46-66 & 29 O'Connell Street, Caddens
Biodiversity Development Assessment Report

Vantager Group

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Executive Summary

Eco Logical Australia Pty Ltd was engaged by Vantager Group to prepare a Biodiversity Development Assessment Report (BDAR) for the proposed new residential development at O'Connell Street, Caddens (the 'development site') in Penrith local government area. The proposed development will be assessed under Part 4 of the *Environment Planning and Assessment Act 1979* (EP&A Act).

The proposed new development will impact upon land mapped under the Biodiversity Values Map and therefore triggers entry into the Biodiversity Offset Scheme (BOS). The proposed development requires the preparation of a BDAR under the NSW *Biodiversity Conservation Act 2016* (BC Act) to be submitted as part of a Development Application (DA) to Penrith City Council.

This report has been prepared to meet the requirements of the Biodiversity Assessment Method 2017 (BAM) established under Section 6.7 of the BC Act. Requirements of the Penrith Local Environment Plan 2011 (LEP) and Development Control Plan 2011 (DCP) have also been addressed in this document. Measures taken to avoid, minimise and mitigate impacts to the vegetation and species habitat present within the development site and methodologies to minimise impacts during construction and operation of the development have been included in this BDAR.

The vegetation within the development site has previously been cleared for an orchard and grazing lands. Regenerating Cumberland Plain Woodland (CPW) present as derived native grassland (DNG) and scattered shrubs and canopy species have established within the development site. A patch of intact CPW was located along the southern portion of the development site and has been mapped on the Biodiversity Values Map. A portion of this vegetation will be affected for the construction of paths, playground and landscaping and has been included in this assessment.

Cumberland Plain Woodland in the Sydney Basin Bioregion corresponds with Plant Community Type (PCT) *PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion.* The vegetation mapped within the development site varied in condition. The patch of remnant Cumberland Plain Woodland was assigned PCT 849_Intact CPW. This patch of vegetation satisfied the criteria for listing as part of the critically endangered ecological community under the state BC Act and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Areas of scattered regenerating shrubs/canopy species and DNG conforms to a modified form of PCT 849 (i.e. PCT 849_Regenerating, PCT 849_DNG and PCT 849_DNG_scattered_olives). The degraded forms of CPW (i.e. regenerating and DNG) did not satisfy listing under the EPBC Act. The remaining vegetation within the development site contains exotic species.

Targeted traverses were conducted for the following threatened flora species:

- *Acacia pubescens* (Downy Wattle)
- *Grevillea juniperina* subsp. *juniperina* (Juniper-leaved Grevillea)
- *Marsdenia viridiflora* subsp. *viridiflora* (endangered population)
- *Pimelea spicata* (Spike Rice-Flower).

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No threatened flora species were recorded on or within the development site or are likely to persist in the soil profile. The vegetation within the development site was deemed highly disturbed and fragmented. It does not represent potential habitat for these species.

Targeted surveys were conducted for one potential species credit species entity, *Meridolum corneovirens* (Cumberland Plain Land Snail). No live snails or deceased snail shells were located in the development site, additionally the habitat within the development site contained high density of exotic woody shrubs and exotic grasses and limited leaf litter and logs which does not provide suitable habitat for this species. Following targeted surveys and habitat assessment, it was deemed that the development site does not provide suitable habitat for this species and therefore, this species was not considered a candidate species credit species and does not require offsets.

No additional threatened fauna species were recorded within the development site. There is potential that highly mobile threatened species may utilise the vegetation for foraging resources on occasion. Consideration has been given to these highly mobile species during the preparation of this BDAR.

Following consideration of all the above aspects, the residual unavoidable impacts of the project were calculated in accordance with the BAM by utilising the Biodiversity Assessment Method Credit calculator (BAMC). The number of credits required to offset the removal of PCT 849_Intact CPW is provided below.

Ecosystem credits required

Veg zone	PCT #	PCT name	Condition	Vegetation integrity score	Trading Group	Direct impact (ha)	Credit required
1	**849**	***Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion***	**Intact CPW**	**42**	**Coastal Valley Grassy Woodlands >90%**	**0.43**	**11**
2	849	*Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion*	Regenerating CPW	12.1	N/A	0.51	0
3	849	*Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion*	DNG	2.8	N/A	0.19	0
4	849	*Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion*	DNG_olives	1.5	N/A	2.21	0
					TOTAL	**3.34**	**11**

The remaining native vegetation mapped within the development site was in poor condition and did not require offsets. The vegetation integrity score for PCT 849_regenerating_CPW, PCT 849_DNG and PCT 849_DNG_olives had a vegetation integrity score less than 15 and therefore, did not require offsets.

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The development site contains one candidate for Serious and Irreversible Impact (SAII), Cumberland Plain Woodland. There are currently no published thresholds under the BioNet Threatened Biodiversity Data Collection to assess SAII for Cumberland Plain Woodland. An assessment of SAII has been included to determine if 3.69 ha of impacts to Cumberland Plain Woodland (in varying condition) is likely to be considered SAII.

Two Matters of National Environmental Significance (MNES), *Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest* and *Pteropus poliocephalus* (Grey-headed Flying-fox) were identified as having potential to be affected by the proposed works. Grey-headed Flying-fox is listed as Vulnerable under the EPBC Act and it is considered that this species is likely to use some of the development site for foraging (0.43 ha). *Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest* is listed as critically endangered under the EPBC Act; the proposed development will affect 0.43 ha of this vegetation community. An assessment of the Commonwealth Significant Impact Criteria was undertaken for both MNES and concluded that the project would not have a significant impact on this threatened species or ecological community.

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Abbreviations

Abbreviation	Description
AOBV	Areas of Outstanding Biodiversity Values
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
CPW	Cumberland Plain Woodland
DA	Development Application
DAWE	Department of Agriculture, Water and the Environment (formally DoEE)
DNG	Derived Native Grassland
DoEE	Commonwealth Department of Environment and Energy (now DAWE)
DPE	NSW Department of Planning and Environment
DPIE	NSW Department of Planning, Infrastructure and Environment (formerly OEH, see below)
ELA	Eco Logical Australia Pty Ltd
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*

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Abbreviation	Description
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
HBT	Hollow-bearing tree
IBRA	Interim Biogeographic Regionalisation for Australia
LGA	Local Government Area
LLS	Local Land Service
MNES	Matters of National Environmental Significance
NSW	New South Wales
NOW	NSW Office of Water
OEH	NSW Office of Environment and Heritage (now Department of Planning, Infrastructure and Environment)
PCT	Plant Community Type
SAII	Serious and Irreversible Impacts
SEPP	State Environmental Planning Policy
TEC	Threatened Ecological Community
VMP	Vegetation Management Plan
VIS	Vegetation Information System
WM Act	NSW *Water Management Act 2000*

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1. Stage 1: Biodiversity assessment

1.1 Introduction

This Biodiversity Development Assessment Report (BDAR) has been prepared by Belinda Failes, an accredited person (BAAS18159) under the *Biodiversity Conservation Act 2016* (BC Act). The report was peer reviewed by Dr Meredith Henderson (BAAS17001) who is also an accredited person under the BC Act.

1.1.1 General description of the development site

The proposed development site, defined as the area of land that is subject to the proposed development application, is approximately 12.20 ha and within the Penrith City Council Local Government Area (LGA). The development site currently contains remnants of a disused orchard, native vegetation and regenerating native vegetation. The development site consists of three adjoining parcels of land:

- 46-66 O'Connell Street, Caddens (Lot 3 / DP 1103503)
- 29 O'Connell Street, Caddens (Lot 6 / DP 593628)
- O'Connell Street, Caddens (Lot 2 / DP 1217434).

The development site is a rectangular size and orientated in an east-west direction and gently slopes south-east. It is bordered by O'Connell Street in the west, Nepean-Kingswood TAFE campus in the north, Western Sydney University (Werrington Campus) in the east and construction works for a shopping centre complex in the south.

The development site is currently zoned R3 Medium density residential over the majority of the development site and a portion of the west of the development site is zoned B2 Local Centre under the Penrith Local Environmental Plan 2010 (LEP).

The general description of the development site is displayed in two maps, the Site Map (Figure 1) and the Location Map (Figure 2).

1.1.2 Background

The development site was used for as an orchard until 2008 when the orchard was cleared (Travers 2017). A small patch of remnant vegetation is located along the southern boundary and was evident on historic 1943 aerial photography imagery (accessed via NearMaps). The remnant patch of vegetation has been mapped under the Biodiversity Values Map (21 July 2020). A large portion of remnant vegetation will be retained and subject to weed management in accordance with the Vegetation Maintenance Plan (VMP) prepared by ELA. ELA conducted a review of existing ecological surveys in the development site. The results are provided in Section 1.4.1.

Vantager Group recently received approval from Penrith City Council for a development application (DA #20/0413) under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the demolition of two existing residential dwellings and farming sheds within the development site. Works to remove the structures was conducted between June-July 2020. There are currently no remaining structures present in the development site.

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It was noted during July 2020 surveys that exotic trees adjacent to the buildings were also removed during the demolition works. Several mature *Eucalyptus tereticornis* (Forest Red Gum) and regenerating native vegetation were also removed around the land mapped under the Biodiversity Values Map. Although the native vegetation has already been removed, ELA has assessed the area as part of the impacts associated with the proposed development and included the removal in the ecosystem credit calculations.

1.1.3 Development site footprint

The proposed development will involve the subdivision of the development site into residential lots. A development footprint map is provided in Figure 3.

The proposed DA seeks council permission for:

- Bulk earthworks.
- Construction of temporary haul roads.
- Construction of bioretention basins.
- Construction of residential dwellings and internal access roads.
- Clearing of native and exotic vegetation.
- Retained lands including conservation areas and open space which will also feature pathways.

The proposed Masterplan will proceed as a multi-staged project. The DA seeks approval for Stages 1-3.

- Stage 1:
  - Subdivision of 94 lots
  - Installation of north-western basin.
- Stage 2:
  - Subdivision of 32 lots.
- Stage 3
  - Subdivision of 34 lots
  - Installation of south-eastern basin
  - Landscaping works.

The residual lot 501 (on B2 zoned land) in the south-western portion of the development site has not been included in as part of subdivision to date. This area will be utilised during the construction phase for temporary basins and other works. The lot will be kept clear of weeds and will be managed under the VMP during construction phase.

Vantager Group has purchased Lot 2 DP 1217434 along the northern boundary of the development site. This narrow linear lot currently contains an existing vehicle track and telegraph powerlines. It will provide access into the development during construction and as part of the Masterplan design of the subdivision.

1.1.4 Sources of information used

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

- BioNet Vegetation Classification System (accessed July 2020)

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- BioNet / Atlas of NSW Wildlife 5 km database search (DPIE 2020a) (accessed July 2020)
- Biodiversity Assessment Methodology Calculator (BAMC) (accessed August 2020)
- *Environment Protection and Biodiversity Conservation Act 1999* EPBC Act Protected Matters Search Tool 5 km database search (DAWE 2020a) (accessed August 2020)
- NSW Government Biodiversity Values Map (accessed on 21 July 2020)
- The Native Vegetation of the Sydney Metropolitan Area (Office of Environment and Heritage OEH 2016)
- Threatened species profiles and recovery plans (DAWE 2020b and DPIE 2020b) (accessed July 2020)
- National Flying-Fox Monitoring data (DAWE 2020c) (access August 2020)
- Existing ecological reports:
    - Flora and Fauna Assessment (Travers 2017)
    - Ecological Constraints Assessment (ELA 2018)
    - Statement of Environmental Effects – Demolition DA (Think Planners 2020)
- Historical aerial photography interpretation (Six Maps accessed 21 July 2020).

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Figure 1: Site Map

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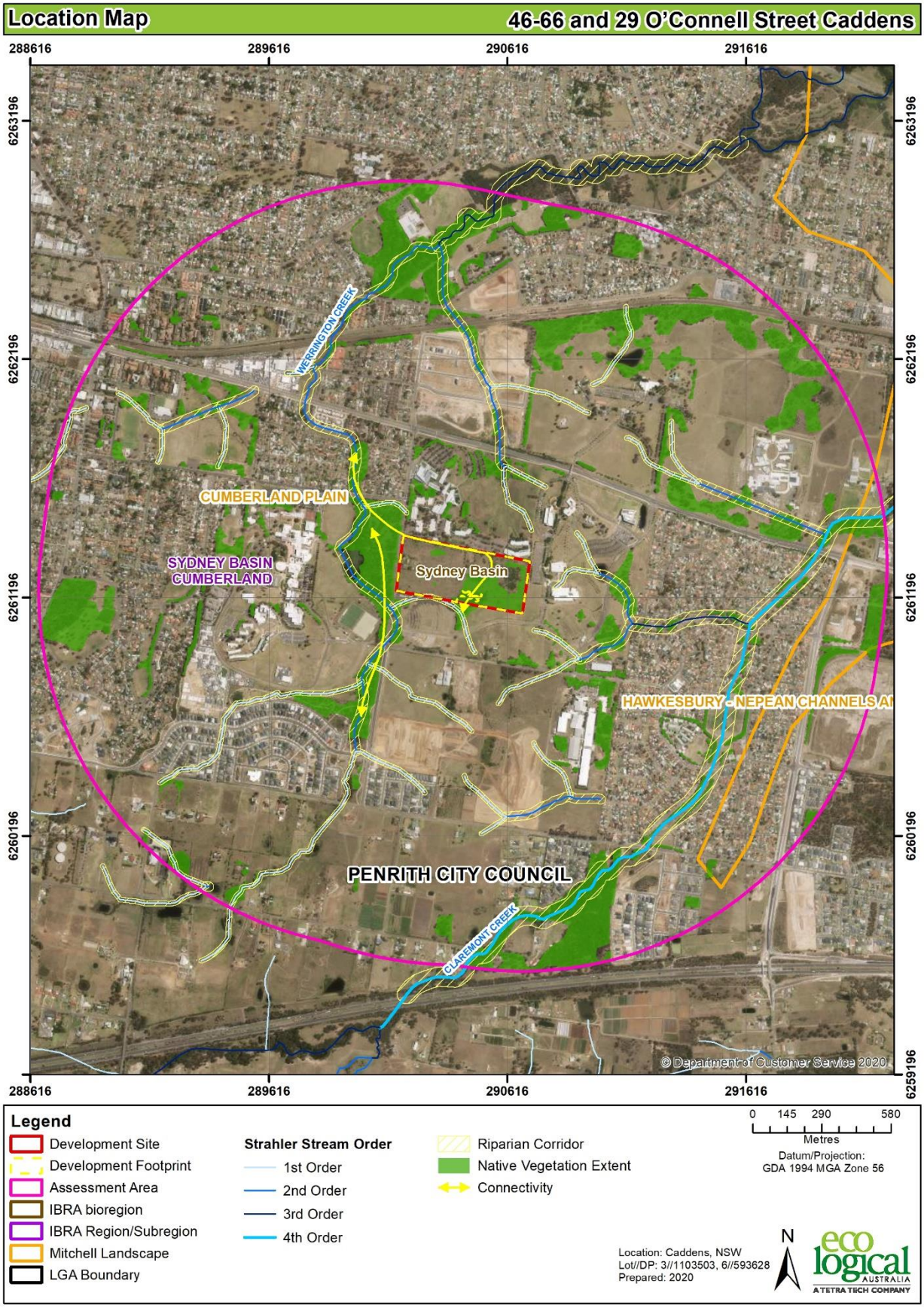

Figure 2: Location Map

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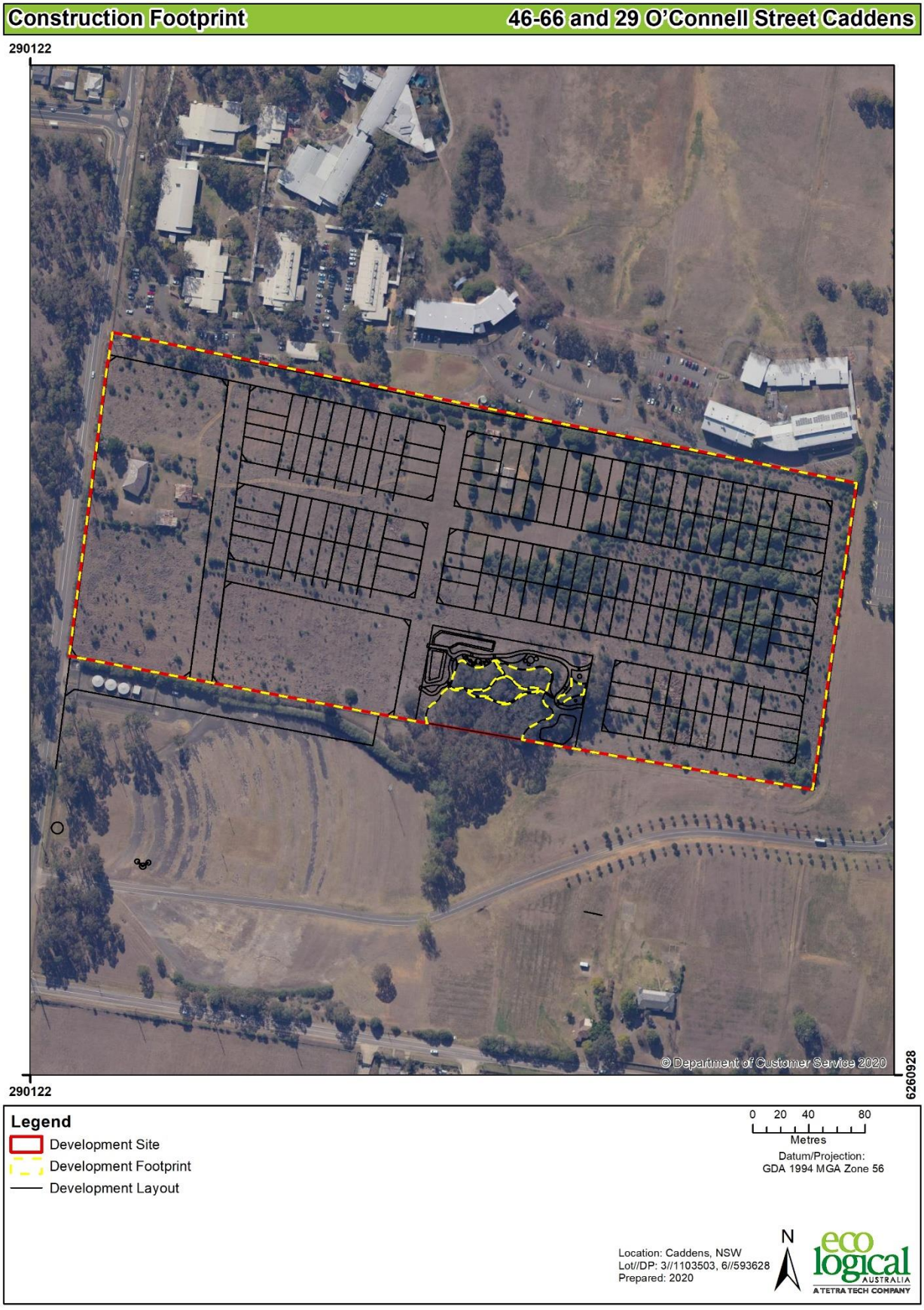

Figure 3: Construction footprint

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1.2 Legislative context

Table 1: Legislative context

Name	Relevance to the project
Commonwealth	
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	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.
State	
Environmental Planning and Assessment Act 1979 (EP&A Act)	The proposed development requires consent under Penrith Local Environmental Plan (LEP) 2010 and is to be assessed under Part 4 of the EP&A Act.
Biodiversity Conservation Act 2016 (BC Act)	The proposed development requires submission of a BDAR (i.e. this report) under the BC Act. The development application will need to be assessed in accordance with the BC Act 2016. A BDAR is required to be submitted with any development that has a significant impact on biodiversity values. There are four triggers for a significant impact: • exceeding the clearing threshold in section 7.2 of the BC Regulation 2017 (see below) • impacting on vegetation shown on the Biodiversity Values Map in section 7.3 of the BC Regulation 2017. (see below) • a significant impact in accordance with section 7.3 of the BC Act 2016 • impacts to Areas of Outstanding Biodiversity Value (AOBV). As there are not AOBV on site, this trigger does not apply. The minimum size lots is 400 m^2 LEP and the threshold for clearing native vegetation is 0.25 ha. The proposed works will result in the removal of up to 3.34 ha of native vegetation. The proposed development exceeds the BAM threshold and proposes to affect 0.43 ha of land included on the Biodiversity Values Map (dated 21 July 2020). Therefore, submission of a BDAR is required.
Fisheries Management Act 1994 (FM Act)	The development does not involve impacts to Key Fish Habitat, 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.
Local land Services Amendment Act 2016 (LLS Act)	The LLS Act does not apply to areas of the state to which the SEPP Vegetation applies. The Vegetation SEPP applies to the City of Penrith local government area.
Water Management Act 2000 (WM Act)	The development site contains a very small portion of an unnamed 1st order tributary in the south (Figure 1). Although there is currently no evidence of the tributary within the development site, confirmation of the presence of the watercourse from Natural Resources Access Regulator (NRAR) is required for the development application. Therefore, under the WM Act the proposed works occurs within 40 m waterfront land and a Controlled Activity Approval under s91 of the WM Act is required.
Planning Instruments	
State Environmental Planning Policy (SEPP) (Vegetation in Non-Rural Areas) 2017	The Vegetation SEPP applies to development that does not require consent. As this project requires consent under the EP&A Act the Vegetation SEPP is not relevant.
SEPP (Coastal Management) 2018	The proposed development is not located on land subject to this SEPP.

