Eastern Creek Business Hub Stage 3
Biodiversity Development Assessment Report

Prepared for Frasers Property Pty Ltd

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DOCUMENT TRACKING

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Template 2.8.1

Executive Summary

Eco Logical Australia Pty Ltd (ELA) was engaged by Frasers Property Pty Ltd to prepare a Biodiversity Development Assessment Report (BDAR) for the proposed amended concept plan to Stage 3 of the Eastern Creek Business Hub State Significant Development (SSD 5175), Beggs Road, Eastern Creek (Figure **1** and Figure **2**).

This BDAR has been prepared to meet the requirements of the Biodiversity Assessment Method (BAM) established under Section 6.7 of the NSW *Biodiversity Conservation Act 2016* (BC Act). Requirements of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) have also been addressed in this report.

This BDAR outlines the measures taken to avoid, minimise and mitigate impacts on the vegetation and species habitat present within the development footprint and measures to minimise impacts during construction and operation of the development. Following consideration of the above aspects, the residual unavoidable impacts of the project were calculated in accordance with BAM by utilising the Biodiversity Assessment Method Credit Calculator (BAMC).

The development site contains a remnant patch of native vegetation comprised of *PCT 849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion*. PCT 849 forms part of Cumberland Plain Woodland in the Sydney Basin Bioregion which is listed as a critically endangered ecological community under the BC Act. This PCT also forms part of Cumberland Plain Shale Woodlands and Shale Gravel Transition Forest listed as critically endangered ecological community under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Thirty-six (37) ecosystem credits are required for the removal of 1.16 ha of PCT 849 within the development site and the adjacent road upgrades outside of the development site along Rooty Hill Road South and Church Street. One species credit species *Meridolum corneovirens* (Cumberland Plain Land Snail) was identified in the proposed road upgrade portion of the development site. A species polygon has been drawn for this species, and six (6) credits are required for the removal of 0.23 ha of habitat.

Serious and Irreversible Impacts (SAII) have been considered as part of this assessment. PCT 849 - Cumberland Shale Plains Woodland is a listed as a candidate entity. Approximately 1.16 ha of Cumberland Plain Woodland would be affected as a result of the development. It is noted that the threshold for what is considered a SAII is yet to be published by Department of Planning and Environment (DPE). A SAII assessment has been undertaken consistent with subsection 10.2.2 of the BAM. The determination of SAII on biodiversity values is to be made by the approval authority.

Matters of National Environmental Significance have been addressed in an EPBC Act Referral (2020/8715) made to the Commonwealth by Frasers Property. The Commonwealth determined that the proposed action was a controlled action resulting from significant impacts to Cumberland Plain Shale Woodlands and Shale Gravel Transition Forest. The Commonwealth determined that the proposed action will be assessed using the bilateral agreement made under Section 45 of the EPBC Act. Since the EPBC referral was already submitted and determined, a letter notifying the Commonwealth of the additional impacts associated with the proposed upgrade will be submitted.

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Abbreviations

Abbreviation	Description
BAAS	Biodiversity Accredited Assessor System
BAM	Biodiversity Assessment Method
BAMC	Biodiversity Assessment Method Credit Calculator
BC Act	NSW *Biodiversity Conservation Act 2016*
BCC	Blacktown City Council
BDAR	Biodiversity Development Assessment Report
CEEC	Critically Endangered Ecological Community
DAWE	Commonwealth Department of Agriculture, Water and Environment
DPE	NSW Department of Planning and Environment (formerly DPIE)
DPE	Department of Planning and Environment
ELA	Eco Logical Australia Pty Ltd
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
FM Act	NSW *Fisheries Management Act 1994*
GIS	Geographic Information System
GPS	Global Positioning System
IBRA	Interim Biogeographic Regionalisation for Australia
LGA	Local Government Area
LLS	Local Land Service
NSW	New South Wales
OEH	NSW Office of Environment & Heritage (now Department of Planning and Environment)
PCT	Plant Community Type
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SSDA	State Significant Development Application
TEC	Threatened Ecological Community
TfNSW	Transport for NSW
WM Act	NSW *Water Management Act 2000*

1. Introduction

This Biodiversity Development Assessment Report (BDAR) has been prepared by Alex Gorey. The report has been peer reviewed and certified by Accredited Assessor Meredith Henderson (BAAS17001). Definitions of terminology used throughout this report are presented in Appendix A.

This BDAR has been prepared for Frasers Property Australia to support a State Significant Development Application (SSDA) submitted to the former Department of Planning, Industry and Environment (DPIE) (now Department of Planning and Environment -DPE) relating to Lot 3 of the Eastern Creek Quarter Site at Rooty Hill Road South, Eastern Creek. The application seeks Concept Plan approval for the staged construction of a new retail outlet centre at Lot 3 with supporting food and beverage tenancies, and ancillary entertainment and recreation usages as well as road upgrades for the Church Street and Rooty Hill Road South intersection. This report addresses the following items of the Secretary's Environmental Assessment Requirements (SEARs):

8. Biodiversity

- Provide an assessment of the proposal's biodiversity impacts in accordance with Section 7.9 of the *Biodiversity Conservation Act 2017*, the Biodiversity Assessment Method and documented in a Biodiversity Development Assessment Report where required under the Act. The BDAR must include information in the form detailed in the *Biodiversity Conservation Act 2016* (s6.12), *Biodiversity Conservation Regulation 2017* (s6.8) and Biodiversity Assessment Method, including an assessment of the impacts of the proposal (including an assessment of impacts prescribed by the regulations)
- The BDAR must document the application of the avoid, minimise and offset framework including assessing all direct, indirect and prescribed impacts in accordance with the Biodiversity Assessment Method
- The BDAR must include details of the measures proposed to address the offset obligation as follows:
    - the total number and classes of biodiversity credits required to be retired for the development/project
    - the number and classes of like-for-like biodiversity credits proposed to be retired
    - the number and classes of biodiversity credits proposed to be retired in accordance with the variation rules
    - any proposal to fund a biodiversity conservation action o any proposal to conduct ecological rehabilitation (if a mining project) o any proposal to make a payment to the Biodiversity Conservation Fund
    - if seeking approval to use the variation rules, the BDAR must contain details of the reasonable steps that have been taken to obtain requisite like-for-like biodiversity credits.
- The BDAR must be submitted with all spatial data associated with the survey and assessment as per Appendix 11 of the BAM.

1.1 Project history

This BDAR has been prepared to assess the potential impacts associated with the new SSD application. There have been eight modifications to the approved concept proposal. Frasers Property has advised that during the detailed design phase for Stage 3, a new layout was proposed that would provide a better outcome for the use of the site as a retail outlet (Figure **2**). During the consultation period, Transport for NSW requested that the Rooty Hill Road South and Church Street intersection be upgraded to a four-way intersection. This impact was not previously assessed and has been included in this BDAR. All other impacts were previously assessed and offset under the existing SSD 5175 approval. Part B condition B2. Biodiversity Offset Strategy specified the following:

> *B2. The applicant shall retire 46.3 ecosystem credits of Grey Box – Forest Red Gum Woodland at the Chandos West Biobank Site (Biobank site 70) in accordance with the offset strategy in the ecological assessment prepared by Eco Logical Australia dated August 2012 to offset the loss of 1.93 ha of Cumberland Plain Woodland (sub community) on the subject site.*

These credits were sourced and retired (Appendix G). Therefore, no further assessment is required for the previously assessed areas and they have not been included in this BDAR.

Consent was then granted to Western Sydney Parkland Trust for the Eastern Creek Business Hub Stage DA Concept Proposal (SSD 5175) on 7 January 2015 (Figure **1**). The conditions of consent (condition B10) required that a vegetation management plan be prepared prior to the commencement of works, for the restoration and rehabilitation of the conservation area along the eastern boundary of the site.

1.2 General description of the development site

The 34 ha Eastern Creek Quarter site is situated to the north of the Great Western Highway between Rooty Hill Road South and the M7 Motorway. Church Street marks the business hub site's northern boundary while proposed intersection stretches along a portion of Rooty Hill Road South and Church Street (Figure 3). The site forms part of the Western Sydney Parklands and is located within the Blacktown LGA. It is located approximately 1.5km south east of Rooty Hill Station.

This SSDA relates to Lot 3 of the ECQ site, which is the final lot proposed to be developed. The development site consists of Cumberland Plain Woodland. This report includes two base maps, the Site Map (Figure 3) and the Location Map (Figure 4) in the context of stage 1 and stage 2.

1.3 Proposed development

The proposed State Significant Development Application (SSDA) seeks Concept Plan approval for a new retail outlet centre at Lot 3 of the Eastern Creek Quarter site and adjacent road upgrades. The Concept Plan will establish the following framework to guide the future detailed design of the Lot 3 development:

- land uses, including retail (factory outlet), food and drink premises, amusement centre and indoor recreation facility;
- building footprints, including basement, with a maximum height of 12m;
- a maximum GFA of 39,500m^2 at Lot 3 which will be staged as follows:
  - Phase A: 29,500m^2
  - Phase B: 10,000m^2

- upgrade of Church Street for vehicular access, a four way intersection and traffic signals at the Church Street/Rooty Hill Road South intersection;
- it is also proposed to seek consent for a series of early works including:
  - Removal of up to 1.16 ha of Cumberland Plain Woodland;
  - Bulk earthworks within Lot 3; and
  - Extension of the internal access road to connect to the basement car park.
- the proposed outlet centre at Lot 3 will necessitate the inclusion of conditions of consent which requires the modification of SSD 5175 (the existing Concept Plan for the broader ECQ site) to amend the overall allocation of GFA and associated uses, relevant Concept Plans and the existing Design Guidelines
- upgrade of portions of Rooty Hill Road South and Church Street.

Recent discussions with Roads and Maritime Services and Council have indicated that upgrades to Rooty Hill Road South and Church Street will be required. The impacts associated with these upgrades are outside of the ECQ site, however the upgrades are proposed to form part of the works. The design of the road upgrades have progressed and numerous iterations of the design have been discussed with TfNSW. Where impacts are known, they have been included in the BDAR.

