Ingleburn Logistics Park Stage 3 Biodiversity Development Assessment Report

Stockland Development Pty Ltd



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DOCUMENT TRACKING

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Accredited Assessor Certification	I certify that this report has been prepared on the basis of the requirements of, and information provided under, the Biodiversity Assessment Method and s6.15 of the BC Act. In preparing this assessment I have acted in accordance with the Accredited BAM ASSESSOR Code of Conduct.
	I declare that I have considered the circumstances and there is no actual, perceived or potential conflict of interest. Diane Campbell (BAAS 17069)
	Mh

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Template 2.8.1

Executive Summary

Eco Logical Australia Pty Ltd (ELA) was engaged by Stockland Development Pty Ltd to prepare a Biodiversity Development Assessment Report (BDAR) for the proposed development at Stage 3, 35 - 47 Stennett Road, Ingleburn. The development footprint includes the construction of three warehouses, associated truck suitable driveways and landscaped setbacks along street frontages.

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), Local Environmental Plan, Development Control Plan and applicable State Environmental Planning Policies 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 site and measures to minimise impacts during construction and operation of the development.

Due to the small area of vegetation being removed and the majority of vegetation being planted native vegetation within the development site, this BDAR was prepared under the streamlined assessment modules for small area and planted native vegetation consistent with Appendix C and Appendix D respectively of BAM 2020.

The development site has been subject to extensive previous modification of vegetation. The field surveys confirmed that the development site contained a small area (0.096 ha) of remnant vegetation consistent with PCT 1071: *Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion* associated with man-made drains, that was the dominant PCT on the subject land and PCT 849: *Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion*. The occurrence of a very small area of PCT 849 (0.044 ha) within the subject land is consistent with the Threatened Ecological Community (TEC) *Cumberland Plain Woodland in the Sydney Basin Bioregion*, listed as critically endangered under the BC Act. Cumberland Plain Woodland is also listed as a critically endangered ecological community under the EPBC Act, however due to lack of native species cover within the understorey (<30%), the Cumberland Plain Woodland within the subject land is not consistent with the BAM 2020 Appendix C *Streamlined assessment module – Small area* in accordance with the BAM 2020.

The proposed development will result in the removal of 0.583 ha of native vegetation within the subject land for the development footprint. The development will retain a large hollow-bearing remnant tree which contains the most important biodiversity values, representing retention of 0.031 ha of Cumberland Plain Woodland, with 0.013 ha removed.

The subject land comprises planted native vegetation around the north and western perimeter, degraded native vegetation, and stormwater drains with vegetation in degraded condition.

Vegetation Community	Area	Impact	Retained
PCT 1071: Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion (degraded)	0.096	0.096	0
PCT 849: Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (degraded)	0.044	0.013	0.031
Native (no PCT)	0.016	0.016	0
Planted	0.458	0.458	0
Exotic	0.009	0.009	0
Total	0.623	0.592	0.031

The literature reviewed and field inspection identified that the majority of vegetation within the development site is planted native vegetation. Landscaping works have incorporated planted native species as part of the previous industrial development. The planted native vegetation on the site was assessed in accordance with the BAM 2020 Appendix D *Streamlined assessment module – Planted native vegetation* in accordance with the BAM 2020.

Following consideration of all the above aspects, the residual unavoidable impacts of the proposal were calculated consistent with BAM by using the BAMC Version 50. A total of 1 ecosystem credit was calculated and are detailed in the table below.

PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Condition	Impact Area (ha)	Credits required
849	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Coastal Valley Grassy Woodlands	Grassy Woodlands	Degraded	0.044	0 – impacts do not require offset for PCT 849 as the vegetation integrity score <15
1071	Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion	Coastal Freshwater Lagoons	Freshwater Wetlands	Degraded	0.096	1
				Total	0.14	1

No threatened flora or fauna species were recorded within the development site. Two Matters of National Environmental Significance (MNES) listed under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) were considered as having potential to occur in the development site. The Significant Impact Criteria were applied to two threatened fauna species – *Lathamus discolor* (Swift Parrot) and *Pteropus poliocephalus* (Grey-headed Flying-fox) – and concluded that the proposed development is unlikely to constitute a significant impact.

Serious and Irreversible Impacts (SAII) have been considered as part of this assessment. The development site contains Cumberland Plain Woodland, an SAII entity.

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Abbreviations

Abbreviation	Description
BAAS	Biodiversity Accredited Assessor System
BAM	Biodiversity Assessment Method
BAMC	Biodiversity Assessment Method Credit Calculator

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

1. Introduction

This Biodiversity Development Assessment Report (BDAR) has been prepared by James King and Diane Campbell (BAAS 17069) who is an Accredited Person to apply the Biodiversity Assessment Method (BAM) under the NSW *Biodiversity Conservation Act 2016* (BC Act).

Definitions of terminology used throughout this report and set out in the Biodiversity Assessment Method (BAM) are presented in Appendix A.

1.1 General description of the development site

The development site is known as Stage 3 at 35 - 47 Stennett Road, Ingleburn and is legally described as Part Lot 1 DP 1092198 and Lot 26 DP 863617.

The site is located within the Ingleburn Logistics Park, 36 km south-west of the Sydney CBD and 7 km north of Campbelltown Town Centre. The site is situated along the southern boundary of Stennett Road.

The site is partially occupied by Coates Hire machinery company. The site predominantly a hardstand area with a comparatively thin strip of vegetation along three of the four sides comprising of planted, exotic and remnant vegetation. There are no buildings on the development site.

1.2 Brief description of the proposal

The proposed development comprises the expansion of the existing logistics park at Stage 3 at 35 - 47 Stennett Road, Ingleburn. The development is outlined in the following table:

Element	Proposed
Site Preparation	Vegetation clearing.Bulk earthworks and level alteration.
Development summary	 Construction of a new warehouse in northern portion of site. Construction of a new warehouse in southeast portion of site. Construction of a new warehouse in southwest portion of site. Construction of truck suitable access roads. Landscaped setbacks along street frontage.

Table 1: Proposed development

This report includes two base maps, the Site Map (Figure 1) and the Location Map (Figure 2). The subject land is shown on the Site Map.

1.3 Development site footprint

The development site has a total area of approximately 95,330 m^2 (9.5 ha). The construction and operational footprint are wholly within the development footprint.

1.4 Sources of information used

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

- BioNet Vegetation Classification System Version 3.1
- BioNet / Atlas of NSW Wildlife 5 km database search (Department of Planning, Industry and Environment (DPIE) 2021a) (accessed September 2021)
- Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) Protected Matters Search Tool 5 km radius database search (Department of Agriculture, Water and Environment (DAWE) 2021a) (accessed September 2021)
- NSW Government ePlanning Spatial Viewer
- National Flying-fox Monitoring data (DAWE 2020b) (accessed September 2021)
- Biodiversity Assessment Method 2020
- Biodiversity Assessment Methodology Calculator (BAMC) version 45
- NSW Government Biodiversity Values Map (DPIE 2021b) (accessed September 2021)
- Threatened species profiles and recovery plans (DAWE 2021c and DPIE 2021c)
- The Native Vegetation of the Sydney Metropolitan Area (Office of Environment and Heritage (OEH), 2016), Version 2.0



Figure 1: Site Map



Figure 2: Location map



Figure 3: Development Footprint



Figure 4: Construction and operation footprint

1.5 Legislative context

Legislation relevant to the development site is outlined in Table 2.

Table 2: Legislative context

Name	Relevance to the project			
Commonwealth				
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	Two (2) Matters of National Environmental Significance (MNES) have been identified on or near the development site. This report assesses impacts to MNES and concludes that the development is not likely to have a significant impact on MNES.			
State				
Environmental Planning and Assessment Act 1979 (EP&A Act)	The proposed development requires consent under the Campbelltown Local Environmental Plan (LEP) and is to be assessed under Part 4 of the EP&A Act.			
Biodiversity Conservation Act 2016 (BC Act)	The BC Act seeks to conserve biological diversity at bioregional and State scales; to maintain the diversity and quality of ecosystems and enhance their capacity to adapt to change and provide for the needs of future generations; to assess the extinction risk of species and ecological communities and identify key threatening processes through an independent and rigorous scientific process; and to establish a framework to avoid, minimise and offset the impacts of proposed development and land use change on biodiversity. The proposed development exceeds the native vegetation clearing threshold triggering the Biodiversity Offsets Scheme (BOS) and requiring a BDAR to be prepared.			
Fisheries Management Act 1994 (FM Act)	The development does <u>not</u> involve impacts to Key Fish Habitat, does not involve harm to marine vegetation, dredging, reclamation or obstruction of fish passage. A permit or consultation under the FM Act is <u>not</u> required.			
Local land Services Amendment Act 2016 (LLS Act)	The LLS Act does not apply to areas of the state to which the State Environmental Planning Policy (SEPP) Vegetation in Non-Rural Areas 2017 (Vegetation SEPP) applies. The Vegetation SEPP applies to the Campbelltown local government area.			
Water Management Act 2000 (WM Act)	The project does not involve works on waterfront land. A Controlled Activity Approval under s91 of the WM Act is not required.			
Planning Instruments				
State Environmental Planning Policy (SEPP) (Vegetation in Non-Rural Areas) 2017 (Vegetation SEPP)	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.			
State Environmental Planning Policy (Coastal Management) 2018 (Coastal Management SEPP)	The SEPP Coastal Management 2018 consolidated SEPP 14 Coastal Wetlands, SEPP 26 Littoral Rainforests and SEPP 71 Coastal Protection. The proposed development is not located on land subject to the Coastal Management SEPP, therefore this SEPP is not applicable.			
State Environmental Planning Policy (Koala Habitat Protection) 2021	The proposed development is located within a local government area to which the SEPP (Koala Habitat Protection) 2021 applies. A comprehensive Koala Plan of Management (CKPoM) has been approved for the Campbelltown area. A Koala Activity Assessment Report (KAAR) will be prepared in line with the Campbelltown CKPoM and submitted along with the DA.			

Name	Relevance to the project			
Campbelltown Local Environment Plan 2015 (LEP)	The development site is zoned IN1 (General Industrial) under the Campbelltown LEP 2015. The development site is not mapped under the Terrestrial Biodiversity Layer, Environmentally Sensitive Lands Layer or Watercourses and Riparian layer and does not require consideration of the matters listed in the LEP.			
Campbelltown (Sustainable City) Development Control Plan (DCP) 2015	 The Campbelltown SCDCP objectives state: Protect and conserve the City's biodiversity through the retention of native vegetation. Maintain, enhance and/or establish corridors, which enable existing plant and animal communities to survive and range in their natural habitat. Protect habitat resources including hollow-bearing trees and hollow logs within Campbelltown LGA. Provide appropriate measures to compensate for the loss of hollow-bearing trees within the LGA. The DA seeks to meet these objectives by not impacting on a corridor that provides connectivity throughout the greater area and retaining a large hollow-bearing tree on site that provides significant biodiversity values. 			

2. Use of streamlined assessment modules

Two streamlined assessment modules were utilised in this BDAR. These include specific requirements that must be met to assess the impacts on biodiversity values. This is shown in Figure 5.

Section 2.2 of BAM sets out the streamlined modules. Appendix C sets out the circumstances in which the small area assessment can be used. The restrictions for the use of the streamlined assessment module -small area are:

- must only be used according to the area clearing threshold compliance with this is shown in Table 3
- must still apply the hierarchy of avoiding and minimising impacts on biodiversity before considering offsetting residual impacts this is addressed in Section 7.1
- may be used to assess the biodiversity values of land that is located within an area on the Biodiversity Values Map, except where the biodiversity value included on the Biodiversity Values Map is core koala habitat identified in a plan of management under the State Environmental Planning Policy (Koala Habitat Protection) 2019 – the land is not located on the Biodiversity Values Map.

Appendix C also does not specify that it cannot be used with other modules such as Appendix D Streamlined assessment module – planted native vegetation. The planted native vegetation module therefore been used as set out in Section 2.2.



Figure 5: Streamlined assessment module

2.1 Appendix C – Small area

Appendix C of the BAM 2020 outlines a streamlined assessment module for assessing small areas. The streamlined assessment module can be applied where the area clearing limits are under a certain threshold, outlined below in **Table 3**. The minimum lot size for the property is 4000 m² and the area to be cleared is less than 1 ha, therefore, the small area module has been applied to part of this assessment in accordance with Appendix C of the BAM 2020.

Minimum lot size associated with the property *	Maximum area clearing limit for application of the small area development module
Less than 1 ha	≤1 ha
Less than 40 ha but not less than 1 ha	≤2 ha
Less than 1000 ha but not less than 40 ha	≤3 ha
1000 ha or more	≤5 ha

Table 3: Area clearing limits for application of the small area development module

*shown in the lot size maps made under the relevant local environmental plan (LEP), or actual lot size (where there is no minimum lot size provided for the relevant land under the LEP.

This assessment has applied the hierarchy of avoiding and minimising impacts on biodiversity before considering offsetting residual impacts through retention of a large remnant tree that provides significant biodiversity values.

2.2 Appendix D – Planted native vegetation

Due to the presence of planted native vegetation within the development site, part of this BDAR was prepared under the streamlined assessment module for the planted native vegetation consistent with Appendix D of BAM 2020. This appendix contains a decision-making key which provides a framework for the assessment of planted native vegetation.

The cleared nature of the site and subsequent perimeter plantings are documented in the aerial photos and photos in Figure 6 and Figure 9. The species composition of the planted vegetation is predominantly *Eucalyptus microcorys* (Tallowwood), *E. saligna* (Sydney Blue Gum) and *E. punctata* (Grey Gum) (AIA, 2021).



Figure 6: Aerial photos 1947 and 1998 (JBS&G, 2021)

The planted native vegetation framework is applied to the proposal in Table 4.

Table 4: Decision making tool for Planted Native Vegetation in accordance with Appendix D of the BAM 2020

Que	stion	Response and justification		
1)	Does the planted native vegetation occur within an area that contains a mosaic of planted and remnant native vegetation and which can be reasonably assigned to a PCT known to occur in the same IBRA subregion as the proposal?	No, the planted vegetation does not occur in a mosaic of planted and remnant vegetation. The canopy species were planted in a row around the edge of a hardstand area.		
2.	 Is the planted native vegetation: a. Planted for the purpose of environmental rehabilitation or restoration under an existing conservation obligation listed in BAM Section 11.9(2.), and b. The primary objective was to replace or regenerate a plant community type of a threatened plant species or its habitat? i Yes – the planted native vegetation must be assessed in accordance with Chapters 4 and 5 of the BAM ii No – Go to 3. 	No – planted native vegetation was not representative of a PCT. There was a range of planted Eucalypt species and a <i>Grevillea</i> cultivar with the primary purpose of landscaping. These included <i>Eucalyptus</i> <i>saligna</i> (Sydney Blue Gum), <i>E. microcorys</i> (Tallowwood) and <i>E. punctata</i> (Grey Gum).		
3.	 Is the planted / translocated native vegetation individuals of a threatened species or other native species planted/ translocated for the purpose of providing threatened species habitat under one of the following: a. A species recovery project b. Saving our Species project c. Other types of government funded restoration project d. Condition of consent for a development approval that required those species to be planted or translocated for the purpose of providing threatened species habitat e. Legal obligation as part of a condition of ruling of court. This includes regulatory directed or ordered remedial plantings (e.g. Remediation Order for clearing without consent issued under the BC Act or the Native Vegetation Act) f. Ecological rehabilitation to re-establish a PCT or TEC that was, or is carried out under a mine operations plan, or g. Approved vegetation management plan (e.g. as required as part of a Controlled Activity Approval for works on waterfront land under the NSW Water Management Act 2000)? i Yes – the planted native vegetation must be assessed in accordance with Chapters 4 and 5 of the BAM 	No – the tree species present are commonly used as street or landscaping trees and are not representative of a PCT or TEC, therefore it is unlikely that they were planted or translocated for any of the purposes listed.		
4.	Was the planted native vegetation (including individuals of a threatened flora species) undertaken voluntarily for revegetation, environmental rehabilitation or restoration within a legal obligation to secure or provide for management of the native vegetation? i Yes – Go to D.2 Assessment of planted native vegetation for threatened species habitat (the use of Chapters 4 and 5 of the BAM are not required to be applied)	No, the planted native vegetation was not undertaken as part of any conservation or rehabilitation projects or to satisfy a legal obligation.		

• No – Go to 5.

Que	estion	Response and justification			
5.	Is the planted native vegetation (including individuals of a threatened flora species) planted for functional, aesthetic, horticultural or plantation forestry purposes? This includes examples such as; windbreaks in agricultural landscapes, roadside plantings (including street trees, median strips, roadside batters), landscaping in parks, gardens and sport fields/complexes, macadamia plantations or teatree farms? i Yes – Go to D.2 Assessment of planted native vegetation for threatened species habitat (the use of Chapters 4 and 5 of the BAM are not required to be applied) ii No – Go to 6.	Yes, the planted native vegetation was established for landscaping for the industrial site.			
6.	 Is the planted native vegetation a species listed as a widely cultivated native species on a list approved by the Secretary of the Department (or an officer authorised by the Secretary)? i Yes – Go to D.2 Assessment of planted native vegetation for threatened species habitat (the use of Chapters 4 and 5 of the BAM are not required to be applied) ii No – There may be other types of occurrences of planted native vegetation that do not easily fit into the decision-making key above. 	N/A			

3. Landscape features

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

The landscape features considered for this assessment are presented in Table 5, Figure 1 and Figure 2.

