Pacific Road, Erskine Park
Biodiversity Development Assessment Report

Penrith City Council

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Template 2.8.1

Executive Summary

Eco Logical Australia Pty Ltd (ELA) was engaged by Penrith City Council to prepare a Streamlined (small area) Biodiversity Development Assessment Report (BDAR) for part of Lot 1444 DP788282, Pacific Rd, Erskine Park (the 'development site) within the Penrith local government area.

This report has been prepared consistent with the Biodiversity Assessment Method (BAM) 2020, under the NSW Biodiversity Conservation Act 2016 (BC Act).

The development site (part of Lot 1444 DP788282) is 0.13 ha. The proposed development consists of a 2-lot subdivision within the eastern part of Phoenix Reserve. Prior to site development, the clearance of vegetation will be required to allow for the construction of the two residences, driveways and landscaped areas.

Field survey was undertaken to validate and map Plant Community Types (PCTs), undertake the required vegetation integrity plots and assess habitat values. Native vegetation was mapped within the development site, consisting of 0.01 ha of planted native vegetation and 0.02 ha of PCT 849 *Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion*. PCT 849 was present in one condition state – low.

One full-floristic vegetation integrity plot was undertaken within PCT 849_low in accordance with the BAM. A vegetation integrity assessment using the BAM Calculator (BAMC) was undertaken and resulted in a vegetation integrity score of 32.2.

The 0.01 ha of planted native vegetation was assessed against Appendix D: Streamlined assessment module - planted native vegetation of the BAM 2020 and does not require offsetting. The remaining vegetation within the development site was either exotic to NSW or cleared land dominated by exotic grasses.

PCT 849 forms part of the Threatened Ecological Community (TEC) *Cumberland Plain Woodland in the Sydney Basin Bioregion*. This vegetation community is listed as Critically Endangered under the BC Act. PCT 849 also forms part of the Federally listed TEC *Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest*. However, the vegetation within the development site did not meet any of the required condition classes and as such, is not recognised under the EPBC Act.

Cumberland Plain Woodland in the Sydney Basin Bioregion is a candidate for a Serious and Irreversible Impact (SAII) and an assessment has been undertaken to assist the consent authority to decide whether an SAII will result.

As this BDAR is being assessed via the streamlined (small area) assessment (Appendix C, BAM 2020), only those candidate species at risk of a Serious and Irreversible Impact (SAII) require targeted survey. All the candidate species generated by the BAMC are entities at risk of a SAII. However, the development site does not contain breeding habitat for the candidate fauna species (*Anthochaera Phrygia, Chalinolobus dwyeri, Lathamus discolor, Miniopterus australis, Miniopterus orianae oceanensis*). Only one flora species, *Caladenia tessellata*, was considered a candidate species. However, the development site does not provide habitat for this species. As such, no further assessment or targeted survey is required, and no species credits are required to offset impacts.

The removal of 0.02 ha of PCT 849_low requires 1 credit to offset impacts.

Supervision of vegetation removal by an ecologist should be undertaken to ensure any fauna present are taken into care and relocated into similar nearby habitat. Sediment and erosion control measures are recommended to prevent stormwater pollution or movement of soils from the development site.

Contents

List of Figures

List of Tables

Abbreviations

Abbreviation	Description
ASL	Above sea level
BAM	Biodiversity Assessment Method
BAMC	Biodiversity Assessment Method Credit Calculator
BC Act	NSW *Biodiversity Conservation Act 2016*
BDAR	Biodiversity Development Assessment Report
CEEC	Critically Endangered Ecological Community
DAWE	Commonwealth Department of Agriculture, Water and the Environment
DPIE	NSW Department of Planning, Industry and Environment
EEC	Endangered Ecological Community
ELA	Eco Logical Australia Pty Ltd
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
FM Act	NSW *Fisheries Management Act 1994*
GIS	Geographic Information System
GPS	Global Positioning System
IBRA	Interim Biogeographic Regionalisation for Australia
LGA	Local Government Area
LLS	Local Land Service
NSW	New South Wales
PCT	Plant Community Type
OEH	Office of Environment and Heritage
SEPP	State Environmental Planning Policy
TEC	Threatened Ecological Community
VIS	Vegetation Information System
WM Act	NSW *Water Management Act 2000*

1. Introduction

This Biodiversity Development Assessment Report (BDAR) has been prepared by Karen Spicer, an Accredited Person (BAAS18141) to apply the Biodiversity Assessment Method (BAM) under the NSW *Biodiversity Conservation Act 2016* (BC Act). All credit calculations have been undertaken using the BAM Calculator (BAMC) (version 1.3.0.00) in case number 00028936/BAAS18141/21/00028937. Given the minimum lot size for the development site is 550 m^2 and 0.03 ha of native vegetation will be impacted, *Appendix C Streamlined assessment module – Small area* of the BAM was applied.

Definitions of terminology used throughout this report are presented in Appendix A.

1.1. General description of the development site

The development site is Phoenix Reserve (Lot 1444 DP788282) at Pacific Road Erskine Park, within Penrith Local Government Area (LGA). The development site is zoned RE1 Public Recreation and R2 Low Density Residential under the Penrith Local Environment Plan (LEP) 2010. All adjacent land is zoned R2.

Existing residential areas surround the development site, with Pacific Road forming the northern boundary and Phoenix Crescent forming the southern boundary. Phoenix Reserve includes native vegetation, planted native vegetation/landscaped areas, a picnic shelter and playground areas.

This report includes two base maps, the Location Map, which shows the landscape features (Figure 1), and the Site Plan (Figure 2).

1.2. Brief description of the proposal

The development site (Lot 1444 DP788282) is approximately 1.3 ha and is proposed to be subdivided into three lots to facilitate the development of two house and land packages within the eastern part of the reserve. The land proposed for residential development (referred to as the "development footprint") has already been rezoned from RE1 to R2 and has a total area of is 1,276 m^2. The development will include clearing of vegetation to allow for the construction of the new residences, provision of services (water, sewer and electricity), driveways and landscaping.

The project is part of Penrith City Council's Open Space Reinvestment project. Funds raised from the sale of these packages will be reinvested into open space improvements within the suburb of Erskine Park.

1.3. Development footprint

Once subdivided, the two residential lots will be 646 m^2 and 630 m^2, and will require removal of all vegetation from within the lots to allow for construction of the residences, driveways and landscaped areas.

Impacts associated with the proposed development have been assessed for all trees within and immediately adjacent to the development site by Laws 2021. The findings in this Arboricultural Impact Assessment Report (Laws 2021) have been used to determine the extent of impacts for BAMC credit calculations and preparation of this BDAR. The development site boundary and development footprint are presented in Figure 2.

1.4. Sources of information used

The following data sources were reviewed as part of this report:

- BioNet Vegetation Classification (DPIE 2021)
- BioNet Atlas Database (DPIE 2021) (accessed 29 September 2021)
- Threatened Biodiversity Data Collection
- ePlanning Spatial Viewer (DPIE 2021) (accessed 6 December 2021)
- Protected Matters Search Tool (PMST) (Department of the Environment, Water, Heritage and the Arts (DAWE) 2021)
- National Flying-fox Monitoring Viewer (DAWE 2021) (accessed 6 December 2021)
- Biodiversity Values Map (DPIE 2021) (accessed 6 December 2021)
- *Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest, A guide to identifying and protecting the nationally threatened ecological community Environment Protection and Biodiversity Conservation Act 1999, Policy Statement 3.31*. (DEWHA 2010)
- Cumberland Plain Recovery Plan (Department of Environment, Climate Change and Water NSW (DECCW) 2010.

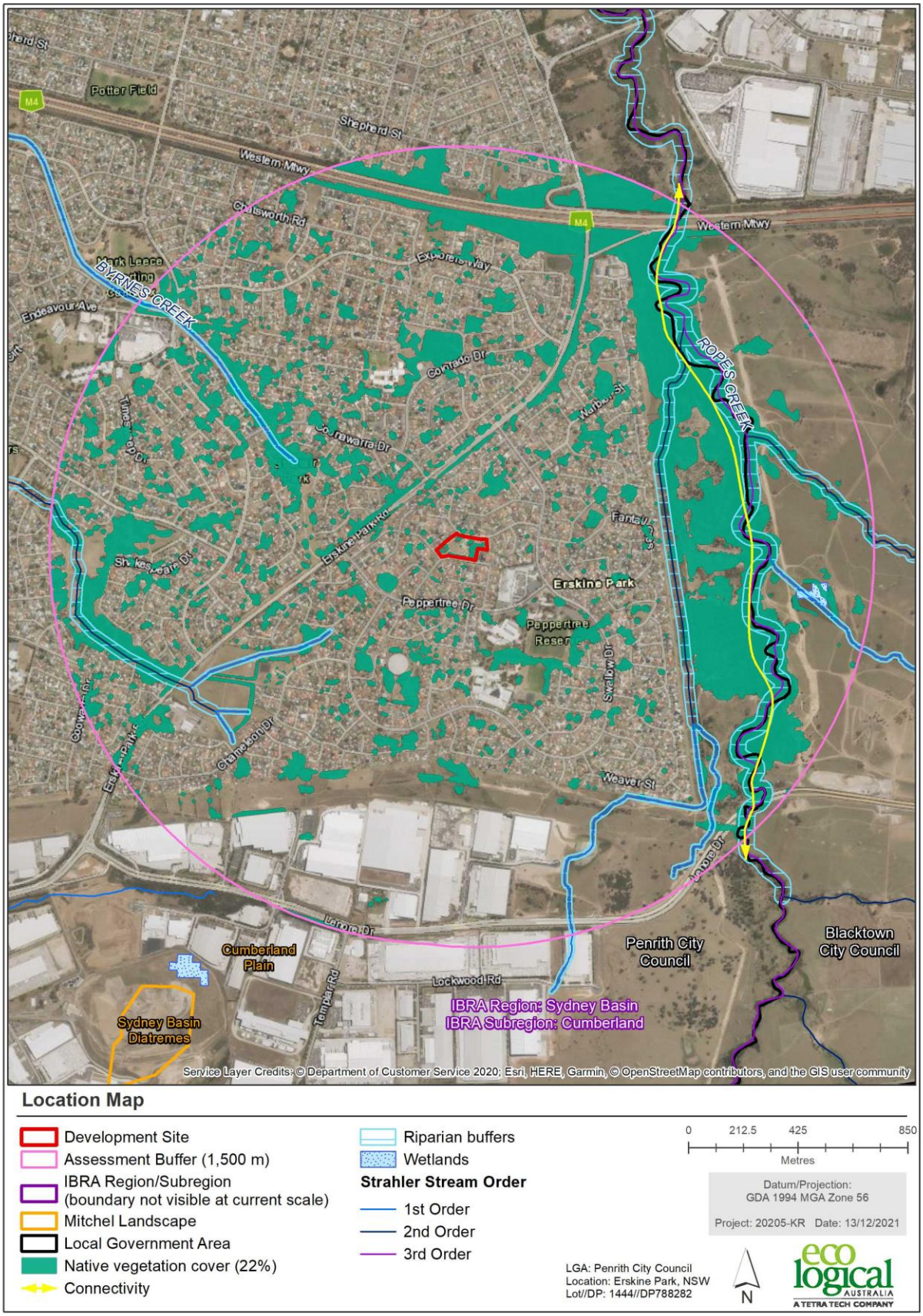

Figure 1: Location map and landscape features

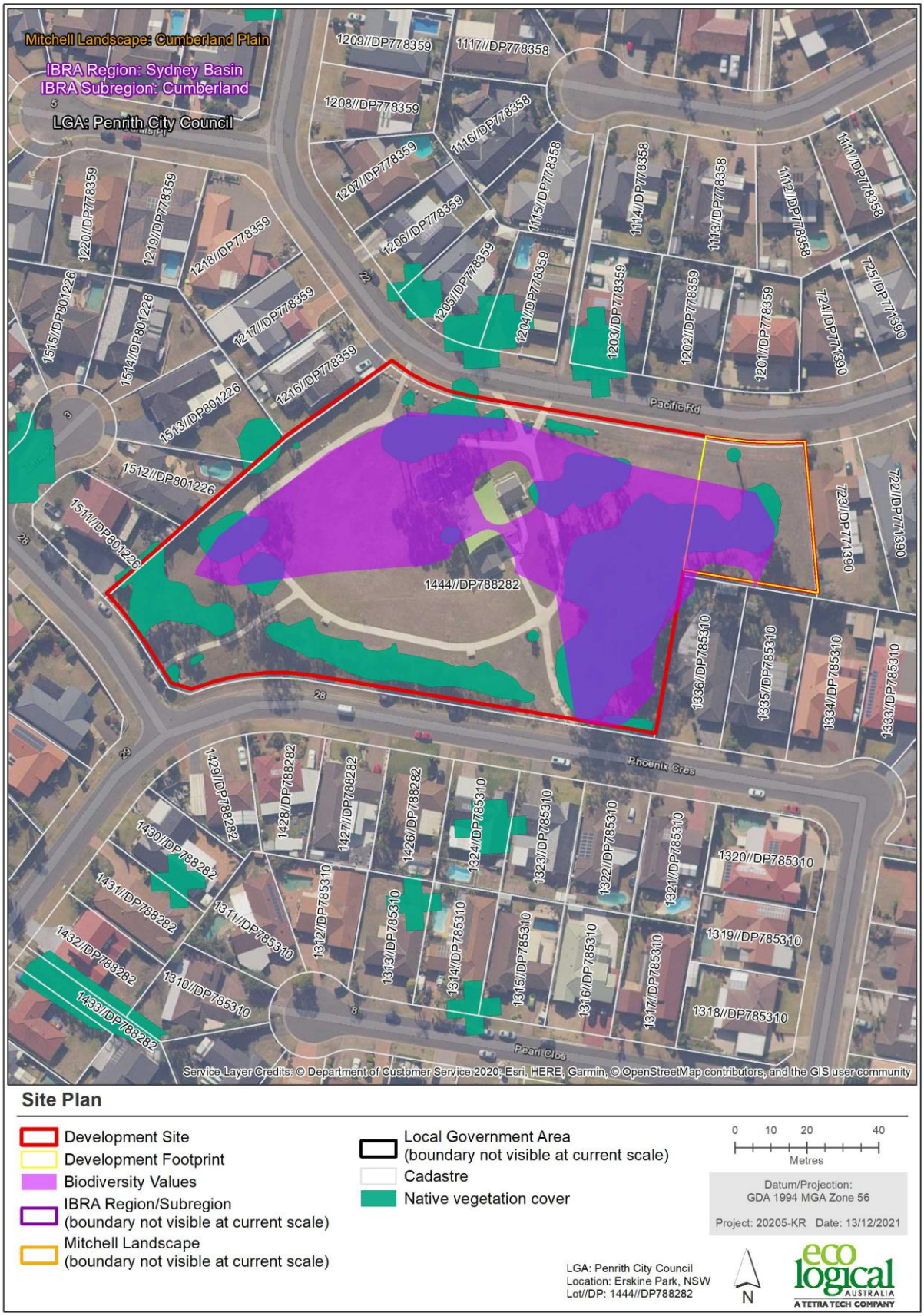

Figure 2: Site Plan

1.5. Legislative context

Legislation relevant to the development site is outlined in Table 1.