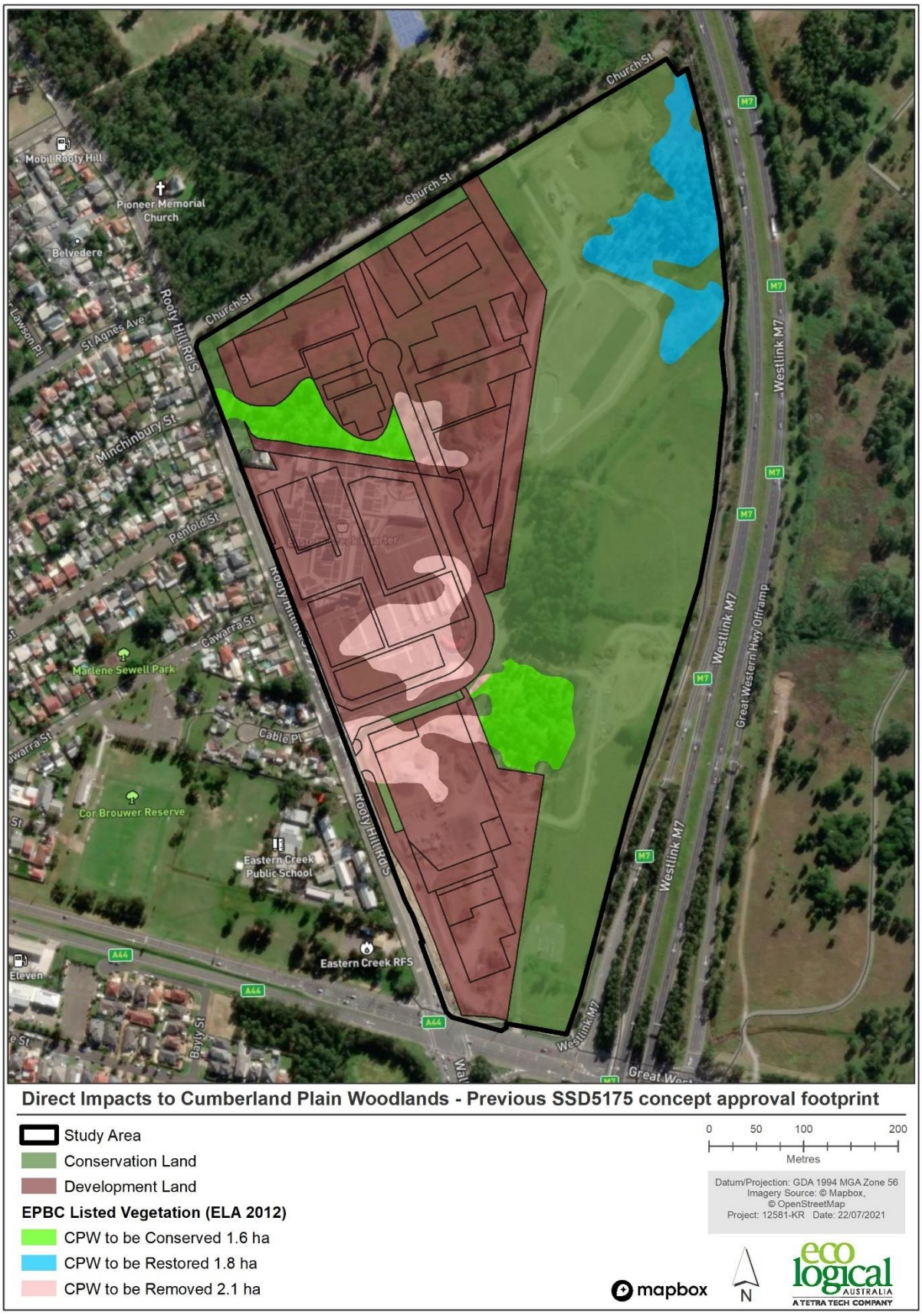

Figure 1: Previous SSD5175 concept approval footprint

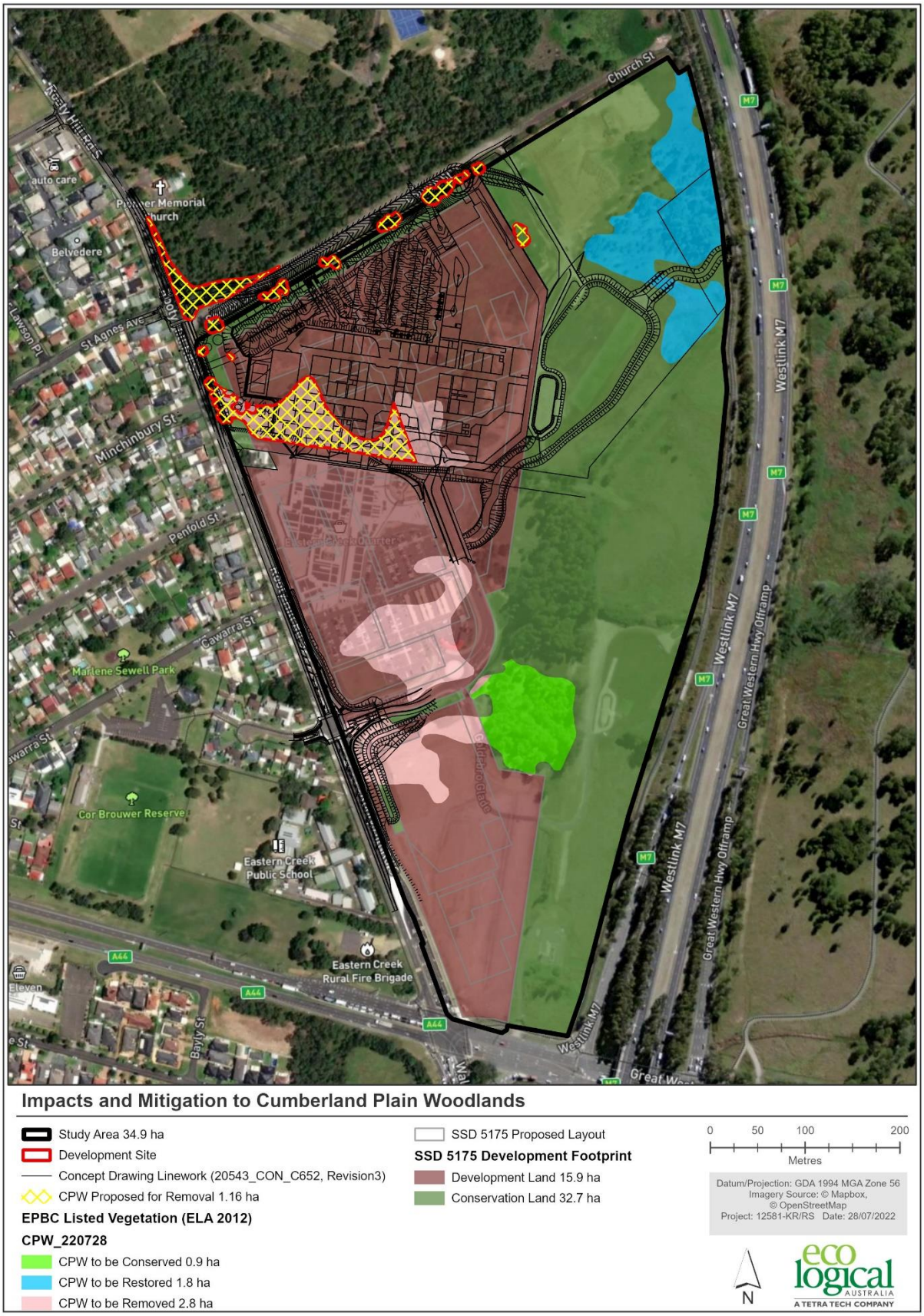

Figure 2: Proposed new SSD application to amend SSD 5175

Figure 3: Site Map

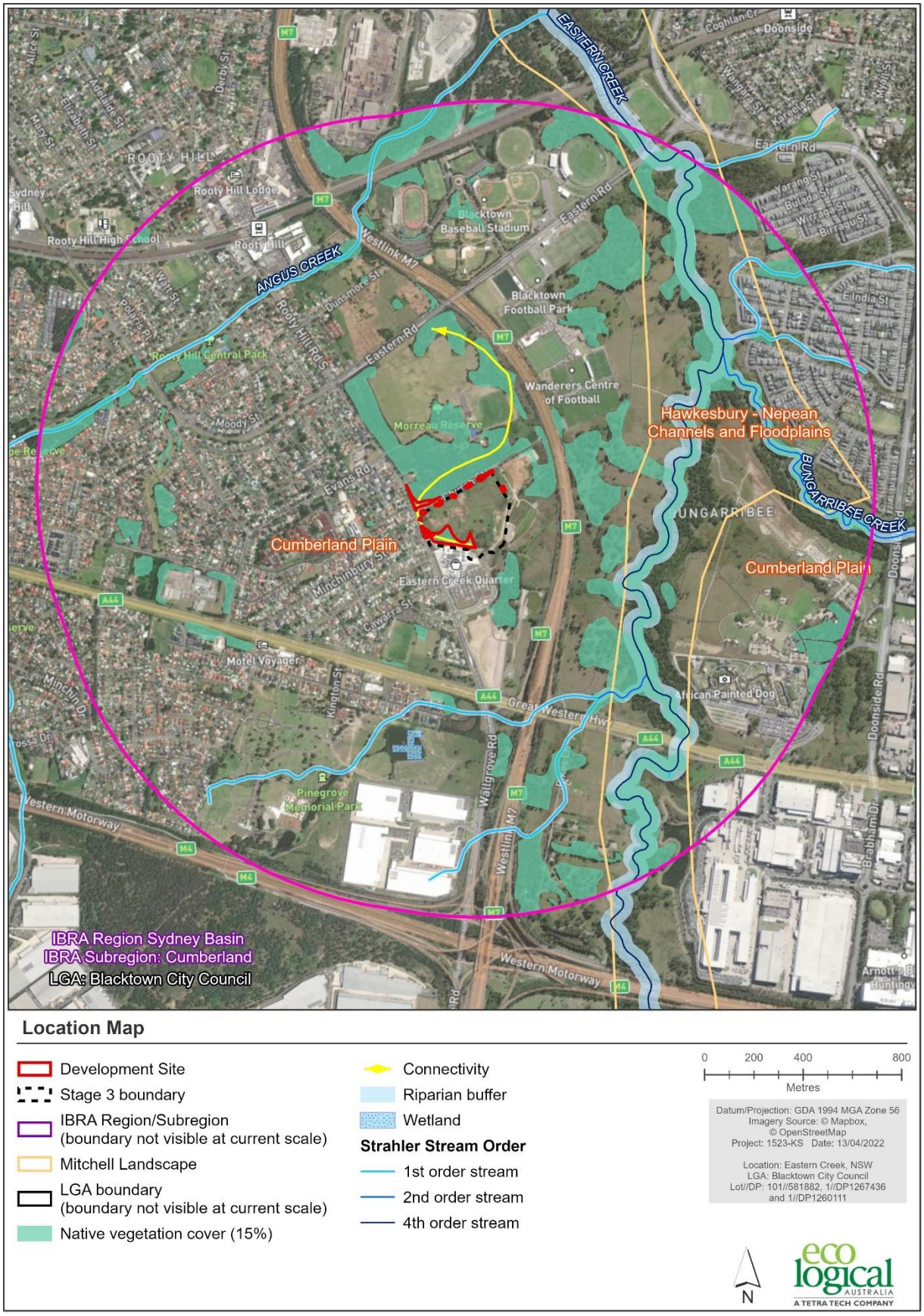

Figure 4: Location Map

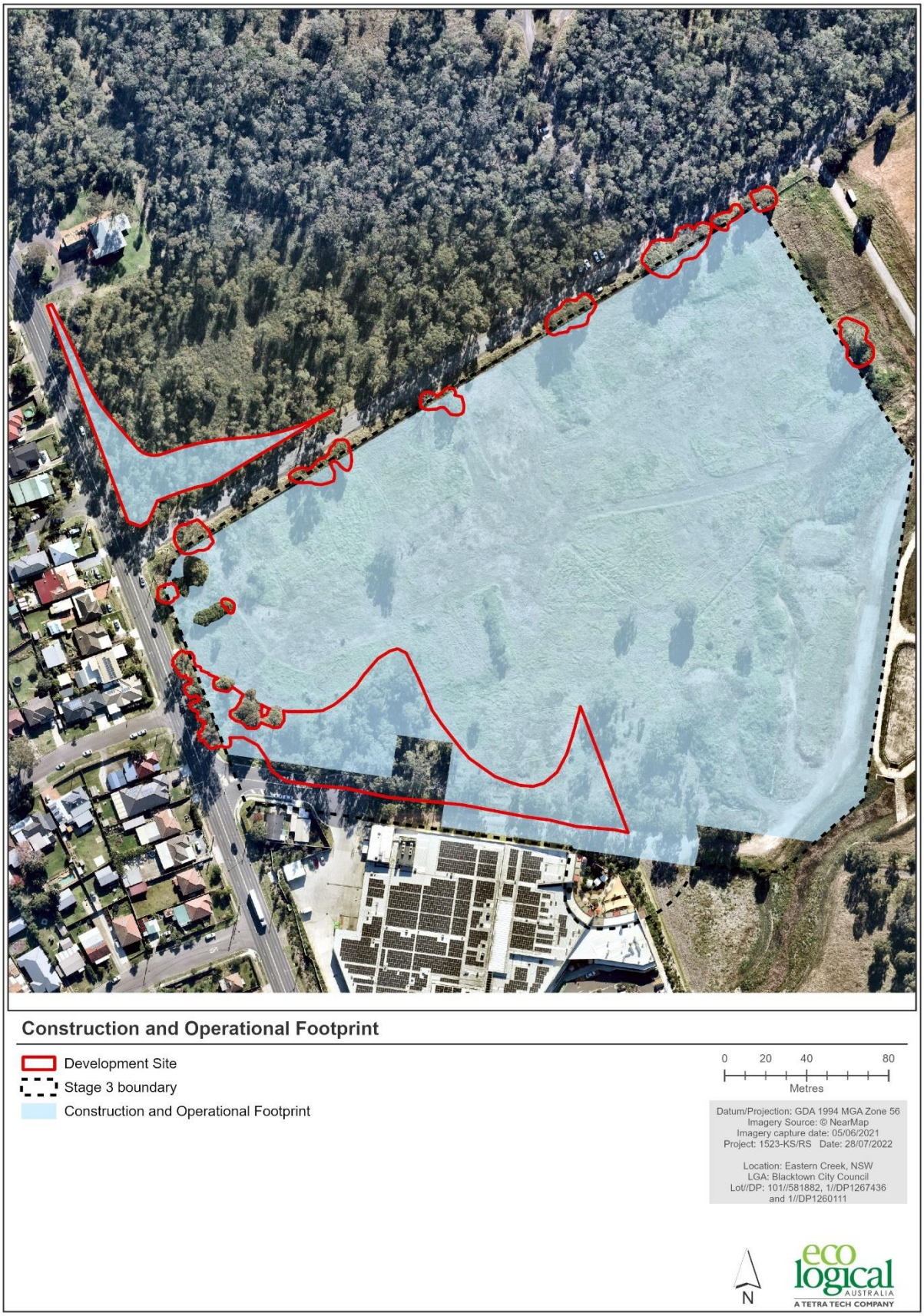

Figure 5: Construction and operational footprint

2. Legislative context

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

Table 1: Legislative context

Name	Relevance to the project	Report Section
Commonwealth		
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	Two Matters of National Environmental Significance (MNES) has been identified on the development site; Cumberland Shale Plains Woodland and Shale Gravel Transition Forest (Cumberland Plain Woodland) and *Pimelea curviflora* var *curviflora*. *Pteropus poliocephalus* (Grey-headed Flying-fox) is predicted as likely to forage over the development site. This report assesses impacts to these MNES and concludes that the development is likely to constitute a significant impact to Cumberland Plain Woodland. A referral has been made to the Commonwealth Department of Agriculture, Water and Environment (DAWE). DAWE determined that the proposed action is a controlled action and will be assessed using the Bilateral Agreement. The development is unlikely to constitute a significant impact to the Grey-headed Flying-fox.	Section 6, provided in separate report
State		
Environmental Planning and Assessment Act 1979 (EP&A Act)	The proposed development requires consent from DPE as a State Significant Development and is to be assessed under Part 4 of the EP&A Act.	Section 6
Biodiversity Conservation Act 2016 (BC Act)	The proposed development is proposed as a new SSD to amend the existing State Significant Development (5175) which automatically triggers the Biodiversity Offsets Scheme (BOS) and requires a BDAR.	Entire report
Fisheries Management Act 1994 (FM Act)	The development does not involve impacts to any matters listed under the FM Act.	N/A
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.	N/A
Water Management Act 2000 (WM Act)	The project involves works do not involve works on waterfront land. No further assessment is required.	N/A
Environmental Planning Instruments		
Biodiversity and Conservation SEPP (Vegetation)	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.	N/A
SEPP (Koala Habitat Protection) 2019 – (now listed as part of the Biodiversity and Conservation SEPP)	The proposed development is not located on land mapped on the Land Application Map. No further assessment of this SEPP is required.	N/A
Western Sydney Parklands SEPP 2009 (now listed as the Precincts (Western Parkland City) 2021 SEPP	The subject site is subject to the Western Sydney Parklands SEPP. Under the SEPP, the land does not form part of the Environmental Conservation Area, Heritage area or Bulk Water Supply areas. There are no controlling provisions relevant to the site.	N/A

3. Methodology

3.1 Literature and data reviews

The following literature and data sources were reviewed prior to undertaking the field survey:

- Biodiversity Assessment Method Calculator Version: 30
- NSW Government BioNet Vegetation Classification (EES 2022)
- BioNet / Atlas of NSW Wildlife 5 km database search (EES 2022)
- Commonwealth Department of Agriculture, Water and the Environment (DAWE) Protected Matters Search Tool 5 km database search (DAWE 2022)
- The Native Vegetation of the Sydney Metropolitan Area v.3 (OEH 2016)
- BioNet PCT predicted species reports
- aerial mapping (SIXMaps)
- additional GIS datasets including soil, topography, geology and drainage
- SSD 5175 application conditions of consent, issued by the Minister for Planning and Environment, 7 January 2015.
- Eco Logical Australia (ELA) 2020. *Eastern Creek Business Hub Stage 3 EPBC Referral*. Prepared for Frasers Property Retail Holdings
- Eco Logical Australia (ELA) 2012. *Ecological Assessment for the Eastern Creek Business Hub State Significant Development*. Prepared for Western Sydney Parklands Trust.

Prior to the commencement of field surveys, a list of species credit species either known or considered likely to occur was compiled to guide the field survey methodology.

3.1.1 Use of local data

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

3.1.2 Expert reports

Expert reports were not used as part of this assessment.

3.2 Native vegetation

Extensive field survey was conducted in 2009 and 2012 across the entire Eastern Creek Business Hub (the development site) which included survey across the development site. The 2009 and 2012 field survey included vegetation validation, targeted microchiropteran bat surveys and opportunistic diurnal bird survey (Appendix D and Appendix E).

Vegetation validation was conducted across the development site by ELA Ecologists Lucas McKinnon and Rodney Armistead in April 2012 for a total of 22 person hours (Table 2; Appendix E). The field survey focused on identifying the vegetation communities present, including their condition and extent. Vegetation communities were mapped to Biometric Vegetation Types using 20 m x 29 m quadrat surveys (ELA 2012).

Vegetation survey consistent with the Biodiversity Assessment Method (BAM) was undertaken within the development site by ELA ecologists Alex Gorey, Carolina Mora, Belinda Failes and James King on 27 August 2020 and 28 February 2022. Survey included validating previously mapped Biometric Vegetation

Types to Plant Community Types (PCTs), their extent and assigning a vegetation zone. A total of two vegetation integrity plots were undertaken to assess the composition, structure and function components of the vegetation zone consistent with the BAM (Table 3). The data collected was also used to determine whether the vegetation met the definition of an EPBC Act listed threatened ecological community.

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

Table 2: Previous survey effort across the Eastern Creek Business Hub site

Date	Temperature min (°C)	Temperature max (°C)	Wind speed at 9 am (km/hr)	Rain (mm)
3 April 2012	14.7	29.3	Calm	0
4 April 2012	15.4	27.8	4 NNW	0
19 April 2012	16.5	24.5	Calm	86.2
20 April 2012	15.4	25.2	Calm	1.1
21 April 2012	14.6	25.4	Calm	0
22 April 2012	14.0	23.0	Calm	0
9 May 2012	8.0	24.9	4 NW	0
27 August 2020	0.8	16.6	-	0
28 February 2022	22	25	Calm	13

Table 3: Full floristic and vegetation integrity plots

Veg Zone	PCT ID	PCT Scientific Name	Condition	Area (ha)	Plots required	Plots surveyed
1	849	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Good	1.16	1	2
			Total	**1.16**	**1**	**2**

3.3 Threatened species

Habitat assessments and targeted surveys were undertaken for ecosystem and species credit species in 2009, 2012, 2020 and 2022 by ELA ecologists. These are detailed below.

3.3.1 Targeted surveys

Targeted surveys for species credit species were undertaken within the entirety of the site boundary in 2009 and 2012 and within the development site in 2020 and 2022. The survey effort is detailed in the following sections. Targeted survey methodology was undertaken consistent with the following documents:

- Surveying Threatened Plant and their Habitats - NSW Survey Guide for the Biodiversity Assessment Method (DPIE 2020)
- Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities Working Draft (DEC 2004).

3.3.1.1 Avifauna

Diurnal Birds

Survey for diurnal birds was conducted in April 2012 by ELA ecologists Rodney Armistead and Lucas McKinnon (Table 2). Survey was opportunistic with observers moving through vegetation communities and grasslands supporting potential habitat for diurnal birds over the entire survey period. Previous observations had been made by ELA (2009; Appendix D).

3.3.1.2 Microchiropteran bats

Survey for microchiropteran (microbats) bats was conducted using ultrasonic Anabat detectors equipped with ZCAIM recording devices in eight locations across the development site for two nights (April 2012) at each site (consistent with TBSA guidelines (DEC 2004) and DSEWPaC (2010)) (Figure 8, Appendix D, Appendix E). Survey locations focused on larger remnants of native vegetation, major watercourses and large hollow bearing trees. On each night of survey the Anabats were turned on at 1800 hours and then turned off the following morning between 0600 hours. Anabat calls were downloaded in the office and analysed by Peter Knock (Ecologist, Eco Logical Australia, Coffs Harbour).

Bat calls were analysed using the program AnalookW (Version 3.3q 03 October 2006, written by Chris Corben, www.hoarybat.com). Call identifications were made using regional based guides to the echolocation calls of microbats in New South Wales (Pennay et al. 2004); and south-east Queensland and north-east New South Wales (Reinhold et al. 2001) and the accompanying reference library of over 200 calls from north-eastern NSW (http://www.forest.nsw.gov.au/research/bats/default.asp). Bat calls are analysed using species-specific parameters of the call profile such as call shape, characteristic frequency, initial slope and time between calls (Reinhold et al. 2001). To ensure reliable and accurate results the following protocols (adapted from Lloyd et. al. 2006) were followed:

- Recordings containing less than three pulses were not analysed (Law et al. 1999)
- Only search phase calls were analysed (McKenzie et al. 2002)
- Four categories of confidence in species identification were used (Mills et al. 1996): o Definite – identity not in doubt o Probable – low probability of confusion with species of similar calls o Possible – medium to high probability of confusion with species with similar calls o Unidentifiable – calls made by bats which cannot be identified to even a species group Nyctophilus spp. are difficult to identify confidently from their calls and no attempt was made to identify this genus to species level (Pennay et al. 2004).

3.3.1.3 *Meridolum corneovirens* (Cumberland Plain Land Snail) and *Pommerhelix duralensis* (Dural Land Snail)

Targeted survey for Cumberland Land Snail was undertaken on 25 November 2009 by ELA ecologists, within potential habitat for the species occurring within the woodland areas (particularly in association with *Eucalyptus tereticornis* and *Eucalyptus moluccana* trees that had deep leaf/bark litter layers around their base), grass clumps in or near woodland areas, and dumped rubbish or sheet metal in or near woodland areas.

Further survey was conducted for Cumberland Plain Land Snail and Dural Land Snail by ELA ecologists Alex Gorey, Carolina Mora and James King on 27 August 2020 for a total of three person hours by gently raking away leaf litter and parting grass clumps at the base of trees and fallen logs (Figure 7). When a

live snail or shell was identified, photographs were taken of the specimen against a ruler for scale. A point was also taken using Azenva maps or a handheld GPS unit.

Additionally, survey for Cumberland Plain Land Snail and Dural Land Snail was conducted by ELA ecologists Belinda Failes and James King on 28 February 2022 for a total of 4 person hours in the proposed Rooty Hill South Road and Church Street intersection impact area. As per the previous survey, leaf litter at the base of *Eucalyptus* sp. trees was raked away and inspected for shells or live snails. Any shells or snails found were photographed and mapped with a handheld GPS unit.

3.3.1.4 Threatened flora survey

Targeted survey for threatened flora species was conducted by ELA ecologists Alex Gorey, Carolina Mora and James King on 27 August 2020 and by Belinda Failes and James King on 28 February 2022 (Figure 6). Targeted survey was conducted for the following threatened flora species:

- *Pimelea spicata* (Spiked Rice-flower)
- *Pimelea curviflora* var. *curviflora*
- *Pultenaea pedunculata* (Matted Bush-pea)
- *Grevillea juniperina* subsp. *juniperina* (Juniper-leaved Grevillea)
- *Marsdenia viridiflora* R. Br. subsp. *viridiflora* population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith LGAs.

The survey method involved using parallel transects through the development site, consistent with the Threatened Plans Survey Guideline (DPIE 2020). Some patches of the development site contained weed plumes that were dominated by weedy groundcover species. These areas, which were unlikely to provide habitat, were rapidly surveyed. Survey effort concentrated in areas with a high proportion of native groundcover.

3.4 Survey limitations

The microbat survey conducted across the Eastern Creek Business Hub site was not consistent with the BAM survey guidelines for species credit threatened bats (OEH 2018), because at the time of survey the guideline was not published. Field survey still used a methodology; echolocation devices, endorsed by the guideline. Survey across the Rooty Hill Road South and Church Street upgrades were not completed as part this assessment. Assumptions have been made about the condition of the vegetation present. The survey data from the Arboricultural Impact Assessment was used to determine the likely PCT present. A conservative approach was taken in consideration of the condition of the vegetation. It was assumed to be in the same condition as the remainder of the development site.

Figure 6: Survey effort (parallel traverses) for threatened candidate flora species.