Landscape feature	Subject Land/Development Site	Assessment Area	Data source	
IBRA Region(s)	Sydney Basin Sydney Basin		Interim Biogeographic Regionalisation for Australia, Version 7	
IBRA subregion(s)	Cumberland	Cumberland	Interim Biogeographic Regionalisation for Australia, Version 7	
Rivers and streams	None present in or within 50 m of the development site	1 st , 2 nd & 3 rd Order Cottage Creek (4 th Order) Bow Bowing Creek (5 th Order) Bunbury Curran Creek (6 th Order)	NSW LPI Waterway mapping, Aerial imagery	
Estuaries and wetlands	None present in the development site	None present in assessment area	NSW directory of important wetlands, Aerial imagery	
Connectivity of different areas of habitat	The development site contains a narrow strip of mostly planted native vegetation on the boundaries, which exists in a narrow linear band, providing limited connectivity to other planted native vegetation north of Stennett Road.	The assessment area contains some remnant Cumberland Plain Woodland (CPW) to the southwest that further connects to some narrow strips of CPW vegetation alongside Bunbury Curran Creek and the Hume motorway.	Aerial imagery	
Geological features of significance and soil hazard features	The development site area is mapped as having a high and a moderate salinity potential based on 'Salinity Potential in Western Sydney 2002'. No other geological features of significance (i.e., karst, caves, crevices, cliffs etc.) were identified within the development site.	The assessment area is predominantly mapped as moderate and low salinity potential with some areas mapped as high salinity potential. No other geological features of significance (i.e., karst, caves, crevices, cliffs etc.) were identified within the assessment area.	Aerial imagery NSW Planning Portal EPI Acid Sulfate Soils layer	

Table 5: Landscape features

Landscape feature	Subject Land/Development Site	Assessment Area	Data source	
Biodiversity Values	The development site does not include areas mapped under the NSW Biodiversity Values Map (accessed June 2021).	The assessment area includes areas mapped under the NSW Biodiversity Values Map along Cottage Creek, Bow Bowing Creek and Bunbury Curran Creek (accessed September 2021).	Biodiversity Values Map and Threshold Tool	
Areas of Outstanding Biodiversity Value	No (accessed September 2021).	No (accessed September 2021).	RegisterofDeclaredAreasofOutstandingBiodiversityValue(DPIE 2020)	
NSW (Mitchell) Landscapes	Cumberland Plain	Cumberland Plain (89%) Georges River Alluvial Plain (93%) Ashfield Plains (98%) Woronora Plateau (13%)	NSW (Mitchell) Landscapes - version 3.1 (DPIE 2016)	
		There are no differences between the mapped vegetation extent and the aerial imagery. The development footprint is approximately 9.53 ha and contains approximately 0.63 ha of native vegetation. The assessment area is approximately 906 ha and contains approximately 89.5 ha of native vegetation; therefore, the percentage native vegetation cover is 9.8%.	Calculated using aerial imagery and ArcGIS software	

4. Native vegetation

4.1 Survey effort

An ecological assessment within the development site was conducted by James King on 17 September 2021. The site was traversed on foot to:

- Determine if any of the vegetation met descriptions for any plant community types (PCTs) and associated threatened ecological communities (TECs)
- Search for any threatened flora species that may be present
- Search for hollows, nests or dreys, or any other habitat feature that may be important for threatened fauna species.

Any notable features were logged using a handheld Global Positioning System (GPS) unit.

4.2 Vegetation present

The majority of the vegetation on site was planted with an understory of exotic grasses and weeds (Table 6). The native canopy contained planted native trees, including *E. microcorys* (Tallowwood), *E. saligna* (Sydney Blue Gum) and *E. punctata* (Grey Gum). There were also two *Pinus* spp. individuals dispersed across the site. The exotic grasses and weeds included *Plantago lanceolata* (Plantain), *Vicia sativa* (Common Vetch), *Sonchus oleraceus, Pennisetum clandestinum* (Kikuyu), *Chloris gayana* (Rhodes Grass) and *Briza minor* (Little Quaking-Grass), among others. Other exotic grasses, weeds and forbs present included *Eragrostis curvula* (African lovegrass), *Cynodon dactylon* (Couch grass, a native cultivated as lawn), *Echium plantagineum* (Pattersons curse), *Senecio madagascariensis* (Fireweed), *Onopordum acanthium* (Scotch thistle), *Conyza canadensis* var. *canadensis* (Canadian fleabane), *Rubus fruticosus* agg. spp. (Blackberry), *Sida rhombifolia* (Paddy's lucerne) and *Olea europaea* subsp. *cuspidata* (African olive). Small occurrences of native forbs/herbs occurred including *Oxalis perennans, Wahlenbergia gracilis, Juncus usitatus* and *Solanum priniphyllum*,

Vegetation along Stennett Road on the outside of the property fence (but still with the property boundary) consisted of linear roadside vegetation of established *E. microcorys* (Tallowwood) and *Grevillea* cultivar 'Ivory Whip' with a mulched ground cover.

A portion of the vegetation was naturally occurring, on the development site. These were areas that had originally been dug as drainage ditches surrounding the hardstand area, to aid in drainage from site, that allowed some standing water and were now dominated by *Typha orientalis*. Being the largest area of naturally occurring vegetation on site, this was determined to be the dominant PCT 1071: *Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion*, for the purpose of the streamlined small area module. The condition of this community was degraded, being small and linear in nature and dominated by only a single native species with numerous weeds interspersed. The fact that the landform was artificially made for the purposes of drainage, and there was no connectivity to similar habitat nearby, suggests that this PCT was not of high quality or providing high quality habitat.

There were also a single small stand of *Casuarina glauca* along the northern boundary of the site, likely progeny of the same species planted elsewhere on site. Casuarinas do not correspond to PCT 1071. Due

to their small size and likely provenance, they were not considered to constitute a PCT. These have been mapped as native vegetation (no PCT).

The development site also contained a remnant tree, a large *Eucalyptus moluccana* (Grey box). This tree is being avoided by the development footprint. Campbelltown City Council has raised the issue of whether Tree 4 has naturally regenerated, and whether, together with the large remnant tree (Tree 5), Trees 60, 65, 67 and 68 should be assigned to PCT 849: *Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion*. On consideration PCT 849 was assigned to the above trees. Note that some slight adjustment has been made to include removal of the canopy outside of the development site.

Table 6: Vegetation communities areas and impacts	

Vegetation Community	Area	Impact	Retained
PCT 1071: Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion (degraded)	0.096	0.096	0
PCT 849: Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	0.044	0.013	0.031
Native (no PCT)	0.016	0.016	0
Planted	0.458	0.458	0
Exotic	0.009	0.009	0
Total	0.623	0.592	0.031

4.3 Threatened Ecological Communities

There is one threatened ecological community (TEC) within the subject land. TECs and PCTs are presented in Figure 10 and Figure 11.

PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion conforms to Cumberland Plain Woodland in the Sydney Basin Bioregion (CPW), a critically endangered Ecological Community (CEEC) listed under NSW BC Act.

Cumberland Plain Woodland is also listed as a critically endangered ecological community under the Commonwealth EPBC Act, however due to the lack of native species within the understorey (<30%), the Cumberland Plain Woodland within the subject land is not consistent with the EPBC condition criteria (DEWHA, 2010).

PCT 1071: *Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion* potential corresponds to two TECs. Neither was present on site as outlined in Table 7 below.

Threatened E Community	Ecological	Threat Status	Act	Justification for TEC inclusion or exclusion
Cumberland Plain W in the Sydney Basin B	Voodland Bioregion	Critically endangered	BC Act EPBC Act	This vegetation zone met the criteria for BC Act listing but did not meet the description of the critically endangered ecological community as set out in the Conservation Advice (DEWHA, 2009).

Table 7: Potential Threatened Ecological Communities

Threatened Ecological Community	Threat Status	Act	Justification for TEC inclusion or exclusion
Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Endangered	BC Act	'They typically occur on silts, muds or humic loams in depressions, flats, drainage lines, back-swamps, lagoons and lakes associated with coastal floodplains. Floodplains are level landform patterns on which there may be active erosion and aggradation by channelled and overbank stream flow with an average recurrence interval of 100 years or less (adapted from Speight 1990). Freshwater Wetlands on Coastal Floodplains generally occur below 20 m elevation in the NSW North Coast, Sydney Basin and South East Corner bioregions.' (NSW Scientific Committee – final determination). The location of the site is at a height of approximately 40 m above sea level and is not associated with a coastal floodplain. Item 4 of the Final Determination states that 'artificial wetlands created on previously dry land specifically for purposes such as sewerage treatment, stormwater management and farm production, are not regarded as part of this community.' PCT 1071 within the subject land surrounds stormwater drains. It was therefore excluded as a TEC.
Sydney Freshwater Wetlands in the Sydney Basin Bioregion	Endangered	BC Act	'Sydney Freshwater Wetlands are restricted to freshwater swamps in swales and depressions on sand dunes and low nutrient sandplain sites in coastal areas. These areas are generally on the sands of the Warriewood and Tuggerah Soil Landscapes' (NSW Scientific Committee – final determination). The soil landscapes for the site are Blacktown and South Creek and are not located in a coastal sand dune or coastal sandplain. PCT was therefore excluded as a TEC.



Figure 7: Planted native vegetation along western boundary with remnant PCT 1071 in drainage ditch



Figure 8: Landscaped vegetation along northern boundary outside of fence



Figure 9: Planted native vegetation along southern boundary



Figure 10: Threatened ecological communities



Figure 11: Plant Community Types

4.4 Patch size

Patch size was calculated using aerial photographic interpretation of available vegetation mapping for all patches of intact native vegetation on and adjoining the development site. Patch size was assigned to one of four classes (<5 ha, 5-24 ha, 25-100 ha or \geq 100 ha). All vegetation withing the development site is part of a single patch. The patch size for the development site was 80.2 ha and therefore falling into the 25-100 ha category.

4.5 Vegetation integrity of the dominant PCT and TEC

Vegetation integrity of the dominant PCT was determined qualitatively by observing values for the condition attributes. These included species richness for all stratums, cover of all stratums and function attributes such as tree size classes and litter cover. After initial observation it was determined that these observations would be sufficient without completing plots. PCT 1071 had only one native species, *Typha orientalis*, that completely dominated the area, being then surrounded by various exotic weed species. Richness and cover could therefore be easily assessed. There were no trees, no regeneration, no logs and no litter. The estimated percentage cleared value of the dominant PCT is 75%. PCT 849 included several trees, with no shrubs, very sparse native groundcovers being dominated by weeds.

4.6 Vegetation integrity score

The vegetation integrity score was determined by entering observed values into the small area module of the BAM-C, see below in Table 8.

PCT ID	Condition	Area (ha)	Composition Condition Score	Structure Condition Score	Function Condition Score	Presence of Hollow bearing trees	Current vegetation integrity score
1071	Degraded	0.1	3.1	94.3	-	-	17
849	Degraded	0.01	10.3	2.8	52.2	-	11.4

Table 8: Vegetation integrity score

5. Threatened species habitat

The development site was surveyed for potential threatened fauna species habitat. Habitat assessments were undertaken during field surveys on 17 September 2021 to determine the likelihood of threatened species utilising the development site on occasion or a permanent basis.

Habitat assessments involved a search for important habitat features for threatened fauna species, such as hollow bearing trees, ephemeral pools, rocky outcrops or deep leaf litter and coarse woody debris. Assessments also included a search for evidence of fauna foraging or roosting such as chewed cones, sap trees, white-wash/pellets and inspections of suitable roosting or breeding habitat for threatened raptor birds (i.e. nest trees) or hollow-bearing trees for microchiropteran bats (microbats). Binoculars were used when required to inspect within high branches in the tree canopies.

Random meanders were undertaken during field survey in search of habitat features and predicted candidate flora species.

There were few fauna habitat types present due to the modified and maintained nature of the development site. Fauna habitat features were limited within the development site. The vegetation within the study area contained nectar producing plants (Eucalyptus species) including winter flowering species (*E. tereticornis*). These nectar producing species may provide foraging habitat for highly mobile species such as birds, microbats and flying-foxes.

The native canopy within the development site may be used as potential seasonal foraging habitat for microbats.

There was one hollow-bearing tree present containing at least two hollows and one nest. The hollows were medium (10 - 20 cm) and small (0 - 10 cm) in size. The nest was approximately 50 cm in diameter and was inhabited by *Corvus coronoides* (Australian Raven).

The vegetated area surrounding the hardstand area also acted as a drainage are, having initially been dug as a ditch. In the sections were water was standing, there Typha dominated and frogs could be heard (*Crinea signifera*).

Despite these two habitat features, they were relatively small and surrounded by exotic/cleared grass and hardstand areas. Overall, fauna habitats were highly degraded and unlikely to support populations of any threatened fauna species.

Pteropus poliocephalus (Grey-headed Flying Fox) has many BioNet records within the 1,500 m assessment area. There are no known camps on the development site and no prospect of a camp developing given the small number of trees present. There is a Nationally Significant Flying Fox Camp is 4 km to the north-east at Macquarie Fields.

There were no buildings on the development site that might provide habitat for threatened fauna such as microbats.

5.1 Ecosystem credit species

Ecosystem credit species predicted to occur within the development site are generated by the BAMC following the input of VI data and the PCTs identified within Chapter 4. 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 included and excluded from the assessment and relevant justification is also included within **Table 9**.

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification if species included / excluded
Anthochaera phrygia	Regent Honeyeater (Foraging)	-	-	High	CE	CE	Included. Habitat element present or within geographic range for species.
Artamus cyanopterus cyanopterus	Dusky Woodswallow	-	-	Moderate	V	-	Included. Habitat element present or within geographic range for species.
Botaurus poiciloptilus	Australasian Bittern	Waterbodies Brackish or freshwater wetlands	-	Moderate	Ε	Ε	Included. Habitat element present or within geographic range for species.
Calidris ferruginea	Curlew Sandpiper (Foraging)	-	-	High	E	CE	Included. Habitat element present or within geographic range for species.
Dasyurus maculatus	Spotted- tailed Quoll	-	-	High	V	Ε	Included. Habitat element present or within geographic range for species.
Ephippiorhynchus asiaticus	Black-necked Stork	Swamps Shallow, open freshwater or saline wetlands or shallow edges of deeper wetlands within 300m of these	-	Moderate	Ε	-	Included. Habitat element present or within geographic range for species.

Table 9: Predicted ecosystem credit species and justification for their inclusion or exclusion.

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification if species included / excluded
		swamps. Waterbodies Shallow lakes, lake margins and estuaries within 300m of these waterbodies					
Epthianura albifrons	White- fronted Chat	-	-	Moderate	V	-	Included. Habitat element present or within geographic range for species.
Glossopsitta pusilla	Little Lorikeet	-	-	High	V	-	Included. Habitat element present or within geographic range for species.
Haliaeetus leucogaster	White-bellied Sea Eagle (Foraging)	Waterbodies Within 1 km of a rivers, lakes, large dams or creeks, wetlands and coastlines	-	High	V	-	Included. Habitat element present or within geographic range for species.
Hirundapus caudacutus	White- throated Needletail	-	-	High	-	V	Included. Habitat element present or within geographic range for species.
Irediparra gallinacea	Comb-crested Jacana	Waterbodies Freshwater wetlands with a good surface cover of floating aquatic vegetation	-	Moderate	V	-	Included. Habitat element present or within geographic range for species.
Lathamus discolor	Swift Parrot (Foraging)	-	-	Moderate	С	CE	Included. Habitat element present or within

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification if species included / excluded
							geographic range for species.
Limicola falcinellus	Broad-billed Sandpiper (Foraging)	-	-	High	V	-	Included. Habitat element present or within geographic range for species.
Limosa limosa	Black-tailed Godwit (Foraging)	-	-	High	V	-	Included. Habitat element present or within geographic range for species.
Melanodryas cucullata cucullata	Hooded Robin (south- eastern form)	-	-	Moderate	V	-	Included. Habitat element present or within geographic range for species.
Micronomus norfolkensis	Eastern Coastal Free- tailed Bat (Foraging)	-	-	High	V	-	Included Potential foraging habitat is available within the subject land.
Miniopterus australis	Little Bent- winged Bat (Foraging)	-	-	High	V	-	Included Potential foraging habitat is available within the subject land.
Miniopterus orianae oceanensis	Large Bent- winged Bat (Foraging)	-	-	High	V	-	Included Potential foraging habitat is available within the subject land.
Pandion cristatus	Eastern Osprey (Foraging)	-	-	Moderate	V	-	Included. Habitat element present or within geographic range for species.
Petroica boodang	Scarlet Robin	-	-	Moderate	V	-	Included. Habitat element present or within geographic range for species.
Petroica phoenicea	Flame Robin	-	-	Moderate	V	-	Included. Habitat element present or within
Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification if species included / excluded
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							geographic range for species.
Phascolarctos cinereus	Koala	-	-	High	V	V	Included. Habitat element present or within geographic range for species.
Pteropus poliocephalus	Grey-headed Flying-fox (Foraging)	-	-	High	V	V	Included. Habitat element present or within geographic range for species.
Rostratula australis	Australian Painted Snipe	-	-	Moderate	Ε	Ε	Included. Habitat element present or within geographic range for species.
Stagonopleura guttata	Diamond Firetail	-	-	Moderate	V	-	Included. Habitat element present or within geographic range for species.
Stictonetta naevosa	Freckled Duck	-	-	Moderate	V	-	Included. Habitat element present or within geographic range for species.

CE = Critically Endangered; E = Endangered; V = Vulnerable

5.2 Species credit species

5.2.1 Identification of species credit species

In accordance with Appendix C, Table 13 of the BAM, the candidate species assessed for species credits were determined. All of the candidate species credit species identified for the proposal according that are at risk of an SAII need to be further assessed by a survey (Table 10).

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act listing status	EPBC Act Listing status	SAII entity	Justification if species included / excluded from further assessment
Anthochaera phrygia	Regent Honeyeater (Breeding)	-	-	High	CE	CE	Yes	Excluded The potential vegetation on site is small, highly degraded and in a highly urban area. It is unlikely to support this species. Important area maps for Regent Honeyeater were checked (accessed 22 March) and the site is not mapped as habitat for the species.
Caladenia tessalata	Thick Lip Spider Orchid	-	-	Moderate	E	V		<u>Excluded</u> Habitat degraded.
Calidris ferruginea	Curlew Sandpiper (Breeding)	-	-	High	E	CE	Yes	Excluded The potential vegetation on site is small, highly degraded and in a highly urban area. It is unlikely to support this species. Important area maps for migratory shorebirds were checked (accessed 27 September) and the site is not mapped as habitat for the species.
Lathamus discolor	Swift Parrot			Moderate	E	CE	Yes	<u>Excluded</u> Habitat degraded. Not mapped in important area maps.
Miniopterus australis	Little Bent- winged Bat (Breeding)	Caves Cave, tunnel, mine, culvert or other structure known or suspected to be used for	Degraded	Very High	V	Not Listed	Yes	Excluded SAII applies only to breeding habitat. Species known only to breed in maternity caves. No breeding habitat present in the development site.

