy, with most mature eucalypt species to be retained.

There is potential that during construction works the production of noise and other disturbances may deter some species from foraging in this area, however, these are only temporary disturbances. Therefore, the proposed subdivision is unlikely to reduce the area of occupancy of the Regent Honeyeater.

Criteria c: fragment an existing population into two or more populations

There are three potential sub-communities of the Regent Honeyeaters; the Bundarra-Barraba area and the Capertee Valley in NSW, and north-eastern Victoria (DotEE 2016) and genetic evidence suggests that all the Regent Honeyeaters population are part of one continuous population.

Given that the Regent Honeyeater is part of one population the removal of 0.55 ha of CRCIF is highly unlikely to result in the fragmentation of habitats such that the sub-communities would be split into two or more populations.

Criteria d: adversely affect habitat critical to the survival of a species

No habitat critical to the survival of the Regent Honeyeater has been declared, however, there are several management sites declared under NSW OEH (OEH 2016b) which are known breeding habitats. These sites are located west of the Great Dividing Range and therefore located outside of the study area.

Criteria e: disrupt the breeding cycle of a population

There are three known breeding sites in NSW for the Regent Honeyeater. Possible impacts on the breeding cycle would include the removal of breeding habitat or foraging habitat along migratory routes and increase in predation of chicks or adults.

The study area is located outside of the known breeding sites for the Regent Honeyeater and the removal of small amount of shrubs and ground cover species are unlikely to impact on the availability of foraging resources considering the availability of suitable nectar producing species retained within the study area and the adjacent landscape. Therefore, the works are highly unlikely to disrupt the breeding cycle of the population.

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

The lot layout has been designed to maximise the retention of CRCIF considered foraging habitat within the study area. The proposed subdivision will result in the removal of 0.55 ha of CRCIF within the study area. The CRCIF to be removed is located on the western fringe of the community and is bordered by Rickards Road to the west. The proposed subdivision would not fragment CRCIF within the study area, or in the surrounding landscape. Given the highly mobile nature of this species and the availability of habitat within the study area and adjacent landscape, the habitat to be removed would not isolate or fragment foraging habitat.

Criteria g: result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

The proposed works are unlikely to result in the establishment of an invasive species that is harmful to the Regent Honeyeater. The works involve clearance of native vegetation and incorporation of strict controls to prevent spread of weeds through a VMP as part of the conservation agreements.

Criteria h: introduce disease that may cause the species to decline, or

The proposed works are unlikely to result in the establishment of an introduced disease that is harmful to the Regent Honeyeater. The works involve clearance of native vegetation and incorporation of strict controls to prevent the introduction of new disease into the area.

Criteria i: interfere with the recovery of the species.

Approximately 11.59 ha of potential foraging habitat will be retained throughout the study area which forms part of a larger patch that extends into the adjacent landscape. Given the highly mobile nature of this species and its wide foraging range, the proposed works will not interfere with the recovery of the Regent Honeyeater.

Conclusion

Based on these criteria, it is unlikely that the proposed works will lead to a significant impact on the Regent Honeyeater. A Referral to the Commonwealth is not required for this species.

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

Grey-headed Flying-fox (GHFF) is listed as a vulnerable threatened species under the EPBC Act. No individuals of the GHFF were recorded during the field survey, although there are known records of the species within a 5 km radius of the site (OEH 2016). There is potential that the subject site is used occasionally by the GHFF, although it is unlikely that individuals of this species are dependent upon the study area. The potential impact of the removal of 0.55 of CRCIF has been assessed below. The 1.01 ha of CRCIF to be modified has not been assessed, as the canopy will be retained.

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

Criterion a: lead to a long-term decrease in the size of an important population of a species

The action would result in the removal of 0.55 ha and modification of 1.01 ha of CRCIF, which is potential foraging habitat for the GHFF. Selective thinning of shrubs and suppression of the ground layer is required to maintain APZ. No known camps would be impacted.

The species is highly mobile and has a large home range travelling long distances on feeding forays (up to 50 km). There is good quality habitat available in the study area and surrounding landscape. Therefore, the action is unlikely to lead to a long-term decrease in the size of an important population of a species.

Criterion b: reduce the area of occupancy of an important population

There is a single interbreeding population of GHFF in Australia, and as such, any colony or individual of the species is an important population of the species. The action is unlikely to reduce the area of occupancy of an important population given that no campsites have been recorded within the study area and that extensive foraging habitat exists in the study area and surrounding landscape.

Criterion c: fragment an existing important population into two or more populations

There is a single interbreeding population of GHFF in Australia, and as such, any colony or individual of the species is an important population of the species. The area of habitat that would be impacted for the proposed development is located on the western fringe of the community and is bordered by Rickards Road to the west. The action would not remove connecting habitat between the study area and the surrounding landscape as the vegetation extends beyond the patch recorded within the study area to the north, east and south and is one connected patch. Therefore, the action will not fragment an existing important population into two or more populations.

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

Foraging habitat within a 50 kilometre radius of a roost site with greater than 30,000 individuals is foraging habitat critical to the survival of this species. The study area is located 5 km south of a known camp containing approximately 2,500 individuals. However, the proposed works will not directly impact the camp and would result in the removal/modification of a small amount of marginal foraging habitat consisting of 1.56 ha of CRCIF. Given the highly mobile nature of the species and the fact that the vegetation to be removed on site does not represent primary roosting or foraging habitat and extensive areas of habitat are present adjacent to the study area, the proposed action is not considered to have an adverse impact of habitat critical to the survival of the species.

Criterion e: disrupt the breeding cycle of an important population

As no roosting habitat would be removed or disturbed, it is unlikely the proposed action would disrupt the breeding cycle of an important population. Potential foraging habitat to be removed is minimal given the retention of 11.59 ha of potential foraging habitat within the study area and availability in adjacent areas. Thus the action is unlikely to affect the amount of resources available to any breeding individuals.

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

This species is highly mobile in nature and the vegetation to be removed on site does not represent primary roosting habitat. In addition, there are extensive areas of habitat present within and adjacent to the study area. Therefore, the proposed works will not modify, destroy, remove, or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Criterion g: Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;

The action would not result in invasive species, such as weeds, that would be harmful to GHFF. The works involved clearance of vegetation and incorporation of a VMP to manage the spread of weeds.

Criterion h: Introduce disease that may cause the species to decline;

GHFF are reservoirs for the Australian bat lyssavirus and can cause clinical disease and mortality in the species. The proposed works are unlikely to present a significant ecological stress on known individuals or camps utilizing the subject site and therefore unlikely to affect this species. The proposed works would be unlikely to introduce a disease that may cause this species to decline.

Criterion i: Interfere substantially with the recovery of the species;

A Draft National Recovery Plan exists for the GHFF (DECCW 2009). The overall objectives of the recovery plan are:

- To reduce the impact of threatening processes on the GHFF and arrest decline throughout the species' range,
- To conserve the functional roles of GHFF in seed dispersal and pollination,
- To improve the standard of information available to guide recovery of the GHFF, in order to increase community knowledge of the species and reduce the impact of negative public attitudes on the species.

Given the proposed action will result in the removal of 0.55 ha and modification of 1.01 ha of potential foraging habitat for the species, the proposed development is consistent with the objectives of the draft National Recovery Plan (DECCW 2009).

Conclusion

Based on the above assessment it is concluded that the proposed works is unlikely to have a significant impact on a population of GHFF. As such, no referral to the Commonwealth Department of Environment and Energy for assessment and approval by the Environment Minister is necessary.

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