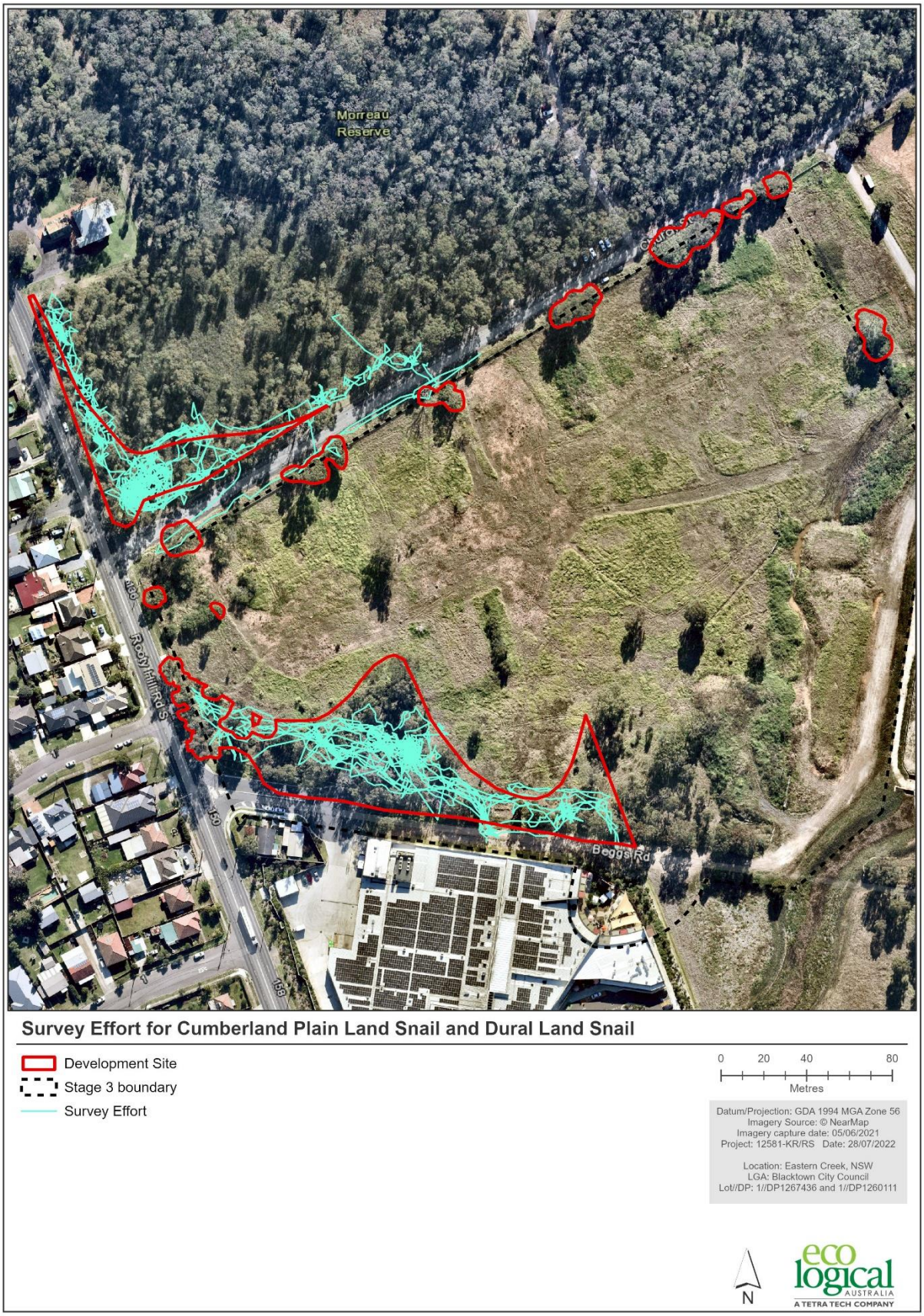

Figure 7: Survey effort for Cumberland Plain Land Snail and Dural Land Snail.

Figure 8: Survey locations for threatened microchiropteran bats (ELA 2012)

4. Results

4.1 Landscape features

Landscape features within the development site are described below and are shown in Figure 3 and Figure 4.

4.1.1 IBRA regions and subregions

The development site has an area of 1.16 ha and falls wholly within the Sydney Basin IBRA region and the Cumberland Plain IBRA subregion (Figure 4). 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.

4.1.2 NSW (Mitchell) Landscapes

The development site falls within the Cumberland Plain NSW (Mitchell) Landscapes (DECC 2002) as outlined in Table 4. The assessment area also includes Hawkesbury – Nepean Channels and Floodplains (Figure 4, Table 4).

Table 4: NSW (Mitchell) landscapes

NSW (Mitchell) landscape	Description
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. Woodlands and open forest of *Eucalyptus moluccana*, *Eucalyptus tereticornis*, *Eucalyptus crebra*, *Eucalyptus eugenioides*, *Eucalyptus amplifolia* and *Angophora subvelutina*. Grassy to shrubby understorey often dominated by Bursaria spinosa, poorly drained valley floors, often salt affected with *Casuarina glauca* and paperbark *Melaleuca* sp.

4.1.3 Native vegetation extent

The extent of native vegetation within the development site and assessment area is outlined in Table 5. There are no differences between the mapped vegetation extent and the aerial imagery.

Table 5: Native vegetation extent

Area within the development site (ha)	Area within the assessment area (ha)
1.16	126.69

4.1.4 Rivers and streams

The development site does not contain any rivers or streams.

4.1.5 Wetlands

The development site does not contain any natural wetlands, nor does it contain any previously mapped important wetlands.

4.1.6 Connectivity features

The development site is comprised of a patch of Cumberland Plain Woodland which is bordered by cleared land on all sides with the exception of the south, where the patch of the community is bordered by Beggs Road and to the north of Church Street. The patch to the south of Church Street is disconnected from other patches of the community but may provide part of a habitat link for highly mobile species such as birds and bats.

4.1.7 Areas of geological significance and soil hazard features

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

4.1.8 Site context

4.1.8.1 *Method applied*

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

4.1.8.2 *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 Nearmap using increments of 5%. The percent native vegetation cover within the assessment area (783.71 ha) is 14.64% (126.69 ha) (Table 5).

4.1.8.3 *Patch Size*

Patch size was calculated using available vegetation mapping for all patches of intact native vegetation on and adjoining the development site. The patch size is 83.68 ha, which falls into the size category 25 - 100 ha under the BAM.

4.2 Native vegetation

4.2.1 Plant Community Types present

One PCT, PCT 849: Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (Cumberland shale plains woodland), was identified within the development site (Table 6, Figure 9,Figure 10).

Table 6: Plant Community Types

PCT ID	PCT Scientific Name	Vegetation Class	Vegetation Formation	Area within development site	Percent cleared
849	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Coastal Valley Grassy Woodlands	Grassy Woodlands	1.16	93%

4.2.2 Plant Community Type selection justification

PCT 849 was previously mapped within the development site as Cumberland Plain Woodland (EPBC Act condition) (ELA 2012). The field survey confirmed vegetation is consistent with PCT 849 in EPBC Act condition, with native species present and dominant in all structural layers. Diagnostic canopy species included *Eucalyptus tereticornis* (Forest Red Gum) and *Eucalyptus moluccana* (Grey Box). Diagnostic midstorey species included *Bursaria spinosa* (Native Blackthorn) with the groundcover comprised of

Microlaena stipoides var. *stipoides* (Weeping Grass), *Chloris ventricosa* (Windmill Grass), *Cheilanthes sieberi* (Cloak Fern) and *Themeda triandra* (Kangaroo Grass).

This PCT occurs on clay/loam soils derived from Wianamatta Shales on the Cumberland Plain at low altitudes (mainly below 150 m), which is consistent with the soil landscape mapping and IBRA subregion for the development site.

4.2.3 Vegetation Zones

One vegetation zone was present in the development footprint (Figure 9 and Figure 10). Zone 1: PCT 849 in good condition was represented by a canopy of *Eucalyptus moluccana* and occasional *Eucalyptus tereticornis.* Dense patches of *Bursaria spinosa* were scattered throughout the zone and the groundcover was dominated by native groundcover species including *Microlaena stipoides* var. *stipoides* (Weeping Grass), *Chloris ventricosa* (Windmill Grass), *Cheilanthes sieberi* (Cloak Fern), *Themeda triandra* (Kangaroo Grass), *Mentha satureioides* and *Eremophila debilis*. The groundcover included some isolated weed plumes of *Cenchrus clandestinus* (Kikuyu) and *Setaria parviflora* (Pigeon Grass). Exotic species included *Ligustrum sinense* (Small-leaved Privet) and *Lycium ferocissimum* (African Boxthorn) in low densities. The canopy was dominated by *Eucalyptus tereticornis* and *Eucalyptus moluccana*.

4.2.4 Threatened Ecological Communities

The BioNet Vegetation Classification lists PCT 849 as associated with Cumberland Plain Woodland, a TEC listed as a Critically Endangered Ecological Community (CEEC) under both the BC Act and EPBC Act. Vegetation Zone 1 contained flora species which fit the description of the community as listed in the NSW Scientific Committee's Final Determination (Table 7, Figure 11). Vegetation Zone 1 met condition threshold A set out by the EPBC Act Listing Advice (DEWHA 2009) for the following reasons:

- The patch size was > 0.5 ha
- > 50% of the perennial understorey vegetation cover was made up of native species.

Table 7: Threatened Ecological Communities

PCT ID	BC Act			EPBC Act		
	Listing	Name	Area (ha)	Listing	Name	Area (ha)
849	CEEC	Cumberland Plain Woodland in the Sydney Basin Bioregion	1.16	CEEC	Cumberland Shale Plains Woodland and Shale Gravel Transition Forest	1.16

CEEC – Critically endangered ecological community

4.2.5 Vegetation integrity assessment

A vegetation integrity assessment using the BAM Calculator (BAMC) was undertaken and the results are outlined in Table 8.

Table 8: Vegetation integrity

Veg Zone	PCT ID	Condition	Area (ha)	Composition Condition Score	Structure Condition Score	Function Condition Score	Current vegetation integrity score
1	849	Good	1.16	35.1	60.4	62	50.8

Figure 9: Plant community types

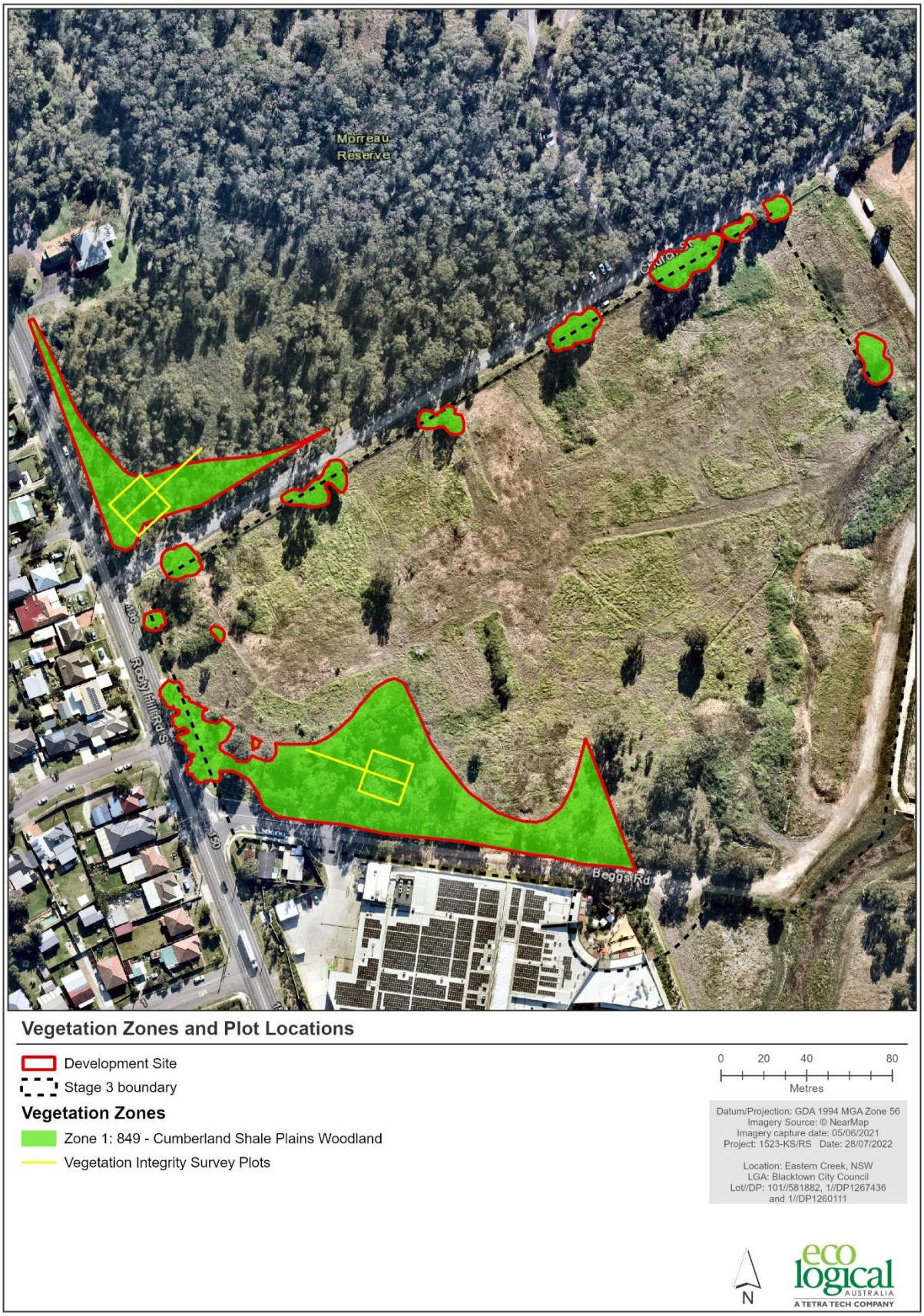

Figure 10: Plot locations and vegetation zones within the development footprint

Figure 11: Threatened Ecological Communities

4.3 Threatened species

4.3.1 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 9. Ecosystem credit species which have been excluded from the assessment and relevant justification are also included in Table 9.

Table 9: Predicted ecosystem credit species

Species	Common Name	Habitat constraints/ Geographic limitations	Sensitivity to gain class	BC Act listing status	EPBC Act listing status	Justification for inclusion or exclusion
Anthochaera phrygia	Regent Honeyeater	-	High	Critically Endangered	Critically Endangered	Included Marginal foraging habitat available.
Artamus cyanopterus cyanopterus	Dusky Woodswallow	-	Moderate	Vulnerable	Not Listed	Included Potential habitat is available within the development site.
Callocephalon fimbriatum	Gang Gang Cockatoo	-	Moderate	Vulnerable	Not listed	Included Potential habitat is available within the development site.
Chthonicola sagittata	Speckled Warbler	-	High	Vulnerable	Not Listed	Excluded Absence of potential foraging habitat due to landscape position (not on a rocky ridge or gully) and development site is a fragmented patch which is not preferred habitat.
Circus assimilis	Spotted Harrier	-	Moderate	Vulnerable	Not Listed	Included Potential foraging habitat is available within the development site.
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	-	High	Vulnerable	Not Listed	Excluded Absence of preferred foraging tree species in the development site.

Species	Common Name	Habitat constraints/ Geographic limitations	Sensitivity to gain class	BC Act listing status	EPBC Act listing status	Justification for inclusion or exclusion
Daphoenositta chrysoptera	Varied Sittella	-	Moderate	Vulnerable	Not Listed	Included Potential foraging habitat is available within the development site.
Dasyurus maculatus	Spotted-tailed Quoll	-	High	Vulnerable	Endangered	Excluded Habitat connectivity is fragmented within the urbanised locality such that this species is unlikely to be present.
Glossopsitta pusilla	Little Lorikeet	-	High	Vulnerable	Not Listed	Included Potential habitat is available within the development site.
Grantiella picta	Painted Honeyeater	- Mistletoes present at a density of greater than five mistletoes per hectare	Moderate	Vulnerable	Vulnerable	Excluded Mistletoes not present at required density.
Haliaeetus leucogaster	White-bellied Sea-Eagle	- Waterbodies - Within 1km of rivers, lakes, large dams or creeks, wetlands and coastlines.	High	Vulnerable	Not Listed	Included Marginal habitat available.
Hieraaetus morphnoides	Little Eagle	-	Moderate	Vulnerable	Not Listed	Included Marginal foraging habitat available
Lathamus discolor	Swift Parrot (Foraging)	-	Moderate	Endangered	Critically Endangered	Excluded Key feed tree species not present in the development site.
Lophoictinia isura	Square-tailed Kite (Foraging)	-	High	Vulnerable	Not Listed	Included Potential foraging habitat is available within the development site.

Species	Common Name	Habitat constraints/ Geographic limitations	Sensitivity to gain class	BC Act listing status	EPBC Act listing status	Justification for inclusion or exclusion
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	-	Moderate	Vulnerable	Not Listed	Excluded Potential habitat not present. This species prefers structurally diverse habitats and relies on dead stumps and fallen timber to forage from. The development site lacked structural complexity and features that would facilitate foraging for this species. The Hooded Robin also requires 30 ha of foraging habitat outside of the breeding season, and the site comprises 1.16 ha. Although there are other vegetated areas within the vicinity, they are highly fragmented.
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	-	Moderate	Vulnerable	Not Listed	Excluded Potential foraging habitat is not available within the development site. This species relies on *Eucalyptus sideroxylon*, *E. albens*, *E. microcarpa*, *E. melliodora*, *E. blakelyi* and *E. tereticornis* of which only one is present, and, where present it is in low abundance. This species requires large patches of vegetation to forage of around 5 ha. The species will rely on the largest patch within the locality. Compared to the vegetation adjacent to the site along Church Street, the 1.16 ha within the development site is not the biggest patch in the locality.
Micronomus norfolkensis	Eastern Coastal Freetail-bat	-	High	Vulnerable	Not Listed	Included Potential foraging and roosting habitat is available within the development site. This species was detected during targeted survey.
Miniopterus australis	Little Bentwing-bat (Foraging)	-	High	Vulnerable	Not Listed	Included Potential foraging and secondary roosting habitat is available within the development site.