Table 10: Identification of species credit species

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act listing status	EPBC Act Listing status	SAII entity	Justification if species included / excluded from further assessment
		breeding including species records in BioNet with microhabitat code 'IC – in cave' observation type code 'E nest- roost' with numbers of individuals >500 or from the scientific literature						
Miniopterus orianae oceanensis	Large Bent- winged Bat (Breeding)	Caves Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records with microhabitat code IC - in cave observation type code "E nest- roost with numbers of individuals >500		Very High	V	-	Yes	Excluded SAII applies only to breeding habitat. Species known only to breed in maternity caves. No breeding habitat present in the development site.
Pilularia novae- hollandiae	Austral Pillwort	-	-	High	E	-	Yes	Excluded Habitat highly degraded and no known records within 5 km of development site.

CE = Critically Endangered; E = Endangered; V = Vulnerable

5.2.2 Assessment of habitat constraints and vagrant species

Habitat assessments were undertaken during field survey on 17 September 2021 to determine the likelihood of threatened species occurring within the subject land on an intermittent or permanent basis. Survey effort is presented in Figure 12. Habitat assessments involved a search for important habitat features for threatened fauna species, such as hollow bearing trees, rocky outcrops or deep leaf litter. Assessments also included a search for evidence of fauna foraging or roosting such as chewed cones, sap trees and whitewash/pellets.

5.2.3 Candidate species requiring further assessment

For the Small Area assessment module under the Streamlined Assessment only Serious and Irreversible Impacts (SAII) species require targeted survey. Candidate species credit species that are not at risk of an SAII and are not incidentally recorded on the subject land do not require further assessment. The proposed development is not likely to place any species at risk of a SAII and therefore targeted survey for species credit species is not required.

5.2.4 Habitat assessment results

No candidate flora species were identified in the subject land. No evidence of threatened fauna foraging was identified within the subject land.

One large hollow-bearing tree was identified within the subject land. It contained two hollows that may provide habitat for threatened microbat species or birds and a large nest occupied by Australian Ravens. No urine stains, droppings, remains, and bat fly casings were evident in the vicinity of the spouts. This tree is not within the construction or development footprint so no further survey is required.

The native vegetation within the subject land may be used as intermittent foraging habitat for microbats and *Pteropus poliocephalus* (Grey-headed Flying-fox). The nearest Flying-fox camp is located approximately 4 km north west at Macquarie Fields of the subject land. Much larger areas of suitable foraging habitat are present to the west of the subject land along the riparian zone of Bunbury Curran Creek.



Figure 12: Survey effort

5.3 Identification of prescribed additional biodiversity impact entities

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

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

5.3.2 Human-made structures and non-native vegetation

There are no human-made structures that would provide habitat for threatened species.

Non-native vegetation includes canopy of *Pinus* spp. This species may be used as a potential occasional roost by GHFF as they have been observed in the species *Pinus radiata* before.

5.3.3 Habitat connectivity

Vegetation on the development site provides limited connectivity from planted native vegetation north of Stennett Road to a patch of remnant PCT 849: *Cumberland Shale Plains Woodland*. The distance to this remnant patch however is approximately 90 m and would only provide connectivity to highly mobile species such as Grey-headed Flying-fox that are able to travel much further distances on feeding forays. This loss of connectivity is therefore unlikely to have a significant impact on threatened species.

5.3.4 Water bodies, water quality and hydrological processes

There are drainage ditches surrounding the hardstand area along the edges of the site. In some patches, were there is standing water, the drainage ditches are dominated by the species *Typha orientalis*. These drainage ditches, however, are manmade, highly degraded and choked by this one species and are therefore unlikely to provide habitat for any threatened species.

5.3.5 Wind farm developments

The planning proposal is not for a wind farm development.

5.3.6 Vehicle strikes

The planning proposal is unlikely to result in vehicle strike on threatened fauna.

6. Prescribed biodiversity impacts

6.1 Locating and designing a proposal to avoid and minimise prescribed biodiversity impacts

The development has been located and designed in a way which avoids prescribed biodiversity impacts. The measures to minimise impacts are outlined in Table 11.

BAM Section 7.2 location and design principles	How addressed / Justification
Locate surface works and design measures to avoid direct impacts on the habitat features identified as potential prescribed biodiversity impacts	The proposed works will only remove a tiny amount of non- native vegetation, a total of two trees (approximately 0.009 ha). <i>Pinus</i> spp. may on occasion provide roosting habitat for the threatened GHFF, however, such a negligible amount is unlikely to be utilised very often and will not have an impact on this highly mobile species.
Locate subsurface works, in both the horizontal and vertical planes, and design measures to avoid and minimise operations beneath the habitat features identified as potential prescribed biodiversity impacts	N/A – the development site does not include geological features of significance or groundwater-dependent plant communities that may provide habitat for threatened species.
Locate the proposal to avoid severing or interfering with corridors connecting different areas of habitat and migratory flight paths, to important habitat or local movement pathways	The proposed development will remove vegetation which provides, at most, stepping-stone habitat within the fragmented industrial landscape.
Optimise the proposal layout and include design elements to minimise interactions with threatened entities	N/A – the proposed development does not include the construction of structures which could regularly interact with threatened entities (e.g., wind turbines).
Locate the proposal to avoid impacts on water bodies or hydrological processes and design measures that maintain hydrological processes that sustain threatened entities and control the quality of water released from the site, to avoid or minimise downstream impacts on threatened entities	N/A – the development site contains drainage ditches to control runoff from the hardstand area, however these are small, isolated, lacking in diversity and not considered to provide habitat for threatened entities. Therefore, the development site does not contain water bodies and would not result in prescribed impacts to hydrological processes.
 Engineering solutions, such as proven techniques to: minimise fracturing of bedrock underlying features of geological significance or groundwater-dependent communities and their 	N/A – the development site does not have prescribed impacts that require engineering solutions.

• restore connectivity and movement pathways

supporting aquifers

6.2 Identification and assessment of prescribed biodiversity impacts

The development site has the prescribed biodiversity impacts as outlined in Chapter 6 of the BAM 2020.

Table 12: Prescribed biodiversity impacts

Prescribed biodiversity impact	Threatened entities associated with prescribed impacts	Importance of habitat features to the species	Nature, extent frequency, duration and timing	Predicted consequences of impacts on threatened entities				
Karst, caves, crevices, cliffs rock and other geological features of significance	N/A – the development site does r	N/A – the development site does not contain geological features of significance						
Occurrences of human-made structures	There are no human made structu	res on the development site.						
Occurrences of non-native vegetation	There is non-native vegetation within the development area. The planted <i>Pinus</i> spp. may provide occasional roosting habitat for Grey-headed Flying- fox .	There is a negligible amount of non-native vegetation being removed (0.009 ha). GHFF are highly mobile travelling up 50km a night on feeding forays. It is highly unlikely that this tiny patch of non-native vegetation is utilised often by this species and is therefore not considered important for this species.	All non- native trees are proposed to be removed for the development site.	The removal of non-native trees will not affect the persistence of any Grey-headed Flying-fox or microbats in the locality or bioregion.				
Corridors or other areas of connectivity linking habitat for threatened entities / movement of threatened species that maintains their life cycle	Non-native trees within the study area may provide occasional roosting habitat for highly mobile threatened species, including Grey-headed Flying-fox.	There is connectivity with planted trees on the perimeter and within landscaped parts of the site, to remnant vegetation to the southeast of the site. The non- native vegetation could provide occasional stepping-stone habitat for Grey-headed Flying-fox, however it is highly unlikely to be utilised very often as preferable habitat within the locality can	The proposed development would result in the removal of habitat for highly mobile species.	There will be a miniscule change to the stepping-stone habitat connectivity proposed under the development.				

Prescribed biodiversity impact	Threatened entities associated with prescribed impacts	Importance of habitat features to the species	Nature, extent frequenc duration and timing	y, Predicted consequences of impacts on threatened entities
		easily be accessed by this highly mobile species.		
Water bodies or any hydrological processes that sustain threatened entities	N/A – the development site does r	not contain water bodies and would n	ot result in prescribed impacts	to hydrological processes
Where the proposed development may result in vehicle strike on threatened fauna or on animals that are part of a threatened ecological community	N/A – the proposed development site.	would be unlikely to result in vehicle	e striking fauna during construc	tion or during operation as an industrial

7. Stage 2: Impact assessment (biodiversity values)

7.1 Avoiding impacts

7.1.1 Locating and designing a project to avoid and minimise impacts on vegetation and habitat

The project will result in the removal of planted native vegetation and some remnant vegetation from within the development footprint. The development footprint has been reduced to conserve a large, remnant hollow-bearing tree. The project design has avoided or mitigated impacts to biodiversity values as discussed below Table 13.

Approach	How addressed and justification
Locating the project (including ancillary facilities) in areas where there are no biodiversity values	The vast majority of the development footprint is located on hardstand area. The impacts to vegetation are then mostly to planted native and exotic vegetation. The single large, hollow-bearing tree on site is being retained to avoid impacts where the most important biodiversity values are. The area of native vegetation removal is small and in a degraded condition.
Locating the project (including ancillary facilities) in areas where the native vegetation or threatened species habitat is in the poorest condition	The development footprint has been located in areas that contain planted native vegetation which provides limited habitat for threatened species and PCTs 1071 and 849 that are in a highly degraded state. The only tree on site that provides habitat values is being retained.
Locating the proposal (including ancillary facilities) in areas that avoid habitat for species with a high biodiversity risk weighting or land mapped on the important habitat map, or native vegetation that is a TEC, a highly cleared PCT or an entity at risk of a serious and irreversible impact (SAII)	The development footprint has been located in areas of planted native vegetation that provides occasional foraging habitat for highly mobile species such as birds and bats as well as the and highly degraded PCTs 1071 which does not correspond to a TEC and provides no habitat to threatened entities. It does require removal of a very small area (0.013 ha) of PCT 849, a TEC in a degraded state, but retains a larger area (0.031 ha).
Locating the proposal in areas outside of the buffer area around breeding habitat features such as nest trees or caves	The only habitat tree on site will be retained. In order to avoid disturbing important breeding habitat, impacts within the tree protection zone should be avoided and minimised as much as possible. Services within the tree protection zone are recommended to be moved to the east or underbored.
Reducing the proposal's clearing footprint by minimising the number and type of facilities	The development footprint has been located in areas of planted native vegetation, a highly degraded PCT and existing carparks and buildings.
Designing a proposal to include actions and activities that provide for rehabilitation, ecological restoration and/or ongoing maintenance of retained areas of native vegetation, threatened species, threatened ecological communities and their habitat on the subject land	Landscaping with native species is part of the proposed scope for this development.

Table 13: Locating and designing a project to avoid and minimise impacts on vegetation and habitat

7.2 Assessment of direct impacts

The proposed development would directly impact 0.125 ha of remnant native vegetation (PCT 1071 and *Casuarina* sp.). It will impact on 0.476 ha of planted native vegetation that may provide occasional foraging habitat for threatened fauna species. In addition, 0.009 ha of exotic species that provide no habitat value will also be removed. Species credits are not required to offset the proposed impacts in accordance with Appendix D.2 of BAM 2020.

Table 1	4: Assessmen	t of direct	impacts	on native	vegetation
TUNIC 1	.4. Assessmen	cor ance	mpaces	onnative	vegetation.

Vegetation Community	Direct Impact (ha)
PCT 1071: Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion	0.096
PCT 849: Grey Box – Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (degraded)	0.013
Planted Native	0.476
Native (no PCT)	0.016
Planted Exotic	0.009
Total	0.592

7.3 Assessment of indirect impacts

There will be one remaining, large remnant tree that will be at risk of indirect impacts. Due to it being a single tree on its own, the area of indirect impacts has been calculated as the entire tree, 0.032 ha. The indirect impacts of the development are outlined below. The indirect impact has been calculated as a precautionary measure as it is intended to retain the tree.

Indirect impacts	Project phase	Nature	Extent	Frequency	Duration of short-term and long- term impacts	Timing
Inadvertent impacts on tree	Construction / operation	Runoff during construction works and operation	Sedimentation confined to development site with fencing. Nutrient rich run-off treated prior to leaving the site through stormwater management measures.	During heavy rainfall or storm events	During rainfall events	Short- term impacts

Indirect impacts	Project phase	Nature	Extent	Frequency	Duration of short-term and long- term impacts	Timing
Reduced viability of adjacent habitat due to noise, dust or light spill	Construction / operation	Noise impacts may disturb fauna using foraging or nesting habitat	Remnant E. moluccana	Daily, or nightly or during construction works and during heavy rainfall or storm events	Throughout construction period	Short- term impacts
Transport of weeds and pathogens from the site to adjacent vegetation	Construction	Spread of weed seed or pathogens	Potential for spread into adjacent habitat	Daily, during construction works	Sporadic throughout construction period	Potentially long-term impacts
Inhibition of nitrogen fixation and increased soil salinity	Construction / operation	Runoff during construction works	Confined to development footprint with sediment fencing	During heavy rainfall or storm events	During rainfall events	Short- term impacts



Figure 13: Indirect impact area shown in orange

7.3.1 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.

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
DevelopandimplementaConstructionEnvironmentalManagement Plan that includes:•tree protection measures consistent with Australian StandardStandardAS4970-2009 Protection of Trees on Development Sites•soil erosion and sediment controls	Moderate	Minor	The tree identified for retention should be clearly delineated as a 'No Go' zone with high visibility bunting. Appropriate controls are to be utilised to manage exposed soil surfaces and stockpiles to prevent sediment discharge into waterways. Soil and erosion measures such as sediment fencing, clean water diversion must be in place prior the commencement of the construction work and must be regularly inspected and maintained throughout the development of the site.	The tree to be retained outside of the development site boundary will not be disturbed/impacted. Erosion and sedimentation will be controlled.	Demarcation of the tree to be set up prior to any works occurring on site and to remain throughout duration of construction works. Sediment controls to be in place and maintained for the duration of construction works.	Project Manager

Table 16: Measures proposed to mitigate and manage impacts

8. Impact summary

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

8.1 Serious and Irreversible Impacts (SAII)

The development has candidate Serious and Irreversible Impacts (SAII) values as outlined in Table 17. Detailed consideration of whether impacts on TECs that are serious and irreversible is included in Table 19.

Table 17: Serious and Irreversible Impact entity

Species / Community	Common Name	Principle	Direct impact individuals / area (ha)
Cumberland Plain Woodland in the Sydney Basin Bioregion	Cumberland Plain Woodland in the Sydney Basin Bioregion	1&2	0.013

Table 18: Determining which Principles apply to SAII candidate entities (6.7 BC Regulation)

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?	The SAII threshold is currently under development for Cumberland Plain Woodland. The proposed development will result in direct impacts to 0.013 ha to Cumberland Plain Woodland in a degraded condition.
Principle 2	
Does the proposal impact on a species that is a candidate entity because it has been identified as having a very small population size?	Yes
If yes, is the impact in excess of any threshold identified and therefore likely to be serious and irreversible?	The SAII threshold is currently under development for Cumberland Plain Woodland. The proposed development will result in direct impacts to 0.013 ha to Cumberland Plain Woodland in a degraded condition.
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?	No
If yes, is the impact in excess of any threshold identified and therefore likely to be serious and irreversible?	N/A
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

Determining whether impacts are serious and irreversible	Assessment
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 TEC consistent with 9.1.1 of the BAM

Impact Assessment Provisions	Assessment			
1. the action and measures taken to avoid the direct and indirect impact on the potential entity for an SAII	The proposal has avoided most (0.031) of the SAII entity on site, including the large hollow-bearing tree.			
2a. evidence of reduction in geographic distribution (Principle 1, clause 6.7(2)(a) BC Regulation) as the current total geographic extent of the TEC in NSW AND the	The most recent information about the reduction in geographic distribution of the TEC in NSW is contained in the Final Determination, which includes the following:			
estimated reduction in geographic extent of the TEC since 1970 (not including impacts of the proposal)	• The total extent of Cumberland Plain Woodland was estimated to be ~8.8% of the community's pre- European distribution by Tozer in 2003 based on aerial photography from 1998.			
	 This estimate was updated in 2007, showing a decline of ~5.2% in 9 years. 			
	There are currently no estimates of the decline in the TEC since 1970.			
2b. extent of reduction in ecological function for the TEC using evidence that describes the degree of environmental	The extent of reduction in ecological function for the TEC is also found in the Final Determination, as follows:			
degradation or disruption to biotic processes (Principle 2, clause 6.7(2)(b) BC Regulation) indicated by:	• The community structure has changed such that almost all of the remaining Cumberland Plain Woodland is			
i. change in community structure	considered to be regrowth forest and woodland from			
II. change in species composition	 Species composition has changed such that remnants are largely degraded by weed invasion and regrowth stands with high densities of saplings or shrubs may 			
in. disruption of ecological processes				
v. degradation of habitat. and				
vi. fragmentation of habitat	supress ground flora.			
	 Ecological processes have been disrupted by the chemical and structural modification associated with agricultural land uses and more recent expansion of urban land uses which the Cumberland Plain has historically been subjected to. 			
	The TEC has been identified as being severely fragmented.			
 2c. evidence of restricted geographic distribution (Principle 3, clause 6.7 (2) (c) BC Regulation), based on the TECs geographic range in NSW according to the: i. extent of occurrence ii. area of occupancy, and iii. number of threat-defined locations. 	Cumberland Plain woodland is highly restricted to the Sydney Basin Bioregion. According to the Final Determination, it was estimated to occur within an extent of 2,810 km ² and is known from the Auburn, Bankstown, Baulkham Hills, Blacktown, Camden, Campbelltown, Fairfield, Hawkesbury, Holroyd, Liverpool, Parramatta, Penrith and Wollondilly LGAs. These locations are all subject			
	to threats to the TEC, including weed invasion and clearing of native vegetation			
2d. evidence that the TEC is unlikely to respond to management (Principle 4, clause 6.7 (2) (d) BC Regulation).	The Final Determination states that areas where management aims to conserve the TEC suggests that it is capable of some recovery, provided the soil has not been disturbed by earthworks, cultivation, fertiliser application or			