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Name	Relevance to the project
SEPP Koala Habitat Protection 2019	The proposed development is not located within a Local Government Area to which the Koala Habitat Protection 2019 applies.
Penrith Local Environment Plan (LEP) 2010	The development site is zoned as the following under the Penrith LEP: • R3: Medium Density Residential • B2: Local Centre The site is not subject to the Biodiversity or Riparian overlay under the LEP.
Penrith Development Control Plan (DCP) 2014	The Penrith DCP contains provisions relating to native vegetation. Section C2 Vegetation Management states that: • To adopt the principles of ecologically sustainable development (ESD) in protecting and enhancing Penrith's native vegetation; • To preserve existing trees and vegetation for the benefits they provide; • To preserve existing trees and vegetation, where possible, during the design, development and construction process and justify any tree or vegetation removal to Council; • To protect and enhance native vegetation and biodiversity in the Penrith Local Government Area, including habitat for threatened species, populations and ecological communities and corridors for flora and fauna; • To retain native vegetation in parcels of a size and configuration which will enable existing plant and animal communities to survive in the long term; • To protect and enhance the landscape character and scenic qualities of the Penrith Local Government Area; and • To manage the conflict between protecting and removing vegetation to address natural hazards such as bushfires. The proposed development is not consistent with some of the objectives of the DCP.

1.3 Landscape features

1.3.1 IBRA regions and subregions

The development site has an area of 12.20 ha and falls within the Sydney Basin IBRA region and Cumberland IBRA subregion as shown in Figure 2. The assessment area, defined as the area within a 1,500 m buffer of the development site, also falls within the Sydney Basin IBRA region and Cumberland IBRA subregion (Figure 2).

1.3.2 Mitchell Landscapes

The development site falls within the Cumberland Plain Mitchell Landscape (DECC 2002) as outlined in Table 2.

Table 2: Mitchell Landscapes (DECC 2002)

Mitchell landscape	Description	% Cleared
Cumberland Plain	Low rolling hills and valleys in a rain shadow area between the Blue Mountains and the coast on horizontal Triassic shales and lithic sandstones forming a down-warped block on the coastal side of the Lapstone monocline. Intruded by a small number of volcanic vents and partly covered by Tertiary river gravels and sands (Hawkesbury-Nepean Terrace Gravels landscape). Quaternary alluvium along the mains streams. General elevation 30 to 120m, local relief 50m. and sometimes affected by salt in tributary valley floors. Pedal uniform red to brown clays on volcanic hills. Red and brown texture-contrast soils on crests grading to yellow harsh texture-contrast soils in valleys.	89%

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Mitchell landscape	Description	% Cleared
	Woodlands and open forest of *Eucalyptus moluccana* (Grey Box), *Eucalyptus tereticornis* (Forest Red Gum), *Eucalyptus crebra* (Narrow-leaved Ironbark), *Eucalyptus eugenioides*, *Eucalyptus amplifolia* (Cabbage Gum) and *Angophora subvelutina*. Grassy to shrubby understorey often dominated by *Bursaria spinosa*, poorly drained valley floors, often salt affected with *Casuarina glauca* and *Melaleuca* sp.	

1.3.3 Native vegetation extent

The extent of native vegetation within the development site and 1,500 m buffer is outlined in Table 3. There are no differences between the mapped vegetation extent and the aerial imagery. This area was calculated using the existing Office of Environment and Heritage (OEH) 2016 vegetation datasets. Native vegetation for the purpose of this step has included native/exotic urban vegetation but does not include weeds or urban exotic/native vegetation.

Table 3: Native vegetation extent

Location	Area (ha)	Extent of Native Vegetation (ha)
Development site	12.20	3.69
Assessment area	945.25	112.72

1.3.4 Rivers and streams

The development site intercepts a very small portion of an unnamed tributary of Werrington Creek in the south of the development site. The tributary is mapped as a first order stream under the Strahler classification system (Figure 1). No functioning watercourses were observed during field surveys conducted in November 2019. Additionally, it was noted during field surveys in July 2020 that the mapped 1st order course within the development and in the adjacent site to the south, has been recently cleared of all vegetation and levelled as part of the development of the shopping complex to the south of the development site. As such, the stream location in the landscape has been substantially altered and does not currently function as a watercourse or river.

The *Water Management Act 2000* (WM Act) defines a river as:

- any watercourse, whether perennial or intermittent and whether comprising a natural channel or a natural channel artificially improved, and
- any tributary, branch or other watercourse into or from which a watercourse referred to in paragraph (a) flows, and
- anything declared by the regulations to be a river.

The mapped first order watercourse within the development site did not meet the definition of a 'river' under the WM Act, as there was no defined bed or banks observed in the location of the mapped stream. However, confirmation from the Natural Resource Access Regulator is required to validate the presence of the mapped watercourse. Therefore, for the purpose of this assessment, the unnamed tributary was entered in the BAMC.

1.3.5 Wetlands

The development site does not contain any mapped local or important wetlands.

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1.3.6 Connectivity features

The development site contains limited connectivity features outlined in Table 4 and shown in Figure 2.

A large tract of vegetation has been mapped adjacent to the development site along Werrington Creek to the west. The vegetation is located on the University of Western Sydney (Kingswood campus) and is surrounded by a 2 m high fence. This vegetation has been fragmented from other tracts of vegetation by the formation of major arterial roads, namely, M4 Western Motorway in the south and Great Western Highway in the north which surrounds the development site. Some connectivity may remain for highly mobile species such as birds or bats. This includes flyways for migratory birds and bat species moving through the landscape.

Fragmented connections are present for highly mobile species as seen in Figure 2. For the purpose of this assessment, the connectivity features were entered into the BAMC.

Table 4: Connectivity features

Connectivity feature name	Feature type
Werrington Creek	Connectivity links

1.3.7 Areas of geological significance and soil hazard features

The development site does not contain areas of geological significance and soil hazard features.

1.3.8 Site context

1.3.8.1 Method applied

The site-based method has been applied to this development.

1.3.8.2 Percent native vegetation cover in the landscape

The current percent native vegetation cover in the landscape was assessed in a Geographic Information System (GIS) using aerial imagery sourced from SIX Maps using increments of 5%. The percent native vegetation cover within the 1,500 m buffer area is 15 % (113 ha).

1.3.8.3 Patch size

Patch size was calculated using available vegetation mapping for all patches of intact native vegetation on and adjoining the development site. Due to the geographic barriers of major roads, namely M4 and Great Western Highway and large open landscapes surrounding the development site, there is limited connectivity of the vegetation within the development site with other patches of native vegetation. Therefore, the patch size area is 21 ha, therefore, the patch size area is within the size category of 5-24 ha.

1.4 Native vegetation

1.4.1 Literature review and previous ecological surveys

A desktop and literature review were conducted prior to field validation. Previous ecological surveys have been undertaken by Traverse (2017) and ELA (2018) within the development site. A summary of the ecological surveys and results are provided below in Table 5.

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Table 5: Summary of previous ecological surveys conducted within the development site

Company report and date	Surveys	Results
Travers Flora and Fauna Assessment 2017	Random meander over the entire development site over 12 hours. Four 0.04 ha quadrats Targeted surveys for threatened species using traverse and meander techniques: • *Acacia pubescens* • *Dillwynia tenuifolia* • *Grevillea juniperina* ssp. *juniperina* • *Grevillea parviflora* ssp. *parviflora* • *Pimelea spicata* • *Pultenaea parviflora* • *Marsdenia viridiflora* subsp. *viridiflora.* Opportunistic observations for fauna species and habitat assessment for Koalas, hollow-bearing trees (HBT), caves, waterbodies One-hour targeted survey for Cumberland Plain Land Snail within leaf litter.	The report indicates that the Cumberland Plain Woodland in the development site did not satisfy EPBC Criteria as it contained a contained approximately 15-20 % native understorey vegetation. No threatened flora species were recorded or were considered likely to occur due to historical disturbance of the vegetation. Targeted surveys were conducted for Cumberland Plain Land Snail. No individuals were recorded or considered unlikely to occur within the development site. The surveys concluded that the development site lacks habitat for most threatened fauna species due to an absence of suitable foraging or breeding habitat (i.e. hollow-bearing trees, caves, termite mounds, waterbodies). Patch of remnant CPW contained HBTs and was considered suitable for threatened microbat, mega-bat species and highly mobile birds: • *Lathamus discolour* (Swift Parrot) • *Artamus cyanopterus* (Dusky Woodswallow) • *Pteropus poliocephalus* (Grey-headed Flying-fox) • *Micronomus norfolkensis* (Eastern coastal Freetail Bat) • *Falsistrellus tasmaniensis* (Eastern Falsistrellus) • *Miniopterus australis* (Little Bent-wing Bat) • *Miniopterus orianae oceanensis* (Eastern Bentwing-bat). No targeted surveys were conducted for these species.
ELA Ecological Constraints Assessment 2018	Brief random meander and vegetation validation and condition assessment.	Confirmed the presence of 0.74 ha of PCT 849 which corresponds to CPW under the BC and EPBC Acts. The presence of several small tree hollows was noted, however, the location was not provided in constraints report.

1.4.2 Survey effort

Vegetation survey was conducted on 27 November 2019 by Belinda Failes and Stacey Wilson and 9 July 2020 by Belinda Failes. A total of five (5) full-floristic and vegetation integrity plots were undertaken to identify plant community types (PCTs) and threatened ecological communities (TECs) on the development site (Figure 5 and Table 6). The vegetation integrity plots were undertaken within the

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development site in accordance with the BAM (Table 7). All field data collected is included in Appendix B.

The site visits also involved vegetation mapping of the development site and assessment of potential habitat for threatened flora and fauna species.

Targeted surveys for threatened flora species and one threatened fauna species, *Meridolum corneovirens* (Cumberland Plain Land Snail) was conducted in suitable habitat. More information is provided in Section 1.6.1 and displayed on Figure 7.

Table 6: 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 (Cumberland Plain Woodland	5

Table 7: Vegetation integrity plots

Veg Zone	PCT ID	PCT Name	Condition	Area (ha)	Plots required	Plots surveyed
1	849	Intact CPW	Moderate	0.78	1	1
2	849	Regeneration CPW	Low	0.51	1	1
3	849	DNG	Low	0.19	1	1
4	849	DNG_olives	Low	2.21	2	2
			TOTAL	**3.69**	**5**	**5**

1.4.3 Plant Community Types present

One PCT (*PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion*) in varying condition was identified within the development site (Table 8, Figure 4). This PCT corresponds with listed TECs under the BC and/or EPBC Act (Table 12, Figure 6). Justification for PCT selection is provided below.

Table 8: Plant Community Types in the development site

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 (Cumberland Plain Woodland	Coastal Valley Grassy Woodland	Grassy Woodlands	3.69	93%

1.4.4 PCT selection justification

Justification of the selection of PCTs recorded within the development site is based on quantitative analysis of full-floristic plot data and a summary is provided in Table 9. The soil landscape, elevation and vegetation mapping of the development site was used to determine the 'best-fit' PCT for native

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vegetation including regenerating native shrubs and canopy and patches of native grasslands. PCT 849 was determined the most appropriate PCT for the development site.

Previous vegetation mapping (OEH 2016) indicated that the vegetation within the development site contains a patch of Shale Plains Woodland (which is a sub-community of Cumberland Plain Woodland) in the southern portion of the development site. The remaining vegetation has not been mapped by previous vegetation data sets.

The field survey confirmed the remnant vegetation within the southern boundary of the development site is consistent with PCT 849. The canopy contained *Eucalyptus tereticornis* (Forest Red Gum) and occasional *E. moluccana* (Grey Box) and *Eucalyptus amplifolia* (Cabbage Gum). Dense clusters of woody weeds *Ligustrum lucidum* (Broad-leaved Privet) and *Olea europaea* ssp. *cuspidata* (African Olive) were prevalent in this area. Where woody weeds were limited, a mix of native ground cover species were recorded including *Microlaena stipoides* var. *stipoides* (Weeping Meadow Grass), *Einadia polygonoides* and *Dichondra repens* (Kidney Weed). One native shrub was present in this vegetation patch, *Bursaria spinosa* (Blackthorn). Quantitative analysis of the floristic plot data (plot 1) within this patch confirmed that the vegetation resembles PCT 849 (Appendix C).

Soil landscapes were also used to determine the best-fit PCT. The development site is mapped on the Luddenham (erosional) soil landscapes which is associated with Wianamatta Shale group with low local relief of 50 – 120 m and gentle rolling hills (Chapman and Murphy 1989). The land associated with Luddenham has been cleared for grazing, remnant vegetation includes *E. moluccana*, lesser occurrence of ironbark species and *E. tereticornis*. The soil landscape and relief are consistent with vegetation PCT 849 identified within the development site.

A patch of regenerating native vegetation (Eucalyptus saplings and *Bursaria spinosa* (Blackthorn)) were observed around the remnant vegetation and were dominated by native grass *Aristida ramosa* (Purple Wire-grass). A large portion of the development site contains open grasslands. This varied from dense exotic grasses (*Eragrostis curvula*- African Lovegrass) predominantly in the west of the development site, to large swards of native grasslands (*Aristida ramosa*) in the eastern portion of the development site. Large areas of native grasslands maybe considered a sub-form of Cumberland Plain Woodland, also referred to as a 'derived native grassland'. These areas were mapped as part of PCT 849 and assigned a separate vegetation zone. Regenerating shrubs and canopy were also assigned a separate vegetation zone and are considered a degraded form of Cumberland Plain Woodland. Quantitative analysis of plots 2-5 identified that the DNG and regenerating vegetation contained representative species of Cumberland Plain Woodland (i.e. PCT 849) however these vegetation zones lacked a canopy or midstorey and contains low native species diversity.

Occasional exotic fruit trees were also recorded during the field surveys. Fruit trees and exotic grasslands were not mapped as part of a PCT.

Table 9: PCT selection justification

PCT ID	PCT Name	Selection criteria	Species relied upon for identification of vegetation type and relative abundance
849	Grey Box - Forest Red Gum grassy woodland on flats of the	IBRA region, subregion, soil landscape, elevation and	Presence of *Eucalyptus tereticornis* (Forest Red Gum), *E.*

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PCT ID	PCT Name	Selection criteria	Species relied upon for identification of vegetation type and relative abundance
	Cumberland Plain, Sydney Basin Bioregion (Cumberland Plain Woodland	results of floristic plot analysis including the presence of positive diagnostic canopy species	*moluccana* (Grey Box), *Bursaria spinulosa* (Blackthorn) in midstorey and native grasses (*Aristida* sp. and *Microlaena stipoides*) in ground layer. This PCT is a strong match.

1.4.5 Vegetation zones

A description of the vegetation zones is provided in Table 10. The locations of vegetation zones are shown in Figure 5. Photos of the vegetation zones 1- 4 are shown in Photos 1-4, respectively.

Table 10: Vegetation zones in development site

Veg zone	PCT	Condition	Total area (ha)	Description
1	849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (Cumberland Plain Woodland	Intact CPW	0.78	A patch of intact native vegetation was mapped as vegetation zone 1 along the southern boundary of the development site. Several mature and immature *Eucalyptus tereticornis* and minor occurrences of *E. moluccana* was noted in this vegetation zone (Photo 1). Clusters of woody weeds (*Ligustrum lucidum* and *Olea europaea* ssp. *cuspidata*) was recorded within this vegetation zone. Patches of native ground cover species were also recorded such as *Microlaena stipoides, Dichondra repens* and *Einadia nutans*.
2	849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (Cumberland Plain Woodland	Regenerating CPW	0.51	A dense patch of *Bursaria spinosa* and regenerating eucalypt saplings was recorded within the development site (Photo 2). This vegetation zone contained a dense understorey of native grasses, predominately *Aristida ramosa* and scattered clusters of *Olea europaea* ssp. *cuspidata*.
3	849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (Cumberland Plain Woodland	DNG	0.19	This vegetation zone represented several small patches of native grasses which lacked a native midstorey or exotic woody weeds (Photo 3). Native species within the ground layer includes *Aristida ramosa* and other native grasses less frequently such as *Cymbopogon refractus* and *Themeda triandra* (Kangaroo Grass). Native sedges *Carex inversa* and *Fimbristylis dichotoma* were present in very small numbers.
4	849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (Cumberland Plain Woodland	DNG_olives	2.21	This vegetation zone was similar to vegetation zone 3, except it contained scattered patches of woody weeds *Olea europaea* ssp. *cuspidata* and *Pyracantha crenulata* (Nepalese Firethorn) (Photo 4). The ground layer was similar to vegetation zone 3 with a mix of native grasses predominately *Aristida ramosa*. Native herbs, *Wahlenbergia gracilis* and *W. stricta* subsp.

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Veg zone	PCT	Condition	Total area (ha)	Description
				stricta and *Geranium solanderi* var. *solanderi* were occasionally dispersed within the native grasses.
N/A	N/A	Exotic	8.51	This zone consists of either dense clusters of woody weeds namely *Olea europaea* ssp. c*uspidata* with limited groundcover species (Photo 5). This zone also includes exotic grasslands consisting of *Eragrostis curvula* (African Lovegrass) (Photo 6).
		TOTAL	**12.20**	

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Photo 1: Vegetation zone PCT 849 Intact CPW – start of vegetation integrity plot 1

Photo 2: Vegetation zone 2 PCT 849_regenerating CPW start of plot 2

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Photo 3: Vegetation zone 3 PCT 849_DNG start of plot 3

Photo 4: Vegetation zone 4 PCT 849_DNG_olives start plot 4

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Photo 5: Dense patches of woody weeds mapped as exotic

Photo 6: Cleared lands with exotic grasses mapped as exotic vegetation

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1.4.6 Threatened Ecological Communities Justification

The BioNet Vegetation Classification lists PCT 849 as a component of Cumberland Plain Woodland which is listed as critically endangered under the BC Act and as critically endangered as part of Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest under the EPBC Act (Table 12).

The final determination for Cumberland Plain Woodland listed under the BC Act states:

"*Native grassland derived from clearing of the woodland and forest are also part of this community if they contain characteristic non-woody species listed in paragraph 3.*" (Scientific Committee 2009).

PCT 849 vegetation zones 1-4 mapped in the development site contains native grasses *Aristida ramosa, Themeda triandra* and *Cymbopogon refractus* and native herbs. Therefore, it satisfies the criteria for listing as part of the Cumberland Plain Woodland under the BC Act.

PCT 849 may also correspond with Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest listed as a critically endangered ecological community, provided it satisfied the listing criteria under the EPBC Act (Threatened Species Scientific Committee 2009) (Table 11).

PCT 849 vegetation zone 1 is approximately 1 ha in size, contains hollow bearing trees and contains perennial understorey of >30 % native species. The vegetation patch satisfies listing under the EPBC Act as Category D.

According to the conservation advice (DEWHA 2009), vegetation listing under the EPBC Act for Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest "*always has upper tree layer species present and either a shrub or ground layer present*."

PCT 849 vegetation zones 2-4 did not meet the threshold criteria for listing under the EPBC Act as the vegetation did not contain a canopy and /or a native shrub layer. Vegetation zones 2-4 still meet the criteria for listing under the BC Act.

Table 11: Condition thresholds for patches that meet the definition of Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest critically endangered ecological community

Category and rationale	Thresholds
A. Core thresholds that apply under most circumstances: patches with an understorey dominated by natives and a minimum size that is functional and consistent with the minimum mapping unit size applied in NSW.	Minimum patch size is ≥0.5ha; AND ≥50% of the perennial understorey vegetation cover is made up of native species.
OR	
B. Larger patches which are inherently valuable due to their rarity	The patch size is ≥5 ha; AND ≥ 30% of the perennial understorey vegetation cover is made up of native species
OR	
C. Patches with connectivity to other large native vegetation remnants in the landscape	The patch size is ≥0.5 ha; AND The patch is contiguous with a native vegetation remnant (any native vegetation where cover in each layer present is dominated by native species) that is ≥ 5 ha in area.

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Category and rationale	Thresholds
OR	
D. Patches that have large mature trees or trees with hollows (habitat) that are very scarce on the Cumberland Plain.	The patch size is ≥ 0.5 ha in size; AND ≥ 30% of the perennial understorey vegetation cover is made up of native species; AND The patch has at least one tree with hollows per hectare or at least one large tree (≥80 dbh) per hectare from the upper tree layer species.