Species	Common Name	Habitat constraints/ Geographic limitations	Sensitivity to gain class	BC Act listing status	EPBC Act listing status	Justification for inclusion or exclusion
Miniopterus schreibersii oceanensis	Large Bentwing-bat (Foraging)	-	High	Vulnerable	Not Listed	Included Potential foraging habitat and secondary roosting habitat is available within the development site. This species was detected during targeted survey.
Neophema pulchella	Turquoise Parrot	-	High	Vulnerable	Not listed	Included Marginal foraging habitat available
Ninox connivens	Barking Owl (foraging)	-	High	Vulnerable	Not listed	Included Marginal foraging habitat is available
Ninox strenua	Powerful Owl (foraging)	-	High	Vulnerable	Not listed	Excluded Development site is not within proximity to any suitable breeding habitat. Site is highly fragmented and would be unlikely to provide foraging resources.
Petroica boodang	Scarlet Robin	-	Moderate	Vulnerable	Not Listed	Included Potential foraging habitat is available within the development site.
Petroica phoenicea	Flame Robin	-	Moderate	Vulnerable	Not Listed	Included Marginal foraging habitat is available within the development site.
Phascolarctos cinereus	Koala	-	High	Vulnerable	Vulnerable	Excluded Habitat connectivity is fragmented within the urbanised locality such that this species is unlikely to be present.
Pteropus poliocephalus	Grey-headed Flying-fox	-	High	Vulnerable	Vulnerable	Included Marginal foraging habitat is available within the development site.
Saccolaimus flaviventris	Yellow-bellied Sheath tail Bat	-	High	Vulnerable	Not listed	Included

Species	Common Name	Habitat constraints/ Geographic limitations	Sensitivity to gain class	BC Act listing status	EPBC Act listing status	Justification for inclusion or exclusion
						Marginal foraging habitat is available within the development site. This species was detected during targeted survey.
Stagonopleura guttata	Diamond Firetail	-	Moderate	Vulnerable	Not listed	Included Marginal foraging habitat is available within the development site.
Tyto novaehollandiae	Masked Owl (foraging)	-	High	Vulnerable	Not listed	Excluded Development site is not within proximity to any suitable breeding habitat. Site is highly fragmented and would be unlikely to provide foraging resources.

4.3.2 Species credit species

Species credit species predicted to occur at the development site, their associated habitat constraints, geographic limitations and sensitivity to gain class is included in Table 10. Species credit species which have been excluded from the assessment and relevant justification are also included in Table 10.

Table 10: Candidate species credit species

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Justification for inclusion or exclusion of species	Presence/absence
Acacia bynoeana	Bynoe's Wattle	-	-	High	E	V	Excluded Suitable habitat is not present within the development site due to unsuitable soil type (occurs on sandy soils) and lack of associated species (Red Bloodwood, Scribbly Gum, Parramatta Red Gum, Saw Banksia and Narrow-leaved Apple).	N/A
Acacia pubescens	Downy Wattle	-	-	High	V	V	Excluded Suitable habitat is not present within the development site due to unsuitable soil type (occurs on sandy soils) and lack of associated species (Red Bloodwood, Scribbly Gum, Parramatta Red Gum, Saw Banksia and Narrow-leaved Apple).	N/A
Anthochaera phrygia	Regent Honeyeater	- OEH mapped areas	-	High	CE	CE	Excluded The development site does not contain mapped important areas.	N/A
Burhinus grallarius	Bush Stone-curlew	Fallen / dead or standing timber	-	High	E	Not listed	Excluded The development site is degraded and does not contain any fallen or standing timber suitable for this species.	N/A
Caladenia tessellata	Thick Lip Spider Orchid	-	-	Moderate	E	V	Excluded Habitat modified/degraded such that species is unlikely to be present.	N/A

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Justification for inclusion or exclusion of species	Presence/absence
Callocephalon fimbriatum	Gang-gang Cockatoo (breeding)	Hollow bearing trees, Eucalypt tree species with hollows greater than 9 cm diameter	-	High	V	Not listed	Excluded Suitable habitat in the form of large hollow bearing trees is not present for this species.	N/A
Cercartetus nanus	Eastern Pygmy Possum	-	-	High	V	Not listed	Excluded Habitat within the development site is substantially degraded such that the species is unlikely to utilise the development site.	N/A
Chalinolobus dwyeri	Large-eared Pied-bat	Cliffs, Within two km of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels	-	Very high	V	V	Excluded The development site is not within 2 km of cliffs or rocky areas. This species also was not recorded during targeted echolocation surveys.	N/A
Cynanchum elegans	White-flowered Wax Plant	-	-	High	E	E	Excluded Habitat within the development site marginal and the species has not been recorded within a 10 km radius of the development site.	N/A
Dillwynia tenuifolia	-	-	-	Moderate	V	Not Listed	Excluded Habitat within the development site marginal and the species has not been recorded within a 10 km radius of the development site. This	N/A

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Justification for inclusion or exclusion of species	Presence/absence
							species is more commonly associated with Castlereagh Ironbark Forest, Shale Gravel Transition Forest and Castlereagh Scribbly Gum Woodland. Not recorded during flora survey.	
Dillwynia tenuifolia – endangered population	Dillwynia tenuifolia, Kemps Creek	-	- The area bounded by western Road, Elizabeth Drive, Devonshire Road and Cross Street, Kemps Creek in the Liverpool Local Government Area	N/A	E2	Not Listed	Excluded Development site outside the geographic limitation for this endangered population.	N/A
Eucalyptus benthamii	Camden White Gum	-	-	High	V	V	Excluded Conspicuous species not recorded during field surveys. Known only from two populations on the Nepean River and its tributaries.	N/A
Grevillea juniperina subsp. *juniperina*	Juniper-leaved Grevillea	-	-	High	V	Not Listed	Included Potential habitat is present for this species.	Not present. Not recorded during targeted survey.
Haliaeetus leucogaster	White-bellied Sea-eagle (Breeding)	- Living or mature dead trees within 1 km of rivers, lakes, large	-	High	V	Not Listed	Excluded No breeding habitat (large stick nests) present in the development site.	N/A

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Justification for inclusion or exclusion of species	Presence/absence
		dams or creeks, wetlands and coastlines AND the presence of a large stick nest in the canopy						
Hieraaetus morphnoides	Little Eagle	Other, nest trees - live (occasionally dead) large old trees within vegetation)	-	Moderate	V	Not listed	Excluded The development site does not contain any nest trees.	N/A
Lathamus discolor	Swift Parrot (Breeding)	- As per OEH mapped areas	-	Moderate	E	CE	Excluded Not within OEH mapped area.	N/A
Litoria aurea	Green and Golden Bell Frog	- Within 1km of wet areas - Within 1km of swamp - Within 1km of waterbody	-	High	E	V	Excluded This species was not included as there is no habitat present within the development site.	Not present. Species not recorded during targeted survey throughout Stage 3.
Lophoictinia isura	Square-tailed Kite (breeding)	Other, nest trees	-	Moderate	V	Not listed	Excluded The development site does not contain any breeding habitat.	N/A
Marsdenia viridiflora subsp. *viridiflora* – *endangered population*	*Marsdenia viridiflora* R. Br. subsp. *viridiflora* population in the Bankstown, Blacktown,	-	Those LGAs named in the population's listing	High	E2	Not Listed	Included Known nearby records and potential habitat present.	Absent. Species not recorded during targeted survey.

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Justification for inclusion or exclusion of species	Presence/absence
	Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith LGAs							
Meridolum corneovirens	Cumberland Plain Land Snail	-	-	High	E	Not Listed	Included This species was included in the targeted survey.	Present in the proposed road upgrade only. Species not recorded during targeted survey in the remainder of the development footprint.
Miniopterus australis	Little Bentwing-bat (Breeding)	Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding	-	Very High	V	Not Listed	Excluded Species known only to breed in maternity caves. No breeding habitat present in the development site.	N/A
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat (Breeding)	Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding	-	Very High	V	Not Listed	Excluded Species known only to breed in maternity caves. No breeding habitat present in the development site.	N/A

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Justification for inclusion or exclusion of species	Presence/absence
Myotis macropus	Southern Myotis	- Hollow-bearing trees - Within 200m of a riparian zone - Bridges, caves or artificial structures within 200m of riparian zone	-	High	V	Not Listed	Excluded There are no bodies of water within 200 m of the site. The closest body of water is Eastern Creek, 1 km to the east of the development site.	N/A.
Ninox connivens	Barking Owl (breeding)	Hollow bearing trees, Living or dead trees with hollow greater than 20cm, > 4 m above the ground	-	High	V	Not listed	Excluded No suitable breeding habitat present. Hollows present in the development site were 5-10 cm in diameter.	N/A
Ninox strenua	Powerful Owl (breeding)	Hollow bearing trees, Living or dead trees with hollow greater than 20cm	-	High	V	Not listed	Excluded No suitable breeding habitat present. Hollows present in the development site were 5-10 cm in diameter.	N/A
Persoonia bargoensis	Bargo Geebung	-	-	High	E	V	Excluded Associated soil profile (sandstone or shale-sandstone transition soils) are not present in the development site. Known northern limit of the range is Douglas Park and Picton, over 70 km south of the development site.	N/A
Petaurus norfolcensis	Squirrel Glider	-	-	High	V	Not Listed	Excluded	N/A

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Justification for inclusion or exclusion of species	Presence/absence
							Habitat within the development site is substantially degraded such that the species is unlikely to utilise the subject land.	
Phascolarctos cinereus	Koala (Breeding)	- Areas identified as important habitat via survey	-	High	V	V	Excluded Habitat within the development site is substantially degraded such that the species is unlikely to utilise the subject land.	N/A
Pimelea curviflora var. *curviflora*	-	-	-	High	V	V	Included Known nearby records and potential habitat present.	Potential. One sample taken and sent to the herbarium for classification.
Pimelea spicata	Spiked Rice-flower	-	-	High	E	E	Included This species was included in the targeted survey. No individuals were recorded.	Absent. Species not recorded during targeted survey.
Pommerhelix duralensis	Dural Woodland Snail	- Leaf litter and shed bark or within 50m od litter or bark - Rocks or within 50m of rocks - Fallen/standing dead timber including logs and bark or within 50m of logs or bark	-	High	E	E	Included This species was included in the targeted survey. No individuals were recorded.	Absent. Species not recorded during targeted survey.

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Justification for inclusion or exclusion of species	Presence/absence
Pteropus poliocephalus	Grey-headed Flying-fox (Breeding)	- Breeding camps	-	High	V	V	Excluded No camps present in development site.	N/A
Pterostylis saxicola	Sydney Plains Greenhood	-	-	High	E	E	Excluded Suitable habitat not present, typically occurs on sandstone rock shelves above cliff lines. No records within 5km of development site.	N/A
Pultenaea pedunculata	Matted Bush-pea	-	-	N/A	E	Not Listed	Included Potential habitat present.	Absent. Species not recorded during targeted survey.
Thesium australe	Austral Toadflax	-	-	High	V	V	Excluded Habitat substantially degraded.	N/A
Tyto novaehollandiae	Masked Owl (breeding)	Hollow bearing trees, living or dead trees with hollows greater than 20cm diameter	-	High	V	Not listed	Excluded No suitable breeding habitat present in the development footprint. Hollows present in the development site were 5-10 cm in diameter.	N/A

4.3.3 Ecosystem credit species habitat assessment results

Hollow bearing trees with hollow sizes of 5-10 cm were identified within the development site. These hollows may be used by microbats or small woodland and peri urban birds for roosting habitat. The trees within the development site may be used as potential seasonal foraging habitat for microbats and *Pteropus poliocephalus* (Grey-headed Flying-fox). The nearest Flying-fox Camp is located approximately 8 km west of the development site at Ropes Creek. It is more likely that suitable breeding habitat would be present outside the development site in this core area. Camps have never been recorded or observed within this development site.

Anabat echolocation surveys undertaken as part of targeted microbat surveys identified positive calls for the following threatened bats:

- *Falsistrellus tasmaniensis* (Eastern False Pipistrelle)
- *Micronomus norfolkensis* (Eastern Coastal Free-tail Bat)
- *Miniopterus orianae oceanensis* (Large Bent-winged Bat).

4.3.4 Species credit species targeted survey results

Details of targeted survey effort are discussed in Section 3.3.1. The results of targeted surveys are presented in Table 11.

Table 11: Targeted survey results by species.

Target species	Common name	BAM survey period	Survey dates	Species recorded during survey	Species credits required
Grevillea juniperina subsp. *juniperina* *Marsdenia viridiflora* subsp. *viridiflora* *Pimelea curviflora* var. *curviflora* *Pimelea spicata* *Pultenaea pedunculata*	Juniper-leaved Grevillea Spiked Rice-flower Matted Bush-pea	Jan – Dec Nov – Feb Oct – Mar Jan – Dec Sep - Nov	27 August 2020 and 28 February 2022 for all species	No species recorded during survey.	No. None of the species were recorded within development site. One sample for *Pimelea* sp. was taken and sent to the Herbarium for identification. The ID from the herbarium is yet to be received.
Meridolum corneovirens *Pommerhelix duralensis*	Cumberland Plain Land Snail Dural Land Snail	Jan - Dec	27 August 2020 28 February 2022	Yes.	Yes. Cumberland Plain Land Snail was identified within the development site. No Dural Land Snail individuals were found during survey.

Target species	Common name	BAM survey period	Survey dates	Species recorded during survey	Species credits required
Miniopterus orianae oceanensis	Large Bent-winged Bat	Jan, Feb, Dec	April 2012	Yes. Anabat echolocation data identified positive calls for this species.	No. There is no potential roosting or breeding habitat in the form of caves, mines, tunnels or culverts within the development site. It is likely that the species would only utilise the site for foraging. Foraging habitat for this species has been offset using ecosystem credits.

4.3.5 Species credits species included in this assessment

Following completion of targeted surveys, one species credit species was included in the assessment:

- *Meridolum corneovirens* (Cumberland Plain Land Snail).

This species was identified in the development site during the February 2022 surveys. The species was only identified in the area proposed to form part of the Church Street / Rooty Hill Road South upgrade, and therefore, this is the only habitat that was included as part of the species polygon (Figure 14). *Pimelea* sp. was identified within the development site. A sample has been sent to the herbarium for identification. Once the identification is received, this BDAR will be updated.

5. Impact assessment (biodiversity values)

5.1 Avoiding impacts

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

The proposed development is a new SSD application to amend the existing State Significant Development for Eastern Creek Business hub (SSD 5175). Following review of the BDAR v3 submitted with the SSD application, a Request for Information was made by the then DPIE to explore options for retaining additional trees on the site (where they are not impacted by the proposed building and car park). The development site has also been modified to include proposed road upgrades for the intersection of Church Street and Rooty Hill Road South to form a four-way intersection at the request of TfNSW. The discussion of how impacts have been avoided and minimised through the design process are discussed in two parts – in relation to the ECQ Stage 3 Development and in relation to the proposed road upgrade.

ECQ Stage 3 Development Footprint

Further design work has been undertaken and it is now proposed to retain 15 of the existing trees within the landscape zone. This has resulted in a reduction to the area of vegetation removal located within the site boundary from 0.73ha down to 0.64ha. The removal of the remaining trees within this zone is necessary due to their proximity to future works and consequential encroachment within the Tree Protection Zone.

Notwithstanding the retention of existing trees within the site, as part of the Response to Submission process further consultation has been undertaken with Council and TfNSW in relation to the proposed transport upgrades. As a result of this process, Frasers has been requested to:

- Upgrade Church Street to Council's standards for an 'Other - Industrial Road' (including the widening of Church Street to 20.5m); and
- Upgrade the intersection of Church Street and Rooty Hill Road South to form a four-way intersection
- The installation of a bike path along RHRS to continue the path being provided for Stages 1 and 2.

These works will facilitate access to the site in accordance with Council's and TfNSW's specifications, but they will also deliver broader public benefits by enhancing access to Council's playing fields and extending the bicycle path network. Whilst the detailed design of these works has not been resolved and will be subject to separate approvals, it is likely that they will be required.

Rooty Hill Road South / Church Street intersection upgrades

Substantial consultation with TfNSW and Blacktown City Council (Council has been completed to determine the most appropriate intersection for Church Street and Rooty Hill Road South.

Numerous routes were explored in an attempt to meet TfNSW and Council requirements whilst minimising impacts to biodiversity values. The Frasers project team recommended a 3-way intersection positioned to the south of St Agnes Avenue which minimises the biodiversity impact of the intersection

by minimising the encroachment of the intersection into PCT 849 on the northern side of Church Street. This option was proposed as part of the concept plan lodgement in December 2020. However, following review by both Council and TfNSW and ongoing consultation, while the intersection design is supported in principle, both authorities have asked Frasers to pursue a 4-way intersection instead.

The DPE has also requested the 4 way intersection be pursued to minimise impacts to St Agnes Avenue and Minchinbury Street and to provide a long-term safe, efficient, and equitable access arrangement for the community and the broader road network. Please refer to the DPE request for additional information, dated 22 February 2022 (Appendix I):

> *"The Department recommends that you explore alternative options/concept designs for signalisation of the Church Street and Rooty Hill Road South intersection to minimise impacts to St Agnes Avenue and Minchinbury Street. This should include options to provide a 4-way intersection which aligns with St Agnes Avenue to provide a long-term safe, efficient, and equitable access arrangement for the community and the broader road network. It should also seek to minimise the potential environmental and heritage impacts on The Rooty Hill."*

Please also refer to the TfNSW RFI letter dated 28 March 2022, and BCC letter dated 31 March 2022 (Appendix J). To summarise:

- While TFNSW accept that a 3-way intersection could function, the design restricts access to St Agnes Avenue and hence a 4 way intersection is preferred; and
- BCC no longer support the 3-way intersection.

In terms of existing site constraints (mainly services and structures along Rooty Hill Road South and Church Street), the following has been carefully considered:

- there are existing driveways along the frontage of Rooty Hill Road South and St Agnes Avenue intersection. These cannot be moved and as such the current kerb return, pram ramp and footpath design has had to accommodate these existing features.
- the proposed pedestrian crossing on St Agnes Avenue can accommodate a 3m width, but not the preferred 3.5m width as this would require widening into privately owned land and boundary adjustments which is not an acceptable solution.
- there is an existing power pole that is currently on the southern corner of St Agnes Avenue. The proposed kerb return has allowed for this to be kept.
- existing stormwater lintel pit to the south of St Agnes Avenue is to remain and this sets the position of the proposed pedestrian crossing at this location.

Engineering solutions / design iterations were explored in attempt to minimise impact on biodiversity. The design for the 4-way intersection has carefully considered the following key requirements:

- Requirement of aligning Church Street with St Agnes Avenue in the 4-way intersection
- Traffic design requirements for the intersection (including turning lanes, swept paths, pedestrian crossing etc.) to ensure a safe and efficient traffic outcome
- BCC's requirement for convenient vehicular access via Church Street to the Sporting Field (Helen Beck Field)

- Residents' desire for convenient vehicular and pedestrian access to Eastern Creek Quarter development (based on feedback from community consultation campaign undertaken during February – March 2022).