Table 1: Legislative context

Name	Relevance to the project	Report Section
Commonwealth		
Environmental Protection and Biodiversity Conservation Act 1999	Matters of National Environmental Significance (MNES) have been identified on or near the development site. This report assesses impacts to MNES and concludes that the development is not likely to have a significant impact on MNES. There are seven MNES that are triggers for Commonwealth assessment and approval. These are: 1. World Heritage properties 2. National Heritage places 3. Ramsar wetlands of international importance 4. Nationally threatened species and communities 5. Migratory species 6. Nuclear actions 7. Commonwealth marine environment. Appendix E contains a likelihood or occurrence table for species listed under the EPBC Act. One MNES has been identified as having the potential to occur or is known to occur within the development site, *Pteropus poliocephalus* (Grey-headed Flying-fox). Further assessment of this MNES is addressed in Section 8.1. Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest is not present at the site.	8.1
State		
Environmental Planning and Assessment Act 1979	The EP&A Act is the principal planning legislation for NSW. It provides a framework for the overall environmental planning and assessment of development proposals. The proposed development requires consent under the (Penrith Local Environmental Plan (LEP) and is to be assessed under Part 4 of the EP&A Act.	
Biodiversity Conservation Act 2016	The proposed development will affect land mapped on the Biodiversity Values Map (BV Map) (Figure 2) and therefore requires submission of a Biodiversity Development Assessment Report (BDAR). This BDAR has been prepared consistent with the Biodiversity Assessment Method (BAM) 2020. One entity at risk of a Serious and Irreversible (SAII) has been identified within the development site- *Cumberland Plain Woodland in the Sydney Basin Bioregion.* An assessment is provided for assisting council with deciding whether a SAII is likely to occur.	Section 1 to 7
Local Land Services Amendment Act 2016	The Local Land Services Amendment Act 2016 does not apply to areas of the state to which the Vegetation SEPP applies. The Vegetation SEPP applies to Penrith Council local government area.	N/A
Fisheries Management Act 1994	The development does not involve impacts to Key Fish Habitat and does not involve harm to marine vegetation, dredging, reclamation or obstruction of fish passage. A permit or consultation under the FM Act is not required.	N/A
Water Management Act 2000	The project does not involve works on waterfront land. A Controlled Activity Approval under s91 of the WM Act is not required.	N/A
Planning Instruments		

Name	Relevance to the project	Report Section
State Environmental Planning Policy (Coastal Management) 2018	The proposed development is not located on or adjacent to land subject to this SEPP therefore this SEPP is not applicable.	N/A
State Environmental Planning Policy (Koala Habitat Protection)	The State Environmental Planning Policy (Koala Habitat Protection) 2020 and 2021 do not apply to Penrith Local Government Area.	N/A
Penrith Local Environment Plan (LEP) 2010	The development site is zoned R2 Low Density Residential under the Penrith LEP. The development site is not subject to a Biodiversity or Riparian overlay under the LEP.	
Penrith Development Control Plan (DCP) 2014	The Penrith DCP contains provisions relating to native vegetation. Part C2 Vegetation Management sets objectives which includes protection and conservation of biodiversity values of trees and other vegetation in the City. There are no additional requirements under this DCP that must be addressed as part of this BDAR.	

2. Landscape features

The site-based method was applied for this assessment, therefore the assessment area is the 1,500 m buffer surrounding the outside edge of the boundary of the development site.

The landscape features considered for this assessment are presented in Table 2, Figure 1 and Figure 2.

Table 2: Landscape features

Landscape feature	Description	Data source
IBRA Region(s)	Sydney Basin	Interim Biogeographic Regionalisation for Australia, Version 7
IBRA subregion(s)	Cumberland	Interim Biogeographic Regionalisation for Australia, Version 7
Rivers and streams	There are no mapped water courses within the development site.	NSW LPI Waterway mapping
Estuaries and wetlands	None present within the development site.	NSW directory of important wetlands
Connectivity of different areas of habitat	The development site is located within a highly urbanised landscape. Adjacent land to the west consists of cleared exotic parkland with patches of native vegetation. Isolated street trees exist within the surrounding residential areas. Given the lack of connectivity to large patches of habitat, only highly mobile threatened species are likely to occur within the development site (eg. Bats and birds).	Aerial imagery
Geological features of significance and soil hazard features	There are no geological features such as karst, caves, crevices or cliffs within the development site.	Aerial imagery
Areas of Outstanding Biodiversity Value	No areas of Outstanding Biodiversity Values occur within the development site.	Register of Declared Areas of Outstanding Biodiversity Value (DPIE 2020)
NSW (Mitchell) Landscapes	Cumberland Plain	NSW (Mitchell) Landscapes - version 3.1 (DPIE 2016)
Additional features required to be assessed	N/A. Any additional applicable legislation has been addressed in Section 8, including the EPBC Act.	
Percent (%) native vegetation extent	There are no differences between the mapped vegetation extent and the aerial imagery. The development footprint is approximately 0.13 ha and contains approximately 0.03 ha of native vegetation. The assessment area is approximately 781 ha and contains approximately 172 ha of native vegetation (22%).	Calculated using aerial imagery and ArcGIS software

3. Native Vegetation

3.1. Survey Effort

Vegetation survey was undertaken within the development site by ELA ecologists Karen Spicer and Griffin Taylor-Dalton on 11 October 2021 (Figure 5).

One full-floristic vegetation plot was collected to identify Plant Community Types (PCTs) and Threatened Ecological Communities (TECs) on the development site (Table 3). The plot was undertaken on the development site to assess the composition, structure and function components of each vegetation zone in accordance with the BAM.

All field data collected at full-floristic and vegetation integrity plots is included in Appendix B and Appendix C.

Table 3: Full-floristic PCT identification plots

PCT ID	PCT Name	Number of plots surveyed
849	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	1

3.2. Native vegetation extent on the development site

The development site consists of cleared exotic parkland which is regularly mown, with patches of native vegetation, some of which has been planted for amenity and landscaping within the reserve. There is no difference between the vegetation extent shown on the aerial imagery in this report and the extent of vegetation within the development site.

Under the BAM, the proposal has been assessed as a site-based development (i.e. not a linear development). Based on the amount of clearing proposed, this proposal has been assessed via Appendix C of the BAM: *Streamlined assessment module – small area*, as less than1 ha of vegetation is proposed for removal.

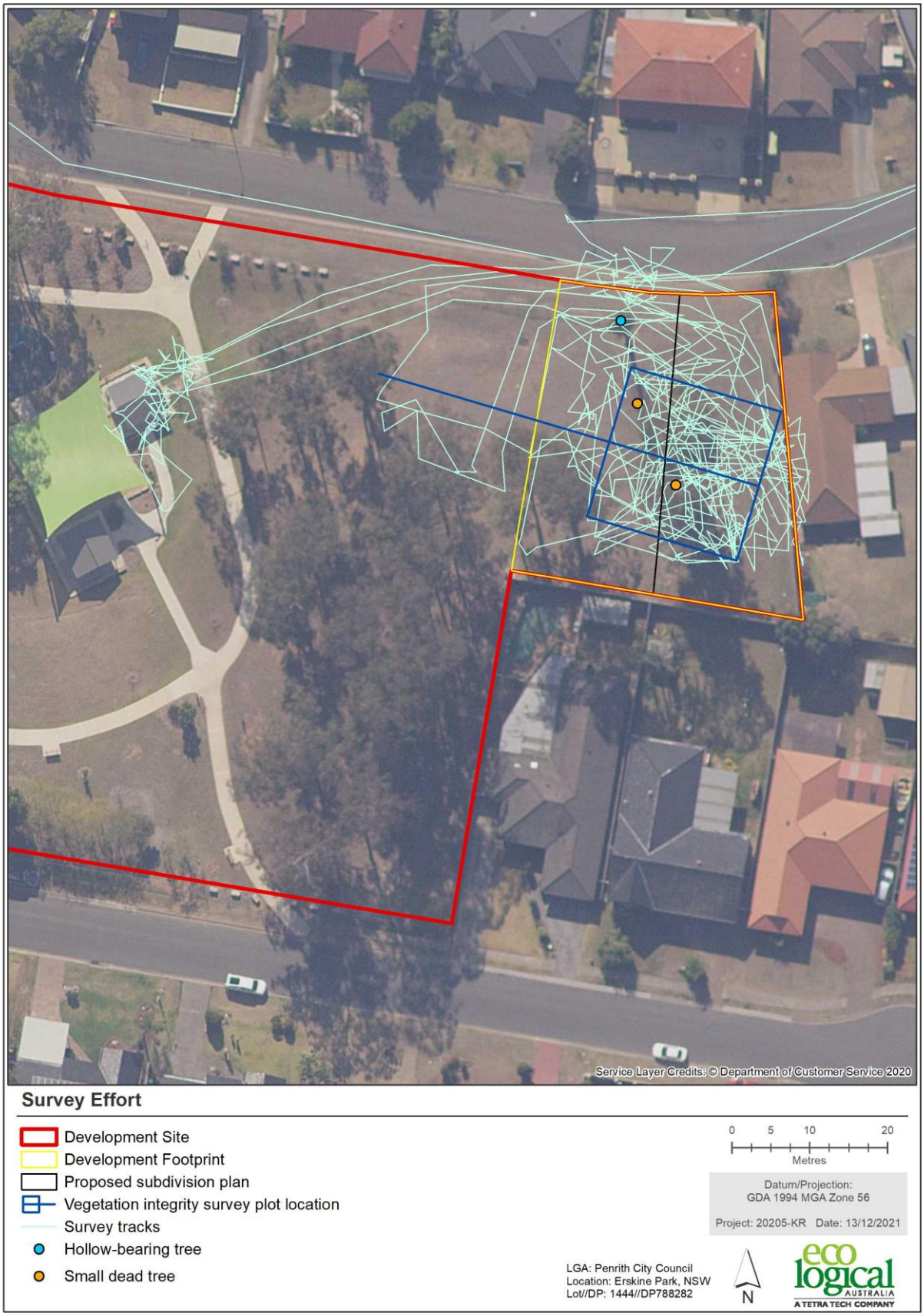

Figure 3: Survey Effort

3.3. Plant Community Types present

Plant community type (PCT) identified within the development site are presented in Table 4. The development site also contained cleared areas, exotic vegetation and planted native vegetation which did not correspond with any PCT.

Table 4: Plant Community Types

PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Area	Percent cleared
849	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Coastal Valley Grassy Woodland	Grassy Woodlands	0.02 ha	93%

3.3.1. Plant Community Type selection justification

In determining the PCT for the development site, various attributes were considered in combination to assign vegetation to the best fit PCT. Attributes included dominant species in each stratum and relative abundance, community composition, soils and landscape position. Reference was made to the PCT descriptions in the BioNet Vegetation Classification and the final scientific determinations for TECs. Possible PCT options are provided in Table 5.

Table 5: Potential PCTs

Selected PCT ID	PCT Name	Other PCT options
849	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	724, 725, 835, 850

- PCT 724 *Castlereagh shale - gravel transition forest* is associated with shale-influenced sandy soils that support a component of ironstone gravels. Typically, the canopy includes *Eucalyptus fibrosa* (Broad-Leaved Ironbark) along with a wide variety of other eucalypts depending on location and a lower canopy of *Melaleuca decora.* While one *E. fibrosa* was recorded within the development site, the dominance of *E. tereticornis* and clay soils align more with PCT 849.

- PCT 725 *Castlereagh Ironbark forest* is associated with clay soils derived from Tertiary alluvial deposits and has a typical structure of low dense thickets of paperbarks with low emergent eucalypts. The dominant canopy species is *Eucalyptus fibrosa* (Broad-Leaved Ironbark) and discussed for PCT 724, this species is not a dominant species throughout the development site and Phoenix Reserve.

- PCT 835 Cumberland riverflat forest occurs on alluvial flats of the Cumberland Plain. As the development site is not located within a riverflat or low-lying drainage area, this PCT was disregarded.

- The landscape position within the relatively flat land of the Cumberland Plain eliminated PCT 850 *Cumberland Shale Hills Woodland,* which has similar canopy species as PCT 849, but occurs on higher elevations associated with the hills and rises south from Prospect (BioNet VIS, DPIE 2021).

3.4. Threatened Ecological Communities

PCT 849 is associated with the TEC *Cumberland Plain Woodland in the Sydney Basin Bioregion* listed as a Critically Endangered Ecological Community (CEEC) under the BC Act. PCT 849 is also associated with the TEC *Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest* listed as a CEEC under the EPBC Act. To be recognised under the EPBC Act, the vegetation must meet the condition thresholds outlined in the approved listing advice (DEWHA 2009). The patch of vegetation within the development site did not meet the condition thresholds under the EPBC Act. Justification for this decision is outlined in section 8.1 of this document.

Table 6: Threatened Ecological Communities

PCT ID	BC Act			EPBC Act		
	Listing status	Name	Area (ha)	Listing status	Name	Area (ha)
849	Critically Endangered	*Cumberland Plain Woodland in the Sydney Basin Bioregion*	0.02	Critically Endangered	*Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest*	0

3.5. Vegetation integrity assessment

3.5.1. Vegetation zones

One vegetation zone was identified on the development site (Figure 6, Table 7), being low condition of PCT 849 *Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion*. Descriptions of the vegetation zone is provided in Table 8.