Table 12: Threatened Ecological Communities

PCT ID	BC Act			EPBC Act		
	Listing status	Name	Area (ha)	Listing status	Name	Area (ha)
849	CEEC	Cumberland Plain Woodland	3.69	CEEC*	Shale Plains Woodland and	0.78

* VEGETATION ZONE 1 SATISFIES LISTING UNDER THE EPBC ACT. VEGETATION ZONE 2-4 SATISFY BC ACT ONLY

1.4.7 Vegetation integrity assessment

A vegetation integrity assessment using the Credit Calculator (BAMC) was undertaken and the results are outlined in Table 13.

Table 13: Vegetation integrity

Veg Zone	PCT ID	Condition	Area impacted (ha)	Composition Condition Score	Structure Condition Score	Function Condition Score	Current vegetation integrity score
1	849	Intact CPW	0.43	29.4	42.2	59.5	42
2	849	Regenerating CPW	0.51	8.6	13.7	15	12.1
3	849	DNG	0.19	15.1	41.5	0	2.8
4	849	DNG_olives	2.21	27.9	41.5	0	1.5

1.4.8 Use of local data

The use of local data is not proposed for this assessment.

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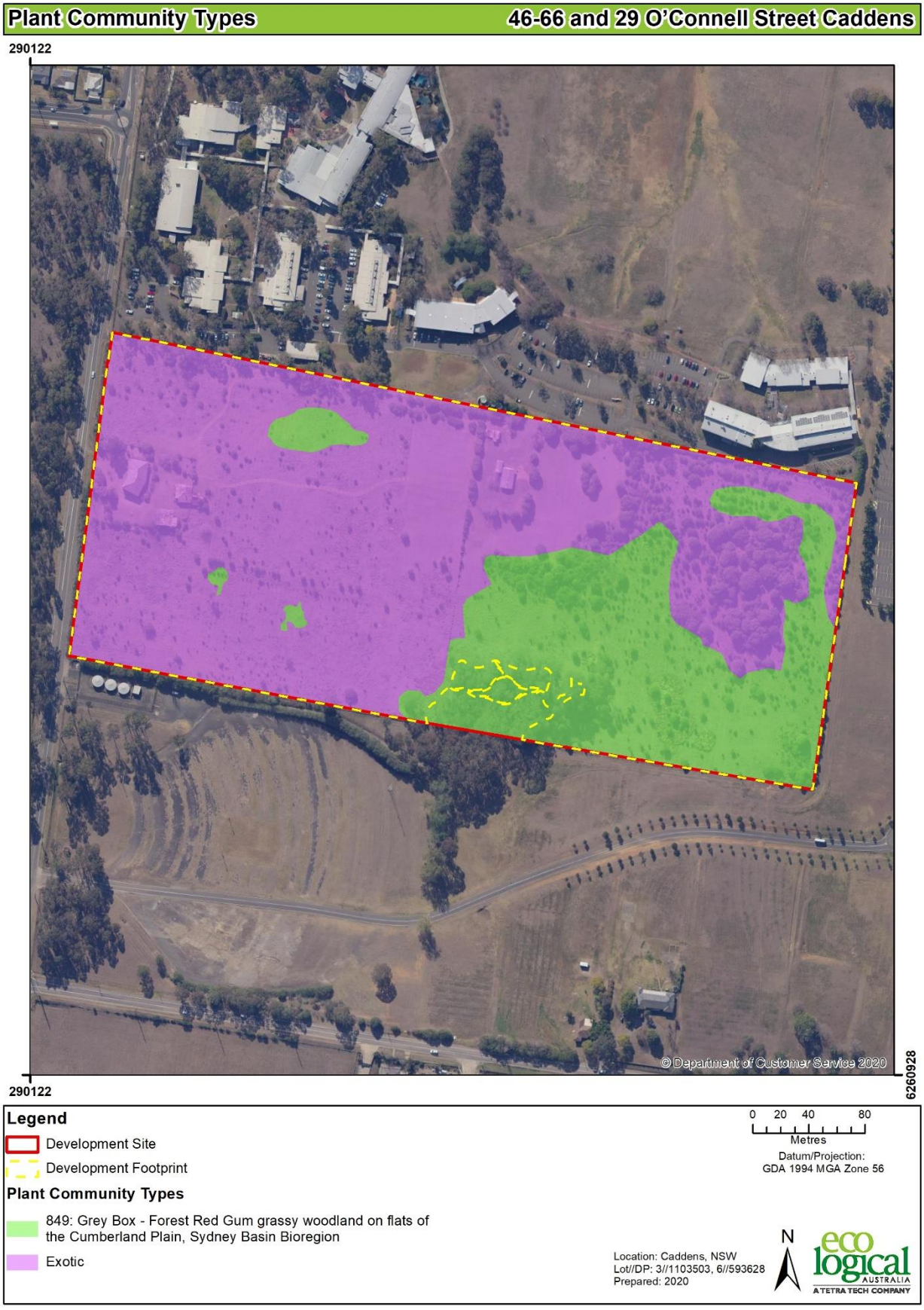

Figure 4: Plant Community Types and habitat features

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Figure 5: Plot locations and vegetation zones

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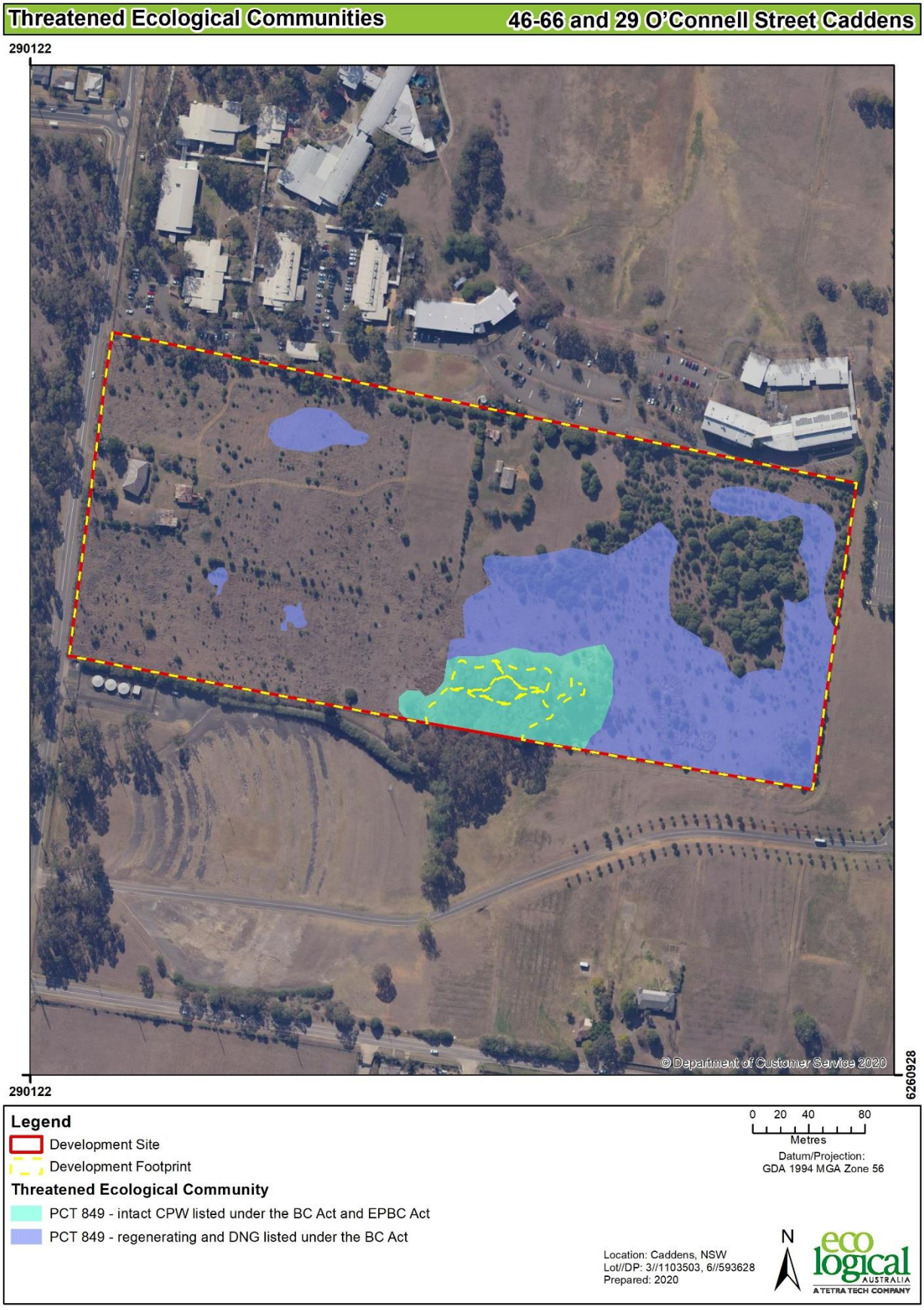

Figure 6: Threatened Ecological Communities

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1.5 Threatened species

1.5.1 Survey effort

Habitat assessments were undertaken during field surveys on 27 November 2019 and 9 July 2020 to determine the likelihood of threatened species occurring within the development site on an intermittent or permanent basis. Survey effort is present in Figure 7.

Habitat assessments involved a search of important habitat features for threatened fauna species, such as hollow-bearing trees, rocky outcrops (if present) and deep leaf litter. Assessments also included a search of evidence of fauna foraging or roosting such as chewed cones, sap trees or roosting habitat in the form of white wash/pellets, plus inspection of structures to determine of suitable roosting/breeding habitat for threatened microbats. Binoculars were used to inspect tree hollows. No hollows inspected displayed any apparent visual evidence of microbat occupation.

Random meander and transects for threatened flora species were conducted in suitable habitat within the development site.

Targeted surveys were conducted for Cumberland Plain Land Snail (details are provided in Section 1.6.1).

1.5.2 Survey results

A range of urban birds were observed foraging in the development site including the small bird species such as *Zosterops lateralis* (Silvereyes), *Myzomela sanguinolenta* (Scarlet Honeyeaters) and *Malurus cyaneus* (Superb Fairy-wren) and a number of exotic bird species (see Table 45 in Appendix C).

The site currently contains a population of approximately 20 - 30 *Macropus giganteus* (Eastern Grey Kangaroos) including young (Photo 7). The kangaroos currently utilise the development site as their main occupied territory. The development site provides suitable foraging habitat (native grasses) and sheltering locations (amongst the woody weeds and Bursaria thickets). This species is not listed as threatened species under the BC Act/EPBC Act and therefore this species is not included as an ecosystem or species credit species. However, the species is still protected under the BC Act and consideration of the impacts of the proposed development on the population is required. The proposed works has potential to remove 2.40 ha of DNG grazing land and 0.41 of vegetation zone 1 considered suitable sheltering habitat. The vegetation in the land to the north, east and south is currently subject to development or proposed future development. Consideration of the accumulative impacts has been given in this scenario and has identified that the proposed works is likely to negatively impact upon this species.

A medium sized stick nest was recorded in PCT 849_intact CPW in the southern boundary of the development site (Photo 8). Two *Corvus coronoides* (Australian Ravens) were observed in the tree near the nest during the field survey in July 2020. As the nest is not a large stick pile, the nest is located at the outer branches of the tree and the presence of two ravens near the nest, it can determined with reasonable certainty that the stick nest does not belong to a large threatened species such as Little Eagle, Square-tailed Kite or Spotted Harrier. Additionally, the nest will not be removed from the site.

Microbat scats and/or markings were not observed around any of the tree hollow entrances, nor were any microbats observed when inspecting inside the accessible hollows.

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The native canopy within the development site may be used as potential seasonal foraging habitat for microbats, and the hollows may potentially be used as temporary roosting habitat. The majority of the native canopy will be retained in the development site and may provide suitable breeding habitat for microbats. However, the exotic vegetation and derived native grasslands and regenerating native vegetation does not provide suitable roosting/breeding habitat for microbat species as they lack suitable habitat such as tree hollows and flaky bark trees.

Four hollow-bearing trees were identified within the development site of which all trees will be retained in the residual lot in the south (Figure 7). There are three stags, recorded in the development site which will be retained, these provide perching habitat for bird species and may also contain small cracks for microbat roosting habitat.

Photo 7: Eastern Grey Kangaroos recorded within the development site

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Photo 8: Stick nest in the retained lands, possibly Australia Raven as a pair was observed near the nest

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Figure 7: Survey effort November 2019 and July 2020

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1.5.3 Ecosystem credit species

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 14.

Table 14: Predicted ecosystem credit species and relevant justification for their exclusion or inclusion from the assessment

Species	Common Name	Habitat constraints / Geographic limitations	Sensitivity to gain class	BC Act listing status	EPBC Act listing status	Justification for exclusion or inclusion
Anthochaera phrygia	Regent Honeyeater (Foraging)	N/A	High	Critically Endangered	Critically Endangered	**Included** Habitat features for this species are only present in the PCT 849 vegetation zone 1 at this site. The remaining vegetation zones in the development site do not comprise key plant species required for foraging.
Artamus cyanopterus cyanopterus	Dusky Woodswallow	N/A	Moderate	Vulnerable	Not Listed	**Included** Habitat features for this species are present at in the development site.
Callocephalon fimbriatum	Gang-gang Cockatoo (Foraging)	N/A	Moderate	Vulnerable	Not Listed	Excluded Habitat features for this species are not present at this site. The site is substantially degraded. There are only two BioNet records for this species within a 5 km radius of the development site.
Chthonicola sagittata	Speckled Warbler	N/A	High	Vulnerable	Not Listed	Excluded This species requires a relatively large undisturbed remnant vegetation to persist in an area. The development site is substantially degraded and contains limited remnant vegetation for this species. There are ten BioNet records for this species within a 5 km radius of the development site.
Circus assimilis	Spotted Harrier	N/A	Moderate	Vulnerable	Not Listed	**Included** Habitat features for this species are present at this site.

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Species	Common Name	Habitat constraints / Geographic limitations	Sensitivity to gain class	BC Act listing status	EPBC Act listing status	Justification for exclusion or inclusion
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	N/A	High	Vulnerable	Not Listed	Excluded This species inhabits open forests and woodlands. Fallen timber is considered an important habitat requirement for this species. Habitat features for this species are not present at this site. The site is substantially degraded. There are no BioNet records for this species within a 5 km radius of the development site.
Daphoenositta chrysoptera	Varied Sittella	N/A	Moderate	Vulnerable	Not Listed	Excluded This species is a sedentary species and inhabits woodlands. It will avoid open grasslands. Habitat features for this species are not present in the development site. The site is substantially degraded. There are five BioNet records for this species within a 5 km radius of the development site.
Dasyurus maculatus	Spotted-tailed Quoll	N/A	High	Vulnerable	Endangered	Excluded Habitat features for this species are not present at this site. This species requires habitat features such as maternal den sites, an abundance of food (birds and small mammals) and large areas of relatively intact vegetation to forage. There are two historic and one recent record for this species within a 5 km radius of the development site.
Glossopsitta pusilla	Little Lorikeet	N/A	High	Vulnerable	Not Listed	**Included** There are two BioNet records for this species within a 5 km radius of the development site. This species may utilise the flowering species within the development site for seasonal foraging.
Grantiella picta	Painted Honeyeater	Other	Moderate	Vulnerable	Vulnerable	Excluded

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Species	Common Name	Habitat constraints / Geographic limitations	Sensitivity to gain class	BC Act listing status	EPBC Act listing status	Justification for exclusion or inclusion
		Mistletoes present at a density of greater than five mistletoe per ha				This species inhabits woodlands and forests where it feeds on mistletoes. The development site does not comprise key plant species (mistletoe) required for foraging. There are no BioNet records for this species within a 5 km radius of the development site.
Haliaeetus leucogaster	White-bellied Sea-Eagle (Foraging)	Waterbodies Within 1 km of rivers, lakes, large dams or creeks, wetlands and coastlines	High	Vulnerable	Not Listed	**Included** There are no BioNet records for this species within a 5 km radius of the development site. The development site does not contain any waterbodies; however, it is located within 1 km of Werrington Creek.
Hieraaetus morphnoides	Little Eagle (Foraging)	N/A	Moderate	Vulnerable	Not Listed	**Included** There is one BioNet records for this species within a 5 km radius of the development site. The development site contains potential foraging habitat for this species.
Lathamus discolor	Swift Parrot (Foraging)	N/A	Moderate	Endangered	Critically Endangered	**Included** On mainland Australia this species utilises *Eucalyptus tereticornis* which was recorded in PCT 849 vegetation zone 1.
Lophoictinia isura	Square-tailed Kite (Foraging)	N/A	Moderate	Vulnerable	Not Listed	**Included** There are two BioNet records for this species within a 5 km radius of the development site. The development site contains potential foraging habitat for this species.
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	N/A	Moderate	Vulnerable	Not Listed	**Included** This species inhabits woodlands and cleared areas. The development site provides suitable habitat for this species. There are no BioNet records for this species within a 5 km radius of the development site.

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Species	Common Name	Habitat constraints / Geographic limitations	Sensitivity to gain class	BC Act listing status	EPBC Act listing status	Justification for exclusion or inclusion
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	N/A	Moderate	Vulnerable	Not Listed	Excluded This species inhabits dry woodlands dominated by box species or ironbark eucalypts. Habitat features for this species are not present in the development site. The site is substantially degraded. There are no BioNet records for this species within a 5 km radius of the development site.
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	N/A	High	Vulnerable	Not Listed	**Included** Seasonal foraging habitat was identified in this assessment.
Miniopterus australis	Little Bent-winged-Bat (Foraging)	N/A	High	Vulnerable	Not Listed	**Included** Seasonal foraging habitat was identified in this assessment.
Miniopterus orianae oceanensis	Large Bent-winged Bat (Foraging)	N/A	High	Vulnerable	Not Listed	**Included** Seasonal foraging habitat was identified in this assessment.
Neophema pulchella	Turquoise Parrot	N/A	High	Vulnerable	Not Listed	**Included** This species is associated with woodlands and feeds on seeds and herbs in grasslands. Suitable foraging habitat is present in the development site. There are no BioNet records for this species within a 5 km radius of the development site.
Ninox strenua	Powerful Owl (Foraging)	N/A	High	Vulnerable	Not Listed	**Included** There are four BioNet records for this species within a 5 km radius of the development site. The development site contains potential foraging habitat for this species.
Petroica boodang	Scarlet Robin	N/A	Moderate	Vulnerable	Not Listed	**Included**

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Species	Common Name	Habitat constraints / Geographic limitations	Sensitivity to gain class	BC Act listing status	EPBC Act listing status	Justification for exclusion or inclusion
						This species has been included as a candidate species as during autumn and winter individuals may move to grasslands or grazed paddocks with scattered trees. There are two BioNet records for this species within a 5 km radius of the development site.
Petroica phoenicea	Flame Robin	N/A	Moderate	Vulnerable	Not Listed	**Included** This species utilises open understorey habitat for foraging. Breeding habitat occurs in ridgetops in tall moist forests. The development site contains potential foraging habitat for this species. There are no BioNet records for this species within a 5 km radius of the development site.
Phascolarctos cinereus	Koala (Foraging)	N/A	High	Vulnerable	Vulnerable	Excluded Habitat present is substantially degraded and highly fragmented such that this species is unlikely to utilise the development site. There are only two BioNet records within a 5 km radius of the development site.
Pteropus poliocephalus	Grey-headed Flying-fox (Foraging)	N/A	High	Vulnerable	Vulnerable	**Included** Limited foraging resources were present within the development area for this highly mobile species. This species may occasionally utilise the Eucalyptus species during flowering seasons to supplement foraging resources.
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	N/A	High	Vulnerable	Not Listed	**Included** Seasonal foraging habitat was identified in this assessment.
Stagonopleura guttata	Diamond Firetail	N/A	Moderate	Vulnerable	Not Listed	**Included** This species feeds exclusively on the ground for grasses and herbs in woodland environments including derived

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Species	Common Name	Habitat constraints / Geographic limitations	Sensitivity to gain class	BC Act listing status	EPBC Act listing status	Justification for exclusion or inclusion
						grasslands. The development site contains suitable foraging habitat for this species. There are no BioNet records within 5 km radius of the development site.
Tyto novaehollandiae	Masked Owl (Foraging)	N/A	High	Vulnerable	Not Listed	**Included** There is one BioNet records for this species within a 5 km radius of the development site. The development site contains potential foraging habitat for this species.

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1.6 Species credit species

Species credit species predicted to occur at the development site (i.e. candidate species), their associated habitat constraints, geographic limitations and sensitivity to gain class is included in Table 15. Species credit species which have been excluded from the assessment and relevant justification are also included in Table 15.