Balancing above requirements with attempt to minimise the extent of land needed for the intersection design, the intersection designer endeavoured to keep the curve radii (of Church Street) as tight as possible, to quickly connect back to the existing Church Street alignment and hence minimise the impact to PCT 849. Following design re-iterations, the extent of land required in the adjacent BCC land has been reduced from nearly 3 ha to 2.1 ha, while maintaining the safety and connectivity requirements listed above.

Further explanation and justification of the design considerations is provided in the Response to Submissions (ELA 2021).

Table 12: Locating and designing 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 proposed application would remove 1.16 ha of PCT 849 in good condition.	The proposed development would affect 1.16 ha of native vegetation within the development footprint. About 0.87 ha of CPW has been previously marked for retention, with 1.8 ha to be restored as part of the Eastern Conservation Area (Figure **2**). Additional offsets would be obtained for the increased impacts.
locating the project in areas where the native vegetation or threatened species habitat is in the poorest condition	Impacts across the Eastern Creek Business Hub SSD development footprint are mostly limited to areas containing exotic vegetation. The proposed application would remove an additional 1.16 ha of good condition PCT 849.	The proposed development would affect 1.16 ha of native vegetation in good condition within the development footprint. The Eastern Creek Business Hub SSD development footprint has been designed to mostly affect exotic pasture (Figure **2**).
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	A majority of the Eastern Creek Business Hub SSD development footprint is located on exotic pasture. The proposed application would remove 1.16 ha of good condition PCT 849.	The proposed application would affect 1.16 ha of PCT 849 with a majority of the development footprint located on exotic pasture. The 1.16 ha of PCT 849 to be removed would form foraging habitat for highly mobile species, such as birds and microbats.
locating the project such that connectivity enabling movement of species and genetic material between areas of adjacent or nearby habitat is maintained	The proposed application would affect 1.16 ha of PCT 849 that is currently fragmented from other areas of the community.	There is limited connectivity of the development site with areas of surrounding habitat. The connectivity would be limited to highly mobile species such as birds and bats. The removal of 1.16 ha of PCT 849 in the development site would not substantially affect connectivity or the transfer of genetic material throughout the Stage 3 site (Figure **2**).

Approach	How addressed	Justification
reducing the clearing footprint of the project	A majority of the Eastern Creek Business Hub footprint is located on exotic pasture. The proposed application would remove an additional 1.16 ha of native vegetation.	The proposed development would affect 1.16 ha of PCT 849. The Eastern Creek Business Hub SSD would retain and revegetate 2.67 ha of PCT 849 as part of the Eastern Conservation Area
locating ancillary facilities in areas where there are no biodiversity values or threatened species habitat or habitat for species and vegetation in high threat status categories (e.g. an EEC or CEEC)	There are no ancillary services that would encroach into the development site.	There are no ancillary services that would encroach into the development site.
providing structures to enable species and genetic material to move across barriers or hostile gaps	The proposed development would not inhibit or fragment any existing movement corridors.	The development footprint would not result in any barriers or hostile gaps in an existing vegetated corridor. The vegetation proposed for removal is fragmented from other areas of vegetation.
making provision for the demarcation, ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on the development site.	Establishment and implementation of a Vegetation Management Plan.	A Vegetation Management Plan has been prepared and should be implemented across the Eastern Conservation Area. This would include fencing of the development footprint to demarcate the boundary of retained vegetation. This method is consistent with standard environmental management measures, which have been included in Section 5.2.4.
efforts to avoid and minimise impacts through design must be documented and justified	The proposed application will affect an additional 1.16 ha of PCT 849 in good condition.	There have been 23 iterations of the development footprint that have considered all constraints relevant to the proposal. Following a request by agencies to further avoid impacts, it is now proposed to retain 15 of the existing trees within the landscape zone, reducing the CPW removal area from 0.73 ha to 0.64 ha in this part of the site, however some additional vegetation removal was required along Church Road, so that the final impact is 1.16 ha. These details has been included in the revised Arboricultural Impact Assessment.

5.2 Assessment of Impacts

5.2.1 Direct impacts

The direct impacts of the development on native vegetation and Threatened Ecological Communities are presented in Table 13. .

Table 13: Direct impacts to native vegetation and threatened ecological communities

Veg Zone	PCT ID	PCT Scientific name	Vegetation Class	Vegetation Formation	TEC	Condition	Impact (ha)
1	849	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Coastal Valley Grassy Woodlands	Grassy Woodlands	BC Act: CEEC EPBC Act: CEEC Condition A	Good	1.16

5.2.2 Change in vegetation integrity

The change in vegetation integrity as a result of the development is outlined in Table 14.

Table 14: 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	Good	1.16	50.8	0	-50.8

5.2.3 Indirect impacts

The indirect impacts of the development are outlined in Table 15.

Table 15: Indirect impacts

Indirect impact	Project phase	Nature	Extent	Frequency	Duration	Timing
Sedimentation and contaminated and/or nutrient rich run-off	Construction	Runoff during works	Confined to development site with the implementation of sediment fencing	During heavy rainfall or storm events	During rainfall events	Short term
Noise, dust or light spill	Construction	Noise and dust created from machinery (no night works proposed therefore no light spill)	Noise and dust likely to carry beyond development site boundary	Daily, during construction works	Sporadic throughout construction period	Short-term impacts
Inadvertent impacts on adjacent habitat or vegetation	Construction / operation	Damage to adjacent habitat or vegetation	Adjacent vegetation	Daily, during construction works and operation	Throughout construction and operation period	Short-term impacts
Transport of weeds and pathogens from the site to adjacent vegetation	N/A	No patches of native vegetation in the vicinity that could be affected	N/A	N/A	N/A	N/A
Trampling of threatened flora species	N/A	No threatened flora present	N/A	N/A	N/A	N/A
Vehicle strike	Construction / operation	Potential for native fauna to be struck by working machinery and moving vehicles	Within development site	Daily, during both construction and operational phases.	Throughout life of project	Potentially long-term impacts
Rubbish dumping	Construction / operation	Illegal dumping by construction crews / future landholder	Potential for rubbish to spread via wind into nearby vegetation	Potential to occur at any time throughout construction or operational phases	Throughout life of project	Short-term impacts

Indirect impact	Project phase	Nature	Extent	Frequency	Duration	Timing
Wood collection	Construction / operation	Minimal woody debris available for collection.	Within retained vegetation.	Daily, during both construction and operational phases.	Throughout life of project	Short term impact.
Disturbance to specialist breeding and foraging habitat, e.g. beach nesting for shorebirds.	N/A	None identified	N/A	N/A	N/A	N/A
Increase in predatory species populations	Construction / operation	Negligible likelihood of impact occurring because only a small area of native vegetation will be removed	N/A	N/A	N/A	N/A
Increase in pest animal populations	Construction / operation	Negligible likelihood of impact occurring because only a small area of native vegetation will be removed	N/A	N/A	N/A	N/A

5.2.4 Prescribed biodiversity impacts

There is one prescribed biodiversity impact associated with the proposed development – vehicle strike. Vehicle strike may present a risk during the construction phase, whilst the native vegetation in the development site is still present. However, the risk is determined to be low. This is based on the fragmented nature of the development site, which is likely to result in only highly mobile species such as birds and bats using the native vegetation present. Due to their highly mobile nature, these species are unlikely to be affected by vehicle strike. Once the vegetation is removed, the potential occurrence of vehicle strike would be extremely low, as the road network would not border any native vegetation.

5.2.5 Mitigating and managing impacts

Measures proposed to mitigate and manage impacts at the development site before, during and after construction are outlined in Table 16.

Table 16: Measures proposed to mitigate and manage impacts

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
Clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance; for example, removal of native vegetation by chain-saw, rather than heavy machinery, is preferable in situations where partial clearing is proposed	Minor	Negligible	Works to be implemented consistent with existing Construction Environment Management Plan for Eastern Creek Business Hub	Vegetation to be retained outside of the Development Site boundary (south and east) will not be disturbed/affected	Fencing to be set up prior to any works occurring on site and to remain and be maintained throughout duration of construction works	Project Manager
Sediment barriers or sedimentation ponds to control the quality of water released from the site into the receiving environment	Minor	Negligible	Appropriate controls will be utilised and maintained to manage exposed soil surfaces and stockpiles to prevent sediment discharge into waterways	Erosion and sedimentation will be controlled	For the duration of construction works	Project Manager
Noise barriers or daily/seasonal timing of construction and operational activities to reduce impacts of noise	Minor	Negligible	Daily timing of construction activities is recommended in accordance with Table 1 of Interim Noise Guidelines (2009)	No noise outside of approved construction hours	Minor	Negligible
Adaptive dust monitoring programs to control air quality	Minor	Negligible	Dust suppression measures will be implemented during construction works to limit dust on site	Mitigate dust created during construction activities	For the duration of construction works	Project Manager
Temporary fencing to protect significant environmental features such as riparian zones	High	Minor	Install fencing prior to commencement of any works	access to retained vegetation restricted	For the duration of construction works	Project Manager
Hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas	Moderate	Minor	Vehicles, machinery and building refuse associated with the development construction should remain only within construction footprint areas, avoiding weed or pathogen related impacts to	Prevent spread of weeds or pathogens	For the duration of construction works	Project Manager

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
			vegetation outside of the development site			
Staff training and site briefing to communicate environmental features to be protected and measures to be implemented	Minor	Negligible	All staff working on the development will undertake an environmental induction as part of their site familiarisation. This induction will include items such as: - avoiding indirect impacts to offsite adjacent vegetation - correct storage of chemicals to prevent runoff into adjacent vegetation	All staff entering the Development Site are fully aware of the presence of native vegetation adjacent to the site 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
Development control measures to regulate activity in vegetation and habitat adjacent to residential development including controls on pet ownership, rubbish disposal, wood collection, fire management and disturbance to nests and other niche habitats	Minor	Negligible	Temporary fencing to be placed around the perimeter of the Development Site to prevent impacts to adjacent vegetation.	Protect vegetation and habitat adjacent to Development Site.	During operational phase	Client
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	All revegetation to be consistent with existing Vegetation Management Plan (VMP) for Eastern Creek Business Hub.	No areas within development site will be revegetated. Adjacent vegetation will be revegetated consistent with the VMP	Following completion of construction activities.	Project Manager

5.2.6 Serious and Irreversible Impacts (SAII)

The development has impacts on Cumberland Plain Woodland, a candidate Serious and Irreversible Impacts (SAII) value as outlined in Table 17. The principles for determining SAII, consistent with clause 6.7 of the *Biodiversity Conservation Regulation 2017*, as they relate to Cumberland Plain Woodland are presented in Table 18. State Significant Development is required to consider SAII, however does not trigger an automatic refusal. Detailed consideration of whether impacts on candidate species are serious and irreversible, consistent with subsection 10.2.2 of BAM, is included and Table 19. The extent of the SAII candidate within the development site is presented in Figure 12.

Table 17: Candidate Serious and Irreversible Impacts

Species / Community	Common Name	Principle	Direct impact (ha)	Threshold
Cumberland Plain Woodland in the Sydney Basin Bioregion	Cumberland Plain Woodland in the Sydney Basin Bioregion	1 & 2	1.16	Not published

Table 18: Determining whether impacts are serious and irreversible (consistent with clause 6.7 of the *Biodiversity Conservation Regulation 2017*)

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?	According to the BioNet Threatened Biodiversity data collection, the threshold for Cumberland Plain Woodland is 'Under 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?	No
If yes, is the impact in excess of any threshold identified and therefore likely to be serious and irreversible?	N/A
Principle 3	
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?	Yes
If yes, is the impact in excess of any threshold identified and therefore likely to be serious and irreversible?	According to the BioNet Threatened Biodiversity data collection, the threshold for Cumberland Plain Woodland is 'Under development'.
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?	N/A

Table 19: Evaluation of an impact on a threatened ecological community (consistent with subsection 10.2.2 of BAM)

Impact Assessment Provisions	Assessment
1. The action and measures taken to avoid the direct and indirect impact on the potential entity for an SAII	The majority of the Eastern Creek Business Hub development is located on areas of exotic vegetation. The proposed application will remove an additional 1.16 ha of vegetation identified as being Cumberland Plain Woodland in good condition, with a vegetation integrity score of 50.8. There have been 23 iterations of the development footprint that have considered all constraints relevant to the proposal. Through the various iterations, Frasers Property has determined that the proposed impacts to Cumberland Plain Woodland cannot be avoided because the footprint has been amended to accommodate: • activation of additional land along Rooty Hill Road South for a recreational facility • grading of some portions of the development site • increased retail space • upgrades to Beggs Road • internal walkway to connect stage 1 and stage 3 • upgrade of the Rooty Hill Road South and Church Street intersection .
2. the area and condition of the TEC to be impacted directly and indirectly by the proposed development. The condition of the TEC is to be represented by the vegetation integrity score for each vegetation zone	The proposed development will remove 1.16 ha of Cumberland Plain Woodland in good condition, with a vegetation integrity score of 50.8.
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*	A SAII threshold has not yet been published for Cumberland Plain Woodland.
4. an estimate of the extent and overall condition of the potential TEC within an area of 1000ha, and then 10,000ha, surrounding the proposed development footprint	According to the 2016 OEH vegetation mapping, the area of Cumberland Plain Woodland within 1,000 ha surrounding the development footprint is 96.81 ha and within 10,000 ha is 804.57 ha. It is acknowledged that this data set has not been updated since 2016 and as such, this calculation his likely to include inaccuracies. Therefore, the Cumberland Plain Woodland present within the development footprint represents 1.16 % and 0.14% of the TEC's extent within 1,000 ha and 10,000 ha surrounding the development footprint. The condition is not known for these areas; however, it is expected to range from good to poor. On average, patch size for Cumberland Plain Woodland is <3 ha, with more than 50% of the remaining Cumberland Plain Woodland comprised of small patches. The patch within the development site is consistent with the average patch size of the community.
5. an estimate of the area of the potential TEC that is in the reserve system within the IBRA region and the 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 (OEH 2016). Within the Cumberland Plain IBRA subregion there is also an estimated 1,291.53 ha of Cumberland Plain Woodland remaining within the reserve system. The closest reserve containing Cumberland Plain

Impact Assessment Provisions	Assessment
	Woodland are Nurrangingy Reserve and Doonside Bushland Reserve. Therefore, the Cumberland Plain Woodland present within the development footprint represents 0.05% of the TEC's extent in the reserve system within the Sydney Basin IBRA region.
4. the development proposal's impact on:	
4a. 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 patterns; will it alter natural disturbance regimes that the TEC depends upon, e.g. fire, flooding etc.?	The occurrence of Cumberland Plain Woodland to be removed from within the development site is fragmented from other patches of the community. The removal of Cumberland Plain Woodland is likely to alter the water regime within the locality, as it will be replaced with hardstand surfaces, however, the surrounding environment is comprised of exotic pasture or hardstand surfaces.
4b. 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	PCT 849 within the development footprint achieved a vegetation integrity score of 50.8. The species present in each stratum are common species to PCT 849, including *Eucalyptus tereticornis, Eucalyptus moluccana, Microlaena stipoides* var. *stipoides* and *Bursaria spinosa*. These species are likely to be well represented in other patches throughout the Cumberland IBRA subregion.
4c. 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	PCT 849 within the development footprint achieved a vegetation integrity score of 50.8 and is in good condition. The general patch size of PCT 849 is <3 ha. The patch in the development site is consistent with the average patch size throughout the IBRA subregion. The area of Cumberland Plain Woodland to be removed (1.16 ha) is an isolated patch in the landscape. The proposed application would reduce the quality and integrity of this candidate SAII through its removal.
5. direct or indirect fragmentation and isolation of an area of the TEC	About 1.16 ha of Cumberland Plain Woodland within the development footprint will be removed as part of this proposal. The patch is currently isolated from other patches of the community due to the presence of hardstand development surrounding the patch.
6. the measures proposed to contribute to the recovery of the TEC in the IBRA subregion.	As part of the broader Eastern Creek Business Hub SSD, 2.67 ha of Cumberland Plain Woodland would be retained and / or revegetated immediately adjacent to the development site.

Figure 12: Serious and Irreversible Impacts candidate entities

5.3 Impact summary

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

5.3.1 Serious and Irreversible Impacts (SAII)

The development has candidate SAII values as outlined in Table 20 and shown in Figure 12. State Significant Development requires the consideration of SAII, however, does not trigger automatic refusal.

Table 20: Serious and Irreversible Impacts Summary

Species / Community	Principle	Direct impact (area (ha))
Cumberland Plain Woodland	1 & 2	1.16

5.3.2 Impacts requiring offsets

The impacts of the development requiring offset for native vegetation are outlined in Figure **13** and Table 21. The impacts of the development requiring offset for impacts to Cumberland Plain Land Snail are presented in Figure 14 and in Table 22.

5.3.3 Impacts not requiring offsets

There are no impacts in the development site that do not require offset.

5.3.4 Areas not requiring assessment

Areas not requiring assessment are shown on Figure **13**. These areas have been previously assessed as part of the existing SSD and do not require further assessment.

5.3.5 Credit summary

The number of ecosystem credits and species credits required for the development are outlined in Table 21 and Table 22, respectively. The biodiversity credit report is included in Appendix H.