Impact Assessment Provisions	Assessment
	other means of nutrient or moisture enrichment. The Final Determination also states that opportunities for restoration of the TEC is limited, given that the majority of the former distribution of the community has been subjected to some soil disturbance.
3. Where the TBDC indicated that data is 'unknown' or 'data deficient' for a TEC for a criterion listed in subsection 9.1.1(2), the assessor must record this in the BDAR or BCAR.	N/A – all data is provided in the Final Determination as summarised above
 4a. the impact on the geographic extent of the TEC (Principles 1 and 3) by estimating the total area of the TEC to be impacted by the proposal: i. in hectares, and ii. as a percentage of the current geographic extent of the TEC in NSW. 	The total area of the TEC to be impacted by the development footprint is 0.013 ha. A rapid GIS analysis of aerial imagery conducted as part of this assessment estimated 23,015 ha of Cumberland Plain Woodland (identified as PCT 849 or 850 by previous mapping) is present in NSW. Therefore, the area of TEC to be affected represents an estimate of 0.00006% of the current geographic extent of the TEC. It should be noted that the GIS analysis used existing vegetation mapping datasets and did not include ground truthing the extent of the mapped Cumberland Plain Woodland.
4b. the extent that the proposed impacts are likely to contribute to further environmental degradation or the disruption of biotic processes (Principle 2) of the TEC by: i. estimating the size of any remaining, but now isolated, areas of the TEC; including areas of the TEC within 500 m of the development footprint or equivalent area for other types of proposals	Using aerial imagery, 1.5 ha of Cumberland Plain Woodland were estimated from within 1500 m buffer of the development footprint, excluding the 0.013 ha present within it. It should be noted that the GIS analysis used existing vegetation mapping datasets and did not include ground truthing the extent of the mapped Cumberland Plain Woodland
 ii. describing the impacts on connectivity and fragmentation of the remaining areas of TEC measured by: distance between isolated areas of the TEC, presented as the average distance if the remnant is retained AND the average distance if the remnant is removed as proposed, and estimated maximum dispersal distance for native flora species characteristic of the TEC, and other information relevant to describing the impact on connectivity and fragmentation, such as the area to perimeter ratio for remaining areas of the TEC as a result of the development iii. describing the condition of the TEC according to the vegetation integrity score for the relevant vegetation zone(s) (Section 4.3). The assessor must also include the relevant composition, structure and function condition scores for each vegetation zone. 	This TEC is highly fragmented in the landscape. Aerial imagery suggests that there is some remnant Cumberland Plain Woodland (CPW) to the southwest that further connects to some narrow strips of CPW vegetation alongside Bunbury Curran Creek and the Hume motorway approximately 300 m from the development footprint. There will be some connectivity of this TEC within the development footprint and through revegetation. As most native vegetation would be removed from the development footprint it would also reduce the maximum dispersal distance for native species characteristic of this TEC. Typically seed from canopy species would be spread by fauna such as birds and bats. The Grey-headed Flying Fox is likely to forage within the development footprint. In one foraging night, Grey-headed Flying Fox are known to forage up to 20 kms from their camps. Therefore, removing all vegetation from the site would reduce the amount of vegetation within the dispersal area by 0.013 ha. The absence of shrubs and limited groundcover at the development site, and the proposed removal of

species for recolonisation which is limited within a highly

industrial setting.,

Impact Assessment Provisions	Assessment
	The TEC was identified as being in degraded condition. The
	current vegetation integrity score is 11.4 with a composition
	condition score of 10.3, structure condition score of 2.8 and
	function condition score of 52.2



Figure 14: Candidate Serious and Irreversible Impact entities

8.2 Impacts requiring offsets

The impacts of the development requiring offset for native vegetation are outlined in Table 20 and shown on Figure 15.

Vegetation Zone	PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Direct impact (ha)
1	849	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Coastal Valley Grassy Woodlands	Grassy Woodlands	0.013

Table 20: Impacts of native vegetation that require offsets

8.3 Impacts not requiring offsets

Impacts not requiring offset includes the 0.458 ha of planted native which has been assessed under the planted native vegetation streamlined assessment module, 0.016 ha of native vegetation (no PCT) and 0.009 ha of exotic vegetation.

Impacts to PCT 849 also do not require offset as outlined in Section 9.2.2 of the BAM; The assessor must determine an offset for all impacts of proposals on PCTs that are associated with a vegetation zone that has a vegetation integrity score of:

- a. ≥15, where the PCT is representative of an EEC or a CEEC
- 1. ≥17, where the PCT is associated with threatened species habitat (as represented by ecosystem credits) or represents a vulnerable ecological community
- 2. ≥20, where the PCT does not represent a TEC and is not associated with threatened species habitat.

The vegetation integrity score for PCT 849 was 11.4. Therefore, under the thresholds provided above, it was determined that the as the vegetation integrity score (11.4) is below 15 (where the PCT is associated with a CEEC) that no offsets were required. Impacts not requiring offset are shown in Figure 16.

8.4 Areas not requiring assessment

Areas not requiring assessment within the subject land include the hardstand, shown in Figure 16.

8.5 Credit summary

The number of ecosystem credits required for the development are outlined in Table 21.

Vegetation Zone	PCT ID	PCT Name	Condition	Credit Class	Direct impact (ha)	Credits required
1	849	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Degraded	No HBT Credits	0.01	0 – as described in Section 8.3 PCT 849 has a vegetation integrity score <15

Table 21: Ecosystem credits required

Vegetation Zone	PCT ID	PCT Name	Condition	Credit Class	Direct impact (ha)	Credits required
						and offset credits are not required for impacts to this PCT.
2	1071	Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion	Degraded	No HBT Cr	0.01	1
				Total	0.11	1



Figure 15: Impacts requiring offset



Figure 16: Impacts not requiring offset



Figure 17: Impacts not requiring assessment

9. Consistency with legislation and policy

Additional matters relating to impacts on flora and fauna which are not covered by the BC Act must also be addressed for the proposed development. Potential "Matters of National Environmental Significance" (MNES) in accordance with the EPBC Act have been addressed in Section 2.4.1 below.

9.1 Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

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

The process includes undertaking an Assessment of Significance for listed threatened species and ecological communities that represent a matter of MNES that will be impacted as a result of the proposed action. Significant impact guidelines 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.

A habitat assessment and Likelihood of Occurrence was completed (Appendix C) and the following MNES was assessed for *Lathamus discolor* (Swift Parrot) and *Pteropus poliocephalus* (Grey-headed Flying-fox) under the EPBC Act.

9.1.1 Lathamus discolor (Swift Parrot)

The Swift Parrot is listed as Critically Endangered under the EPBC Act. It is a small parrot the breeds in Tasmania and migrates to the mainland between February and October every year. They feed on flowering eucalypts and will often occur in urban areas.

While the closest record was approximately 2 km away, this is a highly mobile species that can cover large distances looking for suitable feeding sites. Among their favoured feed trees is *Eucalyptus tereticornis* (Forest Red Gum), of which there were several planted on the development site. The DPIE important areas maps for Swift Parrot were checked and the development site is not mapped as an important area. However, there is still the potential the species could utilise this site when foraging.

Significant Impact Criteria	Assessment					
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:						
lead to a long-term decrease in the size of a population	No. The habitat within the site is considered marginal and highly fragmented for the species due to the low relative abundance of preferred feed trees present and the small size of the patch – approximately 0.1 ha of potential feed trees being impacted. No individuals were identified during survey. The species would not rely on the site, are highly mobile and would utilise a range of foraging resources within the locality.					
Reduce the area of occupancy of a species	No. The habitat within the site is considered marginal for the species. No individuals were identified during survey. The species would not rely on the site, are highly mobile and would utilise a range of foraging resources.					

Table 22: EPBC Act Assessment of Significance for Lathamus discolor (Swift Parrot)

Significant Impact Criteria	Assessment
Fragment an existing population into two or more populations	No. There is one single interbreeding population of the Swift Parrot. The proposed action would not impact any known breeding habitat as the species only breeds in Tasmania and migrates to the mainland over the winter. The species would not rely on the site, are highly mobile and would utilise a range of foraging resources.
Adversely affect habitat critical to the survival of the species	Habitat critical to the survival of the species refers to areas that are necessary: for activities such as foraging, breeding, roosting or dispersal, for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the ecological community, such as pollinators), to maintain genetic diversity and long term evolutionary development or for the reintroduction of populations or recovery of the species or ecological community. The proposed action would not impact any known breeding habitat. The species would not rely on the site, are highly mobile and would utilise a range of foraging resources.
Disrupt the breeding cycle of a population	The Swift Parrot breeds in Tasmania during summer and migrates to the mainland during winter. Therefore, no breeding habitat would be affected as part of the proposed action. The species has potential to occasionally utilise the foraging resources available in the development site. However, due to the small extent of available feed trees on the development site it is highly unlikely that these resources would be relied upon.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The Swift Parrot breeds in Tasmania during summer and migrates to the mainland during winter. Therefore, no breeding habitat would be affected as part of the proposed action. The species would not rely on the site, due to its small extent and abundance of suitable habitat within the locality. This species is known to utilise a range of foraging resources. Although the development site would form a mosaic of resources in the locality, it is too small to solely support any individuals.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Invasive species which pose a threat to the Swift Parrot include those which increase competition for food and nesting resources such as the Noisy Miner. The development site contains fragmented, marginal foraging habitat in an area that is located in a moderately dense area. As such, species like the Noisy Miner are already in abundance in these areas due to their preference for open areas. The proposed action would not increase the presence of the Noisy Miner or other nectivorous species likely to be a threat to the Swift Parrot.
Introduce disease that may cause the species to decline	The Swift Parrot is susceptible to Psittacine Beak and Feather Disease (PBFD). Increases in stress caused by competition for food and roosting resources can increase the impacts of PBFD on the population. No known breeding sites would be affected and only marginal foraging habitat which would not be relied upon.
Interfere with the recovery of the species	The recovery actions are outside the scope of this assessment.
Conclusion	 No. The proposed action is unlikely to have a significant impact on the Swift Parrot for the following reasons: Only a small area of potential feed trees being impacted More suitable foraging habitat for this highly mobile species is available outside of the development site.

9.1.2 Pteropus poliocephalus (Grey-headed Flying-fox)

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

Grey-headed Flying Fox has not been recorded on the development site but has been recorded close to the development site. The closest nationally recognised camp is located approximately 4 km northeast at Macquarie Fields and at last recording (February 2020) had approximately 10,000 – 15,999 individuals (DAWE 2020c).

The vegetation within the site provides potential foraging habitat in the form of seasonally flowering myrtaceous tree species including *Eucalyptus tereticornis*. There is the potential that the species would utilise this site on occasion for foraging purposes. No roosting camps are located within the site.

Criterion	Assessment
An action is likely to have a signifi	cant impact on a vulnerable species if there is a real chance or possibility that it will:
Lead to a long-term decrease in the size of an important population of a species	The Grey-headed Flying-fox is considered one population due to the constant exchange of genetic material between individuals and its movement between camps throughout its entire geographic range (DAWE 2021c). Maternity or other roosting habitat is considered important habitat for this species. No roosting habitat (i.e. camps) have been recorded within the development site. According to the National Flying-fox Monitoring Program, no camps currently occur or have ever been recorded within the development site (DAWE 2021b). The nearest Greyheaded Flying-fox camp occurs approximately 4 km to the northeast of the development site, within Macquarie Fields (DAWE 2021b). The development site contains approximately 0.1 ha of potential foraging habitat for the Greyheaded Flying-fox that will be impacted. Additional foraging habitat has been recorded within the broader locality of the development site. Given the proximity of more suitable habitat within the assessment area, the removal of this potential foraging habitat would not lead to the long-term decrease in the size of an important population of Greyheaded Flying-fox
Reduce the area of occupancy of an important population	The proposed development will reduce the extent of available foraging habitat for the Grey-headed Flying-fox. About 0.1 ha of potential foraging habitat will be impacted. The vegetation within the development site may provide supplementary foraging habitat for this species. The development site does not contain breeding or sheltering habitat (i.e. bat camps). The Grey-headed Flying-fox is known to fly long distances (up to 50 km per night) and move between bat camps. As such this species is likely to utilise a large extent of habitat around the Macquarie Fields camp which may include some habitat within the development site and a large amount of habitat in adjacent lands. Due to the extent of habitat within a 50 km radius of the known bat camp at Macquarie Fields, the removal of a small amount of native planted vegetation is unlikely to significantly reduce the extent of occupancy for this species.
Fragment an existing important population into two or more populations	The proposed development will result in the loss approximately 0.1 ha of potential foraging habitat in the form of native species and exotic vegetation within the development site. The proposed works will not affect camps. Additionally, due to the

Table 33. EDDC Ast Assessment	of Ciamificanaa fan De		(Curry hand and Elistica faul)
Table 23: EPBC Act Assessment (of Significance for Pt	eropus poliocephalus	(Grey-neaded Fiying-tox)

Criterion	Assessment
	planted and highly urbanised nature of the vegetation within the development site, it is likely that the vegetation affected by the development is considered marginal or supplementary foraging habitat for this species.
	The Grey-headed Flying-fox is a highly mobile species and is considered part of one large population. As the vegetation within the development site is considered supplementary habitat for this species, it is unlikely that the proposed works will result in the fragmentation of populations for this highly mobile species.
Adversely affect habitat critical to the survival of a species	The Recovery Plan for the Grey-headed Flying-fox 2021 identifies 'a continuous temporal sequence of productive foraging habitats, linked by migration corridors or stopover habitats, and suitable roosting habitat within nightly commuting distance of foraging areas' as habitat critical to the survival of the species. No camps will be affected by the proposed action. The proposed action will affect 0.6 ha of vegetation, of which approximately 0.1 ha comprises suitable foraging habitat for the Grey-headed Flying-fox. The Grey-headed Flying-fox is recorded as travelling long distances (50 km) on feeding forays and suitable habitat is available outside of the development site.
Disrupt the breeding cycle of an important population	The proposed action will affect 0.1 ha of vegetation, some of which comprises suitable foraging habitat for the Grey-headed Flying-fox. The proposed action will not disrupt the breeding cycle of the Grey-headed Flying-fox given that no camps will be impacted by the proposed action and suitable foraging habitat is available adjacent to the development site.
Adversely affect habitat critical to the survival of a species; modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposed action will affect 0.1 ha of vegetation, including foraging habitat for the Grey-headed Flying-fox. Grey-headed Flying-fox camps will not be removed or disturbed, and suitable habitat is available outside of the development site.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The proposed action is unlikely to result in the establishment of an invasive species that is harmful to the Grey-headed Flying-fox.
Introduce disease that may cause the species to decline	Grey-headed Flying-fox are reservoirs for the Australian bat lyssavirus and can cause clinical disease and mortality in Grey-headed Flying-fox. The proposed action would not increase the incidence of this disease.
Interfere substantially with the recovery of the species	A National Recovery Plan for the Grey-headed Flying-fox was adopted in 2021. The relatively small amount of foraging habitat to be removed is unlikely to substantially interfere with the recovery of this species.
Conclusion	No. The proposed action is unlikely to have a significant impact on the Grey-headed Flying-fox for the following reasons:
	More suitable foraging habitat for this highly mobile species is available outside of the development site.

9.2 State Environmental Planning Policy (Koala Habitat Protection) 2021

State Environmental Planning Policy No.44 – Koala Habitat Protection (SEPP44) came into effect in 1995 aiming to reverse koala population declines through better management of habitat that support the species. The principal aim of SEPP44 is to 'encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline.' SEPP44 is a prescribed consideration under the NSW Environmental Planning and Assessment Act, 1979 (EP&A Act) for all development applications (DA) that may impact on koalas or their habitat. SEPP44 was replaced by SEPP (Koala Habitat Protection) 2019, which was then replaced by SEPP (Koala Habitat Protection) 2020, which was then replaced by SEPP (Koala Habitat Protection) 2021.

Part 3 of SEPP 2021 allows for any LGA to which the SEPP applies to prepare a Koala Plan of Management (KPoM) to achieve its aims. Campbelltown City Council is a listed LGA and has subsequently prepared a Comprehensive KPoM in accordance with the SEPP. When a KPoM has been prepared, it can be followed in lieu of the SEPP.

A KAAR will be prepared in line with the Campbelltown CKPoM and submitted with the DA.

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Appendix A Definitions

Terminology	Definition					
Biodiversity credit report	The report produced by the Credit Calculator that sets out the number and class of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a development site, or on land to be biodiversity certified, or that sets out the number and class of biodiversity credits that are created at a biodiversity stewardship site.					
BioNet Atlas	The BioNet Atlas (formerly known as the NSW Wildlife Atlas) is the OEH database of flora and fauna records. The Atlas contains records of plants, mammals, birds, reptiles, amphibians, some fungi, some invertebrates (such as insects and snails) and some fish					
Broad condition state:	Areas of the same PCT that are in relatively homogenous condition. Broad condition is used for stratifying areas of the same PCT into a vegetation zone for the purpose of determining the vegetation integrity score.					
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. The area of land that is directly impacted on by a proposed development, including access roads, and areas used to store construction materials. 					
Development footprint						
Development site	An area of land that is subject to a proposed development that is under the EP&A Act.					
Ecosystem credits	A measurement of the value of EECs, CEECs and threatened species habitat for species that can be reliably predicted to occur with a PCT. Ecosystem credits measure the loss in biodiversity values at a development site and the gain in biodiversity values at a biodiversity stewardship site.					
High threat exotic plant cover	Plant cover composed of vascular plants not native to Australia that if not controlled will invade and outcompete native plant species.					
Hollow bearing tree	A living or dead tree that has at least one hollow. A tree is considered to contain a hollow if: (a) the entrance can be seen; (b) the minimum entrance width is at least 5 cm; (c) the hollow appears to have depth (i.e. you cannot see solid wood beyond the entrance); (d) the hollow is at least 1 m above the ground. Trees must be examined from all angles.					
Important wetland	A wetland that is listed in the Directory of Important Wetlands of Australia (DIWA) and SEPP 14 Coastal Wetlands					
Linear shaped development	Development that is generally narrow in width and extends across the landscape for a distance greater than 3.5 kilometres in length					
Local population	The population that occurs in the study area. In cases where multiple populations occur in the study area or a population occupies part of the study area, impacts on each subpopulation must be assessed separately.					
Local wetland	Any wetland that is not identified as an important wetland (refer to definition of Important wetland).					
Mitchell landscape	Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000.					