Table 15: Candidate species credit species and relevant justification for their exclusion or inclusion from the assessment

Species	Common Name	Habitat constraints / Geographic limitations	Sensitivity to gain class	BC Act listing status	EPBC Act Listing status	Justification for exclusion or inclusion
Acacia bynoeana	Bynoe's Wattle	N/A	High	Endangered	Vulnerable	Excluded This species is associated with dry sclerophyll forests on sandy soils. Habitat for this species was not recorded within the development site. There are no BioNet records for this species within a 5 km radius of the development site.
Acacia pubescens	Downy Wattle	N/A	High	Vulnerable	Vulnerable	**Included** This species is associated with shale soils. Suitable habitat includes PCT 849. This species was included as a candidate species credit species for targeted surveys.
Anthochaera phrygia	Regent Honeyeater (Breeding)	Other As per mapped areas	High	Critically Endangered	Critically Endangered	Excluded This is a dual credit species, and only a species credit species when specific habitat constraints are present for breeding. The development site is not within the DPIE Mapped Important Areas (access in the BOAMS on 21 July 2020).
Burhinus grallarius	Bush Stone-curlew	Fallen / standing dead timber including logs	High	Endangered	Not Listed	Excluded Habitat features (woodland with abundance of fallen logs or standing dead timber) for this species are not present in the development site: There are two BioNet records for this species within a 5 km radius of the development site. The site is substantially degraded and does not contain habitat features.

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Species	Common Name	Habitat constraints / Geographic limitations	Sensitivity to gain class	BC Act listing status	EPBC Act Listing status	Justification for exclusion or inclusion
Caladenia tessellata	Thick Lip Spider Orchid	N/A	Moderate	Endangered	Vulnerable	Excluded Habitat for this species was not considered suitable in the development site. The site is substantially degraded due to orchid production and grazing by livestock. There are no BioNet records for this species within a 5 km radius of the development site.
Callocephalon fimbriatum	Gang-gang Cockatoo (Breeding)	Hollow bearing trees Eucalypt tree species with hollows greater than 9cm diameter	High	Vulnerable	Not Listed	Excluded This is a dual credit species, and only a species credit species when specific habitat constraints are present for breeding. The development site does not contain breeding habitat such as Eucalypt trees with hollows > 9cm in diameter and shrubs that are suitable for the species to utilise the site. There are only two BioNet records for this species within a 5 km radius of the development site.
Cercartetus nanus	Eastern Pygmy-possum	N/A	High	Vulnerable	Not Listed	Excluded Habitat present is substantially degraded such that this species is unlikely to utilise the development site. There is no nesting habitat present or preferred foraging habitat such as *Banksia* sp. present. There are no individuals recorded within 5 km of the development site.
Chalinolobus dwyeri	Large-eared Pied Bat	Cliffs Within two km of rocky areas containing caves, overhangs, escarpment, outcrops, or crevices or within two km of old mines or tunnels	Very High	Vulnerable	Vulnerable	Excluded This species is associated with sandstone escarpment/cliff/cave features which were not recorded within the development site. The development site is located more than 5 km from the foothills of the Great Dividing Range which may provide suitable habitat for this species. There are no BioNet records for this species within a 5 km radius of the development site.

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Species	Common Name	Habitat constraints / Geographic limitations	Sensitivity to gain class	BC Act listing status	EPBC Act Listing status	Justification for exclusion or inclusion
Cynanchum elegans	White-flowered Wax Plant	N/A	High	Endangered	Endangered	Excluded This species is associated with dry rainforest vegetation. The vegetation mapped within the development site does not contain suitable habitat for this species. There are no BioNet records for this species within a 5 km radius of the development site.
Dillwynia tenuifolia	Dillwynia tenuifolia	N/A	Moderate	Vulnerable	Not Listed	Excluded Habitat for this species includes heathy habitats on transitional soils. The vegetation within the development site does not support suitable habitat for this species. There are 26 BioNet records for this species within a 5 km radius of the development site. The site is substantially degraded and does not support suitable habitat for this species.
Dillwynia tenuifolia – endangered population	Endangered population Kemps Creek	Area bounded by Western road, Elizabeth Drive, Devonshire Road and Kemps Creek in the Liverpool LGA	High	Endangered Population	Not Listed	Excluded The development site is not located within the geographic distribution for this endangered population.
Eucalyptus benthamii	Camden White Gum	N/A	High	Vulnerable	Vulnerable	Excluded Habitat for this species was not considered suitable in the development site. The site is substantially degraded. There are no BioNet records for this species within a 5 km radius of the development site.
Grevillea juniperina subsp. *juniperina*	Juniper-leaved Grevillea	N/A	Moderate	Vulnerable	Not Listed	**Included** This species is associated with Wianamatta Shale and may occur in disturbed patches of Cumberland Plain Woodland (PCT 849). There are 554 BioNet records for this species within a 5 km radius of the development

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Species	Common Name	Habitat constraints / Geographic limitations	Sensitivity to gain class	BC Act listing status	EPBC Act Listing status	Justification for exclusion or inclusion
						site. This species was included as a candidate species credit species for targeted surveys.
Haliaeetus leucogaster	White-bellied Sea-Eagle (Breeding)	Other Living or dead mature trees within suitable vegetation within 1 km of rivers, lakes, large dams or creeks, wetlands and coastlines	High	Vulnerable	Not Listed	Excluded This is a dual credit species, and only a species credit species when specific habitat constraints are present for breeding. Although the development site is located within 1 km of a creek, the site does not contain larger patches of intact vegetation or large trees that are suitable for the species to utilise the site. The development site does not contain large rivers, lakes or large dams.
Hieraaetus morphnoides	Little Eagle (Breeding)	Other Nest trees -live (occasionally dead) large old trees within vegetation	Moderate	Vulnerable	Not Listed	Excluded Habitat for this species was not considered suitable in the development site. The development site does not contain old vegetation which may provide nesting locations for this species. The site is substantially degraded. No large nest trees were recorded in the development site.
Lathamus discolour	Swift Parrot (Breeding)	Other As per mapped areas	Moderate	Endangered	Critically Endangered	Excluded The development site is not within DPIE mapped areas.
Litoria aurea	Green and Golden Bell Frog	Semi-permanent / ephemeral wet areas Within 1 km of wet areas/ swamps Within 1 km of swamp/ waterbodies Within 1 km of Waterbody	High	Endangered	Vulnerable	Excluded Habitat for this species was not considered suitable in the development site. The site is substantially degraded. Although a waterbody has been mapped along the southern boundary, no evidence of this 1st order stream was noted during field surveys. Werrington Creek is located more than 1 km from the development site. There are 5 BioNet records for this species within a 5 km radius of the development site. Four records are historic between 1966 and 1998 and a recent 2012 record from a reserve in Blacktown area

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Species	Common Name	Habitat constraints / Geographic limitations	Sensitivity to gain class	BC Act listing status	EPBC Act Listing status	Justification for exclusion or inclusion
						which is located 3 km to the north-east of the development site. The Great Western Highway disconnects the development site and recent record for this species.
Lophoictinia isura	Square-tailed Kite (Breeding)	Other Nest trees	Moderate	Vulnerable	Not Listed	Excluded Habitat for this species was not considered suitable in the development site. The site is substantially degraded. No nest trees were recorded within the development site.
Marsdenia viridiflora subsp. viridiflora – endangered population	Endangered population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith LGA	Those LGAs named in the populations listing	Moderate	Endangered Population	Not Listed	**Included** This species is associated with open shale woodlands such as PCT 849, vegetation zone 1. This species was included as a candidate species credit species for targeted surveys.
Meridolum corneovirens	Cumberland Plain Land Snail	N/A	High	Endangered	Not Listed	**Included** Targeted surveys were conducted for this species within the CPW along the southern boundary in PCT 849 vegetation zone 1. No habitat was present within the regenerating vegetation or other vegetation zones.
Miniopterus australis	Little Bent-winged Bat (Breeding)	Caves 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'	Very High	Vulnerable	Not Listed	Excluded Habitat features for this species are not present at this site. There are no buildings within the development site. This is a dual credit species, and only a species credit species when specific habitat constraints are present for breeding. The development site does not contain breeding habitat such as caves that are suitable for the species to utilise the site. There are 2 BioNet records

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Species	Common Name	Habitat constraints / Geographic limitations	Sensitivity to gain class	BC Act listing status	EPBC Act Listing status	Justification for exclusion or inclusion
		Observation type code 'E nest-roost' With numbers of individuals > 500 Or from the scientific literature				for this species within a 5 km radius of the development site.
Miniopterus orianae oceanensis	Large Bent-winged Bat (Breeding)	Caves 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	Vulnerable	Not Listed	Excluded Habitat features for this species are not present at this site. There are no buildings within the development site. This is a dual credit species, and only a species credit species when specific habitat constraints are present for breeding. The development site does not contain breeding habitat such as caves that are suitable for the species to utilise the site. There are 19 BioNet records for this species within a 5 km radius of the development site.
Myotis macropus	Southern Myotis	Hollow bearing trees Within 200 m of riparian zone / other Bridges, caves or artificial structures within 200 m of riparian zone/waterbodies This includes rivers, creeks, billabongs, dams and other waterbodies on or within 200m of the site	High	Vulnerable	Not Listed	Excluded Although 1st order stream has been mapped along the southern boundary, this does not meet the definition of a 'river'. There are no HBTs within 200m of a waterbody. There are 11 BioNet records for this species within a 5 km radius of the development site.

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Species	Common Name	Habitat constraints / Geographic limitations	Sensitivity to gain class	BC Act listing status	EPBC Act Listing status	Justification for exclusion or inclusion
Ninox strenua	Powerful Owl (Breeding)	Hollow-bearing trees Living or dead trees with hollow >20cm diameter	High	Vulnerable	Not Listed	Excluded This is a dual credit species, and only a species credit species when specific habitat constraints are present for breeding. The hollows recorded within the development site were only small and did not contain large hollow entrance > 20cm diameter. The development site does not contain suitable breeding habitat.
Persoonia bargoensis	Bargo Geebung	N/A	High	Endangered	Vulnerable	Excluded This species is associated with transitional soils. Habitat for this species was not considered suitable in the development site. The site is substantially degraded. There are no BioNet records for this species within a 5 km radius of the development site.
Petaurus norfolcensis	Squirrel Glider	N/A	High	Vulnerable	Not Listed	Excluded Habitat present is substantially degraded such that this species is unlikely to utilise the development site. Habitat in the development site is isolated and disturbed with a higher likelihood of this species more suitable habitat within the locality. Additionally, this species has a strong preference for old growth forests which does not include the development site.
Phascolarctos cinereus	Koala (Breeding)	Other Areas identified via survey as important habitat	High	Vulnerable	Vulnerable	Excluded This is a dual credit species, and only a species credit species when specific habitat constraints are present for breeding. Habitat present is considered unsuitable and substantially degraded such that this species is highly unlikely to utilise the site for breeding. The development does not contain important habitat for this species. There is one recent and one historical

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Species	Common Name	Habitat constraints / Geographic limitations	Sensitivity to gain class	BC Act listing status	EPBC Act Listing status	Justification for exclusion or inclusion
						BioNet record for this species within a 5 km radius of the development site.
Pimelea curviflora var. *curviflora*	Pimelea curviflora var. curviflora	N/A	High	Vulnerable	Vulnerable	Excluded This species occurs on transitional soils on ridgetops which does not include habitat mapped in the development site. The presence of this species was not identified (conspicuous species) and it was determined that the habitat is substantially degraded such that this species is unlikely to occur in the development site. There are no BioNet records for this species within a 5 km radius of the development site.
Pimelea spicata	Spiked Rice-flower	N/A	High	Endangered	Endangered	**Included** This species is known to occur on the Cumberland Plains. There are four BioNet records for this species within a 5 km radius of the development site. This species was included as a candidate species credit species for targeted surveys.
Pommerhelix duralensis	Dural Land Snail	Other Leaf litter and shed bark or 50m of litter or bark/rocky areas Rocks or within 50 m of rocks/ fallen / standing dead timber including logs Including logs and bark or within 50 m of logs or bark	High	Endangered	Endangered	Excluded Habitat present is substantially degraded such that this species is unlikely to utilise the development site. This species is distributed in north-west Sydney between Rouse Hill, Cattai and Wiseman's Ferry. The development site is not located within the geographic distribution of this species distribution. There are no BioNet records for this species within 5 km radius of the development site.
Pteropus poliocephalus	Grey-headed Flying-fox (Breeding)	Other Breeding camps	High	Vulnerable	Vulnerable	Excluded This is a dual credit species, and only a species credit species when specific habitat constraints are present

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Species	Common Name	Habitat constraints / Geographic limitations	Sensitivity to gain class	BC Act listing status	EPBC Act Listing status	Justification for exclusion or inclusion
						for breeding. The development site does not contain any breeding sites that are suitable for the species to utilise. The nearest bat camp is Wetherill Park and the nearest Nationally Important Flying-fox Camp is located at Paramatta Park, 25 km away.
Pterostylis saxicola	Sydney Plains Greenhood	N/A	Moderate	Endangered	Endangered	Excluded This species is associated with shallow soils on sandstone rock shelves above cliff lines. Habitat for this species was not recorded within in the development site. There are no BioNet records for this species within 5 km radius of the development site.
Pultenaea pedunculata	Matted Bush-pea	N/A	High	Endangered	Not Listed	Excluded This species is associated with dry gullies with loamy soils. Habitat for this species was not recorded within the development site. The site is substantially degraded. There are no BioNet records for this species within 5 km radius of the development site.
Thesium australe	Austral Toadflax	N/A	Moderate	Vulnerable	Vulnerable	Excluded This species is associated with coastal headlands and grassy woodlands. The site is substantially degraded. There are no BioNet records for this species within 5 km radius of the development site.
Tyto novaehollandiae	Masked Owl (Breeding)	Hollow bearing trees Living or dead trees with hollows > 20cm diameter	High	Vulnerable	Not Listed	Excluded This is a dual credit species, and only a species credit species when specific habitat constraints are present for breeding. The development site does not contain habitat such as trees with large hollows that are suitable for the species to utilise the site for breeding. There is one BioNet record for this species within a 5 km radius of the site.

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1.6.1 Targeted surveys

Targeted surveys for species credit species were undertaken at the development site on the dates outlined in Table 16. The locations of targeted surveys are shown in Figure 7. Weather conditions during the targeted surveys are outlined in Table 17. A list of previous targeted surveys identified during the literature review is provided in Table 5.

Surveys for threatened flora species involved parallel traverses in accordance with the threatened species survey guidelines (DPIE 2020d) in suitable habitat (i.e. PCT 849_intact CPW) and random meander through the remaining vegetation in the development site.

Surveys for Cumberland Plain Land Snail involved raking back accumulated leaf litter around the base of *Eucalyptus tereticornis* (Forest Red Gum) and *Eucalyptus moluccana* (Grey Box) and searching under logs (where present) or cluster of native grasses.

Table 16: Targeted surveys

Date	Surveyors	Target species	Survey period	Methodology
Flora species				
27 November 2019 9 July 2020	Belinda Failes and Stacey Wilson Belinda Failes	*Acacia pubescens*	All year	Flora transects in PCT 849 vegetation zone 1 and random meander in remaining vegetation zones. Traverses of the development site were conducted over two occasions, one in November 2019 and one in July 2020.
27 November 2019	Belinda Failes and Stacey Wilson	*Grevillea juniperina* subsp. *juniperina*	All year	Flora transects in PCT 849 vegetation zone 1 and random meander in remaining vegetation zones.
27 November 2019	Belinda Failes and Stacey Wilson	*Marsdenia viridiflora* subsp. *viridiflora*	November - February	Flora transects in PCT 849 vegetation zone 1 and random meander in remaining vegetation zones.
27 November 2019 9 July 2020	Belinda Failes and Stacey Wilson Belinda Failes	*Pimelea spicata*	All year	Flora transects in PCT 849 vegetation zone 1 and random meander in remaining vegetation zones. July surveys were conducted 4 weeks after at least 30mm rainfall in accordance with guidelines.
Fauna species				
27 November 2019 9 July 2020	Belinda Failes and Stacey Wilson Belinda Failes	*Meridolum corneovirens* Cumberland Plain Land Snail	All year	Survey for snail shells at three locations in PCT 849 vegetation zone 1. Vegetation zones 2-4 did not contain suitable habitat for this species. Survey involved approximately 5 – 10 mins digging in leaf litter within a 1 m buffer around base of *Eucalyptus tereticornis* or *E. moluccana*.

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Table 17: Weather conditions (Penrith station 06713)

Date	Rainfall (mm)	Minimum temperature ^{0}C	Maximum temperature ^{0}C
27 November 2019	1	11.5	29.4
9 July 2020	0.2	4.1	18.5

The results of the targeted surveys are provided in Table 18. No threatened flora or fauna species were observed during targeted surveys. The vegetation within the development site does not support suitable habitat for threatened species as it has been cleared and grazed. The justification to why species credit species were not included in the assessment are outlined in the table below.

Table 18: Survey results and justifications

Species	Common Name	Species recorded during survey	Justification
Acacia pubescens	Downy Wattle	No	This conspicuous species was not recorded during targeted surveys. The vegetation within the development site is highly disturbed and does not provide suitable habitat for this species. This species is unlikely to persist in the soil seed bank. This species is not considered a species credit species.
Grevillea juniperina subsp. *juniperina*	Juniper-leaved Grevillea	No	This conspicuous species was not recorded during targeted surveys. The vegetation within the development site is highly disturbed and does not provide suitable habitat for this species. This species is unlikely to persist in the soil seed bank. This species is not considered a species credit species.
Marsdenia viridiflora subsp. *viridiflora*	-	No	This conspicuous species was not recorded during targeted surveys. The vegetation within the development site is highly disturbed and does not provide suitable habitat for this species. This species is unlikely to persist in the soil seed bank. This species is not considered a species credit species.
Pimelea spicata	Spiked Rice-flower	No	The vegetation within the development site is highly disturbed and does not provide suitable habitat for this species. This species is unlikely to persist in the soil seed bank. This species is not considered a species credit species.
Meridolum corneovirens	Cumberland Plain Land Snail	No	No live snails or empty shells recorded in PCT 849 vegetation zone 1. The vegetation within the development site is highly disturbed and does not provide suitable habitat for this species. This species is not considered a species credit species.

1.6.2 Expert reports

Expert reports have not been prepared as part of this BDAR.

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2. Stage 2: Impact assessment (biodiversity values)

2.1 Avoiding impacts

2.1.1 Locating a project to avoid and minimise impacts on vegetation and habitat

The project will result in the removal of native vegetation from within the development site. However, the site is located in an urban area which avoids and minimises impacts to better quality vegetation and more important habitat in the locality, as outlined in Table 19. This development has also been designed in a way to avoid and minimise impacts. These matters have been addressed in Table 19.

Table 19: Locating a project to avoid and minimise impacts on vegetation and habitat

Approach	How addressed	Justification
Locating the project in areas where there are no biodiversity values	The project has utilised areas where there are few biodiversity values including areas of exotic vegetation and open exotic grasslands. However, the development also proposes to affect land mapped under the Biodiversity Vales Map which contains high biodiversity values.	The development footprint has been designed to utilise open cleared areas which contains low biodiversity values. The biodiversity values to be affected by the location of the project area in poor condition (such as low vegetation integrity score – PCT 849 vegetation 2-4) and exotic vegetation. The proposed development footprint also proposes to construct bioretention basins and playground within the area of high biodiversity values. About 0.43 ha of PCT 849 vegetation zone 1 will be affected and an additional 0.36 ha will be retained.
Locating the project in areas where the native vegetation or threatened species habitat is in the poorest condition	The majority of the project has been designed and located within areas of disturbed vegetation and threatened species habitat is considered marginal foraging habitat. The proposed will also impact upon vegetation in vegetation zone 1 which contains better condition vegetation.	The project has been generally located in previously cleared vegetation which does not contain foraging (such as canopy species) or roosting habitat (HBTs) for threatened species. This vegetation contains regenerating immature saplings, shrubs or grasses. The proposed playground, road, paths and one of the bioretention basins is located in a patch of high biodiversity values. Areas which contain weeds have been utilised as part of the parkland structures. Basins have been strategically placed due to the topography of the landscape. Areas of high biodiversity value including high species richness and hollow-bearing trees will be retained in the south as part of the residual lot and maintained as part of a Vegetation Management Plan.
Locating the project in areas that avoid habitat for species and vegetation in high threat categories (e.g. an EEC or CEEC), indicated by the biodiversity risk weighting for a species	The project has been designed and located within areas of disturbed CEEC vegetation and areas of quality CEEC.	The development site will result in impacts to highly modified PCT 849 listed as CEEC under the BC Act. This includes impacts to vegetation zones 2-4 (DNG and regenerating CPW). Areas of better quality CPW listed under the BC Act and EPBC Act will be retained where possible. However, the project has located

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Approach	How addressed	Justification
		paths, playground and a basin within areas of high biodiversity values which contains CEEC.
Locating the project such that connectivity enabling movement of species and genetic material between areas of adjacent or nearby habitat is maintained	The development site has limited connectivity value for movement of species and genetic material. Connectivity for highly mobile species will be maintained.	The project is located in a fragmented landscape. A small patch of Intact vegetation was recorded to the west of O'Connell Street. Intact vegetation is limited within the assessment area. The native vegetation within the development site is fragmented and limited to stepping-stone habitat provided by isolated patches of vegetation. Connectivity is likely to be limited to highly mobile species such as threatened birds and bats. Vegetation retained in the southern portion of the development site will continue to facilitate some movement of these highly mobile species.