Table 21: Ecosystem credits required

PCT ID	PCT Scientific Name	Vegetation Formation	Direct impact (ha)	Credits required
849	Grey Box – Forest Red Gum grassy open woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Grassy Woodlands	1.16	37

Table 22: Credit requirement for impacts to species credit species in the development site

Scientific name	Common name	Impact (ha)	Credit requirement
Meridolum corneovirens	Cumberland Plain Land Snail	0.23	6

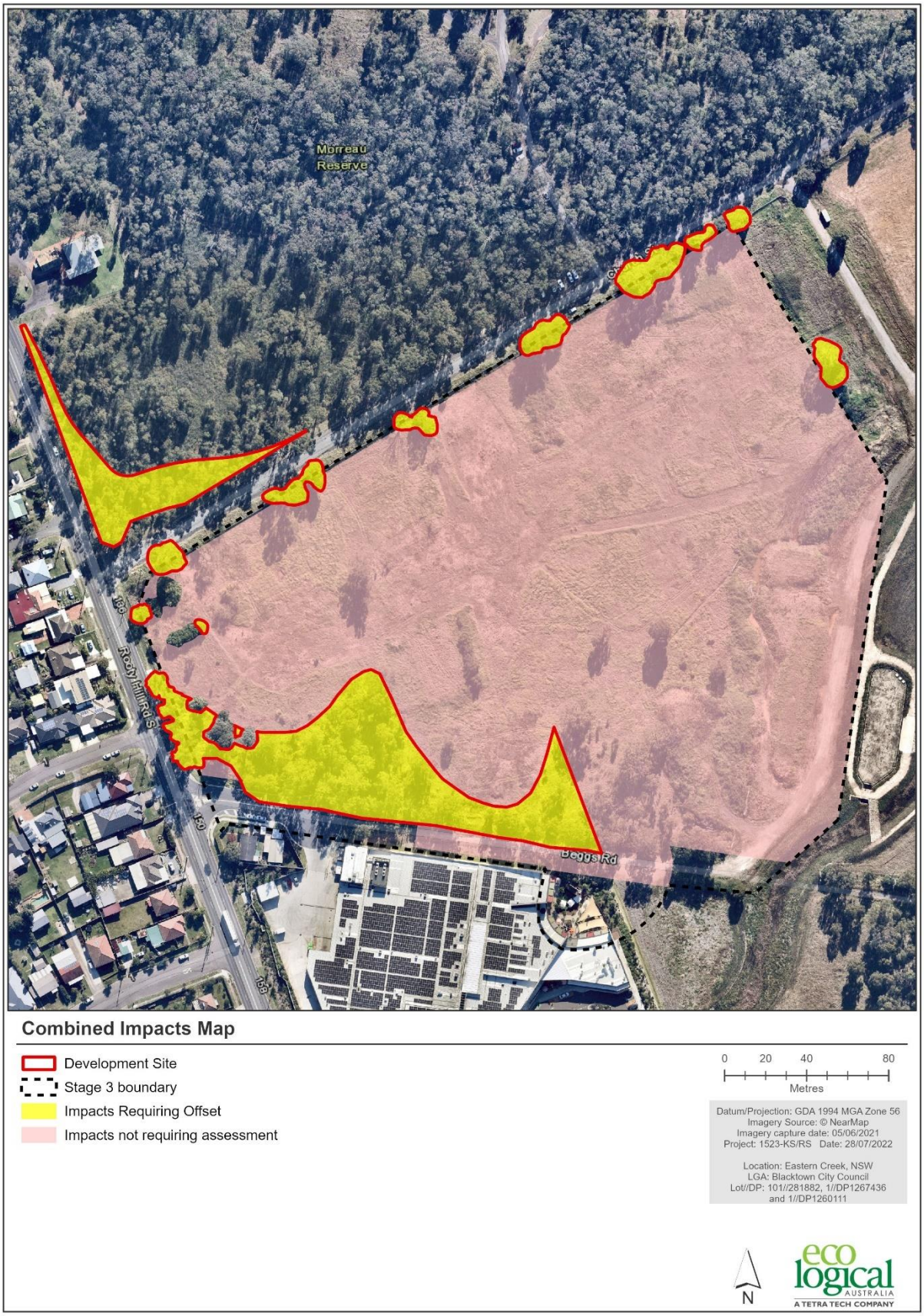

Figure 13: Impacts requiring offset in the development site

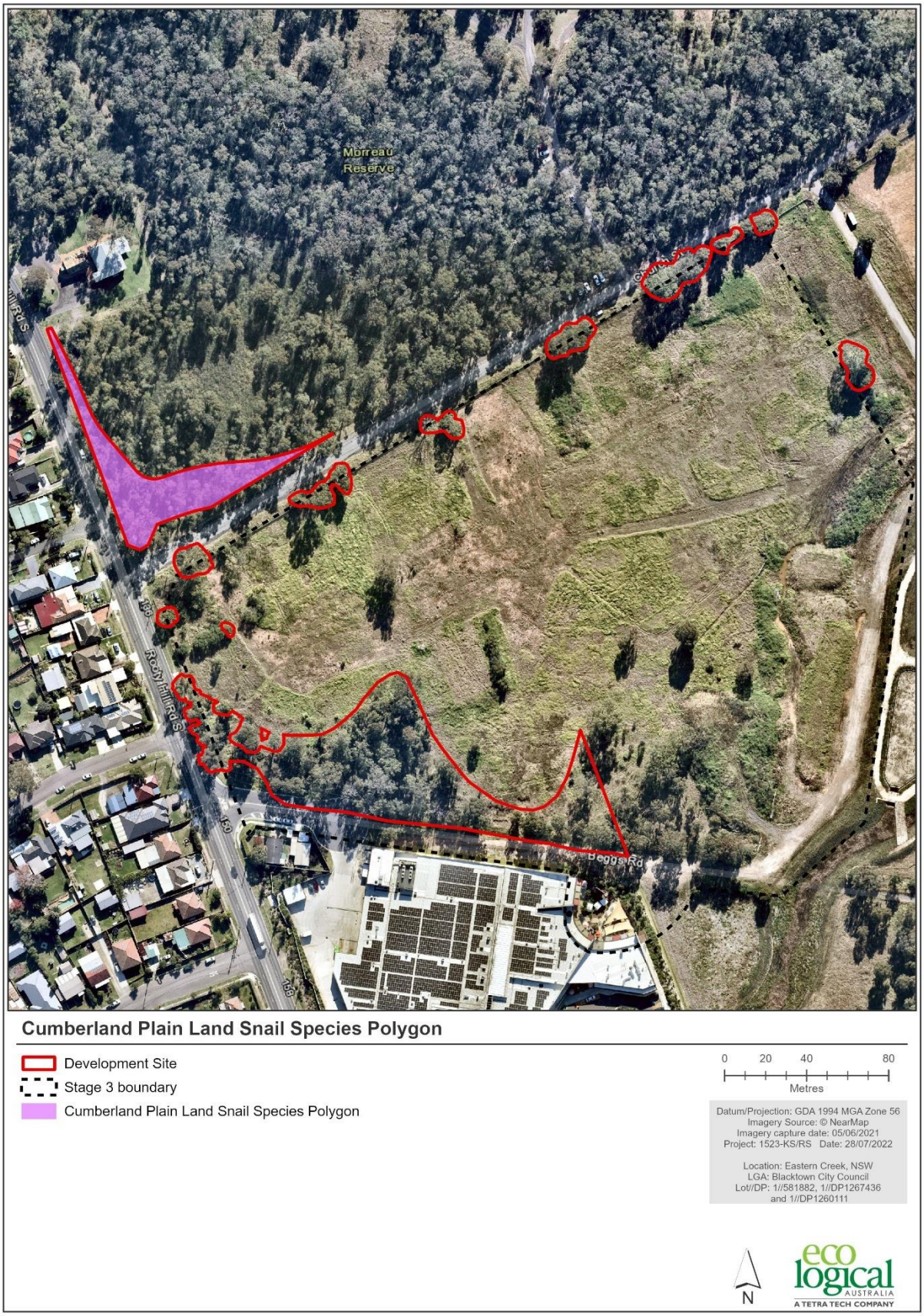

Figure 14: Impacts to Cumberland Plain Land Snail habitat within the development site

6. Consistency with legislation and policy

6.1 *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 the Environment (DAWE), which is responsible for administering the EPBC Act.

The process includes conducting an Assessment of Significance for listed threatened species and ecological communities that represent a matter of MNES that will be impacted as a result of the proposed action. Significant impact guidelines (formerly DotEE 2014) that outline a number of criteria have been developed by the Commonwealth, to provide assistance in conducting the Assessment of Significance and help decide whether or not a referral to the Commonwealth is required.

The following MNES were assessed consistent with the Significant Impact Guidelines 1.1:

- Cumberland Plain Shale Woodlands and Shale Gravel Transition Forest
- *Pteropus poliocephalus* (Grey-headed Flying-fox).

It was determined that the proposed development would constitute a significant impact to Cumberland Plain Woodland. No other Matters of NES were determined controlling provisions. The proposed development was referred to the Commonwealth and was determined a controlled action (2020/8715) to be assessed using the bilateral agreement made under Section 45 of the EPBC Act.

Frasers Property will submit a summary letter to DAWE, explaining the additional impacts to MNES associated with the proposed road upgrade.

6.2 Response to submissions

EES provided the following comments on the BDAR with respect to the survey effort:

- *Surveys for several species were undertaken outside the stipulated season or weather conditions. Table 10 of the BDAR concludes that these species are not present on site as they were not recorded. However, EES disagrees with this conclusion and considers additional justification is required to determine that the following species are not present:*
    - *Surveys for Litoria aurea (Green and Golden Bell Frog) should be undertaken during breeding season (summer), in accordance with survey guidelines in force at the time of survey (e.g. 2004 Threatened Biodiversity Survey and Assessment guidelines)*
    - *the TBDC stipulates surveys should be undertaken for Pimelea curviflora var. curviflora in October to March. This is a cryptic species so is difficult to detect if not flowering*
    - *The TBDC states that surveys for Cumberland Land Snail and Pimelea spicata should occur after rain. It is noted Table 2 says there was no rain on the day of the survey, but there is no information on whether rain occurred on preceding days. If there wasn't rain this would suggest surveys were not undertaken during the required conditions.*

In response to this comment, ELA notes:

In the month of August, there was 58 mm of rain and in the month of July, there was 123 mm of rain recorded at the nearest weather station (Erskine Park Reservoir, BOM 2021). There is some evidence to suggest that rain can trigger flowering events in *Pimelea* sp. The ecologist completing the targeted survey for *Pimelea curviflora* var. *curviflora* has extensive experience in monitoring known populations of this species at other locations throughout Western Sydney, which has included identification when the individuals are not in flower. The ecologist has also frequently identified *Pimelea curviflora* var. *curviflora* when not in flower and is confident in the ID of this species. Survey for this species has been conducted in the past (as described in the BDAR) and it has not been identified.

There are also no historical records for this species in BioNet within the development site. Surveys for the Cumberland Plain Land Snail ensured that the survey methodology was adapted to accommodate for the lack of rainfall immediately prior to the survey. The soil was scratched to below surface level to search for any individuals that may have buried into the soil. The survey guidelines also state that shells can be identified at any time and is not reliant on rain, and if shells are present these are an indication that the species is present. Shells, if present, could have been identified during the survey, irrespective of previous rainfall. Surveys were also conducted from Cumberland Plain Land Snail in 2009, and the species was not identified.

The BioNet records also do not show any historical records for this species within the development site. The BDAR has been amended to include this information. Given the information provided above (lack of historical records, absence of both species during previous targeted survey, ability for both species to be identified without immediate rainfall and the experience of the ecologist), the survey effort for *Pimelea curviflora* var. *curviflora* and Cumberland Plain Land Snail is considered sufficient.

there is no habitat for the Green and Golden Bell Frog within the development site. Therefore, no survey is required. ELA notes that the reference made to GGBF in Table 10 is incorrect. This has been rectified.

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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 DPE database of flora and fauna records. The Atlas contains records of plants, mammals, birds, reptiles, amphibians, some fungi, some invertebrates (such as insects and snails) and some fish
Broad condition state:	Areas of the same PCT that are in relatively homogenous condition. Broad condition is used for stratifying areas of the same PCT into a vegetation zone for the purpose of determining the vegetation integrity score.
Connectivity	The measure of the degree to which an area(s) of native vegetation is linked with other areas of vegetation.
Credit Calculator	The computer program that provides decision support to assessors and proponents by applying the BAM, and which calculates the number and class of biodiversity credits required to offset the impacts of a development or created at a biodiversity stewardship site.
Development	Has the same meaning as development at section 4 of the EP&A Act, or an activity in Part 5 of the EP&A Act. It also includes development as defined in section 115T of the EP&A Act.
Development footprint	The area of land that is directly impacted on by a proposed development, including access roads, and areas used to store construction materials.
Development site	An area of land that is subject to a proposed development that is under the EP&A Act.
Ecosystem credits	A measurement of the value of EECs, CEECs and threatened species habitat for species that can be reliably predicted to occur with a PCT. Ecosystem credits measure the loss in biodiversity values at a development site and the gain in biodiversity values at a biodiversity stewardship site.
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 development site. In cases where multiple populations occur in the development site or a population occupies part of the development site, 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.

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 DPE, 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 DPE 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.

Terminology	Definition
Vegetation Benchmarks Database	A database of benchmarks for vegetation classes and some PCTs. The Vegetation Benchmarks Database is published by DPE and is part of the BioNet Vegetation Classification.
Vegetation zone	A relatively homogenous area of native vegetation on a development site, land to be biodiversity certified or a biodiversity stewardship site that is the same PCT and broad condition state.
Wetland	An area of land that is wet by surface water or ground water, or both, for long enough periods that the plants and animals in it are adapted to, and depend on, moist conditions for at least part of their life cycle. Wetlands may exhibit wet and dry phases and may be wet permanently, cyclically or intermittently with fresh, brackish or saline water
Woody native vegetation	Native vegetation that contains an over-storey and/or mid-storey that predominantly consists of trees and/or shrubs

Appendix B Vegetation plot data

Table 23: Species matrix (species recorded by plot)

Growth form group	Scientific name		Stratum	Cover	Abundance	Stratum	Cover	Abundance
			Plot 1			Plot 2		
Shrub (SG)	*Acacia falcata*					m	0.2	2
Shrub (SG)	*Acacia implexa*	Hickory Wattle				m	3	2
	Araujia sericifera	Moth Vine	g	0.1	20	g	0.1	10
	Asparagus asparagoides	Bridal Creeper	g	0.2	100	g	0.1	3
	Asparagus scandens	Asparagus Fern				g	0.2	100
Forb (FG)	*Asperula conferta*	Common Woodruff				g	0.1	10
	Bidens pilosa var. *pilosa*		g	0.2	50	g	0.3	50
Forb (FG)	*Brunoniella australis*	Blue Trumpet	g	0.1	50	g	0.2	20
Shrub (SG)	*Bursaria spinosa* subsp. *spinosa*	Native Blackthorn	m	2	5	m	5	50
Grass & grasslike (GG)	*Carex inversa*	Knob Sedge	g	0.1	50			
	Cenchrus clandestinus	Kikuyu Grass				g	0.1	10
	Cestrum parqui	Green Cestrum				g	0.1	2
Fern (EG)	*Cheilanthes sieberi* subsp. *sieberi*	Rock Fern	g	0.1	10			
	Chloris gayana	Rhodes Grass				g	0.1	2
Grass & grasslike (GG)	*Chloris ventricosa*	Tall Chloris	g	0.2	100			
	Cirsium vulgare					g	0.1	4
Other (OG)	*Convolvulus erubescens*	Pink Bindweed				g	0.1	2
	Conyza bonariensis	Flaxleaf Fleabane				g	0.1	5
	Cynodon incompletus		g	0.1	50			

Growth form group	Scientific name		Stratum	Cover	Abundance	Stratum	Cover	Abundance
Grass & grasslike (GG)	*Cyperus gracilis*	Slender Flat-sedge	g	0.1	50			
Forb (FG)	*Dichondra repens*	Kidney Weed	g	0.2	500	g	5	1000
Shrub (SG)	*Dillwynia sieberi*					g	0.2	1
	Ehrharta erecta	Panic Veldtgrass	g	0.2	100	g	0.1	2
Forb (FG)	*Einadia nutans* subsp. *nutans*	Climbing Saltbush	g	0.2	100			
	Eragrostis curvula	African Lovegrass				g	0.3	100
Grass & grasslike (GG)	*Eragrostis leptostachya*	Paddock Lovegrass	g	0.1	50			
Shrub (SG)	*Eremophila debilis*	Amulla				g	0.2	10
Tree (TG)	*Eucalyptus moluccana*	Grey Box	u	2	4	u	20	10
Tree (TG)	*Eucalyptus tereticornis*	Forest Red Gum	u	10	20	u	10	10
	Geranium robertianum					g	0.1	1
Other (OG)	*Glycine tabacina*	Variable Glycine	g	0.1	100	g	0.1	10
Forb (FG)	*Hypericum perforatum*					g	0.1	3
	Jacaranda spp.					u	0.1	1
	Ligustrum lucidum	Large-leaved Privet	m	2	2	g	0.1	1
	Ligustrum sinense	Small-leaved Privet	m	1	5	g	0.1	1
	Lycium ferocissimum	African Boxthorn	m	5	10	M	0.2	2
	Malva parviflora	Small-flowered Mallow	g	0.1	5			
Tree (TG)	*Melia azedarach*	White Cedar				g	0.1	2
Forb (FG)	*Mentha satureioides*	Native Pennyroyal				g	0.3	100
Grass & grasslike (GG)	*Microlaena stipoides var. stipoides*	Weeping Grass	g	70	1000	g	85	1000
	Nothoscordum borbonicum	Onion Weed	g	0.1	5			
	Ochna serrulata	Mickey Mouse Plant				m	0.1	3
	Olea europaea subsp. cuspidata					m	1	10
Forb (FG)	*Oxalis perennans*		g	0.1	50	g	0.1	2

Growth form group	Scientific name		Stratum	Cover	Abundance	Stratum	Cover	Abundance
Grass & grasslike (GG)	*Paspalidium distans*					g	0.1	2
	Paspalum dilatatum	Paspalum	g	0.1	50	g	0.1	1
Forb (FG)	*Phyllanthus similis*					g	0.1	1
	Plantago lanceolata	Lamb's Tongues				g	0.1	5
Forb (FG)	*Senecio hispidulus*	Hill Fireweed				g	0.1	3
	Senecio madagascariensis	Fireweed				g	0.1	2
	Senna pendula var. *glabrata*					m	0.2	10
	Setaria parviflora		g	0.2	100	g	0.1	5
	Sida rhombifolia	Paddy's Lucerne	g	0.1	50	g	0.1	10
	Solanum linnaeanum	Apple of Sodom	g	0.1	5	g	0.1	2
	Sonchus oleraceus	Common Sowthistle	g	0.1	100			
	Taraxacum officinale	Dandelion	g	0.1	10			
Grass & grasslike (GG)	*Themeda triandra*		g	0.1	50			
	Tradescantia fluminensis	Wandering Jew	g	0.3	500			
	Verbena bonariensis	Purpletop	g	0.1	5	g	0.1	5

Key: U = Upper, M= Middle, G = Ground. * = exotic.

Table 24: Plot location data

Plot no.	PCT	Vegetation Zone	Condition	Zone	Latitude / eastings	Longitude / northings	Bearing (°)
1	849	1	Good	56	-33.783059	150.853243	282
2	849	2	Good	56	301088	6259958	

Table 25: Vegetation integrity data (Composition, Structure and function)

Composition (number of species)						
Plot no.	Tree	Shrub	Grass	Forb	Fern	Other
1	2	1	6	4	1	1
2	4	5	2	11	0	2

Structure (Total cover %)						
Plot no.	Tree	Shrub	Grass	Forb	Fern	Other
1	12	2	70.6	0.6	0.1	0.1
2	31.1	10.2	86.0	3.2	0.0	1.1

Function												
Plot no.	Large Trees (DBH > 50 cm)	Hollow trees	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	High Threat Weed Cover (%)
1	1	0	65	12.5	1	1	1	1	1	0	1	8.9
2	1	0	81	18	1	1	1	1	1	0	1	17

Note: For stem size classes: 0 = Absence, 1 = Presence.