Terminology	Definition
Multiple fragmentation impact development	Developments such as wind farms and coal seam gas extraction that require multiple extraction points (wells) or turbines and a network of associated development including roads, tracks, gathering systems/flow lines, transmission lines
Operational Manual	The Operational Manual published from time to time by OEH, which is a guide to assist assessors when using the BAM
Patch size	An area of intact native vegetation that: a) occurs on the development site or biodiversity stewardship site, and b) includes native vegetation that has a gap of less than 100 m from the next area of native vegetation (or \leq 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 agreement.
Riparian buffer	Riparian buffers applied to water bodies in accordance with the BAM
Sensitive biodiversity values land map	Development within an area identified on the map requires assessment using the BAM.
Site attributes	The matters assessed to determine vegetation integrity. They include: native plant species richness, native over-storey cover, native mid-storey cover, native ground cover (grasses), native ground cover (shrubs), native ground cover (other), exotic plant cover (as a percentage of total ground and mid-storey cover), number of trees with hollows, proportion of over-storey species occurring as regeneration, and total length of fallen logs.
Site-based development	a development other than a linear shaped development, or a multiple fragmentation impact development
Species credits	The class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Biodiversity Data Collection.
Subject land	Is land to which the BAM is applied in Stage 1 to assess the biodiversity values of the land. It includes land that may be a development site, clearing site, proposed for biodiversity certification or land that is proposed for a biodiversity stewardship agreement.
Threatened Biodiversity Data Collection	Part of the BioNet database, published by OEH and accessible from the BioNet website.
Threatened species	Critically Endangered, Endangered or Vulnerable threatened species as defined by Schedule 1 of the BC Act, or any additional threatened species listed under Part 13 of the EPBC Act as Critically Endangered, Endangered or Vulnerable.

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

Appendix B BAM Credit Summary Report

NSW

BAM Credit Summary Report

Proposal Details		
Assessment Id	Proposal Name	BAM data last updated *
00028332/BAAS17069/21/00028333	Ingleburn Logistics Stage 3	24/11/2021
Assessor Name	Report Created	BAM Data version *
Diane Campbell	24/03/2022	50
Assessor Number	BAM Case Status	Date Finalised
BAAS17069	Finalised	24/03/2022
Assessment Revision	Assessment Type	BOS entry trigger
3	Part 4 Developments (Small Area)	BOS Threshold: Area clearing threshold
	* Disclaimer: BAM data last updated may indicate either database. BAM calculator database may not be complete	complete or partial update of the BAM calculator elv aligned with Bionet.
Ecosystem credits for plant communitie	es types (PCT), ecological communities & threatene	d species habitat

Zone	Vegetatio	TEC name	Current	Change in	Are	Sensitivity to	Species	BC Act Listing	EPBC Act	Biodiversit	Potenti	Ecosyste
	n		Vegetatio	Vegetatio	а	loss	sensitivity to	status	listing status	y risk	al SAII	m credits
	zone		n	n integrity	(ha)	(Justification)	gain class			weighting		
	name		integrity score	(loss / gain)								

Assessment Id

00028332/BAAS17069/21/00028333

Proposal Name Ingleburn Logistics Stage 3 Page 1 of 2

NSW

BAM Credit Summary Report

	erland shal	e plains woodland										
2	849_Low	Cumberland Plain Woodland in the Sydney Basin Bioregion	11.4	11.4	0.01	PCT Cleared - 93%	High Sensitivity to Potential Gain	Critically Endangered Ecological Community	Critically Endangered	2.50	TRUE	C
											Subtot al	C
Iradi	mites austr	ralis and Typha orie	ntalis coasta	freshwa	ter v	vetlands of the	e Sydney Basin	Bioregion				
1	1071_Low	Not a TEC	17	17.0	0.1	PCT Cleared - 75%	High Sensitivity to Potential Gain			2.00		1
1	1071_Low	Not a TEC	17	17.0	0.1	PCT Cleared - 75%	High Sensitivity to Potential Gain			2.00	Subtot al	1 1

Species credits for threatened species

Vegetation zone	Habitat condition	Change in	Area	Sensitivity to	Sensitivity to	BC Act Listing	EPBC Act listing	Potential	Species
name	(Vegetation	habitat	(ha)/Count	loss	gain	status	status	SAII	credits
	Integrity)	condition	(no.	(Justification)	(Justification)				
			individuals)						

Assessment Id

00028332/BAAS17069/21/00028333

Proposal Name Ingleburn Logistics Stage 3 Page 2 of 2


BAM Biodiversity Credit Report (Like for like)

roposul betuils			
Assessment Id	P	roposal Name	BAM data last updated *
00028332/BAAS17069/21/00028333	In	gleburn Logistics Stage 3	24/11/2021
Assessor Name	A	ssessor Number	BAM Data version *
Diane Campbell	B	AAS17069	50
Proponent Names	R	eport Created	BAM Case Status
Chris Demertze	24	4/03/2022	Finalised
Assessment Revision	A	ssessment Type	Date Finalised
	P	art 4 Developments (Small Area)	24/03/2022
3	1.	are reception (small recey	
3 BOS entry trigger	* Disclai	mer: BAM data last updated may indicate eithe	er complete or partial update of the
3 BOS entry trigger BOS Threshold: Area clearing threshold	* Disclai BAM cal	mer: BAM data last updated may indicate eith culator database. BAM calculator database ma	er complete or partial update of the y not be completely aligned with Bionet.
3 BOS entry trigger BOS Threshold: Area clearing threshold Potential Serious and Irreversible Imp	* Disclai BAM cal	mer: BAM data last updated may indicate eithe culator database. BAM calculator database ma	er complete or partial update of the y not be completely aligned with Bionet.
3 BOS entry trigger BOS Threshold: Area clearing threshold Potential Serious and Irreversible Im Name of threatened ecological community	* Disclai BAM cal Dacts Listing status	mer: BAM data last updated may indicate eithe culator database. BAM calculator database ma Name of Plant Community Type/ID	er complete or partial update of the y not be completely aligned with Bionet.
3 BOS entry trigger BOS Threshold: Area clearing threshold Potential Serious and Irreversible Im Name of threatened ecological community Cumberland Plain Woodland in the Sydney Basin Bioregion	* Disclai BAM cal bacts Listing status Critically Endangered Ecological Community	Name of Plant Community Type/ID 849-Cumberland shale plains woodland	er complete or partial update of the y not be completely aligned with Bionet.
3 BOS entry trigger BOS Threshold: Area clearing threshold Potential Serious and Irreversible Imp Name of threatened ecological community Cumberland Plain Woodland in the Sydney Basin Bioregion Species	* Disclai BAM cal bacts Listing status Critically Endangered Ecological Community	Mer: BAM data last updated may indicate eithe culator database. BAM calculator database ma Name of Plant Community Type/ID 849-Cumberland shale plains woodland	er complete or partial update of the y not be completely aligned with Bionet.
3 BOS entry trigger BOS Threshold: Area clearing threshold Potential Serious and Irreversible Imp Name of threatened ecological community Cumberland Plain Woodland in the Sydney Basin Bioregion Species Nil	* Disclai BAM cal bacts Listing status Critically Endangered Ecological Community	mer: BAM data last updated may indicate eithe culator database. BAM calculator database ma Name of Plant Community Type/ID 849-Cumberland shale plains woodland	er complete or partial update of the y not be completely aligned with Bionet.
3 BOS entry trigger BOS Threshold: Area clearing threshold Potential Serious and Irreversible Imp Name of threatened ecological community Cumberland Plain Woodland in the Sydney Basin Bioregion Species Nil Additional Information for Approval	* Disclai BAM cal Listing status Critically Endangered Ecological Community	Mer: BAM data last updated may indicate eithe culator database. BAM calculator database ma Name of Plant Community Type/ID 849-Cumberland shale plains woodland	er complete or partial update of the y not be completely aligned with Bionet.
3 BOS entry trigger BOS Threshold: Area clearing threshold Potential Serious and Irreversible Imp Name of threatened ecological community Cumberland Plain Woodland in the Sydney Basin Bioregion Species Nil Additional Information for Approval Assessment Id	* Disclai BAM cal bacts Listing status Critically Endangered Ecological Community	mer: BAM data last updated may indicate eithe culator database. BAM calculator database ma Name of Plant Community Type/ID 849-Cumberland shale plains woodland	er complete or partial update of the y not be completely aligned with Bionet.



BAM Biodiversity Credit Report (Like for like)

PCT Outside Ibra Added None added

PCTs With Customized Benchmarks									
PCT									
No Changes									
Predicted Threatened Species Not On Site									
Name									
Epthianura albifrons / White-fronted Chat									
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				
1071-Phragmites australis and Typha orientalis coastal	Not a TEC	0.1	0	1	1				

1071-Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion	Not a TEC	0.1	0	1	1
849-Cumberland shale plains woodland	Cumberland Plain Woodland in the Sydney Basin Bioregion	0.0	0	0	0

Assessment Id

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Proposal Name Ingleburn Logistics Stage 3 Page 2 of 4



BAM Biodiversity Credit Report (Like for like)

849-Cumberland shale plains woodland	Like-for-like credit retirement options							
	Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region		
	Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 849, 850	-	849_Low	No	0	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.		
1071-Phragmites australis	Like-for-like credit retirement options							
and Typha orientalis coastal freshwater wetlands of the	Class	Trading group	Zone	HBT	Credits	IBRA region		
freshwater wetlands of the Sydney Basin Bioregion	Coastal Freshwater Lagoons This includes PCT's: 781, 783, 1071, 1290, 1735, 1737, 1741, 1742	Coastal Freshwater Lagoons >=70% and <90%	1071_Low	No		Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.		

Species Credit Summary No Species Credit Data

Assessment ld 00028332/BAAS17069/21/00028333 Proposal Name Ingleburn Logistics Stage 3 Page 3 of 4



BAM Biodiversity Credit Report (Like for like)

Credit Retirement Options

Like-for-like credit retirement options

Assessment ld 00028332/BAAS17069/21/00028333 Proposal Name Ingleburn Logistics Stage 3 Page 4 of 4

NSD

BAM Biodiversity Credit Report (Variations)

Proposal Details				
Assessment Id	Proposal 1	Name	BAM data last updated *	
00028332/BAAS17069/21/00028333	Ingleburn	Logistics Stage 3	24/11/2021	
Assessor Name	Assessor M	Number	BAM Data version *	
Diane Campbell	BAAS1706	59	50	
Proponent Name(s)	Report Cre	eated	BAM Case Status	
Chris Demertze	24/03/202	22	Finalised	
Assessment Revision	Assessmen	nt Type	Date Finalised	
3	Part 4 Dev	Part 4 Developments (Small Area) 24/03/2022		
BOS entry ungger BOS Threshold: Area clearing threshold Potential Serious and Irreversible Impacts	calculator	database. BAM calculator database may no	t be completely aligned with Bionet.	
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				

Assessment Id

00028332/BAAS17069/21/00028333

Proposal Name Ingleburn Logistics Stage 3 Page 1 of 3



BAM Biodiversity Credit Report (Variations)

PCTs With Customized Benchma	arks							
PCT								
No Changes								
Predicted Threatened Species N	ot On Site							
Name								
Epthianura albifrons / White-fr	ronted Chat							
Ecosystem Credit Summary	(Number and class of	biodiversity credits	to be retired)					
Name of Plant Community Type	e/ID	Name of threatened e	cological commun	ity	Area of impac	t HBT Cr	No HBT Cr	Total credits to be retired
1071-Phragmites australis and T freshwater wetlands of the Sydr	lypha orientalis coastal ney Basin Bioregion	Not a TEC			0.1	I 0	1	1.00
849-Cumberland shale plains woodland		Cumberland Plain Woodland in the Sydney Basin Bioregion		iey	0.0	0 0	0	0.00
849-Cumberland shale plains	Like-for-like credit retir	ement options						
woodland	Class	Trading group	Zone	HBT	Credits	IBRA regior	1	
	Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 849, 850	-	849_Low	No	0	Cumberland,Burragorang, Pittwater, Sydney Cataract, Wollemi and Yeng or Any IBRA subregion that is within 10 kilometers of the outer edge of the		ig, Pittwater, ni and Yengo. t is within 100 edge of the
1071-Phragmites australis	Like-for-like credit retir	ement options						
and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion	Class	Trading group	Zone	НВТ	Credits	IBRA region	ı	

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BAM Biodiversity Credit Report (Variations)

Coastal Freshwater Lagoons This includes PCT's: 781, 783, 1071, 1290, 1735, 1737, 1741, 1742	Coastal Freshwater Lagoons >=70% and <90%	1071_Low	No	1	Cumberland,Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Variation options					
Formation	Trading group	Zone	HBT	Credits	IBRA region
Freshwater Wetlands	Tier 2 or higher threat status	1071_Low	No	1	IBRA Region: Sydney Basin, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary No Species Credit Data

Credit Retirement Options Like-for-like options

Assessment Id

00028332/BAAS17069/21/00028333

Proposal Name Ingleburn Logistics Stage 3 Page 3 of 3

Appendix C EPBC Act Likelihood of Occurrence

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

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

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

Table 24: Likelihood of occurrence for threatened ecological communities	
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Scientific Name	EPBC A Status	ct Distribution and Habitat	Likelihood of Occurrence	Impact Assessment Required
Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion	Ε	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, including old ridges, dunes and terraces.	No – not identified during survey.	No
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland	Ε	This ecological community associated with grey-black clay-loams and sandy loams, where the groundwater is saline or sub-saline, on waterlogged or periodically inundated flats, drainage lines, lake margins and estuarine fringes associated with coastal floodplains. Floodplains are level landform patterns on which there may be active erosion and aggradation by channelled and overbank stream flow with an average recurrence interval of 100 years or less. Swamp Oak Floodplain Forest generally occurs below 20 m (rarely above 10 m) elevation in the NSW North Coast, Sydney Basin and South East Corner bioregions. The structure of the community may vary from open forests to low woodlands, scrubs or reedlands with scattered trees. Typically, these forests, woodlands, scrubs and reedlands form mosaics with other floodplain forest communities and treeless wetlands, and often they fringe treeless floodplain lagoons or wetlands with semi-permanent standing water.	No – not identified during survey.	No
Coastal Upland Swamps in the Sydney Basin Bioregion	Ε	Endemic to NSW and confined to the Sydney Basin Bioregion. It occurs in the eastern Sydney Basin from the Somersby district in the north (Somersby-Hornsby plateaux) to the Robertson district in the south (n the Woronora plateau). Occur primarily on impermeable sandstone plateaux with shallow groundwater aquifers in the headwaters and impeded drainage lines of streams, and on sandstone benches with abundant seepage moisture.Generally associated with acidic soils.	No – not identified during survey.	No

Cooks River/Castlereagh CE Ironbark Forest of the Sydney Basin Bioregion	Occurs in western Sydney, with the most extensive stands occurring in the Castlereagh and Holsworthy areas. Smaller remnants occur in the Kemps Creek area and in the eastern section of the Cumberland Plain. Mainly occurs on clay soils derived from the deposits of ancient river systems (alluvium), or on shale soils of the Wianamatta Shales.	No – not No identified during survey.
Cumberland Plain Shale CE Woodlands and Shale- Gravel Transition Forest	Endemic to the shale hills and plains of the Sydney Basin Bioregion in NSW, occurring primarily in, but not limited to, the Cumberland Sub-region. Flat to undulating or hilly terrain, at elevations up to approximately 350 metres above sea level. Predominantly associated with clay soils, that are derived from Wianamatta Shale geology. Minor occurrences may be present on other soil groups, notably Holocene Alluvium and soils derived from the Mittagong Formation.	No – not No identified during survey
River-flat eucalypt forest on CE coastal floodplains of southern New South Wales and eastern Victoria	Found on the river flats of the coastal floodplains. Known from parts of the Local Government Areas of Port Stephens, Maitland, Singleton, Cessnock, Lake Macquarie, Wyong, Gosford, Hawkesbury, Baulkham Hills, Blacktown, Parramatta, Penrith, Blue Mountains, Fairfield, Holroyd, Liverpool, Bankstown, Wollondilly, Camden, Campbelltown, Sutherland, Wollongong, Shellharbour, Kiama, Shoalhaven, Palerang, Eurobodalla and Bega Valley. Associated with silts, clay-loams and sandy loams, on periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains.	No – not No identified during survey
Shale Sandstone Transition CE Forest of the Sydney Basin Bioregion	Occurs at the edges of the Cumberland Plain, where clay soils from the shale rock intergrade with earthy and sandy soils from sandstone, or where shale caps overlay sandstone. The boundaries are indistinct, and the species composition varies depending on the soil influences. It typically occurs in moderately wet sites, with an annual rainfall of 800-1100mm per year, and on clay soils derived from Wianamatta shale. The tree canopy is dominated by Turpentine and a variety of eucalypt species. Its distribution is mainly on the Cumberland Plain of the Sydney region.	No – not No identified during survey.
Upland Basalt Eucalypt E Forests of the Sydney Basin Bioregion	Generally confined to the Sydney Basin bioregion, including the Moss Vale, Ettrema, Burragorang, Sydney Cataract, and Wollemi IBRA sub-regions. However, some patches may extend into in the Kanangra and Oberon IBRA sub-regions of the South Eastern Highlands bioregion. Found on igneous rock (predominately Tertiary basalt and microsyenite). Typically occurs at elevations between 650 and 1050 m above sea level.	No – not No identified during survey.
Western Sydney Dry CE Rainforest and Moist Woodland on Shale	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	No – not No identified during survey.

upper sections of the slope. Occurs almost exclusively on clay soils derived from Wiannamatta Group shales.