Table 7: Vegetation zones and vegetation integrity survey plots collected on the development site

Vegetation Zone	PCT ID	PCT Name	Condition	Area (ha)	Patch Size	Vegetation Integrity Survey Plots required	Vegetation Integrity Survey Plots collected
1	849	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney	Low	0.02	+101	1	1

Vegetation Zone	PCT ID	PCT Name	Condition	Area (ha)	Patch Size	Vegetation Integrity Survey Plots required	Vegetation Integrity Survey Plots collected
		Basin Bioregion					

Table 8: Description of the vegetation zone

849 - *Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion*			
Vegetation formation/class	Grassy Woodlands		
Conservation status	NSW BC Act Critically Endangered: Cumberland Plain Woodland in the Sydney Basin Bioregion		
	EPBC Act Critically Endangered: Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest (although this patch does not meet the EPBC condition threshold)		
Description	This community occurs along the shale plains of the Sydney Basin region on elevations of less than 150m. Rainfall is restricted to a narrow band between 750 and 950 millimetres per annum. Canopy height is typically between 15-20m. Mid-storey species generally occupy a height of 2-5m.		
Characteristic canopy trees	*Eucalyptus moluccana, E. tereticornis, E. fibrosa* and *Corymbia maculata*		
Characteristic mid-storey	No native mid-storey species are present		
Characteristic groundcovers	*Cotula australis, Dichondra repens, Einadia trigonos* subsp*. trigonos* and *Glycine tabacina*		
Mean native richness	11		
Exotic species / HTW cover	*Eragrostis curvula, Cenchrus clandestinus, Paronychia brasiliana, Senecio madagascariensis* – 87% HTW cover		
Condition	Low condition		
Variation and disturbance	High level of disturbance due to high number of exotic species and regular mowing/slashing of the groundcover		
No. sites sampled	1		
Threatened flora species	No threatened flora species were identified during the field survey		
Fauna habitats	One hollow bearing tree was recorded during field survey which may provide habitat for microbats or parrots. Potential foraging habitat for typical peri-urban species of birds and mammals and highly mobile threatened bats		
Composition	**Structure**	**Function**	**Vegetation Integrity Score**
17.8	29.3	63.8	32.2

849 - *Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion*

Approximately 0.03 ha of native vegetation was identified within the development footprint. Of this native vegetation, 0.01 ha has been planted for landscape purposes, and 0.02 ha has been mapped by ELA as remnant trees associated with *PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion*.

The 0.01 ha of planted native vegetation has been assessed against *Appendix D: Streamlined assessment module - planted native vegetation* of BAM 2020. The decision-making process for this module is presented below. The remaining vegetation within the development site was either exotic or cleared land dominated by exotic grasses.

3.5.2. Decision-making key for planted native vegetation (Appendix D BAM 2020)

NB: text in italics is copied directly from Appendix D (BAM 2020)

1: ***Does the planted native vegetation occur within an area that contains a mosaic of planted and remnant native vegetation and which can be reasonably assigned to a PCT known to occur in the same IBRA subregion as the proposal?***

i. ~~*Yes …. The planted native vegetation must be allocated to the best fit PCT and the BAM must be applied.*~~

ii. No..... Go to 2.

Justification:

Although the planted native vegetation occurred within close proximity to the remnant native vegetation, the species *Eucalyptus bicostata* does not naturally occur on the Cumberland Plain.

2: ***Is the planted native vegetation:***

a*. planted for the purpose of environmental rehabilitation or restoration under an existing conservation obligation listed in BAM Section 11.9(2.), and*

b. the primary objective was to replace or regenerate a plant community type or a threatened plant species population or its habitat?

i. ~~Yes …. The planted native vegetation must be assessed in accordance with Chapters 4 and 5 of the BAM.~~

ii. No..... Go to 3.

Justification:

The vegetation within the development site was planted for landscaping purposes, visual amenity and shade. The natural distribution of *Eucalyptus bicostata* does not include the Central Coast botanical subdivision, within which the development site is situated.

3. ***Is the planted/translocated native vegetation individuals of a threatened species or other native species planted/translocated for the purpose of providing threatened species habitat under one of the following:***

a*. a species recovery project*

b. Saving our Species project

c. other types of government funded restoration project

d. condition of consent for a development approval that required those species to be planted or translocated for the purpose of providing threatened species habitat

e. legal obligation as part of a condition or ruling of court. This includes regulatory directed or ordered remedial plantings (e.g. Remediation Order for clearing without consent issued under the BC Act or the Native Vegetation Act)

f. ecological rehabilitation to re-establish a PCT or TEC that was, or is carried out under a mine operations plan, or

g. approved vegetation management plan (e.g. as required as part of a Controlled Activity Approval for works on waterfront land under the NSW Water Management Act 2000)?

i. ~~Yes …. The planted native vegetation must be assessed in accordance with Chapters 4 and 5 of the BAM.~~

ii. No..... Go to 4.

Justification:

Planted native vegetation within the development site does not include any individuals of threatened species nor is the planting associated with any of the above conservation projects.

4. *Was the planted native vegetation (including individuals of a threatened flora species) undertaken voluntarily for revegetation, environmental rehabilitation or restoration without a legal obligation to secure or provide for management of the native vegetation?*

i. ~~Yes..... Go to D.2 Assessment of planted native vegetation for threatened species habitat (the use of Chapters 4 and 5 of the BAM are not required to be applied~~).

ii. No..... Go to 5.

Justification:

No. The primary purpose of the plantings was for landscaping purposes. The planted native species are not consistent with a PCT from the locality.

5. *Is the native vegetation (including individuals of a threatened flora species) planted for functional, aesthetic, horticultural or plantation forestry purposes? This includes examples such as: windbreaks in agricultural landscapes, roadside plantings (including street trees, median strips, roadside batters), landscaping in parks, gardens and sport fields/complexes, macadamia plantations or teatree farms?*

i. Yes .... Go to D.2 Assessment of planted native vegetation for threatened species habitat (the use of Chapters 4 and 5 of the BAM are not required to be applied).

ii. ~~No..... Go to 6.~~

Justification:

The planted native vegetation within the development site was planted for the purposes of landscaping and amenity within Phoenix Reserve.

3.5.3. Patch size

Patch size was calculated using available vegetation mapping for all patches of intact native vegetation on and adjoining the development site. Patch size was assigned to one of four classes (<5 ha, 5-24 ha, 25-100 ha or ≥100 ha). A patch size ≥100 ha was determined for the development site.

3.5.4. Assessing vegetation integrity

A vegetation integrity assessment using the BAM Calculator (BAMC) was undertaken and the results are outlined in Table 9.

Table 9: Vegetation integrity scores

Veg Zone	PCT ID	Condition	Area (ha)	Composition Condition Score	Structure Condition Score	Function Condition Score	Presence of Hollow bearing trees	Current vegetation integrity score
1	849	Low	0.02	17.8	29.3	63.8	Yes	32.2

Figure 4: Plant Community Types

Figure 5: Threatened Ecological Communities

Figure 6: Vegetation Zones and Plots

4. Threatened species

4.1. Ecosystem credit species

Ecosystem credit species predicted to occur within the development site are generated by the BAMC following the input of VI data and the PCTs identified within Chapter 3. Ecosystem credit species predicted to occur at the development site, their associated habitat constraints, geographic limitations and sensitivity to gain class is included in Table 10.

Table 10: Predicted ecosystem credit species

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act listing status	EPBC Act Listing status
Anthochaera phrygia	Regent Honeyeater (Foraging)	-	-	High	CE	CE
Artamus cyanopterus cyanopterus	Dusky Woodswallow	-	-	Moderate	V	Not Listed
Callocephalon fimbriatum	Gang-gang Cockatoo (Foraging)	-	-	Moderate	V	Not Listed
Chthonicola sagittata	Speckled Warbler	-	-	High	V	Not Listed
Circus assimilis	Spotted Harrier	-	-	Moderate	V	Not Listed
Climacteris picumnus victoriae	Brown Treecreeper	-	-	High	V	Not Listed
Daphoenositta chrysoptera	Varied Sitella	-	-	Moderate	V	Not Listed
Dasyurus maculatus	Spotted-tailed Quoll	-	-	High	V	E
Glossopsitta pusilla	Little Lorikeet	-	-	High	V	Not Listed
Grantiella picta	Painted Honeyeater	Mistletoes present at a density of greater than five mistletoes per hectare	-	Moderate	V	V
Haliaeetus leucogaster	White-bellied Sea-Eagle (Foraging)	Within 1km of a rivers, lakes, large dams or creek, wetlands and coastlines	-	High	V	Not Listed

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act listing status	EPBC Act Listing status
Hieraaetus morphnoides	Little Eagle (Foraging)	-	-	Moderate	V	Not Listed
Hirundapus caudacutus	White-throated Needletail	-	-	High	Not Listed	V
Lathamus discolor	Swift Parrot (Foraging)	-	-	Moderate	E	CE
Lophoictinia isura	Square-tailed Kite (Foraging)	-	-	Moderate	V	Not Listed
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	-	-	Moderate	V	Not Listed
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	-	-	Moderate	V	Not Listed
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	-	-	High	V	Not Listed
Miniopterus australis	Little Bent-winged Bat (Foraging)	-	-	High	V	Not Listed
Miniopterus orianae oceanensis	Large Bent-winged Bat (Foraging)	-	-	High	V	Not Listed
Neophema pulchella	Turquoise Parrot	-	-	High	V	Not Listed
Ninox connivens	Barking Owl (Foraging)	-	-	High	V	Not Listed
Ninox strenua	Powerful Owl (Foraging)	-	-	High	V	Not Listed
Petroica boodang	Scarlet Robin	-	-	Moderate	V	Not Listed
Petroica phoenicea	Flame Robin	-	-	Moderate	V	Not Listed
Phascolarctos cinereus	Koala (Foraging)	-	-	High	V	V
Pteropus poliocephalus	Grey-headed Flying-fox (Foraging)	-	-	High	V	V
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	-	-	High	V	Not Listed
Stagonopleura guttata	Diamond Firetail	-	-	Moderate	V	Not Listed

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act listing status	EPBC Act Listing status
Tyto novaehollandiae	Masked Owl (Foraging)	-	-	High	V	Not Listed

Justification for the inclusion or exclusion of ecosystem credit species can be found below in Table 11.

Table 11: Justification for exclusion of predicted ecosystem credit species

Species	Common Name	BC Act listing status	EPBC Act Listing status	Justification for exclusion of species
Grantiella picta	Painted Honeyeater	V	V	It is unlikely that the species would use the development site due to the absence of mistletoes within the site.

4.2. Species credit species

4.2.1. Identification of species credit species

As this BDAR is being assessed via the streamlined (small area) assessment (BAM 2020, Appendix C), only those candidate species at risk of a serious and irreversible impact (SAII) require targeted survey. Candidate Species credit species identified by the BAMC, their associated habitat constraints, geographic limitations and sensitivity to gain class is included in Table 12. All the candidate species identified by the BAMC are entities at risk of a SAII.

Table 13 outlines the justification for the inclusion or exclusion of these species.

Data utilised to inform the below decisions was derived from a variety of sources, including but not limited to the Threatened Biodiversity Data Collection/BioNet Atlas Database (BioNet, DPIE 2021) and the Important Areas Map on the Biodiversity Offsets and Agreements Management System (BOAMS 2021).

Table 12: Candidate species credit species

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act listing status	EPBC Act Listing status
Anthochaera phrygia	Regent Honeyeater (Breeding)	As per mapped areas	-	High	CE	CE
Caladenia tessellata	Thick Lip Spider Orchid	-	-	Moderate	E	V
Chalinolobus dwyeri	Large-eared Pied Bat	Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels	-	Very High	V	V

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act listing status	EPBC Act Listing status
Lathamus discolor	Swift Parrot (Breeding)	As per mapped areas	-	Moderate	E	CE
Miniopterus australis	Little Bent-winged Bat (Breeding)	Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records in BioNet with microhabitat code 'IC – in cave' observation type code 'E nest-roost' with numbers of individuals >500 or from the scientific literature	-	Very high	V	Not listed
Miniopterus orianae oceanensis	Large Bent-winged Bat (Breeding)	Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records with microhabitat code "IC - in cave " observation type code "E nest-roost " with numbers of individuals >500	-	Very high	V	Not listed

Table 13: Justification for the exclusion/ inclusion of species credit species

Species	Common Name	BC Act listing status	EPBC Act Listing status	Justification for exclusion of species
Anthochaera phrygia	Regent Honeyeater (Breeding)	CE	CE	**Excluded:** The development site is not mapped as an important area by DPIE for the Regent Honeyeater.
Caladenia tessellata	Thick Lip Spider Orchid	E	V	**Excluded:** Currently, this species is only known to occur in populations near Braidwood on the NSW Southern Tablelands and around the Wyong Area along the NSW Central Coast. It has been suggested that this species requires frequent fire regimes to stimulate flowering and seeding events (Duncan 2010). Given the location of the development site, it is highly likely that it has been a long time since the development site has been burnt. Given the above information, and the degraded nature of the development site, it is highly unlikely that this species would occur.

Species	Common Name	BC Act listing status	EPBC Act Listing status	Justification for exclusion of species
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	**Excluded:** There are no identified rocky areas or old mines or tunnels located within two kilometres of the development site.
Lathamus discolor	Swift Parrot (Breeding)	E	CE	**Excluded:** The development site is not mapped as an important area by DPIE for the Swift Parrot.
Miniopterus australis	Little Bent-winged Bat (Breeding)	V	Not listed	**Excluded:** There were no caves or culverts for this species to utilise across the development site. As a result, it is very unlikely that this species would utilise the site for breeding habitat.
Miniopterus orianae oceanensis	Large Bent-winged Bat (Breeding)	V	Not listed	**Excluded:** There were no caves or culverts for this species to utilise across the development site. As a result, it is very unlikely that this species would utilise the site for breeding habitat.

4.2.2. Assessment of habitat constraints and vagrant species

Habitat for candidate species derived by the BAMC are not considered likely to occur within the development site based on the lack of habitat and long-term habitat degradation throughout the development site (justification provided in

Table 13).

ELA Botanist and orchid expert Lachlan Copeland provided the following information on *Caladenia tessellate*, which supports excluding this species from the BAMC:

- In the last 15 years *C. tessellata* has only been known from two locations in NSW, despite several historical records for Greater Sydney
- The species is mainly known from sandy soils and it would likely never have occurred on the fertile soils of the Cumberland Plain
- The species is sensitive to disturbance
- It mainly flowers the year after fire, so unless the development site was burnt the previous summer/early Autumn, surveying for this species, even in a good season in spring, would be futile
- The four locations the species is known from in Victoria / NSW are characterised by shallow sandy soils with a mostly shrubby ground-layer. Given the development site is within fertile clay / loam soils with an exotic mown groundcover, there is no habitat for this species.

No other candidate species (in addition to those identified by the BAM C) are considered likely to occur within the development site and no further assessment is required.