Appendix C EPBC Act Likelihood of Occurrence

An assessment of likelihood of occurrence was made for threatened and migratory species identified from the database search. Only species listed under the EPBC Act were included in the assessment. Species listed only under the BC Act were assessed as part of determining credit species included in the BAMC. 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 on site and in the vicinity is unsuitable for the species.

A test of significance was conducted for threatened species that were recorded within the development site 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 development site 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.

The records column refers to the number of records occurring within 5 km of the development site, as provided by the Atlas of NSW Wildlife (BioNet) and Protected Matters Search Tool database search.

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

Table 26: EPBC Act likelihood of occurrence table

Scientific name	Common name	BC Act	EPBC Act	Distribution and habitat	Habitat	Likelihood of occurrence	Impact Assessment Required
ECOLOGICAL COMMUNITIES							
Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion			E	"Sydney Basin Bioregion, mostly in the Cumberland IBRA sub-region, with small occurrences in the Sydney Cataract, Wollemi and Burragorang sub-regions. It occurs primarily in the Castlereagh area in the north-west of the Cumberland Plain with other known occurrences near Holsworthy, Kemps Creek and Longneck Lagoon. Occurs primarily on Tertiary sands and gravels of the Hawkesbury-Nepean river system. At Agnes Banks it primarily occurs on aeolian (wind-blown) sands overlying Tertiary alluvium. Found on flat or gently undulating terrain in rain shadow areas typically receiving 700–900 mm annual rainfall. The ecological community occurs primarily at low elevations up to 80 m above sea level (ASL), including old ridges, dunes and terraces.		No	No
Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest			**CE**	**Endemic to the shale hills and plains of the Sydney Basin Bioregion in NSW, occurring primarily in, but not limited to, the Cumberland Sub-region. Flat to undulating or hilly terrain, at elevations up to approximately 350 metres above sea level. Predominantly associated with clay soils, that are derived from Wianamatta Shale geology. Minor occurrences may be present on other soil groups, notably Holocene Alluvium and soils derived from the Mittagong Formation.**		**Yes**	**Yes**
Shale Sandstone Transition Forest of the Sydney Basin Bioregion			CE	Occurs at the edges of the Cumberland Plain in western Sydney, most now occurs in the Hawkesbury, Baulkham Hills, Liverpool, Parramatta, Penrith, Campbelltown and Wollondilly local government areas. Intergrade between clay soils from the shale rock and earthy and sandy soils from sandstone, or where shale caps overlay sandstone.		No	No
Western Sydney Dry Rainforest and Moist Woodland on Shale			CE	Cumberland Plain Sub-region of the Sydney Basin Bioregion. It generally occurs in rugged terrain and other patches may occur on undulating terrain, with dry rainforest patches typically occupying steep lower slopes and gullies, and moist woodland patches typically occupying upper sections of the slope Occurs almost exclusively on clay soils derived from Wiannamatta Group shales.		No	No
FAUNA							
Actitis hypoleucos	Common Sandpiper		M	Summer migrant. In NSW, widespread along coastline and also occurs in many areas inland. Breeds in Eurasia, uncommon summer migrant to Australia (August to May). Some overwinter.		No	No
Anthochaera phrygia	Regent Honeyeater	E4A	CE	Inland slopes of south-east Australia, and less frequently in coastal areas. In NSW, most records are from the North-West Plains, North-West and South-West Slopes, Northern Tablelands,		Unlikely – marginal,	No

Scientific name	Common name	BC Act	EPBC Act	Distribution and habitat	Habitat	Likelihood of occurrence	Impact Assessment Required
				Central Tablelands and Southern Tablelands regions; also recorded in the Central Coast and Hunter Valley regions. Two of three known key breeding areas are in NSW: the Capertee Valley and Bundarra-Barraba region. The species breeds between July and January and usually nests in horizontal branches or forks in tall mature eucalypts and Sheoaks. The Regent Honeyeater primarily feeds on nectar from box and ironbark eucalypts and occasionally from banksias and mistletoes.		highly fragmented habitat	
Apus pacificus	Fork-tailed Swift		M	Recorded in all regions of NSW. Non-breeding visitor to all states and territories of Australia, arriving from its breeding grounds in Siberia around October, and departing in April. The species is thought to be highly mobile within Australia, moving across the country in search of food. They probably roost aerially.		No – no habitat available	No
Botaurus poiciloptilus	Australasian Bittern	E1	E	Found over most of NSW except for the far north-west. Feed mainly at night on frogs, fish, yabbies, spiders, insects and snails. Feeding platforms may be constructed over deeper water from reeds trampled by the bird. Breeding occurs in summer from October to January; nests are built in secluded places in densely-vegetated wetlands on a platform of reeds.		No – no habitat available	No
Calidris acuminata	Sharp-tailed Sandpiper		M	Summer migrant. Widespread in most regions of NSW, especially in coastal areas, but sparse in the south-central Western Plain and east Lower Western Regions. Breeds Arctic Siberia, summer migrant to Australia August-April. Some overwinter. Forage in wetlands or intertidal mudflats, inundated vegetation of saltmarsh, grass or sedges, sewage ponds. Roosting occurs at the edges of wetlands, on sandy beaches, stony shores or on rocks in water.		No – no habitat available	No
Calidris ferruginea	Curlew Sandpiper	E1	CE, M	Occurs along the entire coast of NSW, and sometimes in freshwater wetlands in the Murray-Darling Basin. It forages in or at the edge of shallow water, occasionally on exposed algal mats or waterweed, or on banks of beach-cast seagrass or seaweed. It roosts on shingle, shell or sand beaches; spits or islets on the coast or in wetlands; or sometimes in salt marsh, among beach-cast seaweed, or on rocky shores. Curlew Sandpipers are omnivorous, feeding on worms, molluscs, crustaceans, insects and some seeds.		No – no habitat available	No
Calidris melanotos	Pectoral Sandpiper		M	Summer migrant to Australia. Widespread but scattered in NSW. East of the Great Divide, recorded from Casino and Ballina, south to Ulladulla. West of the Great Divide, widespread in the Riverina and Lower Western regions. Breeds in northern Russia and North America, migrates to non-breeding areas in South America. Recorded in Australia from September to June.		No – no habitat available	No

Scientific name	Common name	BC Act	EPBC Act	Distribution and habitat	Habitat	Likelihood of occurrence	Impact Assessment Required
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Recorded from Rockhampton in Qld south to Ulladulla in NSW. Largest concentrations of populations occur in the sandstone escarpments of the Sydney basin and the NSW north-west slopes. Roosts in caves, rock overhangs and disused mine shafts and as such is usually associated with rock outcrops and cliff faces. It also possibly roosts in the hollows of trees. The species is thought to require roosting habitat that is adjacent to higher fertility sites which are used for foraging. This species probably forages for small, flying insects below the forest canopy. Likely to hibernate through the coolest months. It is uncertain whether mating occurs early in winter or in spring.		No – no roosting habitat available within the vicinity and not identified during targeted echolocation surveys	No
Dasyurus maculatus	Spotted-tailed Quoll	V	E	Found on the east coast of NSW, Tasmania, eastern Victoria and north-eastern Qld. Mostly nocturnal, although will hunt during the day; spends most of the time on the ground, although also an excellent climber. Consumes gliders, possums, small wallabies, rats, birds, bandicoots, rabbits and insects; also eats carrion and takes domestic fowl. Females occupy home ranges up to about 750 hectares and males up to 3500 hectares; usually traverse their ranges along densely vegetated creeklines.		No – fragmented habitat throughout the landscape	No
Gallinago hardwickii	Latham's Snipe		M	Migrant to east coast of Australia, extending inland west of the Great Dividing Range in NSW. Non-breeding migrant to Australia, arriving between July-November from its breeding grounds in Japan and far-eastern Russia, and departing by late February. It feeds in mud or in very shallow water with low, dense vegetation. Roosting occurs on the ground near or in foraging areas beside or under clumps of vegetation, among dense tea-tree, in forests, in drainage ditches or plough marks, among boulders, or in shallow water if cover is unavailable.		No – no habitat available in the development site	No
Grantiella picta	Painted Honeyeater	V	V	Widely distributed in NSW, predominantly on the inland side of the Great Dividing Range but avoiding arid areas. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus Amyema. Insects and nectar from mistletoe or eucalypts are occasionally eaten. Nest from spring to autumn in a small, delicate nest hanging within the outer canopy of drooping eucalypts, she-oak, paperbark or mistletoe branches.		Unlikely – highly fragmented habitat with no records within 10 km of	No

Scientific name	Common name	BC Act	EPBC Act	Distribution and habitat	Habitat	Likelihood of occurrence	Impact Assessment Required
						development site	
Haliaeetus leucogaster	White-bellied Sea-Eagle	V		Distributed along the coastline of mainland Australia and Tasmania, extending inland along some of the larger waterways, especially in eastern Australia. The breeding season extends from June to January (or sometimes February) in southern Australia. Breeding habitat is usually close to water, but may occur up to a kilometre away. Nests are mainly located in tall open forest or woodland, but sometimes in other habitats such as dense forest, closed scrub or in remnant trees on cleared land. The White-bellied Sea-Eagle feeds opportunistically on a variety of fish, birds, reptiles, mammals and crustaceans, and on carrion and offal.		Unlikely – highly fragmented habitat with no records within 10 km of development site	No
Heleioporus australiacus	Giant Burrowing Frog	V	V	South eastern NSW and Victoria, in two distinct populations: a northern population in the sandstone geology of the Sydney Basin as far south as Ulladulla, and a southern population occurring from north of Narooma through to Walhalla, Victoria. Breeding habitat of this species is generally soaks or pools within first or second order streams. They are also commonly recorded from 'hanging swamp' seepage lines and where small pools form from the collected water. This species breeds mainly in autumn, but has been recorded calling throughout the year. Egg masses are foamy with an average of approximately 500-800 eggs and are laid in burrows or under vegetation in small pools. Spends more than 95% of its time in non-breeding habitat in areas up to 300 m from breeding sites. Whilst in non-breeding habitat it burrows below the soil surface or in the leaf litter.		No - no habitat available	No
Hirundapus caudacutus	White-throated Needletail		M	All coastal regions of NSW, inland to the western slopes and inland plains of the Great Divide. Breeds in eastern Siberia, north-eastern China and Japan. The species arrives in Australia in September–October, and most depart by April. It almost always forages aerially. Recorded roosting in trees in forests and woodlands, both among dense foliage in the canopy or in hollows.		Unlikely – highly fragmented habitat with no records within 10 km of development site	No

Scientific name	Common name	BC Act	EPBC Act	Distribution and habitat	Habitat	Likelihood of occurrence	Impact Assessment Required
Lathamus discolor	Swift Parrot	E1	CE	Migrates from Tasmania to mainland in Autumn-Winter. In NSW, the species mostly occurs on the coast and south west slopes. Favoured feed trees include winter flowering species such as Eucalyptus robusta (Swamp Mahogany), Corymbia maculata (Spotted Gum), C. gummifera (Red Bloodwood), E. sideroxylon (Mugga Ironbark), and E. albens (White Box). Commonly used lerp infested trees include E. microcarpa (Inland Grey Box), E. moluccana (Grey Box) and E. pilularis (Blackbutt). Following winter they return to Tasmania where they breed from September to January.		Unlikely – highly fragmented habitat	No
Litoria aurea	Green and Golden Bell Frog	E1	V	Since 1990, recorded from ~50 scattered sites within its former range in NSW, from the north coast near Brunswick Heads, south along the coast to Victoria. Records exist west to Bathurst, Tumut and the ACT region. The species is active by day and usually breeds in summer when conditions are warm and wet. Males call while floating in water and females produce a raft of eggs that initially float before settling to the bottom, often amongst vegetation. Tadpoles feed on algae and other plant-matter; adults eat mainly insects, but also other frogs.		No – no habitat present with no records within 10 km of development site	No
Litoria raniformis	Southern Bell Frog	E1	V	In NSW, only known to exist in isolated populations in the Coleambally Irrigation Area, the Lowbidgee floodplain and around Lake Victoria. A few recent unconfirmed records have also been made in the Murray Irrigation Area. Breeding occurs during the warmer months and is triggered by flooding or a significant rise in water levels. The species has been known to breed anytime from early spring through to late summer/early autumn. Outside the breeding season animals disperse away from the water and take shelter beneath ground debris such as fallen timber and bark, rocks, grass clumps and in deep soil cracks. Prey includes a variety of invertebrates as well as other small frogs, including young of their own species.		Unlikely – no habitat present with no records within 10 km of development site	No
Merops ornatus	Rainbow Bee-eater			Distributed across much of mainland Australia, including NSW. The breeding season extends from August to January. The nest is constructed in an enlarged chamber at the end of long burrow that is excavated by both sexes. Populations that breed in southern Australia are migratory, birds moving north to northern Australia, Papua New Guinea and eastern Indonesia after breeding, and remaining there for the duration of the Australian winter. Its diet mainly consists of bees and wasps.		Unlikely - marginal habitat present with no records within 10 km of	No

Scientific name	Common name	BC Act	EPBC Act	Distribution and habitat	Habitat	Likelihood of occurrence	Impact Assessment Required
						development site	
Monarcha melanopsis	Black-faced Monarch		M	In NSW, occurs around the eastern slopes and tablelands of the Great Divide, inland to Coutts Crossing, Armidale, Widden Valley, Wollemi National Park and Wombeyan Caves. It is rarely recorded farther inland. The species spends summer and autumn in eastern Australia, and winters in southern and eastern Papua New Guinea from March to August. Breeds from October to March, in rainforest habitat.		No – no habitat present	No
Motacilla flava	Yellow Wagtail		M	Regular summer migrant to mostly coastal Australia. In NSW recorded Sydney to Newcastle, the Hawkesbury and inland in the Bogan LGA. Breeds Europe to Siberia and west Alaska,. Regular summer migrant to Australia (November-April).		No – marginal habitat present	No
Myiagra cyanoleuca	Satin Flycatcher		M	In NSW, widespread on and east of the Great Divide and sparsely scattered on the western slopes, with very occasional records on the western plains. Satin Flycatchers move north in autumn to spend winter in northern Australia and New Guinea and returning south in spring. In NSW, they depart between February and March and return between September and October. In NSW, breeding occurs between November and March, with a nest usually built in the high, exposed outer branches of a tree.		No – no habitat present	No
Numenius madagascariensis	Eastern Curlew		CE, M	Summer migrant to Australia. Primarily coastal distribution in NSW, with some scattered inland records. Breeds in Russia and north-eastern China, summer migrant to Australia August to May. Mainly forages on sheltered intertidal sandflats or mudflats, on saltflats and in saltmarsh, rockpools, coral reefs, and on ocean beaches. Roosts on sandy spits and islets, among saltmarsh or mangroves, on reef-flats, in the shallow water of near-coastal wetlands, and in trees.		No – no habitat present with no records within 10 km of development site	No
Petrogale penicillata	Brush-tailed Rock-wallaby	E1	V	In NSW they occur from the Qld border in the north to the Shoalhaven in the south, with the population in the Warrumbungle Ranges being the western limit. Browse on vegetation in and adjacent to rocky areas eating grasses and forbs as well as the foliage and fruits of shrubs and trees. Shelter or bask during the day in rock crevices, caves and overhangs and are most active at night. Highly territorial and have strong site fidelity with an average home range size of about 15		No – no habitat present with no records within 10 km of	No

Scientific name	Common name	BC Act	EPBC Act	Distribution and habitat	Habitat	Likelihood of occurrence	Impact Assessment Required
				ha. Breeding is likely to be continuous, at least in the southern populations, with no apparent seasonal trends in births.		development site	
Pseudomys novaehollandiae	New Holland Mouse	V		Fragmented distribution across eastern NSW. It is a social animal, living predominantly in burrows shared with other individuals. Distribution is patchy in time and space, with peaks in abundance during early to mid stages of vegetation succession typically induced by fire.		No – no habitat present with no records within 10 km of development site	No
Pteropus poliocephalus	**Grey-headed Flying-fox**	**V**	**V**	**Along the eastern coast of Australia, from Bundaberg in Qld to Melbourne in Victoria. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Annual mating commences in January and a single young is born in October or November. Can travel up to 50 km from the camp to forage. Feed on the nectar and pollen of Eucalyptus, Melaleuca and Banksia species, and fruits of rainforest trees and vines. Also forage in cultivated gardens and fruit crops.**		**Potential – potential habitat in the development site**	**yes**
Rhipidura rufifrons	Rufous Fantail		M	Coastal and near coastal districts of northern and eastern Australia, including on and east of the Great Divide in NSW. The southern subspecies Rhipidura rufifrons rufifrons is migratory, being virtually absent from south-east Australia in winter. Departure from the breeding areas is usually March to early April, most moving to coastal lowlands and off-shore islands in south-east Queensland, north to Cape York Peninsula and Torres Strait Island. Birds arrive back in south-east Australia mostly in September to November, and breed September to February.		No – no habitat present with no records within 10 km of development site	No
Rostratula australis	Australian Painted Snipe	E1	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. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds. The nest consists of a scrape in the ground, lined with grasses and leaves. Breeding is often in response to local conditions; generally occurs from September to December. Forages nocturnally on mud-flats and in shallow water. Feeds on worms, molluscs, insects and some plant-matter.		No – no habitat present with no records within 10 km of	No