2.1.2 Designing a project to avoid and minimise impacts on vegetation and habitat

The development has been designed in a way which avoids and minimises impacts as outlined in Table 20.

Table 20: Designing a project to avoid and minimise impacts on vegetation and habitat

Approach	How addressed	Justification
Reducing the clearing footprint of the project	The clearing footprint has been minimised where possible within the scope of the development by retaining a small patch of native vegetation.	Some effort has been made in the design to avoid affecting native vegetation at the southern extent of the development site. This includes locating the north-western bioretention basin in cleared areas. Additionally, the parklands have located structures within areas of high weeds and retained areas of higher biodiversity values within the CEEC.
Locating ancillary facilities in areas where there are no biodiversity values	Ancillary features will be located within previously cleared areas or highly disturbed vegetation. One bioretention basin in the south-east, paths and playground structures have been located within areas of high biodiversity values.	Some ancillary features for the purposes of construction will be located within the development footprint and such will avoid additional impacts to areas containing biodiversity values or connectivity features. The parkland, road paths and one bioretention basin will be located within areas of high biodiversity value.
Locating ancillary facilities in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e. areas that have a lower vegetation integrity score)	Ancillary facilities will be located within areas of woody weeds within the CEEC, however these areas still contained a high vegetation integrity score.	The parklands, paths and basin have been located at the weedy outer edge of the vegetation zone 1. This vegetation zone had the highest integrity score. The ancillary facilities

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Approach	How addressed	Justification
		will impact upon vegetation with the highest integrity score.
Locating ancillary facilities in areas that avoid habitat for species and vegetation in high threat status categories (e.g. an EEC or CEEC)	Ancillary facilities will be located within the operational footprint.	Some ancillary features will be located within the development footprint and such will avoid additional impacts to areas containing biodiversity values or connectivity features. The north-west basin is located within area of open exotic vegetation. However, the south-eastern basin will result in disturbance to the CEEC.
Providing structures to enable species and genetic material to move across barriers or hostile gaps	Connectivity of vegetation is currently likely to be used only by high mobile species such as birds and bats. This limited connectivity will not be substantially affected. Structures to enable species and genetic material to move across barriers will not be constructed.	The project is located in a fragmented landscape. Intact vegetation was recorded directly west of the development site. Connectivity between these areas and vegetation within the development site is fragmented and limited.
Making provision for the demarcation, ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on the development site.	The development footprint is to be clearly demarcated to avoid impacts to retained vegetation. Provisions have been made to conserve the remaining native vegetation as part of a VMP within the development site.	The development footprint is to be clearly demarcated to avoid impacts to retained vegetation. The native vegetation at the southern portion of the development site will be retained. A Vegetation Management Plan has been prepared and will provide guidance on the conservation of the retained native vegetation. Additional trees will be planted as part of landscaping works.

2.1.3 Prescribed biodiversity impacts

The development site contains prescribed biodiversity impacts.

The list of potential prescribed impacts as per the BAM is provided below:

- Occurrence of karst, caves, crevices and cliffs – none occur within the development site
- Occurrence of rock – no rock outcrops or scattered rocks occur within the development site
- Occurrence of human made structures and non-native vegetation – **Yes, see section below**
- Hydrological processes that sustain and interact with the rivers, streams and wetlands – **See response below**.
- Proposed development for a wind farm and use by species as a flyway or mitigation route – the project does not involve any wind farm development.

Additional information regarding consideration of the removal of non-native vegetation is provided below. Non-native vegetation was identified and assessed for any potential to provide habitat for threatened flora and fauna species, including presence of hollow bearing trees and foraging resources

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(such as flowers or fruit). Hollow-bearing trees may provide important habitat (roosting and/or breeding habitat) for threatened microbat species.

Non-native vegetation includes open exotic grasslands which provides foraging habitat for threatened raptor species such as *Circus assimilis* (Spotted Harrier), *Hieraaetus morphnoides* (Little Eagle) and *Lophoictinia isura* (Square-tailed Kite). No nesting habitat for these raptor species were recorded within the development site.

Threatened microbats may on occasion forage over non-native canopy and open grasses. No suitable roosting or breeding habitat in non—native vegetation was recorded in the development site. These include:

- *Miniopterus australis* (Little Bent-winged Bat)
- *Miniopterus orianae oceanensis* (Large Bent-winged Bat)
- *Falsistrellus tasmaniensis* (Eastern False Pipistrelle)
- *Micronomus norfolkensis* (Eastern Coastal Free-tailed Bat)
- *Saccolaimus flaviventris* (Yellow-bellied Sheath-tail Bat)
- *Scoteanax rueppellii* (Greater Broad-nosed Bat).

Non-native vegetation also includes woody weeds such as and *Olea europaea* ssp. *cuspidata* (African Olive). No woody weeds were identified as containing suitable hollows (i.e. for birds or microbats) or suitable foraging for threatened species. However, possums have been previously recorded in the development site (Travers 2017) and are considered a prey item for *Ninox strenua* (Powerful Owl). No breeding habitat was recorded for the Powerful Owl.

The development site contains occasional fruit trees which may provide supplementary foraging for *Pteropus poliocephalus* (Grey-headed Flying Fox).

Human made structures such as buildings have been removed from within the development footprint.

There is one mapped watercourse within the southern boundary of the development site. This watercourse was not evident during field surveys

Table 21: Prescribed biodiversity impacts

Prescribed biodiversity impact	Description in relation to the development site	Threatened species or ecological communities effected
Impacts of development on the habitat of threatened species or ecological communities associated with: • karst, caves, crevices, cliffs and other geological features of significance, or • rocks, or • human made structures, or • non-native vegetation	The development site contains fruiting and nectar producing non-native vegetation and woody weeds which will be removed as part of the development proposal. This provides foraging habitat for common urban arboreal mammals (possums) which in turn provides foraging opportunities for threatened nocturnal bird species. The development site contains exotic grasslands which may provide foraging habitat for threatened raptor species.	Potential foraging habitat for *Pteropus poliocephalus* (Grey-headed Flying Fox). Potential foraging habitat for *Ninox strenua* (Powerful Owl). Potential foraging habitat for threatened microbat and raptor species above non-native vegetation canopy.

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Prescribed biodiversity impact	Description in relation to the development site	Threatened species or ecological communities effected
	The planning proposal will result in a reduction in the extent of foraging habitat and reduction in availability of their prey items. Roosting habitat for microbats in non-native vegetation is considered to be negligible.	
Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range	The proposed development will require the removal of non-native vegetation from within the development site. The development will result in a minor reduction in the extent of non-native vegetation within the development site. This vegetation may provide stepping stone habitat between urban fragmented patches of vegetation.	Reduction in extent of potential foraging habitat for Grey-headed Flying Fox. Reduction in extent of potential habitat for Powerful Owl. Reduction in extent of potential foraging habitat for other threatened microbats and raptors species.
Impacts of development on movement of threatened species that maintains their lifecycle	The proposed development will result in reduction of vegetation within the development site and marginal loss of potential connectivity for mobile threatened species.	Grey-headed Flying Fox, Powerful Owl, microbat and raptor species.
Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including from subsidence or upsidence resulting from underground mining)	The development site contains one mapped 1st order stream. This stream does not currently function as a 'river' as it does not contain a defined bed and bank and does not support hydrological processes. Therefore, the proposed development does not involve impacts to water bodies or hydrological processes. The development will result in construction of two bioretention basins to improve water quality.	The development does not contain threatened species or threatened ecological communities which are dependent upon hydrological flow or water bodies. The installation of the bioretention basins will be conducted to provide on-site water storage and manage water quality. A set-back around the basins have been provided to manage impacts and implementation of a VMP will protect the TEC on site.

2.1.3.1 Locating and designing a project to avoid and minimise prescribed biodiversity impacts

The development has been located and designed in a way which avoids and minimises prescribed biodiversity impacts as outlined in Table 22.

Table 22: Locating a project to avoid and minimise prescribed biodiversity impacts

Approach	How addressed	Justification
Locating and designing the development to avoid direct impacts on the non- native vegetation and human made structures	There are currently no human-made structures in the development site. Non-native vegetation will be removed from the development site.	The project design has utilised the majority of the disturbed vegetation for construction works and will retain a small patch of native vegetation along the southern boundary. Areas impacted within the development site includes non-native vegetation. The non-native vegetation in the

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Approach	How addressed	Justification
		development site includes disused orchard species such as nuts, citrus trees and stone fruit trees. Non-native orchard trees will be removed from site. The removal of these trees ensures that TECs are protected in the development site. While orchard trees may provide supplementary foraging for Grey-headed Flying-fox, these trees are only fragmented and do not represent important habitat for threatened species.
Locating and designing the development to avoid severing or interfering with corridors connecting different areas of habitat, migratory flight paths to important habitat or preferred local movement pathways	The development site is fragmented by major arterial roads which limits migratory/foraging connectivity and exchange of genetic material of flora species and less mobile fauna species between patches of vegetation.	As above, in the context of the surrounding locality, it is considered that vegetation is in a disturbed condition and already highly fragmented. Thus, the project design is considered to be located in an area where exchange of genetic material between adjacent or nearby habitat is already limited.
Optimising project layout to minimise interactions with threatened and protected species and ecological communities, e.g. designing turbine layout to allow buffers around features that attract and support aerial species, such as forest edges, riparian corridors and wetlands, ridgetops and gullies	The development design has utilised areas with minimal impacts to biodiversity values.	The development design has utilised existing disturbed areas to minimise interactions with threatened species habitat and retained vegetation which may provide habitat for threatened species.

2.2 Assessment of Impacts

2.2.1 Direct impacts

The direct impacts of the development on:

- native vegetation are outlined in Table 23
- threatened ecological communities are outlined in Table 24
- threatened species and threatened species habitat is displayed in Figure 7
- prescribed biodiversity impacts are outlined in Section 2.2.2

Direct impacts including the final project footprint (construction and operation) are shown on Figure 8.

Table 23: Direct impacts to native vegetation

Veg zone	PCT ID	PCT Name	Condition	Direct impact (ha)
1	849	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (Cumberland Plain Woodland	Intact CPW	0.43

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Veg zone	PCT ID	PCT Name	Condition	Direct impact (ha)
2	849	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (Cumberland Plain Woodland	Regenerating CPW	0.51
3	849	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (Cumberland Plain Woodland	DNG	0.19
4	849	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (Cumberland Plain Woodland	DNG_olives	2.21

Table 24: Direct impacts on threatened ecological communities

PCT ID	BC Act			EPBC Act		
	Listing status	Name	Direct impact (ha)	Listing status	Name	Direct impact (ha)
849	CEEC	Cumberland Plain Woodland in the Sydney Basin Bioregion	3.34	CEEC	Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest	0.43

2.2.2 Change in vegetation integrity

The change in vegetation integrity as a result of the development is outlined in Table 25.

A separate management zones was added to PCT 849 vegetation zone 1 to account for the creation of informal paths through the vegetation. Some of the characteristics of the vegetation zone will be retained (i.e. the canopy structure). The future integrity score assumes that the canopy will remain in this management zone (for vegetation zone 1). Therefore, the species diversity and percent cover will remain, however, the ground cover and midstorey will be reduced (see Table 43 in Appendix B). The combined change to the vegetation integrity score for vegetation zone is -41.7.

Table 25: 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	Intact CPW_direct	0.42	42	0	-42
1	849	Intact CPW_paths	0.01	42	10.1	-31.8
2	849	Regenerating CPW	0.51	12.1	0	-12.1
3	849	DNG	0.19	2.8	0	-2.8
4	849	DNG_olives	2.21	1.5	0	-1.5

2.2.3 Indirect impacts

The indirect impacts of the development are outlined in Table 26.

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Table 26: Indirect impacts

Indirect impact	Project phase	Nature	Extent	Frequency	Duration	Timing
Sedimentation and contaminated and/or nutrient rich run-off	Construction	Runoff during construction works	Confined to development site with sediment fencing	During heavy rainfall or storm events	During rainfall events	Short-term impacts
Noise, dust or light spill	Construction	Noise and dust created from machinery (no night works proposed therefore no light spill). Impacts to fauna from new street lights.	Noise and dust likely to carry beyond development site boundary. Impacts to fauna within the site and roosting in the retained vegetation.	Daily, during construction works During life of the project	Sporadic throughout construction period On-going	Short-term impacts Long-term impacts
Inadvertent impacts on adjacent habitat or vegetation	Construction	Damage to adjacent habitat or vegetation	Adjacent vegetation	Daily, during construction works	Throughout construction period	Short-term impacts
Transport of weeds and pathogens from the site to adjacent vegetation	Construction	Spread of weed seed or pathogens	Potential for spread into adjacent habitat	Daily, during construction works	Sporadic throughout construction period	Potentially long-term impacts
Vehicle strike	Construction / operation	Potential for native fauna to be struck by working machinery and moving vehicles	Within access road and development site	Daily, during both construction and operational phases.	Throughout life of project	Short-term impacts
Rubbish dumping	Construction / operation	Potential for rubbish to impact upon the quality and health of fauna and flora species or their habitat retained in the development site.	Within the development site and spread to adjacent properties.	Daily, during both construction and operational phases.	Throughout life of project	Short-term impacts
Disturbance to specialist breeding and foraging habitat	Construction / operation	Hollow-bearing trees were identified in the vegetation to be retained. These may provide roosting or breeding habitat for microbats. These	Within retained vegetation	Daily, during construction and operation phases.	Throughout life of project	Short term and long-term impacts.

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Indirect impact	Project phase	Nature	Extent	Frequency	Duration	Timing
		habitats may be impacted by noise, vibration or artificial lights at night.				
Displacement of native fauna species	Construction	Loss of roosting/sheltering habitat or loss of foraging habitat.	Within the development site	Construction and operational phase	Throughout project	Long- and short-term impacts
Change in edge effects from clearing of vegetation and installation of basins and parklands	Construction / operation	A patch of vegetation along the southern boundary may be subject to edge effects as a result to the proposed development.	The vegetation represents a TEC. Edge effects are likely to be minimal and managed under a VMP.	Construction and operational phase	Throughout project	Long- and short-term impacts
Wood collection	Construction / operation	Minimal woody debris available for collection	Within retained vegetation	Daily, during construction and operation phases.	Throughout life of project	Short term and long-term impacts.

2.2.4 Prescribed biodiversity impacts

The development site has the prescribed biodiversity impacts as outlined in Table 27.

Table 27: Direct impacts on prescribed biodiversity impacts

Prescribed biodiversity impact	Nature	Extent	Frequency	Duration	Timing
Impacts of development on the habitat of threatened species or ecological communities associated with: • karst, caves, crevices, cliffs and other geological features of significance, or • rocks, or • human made structures, or • non-native vegetation	Construction / operation / on-going	Confined to the development site. Redevelopment of the existing buildings and removal of non-native vegetation	Daily, during construction works Ongoing additional noise, vibration	Throughout construction period	Short-term impacts
Impacts of development on the connectivity of different areas of habitat of	Construction / operation / on-going	Confined to the development site	Daily, during construction works	Throughout construction period	Short-term impacts

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Prescribed biodiversity impact	Nature	Extent	Frequency	Duration	Timing
threatened species that facilitates the movement of those species across their range		Production of noise and vibration	Ongoing additional noise and vibration during construction		
Impacts of development on movement of threatened species that maintains their lifecycle	Construction / operation / on-going	Confined to the development site	Daily, during construction works Ongoing additional noise and vibration during construction	Throughout construction period	Short-term impacts

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2.2.5 Mitigating and managing impacts

Measures proposed to mitigate and manage impacts at the development site before, during and after construction are outlined in Table 28.

Table 28: Measures proposed to mitigate and manage impacts

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
Sediment barriers or sedimentation ponds to control the quality of water released from the site into the receiving environment	Moderate	Minor	Appropriate controls are to be utilised to manage exposed soil surfaces and stockpiles to prevent sediment discharge into retained lands. Soil and erosion measures such as sediment fencing, clean water diversion must be in place prior the commencement of the construction work.	Erosion and sedimentation will be controlled	For the duration of construction works	Project Manager
Prevent impacts of noise, dust and light spill on fauna species	Moderate	Minor	Construction lights or development lights should be positioned to prevent shine into retained vegetation. Street lights should use ecologically sensitive designs including use of shields and timers and positioned away from retained vegetation. Noise should be limited to construction hours only. Dust should be managed through appropriate dust control management plan.	Avoid impacts from artificial lighting on nocturnal or diurnal species. Reduction of noise outside of operation hours. Management of dust.	For the duration of the construction works and long-term	Project Manager
Prevent damage to vegetation retained on site	High	Moderate	Clearly delineate clearance limits and identify all trees for removal. Install 'No-go' fencing around vegetation to be retained prior to any works on site.	Prevent accidental removal of native vegetation Prevent damage to retained revegetation	For the duration of construction works	Project Manager

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Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
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	Moderate	Minor	Pre-clearance survey of trees to be removed and identification / location of habitat trees (i.e. for birds or possums) by a suitably qualified ecologist. Trees identified for retention should be clearly delineated as a 'No Go' zone with high visibility bunting. Supervision by a qualified ecologist/licensed wildlife handler during habitat tree removal in accordance with best practise methods. Any tree removal is to be undertaken by a suitably qualified and insured arborist.	Any fauna utilising habitat within the development site will be identified and managed to ensure clearing works minimise the likelihood of injuring resident fauna	During clearing works	Project Manager / Ecologist
Hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas	Moderate	Minor	Vehicles, machinery should be cleaned of soil prior to entry into the development site as external soil may contain pathogens or disease. Weed management to be undertaken as part of the VMP.	Spread of weeds prevented	Post-construction	Project Manager
Prevent the displacement of resident fauna	Moderate	Minor	Pre-clearance survey of trees to be removed and identification/location of habitat trees by a suitably qualified ecologist. Supervision by a qualified ecologist/licensed wildlife handler during tree removal in accordance with best practice methods. Kangaroo exclusion fencing is to be installed prior to works on site.	Resident fauna relocated in a sensitive manner	Prior to and during clearing works	Project Manager/ Ecologist
Timing works to avoid critical life cycle events such as breeding or nursing individuals	Moderate	Minor	Where possible within construction timelines, avoid clearing works in later winter/spring during breeding/ nesting season for animals.	Impacts to fauna during nesting/nursing season avoided	During clearing works	Project Manager

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Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
Making provision for the ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on or adjacent to the development site	Minor	Negligible	Landscaping in the development site is to use locally derived native species and those found within the PCTs present (PCT 849). Vegetation will be retained and managed as part of the VMP.	Areas within the development site will be landscaped using appropriate species	Throughout construction and following completion of construction activities.	Project Manager
Prevent the dumping of rubbish found on site	Minor	Negligible	Waste bins to be present on site. Covers to be used to prevent blown litter and the entry of pest animals or rain. Removal and appropriate disposal of general. New parkland should include waste and recycling bins.	Dumping of rubbish during construction prevented	For the duration of the construction works	Project Manager
Staff training and site briefing to communicate environmental features to be protected and measures to be implemented	Minor	Negligible	Construction staff to be briefed prior to work commencing to be made aware of any sensitive biodiversity values present and environmental procedures such as: • Site environmental procedures (vegetation management, sediment and erosion control, exclusion fencing and weeds) • What to do in case of environmental emergency (chemical spills, fire, injured fauna) Key contacts in case of environmental emergency.	All staff entering the development site are fully aware of all the ecological values present within the Lot and environmental aspects relating to the development and know what to do in case of any environmental emergencies.	To occur for all staff entering/working at the development site. Site briefings should be updated based on phase of the work and when environmental issues become apparent.	Project Manager

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2.2.6 Serious and Irreversible Impacts (SAII)

The development has candidate Serious and Irreversible Impacts (SAII) values as outlined in Table 29. The threshold for Cumberland Plain Woodland listed under the BC Act provided in the Threatened Biodiversity Data Collection (DPIE BioNet) lists it as 'Under Development'. There is currently no threshold to guide the consent authority in assessing candidates for SAII. It is the role of the consent authority (Penrith City Council) to determine if an impact on an entity constitutes a SAII. Table 30 provides justification of Cumberland Plain Woodland as a SAII entity in accordance with the Principles 1-4.

Detailed consideration of whether impacts on candidate TECs are serious and irreversible is included in Table 31.