Table 25: Likelihood of occurrence for threatened species

Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Number of records within 5 km	Likelihood of occurrence within the subject land	Impact Assessment Required
FAUNA						
Anthochaera phrygia	Regent Honeyeater	CE	Inland slopes of south-east Australia, and less frequently in coastal areas. In NSW, most records are from the North-West Plains, North-West and South-West Slopes, Northern Tablelands, Central Tablelands and Southern Tablelands regions; also recorded in the Central Coast and Hunter Valley regions. Eucalypt woodland and open forest, wooded farmland and urban areas with mature eucalypts, and riparian forests of <i>Casuarina cunninghamiana</i> (River Oak).	1	Unlikely – no suitable habitat present on site for this species.	No
Apus pacificus	Fork-tailed Swift	Μ	Recorded in all regions of NSW. Riparian woodland., swamps, low scrub, heathland, saltmarsh, grassland, Spinifex sandplains, open farmland and inland and coastal sand-dunes.	1	Unlikely – no suitable habitat present on site for this species.	No
Botaurus poiciloptilus	Australasian Bittern	Ε	Found over most of NSW except for the far north-west. Permanent freshwater wetlands with tall, dense vegetation, particularly <i>Typha</i> spp. (bullrushes) and <i>Eleocharis</i> spp. (spikerushes).	0	Unlikely – suitable habitat on site is highly degraded, no local records.	No
Calidris ferruginea	Curlew Sandpiper	CE, M	Occurs along the entire coast of NSW, and sometimes in freshwater wetlands in the Murray-Darling Basin. Littoral and estuarine habitats, including intertidal mudflats, non-tidal swamps, lakes and lagoons on the coast and sometimes inland.	0	Unlikely – suitable habitat on site is highly degraded, no local records.	No
Callocephalon fimbriatum	Gang-gang Cockatoo	-	In NSW, distributed from the south-east coast to the Hunter region, and inland to the Central Tablelands and south-west	1	Unlikely – habitat on site is highly degraded.	No

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			slopes. Isolated records known from as far north as Coffs Harbour and as far west as Mudgee. Tall mountain forests and woodlands in summer; in winter, may occur at lower altitudes in open eucalypt forests and woodlands, and urban areas.			
Calyptorhynchus Iathami	Glossy Black- Cockatoo	-	In NSW, widespread along coast and inland to the southern tablelands and central western plains, with a small population in the Riverina. Open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur.	1	Unlikely – no feed trees (<i>Allocasuarina sp.</i>) on site.	No
Chalinolobus dwyeri	Large-eared Pied Bat	V	Recorded from Rockhampton in Qld south to Ulladulla in NSW. Largest concentrations of populations occur in the sandstone escarpments of the Sydney basin and the NSW north-west slopes. Wet and dry sclerophyll forests, Cyprus Pine dominated forest, woodland, sub-alpine woodland, edges of rainforests and sandstone outcrop country.	1	Unlikely – no roosting habitat on site. Ample preferable foraging habitat available in broader locality.	No
Charadrius Ieschenaultii	Greater Sand- plover	V, M	In NSW, recorded between the northern rivers and the Illawarra, with most records coming from the Clarence and Richmond estuaries. Almost entirely restricted to coastal areas in NSW, mainly on sheltered sandy, shelly or muddy beaches or estuaries with large intertidal mudflats or sandbanks.	0	Unlikely – no suitable habitat present on site for this species, no local records.	No
Cuculus optatus	Oriental Cuckoo, Horsfield's Cuckoo	Μ	Northern and eastern Australia, records mainly coastal in NSW south to Bega area. Nonbreeding habitat: monsoonal rainforest, vine thickets, wet sclerophyll forest or open Casuarina, Acacia or Eucalyptus woodland.	0	Unlikely – no suitable habitat present on site for this species, no local records.	No
Dasyurus maculatus maculatus	Spotted-tailed Quoll	E	Found on the east coast of NSW, Tasmania, eastern Victoria and north-eastern Qld. Rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	0	Unlikely – no suitable habitat present on site for this species, no local records.	No
Falco hypoleucos	Grey Falcon	V	Arid and semi-arid zones. In NSW, found chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. Shrubland, grassland and wooded watercourses, occasionally in open woodlands near the coast, and near wetlands.	0	No – the subject land is located outside of the main distribution for this species, no local records.	No

Grantiella picta	Painted Honeyeater	V	Widely distributed in NSW, predominantly on the inland side of the Great Dividing Range but avoiding arid areas. Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests.	0	Unlikely – no suitable habitat present on site for this species, no local records.	No
Heleioporus australiacus	Giant Burrowing Frog	V	South eastern NSW and Victoria, in two distinct populations: a northern population in the sandstone geology of the Sydney Basin as far south as Ulladulla, and a southern population occurring from north of Narooma through to Walhalla, Victoria. Heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based.	0	Unlikely – no suitable habitat present on site for this species, no local records.	No
Hirundapus caudacutus	White- throated Needletail	Μ	All coastal regions of NSW, inland to the western slopes and inland plains of the Great Divide. Occur most often over open forest and rainforest, as well as heathland, and remnant vegetation in farmland.	0	Unlikely – no suitable habitat present on site for this species, no local records.	No
Hoplocephalus bungaroides	Broad-headed Snake	V	Largely confined to Triassic and Permian sandstones within the coast and ranges in an area within approximately 250 km of Sydney. Dry and wet sclerophyll forests, riverine forests, coastal heath swamps, rocky outcrops, heaths, grassy woodlands.	0	Unlikely – no suitable habitat present on site for this species, no local records.	No
Lathamus discolor	Swift Parrot	CE	Migrates from Tasmania to mainland in Autumn-Winter. In NSW, the species mostly occurs on the coast and south west slopes. Box-ironbark forests and woodlands.	218	Potential – some suitable foraging habitat (ie. feed trees) present on site.	Yes
Litoria aurea	Green and Golden Bell Frog	V	Since 1990, recorded from ~50 scattered sites within its former range in NSW, from the north coast near Brunswick Heads, south along the coast to Victoria. Records exist west to Bathurst, Tumut and the ACT region. Marshes, dams and stream-sides,	0	Unlikely – potential habitat highly degraded, no local records.	No
			particularly those containing <i>Typha</i> spp. (bullrushes) or <i>Eleocharis</i> spp. (spikerushes). Some populations occur in highly disturbed areas.			

			Permanent or ephemeral Black Box/Lignum/Nitre Goosefoot swamps, Lignum/Typha swamps and River Red Gum swamps or billabongs along floodplains and river valleys. Also found in irrigated rice crops.			
Monarcha melanopsis	Black-faced Monarch	Μ	In NSW, occurs around the eastern slopes and tablelands of the Great Divide, inland to Coutts Crossing, Armidale, Widden Valley, Wollemi National Park and Wombeyan Caves. It is rarely recorded farther inland. Rainforest, open eucalypt forests, dry sclerophyll forests and woodlands, gullies in mountain areas or coastal foothills, Brigalow scrub, coastal scrub, mangroves, parks and gardens.	0	Unlikely – habitat isolated and degraded, no local records.	No
Monarcha trivirgatus	Spectacled Monarch	Μ	Coastal eastern Australia south to Port Stephens in NSW. Mountain/lowland rainforest, wooded gullies, riparian vegetation including mangroves.	0	Unlikely – habitat isolated and degraded, no local records.	No
Motacilla flava	Yellow Wagtail	Μ	Regular summer migrant to mostly coastal Australia. In NSW recorded Sydney to Newcastle, the Hawkesbury and inland in the Bogan LGA. Swamp margins, sewage ponds, saltmarshes, playing fields, airfields, ploughed land, lawns.	0	Unlikely – habitat highly degraded, no local records.	No
Myiagra cyanoleuca	Satin Flycatcher	Μ	In NSW, widespread on and east of the Great Divide and sparsely scattered on the western slopes, with very occasional records on the western plains. Eucalypt-dominated forests, especially near wetlands, watercourses, and heavily-vegetated gullies.	0	Unlikely – no suitable habitat present on site for this species, no local records.	No
Numenius madagascariensis	Eastern Curlew	CE, M	Summer migrant to Australia. Primarily coastal distribution in NSW, with some scattered inland records. Estuaries, bays, harbours, inlets and coastal lagoons, intertidal mudflats or sandflats, ocean beaches, coral reefs, rock platforms, saltmarsh, mangroves, freshwater/brackish lakes, saltworks and sewage farms.	0	Unlikely – no suitable habitat present on site for this species, no local records.	No
Petauroides volans	Greater Glider	V	Eastern Australia, from the Windsor Tableland in north Queensland through to central Victoria (Wombat State Forest). Eucalypt forests and woodlands. It is typically found in highest	0	Unlikely – no suitable habitat present on site for this species, no local records.	No

			abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows.			
Petrogale penicillata	Brush-tailed Rock-wallaby	V	In NSW they occur from the Qld border in the north to the Shoalhaven in the south, with the population in the Warrumbungle Ranges being the western limit. Rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges.	0	Unlikely – no suitable habitat present on site for this species, no local records.	No
Phascolarctos cinereus	Koala	V	In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. There are sparse and possibly disjunct populations in the Bega District, and at several sites on the southern tablelands. Eucalypt woodlands and forests.	352	Unlikely – small number of feed trees on site, most young. Site is isolated in a highly urbanised landscape making reaching these trees a difficult and unlikely task.	No
Pluvialis fulva	Pacific Golden Plover	Μ	Regular widespread summer migrant to Australia, including coastal NSW, Lord Howe and Norfolk Island. Estuaries, mudflats, saltmarshes, mangroves, rocky reefs, inland swamps, ocean shores, paddocks, sewage ponds, ploughed land, airfields, playing fields.	2	Unlikely – potential habitat highly degraded.	No
Pseudomys novaehollandiae	New Holland Mouse	V	Fragmented distribution across eastern NSW. Open heathlands, woodlands and forests with a heathland understorey, vegetated sand dunes.	0	Unlikely – no suitable habitat present on site for this species, no local records.	No
Pteropus poliocephalus	Grey-headed Flying-fox	V	Along the eastern coast of Australia, from Bundaberg in Qld to Melbourne in Victoria. Subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	175	Potential – feed trees present on site.	Yes
Rhipidura rufifrons	Rufous Fantail	Μ	Coastal and near coastal districts of northern and eastern Australia, including on and east of the Great Divide in NSW. Wet sclerophyll forests, subtropical and temperate rainforests. Sometimes drier sclerophyll forests and woodlands.	0	Unlikely – no suitable habitat present on site for this species, no local records.	No
FLORA						

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Acacia bynoeana	Bynoe's Wattle	V	Found in central eastern NSW, from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains. Heath or dry sclerophyll forest on sandy soils.	0	No – not identified during survey, the subject land has been significantly disturbed, no local records.	No
Acacia pubescens	Downy Wattle	V	Restricted to the Sydney region around the Bankstown- Fairfield-Rookwood and Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon. Open woodland and forest, including Cooks River/Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland. Occurs on alluviums, shales and at the intergrade between shales and sandstones.	1	No – not identified during survey, the subject land has been significantly disturbed.	No
Allocasuarina glareicola	-	Ε	Primarily restricted to the Richmond (NW Cumberland Plain) district, but with an outlier population found at Voyager Point, Liverpool. Castlereagh woodland on lateritic soil. Found in open woodland with Eucalyptus parramattensis, Eucalyptus fibrosa, Angophora bakeri, Eucalyptus sclerophylla and Melaleuca decora.	0	No – not identified during survey, the subject land has been significantly disturbed, no local records.	No
Caladenia tessellata	Thick Lip Spider Orchid	V	Currently known from two disjunct areas; one population near Braidwood on the Southern Tablelands and three populations in the Wyong area on the Central Coast. Grassy sclerophyll woodland on clay loam or sandy soils, or low woodland with stony soil.	0	No – not identified during survey, the subject land has been significantly disturbed, no local records.	No
Cryptostylis hunteriana	Leafless Tongue Orchid	V	In NSW, recorded mainly on coastal and near coastal ranges north from Victoria to near Forster, with two isolated occurrences inland north-west of Grafton. Coastal heathlands, margins of coastal swamps and sedgelands, coastal forest, dry woodland, and lowland forest.	0	No – not identified during survey, the subject land has been significantly disturbed, no local records.	No
Cynanchum elegans	White- flowered Wax Plant	E	Restricted to eastern NSW, from Brunswick Heads on the north coast to Gerroa in the Illawarra region, and as far west as Merriwa in the upper Hunter River valley. Dry rainforest; littoral rainforest; <i>Leptospermum laevigatum-Banksia integrifolia subsp. integrifolia</i> (Coastal Tea-tree– Coastal Banksia) coastal	0	No – not identified during survey, the subject land has been significantly disturbed, no local records.	No

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			scrub; <i>Eucalyptus tereticornis</i> (Forest Red Gum) or <i>Corymbia</i> maculata (Spotted Gum) open forest and woodland; and <i>Melaleuca armillaris</i> (Bracelet Honeymyrtle) scrub.		
Eucalyptus scoparia	Wallangarra White Gum	V	In NSW it is known from only three locations near Tenterfield. Open eucalypt forest, woodland and heaths on well-drained granite/rhyolite hilltops, slopes and rocky outcrops, typically at high altitudes.	1	No – not identified No during survey, the subject land has been significantly disturbed.
Genoplesium baueri	Bauer's Midge Orchid	E	Has been recorded from locations between Nowra and Pittwater and may occur as far north as Port Stephens. Dry sclerophyll forest and moss gardens over sandstone.	0	No – not identified No during survey, the subject land has been significantly disturbed, no local records.
Grevillea parviflora subsp. parviflora	Small-flower Grevillea	V	Sporadically distributed throughout the Sydney Basin and in the Hunter in the Cessnock - Kurri Kurri area. Also known from Putty to Wyong and Lake Macquarie on the Central Coast. Heath and shrubby woodland to open forest on sandy or light clay soils usually over thin shales.	6	No – not identified No during survey, the subject land has been significantly disturbed.
Leucopogon exolasius	Woronora Beard-heath	V	Upper Georges River area and in Heathcote National Park. Woodland on sandstone.	1	No – not identified No during survey, the subject land has been significantly disturbed.
Melaleuca deanei	Deane's Paperbark	V	Ku-ring-gai/Berowra area, Holsworthy/Wedderburn area, Springwood (in the Blue Mountains), Wollemi National Park, Yalwal (west of Nowra) and Central Coast (Hawkesbury River) areas. Heath on sandstone.	0	No – not identified No during survey, the subject land has been significantly disturbed, no local records.
Persicaria elatior	Knotweed	V	In south-eastern NSW recorded from Mt Dromedary, Moruya State Forest near Turlinjah, the Upper Avon River catchment north of Robertson, Bermagui, and Picton Lakes. In northern NSW known from Raymond Terrace (near Newcastle) and the Grafton area (Cherry Tree and Gibberagee State Forests). Beside streams and lakes, swamp forest or disturbed areas.	0	No – not identified No during survey, the subject land has been significantly disturbed, no local records.

Persoonia hirsuta	Hairy Geebung	E	Scattered distribution around Sydney, from Singleton in the north, along the east coast to Bargo in the south and the Blue Mountains to the west. Sandy soils in dry sclerophyll open forest, woodland and heath on sandstone.	3	No – not identified during survey, the subject land has been significantly disturbed.	No
Persoonia nutans	Nodding Geebung	Ε	Restricted to the Cumberland Plain in western Sydney, between Richmond in the north and Macquarie Fields in the south. Northern populations: sclerophyll forest and woodland (Agnes Banks Woodland, Castlereagh Scribbly Gum Woodland and Cooks River / Castlereagh Ironbark Forest) on aeolian and alluvial sediments. Southern populations: tertiary alluvium, shale sandstone transition communities and Cooks River / Castlereagh Ironbark Forest.	21	No – not identified during survey, the subject land has been significantly disturbed.	No
Pimelea curviflora var. curviflora	-	V	Confined to the coastal area of the Sydney and Illawarra regions between northern Sydney and Maroota in the north-west and Croom Reserve near Albion Park in the south. Woodland, mostly on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes.	0	No – not identified during survey, the subject land has been significantly disturbed, no local records.	No
Pimelea spicata	Spiked Rice- flower	E	Two disjunct areas; the Cumberland Plain (Marayong and Prospect Reservoir south to Narellan and Douglas Park) and the Illawarra (Landsdowne to Shellharbour to northern Kiama). Well-structured clay soils. <i>Eucalyptus moluccana</i> (Grey Box) communities and in areas of ironbark on the Cumberland Plain. Coast Banksia open woodland or coastal grassland in the Illawarra.	844	No – not identified during survey, the subject land has been significantly disturbed.	No
Pomaderris brunnea	Brown Pomaderris	V	In NSW, found around the Colo, Nepean and Hawkesbury Rivers, including the Bargo area and near Camden. It also occurs near Walcha on the New England tablelands. Moist woodland or forest on clay and alluvial soils of flood plains and creek lines.	113	No – not identified during survey, the subject land has been significantly disturbed.	No
Pterostylis gibbosa	Illawarra Greenhood	Ε	Known from a small number of populations in the Hunter region (Milbrodale), the Illawarra region (Albion Park and Yallah) and the Shoalhaven region (near Nowra). Open forest or woodland, on flat or gently sloping land with poor drainage.	0	No – not identified during survey, the subject land has been significantly disturbed, no local records.	No

Pterostylis saxicola	Sydney Plains Greenhood	Ε	Restricted to western Sydney between Freemans Reach in the north and Picton in the south. Small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines, adjacent to sclerophyll forest or woodland on shale/sandstone transition soils or shale soils.	284	No – not identified during survey, the subject land has been significantly disturbed.	No
Rhizanthella slateri	Eastern Australian Underground Orchid	E	In NSW, currently known from fewer than 10 locations, including near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wiseman's Ferry area, Agnes Banks and near Nowra. Sclerophyll forest in shallow to deep loams.	0	No – not identified during survey, the subject land has been significantly disturbed, no local records.	No
Rhodamnia rubescens	Scrub Turpentine	-	Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils.	0	No – not identified during survey, the subject land has been significantly disturbed, no local records.	No
Syzygium paniculatum	Magenta Lilly Pilly	V	Only in NSW, in a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest. Subtropical and littoral rainforest on gravels, sands, silts and clays.	21	No – not identified during survey, the subject land has been significantly disturbed.	No
Thelymitra kangaloonica	Kangaloon Sun Orchid	CE	Only known to occur on the southern tablelands of NSW in the Moss Vale / Kangaloon / Fitzroy Falls area at 550-700 m above sea level. Swamps in sedgelands over grey silty grey loam soils.	0	No – not identified during survey, the subject land has been significantly disturbed, no local records.	No
Thesium australe	Austral Toadflax	V	In eastern NSW it is found in very small populations scattered along the coast, and from the Northern to Southern Tablelands. Grassland on coastal headlands or grassland and grassy woodland away from the coast.	0	No – not identified during survey, the subject land has been significantly disturbed, no local records.	No

Appendix D: Staff CVs



Diane Campbell SENIOR ECOLOGIST

I have undertaken extensive work in the management of teams in biodiversity conservation, planning and ecology for more than 25 years in the local and state government sector and four years in consulting. I have a strong appreciation of current and historic biodiversity conservation, local government and Crown lands land management legislation, policy and methods. I am an Accredited Biodiversity Method Assessor and a BioBanking Assessor. I developed a BioBanking program for Hornsby Shire Council, established several BioBanking Agreement sites, developed a suite of additional sites ready for establishment as Biodiversity Stewardship Sites, and built capacity for their ongoing establishment and management within the team. My expertise is in biodiversity conservation and ecology are complemented by extensive knowledge and skills in local government plans of management and natural resource management programs, as well as experience in implementing environmental projects throughout a range of disciplines. I have experience working across NSW including recent projects with Roadside Vegetation Survey, Mapping, Education and Booklet for Moree Plains Shire Council, the update of the Bathurst Regional Council's Vegetation Management Plan and BDAR feasibility study for the Mount Panorama Second Circuit Track.