4.2.3. Candidate species requiring further assessment

As this BDAR is being assessed via the streamlined (small area) assessment (BAM 2020, Appendix C), only those candidate species at risk of a Serious and Irreversible Impact (SAII) require targeted survey. All the candidate species generated by the BAMC (Table 12) are entities at risk of a SAII. However, as there is no breeding habitat present within the development site for the fauna species (*Anthochaera phrygia, Chalinolobus dwyeri, Lathamus discolor, Miniopterus australis, Miniopterus orianae oceanensis*) and no habitat is present for *C. tessellata*, no further assessment or targeted survey is required.

4.3. Identification of prescribed additional biodiversity impact entities

4.3.1. Karst, caves, crevices, cliffs, rocks and other geological features of significance

There are no karst, caves, crevices, cliffs, rocks or other geological features of significance within the development site.

4.3.2. Human-made structures and non-native vegetation

There are no human-made structures within the development site that will require removal.

Non-native vegetation within the development site consists of ground cover species that do not provide habitat for threatened species.

4.3.3. Habitat connectivity

The development site is located within a highly urbanised landscape. Adjacent land to the west consists of cleared exotic parkland with patches of native vegetation. The site is bordered by existing residential areas to the south and east and Pacific Rd to the north. Isolated street trees exist within the surrounding residential areas. Given the lack of connectivity to large patches of habitat, only highly mobile threatened species of birds and bats are likely to occur within the development site (e.g. bats and birds).

4.3.4. Water bodies, water quality and hydrological processes

There are no water bodies present within the development site.

4.3.5. Wind farm developments

Not applicable to this development.

4.3.6. Vehicle strikes

Given the locality is already highly urbanised, vehicle strike is an existing threat to fauna. The proposed development will not involve the construction of internal roads, and therefore no additional threat to fauna from vehicle strike, beyond the existing levels, is likely to result.

5. Avoiding and Minimising Impacts on Biodiversity Values

5.1. Locating a project to avoid and minimise impacts on biodiversity values

5.1.1. Direct and indirect impacts

The BC Act and BAM 2020 requires proponents to avoid and minimise impacts on biodiversity values (refer to Section 7.1.1 of the BAM 2020). The construction of the two residences, driveways and landscaped areas will require the removal of all vegetation from within the development footprint (Figure 4).

As discussed in Section 3.4, the vegetation zone 849_poor conforms to the TEC *Cumberland Plain Woodland in the Sydney Basin Bioregion* listed as a CEEC under the BC Act. Avoiding and minimising impacts to the patches of Cumberland Plain Woodland within the development footprint is unlikely to result in the long-term biodiversity gains for this TEC, given:

- the existing poor condition of the TEC within the development footprint, which consists of canopy species, no shrub layer and a ground cover dominated by exotic species
- the lack of connectivity with large patches of intact native vegetation
- the highly urbanised nature of the locality is unlikely to provide for future expansion in the extent and/or restoration of the TEC, or for connectivity with other native vegetation to be established.

Apart from the removal of 0.02 ha of Cumberland Plain Woodland TEC, the proposed development is avoiding and minimising impacts on biodiversity as follows:

- the development footprint is positioned on the edge of Phoenix Reserve (the development site), within an area that minimises the extent of native vegetation impacted
- a large proportion of the development footprint consists of cleared land / exotic vegetation with no to poor biodiversity values and does not require offsetting or assessment under the BAM as shown in Figure 7
- there are no impacts to breeding habitat for threatened species and no requirement to offset impacts to Species Credit Species
- given the lack of habitat connectivity within the development site, available foraging habitat for ecosystem species included in the assessment (see Table 10) is marginal
- indirect impacts to adjacent habitat are unlikely to result from the proposed development given the adjacent land is highly disturbed, primarily consisting of gardens and cleared lawn
- impacts to adjacent trees within the development site has been assessed by Laws 2021, with no impacts to adjacent trees expected to result
- measures to minimise impacts to biodiversity will include supervision of vegetation removal by an ecologist to ensure any fauna present are taken into care and relocated into similar nearby habitat.

5.1.2. Prescribed biodiversity impacts

Prescribed biodiversity impacts are discussed in Section 4.3. There are no relevant prescribed impacts to be avoided or minimised.

5.2. Designing a project to avoid and minimise impacts on biodiversity values

5.2.1. Direct and indirect impacts

The project has been designed consistent with surrounding development in the locality. The majority of the development footprint does not require assessment or offsets for removal of vegetation. Most of the vegetation within the development site (PCT 849 and planted vegetation) will be retained and maintained for recreational purposes. The project has been designed to create a residential area consistent with the surroundings.

5.2.2. Prescribed biodiversity impacts

Prescribed biodiversity impacts are likely to be minimal and the measures above will ensure they are minimised.

6. Assessment of Impacts

6.1. Direct impacts

The direct impacts of the development on:

- native vegetation and threatened ecological communities are outlined in Table 14
- prescribed biodiversity impacts are outlined in Section 6.4.

Direct impacts including the final development footprint are shown on Figure 7.

Table 14: Direct impacts to native vegetation

PCT ID	PCT Name	BC Act listing	EPBC Act listing	Direct impact (ha)
849	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	CE	N/A	0.02

6.2. Change in vegetation integrity

The change in vegetation integrity resulting from the proposed development is outlined in Table 15.

Table 15: Change in vegetation integrity

Veg Zone	PCT ID	Condition	Area (ha)	Current vegetation integrity score	Future vegetation integrity score	Change in vegetation integrity
1	849	Low	0.02	32.2	0	-32.2

Figure 7: Combined impact map

6.3. Indirect impacts

The indirect impacts of the development are outlined in Table 16. Indirect impact zones may include residential housing to the east and south, Pacific Rd to the north and Phoenix Reserve to the west. Most habitat within this indirect impact zone is highly disturbed and includes exotic gardens and cleared land. Trees associated with PCT 849 occur to the west of the development footprint but have been assessed by Laws (2021) as able to be retained.

Table 16: Indirect impacts

Indirect impact	Description (nature, extent and frequency)	Biodiversity affected	Duration/ Timing	Consequence
Inadvertent impacts on adjacent habitat or vegetation	Inadvertent impacts to adjacent habitat/vegetation are likely to be small-scale and infrequent given the development footprint boundary is bordered by an existing road and fencing.	Impacts to threatened species or their habitat are unlikely given the adjacent habitat is highly disturbed and dominated by exotic vegetation.	During earthworks and construction	Minor impact
Reduced viability of adjacent habitat due to edge effects	Edge effects are likely to be small-scale and infrequent given the existing highly disturbed nature of the adjacent habitat.	As above	During earthworks and construction	Minor impact
Reduced viability of adjacent habitat due to noise, dust or light spill	Adjacent habitat is already highly disturbed residential land. Indirect impacts from dust, noise and light spills will not reduce the viability of adjacent habitat.	As above	Long-term	No impact
Transport of weeds and pathogens from the site to adjacent vegetation	Adjacent land is already highly disturbed and dominated by exotic species and landscaped gardens. There is a risk of new weed species being introduced during site development and from new residents.	As above	Long-term	Minor impact
Increased risk of starvation or exposure and loss of shade or shelter	N/A	N/A	N/A	N/A
Loss of breeding habitat	No breeding habitat for threatened species is likely to occur within the indirect impact area, given the adjacent land is highly disturbed	No impacts expected	Long-term	None expected

Indirect impact	Description (nature, extent and frequency)	Biodiversity affected	Duration/ Timing	Consequence
Trampling of threatened flora species	No threatened flora species are likely to occur within the indirect impact area, given the adjacent land is highly disturbed	No impacts expected	Long-term	None expected
Inhibition of nitrogen fixation and increased soil salinity	N/A	N/A	N/A	N/A
Fertiliser drift	N/A	N/A	N/A	N/A
Rubbish dumping	N/A	N/A	N/A	N/A
Wood collection	N/A	N/A	N/A	N/A
Removal and disturbance of rocks including bush rock	N/A	N/A	N/A	N/A
Increase in predators	N/A	N/A	N/A	N/A
Increase in pest animal populations	N/A	N/A	N/A	N/A
Changed fire regimes	N/A	N/A	N/A	N/A
Disturbance to specialist breeding and foraging habitat, e.g. beach nesting for shorebirds.	N/A	N/A	N/A	N/A
Sedimentation and contaminated and/or nutrient rich run-off	There is the risk of sediment movement during earthworks and site development impacting adjacent land.	No threatened species are likely to be affected	Short-term during earthworks and construction	Minor impact

6.4. Prescribed biodiversity impacts

The development site has the prescribed biodiversity impacts as outlined in Table 17.

Table 17: Direct impacts on prescribed biodiversity impacts

Prescribed biodiversity impact	Description (Nature, extent and frequency)	Consequences	Justification	Additional information
Karst, caves, crevices, cliffs, rocks and other geological features of significance	N/A – no geological features are present	N/A	N/A	N/A
Human made structures or non-native vegetation	N/A - there are no human-made structures within the development site that will require removal.	N/A	N/A	N/A

Prescribed biodiversity impact	Description (Nature, extent and frequency)	Consequences	Justification	Additional information
	Non-native vegetation within the development footprint consists of ground cover species that do not provide habitat for threatened species.			
Habitat connectivity	There is a lack of connectivity to large patches of habitat, so only highly mobile threatened species are likely to occur within the development site (e.g. bats).	Minor loss of foraging habitat for threatened bat species that may forage across site including *Micronomus norfolkensis* (Eastern Coastal Free-tailed Bat), *Miniopterus australis* (Little Bent-winged Bat), *Miniopterus orianae oceanensis* (Large Bent-winged Bat) and *Pteropus poliocephalus* (Grey-headed Flying-fox).	Habitat for these threatened bats within the development site is marginal and is not well connected with areas of large intact foraging habitat for these species. Threatened bird species listed as predicted ecosystem species in Table 11 are unlikely to regularly occur within the development site, given the poor habitat condition (lack of structural and floral diversity) and lack of connectivity with large areas of native bushland.	N/A
Water bodies, water quality and hydrological processes	N/A - there are no water bodies present within the development site.	N/A	N/A	N/A
Wind turbine strikes on protected animals	N/A	N/A	N/A	N/A
Vehicle strikes	The locality is already highly urbanised, and vehicle strike is an existing threat to fauna. The proposed development does not involve construction of internal roads. Additional threats to fauna from vehicle strike beyond the existing levels, is unlikely to result.	N/A	N/A	N/A

6.5. Mitigating and managing direct and indirect impacts

Measures proposed to mitigate and manage impacts at the development site before, during and after construction are outlined in Table 18.

Table 18: Measures proposed to mitigate and manage impacts

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
Timing works to avoid critical life cycle events such as breeding or nursing	N/A	N/A	N/A	N/A	N/A	N/A
Instigating clearing protocols including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecological or licensed wildlife handler during clearing events	Low – one hollow-bearing tree was recorded within the development footprint. No nests or dreys were recorded.	Low	An ecologist be present to supervise vegetation removal and care and relocation of fauna (if present)	Ensuring animal welfare and protection	During vegetation removal	Project ecologist
Installing artificial habitats for fauna in adjacent retained vegetation and habitat or human made structures to replace the habitat resources lost and encourage animals to move from the impacted site, e.g. nest boxes	Low- one habitat tree is being removed as part of the proposal.	Low	Installation of a nest box of appropriate size within the adjacent reserve to replace the habitat resources lost from the removal of one habitat tree.	Ensuring animal welfare and protection	Prior to vegetation removal	Project ecologist
Clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance; for example, removal of native vegetation by chain-saw, rather	High - adjacent trees within Phoenix Reserve may be accidently impacted by construction activities.	Low	Implement tree protection measures for adjacent trees prior to work commencing	Protection of adjacent retained trees	Pre-vegetation removal and ongoing during site development	Site manager

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
than heavy machinery, is preferable in situations where partial clearing is proposed						
Sediment barriers or sedimentation ponds to control the quality of water released from the site into the receiving environment	Moderate	Low	Standard sediment and erosion control (SEC) measures should be implemented	Contain sediments within the site	Establish SEC measures prior to works commencing	Site manager
Noise barriers or daily/seasonal timing of construction and operational activities to reduce impacts of noise	N/A	N/A	N/A	N/A	N/A	N/A
Light shields or daily/seasonal timing of construction and operational activities to reduce impacts of light spill	N/A	N/A	N/A	N/A	N/A	N/A
Adaptive dust monitoring programs to control air quality	Moderate	Low	Standard sediment and erosion control (SEC) measures and dust control measures should be implemented	Control dust during dry periods	Watering of stockpiles and exposed soil during dry periods	Site manager
programming construction activities to avoid impacts; for example, timing construction activities for when migratory species are absent from the site, or when particular species known to or likely to use the	N/A	N/A	N/A	N/A	N/A	N/A

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
habitat on the site are not breeding or nesting						
Temporary fencing to protect significant environmental features such as riparian zones	N/A	N/A	N/A	N/A	N/A	N/A
Hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas	Moderate	Low	Come clean – go clean protocol for plant and equipment entering/exiting the site	Reduce the risk of introducing new weed species	During earthworks and construction of subdivision	Site manager
Staff training and site briefing to communicate environmental features to be protected and measures to be implemented	Moderate	Low	Standard SEC measures and come clean – go clean protocol.	Reduce the risk of introducing new weed species	Prior to commencement of earthworks	Site manager
Development control measures to regulate activity in vegetation and habitat adjacent to residential development including controls on pet ownership, rubbish disposal, wood collection, fire management and disturbance to nests and other niche habitats	N/A	N/A	N/A	N/A	N/A	N/A
Making provision for the ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on or	N/A	N/A	N/A	N/A	N/A	N/A

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
adjacent to the development site						

6.6. Mitigating prescribed impacts

Measures proposed to mitigate and manage prescribed biodiversity impacts at the development site before, during and after construction are outlined in Table 19.