Table 29: Candidate Serious and Irreversible Impacts

Species / Community	Principle	Direct impact individuals / area (ha)	Threshold
Cumberland Plain Woodland	1 - 4	3.34	Listed as 'under development'

Table 30: Determining whether impacts are serious and irreversible

Determining whether impacts are serious and irreversible	Assessment
Principle 1	
Does the proposal impact on a species, population or ecological community that is a candidate entity because it is in a rapid rate of decline?	Yes
If yes, is the impact in excess of any threshold identified and therefore likely to be serious and irreversible?	There are currently no thresholds for Cumberland Plain Woodland listed in the Threatened Biodiversity Data Collection provided in DPIE BioNet. Cumberland Plain Woodland is listed as a SAII candidate as it has undergone a dramatic rate of decline due to the extent of vegetation clearance. However, the vegetation within the development site is a highly degraded form of Cumberland Plain Woodland present as regenerating/DNG vegetation. A portion of the intact Cumberland Plain Woodland will also be removed as part of the proposed development.
Principle 2	
Does the proposal impact on a species that is a candidate entity because it has been identified as having a very small population size?	Yes
If yes, is the impact in excess of any threshold identified and therefore likely to be serious and irreversible?	There are currently no thresholds for Cumberland Plain Woodland. The proposed development will result in the impact to 2.91 ha of low-quality Cumberland Plain Woodland in the form of resprouting canopy and DNG and 0.43 ha of intact Cumberland Plain Woodland.
Principle 3	

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Determining whether impacts are serious and irreversible	Assessment
Does the proposal impact on the habitat of a species or an area of an ecological community that is a candidate entity because it has a very limited geographic distribution?	No
If yes, is the impact in excess of any threshold identified and therefore likely to be serious and irreversible?	There are currently no thresholds for Cumberland Plain Woodland. The development site occurs within the geographic distribution of Cumberland Plain Woodland. The development site is not located within the outer limits of this ecological community.
Principle 4	
Does the proposal impact on a species, a component of species habitat or an ecological community that is a candidate entity because it is irreplaceable?	No
b. If yes, is the impact in excess of any threshold identified and therefore likely to be serious and irreversible?	There are currently no thresholds for Cumberland Plain Woodland. Cumberland Plain Woodland within the development site is not considered irreplaceable as extensive areas of intact Cumberland Plain Woodland has been mapped directly south and west of the development site. The proposed works will not result in a local extinction or result in fragmentation of patches.

Table 31: Evaluation of an impact on a TEC – Cumberland Plain Woodland

Impact Assessment Provisions	Assessment
1. The action and measures taken to avoid the direct and indirect impacts on the potential entity for an SAII	The proposed development has located the proposed subdivision lots in the predominately cleared lands in the north which does not include intact native vegetation. About 2.4 ha of DNG (vegetation zone 3 and 4 combined) and 0.51 ha of regenerating Cumberland Plain Woodland will be removed for the proposed subdivision lot layout. About 0.43 ha of intact Cumberland Plain Woodland will be affected for the construction of the parklands, basin, tracks and roads. About 0.36 ha of intact Cumberland Plain Woodland will be retained within the development site. ELA has prepared a Vegetation Management Plan (VMP) for on-going weed management within this vegetation. Two sediment bioretention basins have been located in open areas where possible to reduce the amount of native vegetation removal. Setbacks of the proposed basins and playground around the vegetation to be retained have been applied to account for potential disturbances and included in the assessment. Indirect impact in the retained Cumberland Plain Woodland will be manage through the VMP.
2. The area and condition of the TEC to be impacted directly and indirectly by the proposed development. The condition	About 0.43 ha of intact Cumberland Plain Woodland (PCT 849_intact CPW vegetation zone 1) will be affected by the

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Impact Assessment Provisions	Assessment
of the TEC is to be represent by the vegetation integrity score for each vegetation zone	proposed development. Vegetation zone 1 had an integrity score of 42 and impacts to this vegetation zone will be offset. Indirect impacts to vegetation zone 1 will be managed through the implementation of a VMP. The remaining Cumberland Plain Woodland was in poor condition. Vegetation zone 2 (regenerating Cumberland Plain Woodland) had a vegetation integrity score of 12.1. Vegetation zone 3 (DNG) had a vegetation integrity score of 2.8 and vegetation zone 4 (DNG_olives) had a vegetation integrity score of 1.5. While still being considered Cumberland Plain Woodland, these areas are of such low quality, they are not required to be offset. This demonstrates the reduced structural and compositional complexity and highly reduced function of the vegetation.
3. A description of the extent to which the impact exceeds the threshold for the potential entity that is specified in the *Guidance to assist a decision-maker to determine a serious and irreversible impact*	The SAII threshold is currently under development for Cumberland Plain Woodland.
4. An estimate of the extent and overall condition of the potential TEC within an area of 1,000 ha and 10,000 ha surrounding the proposed development footprint	The area of Cumberland Plain Woodland within 1,000 ha and 10,000 ha surrounding the development site is estimated at 80.13 ha and 1,222.75 ha respectively (based on OEH 2016 vegetation mapping). The condition is not known for these areas; however, it is expected to range from good to poor. In general, this TEC within 1,000 and 10,000 ha is moderately to highly fragmented with few large, intact patches. The vegetation in the development site to be affected represents 0.5% of the Cumberland Plain Woodland in the 1,000 ha and 0.03 ha in the 10,000 ha area surrounding the development.
5. An estimate of the extant area and overall condition of the TEC remaining before and after the impact of the proposed development has been taken into consideration	The remaining 0.36 ha of Cumberland Plain Woodland to be retained within the development site will be managed in accordance with a VMP for 5 years. This will provide guidance on the management of weeds and revegetation works if required. The proposed development will result in the removal of 0.43 ha of vegetation zone 1. Approximately 0.36 ha will be retained, and its condition will be improved in accordance with the performance criteria provided in the VMP.
6. An estimate of the area of the candidate TEC that is in reserve system within the IBRA region and IBRA subregion.	Within the Sydney Basin IBRA region there is an estimated 1,291.53 ha of Cumberland Plain Woodland remaining in the reserve system. Within the Cumberland Plain IBRA subregion there is also an estimated 1,291.53 ha of Cumberland Plain Woodland remaining within the reserve system. It is estimated that the Cumberland IBRA subregion contains a total of approximately 22,158.8 ha of Cumberland Plain Woodland.
7. The development proposal's impact on:	
a. abiotic factors critical to the long-term survival of the TEC; for example, will the impact lead to a reduction of groundwater levels or substantial alteration of surface water	The proposed development is unlikely to affect abiotic factors critical to the survival of Cumberland Plain Woodland outside of the proposed clearing area. The alteration of

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Impact Assessment Provisions	Assessment
patterns; will it alter natural disturbance regimes that the TEC depends upon, e.g. fire, flooding etc.?	surface water will drain into the basin and discharge away from the Cumberland Plain Woodland.
b. characteristic and functionally important species through impacts such as, but not limited to, inappropriate fire/flooding regimes, removal of under-storey species or harvesting of plants	The development may affect characteristic species and functionally important species such as clearing of native vegetation representative of Cumberland Plain Woodland. A VMP will be provided to protect the remaining Cumberland Plain Woodland. The proposed works may result in the displacement of fauna species including the large population of Eastern Grey Kangaroos which may assist in the function of the Cumberland Plain Woodland. The proposed subdivision is unlikely to increase fire threats due to the removal of vegetation. The basins are likely to prevent flooding issues.
c. the quality and integrity of an occurrence of the TEC through threats and indirect impacts including, but not limited to, assisting invasive flora and fauna species to become established or causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants which may harm or inhibit growth of species in the TEC	There is potential that the remaining Cumberland Plain Woodland may be affected by edge effects including impacts from invasive species and runoff of chemicals from the adjacent lands. Measures to mitigate these impacts are provided in Table 28 and additional measures are provided in the VMP.
8. Direct or indirect fragmentation and isolation of an area of the TEC	The proposed development has potential to reduce the size of the current patch of intact Cumberland Plain Woodland from 0.78 to 0.36 ha. The removal of this vegetation will not result in the loss of connectivity between vegetation to the south of the development site. The proposed development will also result in impacts to 2.4 ha of DNG (vegetation zone 3 and 4 combined) and 0.51 ha of regenerating Cumberland Plain Woodland. Impacts from weeds will be managed through the implementation of the VMP for the first 5 years. On-going weed management should be conducted after this time. Management of trampling of vegetation through human activities will be managed by providing pathways. These pathways are only narrow and are unlikely to result in fragmentation of the vegetation patches. The proposed works including the removal of native vegetation may result in further fragmentation of this vegetation patch.
9. The measures proposed to contribute to the recovery of the TEC in the IBRA subregion.	The VMP will assist in maintaining a small patch of Cumberland Plain Woodland. No other measures are proposed to contribute to the recovery of the TEC.

2.3 Risk assessment

A risk assessment has been undertaken for any residual impacts likely to remain after the mitigation measures have been applied. Likelihood criteria, consequence criteria and the risk matrix are provided in Table 32, Table 33 and Table 34 respectively.

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Table 32: Likelihood criteria

Likelihood criteria	Description
Almost certain (Common)	Will occur, or is of a continuous nature, or the likelihood is unknown. There is likely to be an event at least once a year or greater (up to ten times per year). It often occurs in similar environments. The event is expected to occur in most circumstances.
Likely (Has occurred in recent history)	There is likely to be an event on average every one to five years. Likely to have been a similar incident occurring in similar environments. The event will probably occur in most circumstances.
Possible (Could happen, has occurred in the past, but not common)	The event could occur. There is likely to be an event on average every five to twenty years.
Unlikely (Not likely or uncommon)	The event could occur but is not expected. A rare occurrence (once per one hundred years).
Remote (Rare or practically impossible)	The event may occur only in exceptional circumstances. Very rare occurrence (once per one thousand years). Unlikely that it has occurred elsewhere; and, if it has occurred, it is regarded as unique.

Table 33: Consequence criteria

Consequence category	Description
Critical (Severe, widespread long-term effect)	Destruction of sensitive environmental features. Severe impact on ecosystem. Impacts are irreversible and/or widespread. Regulatory and high-level government intervention/action. Community outrage expected. Prosecution likely.
Major (Wider spread, moderate to long term effect)	Long-term impact of regional significance on sensitive environmental features (e.g. wetlands). Likely to result in regulatory intervention/action. Environmental harm either temporary or permanent, requiring immediate attention. Community outrage possible. Prosecution possible.
Moderate (Localised, short-term to moderate effect)	Short term impact on sensitive environmental features. Triggers regulatory investigation. Significant changes that may be rehabilitated with difficulty. Repeated public concern.
Minor (Localised short-term effect)	Impact on fauna, flora and/or habitat but no negative effects on ecosystem. Easily rehabilitated. Requires immediate regulator notification.
Negligible (Minimal impact or no lasting effect)	Negligible impact on fauna/flora, habitat, aquatic ecosystem or water resources. Impacts are local, temporary and reversible. Incident reporting according to routine protocols.

Table 34: Risk matrix

Consequence	Likelihood				
	Almost certain	Likely	Possible	Unlikely	Remote
Critical	Very High	Very High	High	High	Medium
Major	Very High	High	High	Medium	Medium

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Consequence	Likelihood				
Moderate	High	Medium	Medium	Medium	Low
Minor	Medium	Medium	Low	Low	Very Low
Negligible	Medium	Low	Low	Very Low	Very Low

Table 35: Risk assessment

Potential impact	Project phase	Risk (pre-mitigation)	Risk (post mitigation)
Vegetation clearing	Construction / operation	High	Low
Sedimentation and contaminated and/or nutrient rich run-off	Construction	Medium	Low
Noise, dust or light spill	Construction	Low	Very Low
Displacement of fauna	Construction / operation	High	Low
Inadvertent impacts on adjacent habitat or vegetation	Construction	High	Low
Transport of weeds and pathogens from the site to adjacent vegetation	Construction	Medium	Low
Vehicle strike	Construction / operation	Medium	Low
Rubbish dumping	Construction / operation	Medium	Low
Wood collection	Construction / operation	Medium	Low
Disturbance to specialist breeding and foraging habitat, e.g. beach nesting for shorebirds.	Construction / operation	Medium	Low

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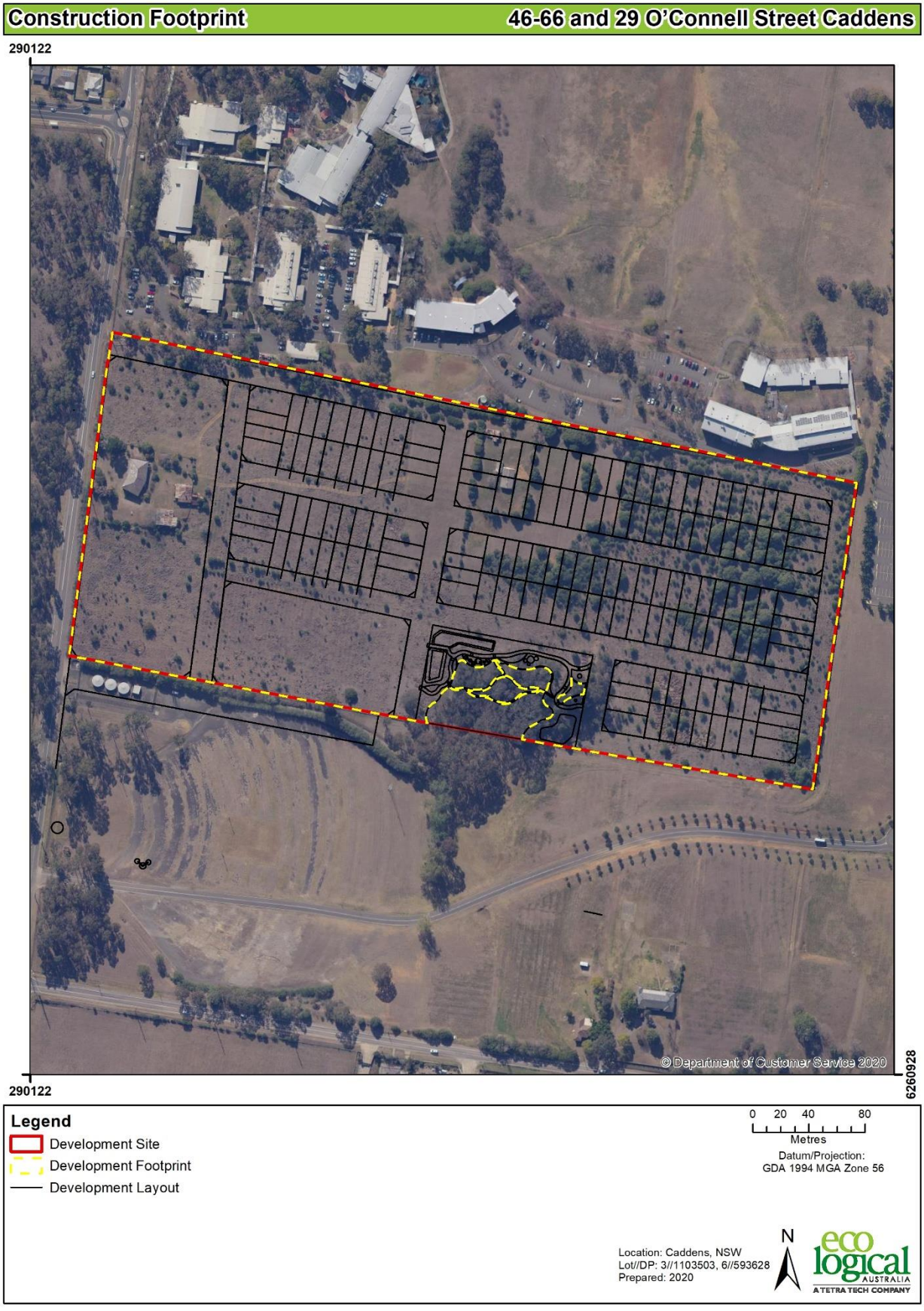

Figure 8: Final project footprint including construction and operation

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2.4 Impact summary

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

2.4.1 Serious and Irreversible Impacts (SAII)

The development has candidate Serious and Irreversible Impact (SAII) values as outlined in Table 36, Table 29 and shown on Figure 9. Detailed consideration of whether impacts on candidate TECs are serious and irreversible is included in Table 31.

Table 36: Serious and Irreversible Impacts Summary

Species / Community	Common Name	Principle	Direct impact individuals / area (ha)
Cumberland Plain Woodland	N/A	1-4	3.34

2.4.2 Impacts requiring offsets

The impacts of the development requiring offset for native vegetation are outlined in Table 37 and shown on Figure 10.

Table 37: Impacts to native vegetation that require offsets

Veg 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 (Cumberland Plain Woodland	Coastal Valley Grassy Woodlands	Grassy Woodlands	0.43

2.4.3 Impacts not requiring offsets

The impacts of the development not requiring offset for native vegetation are outlined in Table 38 and shown on Figure 10.

Vegetation 2 and 3 do not require offsetting as per Section 10.3.1.1 of the BAM - a vegetation zone that has a vegetation integrity score > 15 where the PCT is representative of an endangered or critically endangered ecological community.

Table 38: Impacts to native vegetation that do not require offsets

Veg zone	PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Direct impact (ha)	Rationale
2	849	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (Cumberland Plain Woodland	Coastal Valley Grassy Woodlands	Grassy Woodlands	0.51	Vegetation integrity score (12.1) does not reach the threshold (15) for offset for a TEC.

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Veg zone	PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Direct impact (ha)	Rationale
3	849	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (Cumberland Plain Woodland	Coastal Valley Grassy Woodlands	Grassy Woodlands	0.19	Vegetation integrity score (2.8) does not reach the threshold (15) for offset for a TEC.
4	849	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (Cumberland Plain Woodland	Coastal Valley Grassy Woodlands	Grassy Woodlands	2.21	Vegetation integrity score (1.5) does not reach the threshold (15) for offset for a TEC.

2.4.4 Areas not requiring assessment

Areas not requiring assessment within the development site include those mapped as exotic (8.50 ha). Exotic areas consist of scatted orchard plantings, exotic woody weeds and exotic grasslands. These areas were not mapped as part of a PCT nor did they contain habitat for any threatened species. Buildings and sheds have been previously removed from the development site. Areas not requiring assessment are shown on Figure 12.

2.4.5 Credit summary

The number of ecosystem credits required for the development are outlined in Table 39. A biodiversity credit report is included in Appendix D.

Table 39: Ecosystem credits required

Veg zone	PCT ID	PCT Name	Like for Like credits / Trading Group	Direct impact (ha)	Credits required
1	849	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (Cumberland Plain Woodland	PCT 849, 850 with HBT Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo IBRA region OR Any IBRA subregion within 100 km of the outer edge of the impacted site	0.43	11

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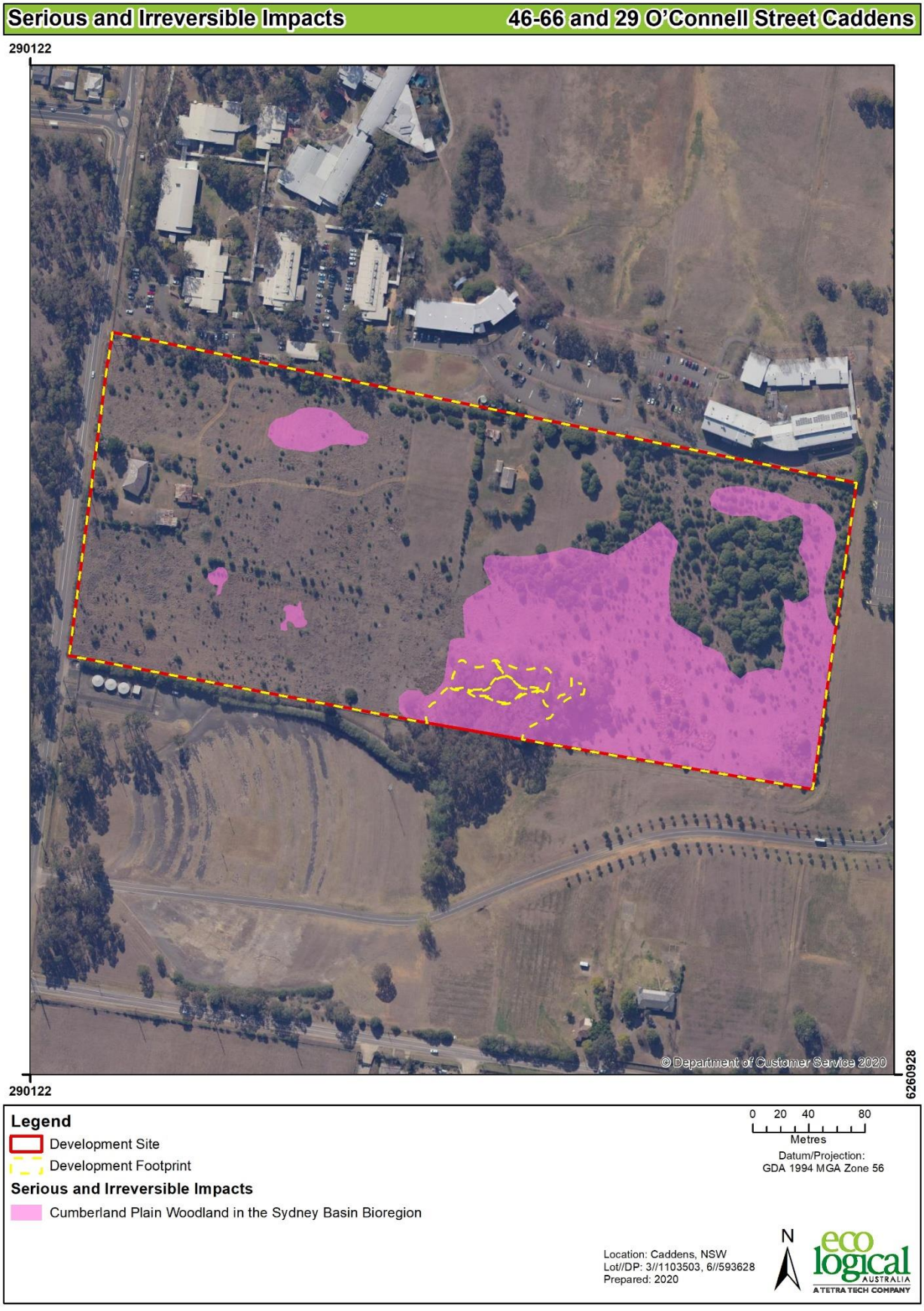