QUALIFICATIONS

Bachelor of Science, University of Sydney Accredited Biodiversity Assessment Method Assessor Accredited Biobank Assessor Certificate IV in Contract ManagementAWARDS Centenary Medal for Services to the Environment

RELEVANT PROJECTS

Biodiversity Assessment Method (BAM), Biobanking and Offsets

Mount Tootie Bilpin, Biodiversity Stewardship Site Feasibility Western Sydney University Stage 6 Masterplan Biodiversity Development Assessment Report (BDAR) Aquatic Drive Kiama Subdivision BDAR, Easts Beach Phillip Street Sydney BDAR Waiver/ diurnal bat roost search O'Briens Road, Cattai Preliminary BDAR / ecological constraints assessment Percy Street, Auburn BDAR Waiver and Diurnal Bat Roost Search Lane Cove Council Golf Course and Recreation Centre BDAR Horsley Drive BDAR Fort Street School BDAR 74 Edinburgh Rd, Marrickville, BAM plots, BDAR Waiver and Diurnal Bat Roost Search Glenlee Biodiversity Stewardship Site Feasibility, SADA Services Vegetation Offsets Guide, Sydney Water Kingswood Hospital BDAR Waiver

- Ecological Constraints Due Diligence Chittick Lane Cobbitty BAM plots and credit calculations for Biodiversity Development Assessment Report (BDAR) and Biodiversity Stewardship Site Report (BSSAR), Hixson Pty Ltd
- Preliminary BDAR and BSAAR credit calculations for Elizabeth Drive, Badgerys Creek Stages 2-4, Elizabeth Drive Enterprises
- BDAR Waiver and Flora and Fauna Assessment Parramatta West Public School, NSW Department of Education
- BDAR 415 Boundary Road, Maraylya, Turnbull International Planning
- Preliminary Scoping Analysis Biodiversity Offsets Scheme for Mt Panorama Second Circuit, Bathurst Regional Council
- BAM Quadrats 27 Jennifer Street, Little Bay, St Michaels Golf Course
- BAM Quadrats and Targeted Searches Redbank Southern Valley Precinct and Community Shopping Precinct, Redbank Communities
- Campbelltown Offsets Policy and Calculator, Campbelltown City Council
- Springwood Land Holdings Constraints Mapping and Biodiversity Credits, Diocese of Parramatta
- St Columbas High School and St Thomas Aquinas Primary School Biobanking Feasibility Report, Diocese of Parramatta
- Vegetation Offset Plan for Federation Forest Mount Druitt, Blacktown City Council
- Upper Pyes Creek and New Farm Road Biobanking Agreement and Credit Sales, Hornsby Shire Council

Dog Pound Creek Biobanking Agreement and Credit Sales, Hornsby Shire Council Green Offsets Policy Development, Review and Implementation, Hornsby Shire Council M2 Upgrade Biodiversity Offset Proposals to Leightons Construction, Hornsby Shire Council Biobanking Expression of Interest, Hornsby Shire Council

- NorthConnex Tunnel Council and Joint Venture Partners Commitment for Biodiversity Offsets and Community Report, Hornsby Shire Council
- Galston Park Biobanking Community Report, Hornsby Shire Council

Ecological and Environmental Impact Assessments and Planning reviews

Franlee Road, Dural, Ecological Impact Assessment (Christ the Redeemer Church)

37 MCarrs Creek Road Church Point, Ecological Impact Assessment (B& C Kneirem)

Mitchells Road Coolongolook, Ecological Impact Assessment (Brewster Murray)

The Maltings Mittagong (Halcyon Hotels) Ecological Constraints Report

Northern Metropolitan Cemetery Ecological Planning Proposal Report, Northern Cemeteries Trust Orchard Hills Biodiversity Planning Review, Legacy Property

- Campbelltown Council In-house Consultant (Campbelltown City Council) in-house consultant for
 2 years to review ecological, contamination, bushfire, wastewater and other impacts of
 development applications, planning proposals, biobanking statements and biocertification.
 Prepared submissions on Coastal Management SEPP, Biodiversity Conservation Regulation,
 input to land acquisition policy.
- Anglicare Village Pembroke Road, Minto Ecological Constraints and Impact Assessment Report (Midson Group) incl. targeted koala surveys, Cumberland Plain land Snail surveys, Cumberland Plain Woodland and River-flat Eucalypt forest EECs.
- St Peter and St Pauls Assyrian School, Cecil Park Ecological Impact Assessment Report (PMDL Planning)

- Biodiversity Assessment Tallawong Road Rouse Hill (Metro Award and Tallawong Pty Ltd) including Cumberland Plain Woodland and threatened microbat species.
- Biodiversity Assessment 44 Cudgeong Road, Rouse Hill (Metro Award) including Cumberland Plain Woodland and threatened microbat species.
- Biodiversity Assessments 10 Advance Street and 5 Schofields Road, Schofields (ARK built Investments Pty Ltd) including Cumberland Plain Woodland, River-flat Eucalypt Forest and threatened microbat species.
- Craigend Road, Leura Ecological Impact Assessment Report and Vegetation Management Plan (John Stuart)
- Ecological Study and Review of Environmental Factors Parramatta Footbridge (Bonacci Infrastructure) including Mangrove and threatened microbat species.
- Review of Environmental Factors and Ecological Impact Assessment Repair of Peter Parade Levee (Parramatta Council) including River-flat Eucalypt Forest and threatened microbat species.
- Statement of Environmental Effects and Fauna Assessment for Dual Occupancy Pendle Hill (Aruna Bellach) undertook fauna and environmental investigations and prepared SEE.
- 70 McCarrs Creek Road Ecological Impact Assessment Report and Biodiversity Management Plan (James de Soyres and assocs.)
- 169 Forest Way, Belrose Update of Road Ecological Impact Assessment Report and Biodiversity Management Plan (Japara Healthcare)
- Review of Environmental Factors for Bar Island Restoration, Hawkesbury River (Hornsby Shire Council) - Prepared the REF for the restoration of the heritage chimney, graves and memorial on Bar Island a naturally vegetated remote island in the Hawkesbury estuary.
- South Dural Planning Proposal (Hornsby Shire Council) Responsible for review of initial South Dural Planning Proposal and input to Council reports.
- Hornsby Mountain Bike Trail (Hornsby Shire Council) Responsible for consultants preparing a range of studies and a Review of Environmental Factors for the mountain bike track and for the Council approval report and environmental controls.
- Hornsby Housing Strategy (Hornsby Shire Council) Prepared consultant brief, worked with strategic planners and consultants and reviewed study on constraints mapping of vegetation for the Hornsby Housing Strategy
- Cherrybrook Station Urban Precinct (Hornsby Shire Council) Responsible for submissions to station precinct planning and urban release planning regarding the conservation of endangered ecological communities, water quality and riparian connectivity and walking track linkages.
- Bush Fire Environmental impact assessments (Hornsby Shire Council) Approved REFs and Part V assessments prepared by staff for hazard reduction burns and fire trail upgrades.
- Warriewood Valley Urban Land Release (Pittwater Council) Responsible for input to the ecological, water management and infrastructure studies, preparation of Section 94 Plan for Bushfire Trail, member Section 94 Committee for the Warriewood Valley and input to the Valley Masterplan.
- Warriewood Wetlands Burn (Pittwater Council) Prepared a assessment of response of wetland flora species to fire as part of the Review of Environmental Factors for the burn that removed a large area of dead aquatic woody weed previously treated as part of the restoration plan.
- Environmental Impact Report for Television and Radio Satellites Lord Howe Island (National Parks and Wildlife Service) - Prepared the Environmental Impact Report for radio and television

satellites including multicriteria analysis of levels of service, coverage, cost and impacts on flora and fauna.

Review of Public Submissions Report and Recommendation for Communications Tower – Morton National Park (National Parks and Wildlife Service) –Prepared the public submissions report following exhibition of the Public Environment Report for Commonwealth tower in Morton National Park.

Vegetation Surveys and Restoration

- Vegetation Management Plan for Peter Parade Flood Levee Repair Works, Old Toongabbie Creek, city of Parramatta
- Report for Vegetation Bonds Release for Exotic Nurseries Old Northern Road Dural, Exotic Nurseries

Flora and Fauna Assessment Report including *Xanthosia scopulicola* for East Station Upgrade of the Scenic World Skyway, Katoomba, Scenic World

Scenic World Katoomba Constraints Report, Vegetation Survey and Mapping, Scenic World Review of Endangered Ecological Community Mapping, Hornsby Shire Council

- Commissioned Study of Vegetation Communities of Hornsby Shire and inclusion into LEP and DCP, Hornsby Shire Council
- Vegetation Condition Analysis and Ranking Study of Hornsby Shire, Hornsby Shire Council Conservation Significance Assessment Map, Hornsby Shire Council
- Urban Remnant Vegetation Study in Hornsby Shire, GIS Maps and incorporation into DCP, Hornsby Shire Council
- Southern Rural Remnant Vegetation in Hornsby Shire, GIS Maps and incorporation into DCP, Hornsby Shire Council
- Land Rationalisation and Acquisition, Assessment of Vegetation on Council Land, Hornsby Shire Council
- Vegetation survey of Yengo National Park proposal, National Parks and Wildlife Service Survey of Cudmirrah Nature Reserve Proposal, National Parks and Wildlife Service
- Delivery and Review of Contract Bushland Restoration Program (Hornsby Shire Council)
- Delivered Contract bushland restoration program (Pittwater Council)

Delivered regional noxious weed and feral animal control programs (Hornsby Council)

- Phytophthora and Myrtle Rust Management Action Plans (Hornsby Council)
- Aboriginal Land Claims (National Parks and Wildlife Service) Assessed vegetation on ALCs throughout NSW.
- Investigation of Aboriginal Land Claims at Moonbi (National Parks and Wildlife Service)
- Investigation of the Colonel Nature Reserve Proposal at Aberdeen NSW (National Parks and Wildlife Service)
- Northern Wheatbelt NSW Vegetation Survey (National Parks and Wildlife Service) member of the team mapping vegetation and undertaking field surveys of native vegetation.

Biodiversity Planning and Conservation

Bellingen Biodiversity Strategy, Bellingen Shire Council Biodiversity Framework and Action Plan, Canada Bay Council Bathurst Regional Council Updated Vegetation Management Plan, Bathurst Regional Council Moree Plains Roadside Vegetation Mapping, Glovebox Guide, Training and Construction Documentation, Moree Plains Shire Council Acquisition of 74ha of Bushland from Department of Planning, Hornsby Shire Council Biodiversity Conservation Strategy, Program Implementation and Strategy/ Program Reviews, Hornsby Shire Council BioMap Project Council Submission, Hornsby Shire Council Habitat Connectivity, Incentives and Capacity Building Project, Hornsby Shire Council Restoration of Roadside Corridors, Hornsby Shire Council Warriewood Wetlands Acquisition Expert Statements, Pittwater Council Hamilton Estate Acquisition, Pittwater Council Ingleside Escarpment Acquisition Flora and Fauna Report and Heritage Analysis, Pittwater Council Bate Bay Masterplan and Studies, NPWS Submission to Department of Planning, National Parks and Wildlife Service Landscape Management Policy, Pittwater Council Pittwater Flora and Fauna Habitat and Corridor Conservation Strategy, Pittwater Council

Feral Animal Management Plan, Canterbury Bankstown Council

Wetlands, Catchment and waterway management

Tudar Road Wetland Plan of Management (Sutherland Shire Council) – Flora and fauna surveys, coordinated catchment hydrology and hydraulic modelling and assessment, community consultation and draft Plan of Management.

One Tree Reach Wetland (Hornsby Shire Council) - Vegetation surveys, obtained multiple grants for restoration and fencing, aquatic and terrestrial studies, land acquisition, investigation and mitigation of acid sulfate soils, bushland restoration, boardwalk construction and access, and plan of management preparation.

Hornsby Council Catchment Remediation Program (Hornsby Council) - Responsible for the CRR program that annually constructed wetlands, stormwater reuse, gross pollutant traps and management devices to the value of \$1.1m and maintained approximately 450 DRR devices to improve stormwater quality entering freshwater creeks and the Hawkesbury River.

Waterbird Study of Hornsby Shire (Hornsby Council) – Identified data gap, grant applications and responsible for staff overseeing the consultant study.

Old Dromana Wetland Fauna Survey Gwydir River Moree Plains (National Parks and Wildlife Service) – member of a small team undertaking fauna survey of the floodplain wetland.

Management of Warriewood Wetlands (Pittwater Council) – Responsible for consultants undertaking palynological study of wetland peat soils and preparing a weed management strategy. Responsible for contactor aquatic weed control and contract bush regeneration post burn, and Bushcare field days.

Management of Careel Bay Wetlands (Pittwater Council) – Responsible for wetland migratory bird and vegetation study, intertidal organisms study including mangroves encroachment into saltmarsh, study of water quality including leachate from former landfill and for saltmarsh relocation and contract and volunteer bush regeneration.

- Narrabeen Creek Constructed Wetland Warriewood (Pittwater Council) Responsible for the project to address stormwater quality through construction of a sediment basin, weed control and restoration of riparian habitat in the creek line corridor.
- Pittwater Estuary Management Study (Pittwater Council) responsible for management study of the Pittwater estuary.

Member of Narrabeen Lagoon Floodplain Management Committee Pittwater (Pittwater Council) Member of Pittwater Coastal Management Committee (Pittwater Council)

Pittwater Estuary Management Committee (Pittwater Council)

Member of Sydney Northern Beaches Catchment Management Committee - provided input to strategic plan and implementing actions

Representative on Coastal Committee of NSW (National Parks and Wildlife Service)

Representative on State Catchment Management Coordinating Committee (National Parks and Wildlife Service)

Threatened species management

- Saving Our Species (Office of Environment and Heritage) expert panel member for Blue Gum High Forest and Sydney Turpentine Ironbark Forest SOS programs
- Threatened Species and Vegetation Management Plan for Rex Road Georges Hall (APP Corporation) – prepared plan to conserve and manage Pimelea spicata, Cumberland Plain Woodland and potential habitat for Cumberland Plain Land Snail retained in two Conservation Areas as part of Donington Gardens Stage 2 seniors living.
- Dural Woodland Snail Commonwealth Endangered Species Listing (Hornsby Shire Council) -Submission on Commonwealth listing of the Dural Land Snail (Pommerhelix duralensis).
- Recovery Team for Blue Gum High Forest (Australian Government) recovery team member for Draft Recovery Plan for Critically Endangered Ecological Community (EPBC Act).
- Recovery Team for Turpentine Ironbark Forest (Australian Government) recovery team member for Draft Recovery Plan Critically Endangered Ecological Community (EPBC Act).
- Recovery Plan for Zieria involucrata (Hornsby Shire Council) Input to draft and implementation of Recovery Plan incl field investigations, liaising with OEH, private landholders and Aboriginal community, Council submission, installing roadside signs and providing on-site information to Works staff undertaking road upgrades.
- Recovery Plan for Asterolasia elegans (Hornsby Shire Council) Input to the Recovery Plan, field investigations with OEH, contributions including the need for ex situ seed bank for the species due to vulnerability to wildfire.
- Darwinia biflora UTS Offset Project (Hornsby Shire Council) Provided offset sites at Mount Colah and North Epping for Darwinia biflora to offset its loss from a housing development at UTS Lindfield.
- Priority Action Statement 2 for Persoonia mollis var. maxima (Hornsby Shire Council) –Contributed to draft PAS2 as part of expert group.
- Hibbertia sp. Turramurra (Hornsby Shire Council) Contributed to conservation plan for new species Hibbertia sp. Turramurra
- Survey of threatened species Ooline (Cadelia pentastylis) (National Parks and Wildlife Service) member of the team undertaking rare plant surveys including soil sampling, vegetation and invertebrates.

Threatened Species Management Plan (Pittwater Council) – Responsible for commissioning the plan. Used the plan to prepare the Biodiversity Development Control Plan for Pittwater.

Community Survey of Koalas, Squirrel Glider and Long-nosed Bandicoot (Pittwater Council)

Project SAFE Saving Animals from Extinction (Pittwater Council) – Developed a joint project for fauna conservation with Taronga Zoo.

Established and Managed Threatened Species Unit (National Parks and Wildlife Service) – following the introduction of new threatened species legislation in NSW.

Plans of Management

Riverglade Reserve Crown Land Plan of Management Hunters Hill Council Sophia Park Wetland Plan of Management, Shellharbour Council Draft Tudar Road Wetland Plan of Management, Sutherland Shire Council Generic Plans of Management for 600 Reserves Community and Crown Land, Hornsby Council Bar Island Plan of Management, Hornsby Council One Tree Reach Studies Coordination and Plan of Management, Hornsby Council Old Mans Valley Plan of Management, Natural Areas, Land Categories and Mountain Bike Tracks, Hornsby Council Specific Plans of Management - Angophora Reserve, McKay Reserve, Stapleton Park, Irrawong

Reserve, Warriewood Wetlands (Volumes 1 & 2), Careel Bay Wetlands, Pittwater Council Urban Bushland Plan of Management, Vegetation and Fauna Overview and Inventory and Action Plan, Pittwater Council

Recreation planning and management

Westleigh Natural Area and Mountain Bike Track Review (Hornsby Shire Council)
 Ecological Feasibility Study - Warrimoo Mountain Bike Trail (Ku-ring-gai Council) – study to assess reopening of trail, incl. field work, Plant Community Types, impact assessment and mitigation with Council staff and Mountain Bike Track builder, and report including IMBA standards and community Trailcare program for construction and maintenance of track.