Table 19: Mitigation measures for prescribed biodiversity impacts

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
Scheduling timing of construction activities to avoid critical life cycle events	N/A	N/A	N/A	N/A	N/A	N/A
Instigating clearing protocols including pre-clearing surveys, daily surveys and staged clearing, and using a trained ecological or licensed wildlife handler during clearing, construction and maintenance activities for human made structures and non-native vegetation	N/A	N/A	N/A	N/A	N/A	N/A
Retaining habitat features within the development footprintor relocating them to adjacent retained remnant vegetation	N/A	N/A	N/A	N/A	N/A	N/A
Installing artificial connectivity measures to re-establish connections between habitat and favoured transport corridors	N/A	N/A	N/A	N/A	N/A	N/A
Erecting temporary fencing to protect significant environmental features such as karst, caves, rock outcrops and water bodies	N/A	N/A	N/A	N/A	N/A	N/A

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
Replacing habitat provided by human made structures and non-native vegetation with alternative habitat	N/A	N/A	N/A	N/A	N/A	N/A
Sediment barriers or sedimentation ponds to control the quality of water released from the site into the receiving environment	Moderate	Low	Standard sediment and erosion control (SEC) measures and dust control measures should be implemented	Contain sediments within the site to avoid entering stormwater	Establish SEC measures prior to works commencing	Site foreman
Staff training and site briefing to communicate environmental features to be protected and measures implemented to protect them	N/A	N/A	N/A	N/A	N/A	N/A
Ecological restoration, rehabilitation actions and/or maintenance of retained native vegetation on or adjacent to the development footprint	N/A	N/A	N/A	N/A	N/A	N/A
Development control measures that regulate the types of activities that can occur in native vegetation and habitat adjacent to residential development including prohibiting the collection of bush rocks	N/A	N/A	N/A	N/A	N/A	N/A

6.7. Adaptive management strategy

Adaptive management for uncertain biodiversity impacts (that are infrequent or difficult to measure) is not relevant or required for the proposed development.

7. Impact summary

Following implementation of the BAM and the BAMC, the following impacts have been determined.

7.1. Serious and Irreversible Impacts (SAII)

The development has candidate Serious and Irreversible Impacts (SAII) values as outlined in Table 20. Detailed consideration of whether impacts on TECs that are serious and irreversible is included in

Table 21.

Table 20: Serious and Irreversible Impacts Summary

Ecological Community	Principle	Direct impact individuals / area (ha)	Threshold
Cumberland Plain Woodland in the Sydney Basin Bioregion	Principle 1 (species or ecological community currently in a rapid rate of decline), and Principle 2 (species or ecological communities with a very small population size)	0.02	Under development

Table 21: Evaluation of an impact on a TEC consistent with 9.1.1 of the BAM

Impact Assessment Provisions	Assessment
1. The action and measures taken to avoid the direct and indirect impact on the potential entity for an SAII	Measures taken to avoid the direct and indirect impacts to Cumberland Plain Woodland are addressed in Section 5. However, given the relatively small size of the development site and the highly disturbed native of the vegetation within the development site, all vegetation will be removed.
2a. Evidence of reduction in geographic distribution (Principle 1, clause 6.7(2)(a) BC Regulation) as the current total geographic extent of the TEC in NSW AND the estimated reduction in geographic extent of the TEC since 1970 (not including impacts of the proposal)	Prior to European settlement, Cumberland Plain Woodland was extensive across the Cumberland Plain in western Sydney on soils derived from Wianamatta Shale (BioNet, DPIE 2021), covering approximately 125,000 ha (NPWS 2004). The current geographic extent of Cumberland Plain Woodland is estimated to be 9% of this original extent (BioNet, DPIE 2021). The estimated reduction in geographic extent since 1970 was not found in relevant literature.
2b. Extent of reduction in ecological function for the TEC using evidence that describes the degree of environmental degradation or disruption to biotic processes (Principle 2, clause 6.7(2)(b) BC Regulation) indicated by: **i. change in community structure** **ii. change in species composition** **iii. disruption of ecological processes** **iv. invasion and establishment of exotic species** **v. degradation of habitat, and** **vi. fragmentation of habitat**	Cumberland Plain Woodland was originally cleared for agriculture during European settlement given its fertile soils, gentle slopes and proximity to early settlement within Sydney (DECCW 2010). As a result, by the middle of the 19th century, most of the Cumberland Plain was being grazed or under cultivation. In more recent years, Cumberland Plain Woodland has been subject to clearing for industrial and residential development and for infrastructure including roads, to service Sydney's growing population (DECCW 2010). In relation to the ecological function of the community: a. The **structure** of the community has changed, primarily to a grassland where canopy and shrub species have been removed. In some areas, such grassland is still dominated by native grasses and is

Impact Assessment Provisions	Assessment
	considered to be Derived Native Grassland (DNG), particularly in areas where pasture improvement and application of fertiliser has not occurred. In other areas, primarily in rural land-use, under-scrubbing has occurred, where a canopy is retained, but the shrub and groundcover removed to allow for grazing and hobby farms. As such, the structure of the TEC has been simplified. b. The **composition** of the community has changed with a general reduction in diversity of native species. As woodland has become fragmented and patch size has reduced, weed invasion has reduced diversity, particularly with long established weeds such as *Olea europea* subsp. *cuspidata* (African Olive). This species has thrived in remnant and regenerating patches of Cumberland Plain Woodland and displaces native species, reducing native flora diversity. Likewise, the diversity of fauna that originally inhabited Cumberland Plain Woodland has been reduced and simplified, with local extinctions of mammals and birds, particularly since the 1950s (DECCW 2010). In turn, some opportunistic native species have increased in numbers over time, including the Noisy Miner (*Manorina melanocephala*). c. **Ecological processes** are the interactions between biota and abiotic components such as water cycle, mineral cycle, decomposition and nutrient cycles, reproduction / pollination and food webs. With a reduction in the extent of Cumberland Plain Woodland into smaller isolated and fragmented patches and a reduction in biodiversity of flora and fauna, such ecological processes have been disrupted. Understanding these processes can be complex, but as an example, the loss of certain pollination vectors is likely to lead of local extinction of some flora species. Changes to fire regimes, particularly due to the urban setting of western Sydney is another example of disruptions to ecological processes. d. As discussed above, **invasion and establishment of exotic species** has become a significant problem within Cumberland Plain Woodland. This community is particularly vulnerable to weed invasion due its grassy understorey, comparatively fertile soils and past agricultural landuses (DECCW 2010). e. The **clearing and fragmentation** of Cumberland Plain Woodland into smaller and more isolated patches makes the remaining of areas of Cumberland Plain Woodland more susceptible to habitat degradation. Degradation results from all the factors listed above

Impact Assessment Provisions	Assessment
	including edge effects, weed invasion, disruption of ecological processes and loss of biodiversity. f. **Fragmentation** of Cumberland Plain Woodland has reduced the resilience of the community. Larger remnants are usually more diverse, less susceptible to edge effects and catastrophic events like bushfire and the expected impacts of climate change (DECCW 2010).
2c. Evidence of restricted geographic distribution (Principle 3, clause 6.7 (2) (c) BC Regulation), based on the TECs geographic range in NSW according to the: **i. extent of occurrence** **ii. area of occupancy, and** **iii. number of threat-defined locations.**	DPIE have not applied this principle to Cumberland Plain Woodland TEC. However, the distribution of Cumberland Plain Woodland TEC is restricted to the Cumberland Plain within the Sydney Basin Bioregion and originally occupied 125,211 ha (pre-1750) (DECCW 2010).
2d. Evidence that the TEC is unlikely to respond to management (Principle 4, clause 6.7 (2) (d) BC Regulation).	This principle does not apply to Cumberland Plain Woodland TEC. The recovery plan (DECCW 2010) discusses how Cumberland Plain Woodland responds to recovery actions, including weed control and revegetation.
3. Where the TBDC indicated that data is 'unknown' or 'data deficient' for a TEC for a criterion listed in subsection 9.1.1(2), the assessor must record this in the BDAR or BCAR.	N/A
4a. The impact on the geographic extent of the TEC (Principles 1 and 3) by estimating the total area of the TEC to be impacted by the proposal: **i. in hectares, and** **ii. as a percentage of the current geographic extent of the TEC in NSW.**	i. The total area of Cumberland Plain Woodland TEC affected by the proposed development is 0.02 ha. ii. Assuming that 9% of the original 125,449 ha of Cumberland Plain Woodland remains today (11,290 ha), the Cumberland Plain Woodland affected by the proposed development represents 0.0002% of the current geographic extent of the TEC in NSW.
4b. The extent that the proposed impacts are likely to contribute to further environmental degradation or the disruption of biotic processes (Principle 2) of the TEC by: **i. estimating the size of any remaining, but now isolated, areas of the TEC; including areas of the TEC within 500 m of the development footprint or equivalent area for other types of proposals** **ii. describing the impacts on connectivity and fragmentation of the remaining areas of TEC measured by:** **• distance between isolated areas of the TEC, presented as the average distance if the remnant is retained AND the average distance if the remnant is removed as proposed, and** **• estimated maximum dispersal distance for native flora species characteristic of the TEC, and** **• other information relevant to describing the impact on connectivity and fragmentation, such as the area to perimeter ratio for remaining areas of the TEC as a result of the development**	The extent that the proposed development is likely to contribute to further environmental degradation and disruption of biotic processes of Cumberland Plain Woodland (CPW) is discussed below, in relation to: i. Remaining areas of TEC within 500 m of the development footprint is 0.96 ha as previously mapped by OEH (2013) and 0.88 ha as validated by ELA (Figure 8), providing a total area of 1.84 ha. This figure reflects the highly urbanised landscape throughout Erskine Park. Each patch within the 500 m buffer of the development site is small and isolated. ii. The existing condition of the Cumberland Plain Woodland TEC within the development site is already highly fragmented. The vegetation is in a poor condition and consists of canopy species, no shrub layer and a ground cover dominated by exotic species/lawn. The vegetation within the development site is part of a larger patch within Phoenix Reserve. Figure 8 shows that removal of the Cumberland Plain Woodland within the development site will result in a 410 m gap between the next closest patch

Impact Assessment Provisions	Assessment
iii. describing the condition of the TEC according to the vegetation integrity score for the relevant vegetation zone(s) (Section 4.3). The assessor must also include the relevant composition, structure and function condition scores for each vegetation zone.	of Cumberland Plain Woodland vegetation to the east. At present, this distance is 387 m. iii. Dispersal of native flora species characteristic of the TEC may be several kilometres when considering pollen vectors such as *Pteropus poliocephalus* and seed dispersal by wind and fauna. However, given the location of the development site is within a largely suburban landscape, dispersal and exchange or flora species characteristic of the Cumberland Plain Woodland is likely to be very limited. iv. The vegetation integrity score for the vegetation zone PCT849_low, which is the only vegetation zone within the development site containing the Cumberland Plain Woodland TEC, is 32.2. This score is derived from a composition score of 17.8, a structure score of 29.3, and a function score of 63.8. A breakdown of these scores is contained in Appendix C. These scores are relatively low when compared to the benchmarks for the PCT 849 (BioNet VIS, 2021). For example, the shrub richness and cover were both zero, but benchmark is 8 and 16 respectively. Tree richness was 4, but benchmark is 5; grass richness was 2 but benchmark is 12. The grass cover was approximately 2% of the benchmark and tree cover, of 34, was below the benchmark of 53. In terms of function data, there were 3 large trees within the plot, in line with the benchmark of 3. However, fallen log total length was 0 m within the plot, but benchmark is 40 m. In summary, the Cumberland Plain Woodland within the site is a simplified patch of large trees lacking structural and floral diversity with a high level of weed invasion (87.2 score for High Threat Exotic).

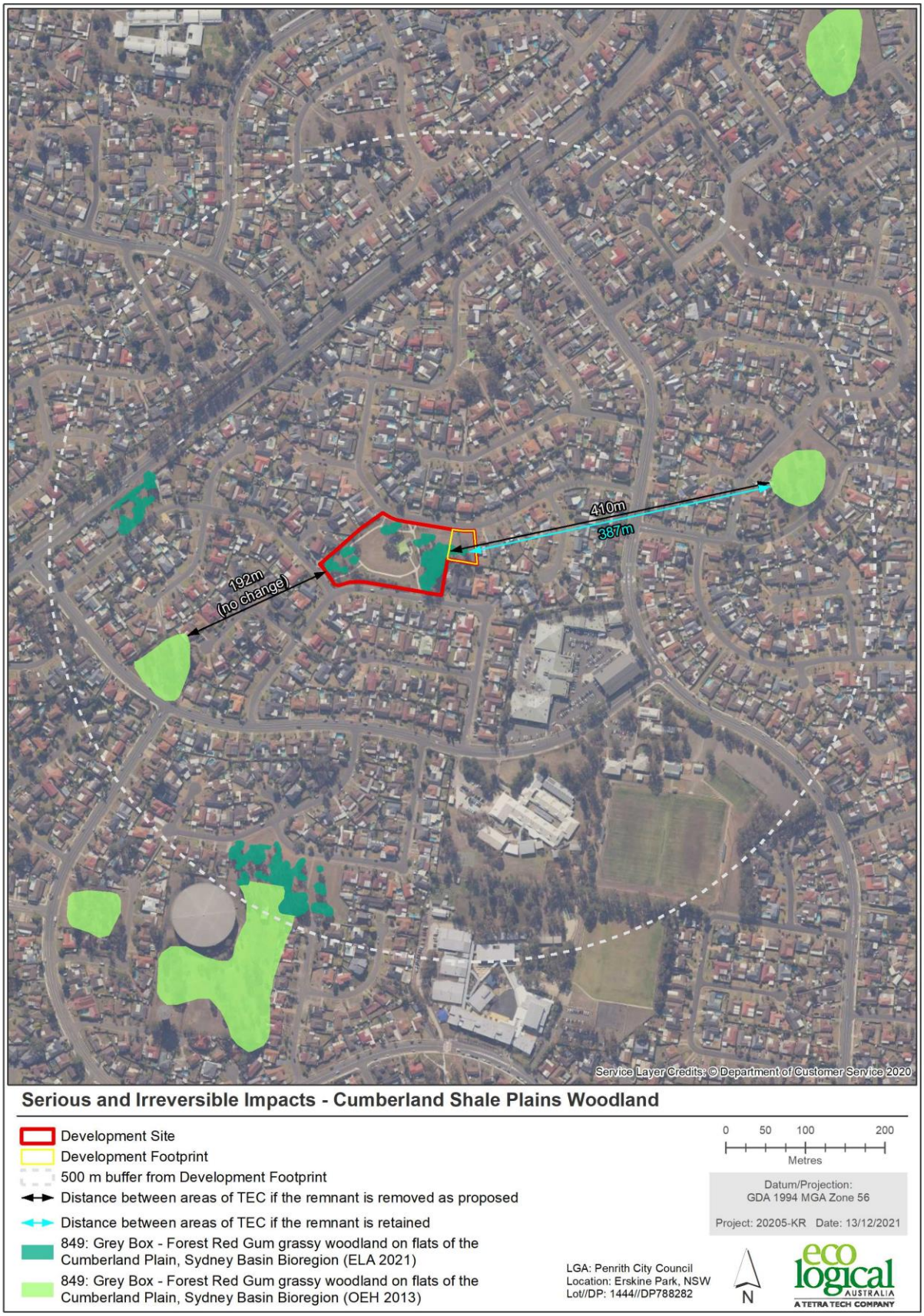

Figure 8: Serious and Irreversible Impacts

7.2. Impacts requiring offsets

The impacts of the development requiring offset for native vegetation are outlined in Table 22 and shown on Figure 7. There are no impacts of the development requiring offset for species credit species or their habitat.