Figure 9: Serious and Irreversible Impacts

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Figure 10: Impacts requiring offset

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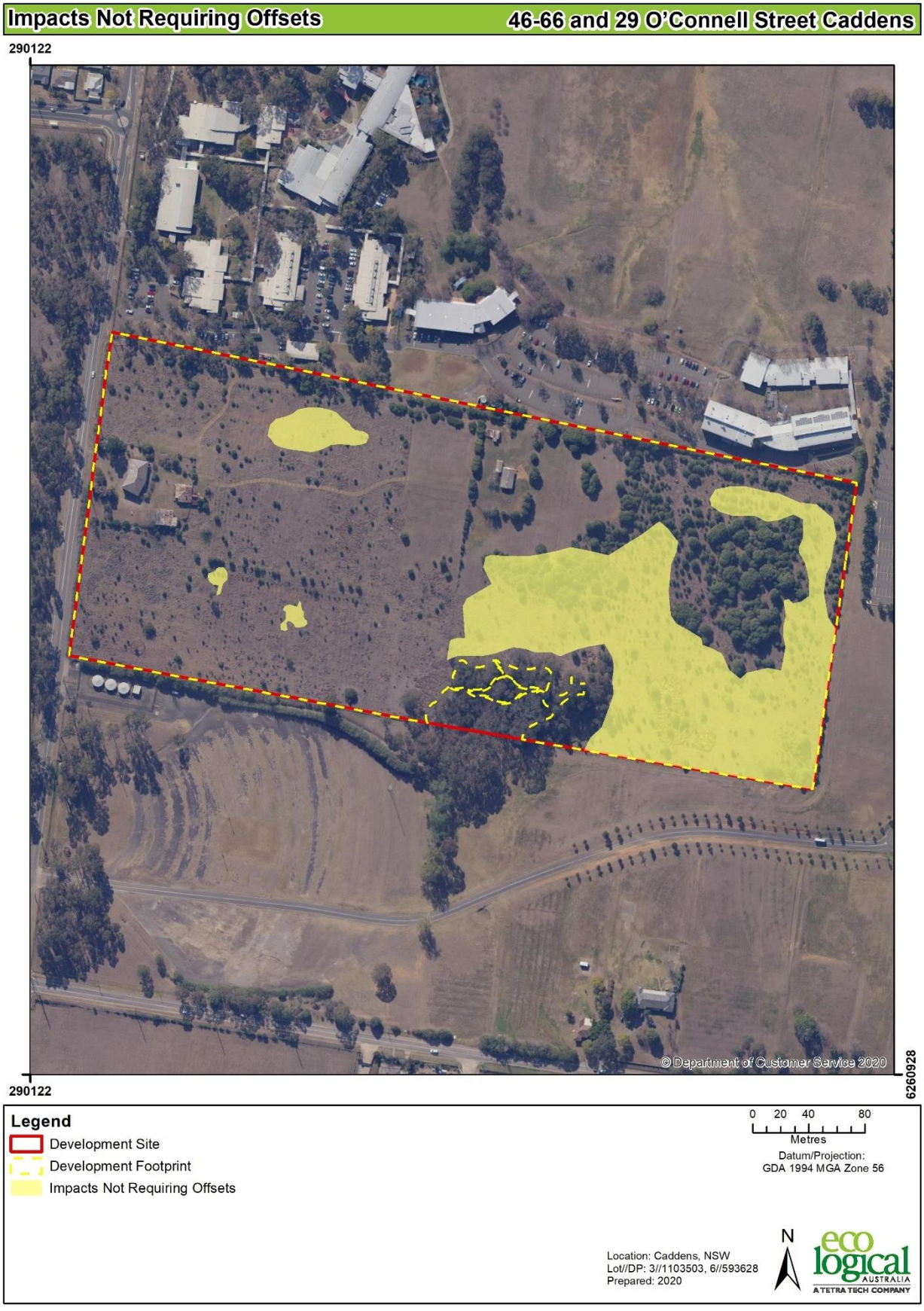

Figure 11: Impacts not requiring offset

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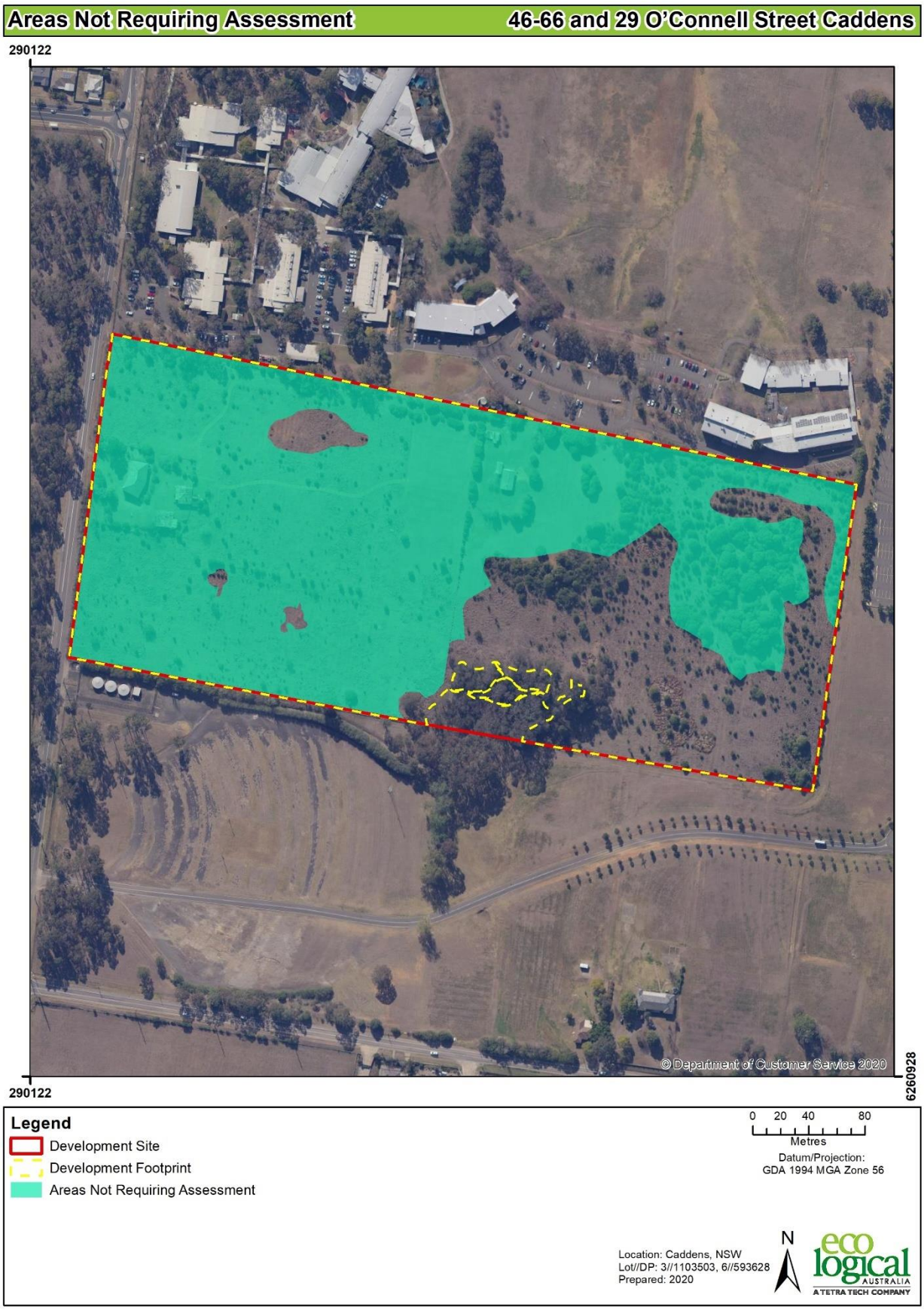

Figure 12: Areas not requiring assessment

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2.5 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 2.5.1.

2.5.1 *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 "Matters of National Environmental Significance" (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 following assessments have been prepared in accordance with the EPBC Act Matters of National Environmental Significance: Significant Impact Guidelines 1.1. These guidelines have been established to assist proponents to determine whether a proposed action is likely to result in a significant impact on MNES.

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 (DECCW 2009).

The closest bat camp is Ropes Creek approximately 3 km east of the development site. The last survey count on August 2019 recorded 500-2,499 individuals. The closest nationally recognised Grey-headed Flying-fox camp is located at Parramatta Park 25 km from the development site (DAWE 2020c).

The vegetation within the development site provides potential seasonal foraging habitat. It is considered likely that this species would use the site on occasion for foraging purposes. According to the National Flying-fox Monitoring Program, no GHFF camps currently occur or have been recorded within the development site (DAWE 2020c).

Table 40: EPBC Act Assessment of Significance for *Pteropus poliocephalus* (Grey-headed Flying-fox)

Criterion	Question	Response
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:		
1)	lead to a long-term decrease in the size of an important population of a species	The Grey-headed Flying-fox is considered one population due to the constant exchange of genetic material between individuals and its movement between camps throughout its entire geographic range (DAWE 2020b). Maternity or other roosting habitat are considered important habitat for this species. No roosting habitat (i.e. camps) have been recorded within the development site. According to the National Flying-fox Monitoring Program, no camps currently occur or have ever

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Criterion	Question	Response
		been recorded within the development site (DAWE 2020c). The nearest active Grey-headed Flying-fox camp occurs approximately 3 km to the east of the development site, within Ropes Creek (DAWE 2020c). The development site contains 0.43 ha of potential foraging habitat for the Grey-headed Flying-fox. An additional 0.36 ha of potential foraging habitat will be retained in the development site. Additional foraging habitat was recorded within the broader locality of the development, this include a patch in the west on the Western Sydney University Kingswood site. Given the proximity of suitable habitat within the assessment area, the removal of this potential foraging habitat is unlikely to lead to the long-term decrease in the size of an important population of Grey-headed Flying-fox.
2)	reduce the area of occupancy of an important population	The proposed development will reduce the extent of available foraging habitat for the Grey-headed Flying-fox. About 0.43 ha of potential foraging habitat will be removed, and 0.36 ha will be retained within the development site. The vegetation within the development site may provide supplementary foraging habitat for this species. The development site does not contain breeding or sheltering habitat (i.e. bat camps). The Grey-headed Flying-fox is known to fly long distances (up to 50 km per night) and move between bat camps. As such this species is likely to utilise a large extent of habitat around the nationally important camp at Parramatta Park or local camp at Ropes Creek. Due to the extent of habitat within a 50 km radius of the known bat camps, the removal of a small amount of native vegetation is unlikely to significantly reduce the extent of occupancy for this species.
3)	fragment an existing important population into two or more populations	The proposed development will affect 0.43 ha of potential foraging habitat in the form of native species within the development site. The proposed works will not affect camps. Additionally, due to the highly fragmented nature of the vegetation within the development site, it is likely that the vegetation affected by the development is considered marginal or supplementary foraging habitat for this species. A large amount of intact better-quality native vegetation was identified directly west of the development site, within Western Sydney University Kingswood. The Grey-headed Flying-fox is a highly mobile species and is considered part of one large population. As the vegetation within the development site is considered supplementary habitat for this species, it is unlikely that the proposed works will result in the fragmentation of populations for this highly mobile species.
4)	adversely affect habitat critical to the survival of a species	The Draft Recovery Plan for the Grey-headed Flying-fox 2017 identifies 'a continuous temporal sequence of productive foraging habitats, linked by migration corridors or stopover habitats, and suitable roosting habitat within

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Criterion	Question	Response
		nightly commuting distance of foraging areas' as habitat critical to the survival of the species. No camps will be affected by the proposed action. The proposed action will affect 0.43 ha of vegetation, some of which comprises suitable foraging habitat for the Grey-headed Flying-fox. The Grey-headed Flying-fox is recorded as travelling long distances (50 km) on feeding forays and suitable habitat is available outside of the development site.
5)	disrupt the breeding cycle of an important population	The proposed action will affect 0.43 ha of vegetation, some of which comprises suitable foraging habitat for the Grey-headed Flying-fox. The proposed action will not disrupt the breeding cycle of the Grey-headed Flying-fox given that no camps will be impacted by the proposed action and suitable foraging habitat is available adjacent to the development site.
6)	modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposed action will 0.43 ha of vegetation, including foraging habitat for the Grey-headed Flying-fox. Grey-headed Flying-fox camps will not be removed, or disturbed, and suitable habitat is available outside of the development site.
7)	result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The proposed action is unlikely to result in the establishment of an invasive species that is harmful to the Grey-headed Flying-fox.
8)	introduce disease that may cause the species to decline, or	Grey-headed Flying-fox are reservoirs for the Australian bat lyssavirus and can cause clinical disease and mortality in Grey-headed Flying-fox. The proposed action would not increase the incidence of this disease.
9)	interfere substantially with the recovery of the species.	A Draft National Recovery Plan for the Grey-headed Flying-fox was developed in 2017. The relatively small amount of foraging habitat to be removed is unlikely to substantially interfere with the recovery of this species.
Conclusion	Is there likely to be a significant impact?	No. The proposed action is unlikely to have a significant impact on the Grey-headed Flying-fox for the following reasons: • No camps will be removed by the proposed action. • More suitable foraging habitat for this highly mobile species is available outside of the development site.

Table 41: EPBC Act Assessment of Significance for Cumberland Plain Shale Woodland and Shale-Gravel Transition Forest

Criterion	Question	Response
An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:		
1)	reduce the extent of an ecological community	The proposed action will impact upon 0.43 ha of vegetation comprising of Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest from within the development site. The local occurrence has been defined as the

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Criterion	Question	Response
		vegetation patch within the development site and in the adjoining land to the south. It represents 1 ha of this TEC. The project will result in the impact to 42% of the extent of the critically endangered community mapped as part of the local occurrence (see Figure 6). An additional 74 ha is mapped within the 1,500 m assessment area. The vegetation impacted by the works represents 0.6% of Cumberland Plain Woodland mapped in the assessment area.
2)	fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines	The proposed action will result in further reduction in the size of the patch of Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest mapped within the local occurrence. This patch of vegetation is fragmented by roads and exotic grasslands from a large patch retained to the west of the development site.
3)	adversely affect habitat critical to the survival of an ecological community	The Approved Conservation Advice for Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest (DEWHA 2009) states that small remnant patches are important for long-term recovery of this community and may act as corridors and stepping-stone habitat for flora and fauna species. Therefore, the small patch of identified within the development site may represent habitat critical to the survival of this ecological community. The development will result in the removal of 0.43 ha of the ecological community and retaining 0.36 ha on site. An additional 0.22 ha is located in the adjacent lands and is considered part of the same patch (local occurrence). The majority of the vegetation in the local occurrence will be retained within the development site and managed for conservation as part of a VMP.
4)	modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns	The proposed parkland, basins, paths and roads are likely to modify non-living factors. The proposed works will result in the clearing of native vegetation for the installation of semi-impervious surfaces and excavation for the basins. This may result in the alteration of surface water drainage patterns as part of construction of the playground and bioretention basins adjacent to the patch of Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest. These impacts will be mitigated through setback areas from the basins and playground and the vegetation to be retained and through implementation of a VMP.
5)	cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting	The proposed action will affect 0.43 ha of Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest and retain an additional 0.36 ha. An additional 0.22 ha will be retained on the adjacent lands to the south. The proposed actions are unlikely to result in a decline or loss of functionally important species as the area will be actively managed for conservation.

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Criterion	Question	Response
6) i	cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: assisting invasive species, that are harmful to the listed ecological community, to become established, or	The proposed actions are unlikely to result in reduction of quality or integrity of the vegetation as the area will be actively managed for conservation. This will include managing the retained vegetation against impacts from invasive species. The VMP in the long-term will improve the quality and integrity of the retained vegetation through the removal of weeds and implementation of pest management actions.
6) ii	cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community, or	As per above. The implementation of the VMP will provide guidance on how to actively manage the retained vegetation. This will include the correct use herbicides in the VMP area.
7)	interfere with the recovery of an ecological community.	There is no Recovery Plan for this TEC listed under the EPBC Act. The Approved Conservation Plan lists Regional Priority Actions relating to habitat loss, disturbance and modification.
Conclusion	**Is there likely to be a significant impact?**	No, the proposed action to affect 0.43 ha of Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest is unlikely to have a significant impact for the following reasons: • 0.36 ha will be retained and managed for conservation • An additional 0.22 ha will of the local occurrence will be retained • The proposed action will mitigate additional impacts on the retained vegetation through the implementation of a VMP.

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Appendix A : Definitions

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 OEH 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.
Buffer area	1500 m buffer created around the development site. This area is used to define the extent of native vegetation.
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.
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
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).
Mitchell landscape	Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000.

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Terminology	Definition
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 OEH, 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.
Remaining impact	An impact on biodiversity values after all reasonable measures have been taken to avoid and minimise the impacts of development. Under the BAM, an offset requirement is calculated 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.
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 OEH 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.

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Terminology	Definition
Vegetation Benchmarks Database	A database of benchmarks for vegetation classes and some PCTs. The Vegetation Benchmarks Database is published by OEH 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

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Appendix B : Vegetation plot data

Table 42: Species matrix (species recorded by plot)

Stratum	Form	Species name	Exotic (*)	High threat weed	Plot 1		Plot 2		Plot 3		Plot 4		Plot 5	
					C	A	C	A	C	A	C	A	C	A
G		*Anagallis* spp.	*								0.1	3	3	100
G		*Araujia sericifera*	*	1	0.1	1								
G	(GG)	*Aristida ramosa*			0.5	10	20	100	60	1000	70	1000	60	1000
G	(FG)	*Asperula conferta*											0.2	20
G		*Bidens subalternans*	*	1							0.1	1		
G		*Briza subaristata*	*	1			0.5	20	0.3	10				
M	(SG)	*Bursaria spinosa subsp. spinosa*					5	20						
G	(GG)	*Carex inversa*			3	100					0.1	5		
G		*Centaurium spp.*	*						0.1	5				
G		*Cirsium vulgare*	*		0.1	1								
G	(FG)	*Commelina cyanea*			0.1	5								
G		*Conyza bonariensis*	*						0.1	10				
G	(FG)	*Cymbonotus lawsonianus*									0.1	4	0.1	10
G	(GG)	*Cymbopogon refractus*							0.2	10	1	20	0.2	10
G		*Cynodon incompletus*	*		0.2	5	0.1	10	0.1	10	0.1	2		
G		*Cyperus brevifolius*	*										0.1	1
G	(GG)	*Cyperus gracilis*			0.5	10			0.1	5				
G	(OG)	*Desmodium varians*			0.1	10	0.1	20	0.1	1				
G	(FG)	*Dianella longifolia var. longifolia*											0.1	5
G	(FG)	*Dichondra repens*			0.1	20	0.1	10						
G		*Ehrharta erecta*	*	1	0.5	20								
G	(FG)	*Einadia hastata*			0.1	1								
G	(FG)	*Einadia nutans* subsp. *linifolia*			1	20								
G		*Eragrostis curvula*	*	1			0.1	10	0.6	20	0.1	3	0.2	10

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Stratum	Form	Species name	Exotic (*)	High threat weed	Plot 1		Plot 2		Plot 3		Plot 4		Plot 5	
					C	A	C	A	C	A	C	A	C	A
U	(TG)	*Eucalyptus tereticornis*			30	20								
G	(FG)	*Euchiton sphaericus*									0.1	5	0.1	10
G	(GG)	*Fimbristylis dichotoma*									0.1	1		
G	(FG)	*Geranium solanderi var. solanderi*											0.1	1
G	(OG)	*Glycine clandestina*			0.1	1								
G	(OG)	*Glycine tabacina*			0.1	5	0.1	1					0.2	20
G		*Hyparrhenia hirta*	*	1					0.1	2			0.1	1
G		*Lactuca serriola f. serriola*	*								0.1	1		
M		*Ligustrum lucidum*	*	1	0.4	3	0.2	2	0.1	1				
G		*Linum trigynum*	*						0.1	10	3	100	2	100
G		*Lotus uliginosus*	*								0.1	10	0.2	20
M		*Lycium ferocissimum*	*	1	5	6								
G	(GG)	*Microlaena stipoides var. stipoides*			20	100	0.2	10	0.1	10	0.4	20	1	100
M		*Olea europaea subsp. cuspidata*	*		20	50	15	50	0.4	5	6	20	5	20
G	(GG)	*Oplismenus aemulus*			0.1	3								
M		*Opuntia stricta var. stricta*	*	1					0.1	1				
G	(GG)	*Panicum simile*									0.3	10		
G	(GG)	*Paspalidium distans*											0.1	1
G		*Paspalum dilatatum*	*	1	0.1	2			0.1	5	0.1	1		
G		*Passiflora edulis*	*		0.1	1								
G		*Petrorhagia dubia*	*						1	50				
G		*Plantago lanceolata*	*				0.1	1	0.1	10	0.5	100		
M		*Prunus spp.*	*				4	10						