Scientific name	Common name	BC Act	EPBC Act	Distribution and habitat	Habitat	Likelihood of occurrence	Impact Assessment Required
						development site	
Synemon plana	Golden Sun Moth	E1	CE	NSW populations are found in the area between Queanbeyan, Gunning, Young and Tumut. Adults are short-lived (one to four days) and do not feed - having no functional mouthparts; the larvae are thought to feed exclusively on the roots of wallaby grasses. Eggs are laid at the bases of wallaby grass tussocks. The flight period typically lasts from six to eight weeks (during November and December in the ACT region). Males fly only in bright sunshine during the warmest part of the day (1000 - 1400 hrs).		No – distribution does not overlap with referral area	No
Tringa nebularia	Common Greenshank		M	Summer migrant to Australia. Recorded in most coastal regions of NSW; also widespread west of the Great Dividing Range, especially between the Lachlan and Murray Rivers and the Darling River drainage basin, including the Macquarie Marshes, and north-west regions. Breeds Scotland to Siberia. Summer migrant to Australia September to April. Forages at edges of wetlands, mudflats, in channels, in shallows and on exposed seagrass beds. Roosts and loafs around wetlands, in shallow pools and puddles, or on rocks, sandbanks or small muddy islets.		No – no habitat present with no records within 10 km of development site	No
FLORA							
Acacia bynoeana	Bynoe's Wattle	E1	V	Found in central eastern NSW, from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains. Seems to prefer open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches. Associated overstorey species include Red Bloodwood, Scribbly Gum, Parramatta Red Gum, Saw Banksia and Narrow-leaved Apple.		No – no habitat present with no records within 10 km of development site	No
Acacia pubescens	Downy Wattle	V	V	Restricted to the Sydney region around the Bankstown-Fairfield-Rookwood and Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon. Flowers from August to October. The pods mature in October to December. Recruitment is more commonly from vegetative reproduction than from seedlings. The percentage of pod production and seed fall for this species appears to be low.		No – no habitat present with no records within 10 km	No

Scientific name	Common name	BC Act	EPBC Act	Distribution and habitat	Habitat	Likelihood of occurrence	Impact Assessment Required
						of development site	
Allocasuarina glareicola		E1	E	Primarily restricted to the Richmond (NW Cumberland Plain) district, but with an outlier population found at Voyager Point, Liverpool. Common associated understorey species include *Melaleuca nodosa, Hakea dactyloides, Hakea sericea, Dillwynia tenuifolia, Micromyrtus minutiflora, Acacia elongata, Acacia brownei, Themeda australis and Xanthorrhoea minor*. Not killed outright by fire but resprouts from the rootstock. Spreads by vegetative means, such that clumps of up to 100s of stems may be a single individual.		No – no habitat present with no records within 10 km of development site	No
Cryptostylis hunteriana	Leafless Tongue Orchid	V	V	In NSW, recorded mainly on coastal and near coastal ranges north from Victoria to near Forster, with two isolated occurrences inland north-west of Grafton. The larger populations typically occur in woodland dominated by *Eucalyptus sclerophylla* (Scribbly Gum*), E. sieberi* (Silvertop Ash), *Corymbia gummifera* (Red Bloodwood) and *Allocasuarina littoralis* (Black Sheoak); appears to prefer open areas in the understorey of this community. Being leafless it is expected to have limited photosynthetic capability and probably depends upon a fungal associate to meet its nutritional requirements from either living or dead organic material. In addition to reproducing from seed, it is also capable of vegetative reproduction and thus forms colonies which can become more or less permanent at a site.		No – no habitat present with no records within 10 km of development site	No
Cynanchum elegans	White-flowered Wax Plant	E1	E	Restricted to eastern NSW, from Brunswick Heads on the north coast to Gerroa in the Illawarra region, and as far west as Merriwa in the upper Hunter River valley. Flowering occurs between August and May, with a peak in November. The fruit can take up to six months to mature. Seed production is variable and unreliable. Seeds are wind dispersed. It is considered to be unlikely that a soil seed bank for this species exists. Plants are capable of suckering from rootstock in response to occasional slashing or grazing. The fire response of the species is unknown.		No – no habitat present with no records within 10 km of development site	No
Darwinia biflora		V	V	Recorded in Ku-ring-gai, Hornsby, Baulkham Hills and Ryde local government areas, in an area bounded by Maroota, North Ryde, Cowan and Kellyville. Flowering occurs throughout the year but is concentrated in autumn, with mature fruits being produced from May to August. Self-		No – no habitat present with	No

Scientific name	Common name	BC Act	EPBC Act	Distribution and habitat	Habitat	Likelihood of occurrence	Impact Assessment Required
				pollination is the usual form of pollination. Fire is an important factor in the life cycle of this species. Fire kills all plants, but also produces a flush of germination from seed stored in the soil. The number of individuals at a site then declines with time since fire, as the surrounding vegetation develops.		no records within 10 km of development site	
Eucalyptus sp. Cattai		E4A		Between Colo Heights and Castle Hill, north-western Sydney.		No – no habitat present with no records within 10 km of development site	No
Genoplesium baueri	Bauer's Midge Orchid	E1	E	Has been recorded from locations between Nowra and Pittwater and may occur as far north as Port Stephens. Flowers February to March.		No – no habitat present with no records within 10 km of development site	No
Grevillea parviflora subsp. *parviflora*	Small-flower Grevillea	V	V	Sporadically distributed throughout the Sydney Basin and in the Hunter in the Cessnock - Kurri Kurri area. Also known from Putty to Wyong and Lake Macquarie on the Central Coast. Plants are capable of suckering from a rootstock and most populations demonstrate a degree of vegetative spread, particularly after disturbance such as fire. Flowering has been recorded between July to December as well as April-May. Flowers are insect-pollinated and seed dispersal is limited. Seedling recruitment after fire is uncommon, and most recovery after disturbance appears to be gesprouting from rhizomes.		No – no habitat present with no records within 10 km of development site	No

Scientific name	Common name	BC Act	EPBC Act	Distribution and habitat	Habitat	Likelihood of occurrence	Impact Assessment Required
Haloragis exalata subsp. *exalata*	Square Raspwort	V	V	Disjunct distribution in the Central Coast, South Coast and North Western Slopes botanical subdivisions of NSW. Flowering specimens in NSW are recorded from November to January.		No – no habitat present with no records within 10 km of development site	No
Micromyrtus minutiflora		E1	V	Restricted to the general area between Richmond and Penrith, western Sydney. Sporadic flowering, June to March Response to fire and mechanical disturbance is uncertain. Regeneration may be due to resprouting or germination of soil-stored seed		No – no habitat present with no records within 10 km of development site	No
Persicaria elatior	Tall Knotweed	V	V	In south-eastern NSW recorded from Mt Dromedary, Moruya State Forest near Turlinjah, the Upper Avon River catchment north of Robertson, Bermagui, and Picton Lakes. In northern NSW known from Raymond Terrace (near Newcastle) and the Grafton area (Cherry Tree and Gibberagee State Forests).		No – no habitat present with no records within 10 km of development site	No
Persoonia hirsuta	Hairy Geebung	E1	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. It is usually present as isolated individuals or very small populations. It is probably killed by fire (as other Persoonia species are) but will regenerate from seed.		No – no habitat present with no records within 10 km of	No

Scientific name	Common name	BC Act	EPBC Act	Distribution and habitat	Habitat	Likelihood of occurrence	Impact Assessment Required
						development site	
Persoonia nutans	Nodding Geebung	E1	E	Restricted to the Cumberland Plain in western Sydney, between Richmond in the north and Macquarie Fields in the south. Peak flowering is from November to March with sporadic flowering all year round. An obligate seed regenerator. Seed germination is promoted by fire and also by physical disturbance. Although listed as a short-lived species much of the ecology is poorly known. Maturity is expected in about 10 years.		No – no habitat present with no records within 10 km of development site	No
Pimelea curviflora* var. *curviflora		**V**	**V**	**Confined to the coastal area of the Sydney and Illawarra regions between northern Sydney and Maroota in the north-west and Croom Reserve near Albion Park in the south. Flowers October to May. It may not always be visible at a site as it appears to survive for some time without any foliage after fire or grazing, relying on energy reserves in its tuberous roots. Likely to be fire tolerant species capable of resprouting following fire due to the presence of a tap root. Seedlings have been observed following fire.**		**Potential - Sample taken for identification, pending results.**	**TBC**
Pimelea spicata	Spiked Rice-flower	E1	E	Two disjunct areas; the Cumberland Plain (Marayong and Prospect Reservoir south to Narellan and Douglas Park) and the Illawarra (Landsdowne to Shellharbour to northern Kiama). Mature plants spread over short distances through underground rhizomes. Flowers may be self-pollinating, although fruit production is variable. A soil seedbank develops and is maintained in the presence of a suitable disturbance regime.		No – not identified in the development site during targeted survey	No
Pomaderris brunnea	Brown Pomaderris	E1	V	In NSW, found around the Colo, Nepean and Hawkesbury Rivers, including the Bargo area and near Camden. It also occurs near Walcha on the New England tablelands. Flowers appear in September and October. The species has been found in association with Eucalyptus amplifolia, Angophora floribunda, Acacia parramattensis, Bursaria spinosa and Kunzea ambigua.		No – no habitat present with no records within 10 km of	No

Scientific name	Common name	BC Act	EPBC Act	Distribution and habitat	Habitat	Likelihood of occurrence	Impact Assessment Required
						development site	
Pterostylis gibbosa	Illawarra Greenhood	E1	E	Known from a small number of populations in the Hunter region (Milbrodale), the Illawarra region (Albion Park and Yallah) and the Shoalhaven region (near Nowra). The Illawarra Greenhood is a deciduous orchid that is only visible above the ground between late summer and spring, and only when soil moisture levels can sustain its growth. The leaf rosette grows from an underground tuber in late summer, followed by the flower stem in winter. After a spring flowering, the plant begins to die back and seed capsules form (if pollination has taken place).		No – no habitat present with no records within 10 km of development site	No
Pterostylis saxicola	Sydney Plains Greenhood	E1	E	Restricted to western Sydney between Freemans Reach in the north and Picton in the south. All species of Pterostylis are deciduous and die back to fleshy, rounded underground tuberoids. The time of emergence and withering has not been recorded for this species, however flowering occurs from October to December and may vary due to climatic conditions. The above ground parts of the plant whither and die following seed dispersal and the plant persists as a tuberoid until the next year. Typically occurs as scattered individuals or in small groups.		No – no habitat present with no records within 10 km of development site	No
Pultenaea parviflora		E1	V	Endemic to the Cumberland Plain. Mainly from Windsor to Penrith and east to Dean Park, with outlier populations at Kemps Creek and Wilberforce. Flowering may occur between August and November depending on environmental conditions. Killed by fire and re-establishes from soil-stored seed. There is no evidence of vegetative spread. Germination can be prolific after a moderate to high intensity fire.		Unlikely – not identified during survey	No
Syzygium paniculatum	Magenta Lilly Pilly	E1	V	Only in NSW, in a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest.		No – no habitat present with no records within 10 km of	No

Scientific name	Common name	BC Act	EPBC Act	Distribution and habitat	Habitat	Likelihood of occurrence	Impact Assessment Required
						development site	
Thesium australe	Austral Toadflax	V	V	In eastern NSW it is found in very small populations scattered along the coast, and from the Northern to Southern Tablelands. Often found in association with Themeda australis (Kangaroo Grass). A root parasite that takes water and some nutrient from other plants, especially Kangaroo Grass. Flowers in spring.		No – no habitat present with no records within 10 km of development site	No

Key: M = Migratory, CD = Conservation Dependent, CE = Critically Endangered, E = Endangered, V = Vulnerable, X = Extinct

Appendix D - Eco Logical Australia (2009). *Ecological Assessment for the Eastern Creek Business Hub State Significant Development.* Prepared for Western Sydney Parklands Trust.

Appendix E - Eco Logical Australia (2012). *Eastern Creek Business Hub-EPBC Assessment Report.* Prepared for Western Sydney Parklands Trust.

Appendix F Australian Museum *Meridolum corneovirens* identification letter

Provided as a separate PDF.

Appendix G - Credit retirement statement

Credit retirement report

Effective date:	28-June-2018
Transaction number:	201806-RT-299
Credit owners' details	
Credit owner ID:	69
Name of credit holder:	Western Sydney Parklands Trust
Other owner(s):	
No other owners	
Reason for retirement:	Retirement for EPBC Act conditions EPBC 2012/6617

NSW GOVERNMENT Office of Environment & Heritage

Page 1 of 3

Ecosystem credit(s) retired								
Number of credits	Credit profile ID	Agreement ID	Vegetation code	Vegetation type	CMA subregion	% surrounding vegetation	Patch size	Vegetation formation(see key)
49	254	70	HN528	HN528/Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Cumberland - Hawkesbury/Nepean	11-30%	>25-100 h	GRW

Key to vegetation formations

Code	Vegetation formation
ALP	Alpine complex
ASA	Arid shrublands (Acacia)
ASC	Arid shrublands (Chenopod)
DSG	Dry sclerophyll forests (shrub/grass)
DSS	Dry sclerophyll forests (shrubby)
FRW	Forested wetlands
FWW	Freshwater wetlands
GLD	Grasslands
GRW	Grassy woodlands
HLD	Heathlands
MES	Miscellaneous ecosystems
RFT	Rainforests
SAW	Saline wetlands
SWG	Semi-arid woodlands (grassy)
SWS	Semi-arid woodlands (shrubby)
WSG	Wet sclerophyll forests (grassy)
WSS	Wet sclerophyll forests (shrubby)

The credit register provides further information about credit holdings and reports about credit trading activity. To view this information, please visit the public register website at www.environment.nsw.gov.au/bimspr/index.htm

For more information, please contact the BioBanking Scheme Manager - phone (02) 9995 6753; email biobanking@environment.nsw.gov.au

Appendix H - Credit summary report

Appendix I DPE Request for further information

Appendix J TfNSW and BCC Intersection Upgrade letters

ecological AUSTRALIA
A TETRA TECH COMPANY

1300 646 131
www.ecoaus.com.au

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00021907/BAAS17001/20/00021908

Proposal Name
Eastern Creek Business Hub Stage 3

BAM data last updated *
16/06/2022

Assessor Name
Meredith Henderson

Assessor Number
BAAS17001

BAM Data version *
54

Proponent Names
Angela Wang

Report Created
29/07/2022

BAM Case Status
Open

Assessment Revision
1

Assessment Type
Major Projects

Date Finalised
To be finalised

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Potential Serious and Irreversible Impacts

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

Species
Nil

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
No Changes

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
849-Cumberland shale plains woodland	Cumberland Plain Woodland in the Sydney Basin Bioregion	1.2	0	37	37

BAM Biodiversity Credit Report (Like for like)

849-Cumberland shale plains woodland	Like-for-like credit retirement options					
	Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
	Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 849, 850	-	849_Good	No	37	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Meridolum corneovirens / Cumberland Plain Land Snail	**849_Good**	0.2	6.00

Credit Retirement Options

Like-for-like credit retirement options

Meridolum corneovirens / Cumberland Plain Land Snail	Spp	IBRA subregion
	Meridolum corneovirens / Cumberland Plain Land Snail	Any in NSW

BAM Candidate Species Report

Proposal Details

Assessment Id 00021907/BAAS17001/20/00021908	Proposal Name Eastern Creek Business Hub Stage 3	BAM data last updated * 16/06/2022
Assessor Name Meredith Henderson	Report Created 29/07/2022	BAM Data version * 54
Assessor Number BAAS17001	Assessment Type Major Projects	BAM Case Status Open
Assessment Revision 1	Date Finalised To be finalised	

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List of Species Requiring Survey

Name	Presence	Survey Months
Grevillea juniperina subsp. juniperina Juniper-leaved Grevillea	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Marsdenia viridiflora subsp. viridiflora - endangered population Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	No (surveyed) *Survey months are outside of the months specified in Bionet.	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☑ Survey month outside the specified months?

Meridolum corneovirens Cumberland Plain Land Snail	Yes (surveyed)	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Miniopterus orianae oceanensis Large Bent-winged Bat	No (surveyed) *Survey months are outside of the months specified in Bionet.	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☑ Survey month outside the specified months?
Pimelea curviflora var. curviflora Pimelea curviflora var. curviflora	No (surveyed) *Survey months are outside of the months specified in Bionet.	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☑ Survey month outside the specified months?
Pimelea spicata Spiked Rice-flower	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Pommerhelix duralensis Dural Land Snail	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Pultenaea pedunculata Matted Bush-pea	No (surveyed) *Survey months are outside of the months specified in Bionet.	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☑ Survey month outside the specified months?

BAM Candidate Species Report

Threatened species Manually Added

None added

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
Austral Toadflax	Thesium australe	Habitat degraded
Bargo Geebung	Persoonia bargoensis	Species is vagrant
Barking Owl	Ninox connivens	Habitat constraints
Bush Stone-curlew	Burhinus grallarius	Habitat degraded Habitat constraints
Bynoe's Wattle	Acacia bynoeana	Species is vagrant
Camden White Gum	Eucalyptus benthamii	Species is vagrant
Dillwynia tenuifolia	Dillwynia tenuifolia	Habitat degraded
Dillwynia tenuifolia, Kemps Creek	Dillwynia tenuifolia - endangered population	Refer to BAR
Downy Wattle	Acacia pubescens	Species is vagrant
Eastern Pygmy-possum	Cercartetus nanus	Habitat degraded
Gang-gang Cockatoo	Callocephalon fimbriatum	Habitat constraints
Green and Golden Bell Frog	Litoria aurea	Refer to BAR
Grey-headed Flying-fox	Pteropus poliocephalus	Habitat constraints
Koala	Phascolarctos cinereus	Habitat degraded
Large-eared Pied Bat	Chalinolobus dwyeri	Habitat constraints
Little Bent-winged Bat	Miniopterus australis	Habitat constraints
Little Eagle	Hieraaetus morphnoides	Habitat constraints
Masked Owl	Tyto novaehollandiae	Habitat constraints
Powerful Owl	Ninox strenua	Habitat constraints
Regent Honeyeater	Anthochaera phrygia	Habitat constraints
Southern Myotis	Myotis macropus	Habitat constraints
Square-tailed Kite	Lophoictinia isura	Habitat constraints

Squirrel Glider	Petaurus norfolcensis	Habitat degraded
Swift Parrot	Lathamus discolor	Habitat constraints
Sydney Plains Greenhood	Pterostylis saxicola	Habitat degraded
Thick Lip Spider Orchid	Caladenia tessellata	Habitat degraded
White-bellied Sea-Eagle	Haliaeetus leucogaster	Habitat constraints
White-flowered Wax Plant	Cynanchum elegans	Habitat degraded

BAM Credit Summary Report

Proposal Details

Assessment Id
00021907/BAAS17001/20/00021908

Proposal Name
Eastern Creek Business Hub Stage 3

BAM data last updated *
16/06/2022

Assessor Name
Meredith Henderson

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

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Ecosystem credits

Cumberland shale plains woodland											
1	849_Good	Cumberland Plain Woodland in the Sydney Basin Bioregion	50.8	50.8	1.2	PCT Cleared - 93%	High Sensitivity to Gain	Critically Endangered Ecological Community	Critically Endangered	2.50	True	37
											Subtotal	**37**
											Total	**37**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAII	Species credits
Meridolum corneovirens / Cumberland Plain Land Snail (Fauna)									
849_Good	50.8	50.8	0.23			Endangered	Not Listed	False	6
								Subtotal	**6**