Table 22: Impacts to native vegetation that require offsets

Vegetation Zone	PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Direct impact (ha)
1	849	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Coastal Valley Grassy Woodlands	Grassy Woodlands	0.02

7.3. Impacts not requiring offsets

The impacts of the development not requiring offset for native vegetation are outlined in Table 23 and shown on Figure 7.

Table 23: Impacts to native vegetation that do not require offsets

Vegetation Zone	PCT ID	PCT Name	Direct impact (ha)	Rationale
Planted Native Vegetation	N/A	N/A	0.01	The decision-making key for planted native vegetation outlined in Appendix D of BAM 2020 was reviewed and determined that the removal of planted native vegetation does not require offsets (see Section 3.5.2 of this BDAR)

7.4. Areas not requiring assessment

Areas not requiring assessment are shown in Figure 7. These areas do not contain native vegetation and do not need to be assessed for ecosystem credits. These areas have been assessed for threatened species habitat and prescribed impacts.

7.5. Credit summary

The number of ecosystem credits required for the development are outlined in Table 24. There are no species credits required for this development. A biodiversity credit report from the BAMC is included in Appendix D.

Table 24: Ecosystem credits required

Vegetation Zone	PCT ID	PCT Name	Credit Class	Direct impact (ha)	Credits required
1	849_low	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Cumberland Plain Woodland in the Sydney Basin Bioregion	0.02	1

8. Consistency with legislation and policy

Additional matters relating to impacts on flora and fauna which are not covered by the BC Act must also be addressed for the proposed development. Potential Matters of National Environmental Significance (MNES) in accordance with the EPBC Act have been addressed in Section 8.1. The likelihood of occurrence table for the EPBC Act listed species is provided in Appendix E.

8.1. *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)

The EPBC Act establishes a process for assessing the environmental impact of activities and developments where MNES may be affected. Under the Act, any action which 'has, will have, or is likely to have a significant impact on a matter of MNES' is defined as a controlled action, and requires approval from the Commonwealth Department of Agriculture Water and Environment (DAWE), which is responsible for administering the EPBC Act.

The process includes undertaking an Assessment of Significance for listed threatened species and ecological communities that represent a matter of MNES that will be affected as a result of the proposed action. Significant impact guidelines that outline a number of criteria have been developed by the Commonwealth of Australia (2013), to provide assistance in conducting the Assessment of Significance and help decide whether or not a referral to the Commonwealth is required.

8.1.1. Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest ecological community

Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest ecological community is listed as Critically Endangered under the EPBC Act. This TEC is confined to the Sydney Basin. Since European settlement, it has been estimated that the total extent of this vegetation has been reduced by 93% (BioNet Atlas, DPIE 2021).

Within the development site, no patches of PCT 849 vegetation met the condition thresholds outlined in the approved listing advice (Commonwealth of Australia, 2010). The flowchart shown in Figure 9: Flowchart to assist with the determination of EPBC Act condition thresholds (credit: Commonwealth of Australia, 2010)Figure 9 demonstrates why the vegetation does not meet the EPBC condition thresholds for this community. As PCT 849 vegetation is not recognised under the EPBC Act, a test of significance under the EPBC Act is not required.

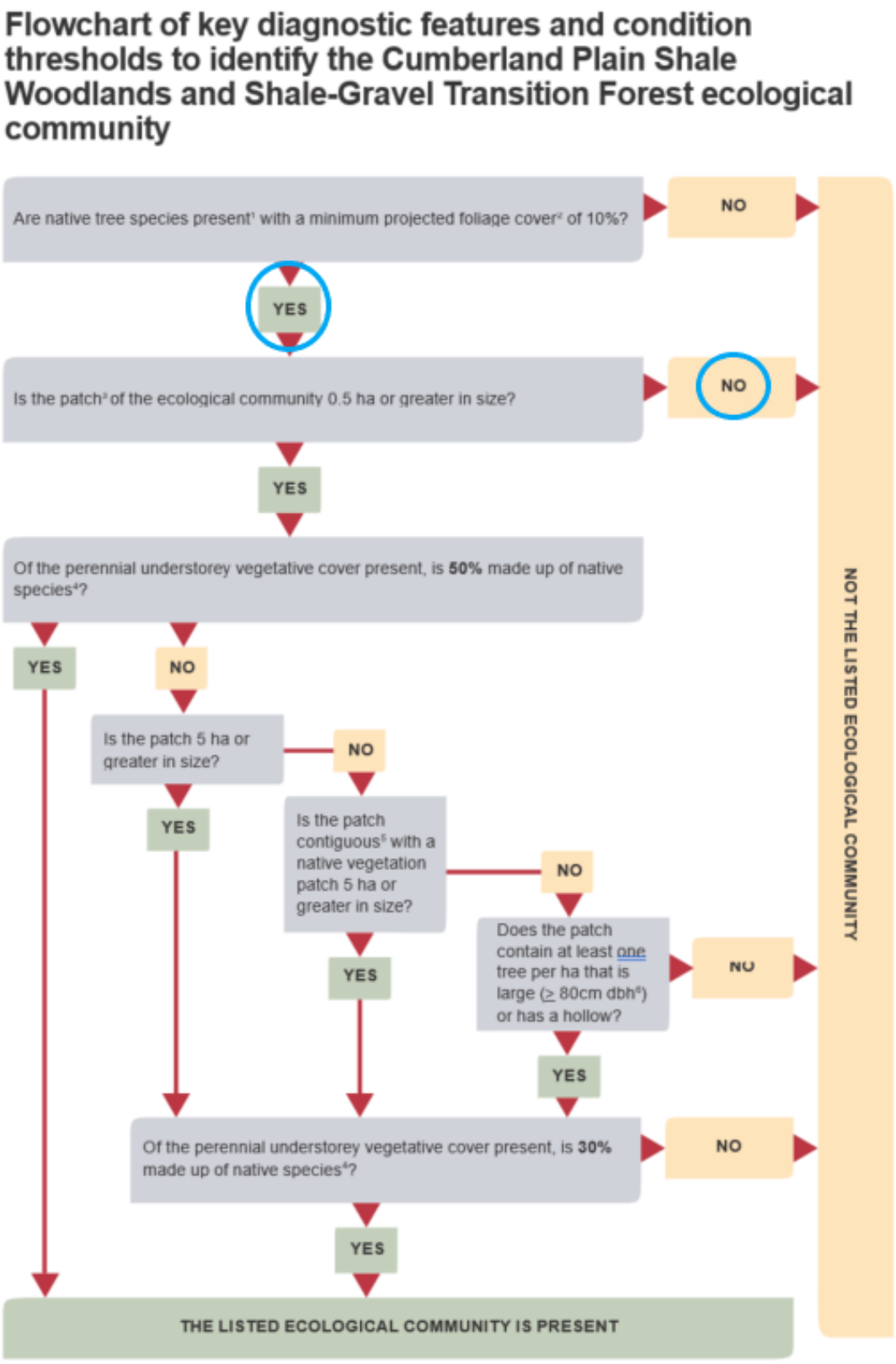

Figure 9: Flowchart to assist with the determination of EPBC Act condition thresholds (credit: Commonwealth of Australia, 2010)

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

The Grey-headed Flying-fox is listed as a vulnerable species under the EPBC Act. This species utilises a wide variety of habitats (including disturbed areas) for foraging and have been recorded travelling long distances on feeding forays. Fruits and flowering plants of a wide variety of species are the main food source. The species roosts in large 'camps' of up to 200,000 individuals. Camps are usually formed close to water and along gullies, however, the species has been known to form camps in urban areas.

The closest camps are listed below:

- Ropes Creek – approximately 3 km to the north
- Wetherill Park – approximately 11 km to the east.

There is potential that this species could use the development site on occasion for foraging purposes. The vegetation within the development footprint provides marginal foraging habitat. This includes the 0.02 ha of PCT 849 and the 0.01 ha of planted native vegetation. An EPBC Act impact assessment has been undertaken for this species. The result of this assessment can be found in Table 25.

Table 25: EPBC Act impact assessment for *Pteropus poliocephalus* (Grey-headed Flying-fox)

Criterion	Assessment
Criterion a: lead to a long-term decrease in the size of an important population of a species	The Matters of National Environmental Significance Impact Guidelines 1.1 (Commonwealth of Australia, 2013) defines an important population as a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are: • Key source populations either for breeding or dispersal • Populations that are necessary for maintaining genetic diversity, and/or • Populations that are near the limit of the species range The development site does not provide habitat for a breeding camp however it could provide marginal foraging habitat for travelling Flying-foxes. Considering the small size of the impact and the amount of more suitable foraging habitat in the locality, it is considered unlikely that action will result on a long-term decrease in the size of an important population.
Criterion b: reduce the area of occupancy of an important population	Considering the small size of the impact and suitable areas of occupancy in the locality, it is considered unlikely that the proposed development will result in a long-term reduction of an area of occupancy of an important population.
Criterion c: fragment an existing important population into two or more populations	The potential seasonal foraging habitat to be removed is considered marginal relative to nearby potential foraging habitat within the locality. While the potential foraging habitat may contribute as a 'steppingstone' for this highly mobile species to other more substantial foraging habitat sites, this function is unlikely to be significantly inhibited by the proposed works, given that scattered vegetation and landscaped gardens will remain in the locality. This species has been recorded in urban environments and is likely to continue to forage adjacent to the development site within Phoenix Reserve and across the broader locality. Therefore, the proposed works are unlikely to fragment an existing important population into two or more populations.
Criterion d: adversely affect habitat critical to the survival of a species	Foraging habitat critical to the survival of this species includes natural habitat that is productive during winter and spring when food bottlenecks have been identified. Critical foraging habitat has also been known to support populations of > 30,000 individuals within a 50km radius, productive during the final stages of gestation, during the weeks of birth, lactation and conception (September to May), productive during the final stages of fruit development and ripening in commercial crops affected by Grey-headed Flying-fox, and known to support a continuously occupied camp (DECCW 2009). The vegetation to be removed is a small amount of

Criterion	Assessment
	potential foraging resources (0.03 ha) in the wider region. Given that this species travels up to 50 km to forage, it is considered unlikely that the works would adversely affect habitat critical to the survival of this species.
Criterion e: disrupt the breeding cycle of an important population	The nearest active Grey-headed Flying-fox camp occurs approximately 3 km to the north of the development site at the Ropes Creek (DAWE 2021). Considering this distance, the marginal nature of the foraging resources in the development site, and the amount of other suitable foraging resources in the locality, it is considered unlikely that the action will disrupt the breeding cycle of an important population.
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	Given the small amount of potential foraging habitat to be removed relative to the amount remaining in the locality, it is considered that potential foraging habitat will persist adjacent to the development site and across the locality. This species is highly mobile, and it is unlikely that the habitat to be removed would cause the species to decline. Furthermore, according to the National Flying-fox Monitoring Program, no Grey-headed Flying-fox camps currently occur or have ever been recorded within the development site (DAWE 2021). The nearest active Grey-headed Flying-fox camp occurs approximately 3 km to the north of the development site at the Ropes Creek camp (DAWE 2021). Therefore, no known Grey-headed Flying-fox roosting camps for this species will be affected by the proposed works.
Criterion g: Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The proposed works will not result in the establishment of an invasive species that is harmful to Grey-headed Flying-fox.
Criterion h: Introduce disease that may cause the species to decline	The proposed works will not result in the introduction of a disease that is harmful to the Grey-headed Flying-fox.
Criterion i: Interfere substantially with the recovery of the species	Considering the above factors, the proposed works will not interfere substantially with the recovery of the species.
Conclusion	In consideration of the above, the proposed works are considered unlikely to have a significant impact on the Grey-headed Flying-fox. No camps are located closer than 3 km away from the development site. The removal of 0.03 ha of native vegetation is unlikely to affect the availability of foraging habitat for this species. The vegetation to be affected is similar in composition to the surrounding environment, as a result foraging Grey-headed Flying-fox will have ample choice of habitat should they forage in this area. As such, a referral is not recommended.

9. Conclusion

Eco Logical Australia Pty Ltd (ELA) was engaged by Penrith City Council to prepare a Streamlined (small area) Biodiversity Development Assessment Report (BDAR) for Phoenix Reserve (Lot 1444 DP788282) at Pacific Rd, Erskine Park (the development site) within the Penrith Local Government Area. The proposed development includes subdivision of Phoenix Reserve into three lots and development of two residential lots with a development footprint of 0.13 ha.

Native vegetation was mapped within the development footprint, consisting of 0.01 ha of planted native vegetation and 0.02 ha of PCT *849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion*. PCT 849 was present in one condition state – low. The remaining vegetation within the development site was either exotic or cleared land dominated by exotic grasses.

PCT 849 corresponds to the threatened ecological community *Cumberland Plain Woodland in the Sydney Basin Bioregion.* This TEC is also an entity at risk of Serious and Irreversible Impact (SAII) and an assessment has been undertaken to assist the consent authority to decide whether a SAII will result.

The 0.01 ha of planted native vegetation was assessed against *Appendix D: Streamlined assessment module - planted native vegetation* of the BAM 2020 and does not require offsetting. The removal of 0.02 ha of PCT 849_low requires 1 credit to offset impacts. No species credits are required to offset impacts.

The development footprint includes one hollow-bearing tree. Supervision of vegetation removal by an ecologist should be undertaken to ensure any fauna present are taken into care and relocated into similar nearby habitat. Sediment and erosion control measures are recommended to prevent stormwater pollution or movement of soils from the development site.

10. References

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Appendix A Definitions

The following terminology has been used throughout this report for the purposes of describing the impacts of the proposal in the context of a biodiversity assessment in accordance with the NSW Biodiversity Assessment Method 2020. This terminology may or may not align with other technical documents associated with the proposed development.