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Stratum	Form	Species name	Exotic (*)	High threat weed	Plot 1		Plot 2		Plot 3		Plot 4		Plot 5	
					C	A	C	A	C	A	C	A	C	A
M		*Pyracantha crenlata*	*	1							0.5	5	0.1	2
G	(FG)	*Ranunculus inundatus*											0.1	1
G		*Senecio madagascariensis*	*	1			0.1	1	0.1	20	0.1	50	0.2	20
G		*Sida rhombifolia*	*		0.1	5							0.1	10
G	(FG)	*Sigesbeckia orientalis subsp. orientalis*									0.1	1		
G		*Solanum linnaeanum*	*		0.3	3								
G		*Solanum pseudocapsicum*	*		0.5	4								
G		*Sonchus oleraceus*	*								0.1	10	0.1	10
G	(GG)	*Sporobolus creber*											0.1	2
G		*Taraxacum officinale*	*										0.1	5
G	(GG)	*Themeda triandra*							0.1	1	0.1	5	0.2	20
G		*Trifolium repens*	*								0.1	10	0.2	20
G		*Verbena bonariensis*	*				0.1	10	0.3	50				
G		*Verbena rigida var. rigida*	*								5	100	0.5	50
G		*Vicia sativa subsp. sativa*	*								0.1	2		
G	(FG)	*Wahlenbergia gracilis*							0.1	1			0.1	1
G	(FG)	*Wahlenbergia stricta subsp. stricta*							0.1	3			0.1	2
G		*Fleshy thing white underside*									0.1	5		

G = GROUND, M = MIDSTOREY, U = UNDERSTOREY. TG = TREE, SG = SHRUB, GG = GRASS AND GRASSLIKE, FG = FORB, EG = FERN, OG = OTHER
C = COVER A = ABUNDANCE

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Table 43: Vegetation integrity data (Composition, structure and function)

Plot No.	PCT	Veg zone	Condition	Zone	Easting	Northing	Bearing
1	849	1	Intact CPW	56	290457	6261187	253
2	849	2	Regenerating CPW	56	290451	6261288	74
3	849	3	DNG	56	290315	6261393	99
4	849	4	DNG_olives	56	290565	6261265	169
5	849	4	DNG_olives	56	290671	6261222	172

Plot no.	Tree	Shrub	Grass	Forb	Fern	Other
1	1	0	5	4	0	3
2	0	1	2	1	0	2
3	0	0	5	2	0	1
4	0	0	7	3	0	0
5	0	0	6	8	0	1

Plot no.	Tree	Shrub	Grass	Forb	Fern	Other
1	30	0	24.1	1.3	0	0.3
2	0	5	20.2	0.1	0	0.2
3	0	0	60.5	0.2	0	0.1
4	0	0	72	0.3	0	0
5	0	0	61.6	0.9	0	0.2

Plot no.	Large trees	Hollows	Litter cover (%)	Length fallen logs (m)	Tree stem 5-9 cm	Tree stem 10-19 cm	Tree stem 20-29 cm	Tree stem 30-49 cm	Tree stem 50-79 cm	Tree stem 80+ cm	Tree regen	HTW cover %
1	2	1	78	0	1	1	1	1	1	0	0	6.1
2	0	0	44.2	0	0	0	0	0	0	0	0	0.9
3	0	0	1.6	0	0	0	0	0	0	0	0	1.4
4	0	0	1.2	0	0	0	0	0	0	0	0	0.9
5	0	0	0	0	0	0	0	0	0	0	0	0.6

FOR STEM SIZE CLASS 0 = ABSENCE, 1 = PRESENCE

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Change in vegetation integrity scores for each management zone

Veg zone	Management zone	Area ha	Composition	Structure	Function	Veg integrity score	Change in score	Total change in score
1	Direct	0.42	29.4	42.2	59.5	42	-42	-41.7
1	Paths	0.01	0.9	25.6	44.5	10.1	-31.8	
2	Direct	0.51	8.6	13.7	15	12.1	-12.1	-12.1
3	Direct	0.19	15.1	41.5	0	2.8	-2.8	-2.8
4	Direct	2.21	27.9	41.5	0	1.5	-1.5	-1.5

Table 44: Other species recorded

Family	Species Name	Common Name	Exotic (*)
Apocynaceae	*Araujia sericifera*	Moth Vine	*
Apocynaceae	*Nerium oleander*	Oleander	*
Asparagaceae	*Asparagus aethiopicus*	Ground Asparagus	*
Asteraceae	*Bidens pilosa*	Cobbler's Pegs	*
Asteraceae	*Cirsium vulgare*	Spear Thistle	*
Asteraceae	*Senecio madagascariensis*	Fireweed	*
Asteraceae	*Sigesbeckia orientalis*	Indian Weed	
Asteraceae	*Taraxacum officinale*	Dandelion	*
Cactaceae	*Opuntia stricta*	Prickly Pear	*
Casuarinaceae	*Casuarina glauca*	Swamp Oak	
Convolvulaceae	*Dichondra repens*	Kidney Weed	
Fabaceae (Faboideae)	*Desmodium varians*	Slender Tick-trefoil	
Lauraceae	*Cinnamomum camphora*	Camphor Laurel	*
Myrtaceae	*Eucalyptus amplifolia*	Cabbage Gum	
Myrtaceae	*Eucalyptus moluccana*	Grey Box	
Myrtaceae	*Eucalyptus tereticornis*	Forest Red Gum	
Oleaceae	*Ligustrum lucidum*	Broad-leaved Privet	*
Oleaceae	*Ligustrum sinense*	Small-leaved Privet	*
Oleaceae	*Olea europaea* subsp. *cuspidata*	African Olive	*
Pittosporaceae	*Bursaria spinosa* subsp. *spinosa*	Blackthorn	
Plantaginaceae	*Plantago lanceolata*	Plantain	*
Poaceae	*Aristida ramosa*	Purple Wiregrass	
Poaceae	*Briza subaristata*		*
Poaceae	*Chloris ventricosa*	Plump Windmill Grass	
Poaceae	*Cymbopogon refractus*	Barbed-wire Grass	
Poaceae	*Cynodon dactylon*	Common Couch	

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Family	Species Name	Common Name	Exotic (*)
Poaceae	*Eragrostis curvula*	African Lovegrass	*
Poaceae	*Imperata cylindrica* var. *major*	Blady Grass	
Poaceae	*Microlaena stipoides* var. *stipoides*	Weeping Grass	
Poaceae	*Paspalum dilatatum*		*
Poaceae	*Themeda triandra*	Kangaroo Grass	
Rosaceae	*Pyracantha crenulata*	Nepalese Firethorn	*
Rosaceae	*Rubus fruiticosus* sp. agg.	Blackberry	*
Rubiaceae	*Asperula conferta*	Common Woodruff	
Solanaceae	*Lycium ferocissimum*	African Boxthorn	*
Solanaceae	*Solanum sisymbriifolium*		*
Ulmaceae	*Ulmus parvifolia*	Chinese Elm	*
Verbenaceae	*Verbena bonariensis*	Purple Tops	*
Verbenaceae	*Verbena spp.*		

Table 45: Fauna species observed in the development site during November 2019 and July 2020 surveys

Class	Family	Scientific Name	Common Name	Observation Type	Exotic (*)
Aves	Acanthizidae	*Acanthiza nana*	Yellow Thornbill	O	
Aves	Artamidae	*Cracticus tibicen*	Australian Magpie	O/W	
Aves	Artamidae	*Cracticus torquatus*	Grey Butcherbird	O	
Aves	Artamidae	*Strepera graculina*	Pied Currawong	W	
Aves	Cacatuidae	*Cacatua sanguinea*	Little Corella	F/O	
Aves	Cacatuidae	*Eolophus roseicapillus*	Galah	W	
Aves	Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo Shrike	O	
Aves	Columbidae	*Ocyphaps lophotes*	Crested Pigeon	O	
Aves	Columbidae	*Spilopelia chinensis*	Spotted Dove	O	*
Aves	Corvidae	*Corvus coronoides*	Australian Raven	1	
Aves	Cuculidae	*Eudynamys orientalis*	Eastern Koel	W	
Aves	Cuculidae	*Scythrops novaehollandiae*	Channel-billed Cuckoo	W	
Aves	Estrildidae	*Taeniopygia bichenovii*	Double-barred Finch	O	
Aves	Eupetidae	*Psophodes olivaceus*	Eastern Whipbird	1	
Aves	Maluridae	*Malurus cyaneus*	Superb Fairy-wren	O	
Aves	Meliphagidae	*Anthochaera chrysoptera*	Little Wattlebird	W	
Aves	Meliphagidae	*Manorina melanocephala*	Noisy Miner	O	

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Class	Family	Scientific Name	Common Name	Observation Type	Exotic (*)
Aves	Meliphagidae	*Myzomela sanguinolenta*	Scarlet Honeyeater	O	
Aves	Monarchidae	*Grallina cyanoleuca*	Magpie Lark	O/W	
Aves	Phalacrocoracidae	*Phalacrocorax varius*	Pied Cormorant	F/O	
Aves	Psittacidae	*Platycercus eximius*	Eastern Rosella	O	
Aves	Psittacidae	*Trichoglossus haematodus*	Rainbow Lorikeet	1	
Aves	Pycnonotidae	*Pycnonotus jocosus*	Red Whiskered Bulbul	W	*
Aves	Sturnidae	*Sturnus tristus*	Common Myna	O	*
Aves	Sturnidae	*Sturnus vulgaris*	Common Starling	O	*
Aves	Threskiornithidae	*Threskiornis molucca*	Australian White Ibis	F/O	
Aves	Timaliidae	*Zosterops lateralis*	Silvereye	O	
Aves	Turdidae	*Turdus merula*	European Blackbird	O	*
Mammalia	Canidae	*Vulpes vulpes*	European Red Fox	scat	*
Mammalia	Leporidae	*Lepus europaeus*	European Hare	O	*
Mammalia	Leporidae	*Oryctolagus cuniculus*	European Rabbit	O	*
Mammalia	Macropodidae	*Macropus giganteus*	Eastern Grey Kangaroo	O	
Reptilia	Scincidae	*Lampropholis delicata*	Grass Skink	O	
Reptilia	Scincidae	*Tiliqua scincoides*	Blue-tongued Skink	O	

O= OBSERVED. W = HEAR. F/O = FLYOVER

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Appendix C : Floristic analysis results

Plot / vegetation zone	Vegetation analysis tool (Tozers Metro)	Selected PCT rational
Plot 1 / vegetation zone 1	PCT 849	PCT 849 had 11 diagnostic species and was the most appropriate PCT identified.
Plot 2 / vegetation zone 2	PCT 849	PCT 849 and PCT 850 each contained four diagnostic species. PCT 849 was identified the most appropriate PCT due to the location within the landscape.
Plot 3 / vegetation zone 3	PCT 849	PCT 849 and PCT 850 each contained six diagnostic species. PCT 849 was identified the most appropriate PCT due to the location within the landscape.
Plot 4 / vegetation zone 4	PCT 849	PCT 849 contained seven diagnostic species and PCT 850 contained six diagnostic species. PCT 849 was identified the most appropriate PCT.
Plot 5 / vegetation zone 4	PCT 849	PCT 849 and PCT 850 contained 10 diagnostic species. PCT 849 was identified the most appropriate PCT due to the location within the landscape.

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Appendix D : EPBC Likelihood of Occurrence

An assessment of the likelihood of occurrence was made for threatened and migratory species identified from the Protected Matters Search Tool. 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 study area and in the vicinity is unsuitable for the species.

A test of significance was conducted for threatened species or ecological communities that were recorded within the study area or had a higher likelihood of occurring and were not recorded during the site visit. It is noted that some threatened fauna species that are highly mobile, wide ranging and vagrant may use portions of the study area intermittently for foraging. For these fauna species, the habitat present and likely to be impacted is not considered to be important to the threatened species, particularly in relation to the amount of similar habitat remaining in the surrounding landscape. As such, a test of significance in reference to Commonwealth legislation was not considered necessary.

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 Data Collection.

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Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
			FAUNA			
Anthochaera phrygia	Regent Honeyeater	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 - foraging habitat features associated with this species were not identified within the development site. The development site is not within an important breeding area for the species.	No	No – the species is highly mobile and preferable foraging habitat is available within the broader locality.
Botaurus poiciloptilus	Australasian Bittern	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).	Unlikely - suitable habitat not identified within the site.	N/A	No
Calidris ferruginea	Curlew Sandpiper	CE, M	Occurs along the entire coast of NSW, and sometimes in freshwater wetlands in the Murray-Darling Basin. Littoral and estuarine habitats, including intertidal mudflats, non-tidal swamps, lakes and lagoons on the coast and sometimes inland.	Unlikely - suitable habitat not identified within the site.	N/A	No
Chalinolobus dwyeri	Large-eared Pied Bat	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 - there is no suitable breeding habitat such as caves, overhangs, mines or culverts present for the species to utilise the site.	N/A	No
Dasyurus maculatus maculatus	Spotted-tailed Quoll	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 – suitable habitat, in the form of maternal den sites or large areas of relatively intact	N/A	No

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Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
				vegetation, were not identified within the site.		
Falco hypoleucos	Grey Falcon	V	This species occurs in arid and semi-arid regions in Australia.	Unlikely - suitable habitat not identified within the site.	N/A	No
Grantiella picta	Painted Honeyeater	V	Widely distributed in NSW, predominantly on the inland side of the Great Dividing Range but avoiding arid areas. Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests.	Unlikely - suitable habitat not identified within the site.	N/A	No
Heleioporus australiacus	Giant Burrowing Frog	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.	Unlikely - suitable habitat not identified within the site.	N/A	No
Hirundapus caudacutus	White-throated Needletail	V	Wide spread in eastern Australia, occurs in coastal regions. Breeds in Asia and migrates to Australia during non-breeding seasons.	Unlikely - suitable habitat not identified within the site.	N/A	No
Lathamus discolor	Swift Parrot	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.	Potential – foraging habitat features associated with this species were identified within the development site.	Yes (minor foraging only)	No – the species is highly mobile and more foraging habitat is available within the broader locality.
Litoria aurea	Green and Golden Bell Frog	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	Unlikely - suitable habitat not identified within the site.	N/A	No

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Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
			region. Marshes, dams and stream-sides, particularly those containing *Typha* spp. (bullrushes) or *Eleocharis* spp. (spikerushes). Some populations occur in highly disturbed areas.			
Numenius madagascariensis	Eastern Curlew	CE	Summer migrant to Australia. Primarily coastal distribution in NSW, with some scattered inland records. Estuaries, bays, harbours, inlets and coastal lagoons, intertidal mudflats or sandflats, ocean beaches, coral reefs, rock platforms, saltmarsh, mangroves, freshwater/brackish lakes, saltworks and sewage farms.	Unlikely - suitable habitat not identified within the site.	N/A	No
Petauroides volans	Greater Glider	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 - habitat present is substantially degraded such that this species is unlikely to utilise the site for foraging or breeding.	N/A	No
Petrogale penicillata	Brush-tailed Rock-wallaby	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.	Unlikely - suitable habitat not identified within the site.	N/A	No
Phascolarctos cinereus	Koala	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 - Habitat present is substantially degraded such that this species is unlikely to utilise the site for foraging or breeding.	N/A	No
Pseudomys novaehollandiae	New Holland Mouse	V	Fragmented distribution across eastern NSW. Open heathlands, woodlands and forests with a heathland understorey, vegetated sand dunes.	Unlikely - suitable habitat not identified within the site.	N/A	No

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Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
Pteropus poliocephalus	**Grey-headed Flying-fox**	**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.**	**Likely – seasonal foraging habitat available within the development site. No camps identified within site.**	**Yes (foraging only)**	**Yes**
Rostratula australis	Australian Painted Snipe	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 - suitable habitat not identified within the site.	N/A	No
Synemon plana	Golden Sun Moth	CE	It is found in native open temperate grasslands and open grassy woodlands dominated by *Austrodanthonia* spp.	Unlikely - suitable habitat not identified within the site.	N/A	No
			FLORA			
Acacia bynoeana	Bynoe's Wattle	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.	Unlikely - the presence of this species was not identified (conspicuous species) and suitable habitat was not identified within the site.	N/A	No
Acacia pubescens	Downy Wattle	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.	Targeted surveys did not record the presence of this conspicuous species and suitable habitat was not identified within the site.	N/A	No

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Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
Allocasuarina glareicola	-	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*.	Unlikely - the presence of this species was not identified (conspicuous species) and suitable habitat was not identified within the site.	N/A	No
Cynanchum elegans	White-flowered Wax Plant	E	Occurs at ecotones between dry subtropical rainforest and sclerophyll rainforest communities.	Unlikely - suitable habitat not identified within the site.	N/A	No
Genoplesium baueri	Bauer's Midge Orchid	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.	Unlikely - suitable habitat not identified within the site.	N/A	No
Haloragis exalata subsp. *exalata*	Wingless Raspwort	V	Occurs in shaded, damp areas in riparian habitats.	Unlikely - the presence of this species was not identified, and suitable habitat was not identified within the site.	N/A	No
Micromyrtus minutiflora	-	V	Grows in Castlereagh Scribbly Gum Woodland, Ironbark Forest, Shale/Gravel Transition Forest habitats.	Unlikely, suitable habitat for this species was not identified within the development site.	N/A	No
Persicaria elatior	Tall Knotweed	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.	Unlikely - the presence of this species was not identified, and suitable habitat was not identified within the site.	N/A	No

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Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
Persoonia hirsuta	Hairy Geebung	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.	Unlikely - suitable habitat not identified within the site.	N/A	No
Persoonia nutans	-	E	Northern populations are confined to aeolian and alluvial sediments and occur in a range of sclerophyll forest and woodland vegetation communities, with the majority of individuals occurring within Agnes Banks Woodland or Castlereagh Scribbly Gum Woodland and some in Cooks River / Castlereagh Ironbark Forests. Southern populations also occupy tertiary alluvium, but extend onto shale sandstone transition communities and into Cooks River / Castlereagh Ironbark Forest	Unlikely - suitable habitat not identified within the site.	N/A	No
Pimelea curviflora var. *curviflora*	-	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 - The presence of this species was not identified (conspicuous species) and it was determined that the habitat is substantially degraded such that this species is unlikely to utilise the development site.	N/A	No
Pimelea spicata	Spiked Rice-flower	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 - suitable habitat not identified within the site.	N/A	No

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Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
Pomaderris brunnea	Rufous Pomaderris	V	Grows in open forests associated with the occurrence of *Eucalyptus amplifolia, Angophora floribunda, Acacia parramattensis, Bursaria spinosa* and *Kunzea ambigua*.	Unlikely, the vegetation within the site is highly disturbed. No species were recorded during traverses.	N/A	No
Pterostylis saxicola	Sydney Plains Greenhood	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.	Unlikely, no suitable habitat mapped in the site.	N/A	No
Syzygium paniculatum	Magenta Lilly Pilly	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 - The presence of this species was not identified (conspicuous species) and it was determined that the habitat is substantially disturbed such that this species is unlikely to utilise the development site.	N/A	No
Thesium australe	Austral Toadflax	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 - suitable habitat not identified within the site.	N/A	No

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Appendix E : Biodiversity credit report

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00018704/BAAS18159/19/00018705	OConnell St Caddens	18/06/2020
Assessor Name	Report Created	BAM Data version *
	13/08/2020	29
Assessor Number	BAM Case Status	Date Finalised
	Open	To be finalised
Assessment Revision	Assessment Type	
0	Part 4 Developments (General)	

* 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.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	Vegetation integrity loss / gain	Area (ha)	Constant	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Potential SAII	Ecosystem credits
Cumberland shale plains woodland								
1	849_Intact_CPW	41.7	0.4	0.25	High Sensitivity to Potential Gain	2.50	TRUE	11
2	849_Regen_CPW	12.1	0.5	0.25	High Sensitivity to Potential Gain	2.50	TRUE	0
3	849_DNG	2.8	0.2	0.25	High Sensitivity to Potential Gain	2.50	TRUE	0

BAM Credit Summary Report

4	849_olive_DNG	1.5	2.2	0.25	High Sensitivity to Potential Gain	2.50	TRUE	0
							Subtotal	**11**
							Total	**11**

Species credits for threatened species

Vegetation zone name	Habitat condition (HC)	Area (ha) / individual (HL)	Constant	Biodiversity risk weighting	Potential SAII	Species credits

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