Hornsby Mountain Bike Trail (Hornsby Shire Council): Responsible for staff and consultant studies to establish mountain bike trail in the Hornsby Shire including extensive stakeholder engagement, scoping and detailed studies and overseeing the construction, establishment and management of the trail. Responsible for commissioning a second REF, trail designs and tender to relocate trial as a result of project to deliver NorthConnex tunnel spoil to the Hornsby Quarry.

- Hornsby Heritage Steps Responsible for staff that delivered the significant heritage restoration grant project. Ensured that the major construction job was staged to match staff capability and WHS considerations with movement of 100 tonne of rock by helicopter to man-handled receiving sites in an inaccessible forest location with high potential for branch drop. Negotiated NPWS staff assistance to coordinate the helicopter including loading of the rock.
- Bushwalking Masterplan, Guided Walks and Microsite (Hornsby Shire Council) Responsible for development of a tracks program and masterplan. Identified and prepared successful funding proposals for the \$10m program from the Special Rate Variation and the Section 94 Developer Contributions and staff prepared grant applications. Responsible for delivery of the track

construction and signage, for expansion of the free guided walks program and major contributions to the 'Discover Hornsby' microsite GIS maps and text.

One Tree Reach Public Facilities (Hornsby Shire Council) – Obtained grants responsible for staff who project managed construction of the boardwalk, forest walk, car park, seats, tables and signage.

Bar Island Jetty, Boardwalk and Track Construction, Hornsby Shire Council)

Warriewood Wetlands Boardwalk (Pittwater Council)

Careel Bay Boardwalk (Pittwater Council)

Irrawong Reserve Boardwalk (Pittwater Council)

Bicentennial Coastal Walkway and Rock Fall Management (Pittwater Council)

Bush fire management

- Bush Fire Management and Fire Trail Upgrades (Hornsby Shire Council) Member of the Hornsby Ku-rg-gai Bush Fire Management Committee, undertook strategic review, expansion and scheduling of Asset Protection Zones (APZs) and maintenance of APZs and fire trails on Council managed land. Project managed grants for the environmental impact assessment and construction/ major upgrade of fire trails including Fraser Road, Bambil Hamley, Woodcourt, Old Mans Valley and Berkeley Trail upgrade with NPWS
- Service Level Agreement with the Rural Fire Service (Hornsby Shire Council) Negotiated then expired SLA with RFS transferring to RFS operational responsibility to prevent, suppress and mitigate fires, with Council retaining responsibility for assets and support services.
- Service Level Agreement with the Rural Fire Service (Pittwater Council) Negotiated SLA with RFS transferring to RFS operational responsibility to prevent, suppress and mitigate fires, with Council requiring leases of brigade buildings, whist retaining other responsibilities for assets and support.
- Hornsby Ku-ring-gai Bush Fire Risk Management Plan (Hornsby Shire Council) Input to the HK Bush Fire RMP 2010- 2015 and 2016 Hornsby Ku-ring-gai Bush Fire Management Plan
- Council Staff Bush Fire Fighter Training (Hornsby Council) Organised staff training in Bush Fire Awareness, Bush Fire Support and modules of Basic Bushfire Fighter modules.
- Warringah Pittwater Bush Fire Risk Management Plan (Hornsby Shire Council) Contributed to the threatened species section of the Warringah Pittwater Bush Fire Risk Management Plan 1997.
 Responsible for all bush fire matters including all Bush Fire Committees, responsible for fire brigade buildings, environmental impact assessment of burns, conducting ecological burns and pre and post fire weeding.
- Warriewood Valley Bushfire Trail Section 94 Plan (Pittwater Council) Responsible for the preparation of the Section 94 Plan for Developer Contributions for construction of the Bush Fire Trail for the Warriewood Valley Urban Land Release.

Heritage management

Mount Penang Natural Heritage Assessment, TDK Architects

Wisemans Cemetery Protection and Restoration - (Hornsby Shire Council) – Following the destruction of headstones by wildfire, developed and implemented NSW Heritage G\grant

project to restore historic graves in accordance with condition report, create an APZ, install a fire trail gate, restore fencing and undertake weed control in the cemetery.

- Plan of Management for Bar Island (Hornsby Shire Council) Plan of management preparation and implementation through multiple grants for restoration of the church chimney and graves, memorial, bush regeneration, APZ, reconstruction of the jetty, seats and signage, walking track upgrades and a boardwalk across the midden following liaison with the Aboriginal community.
- Aboriginal Cultural Heritage Management and Awareness Training (National Parks and Wildlife Advisory Committee)
- Hornsby Heritage Steps (Hornsby Shire Council) Responsible for the project that included detailed heritage inventory and works report and delivery of the step restoration including operational oversight, securing of grants and funding, safety management and project partners.
- Australian Natural Heritage Charter (Australian Government Department of the Environment) Member of Working Party to prepare the Australian Natural Heritage Charter to conserve places of natural heritage significance to complement the ICOMOS Charter for Places of Cultural Significance (the Burra Charter). Also working party member for Guidelines for the use of the Australian Natural Heritage Charter.

Natural resource management

- Northconnex EIS (Hornsby Shire Council) Reviewed and was responsible for part of submission to the EIS on the ecological impacts and impacts on water quality. Responsible for gaining agreement for Lend Lease Bouygues Joint Venture to offset loss of Blue Gum High Forest and Turpentine Ironbark Forest through purchasing biodiversity credits from the establishment of Biobanking sites in Waitara Creek and Arcadia/ Galston.
- Northconnex Quarry EIS (Hornsby Shire Council) Input to EIS submission on the ecological impacts.
- M2 Upgrade (Hornsby Shire Council) Input to EIS submission, negotiated elements of the purchase and temporary use of Council bushland for the project, managed pathogen control on the project site prior to handover to the construction contractor, and provided offset sites for the project's Biodiversity Offset Strategy. Developed a partnership project with Transurban to restore vegetation at a high-profile section of the M2 lease area with Council project managing bush regeneration contractors for Transurban, establishing a model for bushland restoration along the motorway lease.
- North West Rail Link (Hornsby Shire Council) Input to EIS submission on ecological impacts. Responsible for offsets (establishing biobanking sites on Council land), regular construction stakeholder meetings and issues including salvage of trees for reuse as bush furniture, topsoil translocation to Bushcare sites, and the fencing and subsequent planning for protection of a new species listed as threatened.
- Epping to Thornleigh Third Track (Hornsby Shire Council) Input to EIS submission on ecological impacts and worked with consultants on offsets (established biobanking sites on Council land), landscape management and tree management issues.
- Roadworks Construction Environmental Management Plans (CEMP) (Hornsby Council) Reviewed CEMPs for infrastructure projects within the Hornsby local government area.
- Established and Managed Hornsby Council Natural Resources Branch
- Established and Managed Pittwater Council Natural Resources Branch

Community consultation, engagement and education

- Bushland Management Advisory Committee (Hornsby Shire Council) Coordinated committee and prepared annual action plans, field trips and community engagement, including obtaining committee views on controversial and complex projects and support as lobbyists for project funding.
- Rural Lands Incentives Program and Land for Wildlife (Hornsby Shire Council) Designed and delivered key components of grant project that included site visits, environmental workshops, property planning courses and cash incentives for works and for managing land for biodiversity protection. Delivered sections of the property planning courses, reviewed and approved Management Plans and developed the incentives calculations and made payments to implement property plans for bushland restoration, native plants and fencing. Major contributor to the OEH publication *Environmental management on the urban fringe: property management plan 2008*. Signed up Hornsby Council as the first full Land for Wildlife partner in NSW. The project received an award from Local Government and Shires Associations Excellence in the Environment Awards for Biodiversity Conservation.
- Urban Habitat Restoration Gardens for Wildlife Grant Project (Hornsby Shire Council) Designed and implemented the workshop series that educated the community about endangered ecological plant communities and encouraged residents to participate in their conservation, targeting people with little or no previous involvement in environmental issues. The workshops gave residents free access to specific tailored scientific and environmental best practice information on wildlife management issues, environmentally friendly practices at home, living safely with large trees that form part of endangered ecological communities. The project expanded the Bushcare program and conducted site visits for residents attending the workshops providing specific advice on how to restore and manage their gardens land for wildlife conservation. The project received awards from Local Government and Shires Associations Excellence in the Environment Awards for Biodiversity Conservation and Keep Australia Beautiful - Biodiversity Conservation Award.
- Whole Farm Planning Course (Ryde TAFE) developed and taught a Whole Farm Planning Course for Ryde TAFE delivered over two years
- Bush Schools Grant Project (Hornsby Shire Council) Prepared Vegetation Management Plans for six schools to restore Sydney Turpentine Ironbark Forest endangered ecological community on the schools' grounds, linking actions to key curriculum outcomes and global reporting indicators and providing on ground restoration works, interpretive material, activities and signs.
- Bar Island Community Consultation (Hornsby Shire Council) Undertook extensive consultation with six Aboriginal groups, local historians and community members and worked with consultants undertaking the community consultation for the plan of management preparation.
- Community Nursery and Earthwise Cottage (Hornsby Shire Council) Identified the need and obtained grant for expansion and upgrades of the Hornsby Shire Community Nursery and Earthwise Cottage, including nursery upgrade and expansion and sustainable retrofit of the cottage as the home of Hornsby Bushcare. The Nursery won the Nursery and Garden Industry Association Award for the Best Government Nursery in NSW and the ACT and was one of four finalists for Best Government Nursery in Australia.

- Hornsby Bushcare (Hornsby Shire Council) Responsible for 600 volunteers, one of the largest Bushcare programs in Sydney. Review via a volunteer survey identified priorities including recruitment, need to be user friendly, and Group Leader workshops to explore further opportunities and prepare a strategic plan.
- Hornsby Trailcare (Hornsby Shire Council) Responsible for the Hornsby Trailcare Program that involved mountain bike trail Masterplan training for volunteers, developing an MOU with the Sydney North Off-Road Cyclists group, trail monitoring and audit and monthly work activities.
- Pittwater Bushcare (Pittwater Council) Responsible for review of Bushcare Policy, employment of casual Bushcare Coordinators, four Shire wide field events per year and coordination of approximately 200 volunteers.
- Project AWARE on the Rocks (Pittwater Council) Obtained grant with University of Sydney Institute of Marine Ecology to develop a community awareness program about intertidal rock platforms and measure human impacts and level of knowledge about the protected areas.
- Pittwater State of the Environment Report (Pittwater Council) responsible for preparation of the Pittwater State of the Environment Report.
- Policy Advisor to Minister for the Environment the Hon Tim Moore MP (National Parks and Wildlife Service) provided a wide variety of policy advice, provided speech notes for the World Heritage NSW Bill, liaised with all levels of government, lobby and stakeholder groups.
- Ministerial appointment as Member of NPWS Sydney North Region Advisory Committee (National Parks and Wildlife Service) appointed as a resident to the national parks advisory committee for four 3-year terms.
- Responsible for Coastal Environment Centre Narrabeen (Pittwater Council) environmental education facility delivering a wide range of programs to schools and the community.
- Community Environmental Education (Pittwater Council) Participated in community environmental education through appearing on Totally Wild and Channel 7 News
- Pittwater vegetation survey Native Plants for Your Garden (Pittwater Council) prepared booklet for community.
- Bushland Management Advisory Committee (Pittwater Council) Responsible for committee program
- McKay Reserve Management Committee (Pittwater Council) Responsible for committee
- Sydney Coastal Councils Group (Pittwater Council) Responsible for the management of the SCCG hosting arrangement and coordinating environmental interests of Councils in environmental management.
- Hosted Coastcare Coordinator (Pittwater Council) Responsible for the hosting of the Coastcare Coordinator for Newcastle to Wollongong Region.
- Hosted Environs Australia (Pittwater Council) Responsible for the hosting of Environs Australia a local government environment network, to establish a NSW chapter.
- Speaker Weeds Society of NSW Annual Workshop 2013, 2011
- Speaker Hornsby Bushcare Annual Workshops 2012-2015
- Speaker Sydney Olympic Park Wetlands Education 2011
- Ecopolitics Conference 2004 speaker
- Speaker SEDA Conference Workshops
- Speaker Endangered Fauna Conference
- Facilitator at the Pittwater Community Forum
- Trained NPWS staff in threatened species issues

Speaker at Insect Study Group of RZS Speaker for Malacology Society Speaker at NSW Entomological Society Facilitated and delivered training to outdoor staff at Forestry Commission

Forest survey and research

Research into Bullseye borer (Tryphocaria acanthocera) as a vector for microbial infection in Eucalyptus spp. (Forestry Commission of NSW)

- Survey of forest pest species Ips grandicollis in actively harvested Pinus radiata forests across NSW (Forestry Commission of NSW)
- Review of effectiveness of biological control agents for Lantana camara (Forestry Commission of NSW)
- Preliminary survey of Platypodid beetle Austroplatypus incompertus attack in Blackbutt E pilularis forests (Forestry Commission of NSW)
- Investigation of microlepidopteran leaf miners in a Eucalypt forest (Forestry Commission of NSW)

Reports and publications

- Marynissen, P and Campbell, D 2006 Rural lands incentives program and gardens for wildlife In: Preston, C, Watts, JH and Crossman, ND 15th Australian Weeds Conference: Managing Weeds in a Changing Climate, Adelaide, 24-28 September 2006.
- Campbell, D. 2009 Vegetation Conservation in Hornsby Shire Australian Plant Conservation Journal Vol18:3, Canberra.
- Campbell, D 2006 Biodiversity Conservation Strategy for the Hornsby Shire Report for Hornsby Shire Council, Hornsby.
- Department of Environment and Conservation 2004 Environmental management on the urban fringe: Property management plan - a framework for environmental management. Key contributor.
- Hornsby Council, July 2014 Proposal for a Biobank Site at Waitara Creek Upper Catchment -Community consultation report to grant an estate on Council land under Sn 47 Local Government Act. D Campbell author.
- Hornsby Council, July 2014 Draft Proposal for a Biobank Site at Galston Park Bushland Community consultation report to grant an estate on Council land under Sn 47 Local Government Act. D Campbell author.
- Hornsby Council, November 2013 Proposal for a Biobank Site at Upper Pyes Creek and New Farm
 Road Bushland Community consultation report to grant an estate on Council land under Sn
 47 Local Government. D Campbell author.
- Hornsby Council 2004 2008 Generic Plans of Management for Community Land and Crown Reserves Planning Districts 1, 2 3&9, 4, 5, 6, 7, 8 – D Campbell co-author.
- Hornsby Council, 2010, 2011, 2012, 2013, 2014, 2015 Bushland and Biodiversity Annual Reports D Campbell principal author
- Hornsby Council, 2014 and 2015 Natural Resources Branch Annual Reports D Campbell principal author

Hornsby Council 2007 Vegetation Management Plan for Turpentine Ironbark Forest at Glenorie Public School. Campbell, D. Report for Environmental Trust Grant

- Hornsby Council 2007 Vegetation Management Plan for Turpentine Ironbark Forest at Cherrybrook Technology High School. Campbell, D. Report for Environmental Trust Grant
- Hornsby Council 2007 Vegetation Management Plan for Turpentine Ironbark Forest at Normanhurst West School. Campbell, D. Report for Environmental Trust Grant
- Hornsby Council 2007 Vegetation Management Plan for Turpentine Ironbark Forest at Thornleigh West Public School. Campbell, D. Report for Environmental Trust Grant
- Hornsby Council 2007 Vegetation Management Plan for Turpentine Ironbark Forest at John Purchase Public School. Campbell, D. Report for Environmental Trust Grant
- Campbell, D. 1989 Environmental Impact Report for Lord How Island Television and Radio Satellites. Report to the Lord Howe Island Board.
- Crust, D. and Campbell, D. 1987 Inspection of 'The Colonel' Report on Flora and Fauna. For NSW National Parks and Wildlife Service.
- Benson, J, Andrews, D and Campbell, D 1986 Cudmirrah Sand Dunes Report on Flora and Fauna. For NSW National Parks and Wildlife Service.
- Campbell, D and Doherty, M 1984 Inspection of Aboriginal Land Claims at Moonbi. For NSW National Parks and Wildlife Service.

James King ECOLOGIST

James joined Eco Logical Australia in 2019 after graduating from the University of Sydney with a Bachelor of Environmental Systems (Hons) in 2018. Through his studies, James gained skills and experience in tree physiology assessments, hydrological studies and soil science analyses as well as spatial analysis and data management. James also received first class in his Honours thesis which centred around tree physiological analyses to investigate the role of water stress in causing a dieback event in the Monaro region of NSW.

Since being at ELA, James has been involved in a range of projects across multiple disciplines involving biodiversity mapping, data management and analyses, support for the preparation of Biodiversity Development Assessment Reports (BDAR), Review of Environmental Factors (REF), Vegetation Management Plans (VMP), mobile data collection design using ArcCollector and implementation of field survey using differential GPS (DGPS).

QUALIFICATIONS

Bachelor of Environmental Systems (Hons) (The University of Sydney, 2018) White Card (General Construction Induction Card)

EXPERIENCE

ECOLOGICAL ASSESSMENTS - LARGE SCALE SURVEY PREPARATION AND DATA MANAGEMENT/MAPPING

- Sydney Water Prospect to Macarthur Drought Response
- Humelink Ecological Assessment
- Edmondson Regional Park Survey Field surveys using a Trimble DGPS
- Sydney Swans Headquarter Works BDAR
- Northern Gateway Biocertification BDAR
- O'Connell St Caddens FFA, Bushfire and BDAR
- West Pennant Hills, Oratava Avenue BDAR
- Cowan Pole Replacement REF
- Great North Walk Campsite Upgrades REF
- Feeder 683, Clarence Access Track REF
- Withers Rd Fauna and Flora REF
- Ku-Rong Gai Rail Feeder REF
- Helensburg Sydney Trains Access Track REF

BUSHFIRE ASSESSMENTS

- Murrumbateman Bushfire Assessment
- Bringelly Business Hub
- Future Generation Exploratory Works 2 BMP

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

- Moorebank Underpass
- Tallawong Road Rouse Hill Sewer Lead-in

MAPPING

- Canada Bay updating Environmentally Sensitive and Biodiversity Land Maps
- Montara Class Action data analysis and map series preparation