Terminology	Definition
Biodiversity credit report	The report produced by the Credit Calculator that sets out the number and class of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a development site, or on land to be biodiversity certified, or that sets out the number and class of biodiversity credits that are created at a biodiversity stewardship site.
BioNet Atlas	The BioNet Atlas (formerly known as the NSW Wildlife Atlas) is the DPIE database of flora and fauna records. The Atlas contains records of plants, mammals, birds, reptiles, amphibians, some fungi, some invertebrates (such as insects and snails) and some fish
Broad condition state:	Areas of the same PCT that are in relatively homogenous condition. Broad condition is used for stratifying areas of the same PCT into a vegetation zone for the purpose of determining the vegetation integrity score.
Connectivity	The measure of the degree to which an area(s) of native vegetation is linked with other areas of vegetation.
Credit Calculator	The computer program that provides decision support to assessors and proponents by applying the BAM, and which calculates the number and class of biodiversity credits required to offset the impacts of a development or created at a biodiversity stewardship site.
Development	Has the same meaning as development at section 4 of the EP&A Act, or an activity in Part 5 of the EP&A Act. It also includes development as defined in section 115T of the EP&A Act.
Development footprint	The area of land that is directly impacted on by a proposed development, including access roads, and areas used to store construction materials.
Development site	An area of land that is subject to a proposed development that is under the EP&A Act.
Ecosystem credits	A measurement of the value of EECs, CEECs and threatened species habitat for species that can be reliably predicted to occur with a PCT. Ecosystem credits measure the loss in biodiversity values at a development site and the gain in biodiversity values at a biodiversity stewardship site.
Extent of occurrence (EOO)	Measures the spatial spread of a taxon to determine the degree to which risks from threatening factors could impact an entire population, and is not intended to be an estimate of the amount of occupied or potential habitat.
High threat exotic plant cover	Plant cover composed of vascular plants not native to Australia that if not controlled will invade and outcompete native plant species.
Hollow bearing tree	A living or dead tree that has at least one hollow. A tree is considered to contain a hollow if: (a) the entrance can be seen; (b) the minimum entrance width is at least 5 cm; (c) the hollow appears to have depth (i.e. you cannot see solid wood beyond the entrance); (d) the hollow is at least 1 m above the ground. Trees must be examined from all angles.
Important wetland	A wetland that is listed in the Directory of Important Wetlands of Australia (DIWA) and SEPP 14 Coastal Wetlands

Terminology	Definition
Linear shaped development	Development that is generally narrow in width and extends across the landscape for a distance greater than 3.5 kilometres in length
Local population	The population that occurs in the study area. In cases where multiple populations occur in the study area or a population occupies part of the study area, impacts on each subpopulation must be assessed separately.
Local wetland	Any wetland that is not identified as an important wetland (refer to definition of Important wetland).
NSW (Mitchell) landscape	Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000.
Multiple fragmentation impact development	Developments such as wind farms and coal seam gas extraction that require multiple extraction points (wells) or turbines and a network of associated development including roads, tracks, gathering systems/flow lines, transmission lines
Operational Manual	The Operational Manual published from time to time by DPIE, which is a guide to assist assessors when using the BAM
Patch size	An area of intact native vegetation that: a) occurs on the development site or biodiversity stewardship site, and b) includes native vegetation that has a gap of less than 100 m from the next area of native vegetation (or ≤30 m for non-woody ecosystems). Patch size may extend onto adjoining land that is not part of the development site or stewardship site..
Proponent	A person who intends to apply for consent to carry out development or for approval for an activity.
Reference sites	The relatively unmodified sites that are assessed to obtain local benchmark information when benchmarks in the Vegetation Benchmarks Database are too broad or otherwise incorrect for the PCT and/or local situation. Benchmarks can also be obtained from published sources.
Regeneration	The proportion of over-storey species characteristic of the PCT that are naturally regenerating and have a diameter at breast height <5 cm within a vegetation zone.
Residual impact	An impact on biodiversity values after all reasonable measures have been taken to avoid, minimise or mitigate the impacts of development. Under the BAM, an offset requirement is determined for the remaining impacts on biodiversity values.
Retirement of credits	The purchase and retirement of biodiversity credits from an already-established biobank site or a biodiversity stewardship site secured by a biodiversity stewardship agreement.
Riparian buffer	Riparian buffers applied to water bodies in accordance with the BAM
Sensitive biodiversity values land map	Development within an area identified on the map requires assessment using the BAM.
Site attributes	The matters assessed to determine vegetation integrity. They include: native plant species richness, native over-storey cover, native mid-storey cover, native ground cover (grasses), native ground cover (shrubs), native ground cover (other), exotic plant cover (as a percentage of total ground and mid-storey cover), number of trees with hollows, proportion of over-storey species occurring as regeneration, and total length of fallen logs.
Site-based development	a development other than a linear shaped development, or a multiple fragmentation impact development
Species credits	The class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Biodiversity Data Collection.

Terminology	Definition
Subject land	Is land to which the BAM is applied in Stage 1 to assess the biodiversity values of the land. It includes land that may be a development site, clearing site, proposed for biodiversity certification or land that is proposed for a biodiversity stewardship agreement.
Threatened Biodiversity Data Collection	Part of the BioNet database, published by DPIE and accessible from the BioNet website.
Threatened species	Critically Endangered, Endangered or Vulnerable threatened species as defined by Schedule 1 of the BC Act, or any additional threatened species listed under Part 13 of the EPBC Act as Critically Endangered, Endangered or Vulnerable.
Vegetation Benchmarks Database	A database of benchmarks for vegetation classes and some PCTs. The Vegetation Benchmarks Database is published by DPIE and is part of the BioNet Vegetation Classification.
Vegetation zone	A relatively homogenous area of native vegetation on a development site, land to be biodiversity certified or a biodiversity stewardship site that is the same PCT and broad condition state.
Wetland	An area of land that is wet by surface water or ground water, or both, for long enough periods that the plants and animals in it are adapted to, and depend on, moist conditions for at least part of their life cycle. Wetlands may exhibit wet and dry phases and may be wet permanently, cyclically or intermittently with fresh, brackish or saline water
Woody native vegetation	Native vegetation that contains an over-storey and/or mid-storey that predominantly consists of trees and/or shrubs

Appendix B Vegetation Floristic Plot Data

Family	Species	Common Name	Listing Status	ROTAP	Exotic	High Threat Weed	Growth Form Group	Plot 1		
								Stratum & Layer	Cover	Abundance
Asteraceae	*Conyza bonariensis*	Flaxleaf Fleabane			*			g	0.1	10
Asteraceae	*Cotula australis*	Common Cotula					Forb (FG)	g	0.1	50
Asteraceae	*Gamochaeta spp.*				*			g	0.1	10
Asteraceae	*Hypochaeris radicata*	Catsear			*			g	0.1	20
Asteraceae	*Senecio madagascariensis*	Fireweed			*	Yes		g	0.1	5
Asteraceae	*Soliva sessilis*	Bindyi			*			g	0.1	50
Asteraceae	*Sonchus oleraceus*	Common Sowthistle			*			g	0.1	20
Asteraceae	*Taraxacum officinale*	Dandelion			*			g	0.1	20
Brassicaceae	*Lepidium bonariense*	Argentine Peppercress			*			g	0.1	10
Caryophyllaceae	*Paronychia brasiliana*	Chilean Whitlow Wort, Brazilian Whitlow			*			g	0.2	100
Caryophyllaceae	*Petrorhagia dubia*				*			g	0.1	10
Caryophyllaceae	*Stellaria media*	Common Chickweed			*			g	0.1	50
Chenopodiaceae	*Einadia trigonos subsp. trigonos*						Forb (FG)	g	0.1	50
Convolvulaceae	*Dichondra repens*	Kidney Weed					Forb (FG)	g	0.1	10
Crassulaceae	*Crassula* spp.	Stonecrop					Forb (FG)	g	0.1	20
Fabaceae (Faboideae)	*Glycine tabacina*	Variable Glycine					Other (OG)	g	0.1	20
Malvaceae	*Modiola caroliniana*	Red-flowered Mallow			*			g	0.1	20
Malvaceae	*Sida rhombifolia*	Paddy's Lucerne			*			g	0.1	10

Family	Species	Common Name	Listing Status	ROTAP	Exotic	High Threat Weed	Growth Form Group	Plot 1		
								Stratum & Layer	Cover	Abundance
Myrtaceae	*Corymbia maculata*	Spotted Gum					Tree (TG)	u	20	3
Myrtaceae	*Eucalyptus moluccana*	Grey Box					Tree (TG)	u	10	3
Myrtaceae	*Eucalyptus bicostata*	Southern Bluegum					Tree (TG)	u	2	1
Myrtaceae	*Eucalyptus tereticornis*	Forest Red Gum					Tree (TG)	u	2	1
Plantaginaceae	*Plantago lanceolata*	Lamb's Tongues			*			g	0.1	10
Poaceae	*Cenchrus clandestinus*	Kikuyu Grass			*	Yes		g	2	500
Poaceae	*Cynodon dactylon*	Common Couch					Grass & grasslike (GG)	g	1	500
Poaceae	*Eragrostis curvula*	African Lovegrass			*	Yes		g	85	2000
Poaceae	*Paspalum dilatatum*	Paspalum			*	Yes		g	0.1	50
Poaceae	*Sporobolus creber*	Slender Rat's Tail Grass					Grass & grasslike (GG)	g	0.1	10
Poaceae	*Vulpia* spp.	Rat's-tail Fescue			*			g	0.1	50
Solanaceae	*Solanum sisymbriifolium*				*			g	0.1	10

Appendix C Vegetation Integrity Plot Data

Plot location

Plot	PCT	Condition	Zone	Easting	Northing	Bearing
1	849	Low	56	296633	6257578	259°

Composition data

Tree	Shrub	Grass	Forbs	Ferns	Other
4	0	2	4	0	1

Structure data

Tree	Shrub	Grass	Forbs	Ferns	Other
34.0	0.0	1.1	0.4	0.0	0.1

Function data

Large Trees	Hollow trees	Litter Cover	Length of Fallen Logs	Tree Stem 5 to 9	Tree Stem 10 to 19	Tree Stem 20 to 29	Tree Stem 30 to 49	Tree Stem 50 to 79	Tree Stem 80+	Tree Regen	High Threat Exotic
3	0	46	0	0	1	1	1	1	1	0	87.2

Appendix D Biodiversity credit report

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id 00028936/BAAS18141/21/00028937	Proposal Name Pacific Road Erskine Park	BAM data last updated * 24/11/2021
Assessor Name Karen Leigh Spicer	Assessor Number BAAS18141	BAM Data version * 50
Proponent Names Fiona Kulak	Report Created 31/01/2022	BAM Case Status Finalised
Assessment Revision 0	Assessment Type Part 4 Developments (Small Area)	Date Finalised 31/01/2022
BOS entry trigger BOS Threshold: Biodiversity Values Map	* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.	

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Cumberland Plain Woodland in the Sydney Basin Bioregion	Critically Endangered Ecological Community	849-Cumberland shale plains woodland

Species
Nil

Additional Information for Approval

BAM Biodiversity Credit Report (Like for like)

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
Grantiella picta / Painted Honeyeater

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
849-Cumberland shale plains woodland	Cumberland Plain Woodland in the Sydney Basin Bioregion	0.0	0	1	1

BAM Biodiversity Credit Report (Like for like)

849-Cumberland shale plains woodland	Like-for-like credit retirement options					
	Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
	Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 849, 850	-	849_low	No	1	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

No Species Credit Data

Credit Retirement Options

Like-for-like credit retirement options

BAM Biodiversity Credit Report (Like for like)

Appendix E Likelihood of occurrence

An assessment of likelihood of occurrence was made for threatened and migratory species identified from the database search. Five terms for the likelihood of occurrence of species are used in this report. This assessment was based on database or other records, presence or absence of suitable habitat, features of the proposal site, results of the site inspection and professional judgement. Some Migratory or Marine species identified from the Commonwealth database search have been excluded from the assessment, due to lack of habitat. The terms for likelihood of occurrence are defined below:

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

Information provided in the habitat associations' column has primarily been extracted (and modified) from the Commonwealth Species Profile and Threats Database and the NSW Threatened Species Profiles.

Scientific Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence
ECOLOGICAL COMMUNITIES				
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community		E	The ecological community occurs in sub-tropical, sub-humid and temperate climatic zones from Curtis Island, north of Gladstone, in Queensland to Bermagui in southern New South Wales. The ecological community is found within the South Eastern Queensland (SEQ), NSW North Coast (NNC), Sydney Basin (SYB) and South East Corner (SEC) IBRA7 Bioregions. Coastal Swamp Oak Forest is often found in association with other vegetation types such as coastal saltmarsh, mangroves, freshwater wetlands, littoral rainforests or swamp sclerophyll forests in a 'mosaic' of coastal floodplain communities.	No – this community was not identified within the subject site.
River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions		CE	The structure of the community may vary from tall open forests (>40m) to woodlands. The most widespread and abundant dominant trees include *Eucalyptus tereticornis* (forest red gum), *E. amplifolia* (cabbage gum), *Angophora floribunda* (rough-barked apple) and *A. subvelutina* (broad-leaved apple). *Eucalyptus baueriana* (blue box), *E. botryoides* (bangalay) and *E. elata* (river peppermint) may be common south from Sydney. *E. ovata* (swamp gum) occurs on the far south coast, *E. saligna* (Sydney blue gum) and *E. grandis* (flooded gum) may occur north of Sydney, while *E. benthamii* is restricted to the Hawkesbury floodplain. A layer of small trees may be present, including *Melaleuca decora*, *M. styphelioides* (prickly-leaved teatree), *Backhousia myrtifolia* (grey myrtle), *Melia azadarach* (white cedar), *Casuarina cunninghamiana* (river oak) and *C. glauca* (swamp oak). Scattered shrubs include *Bursaria spinosa, Solanum prinophyllum, Rubus parvifolius, Breynia oblongifolia, Ozothamnus diosmifolius, Hymenanthera dentata, Acacia floribunda* and *Phyllanthus gunnii*. The groundcover is composed of abundant forbs, scramblers and grasses. Found on the river flats of the coastal floodplains. Known from parts of the Local Government Areas of Port Stephens, Maitland, Singleton, Cessnock, Lake Macquarie, Wyong, Gosford, Hawkesbury, Baulkham Hills, Blacktown, Parramatta, Penrith, Blue Mountains, Fairfield, Holroyd, Liverpool, Bankstown, Wollondilly, Camden, Campbelltown, Sutherland, Wollongong, Shellharbour, Kiama, Shoalhaven, Palerang, Eurobodalla and Bega Valley.	No – this community was not identified within the subject site.
Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion		E	Typically a low woodland, with canopy species reaching an average 15 m in height. The canopy is often dominated by one or more of *Angophora bakeri* (narrow leaved apple), *Eucalyptus racemosa* (narrow-leaved scribbly gum) and *E. parramattensis* subsp. *parramattensis* (Parramatta red gum). Melaleuca species including *M. decora* (paperbark)	No – this community was not identified within the subject site.

Scientific Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence
			may also be prominent in the canopy and/or mid layer. The understorey has a prominent and diverse mid-layer of sclerophyll shrubs, sometimes dominated by either Banksia or Melaleuca species. It typically has a patchy ground cover of sedges and grasses. The isolation of the alluvial deposits in the Hawkesbury-Nepean river valley and differences in the soil characteristics have led to the development of differences in species composition and abundance across the range of the ecological community. In addition, the Agnes Banks vegetation occurs on aeolian sand and can contain a number of species reminiscent of communities closer to the coast, such as *Dillwynia glaberrima*, *Ricinocarpos pinifolius* (wedding bush) and *Banksia aemula* (wallum). Distributed throughout the Sydney Basin Bioregion, mostly in the Cumberland IBRA sub-region, with small occurrences in the Sydney Cataract, Wollemi and Burragorang sub-regions. It occurs primarily in the Castlereagh area in the north-west of the Cumberland Plain with other known occurrences near Holsworthy, Kemps Creek and Longneck Lagoon.	
Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest		CE	The minimum projected foliage cover of canopy trees is 10% or more and the tree canopy is typically dominated by *Eucalyptus moluccana* (Grey Box), *E. tereticornis* (Forest Red Gum) and/or *E. fibrosa* (Red Ironbark). A sparse lower tree layer may be present, typically with young eucalypts of upper tree canopy species and species of Acacia, Exocarpos and Melaleuca. The understorey typically is dominated by the ground layer, typically comprising a variety of perennial native graminoids and forbs. 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.	No – this community was not identified within the subject site.
Cooks River/Castlereagh Ironbark Forest of the Sydney Basin Bioregion		CE	Ranges from open forest to low woodland, with a canopy dominated by *Eucalyptus fibrosa* (Broad-leaved Ironbark) and *Melaleuca decora* (Paperbark). The canopy may also include other eucalypts such as *E. longifolia* (Woolybutt). 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). The sparse ground layer contains a range of grasses and herbs. 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.	No – this community was not identified within the subject site.

Scientific Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence
Western Sydney Dry Rainforest and Moist Woodland on Shale		CE	Typically a low closed forest, slightly more open in the moist woodland form, with emergent trees up to 25 m high and a lower tree layer. In sheltered gullies and on lower slopes the canopy layer is typically dominated by *Melaleuca styphelioides* (Prickly-leaved Paperbark). Other diagnostic tree species include *Acacia implexa* (Hickory Wattle), *Alectryon subcinereus* (Native Quince), *Brachychiton populneus* (Kurrajong), *Corymbia maculata* (Spotted Gum), *Melicope micrococca* (White Euodia) and *Streblus pendulinus* (Whalebone Tree). Generally on upper slopes to undulating terrain, or at more disturbed sites, the ecological community exhibits its moist woodland form with the canopy dominated by *E. moluccana*, *E. tereticornis, E. crebra* and/or *Corymbia maculata*. Characteristic shrub species include *Breynia oblongifolia* (False Coffee Bush), *Clerodendrum tomentosum* (Hairy Clerodendrum) and *Notelaea longifolia* f. *longifolia* (Large Mock-olive). Vines and other climber species are typically common. The ground layer is variable and generally sparse with a diverse mix of forbs, ferns and shade-tolerant grasses. Distributed throughout the Cumberland Plain Sub-region of the Sydney Basin Bioregion.	No – this community was not identified within the subject site.

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence
FAUNA					
Actitis hypoleucos	Common Sandpiper		M	Summer migrant. In NSW, widespread along coastline and also occurs in many areas inland. Coastal wetlands and some inland wetlands, especially muddy margins or rocky shores. Also estuaries and deltas, lakes, pools, billabongs, reservoirs, dams and claypans, mangroves.	No – no habitat within the subject site.
Anthochaera phrygia	Regent Honeyeater	CE	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 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 *Casuarina cunninghamiana* (River Oak).	Unlikely – lack of suitable habitat present within the subject site.

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence
Apus pacificus	Fork-tailed Swift		M	Recorded in all regions of NSW. Riparian woodland., swamps, low scrub, heathland, saltmarsh, grassland, Spinifex sandplains, open farmland and inland and coastal sand-dunes.	Unlikely – lack of suitable habitat present within the subject site.
Botaurus poiciloptilus	Australasian Bittern	E	E	Found over most of NSW except for the far north-west. Permanent freshwater wetlands with tall, dense vegetation, particularly Typha spp. (bullrushes) and *Eleocharis spp*. (spikerushes).	No – no suitable habitat within the subject site.
Calidris acuminata	Sharp-tailed Sandpiper		M	Summer migrant. Widespread in most regions of NSW, especially in coastal areas, but sparse in the south-central Western Plain and east Lower Western Regions. Shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation.	No – no suitable habitat within the subject site.
Calidris melanotos	Pectoral Sandpiper		M	Summer migrant to Australia. Widespread but scattered in NSW. East of the Great Divide, recorded from Casino and Ballina, south to Ulladulla. West of the Great Divide, widespread in the Riverina and Lower Western regions. Shallow fresh to saline wetlands, including coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands.	No – no suitable habitat within the subject site.
Chalinolobus dwyeri	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 breeding habitat within the subject site. Degraded foraging habitat unlikely to support this species.
Dasyurus maculatus maculatus (SE mainland population)	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.	Unlikely – lack of suitable habitat present within the subject site.
Falco hypoleucos	Grey Falcon	E1		Arid and semi-arid zones. In NSW, found chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. Shrubland, grassland and	Unlikely – lack of suitable habitat

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				wooded watercourses, occasionally in open woodlands near the coast, and near wetlands.	present within the subject site.
Gallinago hardwickii	Latham's Snipe		M	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.	Unlikely – lack of suitable habitat present within the subject site.
Grantiella picta	Painted Honeyeater	V	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 present within the subject site.
Heleioporus australiacus	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 present within the subject site.
Lathamus discolor	Swift Parrot	E	CE	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.	No – lack of suitable habitat present within the subject site.
Litoria aurea	Green and Golden Bell Frog	E	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.	Unlikely – lack of suitable habitat present within the subject site.
Monarcha melanopsis	Black-faced Monarch		M	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 present within the subject site.

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Motacilla flava	Yellow Wagtail		M	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.	Unlikely – lack of suitable habitat present within the subject site.
Myiagra cyanoleuca	Satin Flycatcher		M	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 present within the subject site.
Pandion haliaetus	Osprey		M	The breeding range of the Eastern Osprey extends around the northern coast of Australia (including many offshore islands) from Albany in Western Australia to Lake Macquarie in NSW. Eastern Ospreys occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. They are mostly found in coastal areas but occasionally travel inland along major rivers, particularly in northern Australia. They require extensive areas of open fresh, brackish or saline water for foraging. They frequent a variety of wetland habitats including inshore waters, reefs, bays, coastal cliffs, beaches, estuaries, mangrove swamps, broad rivers, reservoirs and large lakes and waterholes. They exhibit a preference for coastal cliffs and elevated islands in some parts of their range, but may also occur on low sandy, muddy or rocky shores and over coral cays. They may occur over atypical habitats such as heath, woodland or forest when travelling to and from foraging sites.	Unlikely – lack of suitable habitat present within the subject site.
Petauroides volans	Greater Glider population in the Eurobodalla local government area		V	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.	Unlikely – lack of suitable habitat present within the subject site.
Petrogale penicillata	Brush-tailed Rock-wallaby	E	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 present within the subject site.

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence
Phascolarctos cinereus	Koala, Hawks Nest and Tea Gardens population	E,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 natural range and lack of suitable habitat present within the subject site.
Phascolarctos cinereus	Koala in the Pittwater Local Government Area	E, 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 natural range and lack of suitable habitat present within the subject site.
Phascolarctos cinereus	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 – no individuals were observed during the site visit and there is a lack of suitable habitat present within the subject site. Lack of connectivity to known habitat of this species.
Pseudomys novaehollandiae	New Holland Mouse		V	Fragmented distribution across eastern NSW. Open heathlands, woodlands and forests with a heathland understorey, vegetated sand dunes.	No – lack of suitable habitat present within the subject site.
Pteropus poliocephalus	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 – marginal foraging habitat

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					within the subject site.
Rhipidura rufifrons	Rufous Fantail		M	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.	Unlikely – lack of suitable habitat present within the subject site.
Rostratula australis	Australian Painted Snipe	E	E	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.	Unlikely – lack of suitable habitat present within the subject site.
Tringa nebularia	Common Greenshank		M	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 present within the subject site.
FLORA					
Acacia bynoeana	Bynoe's Wattle	E	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 – lack of suitable habitat present within the subject site. Not identified during the field survey.
Acacia pubescens	Downy Wattle	V	V	Restricted to the Sydney region around the Bankstown-Fairfield-Rookwood and Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon. Open woodland and forest, including Cooks River/Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland. Occurs on alluviums, shales and at the intergrade between shales and sandstones.	No – lack of suitable habitat present within the subject site. Not identified during the field survey.

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence
Allocasuarina glareicola		E	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 *Eucalyptus parramattensis*, Eucalyptus fibrosa, Angophora bakeri, Eucalyptus sclerophylla and Melaleuca decora.	No – lack of suitable habitat present within the subject site. Not identified during the field survey.
Cynanchum elegans	White-flowered Wax Plant	E	E	Restricted to eastern NSW, from Brunswick Heads on the north coast to Gerroa in the Illawarra region, and as far west as Merriwa in the upper Hunter River valley. Dry rainforest; littoral rainforest; *Leptospermum laevigatum-Banksia integrifolia* subsp. *integrifolia* (Coastal Tea-tree– Coastal Banksia) coastal scrub; *Eucalyptus tereticornis* (Forest Red Gum) or *Corymbia maculata* (Spotted Gum) open forest and woodland; and *Melaleuca armillaris* (Bracelet Honeymyrtle) scrub.	No – lack of suitable habitat present within the subject site. Not identified during the field survey.
Genoplesium baueri	Bauer's Midge Orchid	E	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 present within the subject site. Not identified during the field survey.
Grevillea parviflora subsp. *parviflora*	Small-flower Grevillea	V	V	Sporadically distributed throughout the Sydney Basin and in the Hunter in the Cessnock - Kurri Kurri area. Also known from Putty to Wyong and Lake Macquarie on the Central Coast. Heath and shrubby woodland to open forest on sandy or light clay soils usually over thin shales.	Unlikely – lack of suitable habitat present within the subject site. Not identified during the field survey.
Haloragis exalata subsp. *exalata*	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 present within the subject site. Not identified during the field survey.

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Melaleuca deanei	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.	Unlikely – lack of suitable habitat present within the subject site. Not identified during the field survey.
Micromyrtus minutiflora		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.	Unlikely – lack of suitable habitat present within the subject site. Not identified during the field survey.
Persicaria elatior	Tall Knotweed	V	V	In south-eastern NSW recorded from Mt Dromedary, Moruya State Forest near Turlinjah, the Upper Avon River catchment north of Robertson, Bermagui, and Picton Lakes. In northern NSW known from Raymond Terrace (near Newcastle) and the Grafton area (Cherry Tree and Gibberagee State Forests). Beside streams and lakes, swamp forest or disturbed areas.	No – lack of suitable habitat present within the subject site. Not identified during the field survey.
Persoonia hirsuta	Hairy Geebung	E	E	Scattered distribution around Sydney, from Singleton in the north, along the east coast to Bargo in the south and the Blue Mountains to the west. Sandy soils in dry sclerophyll open forest, woodland and heath on sandstone.	No – lack of suitable habitat present within the subject site. Not identified during the field survey.
Persoonia nutans	Nodding Geebung	E	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 – lack of suitable habitat present within the subject site. Not identified during the field survey.

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence
Pimelea curviflora var. curviflora		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.	Unlikely – lack of suitable habitat present within the subject site. Not identified during the field survey.
Pimelea spicata	Spiked Rice-flower	E	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.	Unlikely – lack of suitable habitat present within the subject site. Not identified during the field survey.
Pomaderris brunnea	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.	Unlikely – lack of suitable habitat present within the subject site. Not identified during the field survey.
Pterostylis gibbosa	Illawarra Greenhood	E	E	Known from a small number of populations in the Hunter region (Milbrodale), the Illawarra region (Albion Park and Yallah) and the Shoalhaven region (near Nowra). Open forest or woodland, on flat or gently sloping land with poor drainage.	Unlikely – the subject site is not within the known distribution of this species. The habitat on site is degraded. This species was no identified during the field survey.
Pterostylis saxicola	Sydney Plains Greenhood	E	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 present within the subject site. Not identified

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					during the field survey.
Pultenaea parviflora		E	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.	Unlikely – lack of suitable habitat present within the subject site. Not identified during the field survey.
Rhizanthella slateri	Rhizanthella slateri (Rupp) M.A. Clem. & Cribb in the Great Lakes local government area	E,V	E	The population occurs near Bulahdelah (within the Great Lakes LGA). Sclerophyll forest in shallow to deep loams.	No – outside of natural range and lack of suitable habitat present within the subject site.
Rhizanthella slateri	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.	Unlikely – lack of suitable habitat present within the subject site. Not identified during the field survey.
Rhodamnia rubescens	Scrub Turpentine	CE	CE	Occurs in coastal districts north from Batemans Bay in New South Wales, approximately 280 km south of Sydney, to areas inland of Bundaberg in Queensland. Populations of *R. rubescens* typically occur in coastal regions and occasionally extend inland onto escarpments up to 600 m a.s.l. in areas with rainfall of 1,000-1,600 mm. Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils.	No – lack of suitable habitat present within the subject site. Not identified during the field survey.
Syzygium paniculatum	Magenta Lilly Pilly	E	V	Only in NSW, in a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest. Subtropical and littoral rainforest on gravels, sands, silts and clays.	Unlikely – lack of suitable habitat present within the

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence
					subject site. Not identified during the field survey.
Thesium australe	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.	Unlikely – lack of suitable habitat present within the subject site. Not identified during the field survey.

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